The DQ Plan

The Dungeness-Quilcene Water Resources Management Plan

A Plan Submitted to the
Department of Ecology under
The Chelan Agreement

June 30, 1994

Prepared by the
Jamestown S'Klallam Tribe,
Coordinating Entity for the
Regional Planning Group

This plan was prepared by the Jamestown S'Klallam Tribe for the Dungeness-Quilcene Water Resources Pilot Planning Project's Regional Planning Group. Funding for the DQ Project came through a special appropriation from the State of Washington, administered by the Department of Ecology Water Resource,, Program.

Under the Chelan Agreement, the task of the Regional Planning Group was to develop a regional water resources management plan for eastern Clallam and Jefferson Counties. For over two years, eight caucuses worked together planning for the water quality and quantity of the surface and ground waters of the region for the next twenty years.

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Appendices

List of Figures, Tables, and Maps

Figures

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Maps

Abbreviations: Terms

BMP's	Best Management Practices
CCWF	Department of Ecology's Centennial Clean Water Fund
cfs	Cubic feet per second
CRMP	Coordinated Resource Management and Planning
CWA	Federal Clean Water Act
CWSP	Coordinated Water Supply Plan
CZMA	Coastal Zone Management Act
CZARA	Coastal Zone Act Reauthorization Amendment of 1990
DEIS	Draft Environmental Impact Statement
DEM	Digital Elevation Model
DNS	Determination of Non-Significance (a possible result of S.E.P.A.)
EIS	Environmental Impact Statement (a possible requirement under S.E.P.A.)
ESA	Federal Endangered Species Act
FEMAT	Federal Forest Ecosystem Management Assessment Team
FTE	Full-time equivalent
FY	Fiscal Year
GIS	Geographic Information System
GMA	Washington State Growth Management Act
GPS	Global Positioning System
HPA	Hydraulic Project Approval
IFIM	Instream Flow Incremental Methodology
LOD / LWD	Large organic debris / Large woody debris
NAWQA	U.S. Geological Survey's National Water-Quality Assessment
NEPA	National Environmental Policy Act
NPDES	National Pollution Discharge Elimination System
mgd	Million gallons per day
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
ppm	Parts per million
PIE	Dept. of Ecology's Public Involvement and Education Fund
RCW	Revised Code of Washington
Ref. 38	Referendum 38 (Agricultural Water Supply Facilities)
RM	River mile, measured from mouth of river
SASSI	Washington Salmon and Steelhead Stock Inventory
SDWA	Safe Drinking Water Act
SEPA	State Environmental Policy Act
SHB	State House Bill
SMA	Shoreline Management Act
SWIS	Strategic Wetland Information System
TFW	Timber / Fish / Wildlife Agreement
TMDL	Total maximum daily loads
TWR	Washington Dept. of Ecology's Trust Water Rights program
WAC	Washington Administrative Code
WFP	Washington Forest Practices
WRIS	Dept. of Ecology's Water Rights Information System
WRIA.	Water Resource Inventory Area
WQA	Water Quality Act
WUA	Weighted usable area

Abbreviations: Organizations

BLM	United States Bureau of Land Management
CCDCD	Clallam County Department of Community Development
CCCD	Clallam County Conservation District
CD	Conservation District
DNR	Washington Department of Natural Resources
DOE	Washington Department of Ecology
DOH	Washington Department of Health
DOT	Washington Department of Transportation
DTCD	Washington Department of Trade and Community Development (formerly Dept. of Trade and Econ. Dvpmt. and Dept. of Community Dvpmt.)
DRAWMC	Dungeness River Area Watershed Management Committee
Ecology	Washington Department of Ecology
EES	Economic and Engineering Services
EPA	United States Environmental Protection Agency
ES	United States Fish and Wildlife Service, Ecological Services Office
FDA	United States Food and Drug Administration
FEMAT	Forest Ecosystem Management Assessment Team
FERC	Federal Energy Regulatory Commission
FPB	Forest Practices Board
HCCC	Hood Canal Coordinating Council
HCSMP	Hood Canal Salmon Management Plan
JCCD	Jefferson County Conservation District
XT (JST)	Jamestown S'Klallam Tribe
NOAA	National Oceanic and Atmospheric Administration
NOSC	North Olympic Salmon Coalition
NMFS	National Marine Fisheries Service
NFH	National Fish Hatchery
ONP	Olympic National Park
OPT	Olympic Peninsula Trust
OPF	Olympic Peninsula Foundation
PGKT (PGST)	Port Gamble S'Klallam Tribe
PUD	Public Utility District
PNPTC	Point No Point Treaty Council
PSCRBT	Puget Sound Cooperative River Basin Team
PSWQA	Puget Sound Water Quality Authority
QRD	United States Forest Service Quilcene Ranger District
RBT	Puget Sound Cooperative River Basin Team
RPG	Regional Planning Group
SCC	State Conservation Commission
SCS	United States Dept. of Agriculture Soil Conservation' ,Service
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USSCS	United States Department of Agriculture Soil Conservation Service
WDFW	Washington Department of Fisheries and Wildlife (formerly Dept. of Fisheries and Dept. of Wildlife)
WOS	Wild Olympic Salmon
WRF	Water Resources Forum
WSCC	Washington State Conservation Commission
WSU	Washington State University
WUCC	Water Utility Coordinating Committee
WW	Washington State University Cooperative Extension Water Watchers

The Regional Planning Group

The following is a list of delegates and alternate representatives of the DQ Caucuses. Clallam County representatives are on the left and Jefferson County on the right.

Agriculture
Roger Schmidt Roger Short
John Mansfield
Milton Griffing

Business
Kirk Gries Bart Phillips
Marguerite Glover Stan Cupp

Fisheries
Dick Goin Bruce Marston
Walt Blendermann Barbara Donovan
Dana Roberts

Environmental
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Virginia Clark Carol Volk
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Tribal Government
Ron Alien Steve Moddemeyer
Ann Seiter
Mike Reed

State Government
Dave McCraney Steve Keller
Tim Rymer

Local Government
Dave Cameron Julie McCulloch
Dave Johnston Richard Wojt

Dept. of Ecology
Doug Rushton

Technical Committee
Welden Clark

Ground Water Concerns
Eloise Kailin Rita Kepner (1992)

(see hard copy for picture)

Regional Planning Group May 24, 1994

DUNGENESS - QUILCENE WATER RESOURCES
PILOT PLANNING PROJECT

SIGNATURE PAPER

June 30, 1994

This Plan is forwarded to the Department of Ecology as recommendations and strategies developed to provide protection and management for the quality and quantity of the region's surface and ground-water. Any changes or revisions to the Plan will require the written approval of the Dungeness-Quilcene Regional Planning Group. This Signature Page indicates support for the Plan and Planning effort by the main RPG delegates involved. Recommendations in the Plan -which do not have full consensus are indicated within the chapters, and signing this does nothing to change the status of those recommendations.

Agriculture Caucus

Business Caucus

[illegible], Port Townsend Paper Corp.
[illegible] Clallam County   Marguerite A. Glover, Clallam

Environmental Caucus

Paula Mackrow - Jeffco   Steve Hayden - Jefferson Co.

Fish Caucus

Walter H. Blendermann Clallam
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Local Government Caucus

Julie McCulloch, Port Townsend   [illegible] Jeff. Co. BO
Dave Cameron Clallam Co   David Johnston. Sequim

Recreation Caucus

[illegible], Port Orchard
Virginia Clark

State Caucus

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Tribal Caucus

W. Ron Allen, Steve Moddlemeyer
Ann E. Seiter   Mike Reed

Technical Committee Co-Chair

[illegible]

Executive Summary

Executive Summary

This is the water resource management plan for the northeastern Olympic Peninsula, including east Clallam and east Jefferson Counties, developed under the Chelan Agreement. This Agreement recognized that *actions will be guided by the Tribes' objective to achieve an overall net gain of the productive capacity of fish and wildlife habitats and the State's related objective to accommodate growth in a manner which will protect the unique environment of the State.* The Chelan Agreement addressed the concerns of many different parties, and on the Olympic Peninsula diverse interests have worked together since early 1991 as a pilot project for the State, to design a water resource management plan which addresses the water needs of both wildlife and human inhabitants. The recommendations here were designed to increase instream flows and improve salmon runs, to provide more efficient management and use of water, and to protect the area's ground-water resources. *Nothing here authorizes the impairment of any treaty or other right of an Indian Tribe or members under Federal law.*

The eight caucuses designated under the Chelan Agreement comprise the Regional Planning Group, (RPG) of the Dungeness-Quilcene Pilot Planning Project, (DQ) with representatives from diverse areas of concern: agriculture, business, environmental, fish, local government, Tribal, recreation, and State. Delegates representing these caucuses have spent more than two years, and over 10,000 volunteer hours on the project. They have investigated the status of the resources, defined the problems and issues, gathered information and supportive data, crafted solutions to the problems, negotiated agreements, and developed strategies and recommendations for the plan. In the course of this work new relationships have been forged. In some cases, trust has been nurtured between parties who hold differing points-of-view, but who came to understand their neighbor's problems and concerns and worked towards a solution to the benefit of all.

This plan has not been developed in a vacuum. All of the meetings and process have included the public at every step of the way. The majority of the RPG delegates are members of the local community such as farmers, environmentalists, fishers, recreators, and business people. All general meetings have had public participation and there have been special public meetings to gather input from those not actively involved over the long process. In addition, the RPG drew on the best ideas of Tribal, State and Federal fish and wildlife agencies, others with special technical expertise, State water resources' personnel, the Forest Service, the Olympic National Park, and local governments and public utility districts.

Filling the Gap

Early in the effort, the group developed the *gap concept* which acknowledges that a discrepancy exists between the quantity of water needed for optimal fish production and the needs of out-of-stream uses. The gap between the needs of the fish expressed by *recommended* instream flows, and the *present* instream flow after withdrawals for agriculture, municipal, business and future growth needs is substantial. This is amplified by the poor condition of fish habitat, the lack of conservation, the inefficiency of irrigation delivery systems in some areas, and other uses which take water from the system. Under the *gap strategy,* the Regional Planning Group agrees to acknowledge that a discrepancy exists, is likely to continue indefinitely, and that to some extent the parties will have to live with it. In this plan, the RPG makes recommendations intended to bring the sides of the gap closer together. Through participating in *shared sacrifice,* the members of the planning group have agreed to *share the pain and share the gain.* When the weather and other conditions provide abundant flows, ample water is available for all uses; when the opposite occurs, during times of low flows and critical needs for both fish and human uses, all sides agree to restrict uses, and to share water equitably.

Coupled with this strategy is the intent to make better use of available water in two ways. Conservation strategies have been recommended, and in some cases negotiated, which have the potential to provide more water instream. In addition, habitat restoration and enhancement is proposed which may allow better use of existing flows, and provide better habitat for spawning and rearing salmonids and other wildlife.

Scoping for the Project

After the formation of the Regional Planning Group, one of its first tasks was to develop a *scoping document* which described the group's mission, and goals and objectives for the work ahead. Through the course of developing these goals, the caucus members realized that in order to make this planning effort successful, the concerns of each interest must be met. Therefore, the twelve goals listed in Chapter 11 represent the needs and expectations of each of the caucuses. Although at times these goals have been at odds, the RPG has done its best to work within its mission *to work cooperatively to meet water quality and quantity needs of human and natural systems in a manner that will insure the sustainability of both.* This expanded the original Chelan Agreement scope to focus on both *quantity* and *quality* of water, recognizing that the two are inseparable

The Essential Results

During the course of working together, the RPG decided that the issues were distinct enough in each County to focus work separately by major watersheds, and County-specific recommendations were developed. In addition, regional recommendations reflect the commonalty of issues existing across the hydrologic units. Rivers flow across the land and ground water beneath it, heedless of political boundaries. Thus the regional needs are addressed in recommendations and strategies for the northeastern corner of the Olympic peninsula in Chapter 5.

What follows are the highlights of the recommendations for water resources in the Dungeness-Quilcene planning area. The recommendations are given in the following order: Clallam County, Jefferson County and Regional.

Clallam County (Chapter 6)

Since the project was born in Clallam County with the recommendation of the Dungeness River by the Jamestown S'Klallam Tribe, heavy emphasis on resolving water resource conflicts in the Sequim-Dungeness basin took much of the RPG's first year of work. Issues are critical with 5 salmonid stocks at risk of extinction and several others in a depressed state in the northeastern corner of the Olympic Peninsula. The results of intense work have produced solutions which could provide more water in the streams, on-going conservation efforts and cooperative habitat restoration on the river.

Habitat and Instream Flows

- Negotiations between the Tribe and the Dungeness River Agricultural Water Users Association produced agreements to "share" the resource, better manage water use, and implement irrigation ditch conservation measures (C.1 - C.4)
- A recommendation was made to the Department of Ecology to set instream flows for the Dungeness River based on the IFIM studies. (C.6.1)
- It was recommended that no new surface water rights be issued, to protect small streams in the County from over-allocation, until more is known about the resources. (C.6.2)
- The formation of both a Watershed Council and an ad hoc Habitat Work Group was recommended. These groups would coordinate and manage activities in the watershed, including restoration efforts and implementation of major aspects of the DQ Plan (C.7)
- Restoration and enhancement projects are being planned and funding sought in an effort to improve the habitat of the River, so that the wild fish may better use the existing flows. (C.7)

- Recommendations were made to protect and in some cases enhance riparian corridors, wetlands and other aquatic-related ecosystems. (C.10)
- Fish management actions should reflect the need to protect and rebuild wild stocks. (C.8)
- The need for a comprehensive water resources study was shown and joint support from governments, Tribes and agencies is being sought. (More on this in the Regional results.) (C.5)

Ground Water

Because of the concern over the proliferation of single, non-permitted wells caused by the continuing population growth and spread in the County, with threats to both quantity and quality of water, serious discussion focused on the importance of protecting our ground-water resources. Strategies to protect these resources include:

- Conduct a study of regional distribution of ground-water quantity and quality, and sites of hydraulic continuity. A model should be made to estimate safe, sustainable yields of ground water. After the study is completed, a long-term strategy and program should be developed for the protection of ground water. (C.11.1)
- Develop an interim strategy for the next 5 years. The County and City should enact land use controls limiting density of development in areas of high risk for hydraulic continuity or ground-water mining. (C.11.2)
- After the proposed study, establish a long-term strategy and program for the protection of ground water. (C.11.9)
- New wells should be completed in deeper, confined aquifers where possible until the water resources study is completed, to minimize the impacts to instream flows, shallow wells and water quality. (C.11.2)
- Meter all new community systems and record annual use and encourage all new users to do the same. (C.11.5)
- Clallam County should establish a 5 year well metering pilot study of 100 houses within 1/2 mile of the Dungeness River. (C.11.6)

- Protect water quality in the area through well inspection and sampling programs. (C.11.3)
- The City of Sequim is encouraged to explore a long-term source of water and to work to conserve the use of water through a rigorous conservation program. (C.12)
- Develop an educational program to educate well owners and users on how to protect their well and insure their continuing use of it. (C.11.11)

Water Management

- Establish a regional water management system, to encourage efficiency of use and to meet health requirements. (C.14)
- Further define the concept of a watershed protection district. (C.13)

Education and Conservation

- Implement a rigorous educational program about water resources and the best ways to conserve and protect them. (C.15)

Jefferson County (Chapter 7)

With the majority of water rights in the Big Quilcene River held by the City of Port Townsend, future growth in both the City and County could have a serious impact on wild fish in the river and other aquatic habitat. In part because of the physical make-up of the region, land uses have contributed to a seriously degraded habitat and wild stocks in danger of extinction. In the Big Quilcene River, long and intense discussions are leading to negotiations between the City, the Mill, the Port, the Tribe and the State. Beginning strategies which are being developed may provide more available water instream, better habitat, and sufficient and predictable water supplies for residential and industrial use.

In the rest of eastern Jefferson County streams and aquatic habitat are being impacted by new development and other land use practices; this increasing degradation of habitat values raises concerns about native and wild fish and other species in those watercourses and adjacent habitats. Within the Olympic rainshadow, the percentage of salmon stocks in danger of extinction is higher than comparable statewide proportions. Habitat assessments and identification of the problems are the first steps needed for long-term protection of these vital ecosystems. Recommendations and strategies include the following:

Habitat and Instream Flows

- No new surface water rights or permits should be issued for rivers and streams in east Jefferson County, until such time as instream flows for each stream are adopted by rule. (J.5.1)
- A Watershed Council which is representative of all interests should be formed to focus and coordinate restoration efforts in the watershed, to investigate the resources, and to design and implement projects. (J.1)
- The Watershed Council should establish instream flows for recommendation to the State for all east Jefferson County streams, except the Big Quilcene River. (J.5.2)
- Negotiations between the major users and water resource holders on the Big Quilcene should work towards improving instream flows conditions. (J.5.3)

- Habitat protection, restoration and enhancement projects should be designed and implemented to better use the available water and to improve conditions for native and wild fish (J.4)
- A water resources study should be completed to determine the quantity and quality of surface and ground water (J.9)

Fish Management

- To protect and promote wild fish, hatchery practices and impacts on the Big Quilcene River should be analyzed. The hatchery should be managed primarily to protect and provide for native and wild salmonids and other fish species. (J.7)

Ground Water (J.10)

Much is unknown about the ground-water supplies in Jefferson County. Increasing population in the County has added to concerns over sufficient and safe water availability. Instances of seawater intrusion and other pollution, coupled with declining well levels and growing population pressures make it clear that an immediate effort is needed to provide safe and sustainable supplies in the future.

- A comprehensive ground-water study is needed to determine the ground-water resources, their status, and to describe accurately the aquifers and areas of risk. After the study is completed, a long-term strategy and program should be developed, to protect ground-water resources in the County.
- Policies to protect and maintain ground-water quantity and quality are needed at the local level.
- All future wells should require permits, and proof should be provided that they are not in hydraulic continuity with any stream or river, will not contribute to seawater intrusion or adversely affect existing uses.
- Driller's reports for all wells with less than 5000 gallons/day should be logged and entered into the local ground-water data base.
- Land-use plans and actions by local governments should recognize and protect aquifer recharge areas
- Community systems should be encouraged, and metered.

Education and Conservation (J.13)

- Conservation education and practices should be implemented to provide for better efficiency of use of the limited water supplies
- Implement the DQ education plan which focuses education on distinct user groups impacted by alterations of water resource quantity, quality and availability

Regional Recommendations (Chapter 5)

Through the planning effort the RPG found a commonalty of issues that could be jointly agreed upon, and developed strategies for their prospective resolution. Some -- such as *the gap* and the *shared sacrifice strategy* -- are discussed at the beginning of this Chapter. Because of their importance to the individual watersheds, others are listed under County recommendations and may over-lap here. The following are some of the regional strategies and recommendations developed by the RPG.

- Regional use of water: Use water from within the area, and keep the water resources within the region. (R.1)
- Conservation is the most cost-effective way to extend limited water supplies for the foreseeable future, and will need to become a way of life for every water user. (R.4)
- Legal mechanisms such as Trust Water Rights, or other leasing strategies, should be used to transfer conserved water to instream flows, to better protect both water rights holders and stream flows. (R.5)
- Ground water: The RPG believes that ground water has the most potential as a residential and municipal source and that further technical investigations should be implemented. (R.6)
- Mimic Nature: In order to achieve a net gain in productive biological capacity, existing and potential development should incorporate design and components to allow recharge and runoff to wetlands, small streams and ground water. (R.6.6)
- Storage: No new, on-river storage should be allowed in the region. (R.7)
- Habitat: In all management actions, strive to retain or restore structural and functional characteristics of river, riparian and wetland habitats which are important to fish and wildlife. (R.8)
- Flood Plain Management: Protect, and in some cases restore, flood plain and estuarine habitat to provide functions and values necessary for wild fish and other wildlife resources, as well as protect life, safety and property. (R.9) Discourage future development in the flood plain. (R.9.1)
- Forest Practices: Evaluate cumulative impacts of forest practices to short- and long-term regional hydrology,

especially related to at-risk native and wild fish stocks and anadromous species. (R.10)

- Fish Management: Protect, and in some cases restore, salmonid habitat to provide functions and values necessary for native and wild fish and other wildlife resources. (R.11)
- Wildlife Management: Protect wildlife as an important component of the bio-regional ecosystem. (R.12)
- The RPG agrees that water-dependent or water-related recreation is a beneficial use of water. (R.13)
- Designate the Dungeness/Greywolf Rivers (down to the National Forest Service boundary) as a Wild and Scenic River (R.13.1)
- Provide better access to rivers in the region on clearly designated lands that will not interfere with landowners (R.13.2)
- Develop riverside management plans to improve habitat, and conduct an educational program to encourage responsible river use. (R.13.2)

The Water Resources Study

And finally, a recommendation which may have the biggest impact on future use and management of our waters, is to conduct a comprehensive hydrogeologic investigation of the quantity and quality of surface and ground water in the region. A Workplan for a 5-year study has been developed by the U.S. Geological Survey for the DQ project and provides a basis for developing the parameters of the needed work. Coupled with this is the importance of continuing water quality and quantity data management essential for on-going water resource and land use planning efforts.

The members of the Regional Planning Group and others have worked long and hard to produce agreements and recommendations to better provide for the future water resources in the region. As one of the local government caucus members said recently: ***You think that this was hard work. Just wait. The work has just started!***

DUNGENESS
QUILCENE
Water Resource
Pilot Planning Project
The Chelan Agreement

This plan now needs implementation. That implementation must be integrated with Federal, Tribal and State and local watershed protection programs. The watershed assessment, analysis and planning which is occurring on the Federal and State levels must be coordinated with the local process, giving the recommendations that come from this locally-based DQ planning project primary consideration. The Watershed Council will be the mechanism to successfully coordinate these efforts. The immense effort put into this plan by all participants must not be wasted; the time is ripe to move forward in a coordinated effort to better protect and manage our water resources on the eastern Olympic Peninsula. The Dungeness-Quilcene Water Resources Management Plan reflects a major step towards achieving those goals.

Volume 1

Chapter 1

Introduction

Chapter 1
Introduction

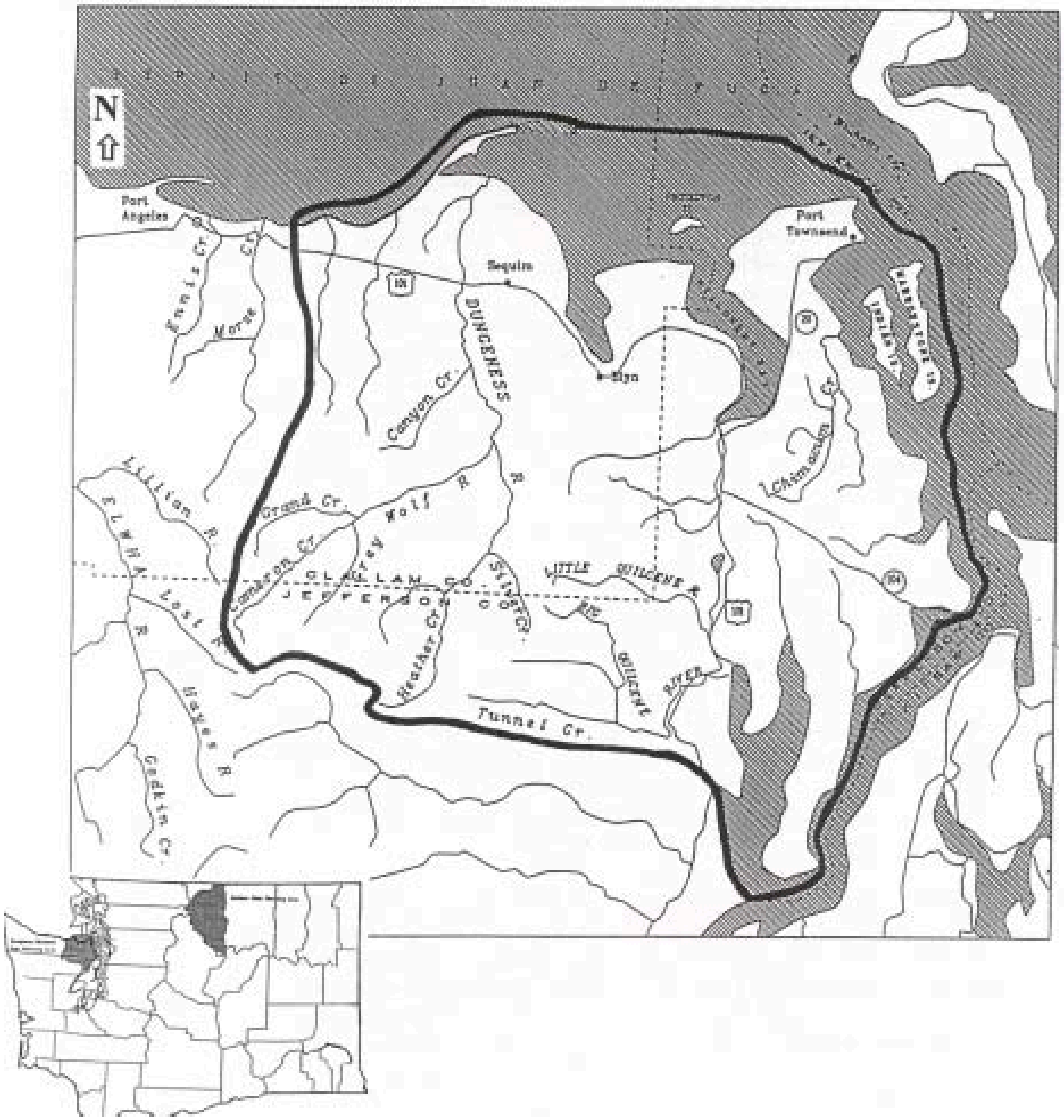
The rainfall reaching the Olympic Peninsula begins a journey from the top of the glacially-formed Olympics, carving deep canyons blanketed with forests, some ancient, others recently cut. From the original rainfall, water continues its route downstream to flow across remnant prairies, with a portion entering into irrigation ditches for rich farmlands, with some flowing through pipes for two cities and other small communities, and a portion rising through evapatranspiraton to form clouds to begin the cycle again. Other water sinks into the porous glacial soils to reach aquifers as ground water. Still some of the original rainfall remains free-flowing in rivers and tributaries, until finally the water reaches the cliffs and estuaries and enters into the Strait of Juan de Fuca, mixing in movement to the east with the Puget Sound waters, and flowing west to the coast, eventually to join with the sea.

The amount of water on bath the surface and under ground, the quality of that water, and its use or mis-use are the topics of this plan. With the intention to develop a water resource management plan for the Dungeness-Quilcene Regional Planning area, a group of concerned individuals from local tribes, governments and community interests spent nearly 3 years intensively working to provide a better way for humans to interact with their landscape and water resources. This plan embodies concerns, ideas, strategies, and recommendations for how to better manage and protect both sufficient quantity and good quality of the water on the northeastern Olympic Peninsula.

The Plan is divided into two volumes. This first is really the plan and the *second* the process. The plan describes the background leading to the work under the Chelan Agreement, the formation and structure of the working groups, and goals which were developed to accomplish the task at hand. A natural resource characterization, and a water use overview of the region bring together information currently distributed

Map 1.1

Dungeness-Quilcene Water Resources Pilot Planning Area Approximate Boundaries



throughout numerous sources. Influences on regional water management are described, including the important linkages tying together rules, laws, planning efforts and the resources. The main recommendations upon which the Regional Planning Group (RPG) has reached consensus are contained in Chapters 5, 6, and 7, followed by implementation strategies to assure that this plan does not sit idly on a shelf, but rather that it is put into action by local governments and other groups, as well as state and federal agencies.

Because this is a pilot planning project for the State Department of Ecology, it was important to describe not only the water resources and to make recommendations for how to better use them, but also the process and players which formed the recommendations, thus Volume 2. The Dungeness-Quilcene (DQ) Committees provided much-needed information, analysis and planning, especially in technical and educational areas; their accomplishments are described in Chapter 13. A description and analysis of the planning process provides useful information, especially critical to the Department of Ecology and to the future regional planning efforts in the State, as well as to other groups pursuing watershed planning efforts. There were many lessons to be learned, and it is hoped that these experiences will be useful to planning efforts based on bioregional, regional and watershed-specific considerations. Finally, a description of the "public process" is coupled with Public Comments on the regional water resources plan.

The planning effort, funded by the Legislature through the Department of Ecology, is now complete, but the work to protect water resources on the Peninsula has just started. What seemed like a never-ending process of meetings, discussions, arguments and agreements has concluded, with the completion of this written document. Because of the work that was accomplished by the planning group members, the water resources of the region will be used, and planned for more carefully in the future. Changes have already started as a result of this effort, and will continue in the future.

The strategies and recommendations made in this plan need implementation. Because they represent such a broad spectrum of interests, it is hoped that the implementation of recommended actions will be shared, and will move forward in a timely manner. Beyond the actual recommendations, the relationships which have been built and broadened throughout the process will lend credibility and strength to implementation, and will provide the energy and momentum needed to make serious changes in how we deal with our local water resources in east Clallam and east Jefferson counties.

Background

Historical Perspective

Since the Great Ice Age, Indians have fished the waters of the Olympic Peninsula, depending upon the rivers and streams rich in salmon and other resources. For thousands of years before the first explorers reached the eastern Olympic Peninsula in the late 1700's and the settlers first arrived in the mid- I 800's to cut the thick stands of timber and float logs down the rivers, Indians survived well on the rich abundance of fish and shellfish growing in these pristine waters, and tribes based much of their culture and economy on the multiple runs of salmon. Throughout the years, Indian water claims have created many uncertainties for development in tribal "usual and accustomed areas."

The Move to a Cooperative Process in Washington State Much has been written on the complexity of Indian claims to water, and in Washington State, the uncertainty of tribal claims to water is connected not only with tribal lands, but also with treaty-reserved rights to fisheries resources, and the instream flows necessary to support fisheries' habitat. The 1974 "Boldt" decision held that the tribes who had signed treaties in 1855, in what is now Washington state, were entitled to the opportunity to harvest half of the harvestable salmon and steelhead returning to off-reservation fishing grounds (U.S. v Washington, 384 F. Supp. 312 [1974]). A subsequent decision held that the right to harvest fish implies a right to protection of fisheries' habitat, otherwise, "the right to take fish would eventually be reduced to the right to dip one's net into the water and bring it out empty" (506 F. Supp. 187, 203 [1980]). Although later decisions left this finding unclear, it is generally recognized that tribes in Washington State have a right to the protection of fish habitat. An independent fact finder hired by the Washington State Legislature in 1988 to review state water policies indicated that the legal entitlement of Indian tribes for both on- reservation use and regional fisheries will have a major impact on the direction of state water policy.

In the 1980's, Washington State policy makers and tribal leaders began an era of cooperation, in the recognition that protection of fisheries' habitat was a mutual goal. State and tribal government discussions over water policy were eventually widened to include a range of water users and interested parties, and culminated in an agreement in November 1990 at a retreat at Lake Chelan.

The Chelan Agreement

The Chelan Agreement incorporated the goals of a number of caucuses including state, local and tribal governments, and agricultural, business, environmental, fisheries and recreation interests. The Agreement established a state-wide forum to review water management policies, and created a framework for the development of regional water management plans. The local planning process provided an opportunity for regional water users to attempt to resolve management conflicts through negotiation and consensus and was not intended to formally resolve legal disputes over water. Legislation passed the same year supported the cooperative planning effort, and provided funding for two pilot areas to test the process, one in the Methow basin in eastern Washington, and the other on the northeast portion of the Olympic Peninsula in the Puget Sound region. The northeast regional planning effort became known as the Dungeness-Quilcene (DQ) project named for the two major rivers and watersheds in the planning area.

Cultural and Historical Considerations on the Dungeness

The Dungeness River was nominated by the Jamestown S'Klallam Tribe as a pilot planning project due to the scope of water resource and fisheries problems on the river, and the cultural and historical significance of the river to tribal members. For the S’Klallam people, the Dungeness River holds cultural and spiritual qualities and has always been the primary river of this band of people. Following the signing of the Treaty of Point No Point in 1855, white settlers pressured government agents to relocate the S’Klallam away from their traditional territory on the northeast Olympic Peninsula to a reservation approximately 75 miles away. To remain close to their river, the Dungeness band of S'Klallams pooled $500 in gold coin and purchased 200 acres near the river mouth in 1874. They named their community "Jamestown" in honor of their leader (Lord James Balch), and tribal descendants live there to this day.

Intergovernmental Cooperation

Over the next century, settlement and development grew at the expense of fisheries and natural resources. By the 1990's, faced with the situation of a serious decline in the runs of salmonids in the river, and the numerous factors contributing to their decline, the Jamestown S'Klallam Tribe had the choice of taking the issue to court, or attempting the new Chelan Agreement process to see if the needs of the fish, agriculture, and a rapidly growing populace could be met by negotiation. A significant element lead to the Tribe's decision to pursue negotiations, and later, to the selection out of over 30 nominated watersheds, of the Dungeness as part of the Chelan pilot project. That important element was the positive relationship between the Jamestown S'Klallam Tribe and Clallam County which had been developed since the mid-1980's.

In 1986 Clallam County initiated a series of discussions on the Dungeness River and its problems, along with a Department of Ecology-funded comprehensive water quality planning effort in the adjacent Sequim Bay watershed. These processes included riparian landowners, irrigators, business people, real estate agents, educators and several state and federal agencies with jurisdiction over river management, along with the Tribe. These early discussions helped lay the groundwork for a cooperative planning process that later covered a wider geographic area, including the Quilcene rivers and watershed and much of east Jefferson County in the project area. The discussions also convinced many of the parties, particularly the agriculture community, that such approaches offer a constructive opportunity to resolve resource management conflicts.

As in similar processes, the negotiations commenced after all parties saw that it was in their interest to participate, and that they could no longer ignore the issues. Besides the degrading conditions of the watersheds, other issues that needed to be addressed immediately included the threat of a lawsuit by the Tribe that could entirely reallocate the region's water supplies, and the fear that the State of Washington could remove matters from local control and develop an alternative water management scheme.

On the basis of similar concerns about the need for protection and better management of water resources in east Jefferson County, and after lengthy discussions with interested parties from the County and the City of Port Townsend, the Department of Ecology designated the Dungeness-Quilcene for the Chelan Agreement's western pilot project. By expanding the project boundary to encompass the entire northeastern Olympic Peninsula in WRIA numbers 17 and 18[1] the breadth of water use issues increased to include irrigation, municipal and industrial use, and surface-ground water interaction. With the inclusion of both eastern Clallam and Jefferson counties and the cities of Sequim and Port Townsend, the State was able to test the process in a multi-governmental setting.

The Chelan Agreement Goals and Principles[2]
The Chelan Agreement recognizes that water is a finite resource. The fundamental guiding concepts of the Agreement include (in no particular order):

- That water resource management decisions be by hydrologic unit or regional planning area as defined in the "boundary" section in this document *(the Chelan Agreement).*

- That future conflicts will be reduced if water use needs located in a hydrologic unit first be met from water resources within that unit.

- The recognition that actions will be guided by the Tribes' objective to achieve an overall net gain of the productive capacity of fish and wildlife habitats and the State's related objective to accommodate growth in a manner that will protect the unique environment of the State as those goals have been identified in the Memorandum of Understanding on Environmental Protection.[3] The participants understand the achievement of an overall net gain of the productive capacity may, in addition to instream flows, include a variety of other means.

[1]WRIA - Water Resource Inventory Area
[2]see Chapter 12 for the complete Chelan Agreement.
[3]see Chapter 12 Memorandum of Understanding Between Federally Recognized Tribes of Washington State and the State of Washington.

- That the water resource planning process described in this Agreement shall in no way affect existing water rights without the consent of the water rights holder. Nor shall this planning process necessitate, require or limit any formal determination or resolution of any legal dispute about water rights under state or federal law or Indian treaty. This process is an alternative process, voluntarily designed by the affected parties to build on the existing system of water rights through a cooperative, flexible process to plan and manage the uses of Washington's water resources.
- To develop and implement a program providing for conservation, efficiency, elimination of waste, water reuse, and restoration of riparian habitat areas for water retention, including the development of legislation and/or regulations where appropriate.
- To assist the Department of Ecology in locating the resources for compliance, enforcement and administration of existing laws and regulations.
- That the participants remain fully committed to the planning process described in this agreement.

On the basis of these guidelines, the Dungeness-Quilcene RPG, for the Scoping Document, established Goals and Objectives to guide the project (see Chapter 11).

The Caucus Structure
The Chelan Agreement sets out a clear decision-making structure for the participants in a regional water planning process. The eight caucuses mandated by the Agreement (State, Local and Tribal Government, Agriculture, Business, Environmental, Fisheries, and Recreation) may add additional caucuses at their discretion. However, a new caucus must demonstrate that it's interests cannot be addressed elsewhere, and neither pilot project accepted a petition from a caucus outside those specified. Though a ground water caucus was proposed, and representatives sat at the RPG table during the "scoping process," the Local Government caucus accepted the responsibility for ground

water issues, and the original designation of caucuses was maintained.4 Federal and State agencies and local Public Utility Districts (PUDs), which may participate at the discretion of the regional planning group, were included on the Local Government caucus where they provided technical assistance. In recognition that governmental support is necessary to implement any water management plan, the Chelan Agreement requires consensus from state, local and tribal governments on planning decisions. The support of a majority of the other caucuses is also required. This structure caused the DQ non-governmental caucuses considerable discomfort in the belief that they could be out- voted. To address this concern, the RPG agreed to proceed by full consensus,5 with the option to revisit this decision if reasonable progress could not be made.

The final composition of the Dungeness-Quilcene Regional Planning Group, consisting of two representatives from each caucus, met the need to incorporate local knowledge and participation, a generally recognized requisite for successful regional planning. Each caucus had two delegates, with alternates who were the primary decision-makers and were able to "vote" on consensus issues. In addition, each caucus had representatives from the local community and governments who met separately, and brought the concerns of the community to the table through the RPG delegates. The Jamestown S'Klallam Tribe served as the Coordinating Entity, and was responsible for management and administration of the project. During the final year of planning the RPG divided into Work Groups by County to focus on watershed-specific issues more closely.

[4] After many weeks of discussion, on April 20, 1993 a final attempt at reaching consensus to include a new ground water caucus was made. Consensus was not reached, and opposing views were put in writing, as required by the RPG process. It was agreed all the caucuses would take into consideration ground water issues, with special emphasis for responsibility taken on by the Local Government caucus. The people representing the original ground water group were invited to continue to attend meetings, and were kept informed about the project by staff.

5 In the Chelan Agreement, "consensus is defined as no negative votes, with abstentions allowed. If no consensus is reached, such will be noted and all the information generated during the process will be collected and made available to all participants." In addition, the DQ group required that opposing viewpoints be given to the RPG in writing on consensus-decisions.

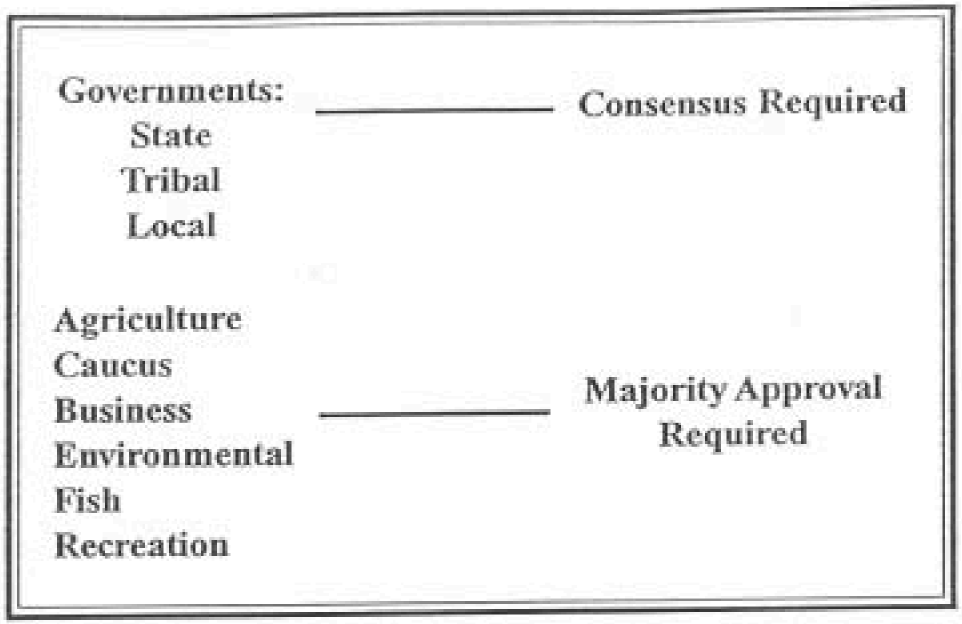


Figure 1.1 Decision Making Structure for Regional Water Planning Under the Chelan Agreement

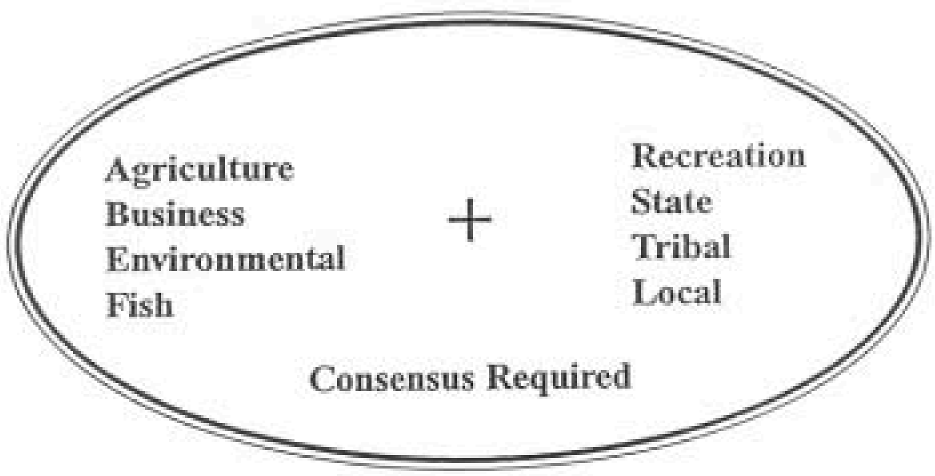


Figure 1.2 Decision Making Structure for the Dungeness - Quilcene Regional Planning Group.

Volume 1

Chapter 2

Characterization of the DQ Region & Its Water Resources

Chapter 2
Characterization of the DQ Region And its Water Resources[1]

The Dungeness-Quilcene Water Resource Pilot Planning Project is focused on the water resources of the northeast Olympic Peninsula -- a region of about 664 sq. miles in area. The region is bounded on the north and east by the sea-level waters of Juan de Fuca Strait, Admiralty Inlet and Hood Canal; on the south and west by the mountain ridges, over 7,000 ft. high at some points, separating the Big Quilcene and Dungeness/Gray-Wolf watersheds from the Dosewallips and Elwha watersheds. There are no substantial water inputs to the region other than precipitation and no substantial water exports from the region except surface and ground-water discharges to tidewaters, evapotranspiration, and consumptive uses.

Our characterization begins with an overview of the geologic and climatic history to highlight the special character of the DQ region. Second, we describe the region as it exists today, first tracing each of the important mountain rivers and streams from their headwaters to their discharge into sea-level saltwaters, and then sketching the coastal uplands and lowlands and the shoreline features of the region.

The third major section of the chapter provides more detail on the important water resources of the region. First is an overview of climate and weather patterns and topographically-caused rainshadow areas. Next, surface water flows are considered, with major emphasis on the Dungeness River system for which long-term historical flow data is available. Ground-water resources are described as possible, with attention to the gaps in our knowledge of the complexity of the hydrogeology of the region.

The fourth section of this characterization deals with the animal and plant life of the region, with major concentration on the anadromous fish that utilize the surface waters of the region.

The last section focuses on ourselves ... the people who have settled this region, who have created impacts on the natural surroundings, and who have the capacity to materially affect the future of the region.

[1] This Chapter was prepared by Welden Clark, who is Co-Chair of the DQ Technical Committee and on the Recreation Caucus, with input from various others. The section on fisheries was prepared by Brad Sete, Fisheries Manager for the Jamestown S'Klallam Tribe.

Characterization of a region of this size and diversity must draw from many perspectives in order to identify the relevance of the natural history, the characteristics of the present-day environment, and the presence and impacts of human habitation. For some aspects a chronological perspective is appropriate, for others a physiographic perspective -- west to east, or higher to lower elevation -- is most meaningful. In some cases a broad brushing of major features is most useful, in others the small details are crucially important.

This characterization is largely derivative, an interpretation of research reports and expository writings of professionals in the fields covered, and of technical notes prepared by DQ project participants. It is intended as a road-map of sorts, to provide a framework from which to understand the discussions and recommendations included in this resource management plan. Sources are cited in footnotes for many points of information. Others, especially topics that have been extensively discussed in the literature, are not explicitly referenced. The reader can find much further relevant information in the references cited in the footnotes and listed in Appendix A. the most generally useful map reference for the DQ Region is the USGS topographic map series.[2]

[2] USGS Topographic Maps. 7.5-minute series, the familiar "topo quads" 22 separate map sheets are needed to cover the DQ Region.

The Geologic and Climate History

Geologic beginnings -- the foundation

The Olympic Peninsula is very young in comparison with most of the North American continent.

Oceanic Crust:
The oldest rocks are generally of the order of 50 million years, and are oceanic crustal basalts apparently formed at and transported away from an "oceanic ridge" toward the north american continental plate, and associated seamounts. In the usual tectonic progression the dense oceanic-crustal material would be ultimately subducted under the lighter continental-crustal plate and reabsorbed into the underlying mantle, but this piece of plate was apparently broken off, surfaced, and "docked" against the pre-existing continental margin when subduction shifted west, beyond the western margin of this plate fragment. These dark volcanic basalt rocks, the Crescent formation of the "peripheral rocks" as shown in Figure 2.1, are almost everywhere evident in the DQ region, from the 7700+ ft. crest of Mt. Constance to the foothills behind Sequim and the shoreline at Mats Bay.[3] While this oceanic crust was still submerged thick sequences of marine sediments were deposited, forming the sedimentary rock strata that are now a prominent feature of the shoreline of the Strait of Juan de Fuca near the western tip of the Olympic Peninsula, and that crop out at various places in the DQ region, such as Bell Mil near Sequim, and in the Snow Creek uplands and the Oak Bay bluffs.[4]

Rise of the Olympic Mountains:
The shift of subduction to a new line west of the peninsula and Vancouver Island began filling a new trench with sediments scraped off of the subducting oceanic crust from the west and sediments carried out from the continent to the east. Eventually these trench deposits, lighter than the overlying crustal rock of the peninsula, broke up through and were pushed up and eastward to form the mountains. These mountain rocks, the "core rocks" as shown on Figure 2.1, are severely twisted, folded, and metamorphosed from the heat and pressure of the trench and the subsequent uplift. Their contact with the "peripheral rocks" is marked by faults circling the north, east, and south portions of the mountains.[5]

Drainage and erosion from the uplifted mountains has cut deep river channels radically out from the high center, as illustrated in Figure 2.2. The Dungeness/Gray Wolf River system drains from the central "core rocks" of the mountains, cutting out through the "peripheral rocks" horseshoe to empty into marine waters, as do the Elwha River to the west, and the

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3 One annotated geologic map (Tabor & Cady, 1978) provides definitive coverage of the DQ region except for the extreme eastern portion. A geologic map and report (Grimstad & Carson, 1981) covers the eastern area. An overview is provided in Roadside Geology of Washington (Alt & Hyndman, 1984), and Tabor presents detailed descriptions of the Olympic mountains terrain (Tabor, 1987).

4 Snavely, P.D., Jr. Makah Formation: A Deep-Marginal-Basin Sedimentary Sequence of Late Eocene and Oligocene Age in the Northwestern Olympic Peninsula, Washington. 1980. Also see Tabor and Cady. 1978.

5 Tabor & Cady. 1978.

Dosewallips River to the south of the DQ. The Big and Little Quilcene Rivers and their tributaries drain the eastern slopes of the "peripheral rocks" horseshoe.

Figure 2.1 Diagram showing basaltic horseshoe of peripheral rocks and the inner core rocks forming the Olympic Mountains, (Tabor, 1987).

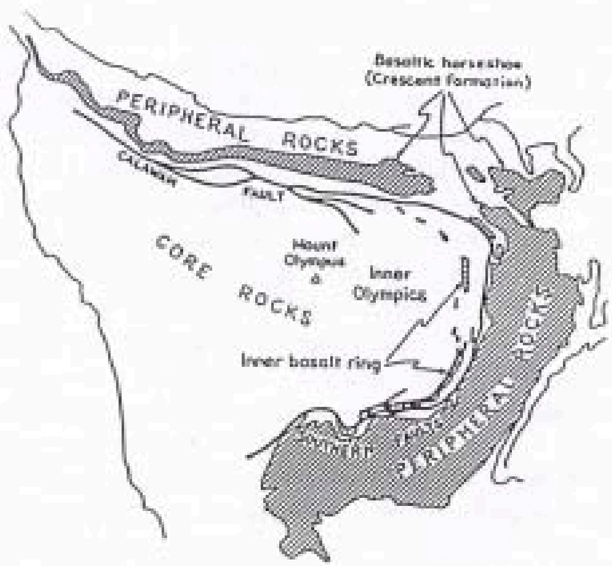
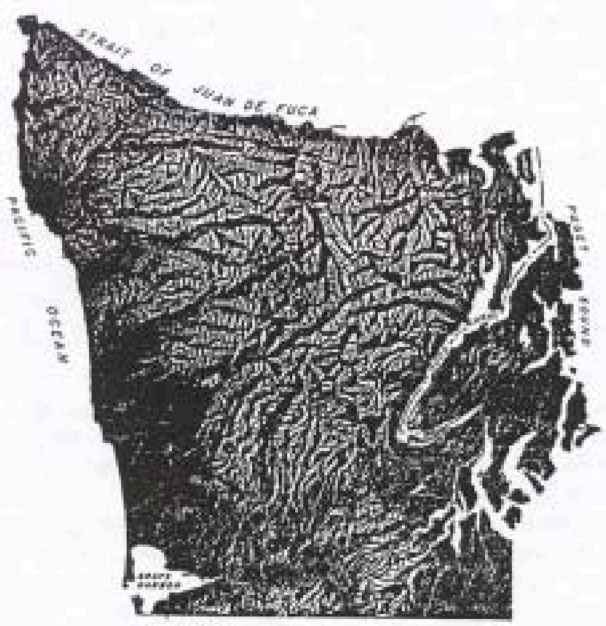


Figure 2.2 Illustration of the pattern of rivers radiating out from the high mountain core of the Olympic Peninsula. The DQ region is the upper right portion of the peninsula. (USGS)



Ice Ages and the consequence of glaciations

Alpine Glaciers and Ice Sheets from Canada:
The past 2 million years, extending up to 10,000 years ago -- an "ice age" -- has been a period of repeated reshaping of the DQ region by glaciers. Alpine glaciers are thought to have extended down the major river courses beyond the mountain front at some time. The Olympic alpine glaciers and snow fields have shaped the rugged interior mountain peaks and the high river canyons, but the major reshaping of the foothills and lowlands has been accomplished by probably four or more cordilleran ice sheets moving down from British Columbia. We know most about the Vashon stade of the Fraser glaciation, the last of these to impact the DQ region, between about 17,000 and 12,000 years ago. The Puget lobe pushed down the Puget lowland to a few miles beyond Olympia, as shown on Figure 2.3, while the Juan de Fuca lobe probably reached the west end of the Strait. The Port Townsend and Sequim areas were under nearly 4,000 feet of ice. The ice sheet moved over all the foothills, over Bon Jon Pass and Gold Creek, up Gray Wolf River over half way to Three Forks, and up the Dungeness mainstem almost to Royal Creek. A glacial lake that formed between the Vashon ice-sheet front and the mountain rivers and higher alpine glaciers in the mid/upper Dungeness watershed is evidenced to have stood at 3300 ft. elevation at one time. The Puget lobe of the Vashon ice sheet reached 3400 ft. elevation on Mt. Zion and Green Mountain, and over topped the Quilcene range. A glacial lake in Townsend Creek topped at about 2600 ft., and one in the Big Quilcene/Tunnel Creek topped at 2750 ft. elevation, spilling into the Dosewallips River over Rocky Brook Pass (probably the last-known export of water from the DQ region).

The glaciations, particularly the large cordilleran ice sheets from British Columbia, are responsible for a major share of the unconsolidated sediments that make up the lowland portions of the DQ region. These unconsolidated sediments (the surficial geology, above the marine sedimentary and oceanic-crust bedrock) are comprised of multiple layers, as is evident in the coastal bluffs as shown in Figure 2.4.[6] Some are the direct result of glacial action: outwash silts, sands and gravels from advancing and regressing glaciers; unsorted tills deposited under the ice or as moraines; rocks and sediments dropped by drifting icebergs; and silts and clays deposited in glacial lake bottoms. The rest are directly the result of river actions and overland storm flows, forming alluvial plains, fans and deltas. Some of the materials carried by the rivers (and by alpine glaciers) are eroded bits of the local mountains, as is usual for mountain streams. In the DQ region, however, much of the sediment carried out of the mountains onto the lowlands and to marine waters is reworked glacial drift that was carried into the lower and mid- elevations of the mountain terrain by the earlier cordilleran glaciations. Any granite-like rocks found in the region are almost certainly "exotic" materials imported from British Columbia and the North Cascades by the cordilleran glacial ice sheets.

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[2] Easterbrook, D.J., Blunt, D.J., and Rutter, N.W. Chronology of Pleistocene Sediments in the Puget Lowland. 1987.

Figure 2.3 Illustration of the maximum advance of the Vashon Puget Lobe of the Fraser cordilleran glaciation, (from Easterbrook).

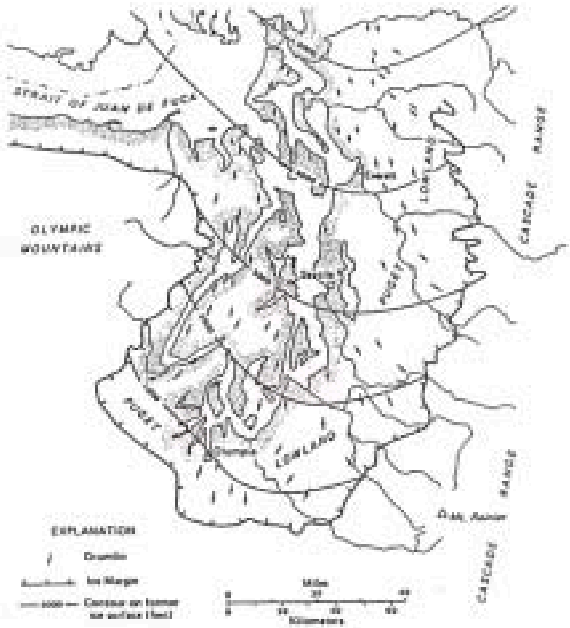
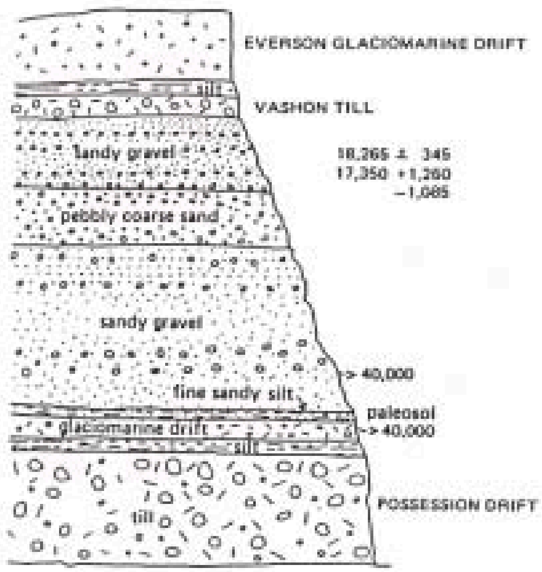


Figure 2.4 Illustrated cross-section of the bluff at Port Williams, near Sequim, showing the sequence of glacial and other sedimentary strata, (from Easterbrook).



Postglacial changes resulting in the terrain we know:
The huge ice sheets of the cordilleran glaciations weighed heavily on the earth's crust, causing depression of the surface by hundreds of feet. Concurrently, sea levels were lowered because of the volume of water trapped in ice-age glaciers. There is evidence that the termination of the latest glacial episode affecting the DQ region, the Vashon, was rapid, with the ice sheet thinning, floating, and breaking up in the eastern Strait, as temperatures rose. The sea-level rise was accordingly rapid, and coastal lowlands freed from glacier ice were submerged under marine waters. The rebound of the earth's crust was more gradual, returning to equilibrium level some 5,000 years ago. At Port Townsend, the rise of the earth's surface has been estimated as nearly 500 ft. since the Vashon ice disappeared.

The coastal bluffs have formed in the time since the last glaciation, by gradual erosion of the coastline from a combination of wave action and wind erosion. Erosion of about one foot per year is evidenced at present in strait-facing bluffs, suggesting total retreat of the coastline of the Strait of perhaps 2 miles in places.

Much is unclear about climate changes since the disappearance of the Vashon ice sheet, but a combination of evidence from the northwest and from other parts of the northern hemisphere shows that the ending of the ice age corresponded to a warming and drying period lasting from 10,000 years ago until 4,000 to 6,000 years ago, called the *climatic optimum*, or the *hypsithermal* period. This warm period was apparently succeeded by several shorter cooling periods, and a marked warm period about 600 years ago known as the medieval optimum. Colder and wetter climate since, lasting up into the late 1800's, is known as the "little ice age." It resulted in enlarged alpine glaciers and ice fields in the Olympics which dwindled again in the 0century since.' Forest and land cover has presumably changed markedly since the Vashon ice disappeared. The earliest post-glacial land surfaces of lodgement till, recessional outwash, and flood alluvial fans would not have supported much plant growth. The warmth of the hypsithermal period is thought to have resulted in growth of conifers such as pines and deciduous trees, to be eventually replaced in cooler, wetter times by the forests of Douglas-fir, cedar, etc., that we consider "old-growth" at present.

At present we can only guess at river flows and channels in the first few thousand years following the disappearance of the Vashon ice, and between early glacial episodes. Casual inspection suggests multiple ancestral channels for some rivers and streams. Flows from catastrophic breaching of glacial lakes and runoff over barren ground must have caused recurrent floods. In the "little ice age" period larger river flows must have resulted from increased precipitation and greater snowpack.

Impacts of natural events on the water resources

Natural phenomena that impact our region can be broadly identified as either individual (catastrophic) events or gradual (multi-year) changes such as climate fluctuations. Some of the individual events can be correlated to the longer-term changes, and others appear to be random occurrences. Examples of seemingly-unexpected individual events are earthquakes and

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[7] Henderson, J.A., et al. Forested Plant Associations of the Olympic National Forest 1989.

tsunamis, and major storms with associated flooding or wind damage. Major fires appear unexpectedly but are often associated with prolonged drought fluctuations in regional weather patterns. Landslides and bluff failures can result from unexpected earthquakes or tsunamis, but are often the result of prolonged wetter periods of regional weather patterns.

Any of these phenomena, either single events or longer-term fluctuations from what appears normal may have disastrous effects on our water resources: drought conditions diminish ground-water supplies, instream flows for fish and wildlife habitat, and available water for out-of-stream diversions; flooding alters stream channels and habitat and endangers human life and developments; landslides and erosion increase stream-borne sediments to the detriment of fish and estuarine shellfish habitats; and major earthquakes and/or tsunamis can cause extensive loss of life and destruction of both natural habitat and human-built environments.

Major fires:
Forest fires of large extent are thought to recur at something like 200 to 300-year frequency in the eastern Peninsula. There is evidence of wide-coverage fires around 1500 AD, the early 1700's, and the **1890's. g**

Major windstorms:
Severe windstorms have occurred on the western Olympic Peninsula perhaps 10 times in the past 200 years,9 with probably less effect on the eastern Peninsula region, but major windstorm blow-downs are far from unknown. The most devastating storms for the eastern Peninsula are often associated with northeast outflow winds related to arctic air masses moving down from Canada.

Flood conditions:
High flows are recorded in the Dungeness River gage 63-year record and in earlier isolated records, and precipitation levels are known to have been higher in the late **1800's,** suggesting more or larger flood flows prior to this century. The largest recorded daily flow conditions occurred in **1949** and 1956.1° The geomorphology of the river basin suggests many bigger floods in the past, and probably more to come in the future.

Major earthquakes:
Major deep (subduction-zone) earthquakes in the Olympic Peninsula/Puget Sound region are infrequent happenings. Some recent evidence suggests 300 to 600 year frequencies. Major shallow crustal earthquakes are also a possibility; recent studies have identified a strong quake in the Seattle/Bainbridge Island area about 1000 years ago that likely would have had consequences in the DQ region (perhaps precipitating one or more of the known, but undated natural landslide events).

[8] Henderson, et al. 1989.

[9] Henderson, et al. 1989.

10 USGS data from gage at RM (River Mile) 11.8, station 12048000. River flow data are presented in the Water Resources section of this chapter. Graphs of mean daily flows at the Dungeness River gage for 60+ years of record are available in an unpublished DQ Technical Note: Dungeness River Daily Flows: Historical Data for 1923-1990 (1992) and an Indication of Bedload Transport, Linn Clark (DQ staff] and Welden Clark, March 1993.

Major climate changes:

We don't understand enough about climate variations yet to be able to even identify, much less predict, trends or climate changes in progress. Most suggested cycles of climate behavior in periods measured in years or decades are not conclusive enough to be good predictors. Even the El Nino -- Southern Oscillation phenomenon that has had major bearing on our recent years' weather, is complex and variable to the point that it eludes quantification. However, evidence is accumulating that our climate of the past hundred years or so is perhaps uncharacteristically stable, and that seeming fluctuations around normal conditions could in fact become changes -- warmer or colder, wetter or dryer. Our limited historical evidence does show that the late 1800's were wetter (perhaps 20%); the early 1800's were probably colder, and the 1920's and 1940's experienced severe drought years in the Dungeness river flows.

Watersheds of the Mountain Rivers and Streams

The Watershed of the Dungeness/Gray Wolf River System

Various aspects of the Dungeness River system have been studied fairly extensively over the past several decades, including fisheries habitat,[11] *impacts from logging and road-building, irrigation diversions, flood control, gravel aggradation and channel instability.*[12] *The entire Dungeness river area was analyzed in a study document for then on point pollution Watershed Management Plan that provides much useful data.* 13 *An early field tour for the DQ RPG participants covered aspects of the watershed, the river itself, and the irrigation diversions.*[14]

The Dungeness/Gray Wolf River system is the largest river in the DQ region. Figure 2.511 illustrates the surface water network of the Dungeness River system, including its major tributary, the Gray Wolf River.

The average annual water flows in the various tributaries of the Dungeness River system are described later in this chapter, in the Water Resources section.

11 See Hiss bibliography in Appendix A. Also, Orsborn, J.F., and Ralph, S.C. An Aquatic Resource Assessment of the Dungeness River Basin System. November 1992. An initial volume of a continuing study .

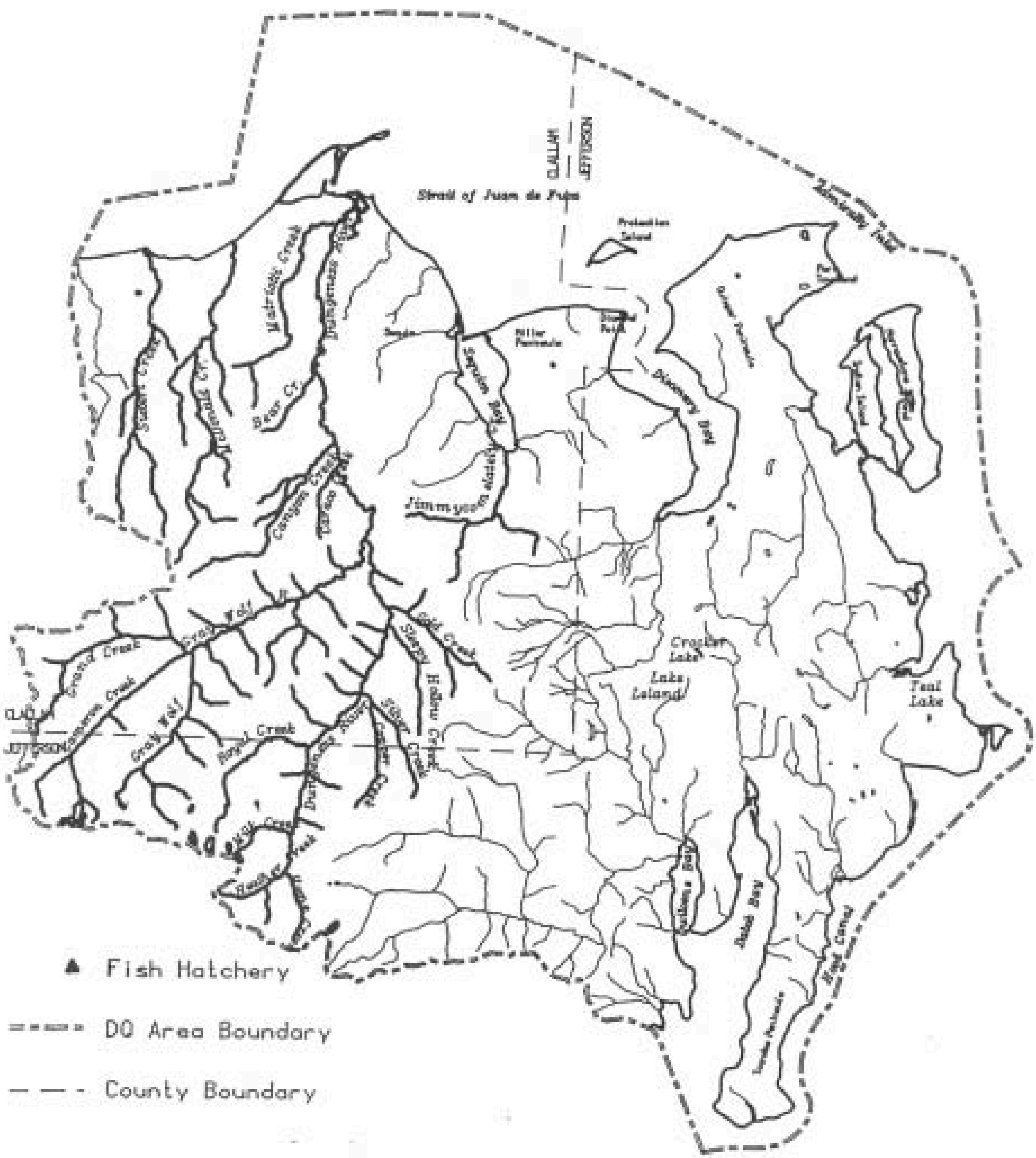
12 The work of this team, active in the late 1980'1, is relevant to a study of aggradation in the lower Dungeness by Northwest Hydraulics Consultants, 1987, and a flood control plan, Kramer, Chin and Mayo, Inc., Dungeness River Comprehensive Flood Control Management Plan, 1989. This latter plan contains good documentation of studies of, and interventions in the river system.

13 Puget Sound Cooperative River Basin Team (PSCRBT). Dungeness Area Watershed (Characterization). June 1991.

14 Enbysk, B.J., DQ field trip and accompanying briefing notes, fall, 1992.

15 Figure 2.5 (and many other maps in the Plan) is a GIS-produced coverage of the DQ region prepared by Linn Clark, DQ data management staff, using data from USGS, USFS, PSCRBT, Clallam County Planning, and Jefferson County Planning sources.

Figure 2.5 Map of the DQ Region showing rivers, streams, lakes and marine waters. The Dungeness/Gray Wolf river system and three smaller mountain streams of east Clallam County are highlighted.



Headwaters of the Dungeness River:

The Dungeness River begins with snow field patches on the southeast face of Mt. Mystery at about 6400 ft. elevation feeding Heather Creek, and flows into the Strait of Juan de Fuca at sea-level about 32 miles downstream and nearly due north of its beginning. Three headwater tributaries (Heather, Home and Milk creeks) combine to form the Dungeness mainstem at river mile (RM) 28 in a steep box-canyon headwaters basin with a floor at 3400 ft. to 2800 ft. elevation, illustrated in Figure 2.6.[16] The form of this basin suggests alpine glaciation. Glacial lake bed deposits are also reported in the basin floor.[17] The west side of this upper basin and Royal Basin above it represents "core rocks" of the Inner Olympics while the east side represents the "peripheral rocks."[18]

The upper Dungeness mainstem:

At about RM 25 the mainstem Dungeness turns from north to northeast and is joined by Royal Creek. Royal Creek flows northeast out of Royal Basin and is fed by a glacier/snow field on the northeast flank of Mt. Deception, and by drainage from the east flank of the Needles, Mt. Clark and Mt. Walkinshaw, and the southeast flanks of Gray Wolf Ridge. Figure 2.6 shows that the floor of Royal Basin (5200 to 4600 ft. elevation) is substantially higher than the upper Dungeness basin.

Royal Basin and Royal Creek nearly down to the Dungeness River are included in Olympic National Park, as is the south end of the upper Dungeness basin. The remainder of the upper Dungeness basin down to just below RM 25 is included in the south unit of the Buckhorn Wilderness that was established in 1984. The east-west boundary that divides Jefferson and Clallam counties lies just south of the wilderness boundary.

Mueller Creek drains the steep south flank of the Mt. Baldy/Tyler Peak extension of Gray Wolf Ridge, joining the Dungeness on the left bank just below RM 24. The terminal moraine marking the limit of advance of the Vashon ice sheet (probably about 15,000 years before present) is in the vicinity of RM 24, and is exposed in steep cut bank slopes and slumps above forest road 2860 on the east side of the river, opposite Mueller Creek.[19] The forest road has continued upriver on the west side, crossed the river just above RM 24, and traversed northeast along the flank of the ridge separating Copper Creek and the Dungeness. The boundary of the south unit of the Buckhorn wilderness parallels the forest road, higher on the slope, and includes most of the Copper Creek subwatershed including the abandoned Tubal

16 The 3-D terrain depictions used throughout this chapter utilize data from USGS 7.5-minute DEM files (digital elevation versions of the familiar "topo quads"). The individual files have been provided by USFS Quilcene, Ecology Water Resources, and Olympic National Park, and processed for these illustrations by W. Clark. Resolutions (the spacing of elevation data points) vary, depending on the size of the area depicted, from approximately 1 point every 100 feet for detail views to 1 point for (approximately) every 40-acre quarter-quarter-section for the DQ Region overview.

17 Long, W.A. Unpublished reports. USFS Olympic National Forest. 1970's. Long, a USFS geologist, studied the glacial history of the eastern Olympic mountains extensively, and his writings provide much valuable insight into, especially, the Vashon cordilleran glaciation and the alpine glacial episodes.

18 Tabor. 1987.

19 Long. 1975.

Cain mine, the Tubal Cain and Tull Canyon mining camp sites,[20] and the upper portion of the Silver Creek subwatershed.

At about RM 23 the mainstem resumes its mostly-northward course, and is joined on the right bank by the combined Silver and Copper creeks that drain high terrain on the northwest side of the Dungeness/Big Quilcene divide. Figure 2.7 illustrates the steep terrain at the confluence of Copper and Silver creeks and the Dungeness. A major landslide here in 1972, in alpine glacial till deposits saturated as a result of prior clear cutting above, and triggered by storm runoff; briefly dammed the river.[21]

A view of the Dungeness watershed looking north from over the upper basin is depicted in Figure 2.8.

The middle reaches of the Dungeness:

Below RM 23 the watershed broadens to the east as indicated on Figure 2.9. Three-o'clock Ridge on the southeast flank of Maynard Peak, circled by the forest road, is a well-known vantage point into the higher country upstream. Several small creeks enter the Dungeness mainstem from both left and right banks. Sleepy Hollow Creek drains a long, narrow subwatershed beginning at the divide with the Little Quilcene River, and joins the Dungeness at RM 19.3.

Gold Creek:

The most extensive subwatershed in this area is that of Gold Creek, shown in Figure 2.10, which joins the Dungeness at RM 18.7. Gold Creek and its tributaries total over 12 miles in length[22] and drain northwest from Bon Jon Pass (at the divide with the Little Quilcene River system) and the southwest flank of Mt. Zion. At the headwaters of Gold Creek just northwest of Bon Jon Pass, a major timber clear-cut has stripped the entire watershed without leaving any riparian buffer. The Gold Creek area contains much glacial drift from the Fraser (and earlier?) cordilleran glaciations, including glacial lake sediments, outwash deposits and lodgement tills. Numerous landslides, both old and new, naturally-occurring and associated with timber harvesting, have contributed sediments to the Dungeness River. One is shown in Figure 2.11. Substantial slides that contributed sediments to the Dungeness occurred in 1969 and 1972.[23] Attempts that have been made to control and/or repair the Gold Creek slides appear to have underestimated the extent of the deposits and the long-term history of the movements.

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20 Wood, RL. Olympic Mountains Trail Guide. 1984.

21 Long. 1975.

22 Clark, V. & W. Stream Profiles of tile Dungeness River System. July 1992 (in Dungeness River Area Watershed Management Plan, May 1993). A table and profile graphs identify locations, lengths, and gradients of stream segments, and relevant geographical features.

23 Golder Associates. Geotechnical Investigation of the Gold Creek Slide Complex. April 1993. Prepared for USFS, Olympic National Forest.

Figure 2.6 Terrain depiction of the Dungeness headwaters and Royal Creek basins.

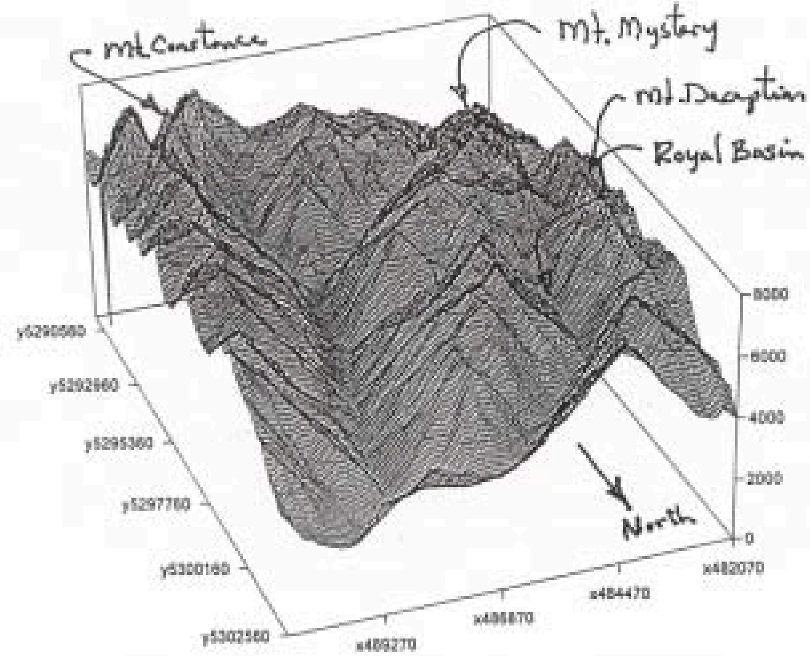


Figure 2.7 Terrain depiction of the Dungeness River at RM 22, where Silver and Copper creeks join it. A serious slide here blocked the river briefly in 1972.

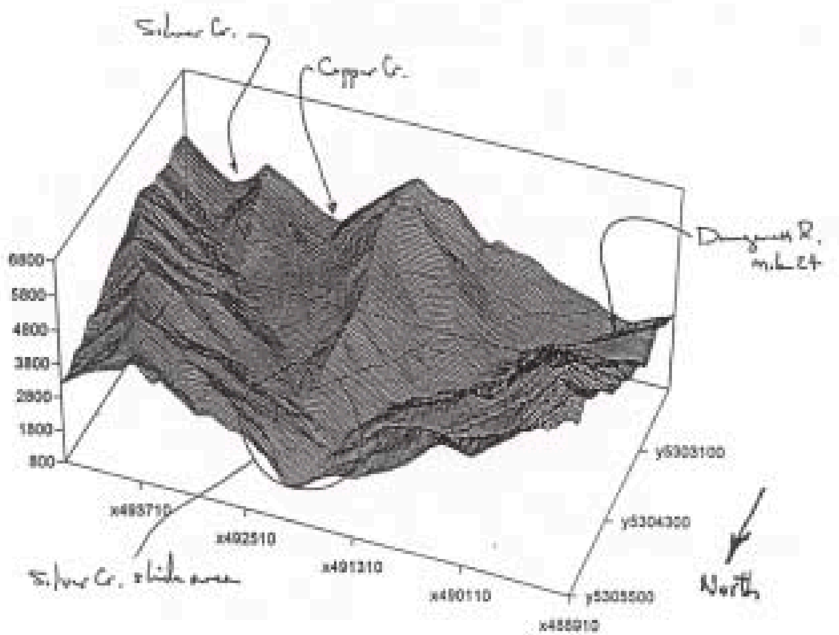


Figure 2.8 Terrain depiction of the Dungeness watershed, looking north from the headwaters basin.

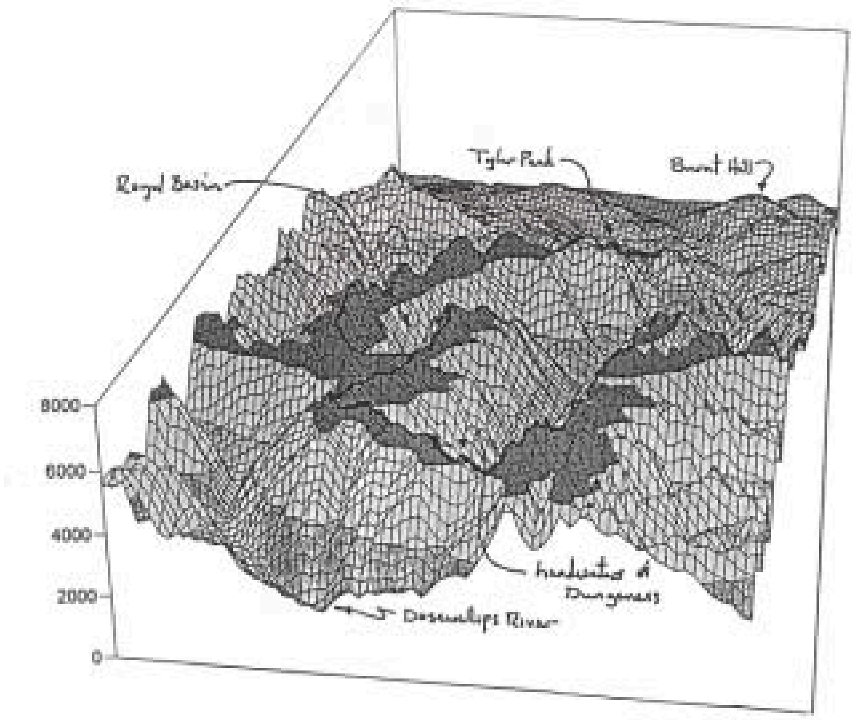


Figure 2.9 Terrain depiction of the middle Dungeness watershed, showing the Copper and Silver, Sleepy Hollow, and Gold creek sub-basins.

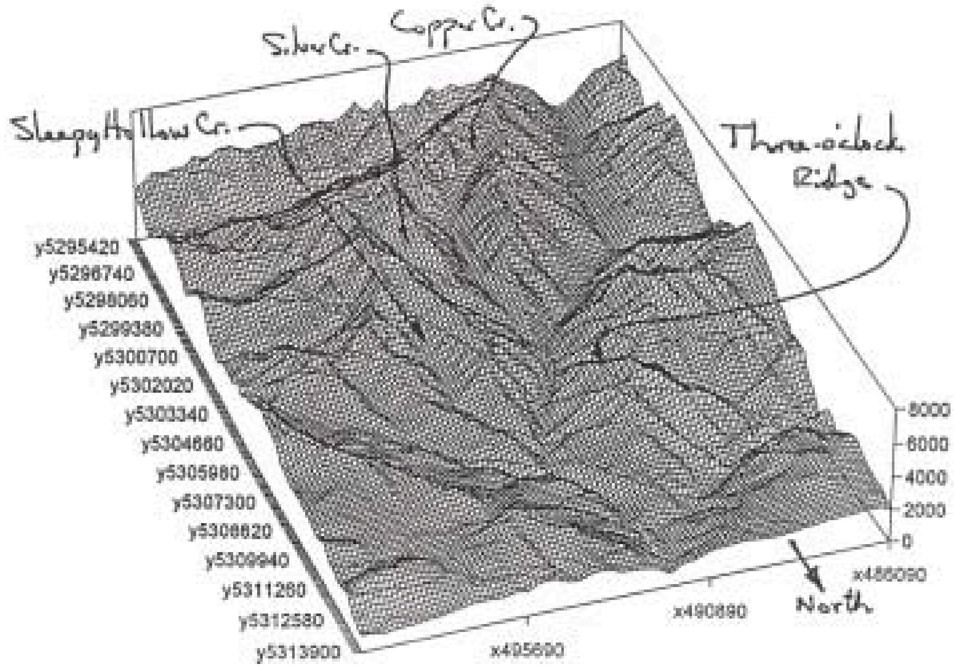


Figure 2.10 Terrain depiction, looking *ESE*, of the Gold Creek sub-basin. This area has been intensively logged in earlier years.

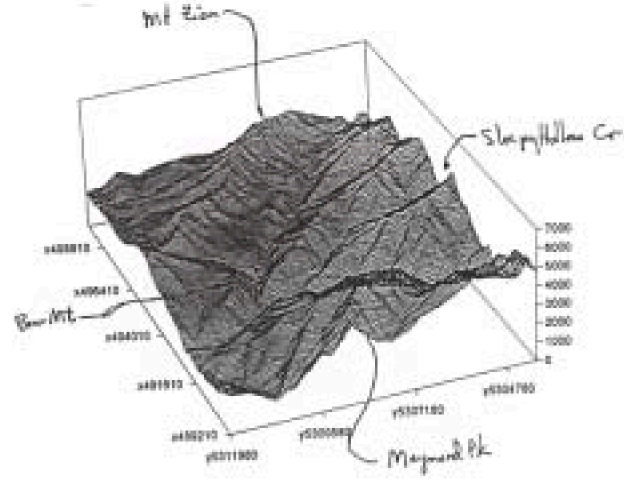


Figure 2.11 A view of a land slide area on Gold Creek. The unstable glacial drift sediments of this area are subject to major long-term movements as well as surface slides.

Figure 2.12 A view, looking south, of the Dungeness river canyon near Gold Creek, with the Forest road bridge crossing.

Below Gold Creek to the confluence with the Gray Wolf River:
From just below Gold Creek to the Forks (the confluence with the Gray Wolf), Forest Road 2860 parallels the river near the east bank. Shortly below Gold Creek the road crosses over the inner river canyon, as shown in Figure 2.12, and climbs out of the inner canyon to join Forest Road 2870 and continue south above the west river bank at a higher elevation.

Eddy Creek, draining the southwest flank of Bear Mountain, flows into the Dungeness at RM 17.0 from the east, and another unnamed small creek enters from the east somewhat below.

We interrupt the description of the Dungeness mainstem at this point to consider its largest tributary, the Gray Wolf.

The Gray Wolf River (once known as the West Fork of the Dungeness): The Gray Wolf River (GWR) begins with three headwater tributaries in high country of the Olympic Mountains "core rocks." It flows into the Dungeness (at Dungeness RM 15.8) in a relatively broad river-valley section.

The Gray Wolf River begins in three distinct headwater basin areas in the SW and W edge of the DQ region, at divides separating the watershed from Dosewallips and Elwha watersheds in the east-central Olympic mountains. The three headwater streams join in the Three Forks area, about RM 9.6 above the confluence with the Dungeness river mainstem. The entire upper Gray Wolf River watershed lies within Olympic National Park (ONP) down to a mile+ below the Three Forks. The three upper basins are shown in Figure 2.13.

The upper Gray Wolf River: The upper Gray Wolf basin is bounded on the southwest by a 6500-7000+ ft. ridge that drains into the headwaters and to Cedar Lake (5280 ft.) and Cedar Creek, which flows into the upper Gray Wolf. On the east the high mountain ridge of The Needles, Mt. Deception (7788 ft.), Mt. Clark (7528 ft.), and Mt. Walkinshaw (7378 ft.) drain west into the upper Gray Wolf River and east into Royal Basin of the upper Dungeness.

Between RM 14.8 and RM 12 the upper Gray Wolf River flows northeast, turning north again about 2 miles west of Gray Wolf Peak (7218 ft.) in a steep, symmetric canyon (easily seen from Blue Mountain) that terminates at the Three Forks. The upper Gray Wolf River, down to the confluence with Cameron Creek, extends 7+ miles and is fed by another 13 miles of smaller tributaries.

Cameron Creek: Cameron Creek originates in the Cameron Basin north of Cameron Pass (6450 ft.) on the divide separating the Dungeness/Gray Wolf River system from the Elwha watershed. Another branch of the Cameron Creek headwaters drains from the Cameron Glaciers along the north face of the east-west Mt. Cameron ridge, and joins the western branch from Cameron Basin about 6 miles above Three Forks. The straight, northeast-trending, steep-walled canyon of Cameron Creek is an extension of the canyon of the lower Gray Wolf River, and was obviously shaped by probably several alpine glacier episodes. Cameron Creek extends nearly 9 miles beyond its confluence with the upper Gray Wolf River at Three Forks, and is fed by 12 miles of smaller tributaries in addition to Grand Creek.

Grand Creek:
The third of the headwater streams of the Gray Wolf River joins Cameron Creek just above its confluence with the upper Gray Wolf River, (accounting for the "Three Forks" name). Grand Creek begins on the north flank of Grand Pass, in a headwater basin containing Gladys Lake (5399 ft.), Moose Lake (5056 ft.), and Grand Lake (4745 ft.). It drains the east flank of Lillian Ridge (the divide separating the Dungeness-Gray Wolf River watershed from Lillian River of the Elwha watershed) and the west/northwest flank of the spur ridge separating Grand and Cameron creeks. Badger Valley Creek, draining the southwest flank of Elk Mtn. (the east extension of Hurricane Ridge) and the northeast face of Lillian Ridge, joins Grand Creek, which arcs around northeast, then east, then southeast, draining the south flanks of Elk Mtn., Maiden Peak, Green Mtn., and Blue Mtn. before joining Cameron Creek. Grand Creek extends *7+* miles above Cameron Creek, and has *17+* miles of smaller tributaries.

The lower Gray Wolf River:
Below the Three Forks, the Gray Wolf River runs nearly 10 miles, essentially northeast, to its confluence with the Dungeness mainstem. In this lower stretch the Gray Wolf River is fed by over a dozen smaller tributaries adding another *27+* miles of stream length. The longest of these, Divide Creek, stretches 9+ miles with several branches, draining the north slopes of Tyler Peak and Baldy and the west side of Maynard Peak.

The Gray Wolf River and its major tributaries are within the ONP beginning about 8 miles above its confluence with the Dungeness mainstem. Below the ONP boundary and down to *2+* miles above the Dungeness, the river and its tributaries lie within the North Unit of the Buckhorn Wilderness of Olympic National Forest (ONF), and only several short tributaries join the Gray Wolf River below the wilderness boundary. Thus, of the roughly 17 miles length of the Gray Wolf River, the additional 16 miles of its two major tributaries and roughly 69 miles of smaller tributaries, more than 95% is protected by park or wilderness restrictions from most human-caused degradation.

The major exception to the unexploited character of the Gray Wolf River watershed is an area of several clear cuts and a quarry to the west of Slab Camp Creek extending over to Deer Ridge. The road into the quarry area shows up on 1939 aerial photos, and the clear-cuts are evident in 1980 photos. The north boundary of the wilderness area established in 1984 jogs south to within about 1/4 mile of the river and *2400* ft. elevation (about 800 ft. above the river on the canyon slope) to exclude these evidences of development and timber harvest.

Near Camp Tony, on the Gray Wolf River just above Slab Camp Creek, are evidences of a terminal (?) moraine marking the extent of Vashon glacier ice sheet penetration up the Gray Wolf River.[24]

[24] Long. 1975.

Figure 2.13 Terrain depiction, looking *SSE*, of the Gray Wolf River headwaters basin.

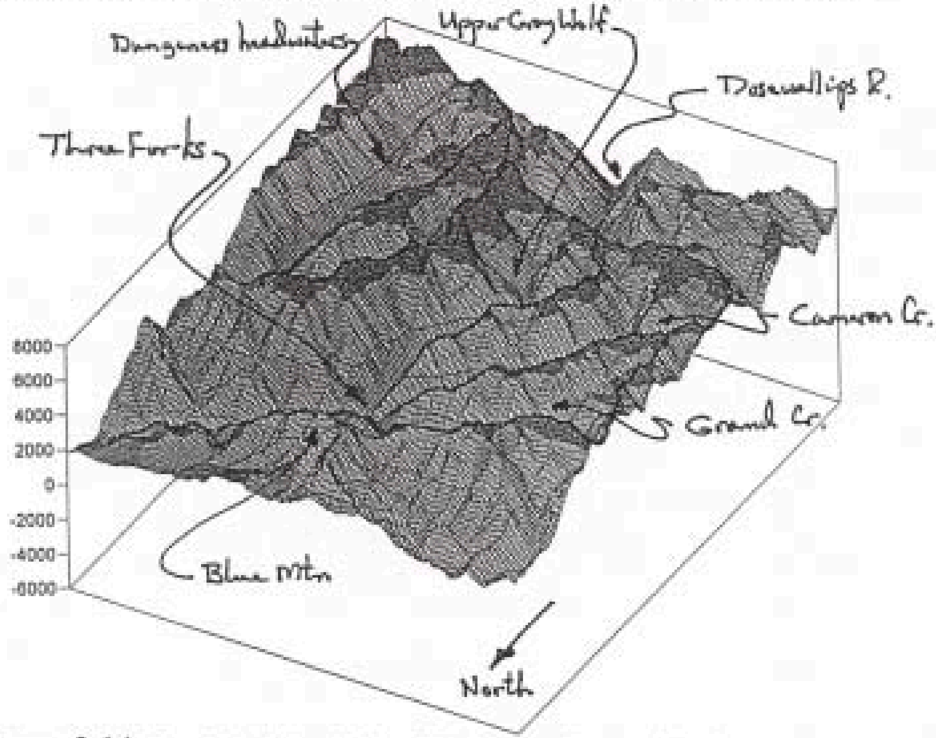
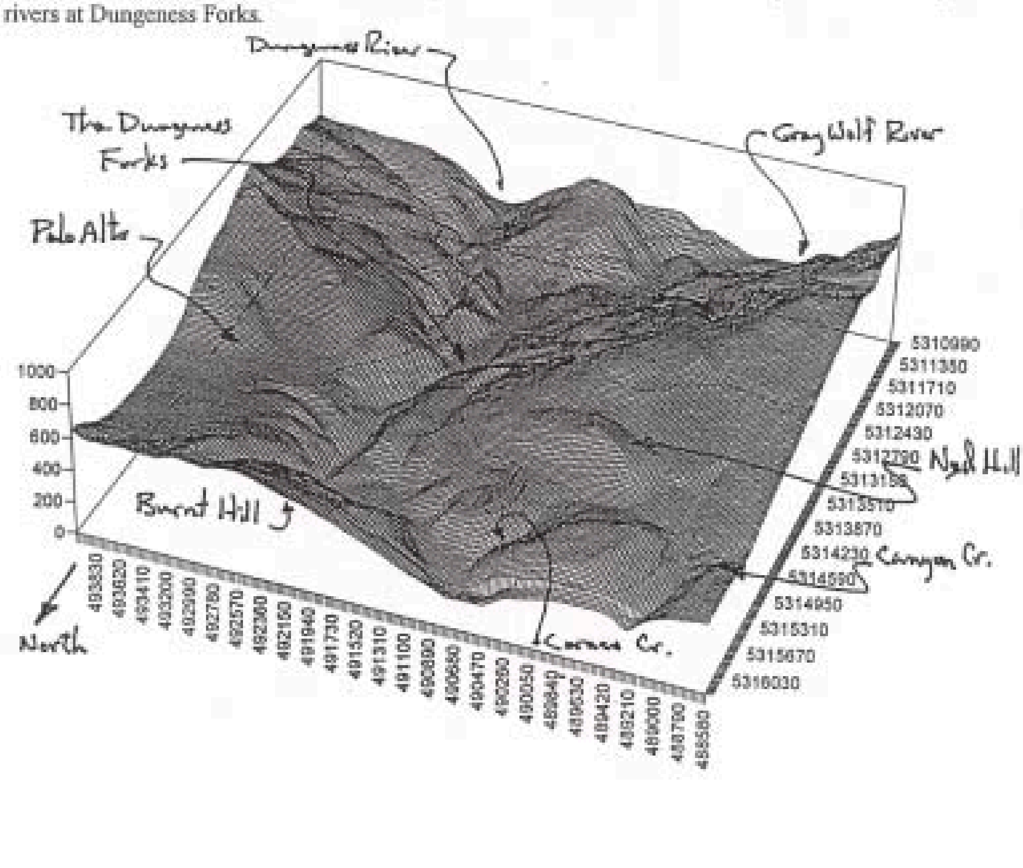


Figure 2.14 Terrain depiction, looking *SSE*, of the confluence of the Gray Wolf and Dungeness rivers at Dungeness Forks.



The confluence of Dungeness and Gray Wolf:

The character of the watershed changes in the area where the two rivers emerge from the steep canyons and high mountains of the Olympics to join at the Dungeness Forks, as Figure 2.14 shows. All of the mountains and foothills north of a fine extending from Mt. Zion to Maynard Peak to Blue Mountain were over-topped by the latest cordilleran ice sheet. As a result, peaks and ridges are rounded and smoothed off, and lower areas have had thick deposits of glacial drift (tills, outwash gravels and sands, and glacial-lake-deposit silts and clays). The rivers and streams have since cut down into the deposits, bringing out bedload and suspended sediments from this middle region of the watershed, but the extent, depth, and composition of the cordilleran glacial deposits and the nature and structural relationships in the underlying bedrock are not adequately known.

Perhaps one-third of this intermediate area drains into the adjacent Gray Wolf River and Dungeness River channels by way of short tributaries. The remainder, the broad expanse of land below the northeast flank of Blue Mountain, west of the river, is drained by Canyon Creek and its tributaries which extend nearly twenty miles, and by Caraco Creek, 2+ miles in length, both visible in Figure 2.14. Caraco Creek joins the Dungeness River at RM 12.1, just above the USGS gaging station. Canyon Creek joins the DR at RM 10.8, below the gage, and thus its contribution to flows is not included in gage readings.

The visual foreshortening in the view from the Sequim-Dungeness valley of the foothills with the snow-covered peaks behind, masks the extent of this intermediate-level terrain. This leads to the common misconception that the river is steep "until it emerges from the mountains" at the hatchery. In reality, the steep gradients of the upper Dungeness and Gray Wolf rivers flatten somewhat coming through this intermediate-level section. The gradient is then relatively constant (at 60 to 75 ft. per mile) for over six miles to near the Hwy. 101 bridge.

This intermediate-elevation, and relatively-open terrain extends to the northernmost foothills, Burnt Hill (2560+ ft.) and Lost Mtn. (2040+ $.). The river flows between these foothills in a narrow and twisting channel, cut down into glacial sediments and bedrock outcroppings, seen in Figure 2.15. It subsequently widens into the broader valley where the Dungeness State Fish Hatchery is located, as shown in Figure 2.16. Below the Hatchery the valley broadens and flattens, the river channel widens, and begins to braid.

Figure 2.15 Terrain depiction, looking *SSE*, of the Dungeness river channel through the foothills

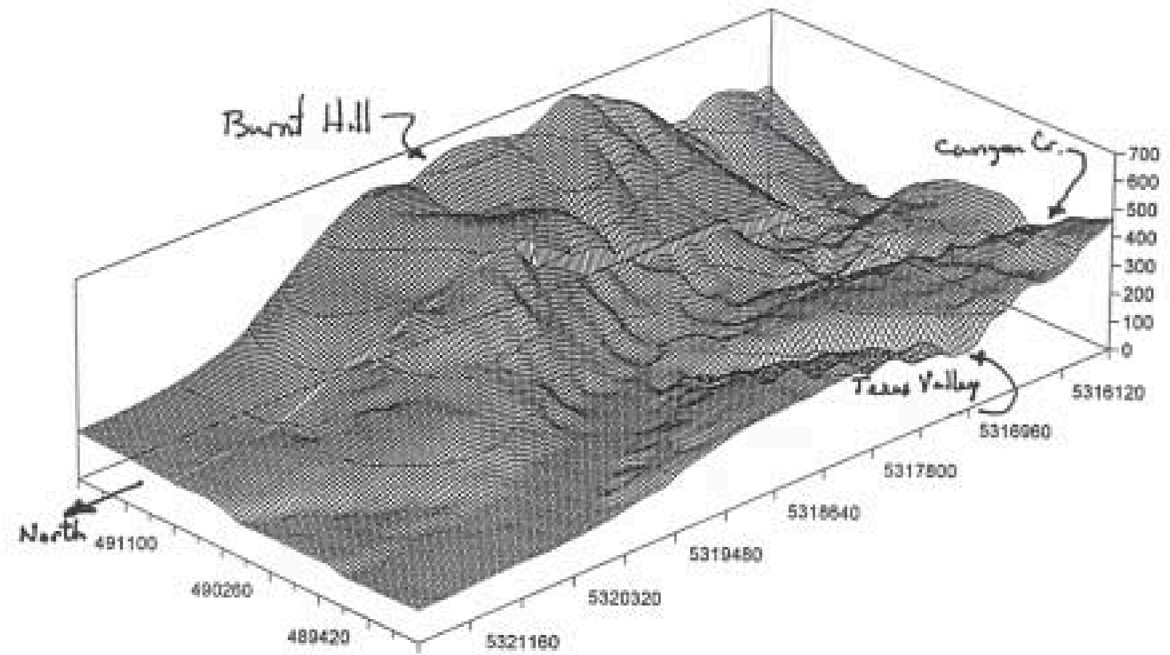
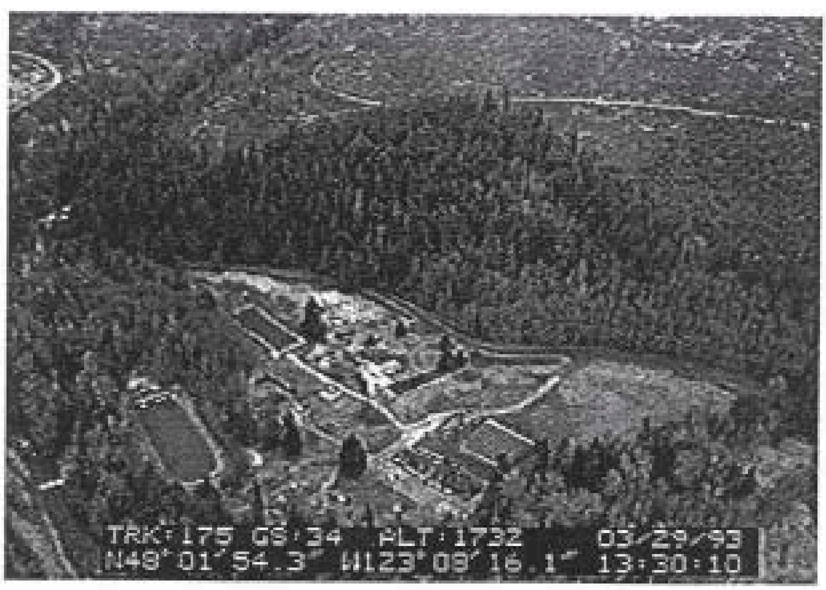


Figure 2.16 A view, looking *SW*, of the Dungeness State Fish Hatchery. The river is at the lower left corner.



At this point we change direction, starting at the mouth of the Dungeness River at Dungeness Bay, and describe the lower river watershed in an *<u>upstream</u>* *direction, from its outlet up to its passage through the foothills. A series of aerial views of the river provides the framework for this description.*

The lower Dungeness River in the Sequim-Dungeness valley:
Figure **2.17** provides an overall depiction of the lower Dungeness River watershed area,[25] also referred to as the Sequim-Dungeness valley, basin or peninsula. The area centered on the river is seen to have many characteristics of an alluvial fan and delta, formed solely by the river flowing out from the mountains. The reality is more complex, however. Cordilleran glaciations, massive ice sheets repeatedly moving south and southwestward over the peninsula and foothills areas from Canadian sources during the "ice ages," have played a large role in the construction of this terrain [as *described in more detail later, in the Hydrogeology subsection of the Water Resources section of this chapter].* According to Downing (Chapter 2), the Dungeness is small and low in sediment transport by comparison with most Puget Sound and Olympic Peninsula rivers.[26] The river's role, in the intervals between glaciations of the 2-million year Pleistocene "ice ages" and in the 10,000+ years since, has probably been in large part to rework the glacial drifts, in places cutting down into the outwash deposits and lodgement tills, and in places transporting and re-depositing them as alluvium over the terrain we now see.[27]

Examination of the broad, relatively flat Sequim-Dungeness peninsula shows substantial relief. Foothill features (Burnt Hill, Lost Mountain, Bell Hill, and the hills of the McDonald/Seibert/ Bagley uplands) have lodgement till deposits and bedrock exposures from over topping by the cordilleran glaciers. Upland valleys (Happy Valley, Texas Valley) suggest evidences of glacial lake ponding and recessional outflows. East-west ridges (Hogback, Dungeness Heights/ Potholes, Grennan, Madrona, etc.) suggest ice-contact kame-terrace and esker glacial outwash deposits. Maps of the surficial geology of the area[28] illustrate these and other features and suggest the present (and probable ancestral) river flood plains. Figure 2.18 is a topographic relief map, generated from the USGS digital elevation data, illustrating the relief and surface drainage patterns of the area as shown in the pictorial of Figure 2.17.

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25 The Dungeness River Area Watershed Management Plan, 1993, produced under a Centennial Clean Water Fund grant, encompassed the upper Dungeness/Gray Wolf basins and the majority of the terrain shown in Figure 2.17. The western boundary, between Bagley and Morse creeks, was considered to represent a hydrogeologic western limit for the lands west of the Dungeness. A line across the face of Burnt Hill, across Happy Valley, through Sequim, and to the shoreline north of Sequim Bay was considered as the boundary with the Sequim Bay watershed.

26 Downing, J. The Coast of Puget Sound: Its Processes and Development. 1983.

27 Wennekens, M.P. Unpublished Technical Notes and Technical Committee presentations, 1993-4, has identified the area of McDonald, Seibert and Bagley creeks as a separate hydrologic region, distinct from the Dungeness drainage. Wennekens has also shown, from topography and soils mapping, the alluvial development of the Dungeness flood-plain areas.

28 Othberg, K. and Palmer, P. Preliminary surficial Geologic Map(s) of the Carlsborg (Sequim, Dungeness, Gardiner) Quadrangle(s), Clallam County, Washington. 1979.

Figure 2.17 Terrain depiction, looking *SSE,* of the Sequim-Dungeness area.

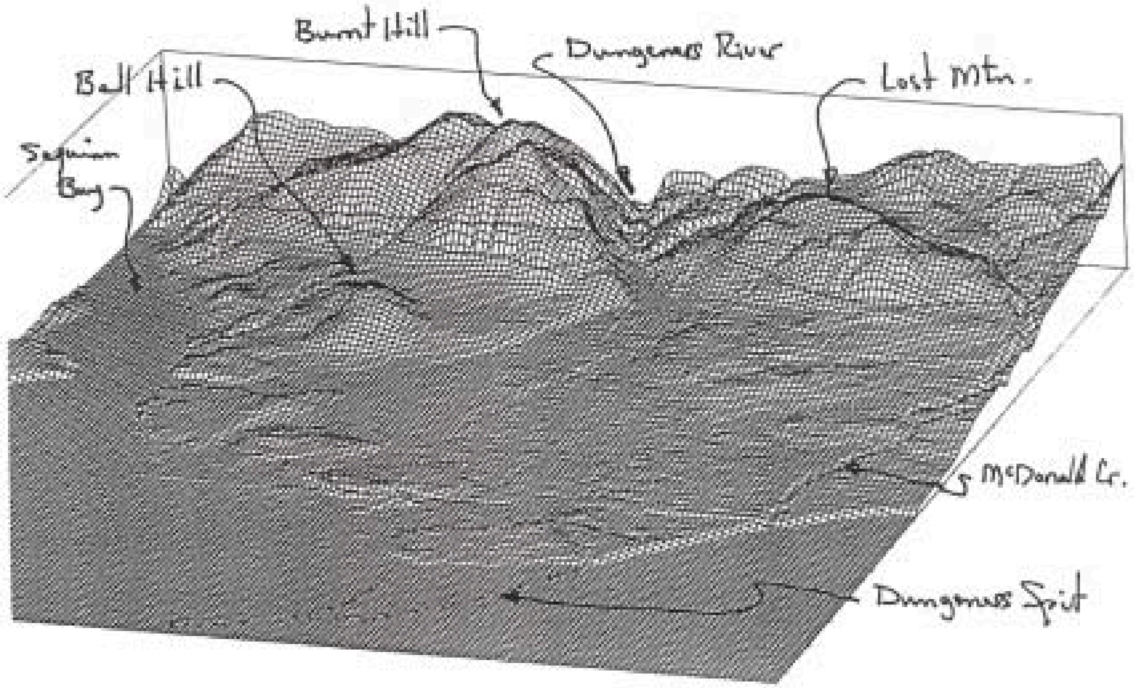
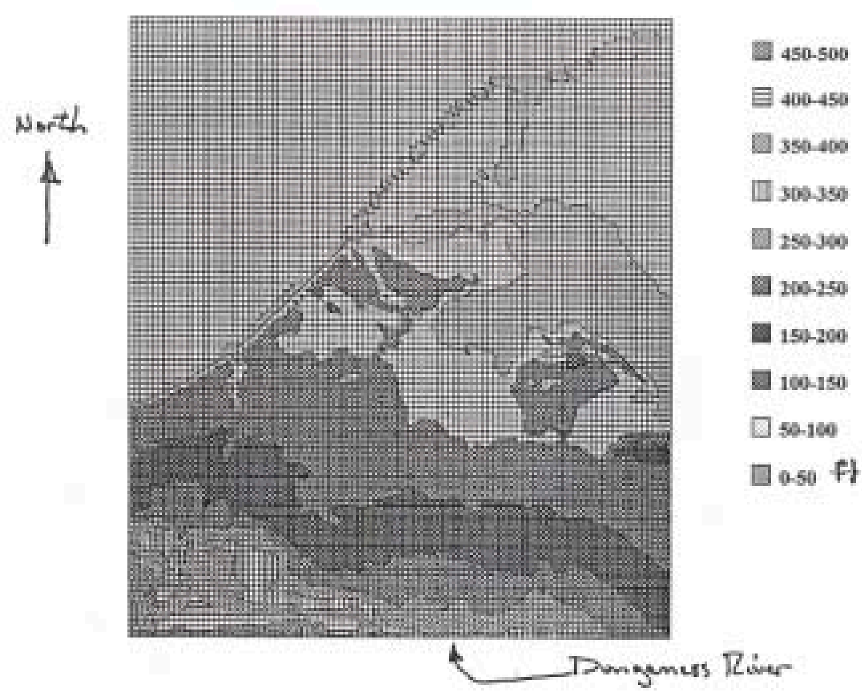


Figure 2.18 A generalized relief map of the lower Sequim-Dungeness peninsula. The low resolution of this depiction masks shallow streams and river channels, but the McDonald Creek canyon is apparent.



Figures 2.19 (*a* to *n)* are views of the lower Dungeness River taken from the USFS helicopter-video survey, flying south from the Dungeness Bay.[29] These views show the instability of the channel, as well as the human impacts -- dikes, bridges, over wintering ponds and gravel traps and gravel mines.[30] The problems are particularly evident in Figure 2.19 *(e)* where west bank erosion has claimed much farmland, below the Rail Road bridge, and in Figure 2.19 (m) where impingement of a river meander threatens to undermine Fish Hatchery Road above a vertical bank. Captions accompanying the figures indicate important features.

Other features of the Sequim Dungeness peninsula are discussed later in this chapter, in the Coastal Uplands, Lowlands and Shorelines section.

[29] The USFS Olympic National Forest undertook a helicopter videotape reconnaissance of rivers and streams of the Olympics in the spring of 1993, with participation by the DQ project enabling coverage of DQ Region in areas outside of Forest Service lands. The coverage, of both oblique area views and near vertical river-course surveillance, included continuous on-frame position and track information. Videotape coverage is available for the Dungeness River and Gray Wolf up to the Olympic National Park boundaries, including the Canyon, Caraco, Gold, and Sleepy Hollow creek tributaries; the Big Quilcene River including Tunnel and Townsend creek tributaries; the Little Quilcene River, McDonald Creek; Jimmycomelately Creek; Chimacum Creek; and Marrowstone and Indian Islands. Aerial photo views throughout this chapter have been captured from the videotape by computer digitization for reproduction here.

[30] Wennekens, M.P. Unpublished DQ Technical Note examining the extent and implications of gravel removal from the lower Dungeness river channel. November 1993.

Figure 2.19a Looking south at the Dungeness River near Dungeness Bay.

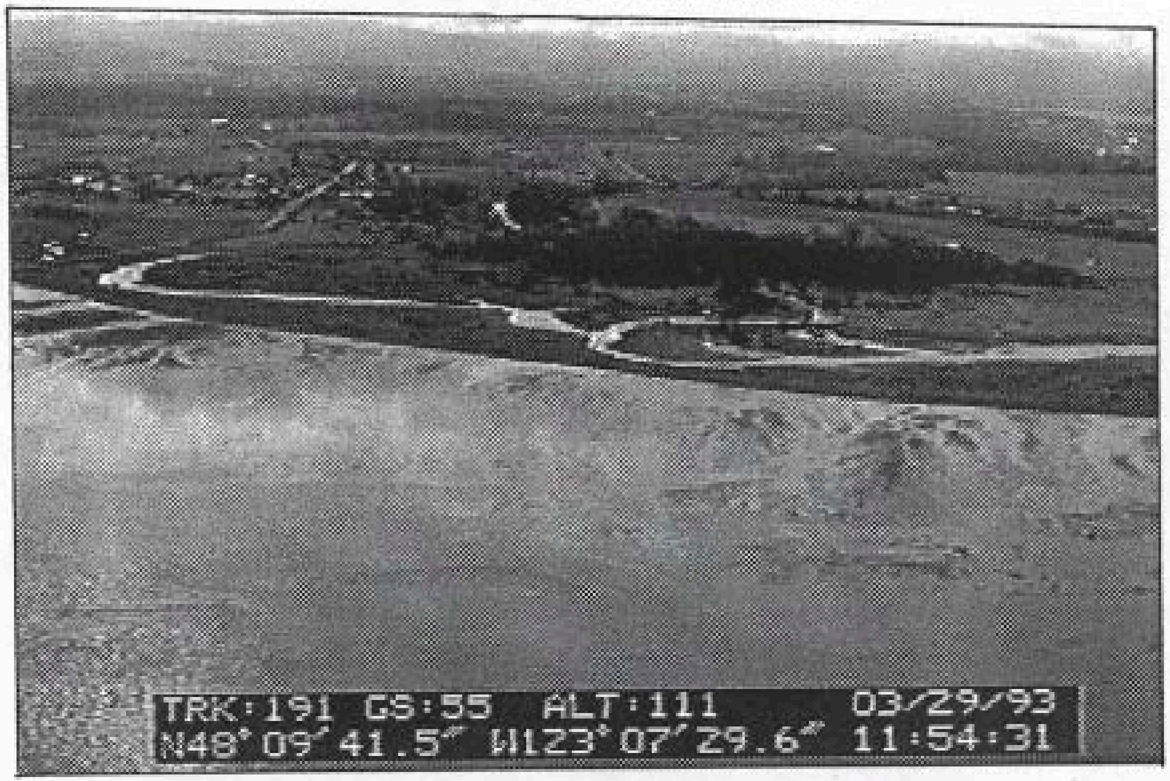


Figure 2.19b Looking south at the Dungeness River and dike north of the schoolhouse bridge at RM 0.85.

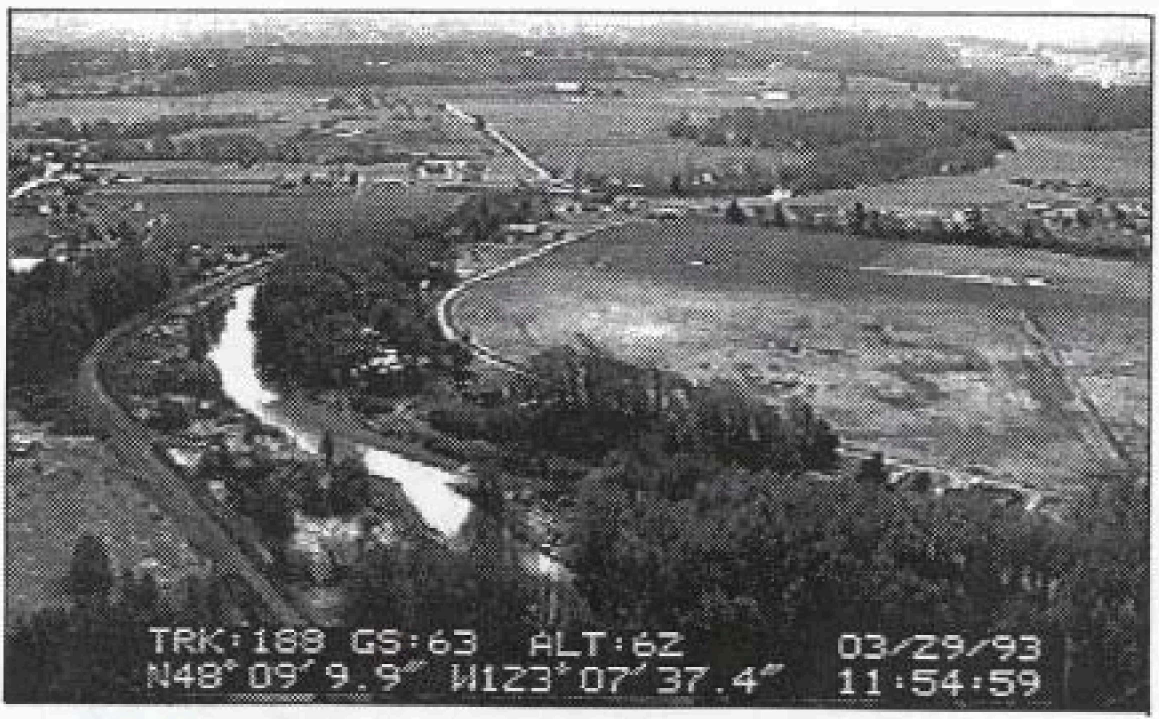


Figure 2.19c Looking *SSW* at the Dungeness River below the Woodcock Road (Ward) bridge at RM 3.25.

Figure 2.19d Looking *SSW* at the Dungeness River below the Old Olympic Highway (Burlingame Bridge) at RM 4.0.

Figure 2.19e Looking south at Dungeness River braiding and bank erosion north of the RR bridge.

Figure 2.19f Looking *SSE* at the Dungeness River at the (abandoned) RR bridge at RM 5.65, now a pedestrian and bicycle trail crossing and park.

Figure 2.19g Looking south at the Dungeness River immediately upstream of the RR bridge, with bank erosion on the west side.

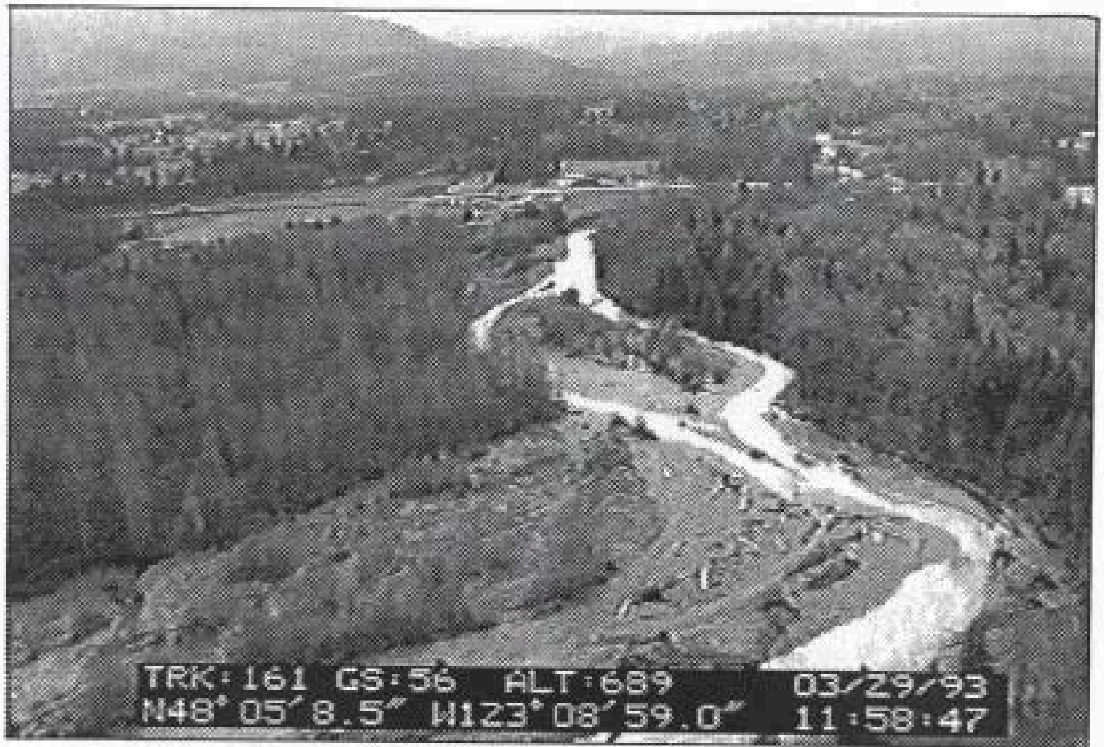


Figure 2.19h Looking *SSW* at the (new) Hwy. 101 bridge over the Dungeness at RM 6.4. Braiding is visible upstream and downstream.

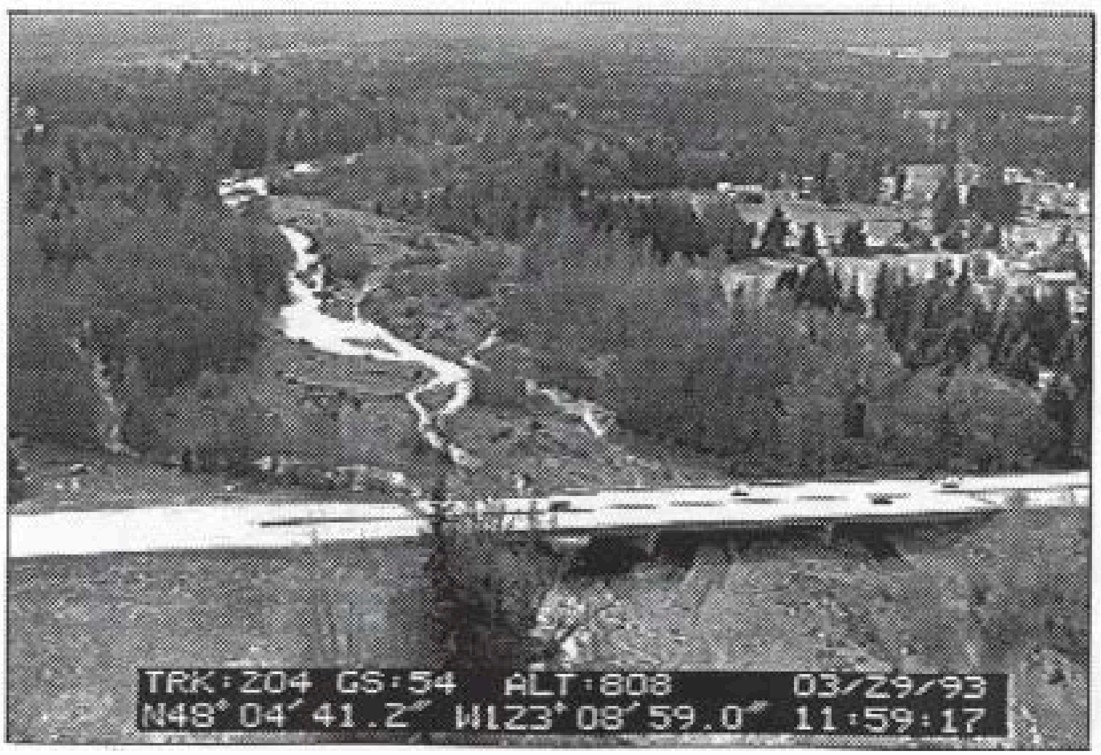


Figure 2.19i Looking south at the Dungeness River braided and aggraded channel and the large gravel trap/mine, south of the Hwy. 101 bridge.

Figure 2.19j Looking south at the impacted Dungeness river channel northwest of Dungeness Meadows residential area. An east-bank dike, upstream over-wintering ponds/gravel traps, and the site of an under-channel infiltration gallery for irrigation diversion are visible.

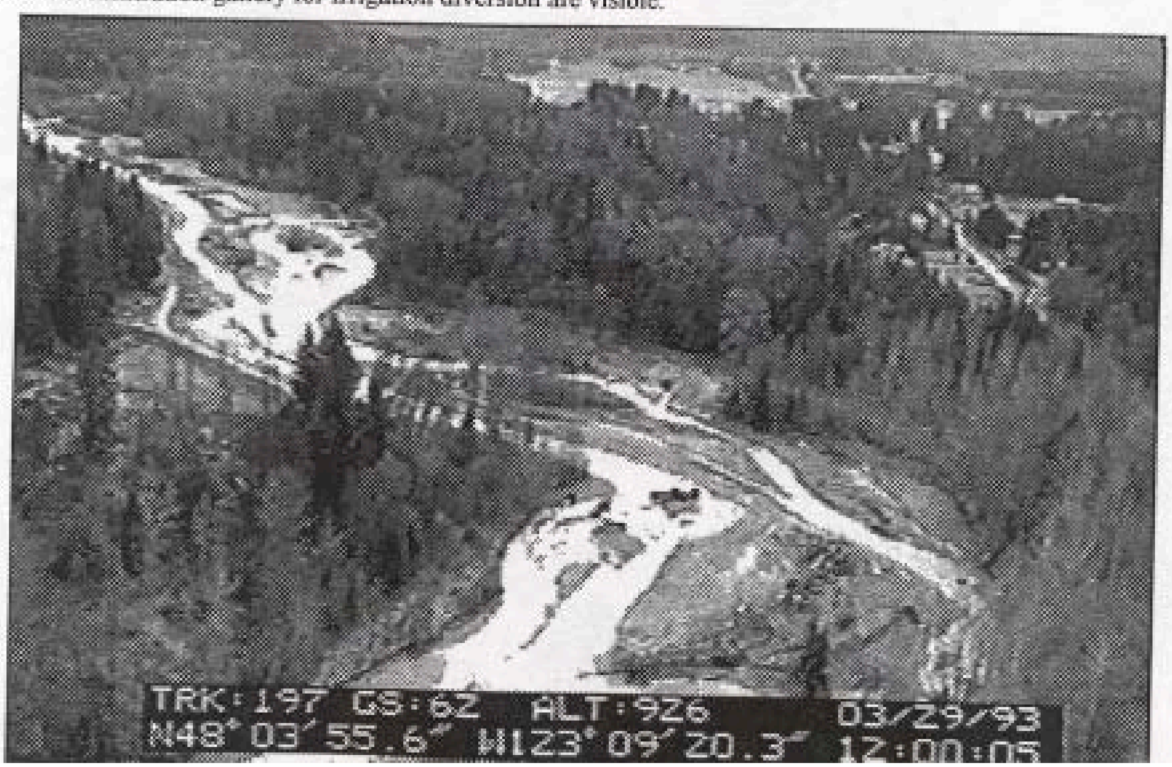


Figure 2.19k Looking south at the Dungeness River location where the BPA electrical transmission lines cross, at RM 8.8

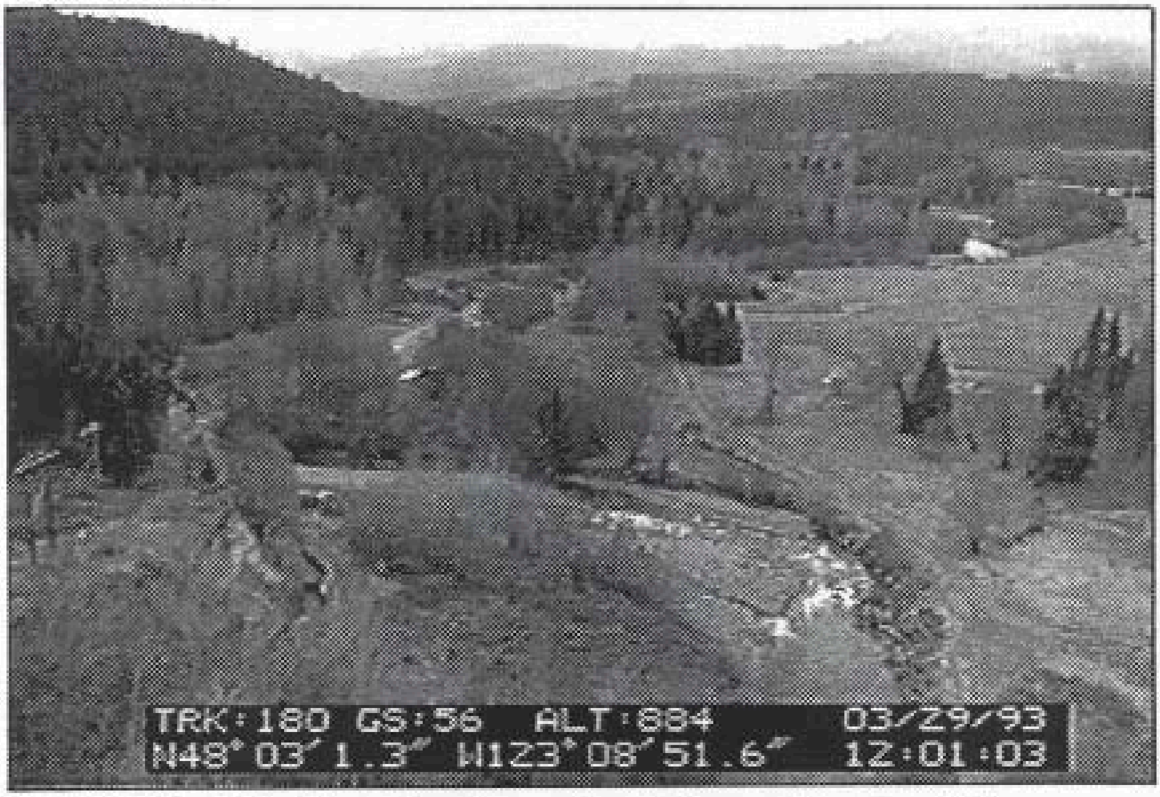


Figure 2.19l Looking *SE* at a riprap dike area along the Dungeness River above RM 9.

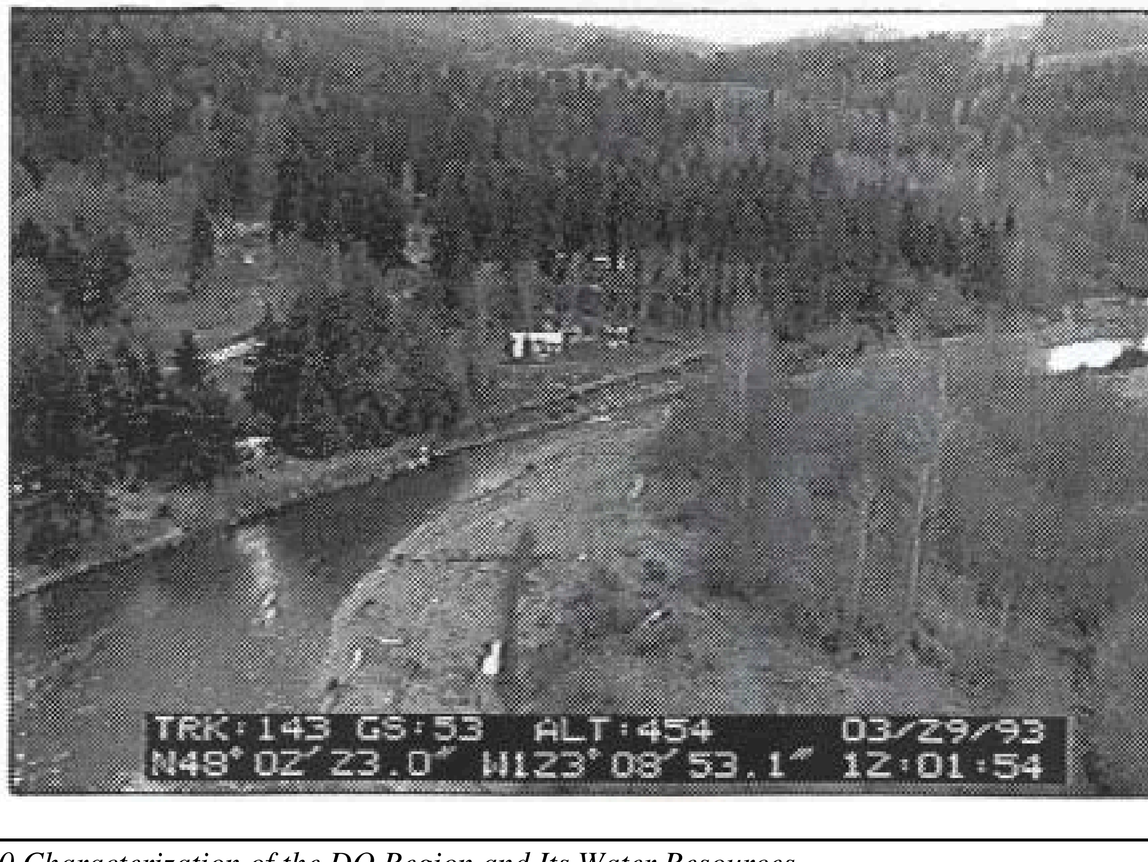
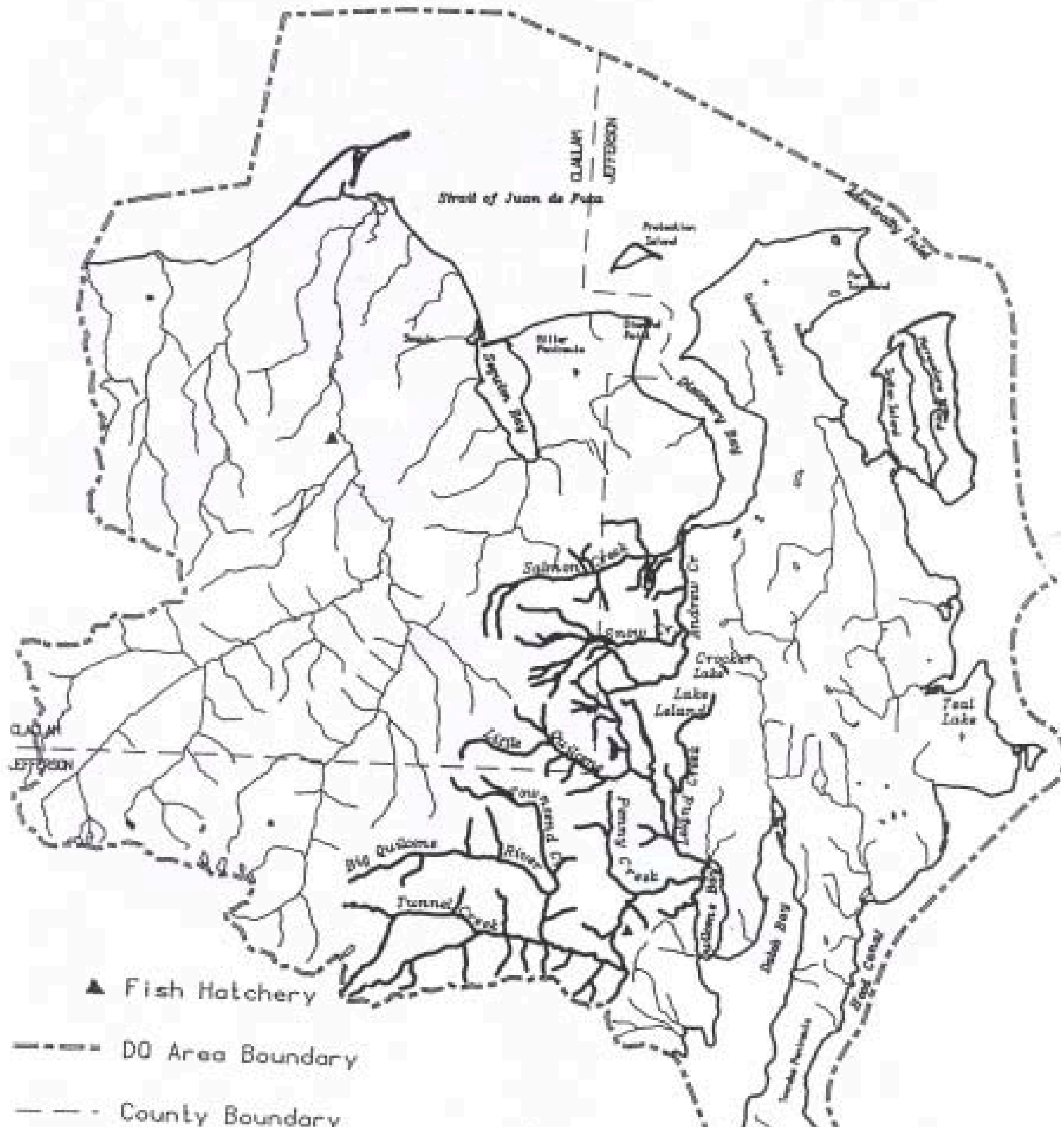


Figure 2.19m Looking *SW* toward severe Dungeness River bank erosion undercutting Fish Hatchery Road at RM 10.

Figure 2.19n Looking south at the Dungeness River at the most upstream irrigation diversion, for Agnew Ditch. The USGS gaging site is 3/4 mile farther upstream.

Figure 2.20 Map of the DQ Region showing rivers, streams, lakes and marine waters. The Big Quilcene and Little Quilcene rivers and Salmon and Snow creeks are highlighted.



The Watershed of the Big Quilcene River

7he following brief characterization sketch identifies the major features of the watershed An early DQ field tour provided first-hand looks at the Quilcene watersheds for participants.[31]

The Big Quilcene watershed has been identified as a key watershed under authority of the President's Forest Plan and the Forest Ecosystem Management Assessment Team process, and detailed assessments are underway. A preliminary watershed assessment prepared by a Local Interagency Team in April 1994 has much useful information [32] *A further watershed analysis is underway, to be completed in fall 1994 by an interagency taskforce co-directed by USFS and WDNR*.[33]

The Big Quilcene River:
The watershed of the second largest river in the DQ region is bounded by the watersheds of the Dungeness, the Dosewallips, and the Little Quilcene, as indicated on the map in Figure 2.20, and in the pictorial view of Figure 2.21. The watershed encompasses about 70 sq. miles in the south-central portion of the DQ region. A diversion dam at RM 9.3 controls a major diversion into a pipeline for Port Townsend and the paper mill. The mainstem of the Big Quilcene extends over 20 miles, with headwaters on the southeast slopes of Buckhorn Mtn. and the northeast slopes of Peak 6852, in the vicinity of Camp Mystery and Marmot Pass (crossing into the Dungeness watershed). Tunnel Creek, the largest tributary, joins the river just above the diversion dam visible in Figure 2.22. Tunnel Creek headwaters drain the east slopes of Mt. Constance and Warrior Peak, beginning at elevations near 6000 ft. The other major tributary, Townsend Creek joins the river from the north at river mile 12.8. Townsend Creek headwaters begin on the southeast slopes of Mt. Townsend and the east slopes of Welch Peaks at elevations above 4000 ft.

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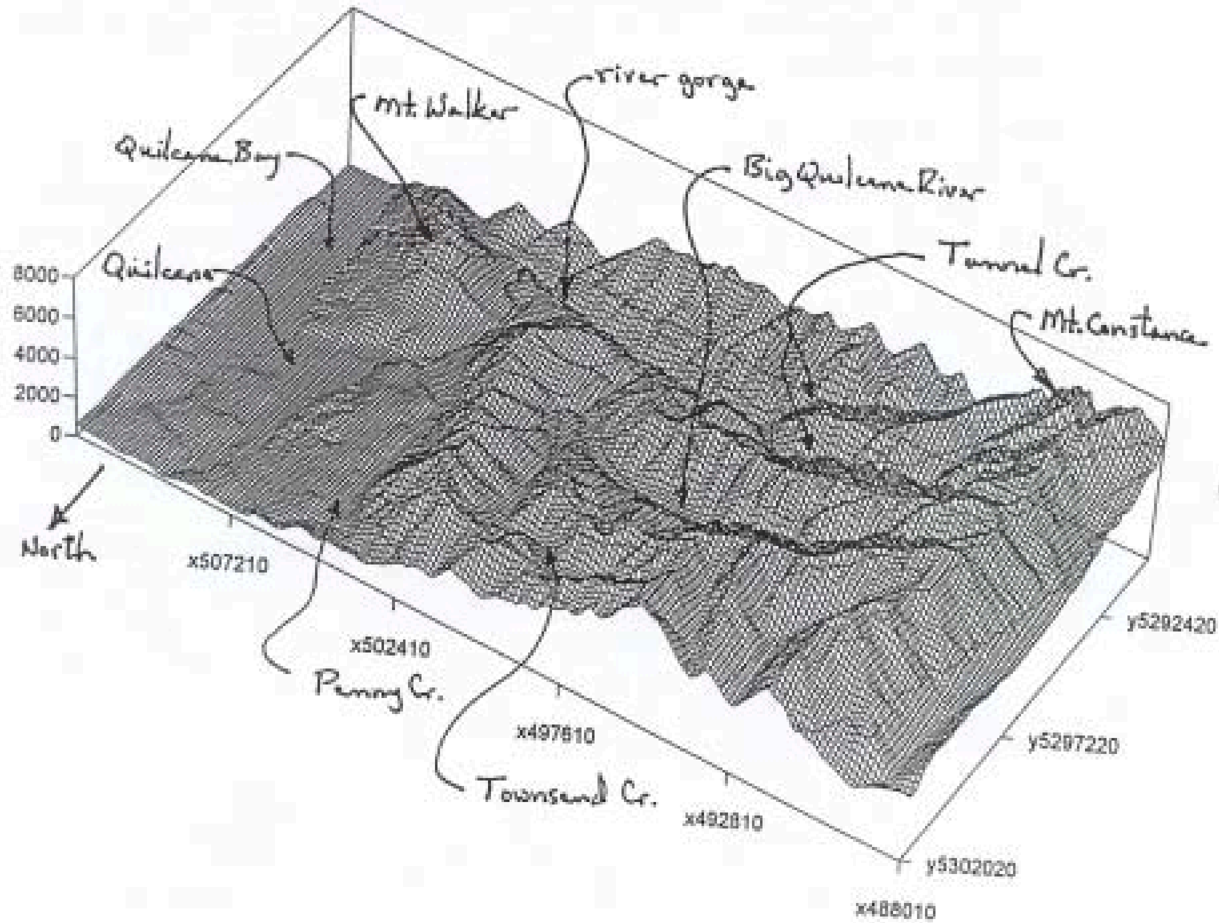
31 Murphy, A., and others, DQ field trip and related briefing notes, Fall 1992.

32 Local Interagency Team (USFWS lead). Big Quilcene River Basin Preliminary Watershed Assessment. April 1994.

33 See description in Chapter 7, J.4.

Figure 2.21 Terrain depiction of the watershed of the Big Quilcene River and its Tunnel Creek and Townsend Creek tributaries.



No long-term gaging of flows is available, but data from a period in the early 1970's showed a 12-month mean flow of 215 cubic feet per second (cfs) downstream of Penny Creek. An overall long-term annual average flow for the river is probably about 200 cfs, when adjusted for the wetter-than-normal period of gaging and for the upstream diversion.[34]

Several clear cuts along the mainstem were logged to the river, without buffer zones, both above and below the confluence with Townsend Creek. The two above Townsend Creek apparently date to the 1960's and the early 1980'S.[35] A habitat restoration project has been undertaken by the US Forest Service (USFS) in the past several years on the logged stretch below Townsend Creek.[36] The river enters a steep canyon or gorge at about RM 7.4, several miles below the diversion darn, as shown in Figure 2.23. At approximately river Mae 7.2 a steep cascade occurs. In some fisheries literature this has been interpreted as limiting the upstream travel of salmonids, but recent scouting of the river suggests that similar cascades on other northwest rivers are negotiated.[37]

The diversion pipeline parallels the river, rising relatively higher above its north (left) bank, from the diversion dam into the beginning of the gorge. It then circles around a point just below the 1000 ft. elevation level and turns north along the east flank of the Quilcene Range, and up the Penny Creek watershed.

At about RM 5.8, the deep gorge and the river turn north where Elbo Creek, draining the northeast slopes of Buck Mtn., joins the river. At this point Hwy. 10 1, heading north from Hood Canal and Brinnon, has passed through the narrow vee (Walker Pass) between Buck Mtn. and Mt. Walker. It parallels the river gorge downstream around the west side of Mt. Walker, at first about 300 ft. above the river. At about RM 4.5 Falls View Campground overlooks the river, where a small tributary drains the west slopes of Mt. Walker and a larger tributary, Falls Creek, drops from the southeast slopes of the Quilcene Range. Below here the river canyon broadens. The small residential community of Hidddendale occupies the east bank in the vicinity of RM 3.5, above another tributary draining the northwest slopes of Mt. Walker. The river channel is reportedly unstable in high-flow conditions here, with bank erosion and flooding. The river stretch immediately above the Quilcene National Fish Hatchery at RM 2.7 is braided. The diversion of Big Quilcene water for the hatchery occurs in this segment. The hatchery also has a right for water withdrawal from Penny Creek, which joins the river just below the hatchery, from the north.

Figure 2.25 (a-h) are views of the lower 4 miles of the Big Quilcene River, from the mouth to meanders above the hatchery. This segment is also illustrated on Figure 2.24.

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34 Clark, W. An Overview of the Water Resources of the DQ Pilot Project Area. March 1993. Unpublished DQ technical note. The estimate adjusted the 12-month USGS gaging in 1971-2 downward by correlation with long-term Dungeness River records, and added 30 cfs for estimated average annual diversion, per data from Parker, J.G., An Analysis of the Water Resource Management of the Big and Little Quilcene River Basins, 1984.

35 Wood. 1984.

36 Donald, M., USFS Quilcene RD, presentation during 1992 DQ field trip to Quilcene watersheds.

37 Volk, C. Personal communication. 1993.

Figure 2.22 A view, looking west, of the diversion dam at RM 9.3, diverting water through a gravity pipeline for municipal and industrial use at Port Townsend.

Figure 2.23 A terrain depiction looking *SE* into the deep gorge section of the Big Quilcene River.

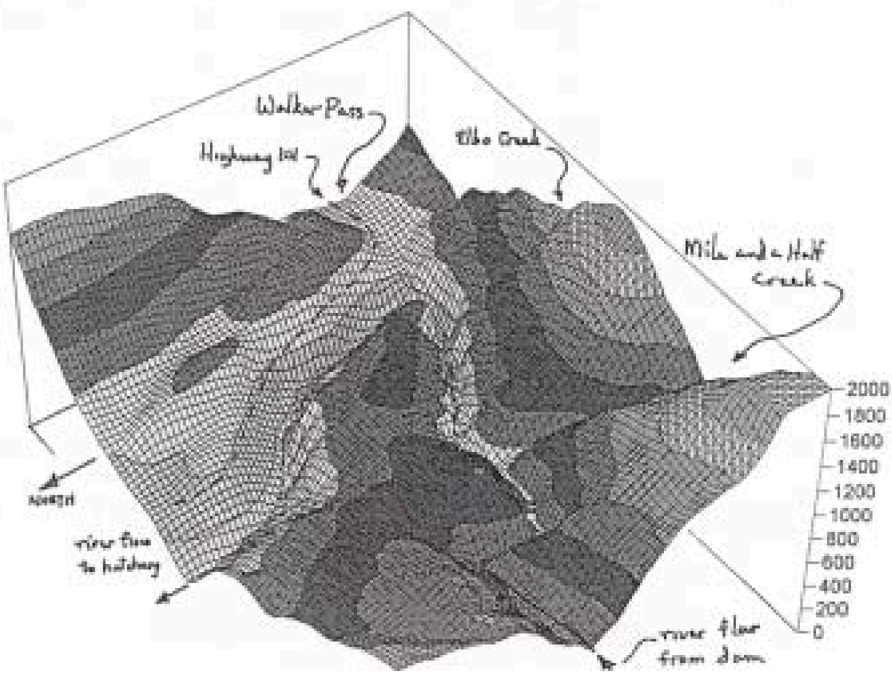


Figure 2.24 Terrain depiction of the lower reaches of the Big Quilcene River and Quilcene Bay (vertical exaggeration).

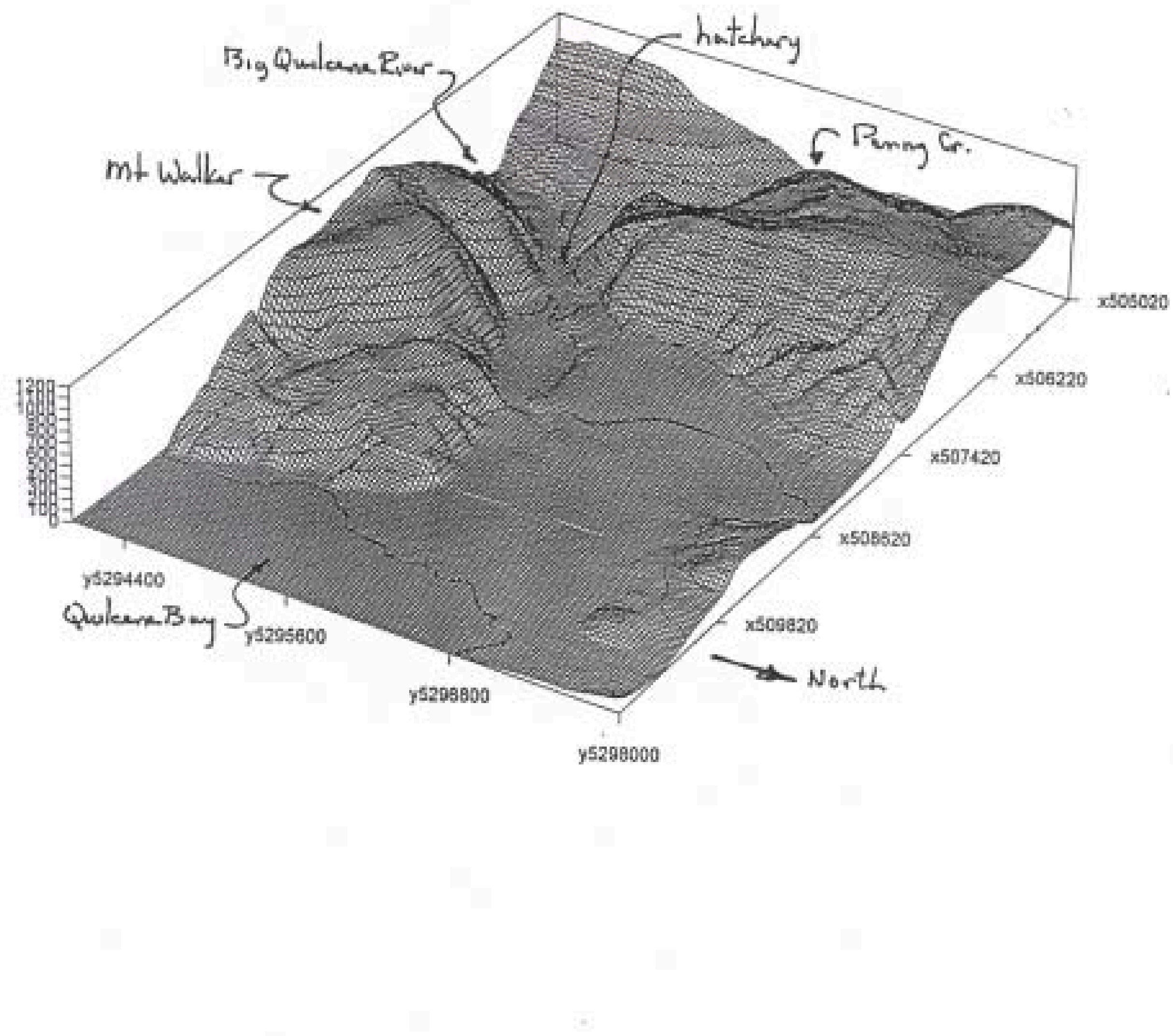


Figure 2.25(a) Looking south near the mouth of the Big Quilcene River.

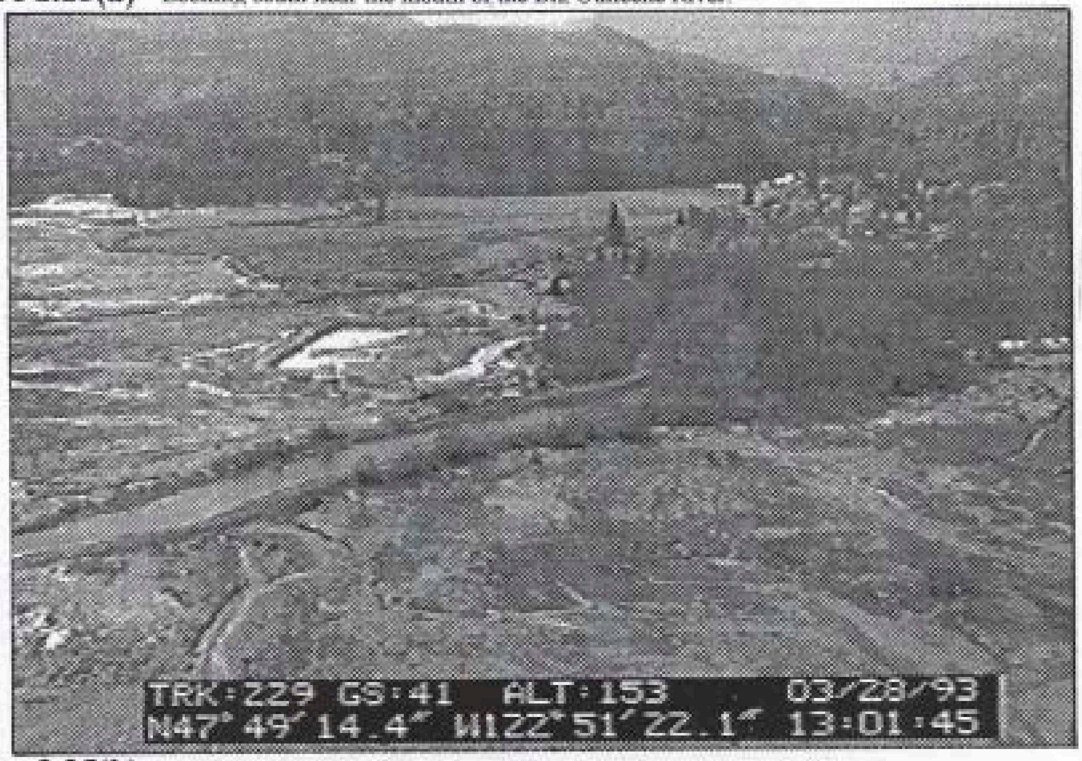


Figure 2.25(b) Looking west at the Big Quilcene River below Linger-Longer bridge.

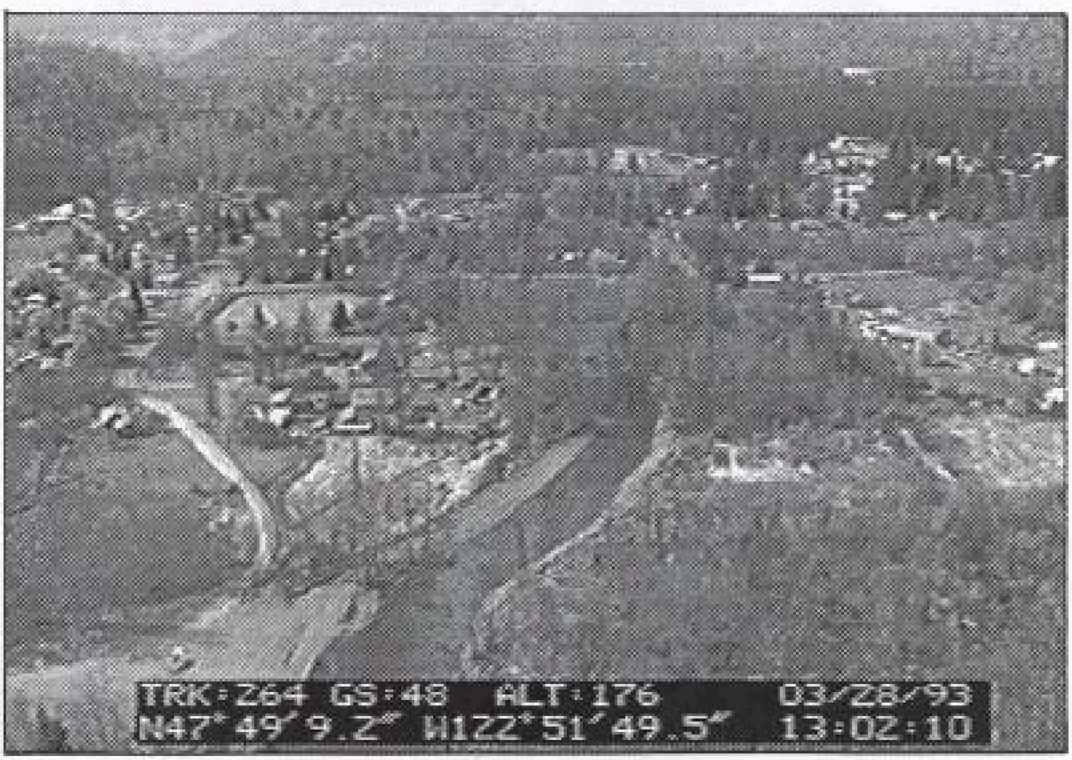


Figure 2.25(c) Looking *WSW* at the Big Quilcene River from above Linger-Longer bridge.

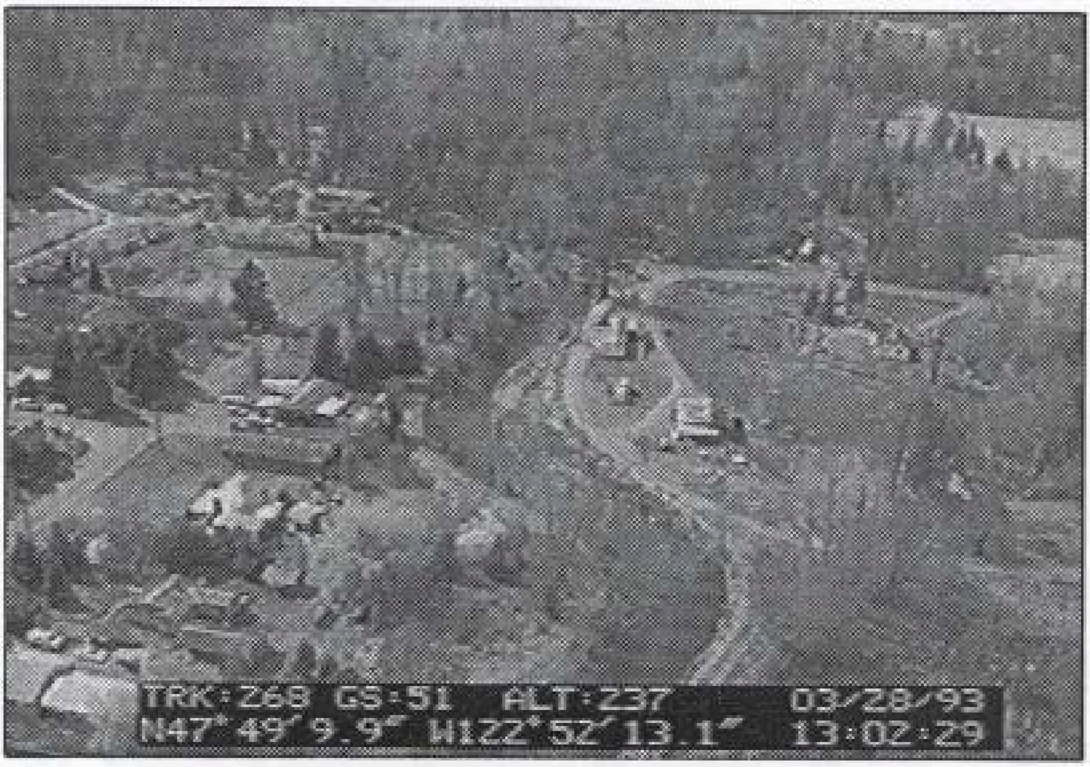


Figure 2.25(d) Looking *SW* at buildings near the Big Quilcene, upstream of Linger-Longer bridge.

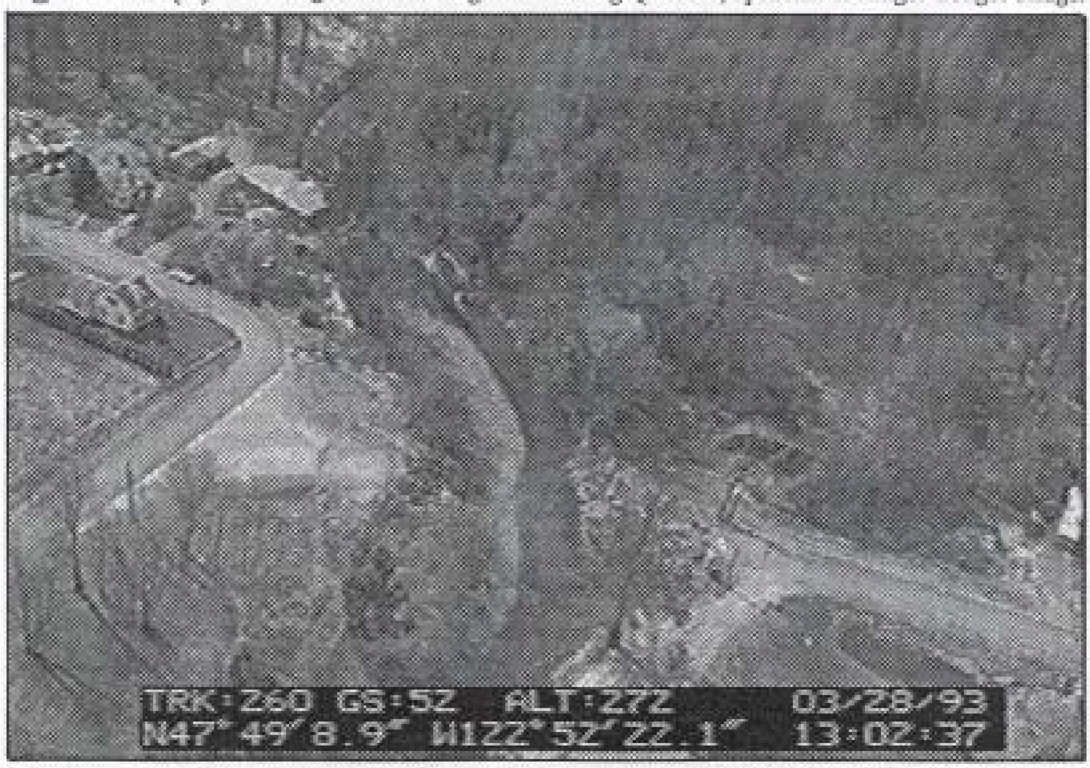


Figure 2.25(e) Looking west at eroding riverbank bluff at about RM 1.7 on Big Quilcene River.

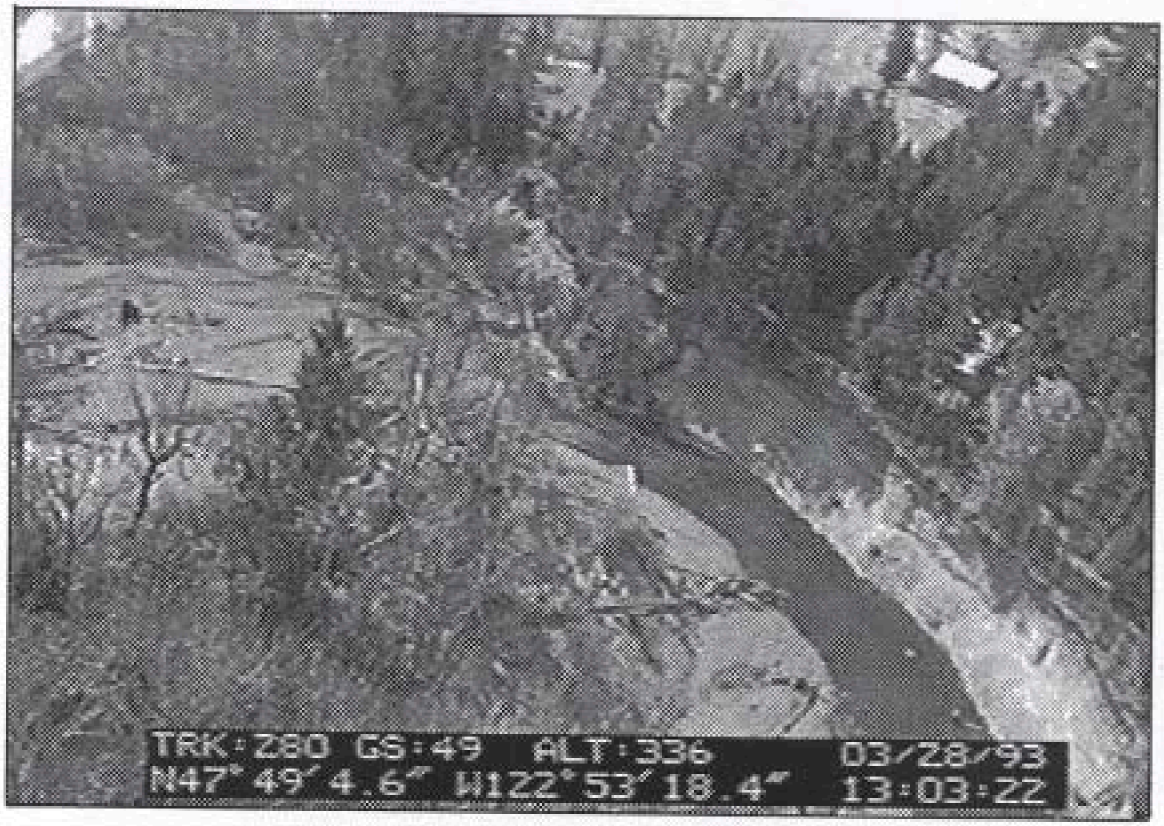


Figure 2.25(f) Looking *SW* at the Hwy. 101 bridge over the Big Quilcene River, RM 2.6.

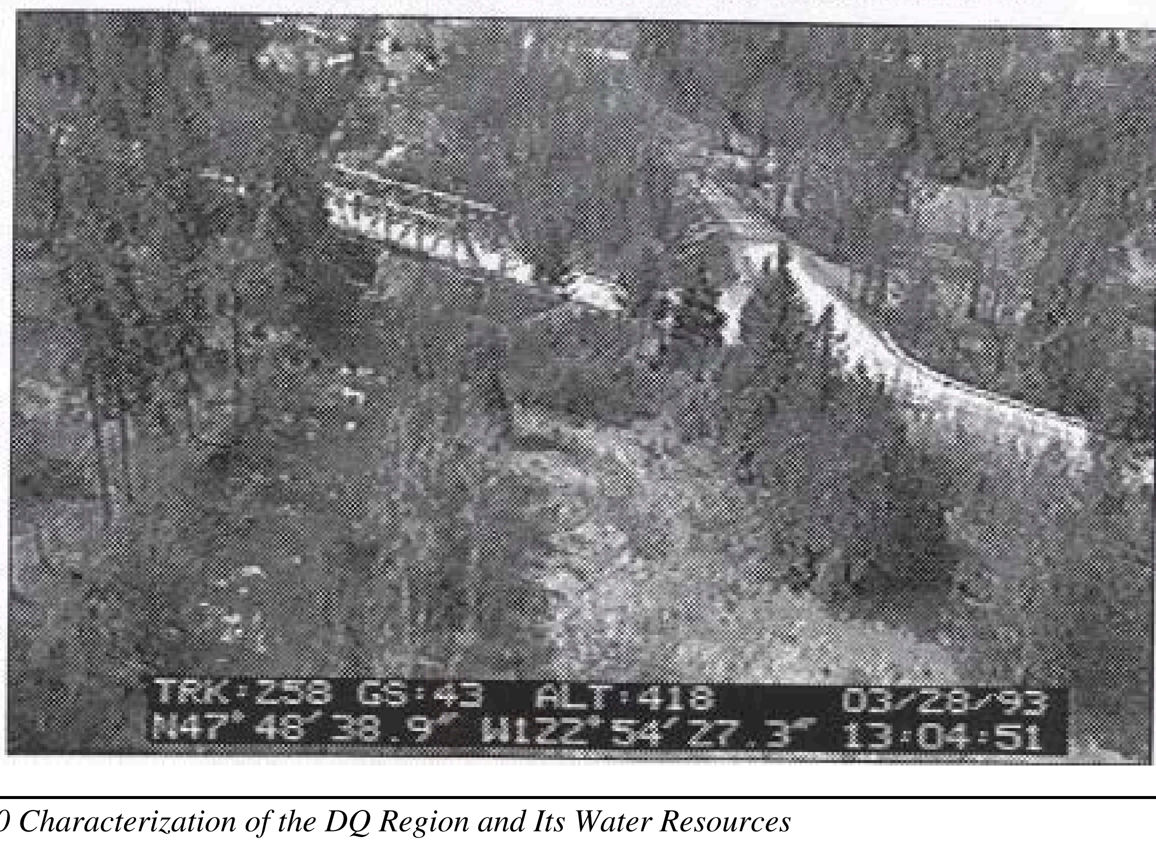


Figure 2.25(g) Looking *SW* toward the Quilcene Nat'l. Fish Hatchery, RM 2.7 on Big Quilcene.

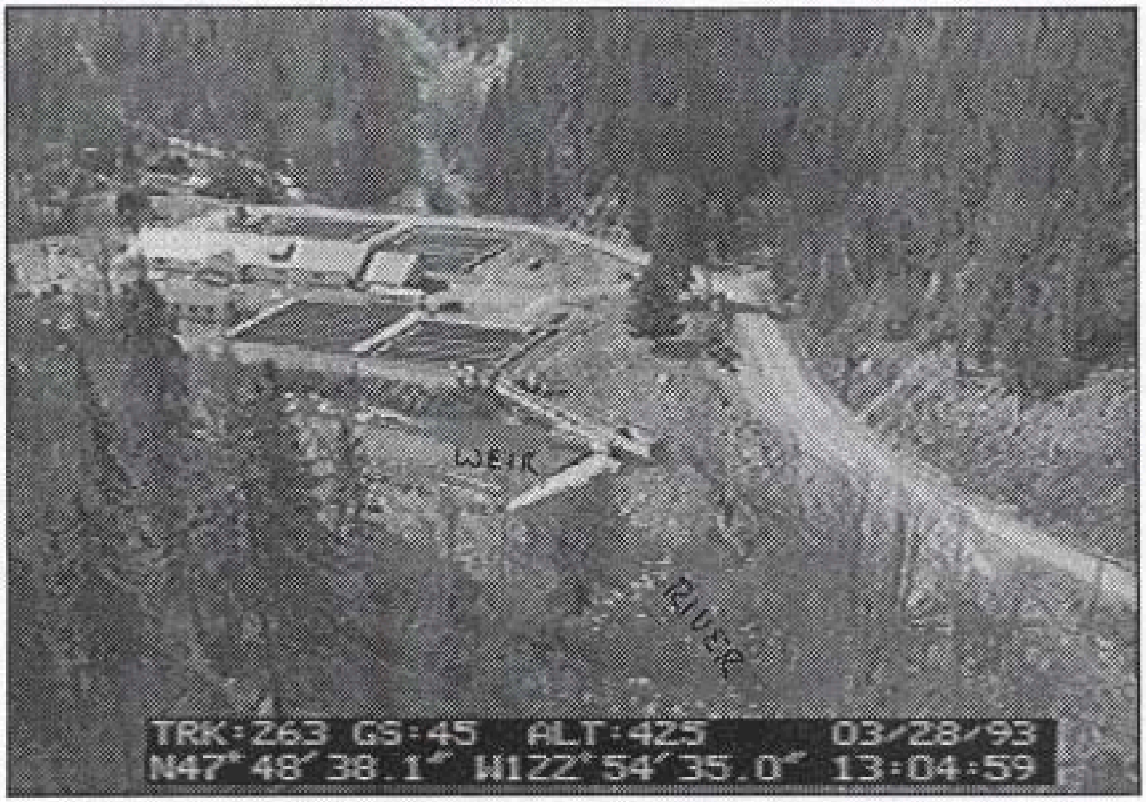
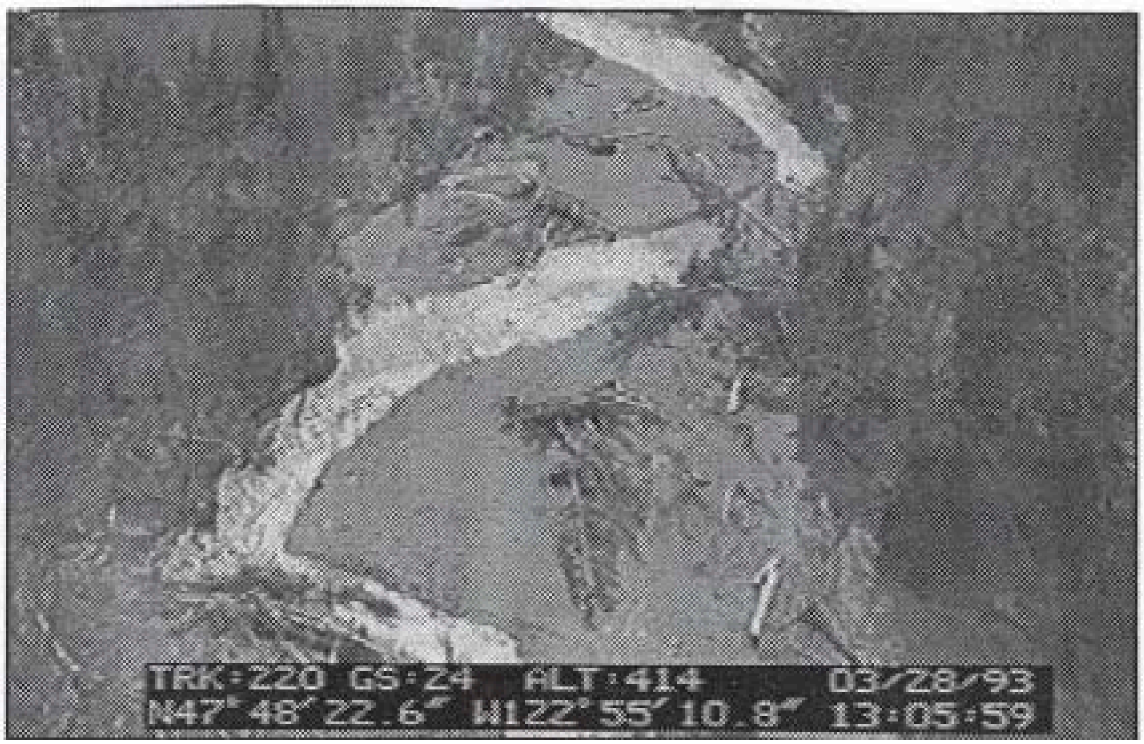


Figure 2.25(h) Looking south at meanders in the Big Quilcene upstream of the fish hatchery.



The river channel was apparently channelized and straightened in the stretch between river mile 2.7 and 2.0 (downstream from the Hwy. 101 bridge) at some time between 1962 and 1972, which may contribute to the sediment load for recent aggradation.[38]

Flooding has been a recurrent problem in the lowest portion of the river, in the area shown on Figure 2.24, presumably aggravated by aggradation in recent years. Aggradation has been in the range of 2 feet in the river stretch between river mile 1. 0 and 0. 5, and as much as 7 feet below river mile 0.5. Diking and gravel removal efforts have exacerbated fisheries habitat and contributed to channel instability without eliminating the flooding potential.[39]

The geology of the watershed area is characterized by bedrock of the Crescent Formation (the oceanic-crustal "peripheral rocks" horseshoe of the Peninsula) covered in lowland and river-valley areas by glacial drifts. The upper watershed (west of approximately Jolley Creek on the mainstem and Mt. Crag south of Tunnel Creek) is entirely in the lower, massive flows unit of the basalt Crescent formation. The major portion of the mainstem out to about the hatchery and the Hwy. 101 bridge, is in the upper unit of the Crescent formation, also principally basalt, but containing less massive flows, more breccias and sedimentary interbeds than the lower Crescent unit. Below the Hwy. 10 1 bridge and in the Penny Creek subwatershed, surficial units overlying the bedrock are principally cordilleran glacial drifts, some reworked as alluvium. Some alluvium occurs in the upper east-west reaches of the mainstem, Tunnel, and Townsend creeks. One impressive feature is the extent of cut-down of the river gorge in the upper unit of the Crescent basalts. Another is the bedded glacial lake and outwash deposits exposed, for example, in the hillsides behind the hatchery and southeast of the Hwy. 101 bridge.[40]

The Watershed of the Little Quilcene River

The Little Quilcene watershed is bounded by the Big Quilcene, the Dungeness, the Snow Creek (Andrews Creek tributary) and the Donovan and Tarboo Creek watersheds. The area is shown in Figure 2.26. The watershed encompasses about 30 sq. miles, immediately north of the Big Quilcene. The mainstem is about 12 miles in length, with another 60+ miles in tributaries.[41]

The mainstem headwaters begin above 4400 ft. on the north slopes of Mt. Townsend. The Deadfall Creek tributary begins above 3 600 ft. on the 4600+ ft. peak southwest of Bon Jon Pass and on the southwest slopes of Mt. Zion at the Pass. Dry Creek and several unnamed tributaries begin on the north and east slopes of Green Mountain at about 3400 ft.

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[38] Collins, B. Sediment Transport and Deposition in the Lower Big Quilcene River and Evaluation of Planned Gravel Removal for Flood Control. 1993.

[39] Collins. 1993.

[40] Long. 1975. Long notes that the Big Quilcene River apparently at one time flowed through Walker Pass to Jackson Cove and Hood Canal, in the present watercourse of Spencer Creek. A terminal moraine blocked the river course between Mt. Walker and Mt. Buck in some alpine glaciation episode of the Pleistocene, resulting in the river being diverted northward. It has eroded its deep gorge in the upper unit of the Crescent formation since that time.

[41] Parker. 1984.

Figure 2.26 Terrain depiction of the watershed of the Little Quilcene River and its tributaries.

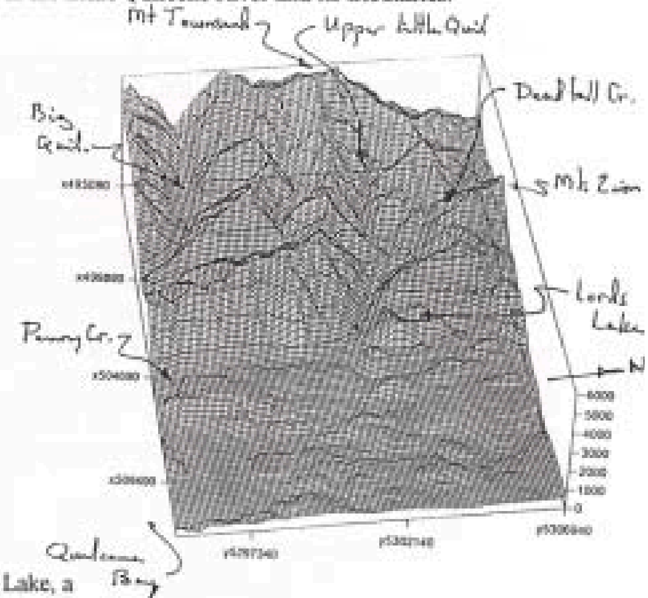
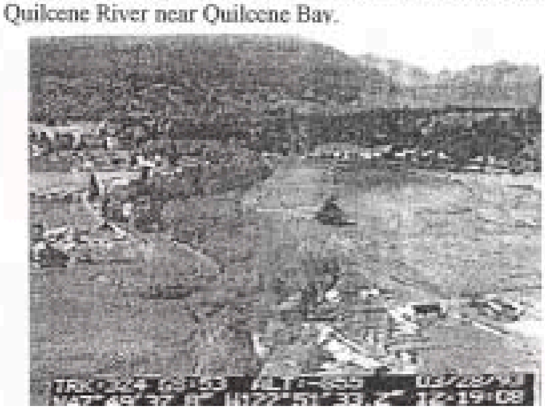


Figure 2.27 Views, looking south, of the Lords Lake, a storage reservoir for Port Townsend municipal and industrial water supply.

Figure 2.28 View, looking *NW*, of the lower Little Quilcene River near Quilcene Bay.



A diversion dam structure on the Little Quilcene at RM 7.2 (about 1000 ft. elevation) diverts water for the Olympic Gravity Water System (Port Townsend and the Port Townsend Paper Mill) under a water right for about 9.6 cfs. The water is diverted to Lords Lake, a reservoir lake for the system, shown in Figure 2.27, from which it is fed into the gravity water pipe to City Lake as needed.[42] [The diversion structure was damaged in storm flows of Dec. 1993.]

Ripley and Howe Creeks drain lower elevations in the foothills of the Quilcene Range. A small creek flows into Leland Lake from near the 500 ft. level on the upland northeast of the lake, and Leland creek flows south out of Leland Lake and joins the Little Quilcene just east of Highway 101 at about RM 1.5, north of the town of Quilcene, near the view in Figure 2.28. The average annual flow for the Little Quilcene, as measured over a 7-year period at a gage near the Leland Creek outlet, approximates 54 cfs (after diversion for the Port Townsend water right).[43]

The Watersheds of Smaller Streams Originating in the Mountains

Salmon and Snow creeks originate in mountainous terrain considered as part of the Discovery Bay watershed A characterization report has been prepared for a non-point-pollution watershed management planning effort for the area, although the project is not completed 7he material included here is largely taken from that report [44]

The Salmon and Snow Creek drainages originate in the Olympic foothills in the northeast comer of the Olympic National Forest, Quilcene Ranger District and empty into the head of Discovery Bay. These were some of the earliest timber production sites in the DQ region, with the settlement of Discovery Bay and an early sawmill by the 1860's, providing lumber that was shipped down the Pacific Coast. The bulk of the old growth timber was harvested early, and several large fires burned over 12,000 acres of the watersheds around 1925. Harvesting was minor over the half-century after the fires up to the 1980's, but about 20% of the forest land has been harvested within the past 10 years.

Salmon Creek:

Salmon Creek and its tributary streams aggregate 59 miles in length, and encompass a watershed of 16.5 sq. miles in area. Figure 2.29 characterizes the area.

Limited flow measurements suggest an annual average discharge of about 8.4 cfs. The headwaters originate on the northern slopes of Mt. Zion, above 3400 ft. in elevation. Over 90% of the watershed is forest land, with about half in public ownership (USFS, WIDNR). Most of the public forest land is in 50+ yr. age stands; about 1/3 of the privately held forest lands have been harvested in the past 10 years. The lowest mile of the creek flows through

42 Parker. 1984.

43 Parker. 1984.

44 PSCRBT. Discovery Bay Watershed (Characterization). November 1992. The watershed as defined for this report includes the eastern half of Miller Peninsula with Eagle and Contractors creeks, the mountainous and lower watersheds of Salmon and Snow creeks and their tributaries, and the northern and western portions of Quimper Peninsula. The characterization includes much useful information as well as GIS-based coverages for land coverage and land use. surface waters- geology and soils- etc.

pasture land and is degraded by animal access and lack of shade. Some residential development is beginning in the lower area, adjacent to Uncas Road and Hwy. 101.

Snow Creek:

Snow Creek and its tributaries encompass a watershed of almost 23 sq. miles, also within the area shown in Figure 2.29.

The stream has an annual average discharge of 22 cfs. Prior to development in the area which resulted in the present channelized outlet at the east side of the valley, Snow Creek emptied into Salmon Creek near its estuary at the head of Discovery Bay (and still connects in flooding conditions). Headwaters originate on the east and northeast slopes of Mt. Zion, above 3600 ft. elevation. Trappers Creek and Andrews Creek including Crocker Lake, are the major tributaries. Prior to development in the area, Andrews Creek apparently flowed south into Leland Lake; thus its 7.5 sq. mile subwatershed (about 1/3 of the Snow Creek watershed) was tributary to the Little Quilcene River, and Crocker Lake had no natural outlet. The Snow Creek watershed is over 90% forest land, with about 60% in public ownership since the recent DNR purchase of troubled forest lands. Large clear cuts in the 1980's and absence of riparian zone buffers have caused stream-degradation problems in the middle and upper portions of the watershed on the south side of Big Skidder Hill. Near the Discovery Bay outlet, and in the Crocker Lake area degradation from animal access, lack of channel shading, and vegetation growth are problems.

Several other small streams begin at relative high elevations in mountainous terrain, influenced by snowpack and increased precipitation, and flow north to the strait or Sequim Bay from the mountain/foothill front. Jimmycomelately Creek is depicted in Figure 2.30. McDonald and Seibert creeks are illustrated in Figure 2.32.

Figure 2.29 Terrain depiction of the Salmon and Snow creek watersheds.

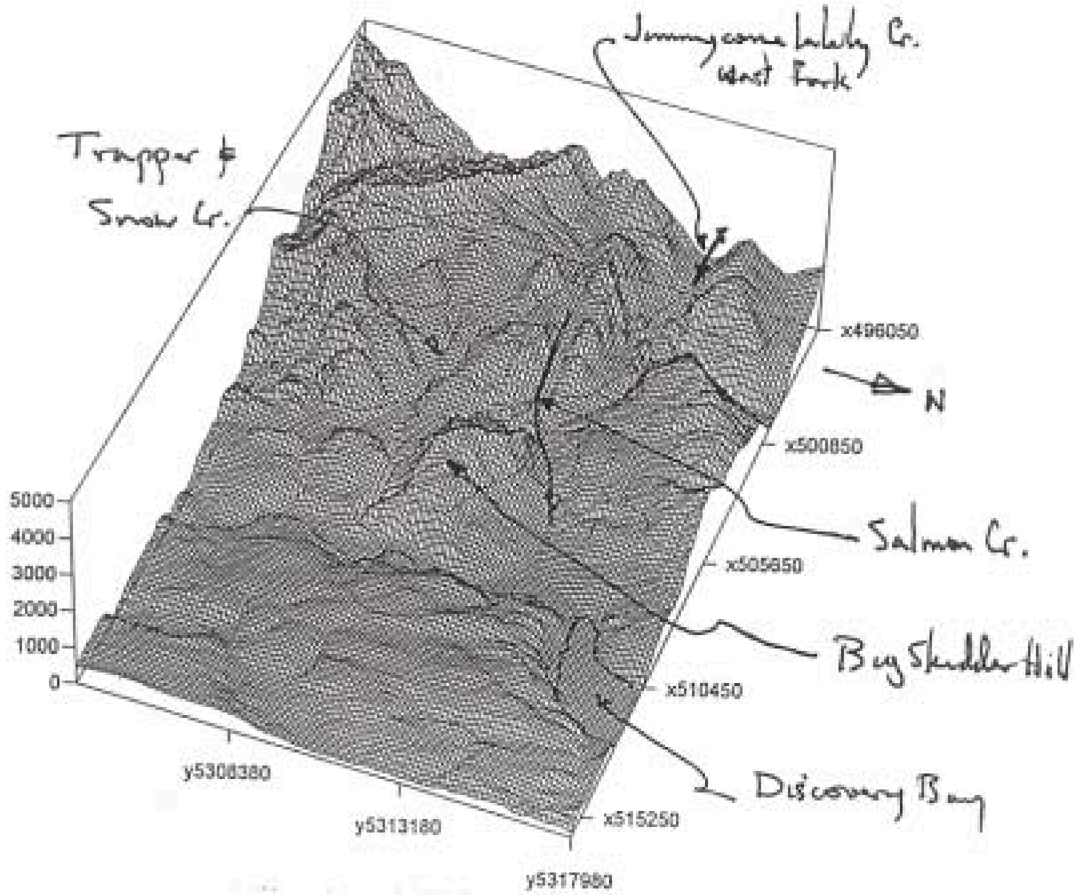
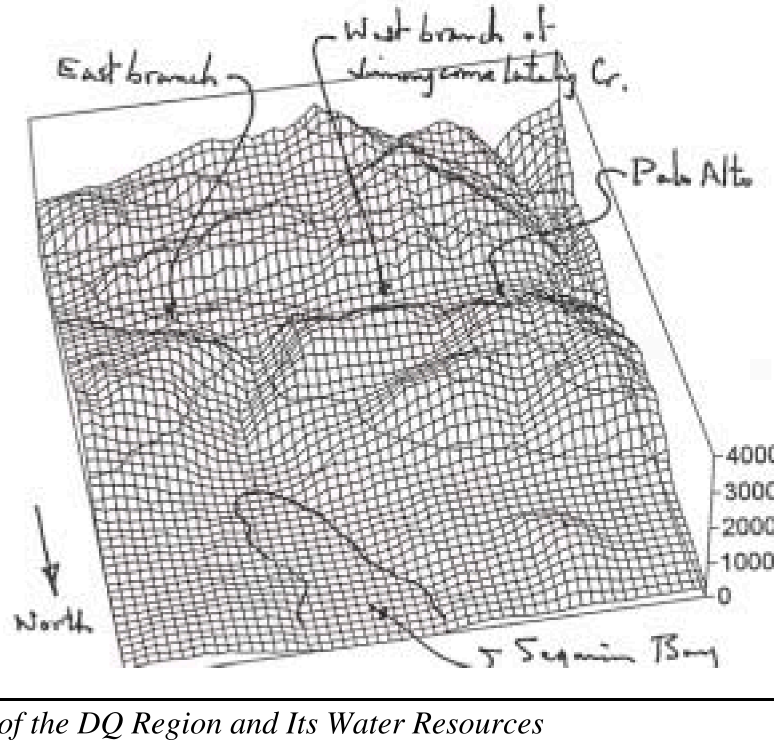


Figure 2.30 Terrain depictions of the Jimmycomelately Creek watershed.



McDonald Creek:[45]

McDonald Creek begins at about the 4200 ft. elevation on the northeast flank of Blue Mountain, with several branches in incised canyons suggesting large flows at some times in the past. [The deep cirque-like canyon in the northeast flank of Blue Mountain from which these streams flow could conceivably have supported significant snow fields in earlier times.] Another tributary begins in an interior valley/saddle to the northeast, just north of peak 3455, at an elevation of about 2000 ft., draining some of the interior glacial-drift mantled terrain.

Farther north, several tributaries drain the area around the west end of Texas Valley (actually a long saddle), in incised channels that begin at about 1400 ft. elevation. [These, and the higher tributary draining the glacial-drift area could have temporarily drained mid-Dungeness ephemeral glacial lakes while the lower Dungeness outlet was still plugged by the ice sheet.] Other tributaries that drain the west end of Lost Mountain join the stream out beyond the base of the mountain at about the 400 ft. level near the west end of Atterberry Road. Peterson Creek, which joins from the west somewhat above the 400 ft. level, begins in elevated, but less precipitous terrain near Round Top and Van Kuren IEII, and flows across gently sloping lands on the east side of Blue Mountain Road.

The Agnew irrigation ditch crosses the creek in a siphon structure in the 400 ft. elevation area west of the end of Atterberry Road, and a connection delivers some water to McDonald Creek for conveyance to a diversion further downstream. The stream channel is deeply incised in the coastal upland and through the coastal bluff to drain into the Strait.

No continuous flow measurements have been recorded for McDonald Creek. Intermittent measurements have ranged from less than I cfs in late summer and early fall, to 20 and 25 cfs in mid- and late spring. Significant erosion and storm damage was reported in a 1986 winter storm.

Seibert Creek:

Seibert Creek is much like McDonald Creek. Its headwaters are on the northwest flank of Blue Mountain, with the east fork beginning about 3800 ft. in elevation, and the west fork about 3000 ft. in elevation, farther west on the sloping ridge that defines the Maiden-Morse Creek watershed. Seibert Creek also flows northward across the Coastal plain and through the coastal bluff in a deeply incised channel, to reach the Strait at Green Point in a small estuary.

Annual mean flows for 16 years of gaging, 1953-69, averaged 17 cfs, with a large instantaneous peak flow reading of 1620 cfs in November 1955, (nearly 1/4 of the maximum instantaneous peak flow of the Dungeness, recorded in 1949 as 6820 cfs).

45 *According to the Washington State Board on Geographic Names, June 1994, McDonald is the correct spelling for this creek. McDonnell Creek may be used commonly in the local community.*

Jimmycomelately Creek:

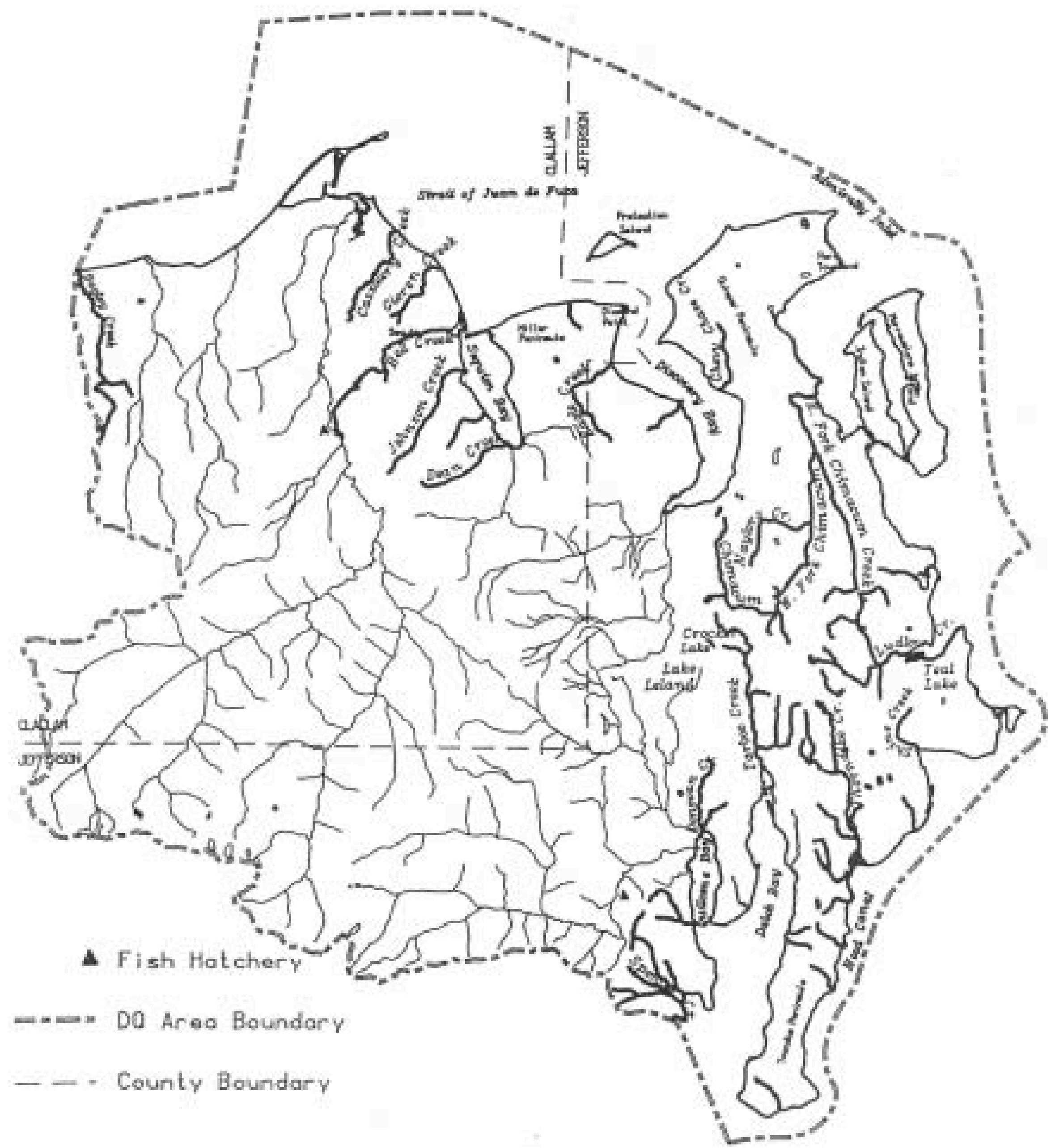
Jimmycomelately Creek drains an extended interior foothill watershed bounded on the south by Bear Mountain and the north ridge of the Gold Creek basin, on the southeast by the divide separating it from the Snow Creek/Trapper Creek headwaters, on the northeast by Blyn Mountain, and on the north by Burnt IFEII and Lookout IFEII. The broad flat valley area that is the central feature of the upper watershed has come to be called Palo Alto, presumably by extension from Palo Alto Road which connects it northward between Burnt Hill and Lookout 11ill to Hwy. 10 1. On the west this valley, (saddle, in reality) overlooks the Dungeness River canyon downstream of the Forks, some 600 ft. below, and a minor stream drains down into the Dungeness below RM 15.

A west fork of Jimmycomelately Creek flows east out of this Palo Alto valley/saddle and is joined by a south fork that originates on the southeast and east flank of Bear Mountain. The creek then curves north, is joined by a shorter east fork that drains the south side of Blyn Mountain, and flows north into the head of Sequim Bay at Blyn.

Jimmycomelately Creek, because of its extended foothills watershed in the Olympic

rainshadow, is subject to wide variations in flow. A number of spring and early summer readings have recorded 5 to 10 cfs, and mid-summer to fall readings are often less than 2 cfs. Flows of 20 to 30 cfs have been recorded in January, and April through June, and two flows of 42 and 49 cfs have been measured in June 1988 and 1990.

Figure 2.31 Map of the DQ Region showing rivers, streams, lakes and marine waters. The small streams of coastal uplands and lowlands are highlighted.



Coastal Uplands, Lowlands, and Shorelines

The map in Figure 2.31 can be used to identify the various coastal and lowland areas and shoreline features to be discussed in this section, in context with the rivers and streams already covered.[46]

The Bluffs west of Dungeness Spit:
Eastward from the Morse Creek estuary Oust west of the DQ boundary) to Dungeness Bay, the marine shoreline is formed by a high bluff (100-200 ft.). Bagley Creek, Siebert Creek, and McDonald Creek have cut channels and minor estuaries beneath the bluffs, and landslides have modified the bluffs at several points. These bluffs show excellent exposures of the multiple lithologies in the unconsolidated sediments of the coastal plains. The bluffs are evident in Figure 2.[32]

The coastal plain west of the Dungeness:
The gently sloping plain behind the bluffs extends south to a series of low basaltic foothills, the largest being Lost Mountain (2000+ ft.), and finally to the northwest-trending ridge of Blue Mountain which forms the divide for the Maiden Creek watershed and part of the western boundary of the DQ region. The northern portions of this coastal plain are mostly in farm and rural residential land uses, with strip commercial activities near the highways. The southern, higher portions are largely still in forest cover, either State or private ownership. There have been many substantial timber cuts in recent years.

Dungeness Bay:
Dungeness Bay is a major tidewater feature on the Strait of Juan de Fuca, shown in Figure 2.32. The Dungeness Spit has been formed and is maintained by longshore currents in the Strait transporting and depositing materials eroded from the bluffs by wind and wave action. Longshore currents from the west maintain the outside of Dungeness Spit, while northeasterly currents maintain the south (inner) side of Dungeness Spit east of Graveyard Spit and the east side of Graveyard Spit, and carry fine sediments into the inner bay. To a lesser extent, and mostly during storm events, the river contributes sediments for deposit, both to extend its estuary and to be transported into the inner bay. One storm event in recent years is reported to have buried ellgrass and oyster-beds in the bay with 1-2 feet of sediments. However, there is obviously some equilibrium in sediment movements into and out of the inner bay -- one reason quoted for moving from Old Dungeness to New Dungeness in 1890 was concern that the inner bay was filling up with silt!

The Dungeness Spit is considered to be robust and expanding. The spit has reportedly grown nearly 1800 ft. in length between an 1855 survey and the 1970's. In the same period the mouth of the river has shifted east a similar amount, and the intertidal zone beyond and east of the

46 Much of the detail for shoreline and bluff geology and features for Jefferson County is from the Coastal Zone Atlas of Washington: Volume 11: Jefferson County, WA Ecology, 1978.

river mouth has shifted and extended north.47 (Downing, 1983 [from Bortleson et at, 19801). [In contrast, Ediz Hook at Port Angeles has suffered since its sediment sources were diminished by damming of the Elwha River and building a sea-wall at the toe of the bluffs west of the Hook to protect a pipeline from the Elwha River.[48]]

The Coast Guard lighthouse near the end of the spit, reportedly the first on the Pacific Coast, was first lighted in 1857. A well drilled at the lighthouse location on the Spit in 1930 is 667 ft. deep. Saltwater was found at about 300 ft. depth, but on drilling deeper an 80 gpm flowing artesian well was constructed providing fresh water.[49]

Dungeness and Graveyard Spits and portions of the bay are designated as a National Wildlife Refuge and managed by USFWS, especially for benefit of migrating waterfowl, and it is known as an exceptional site for birding. Clallam County Parks maintains a popular campground near the base of the spit, adjacent to the wildlife refuge entrance. In recent years the spit and the inner bay have been increasingly used as a public recreational site, to some detriment of the wildlife refuge function, and more stringent access restrictions are now being considered and enforced.

Shellfish farming and harvest are important commercial and recreational activities. The Port of Port Angeles (County) maintains a boat launch facility near the entrance to the inner bay.

A dock on pilings was built out to the north-northeast from New Dungeness in 1891, and was a major shipping port. One account states its length as 4300 ft.,[50] but a 1942 aerial photo shows a length of about 2800 ft. It was taken out of service in 1941.

East of the Dungeness Estuary:
As illustrated in Figure 2.33, for nearly 5 miles east and south-eastward from the Dungeness estuary the coastal land is at sea level, the intertidal zone is broad, and the 10-meter depth line lies as much as 1.5 miles offshore. The northwest portion in the vicinity of Meadowbrook Creek features privately-restored wetlands that were once slated for development. The middle section, Jamestown, is the property purchased as homeland by the Jamestown Mallam Indian Tribe in the 1870's when they resisted being relocated to the Skokomish reservation at the south end of Hood Canal.[51] The last section, Graysmarsh, was reportedly a salt marsh until a control gate was built at the mouth of Gierin Creek in recent decades.

Beyond Graysmarsh the bluff occurs again, now only 80 ft. high, broken by a narrow defile leading to the beach at Port Williams. Now a County beach, the wharf and settlement at Port Williams was an important shipping point for Sequim from the 1890's until abandoned in the

47 Downing, J. 1983.
48 Galster. Ediz Hook: A Case History of Coastal Erosion and Mitigation. (In Engineering Geology in Washington). 1989.
49 Noble, J.B. A Preliminary Report on the Geology and Ground-Water Resources of the Sequim-Dungeness Area. 1960.
50 Keeting, V., Editor. Dungeness, The Lure of a River: A Bicentennial History of the East End of Clallarn County. 1976.
51 Dungeness: the Lure of a River. 1976.

1920's. A flume, and later a pipeline, carried water from the early irrigation system to be supplied to ships at the wharf.[52]

South of Port Williams the bluff recedes back from the shoreline and Gibson Spit has formed to the south, enclosing the lagoon at Washington Harbor, the mouth of Bell Creek. The bluff reappears at the south side of Washington Harbor, and a major marine research institution, Battelle Northwest, has facilities at bluff-top and at water level. This is the entry to Sequim Bay.

Meadowbrook, Cooper, Cassalery, Gierin, Bell Creeks:
Bell Creek begins in the uplands of Happy Valley and the north flank of Burnt Hill, and flows through the eastern portion of Sequim, to flow into the lagoon at Washington Harbor, just outside Sequim Bay. The other creeks are fed from ground-water springs and irrigation ditch tailwaters, and discharge to the Strait, east of Dungeness Bay.

Sequim Bay:
The bay is shown in Figure 2.33. Travis Spit has formed from the east, almost totally closing the entrance to the bay. The bay is about 3 1/2 miles north-to-south, and over a mile wide. The depth increases from broad tidal flats at the south end (the mouth of Jimmycomelately and Dean creeks) to about 60 feet at the middle, and several deeper trenches along the northwest side reach about 120 feet depth.

Shellfish production is important in the bay. The settlement of Blyn and the Jamestown S'Klallam Tribal Center are at the southeast end of the bay, a log dump operates at the southwest comer. Sequim Bay State Park is on the west side, and John Wayne Marina, built in the late 1980's and operated by Port of Port Angeles, is farther north on the west side. Private residential holdings occupy the remainder of the west side, near water level, and most of the east side, on moderate bluffs.

The Sequim Bay Watershed Management Plan was the early action watershed project for Clallarn County,[53] and implementation of its recommendations is underway.

Johnson Creek begins in two branches near the top of Burnt Hill and flows north-northeast past the east side of Bell IFEII and into Sequim Bay at Pitship Point (now the site of the marina). It has cut a substantial ravine into the glacial drifts of the north flank of Burnt all and the slopes east of Bell Hill. Flow measurements include several (spring storm event ?) peaks near 10 cfs, and otherwise mostly values in the 2 to 6 cf; range. Two September readings of less than I cfs are recorded, and no winter readings are available.

Dean Creek is farther south than Johnson Creek, and drains the east side of Burnt I-Ell and the northwest side of Lookout Hill, paralleling Palo Alto Road. It drains into Sequim Bay at the head, west of the Jimmycomelately outlet.

52 Dungeness: the Lure of a River. 1976.
53 Clallam County Water Quality Office. Sequim Bay Watershed Management Plan. 1992.

Figure 2.32 Terrain depiction of coastal areas along the Strait of Juan de Fuca.

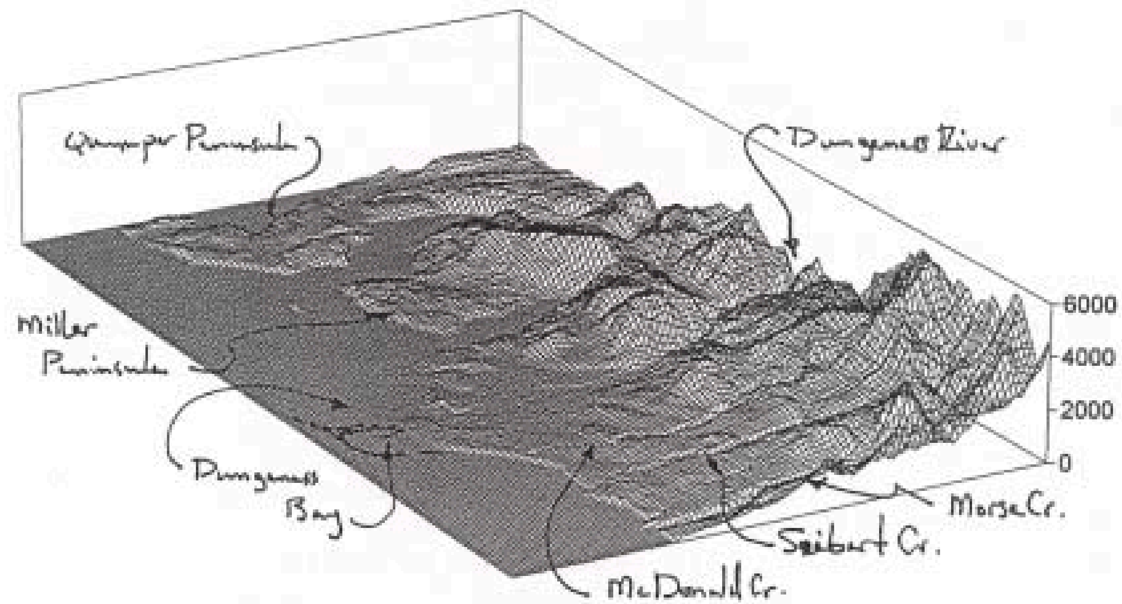
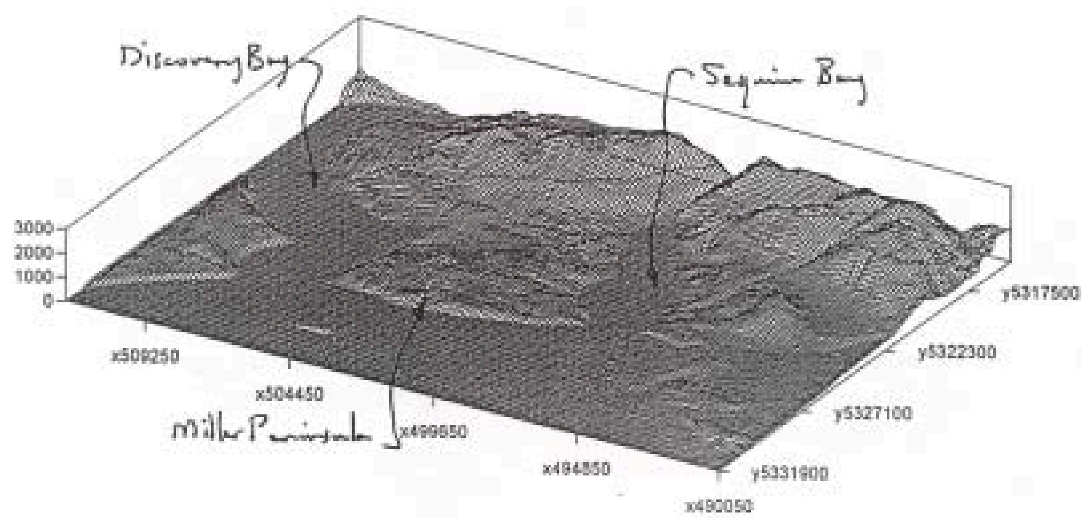


Figure 2.33 Terrain depiction of the east shoreline of the Sequim-Dungeness peninsula, Sequim Bay, Miller Peninsula and Discovery Bay.



The Miller Peninsula bluffs:
The peninsula also shows in Figure 2.33. Around the northeast comer of Sequim Bay, behind the base of Travis Spit, the bluffs are about 120 ft. high. The bluffs form an abrupt, almost east-west square front to the peninsula, reaching a height of 320 ft. about 2 miles east of the base of Travis Spit, and maintaining a height of more than 200 ft. across the four+ mile width of the peninsula to Diamond Point on the northeast comer. A small defile about two-thirds of the way across drains a portion of the plateau above about a mile back, and has provided erosion sediments probably partly responsible for the small, recurved Thompson Spit to the east that traps a small lagoon. [A deep coastline oil test well exists at this location]

A somewhat larger recurved spit and enclosed lagoon has formed at the acute-angled northeast comer of the peninsula and the entrance to Discovery Bay. This Diamond Point Spit was the location of a Klallam Indian village at the time of first white settlements in the 1850's, and was briefly a military reservation in the 1860's (together with Protection Island and Cape George). In the 1890's a public health quarantine station for leprosy and other communicable disease cases was established that was in use until the 1930'S.[54] The spit area is now a small residential community, as is the stepped bluffs area immediately behind.

Highway 101 and the former railroad bed, near sea-level around the base of the bay through Blyn, rise inland to the northeast to cross the Miller Peninsula at about 200 ft. elevation. Chicken Coop Road, an early passage route, follows a more easterly line at about the 400 ft. elevation, turning north at mid-peninsula where it crosses the north-flowing headwaters of Eagle Creek.

The north portion of Miller Peninsula is forested. A large tract was set aside from DNR forest lands in the early 1980's for eventual establishment of a State park. In the late 1980's a destination resort was proposed by a foreign development group that would have occupied the central portion of the peninsula, bordering the park on the west and wrapping around the residential enclave of the Diamond Point area to the east. Local opposition and international economic conditions ended the resort plans, and more of the land has since been transferred fi7om DNR forest lands to enlarge the projected park.

Protection Island:
This small island, 1+ mile long west-to-east and 1/2 mile wide, and mostly less than 200 ft. above sea level, shelters the entrance to Discovery Bay. Captain Vancouver anchored in the lee of the island and remarked about the protection it afforded.[55] In the late 1860's the island, together with Diamond Point (then Clallam Point) and Cape George were established as a military reservation for a few years.[56] In the mid-1900's it was being developed with roads and lots as a vacation development. In the 1980's, a campaign to preserve the island, primarily as nesting habitat for seabirds, resulted in its acquisition and establishment as a National Wildlife Refugee.

54 Dungeness: the Lure of a River. 1976.
55 Meany, E. The Vancouver Journals. 1927?
56 Dungeness: The Lure of a River. 1976.

Discovery Bay:
The bay is visible in Figures 2.33 and 2.34. The bluffs continue around the comer from Diamond Point to the south into Discovery Bay for 1+ mile and then diminish where Eagle Creek flows east-northeast and drains into Discovery Bay. For the next three miles the shoreline of the bay trends south-southeast to Contractors Point. The land slopes gently to the bay from the 600 ft. contour at the base of Blyn Mountain, and Hwy. 101 crosses this area at about the 200 ft. elevation. The Gardiner Community Center and an RV park are near the highway and Old Gardiner Road and the defunct railroad right-of-way are farther down the slope.

The Gardiner salt marsh, partly filled for a boat ramp and a road, is one of the few salt marsh and lagoon systems of the shoreline not occurring at a sand Spit.[57]

South of Contractors Point the highway and an old railroad right-of-way make a wide arc to the south for about 3 miles, below the 200 ft. elevation on a steep side hill that extends up to above 600 ft. in mostly forest lands. Kalset Point and Mill Point (Port Discovery) project from the otherwise narrow, steep shoreline, and a condominium/restaurant development is located below the highway.

The shoreline curves back toward the southwest and the road and railroad right-of-way drop to near sea-level, passing by the settlements of Maynard, Discovery Bay, Discovery Junction and Fairmount. The head of Discovery Bay is the estuary of Salmon Creek and Snow Creek [see section on Watersheds of Mountain Rivers and Streams]. The estuarine and palustrine wetlands and pasture lands are part of a narrow valley extending about 12 miles south, to Quilcene, and traversed by Hwy. 10 1. The valley is bounded on the left by the southeast flank of Blyn Mountain, Big and Little Skidder Hills, and the low foothills that separate the Little Quilcene watershed from Penny Creek of the Big Quilcene. On the east, the valley is bounded in the north end by the low hills of the west branch of the Chimacum Creek headwaters. Farther south, the low hills separating Little Quilcene drainage from that of Tarboo and Donovan Creeks form the valley's east side.

East of the head of Discovery Bay the land rises steeply to 500-700 ft. in wooded hillsides overlying volcanic (Crescent Formation) bedrock, and later marine sedimentary bedrock. Hwy. 20 hugs the side of the slope with the abandoned railroad right-of-way below. It climbs steeply to about 3 00 ft. at the Eaglemount Road intersection, then descends to about 100 ft. at the Anderson Lake Road intersection, where it continues along the steep bank almost to Four Comers. At this point (Adelma Beach), the Discovery Bay east shoreline turns northwest, and a mile beyond, beyond a small stream drainage at the Chevy Chase golf course, the coastal bluff appears again in unconsolidated sediments, rising to 500 ft. in height. The lower bluff portions are mapped as pre-Vashon glacial and non-glacial, the central portions of bluff as Vashon advance outwash, and the top portions as Vashon till and recessional outwash deposits.[58] At Beckett Point, a small recurved sandspit with lagoon has formed at the base of

57 PSCRBT. Discovery Bay Watershed. 1992.
58 Pessl, F., Jr, et al. Surficial Geologic Map of the Port Townsend 30 by 60 minute quadrangle. Puget Sound Region, WA. 1989.

the 300+ ft. bluff and a road descends the bluff to a small community of beach houses. Beyond Beckett Point the shoreline extends north for about 2 miles to Cape George. Here first steep bluffs, and then bluffs receding back from the shoreline farther north to form a sloping westward-facing shelf, are liberally dotted with residences.

The shoreline bears northeast beyond Cape George, as shown on Figures 2.34 and 2.35, and within a mile the bluff height drops to 100+ ft., rising again farther east towards Middle Point (McCurdy Point). This area east of the long bluff/ridge at the Discovery Bay side is mapped as Vashon recessional outwash, and may represent the north end of a sinuous drainage channel. This channel extends up Chimacum and West Valleys from the glacial lakes in the Puget lowlands, behind the wasting Vashon ice sheet. The bluffs presumably have been formed by wave and wind erosion truncating a sloping northward extension of land in the 11,000+ years since ice disappeared from the area.

The northern interior uplands of the peninsula, west of Port Townsend City and south to the airport and Four Comers, are of mixed land uses, though predominantly forest and farm lands. Several small lakes and wetlands occur (Strangers Lake, Buckmans Lake, and a string of wetlands).

Past McCurdy Point the shoreline and bluffs trend east, and the almost vertical bluff reaches nearly 300 ft. height in the next 1 1/2 miles. Beyond, the bluff recedes rapidly, and another trough of recessional outwash deposits, nearly at sea level, crosses the peninsula from south to north. This trough encompasses open-water wetland areas including Chinese Gardens and Kai Tai Lagoon that have been substantially altered by urban pressures,[59] and are now protected as open space.

Past the trough holding Chinese Gardens, the bluff rises sharply again for 1/2 mile, terminating in the near-vertical 200 ft. bluff and broad sand spit of Point Wilson. The bluff and sand spit comprise Fort Worden, active in both world wars as coastal gun emplacements, and now a historic park and campground, with the end of the spit reserved as a Coast Guard reservation for the lighthouse marking the entrance to Admiralty Inlet of Puget Sound.

Admiralty Inlet:

Admiralty Inlet, indicated on the map of Figure 2.31 earlier, is the principal connection between (inner) Puget Sound and the Strait of Juan de Fuca. [Although the entrance to the inlet is defined as an imaginary line -- as Middle Pt. (McCurdy Pt.) to Pt. Partridge on Whidbey Island by Burns,[60] and as Pt. Wilson to Pt. Partridge by Steelquist,[61] the narrowest place is between Pt. Wilson & Admiralty Head/Whidbey Island.] The sill there is 215 ft. depth at the shallowest at the entrance, and the deepest is over 600 ft. east of Marrowstone Island.

The north-south shoreline extending 2 miles between Pt. Wilson and Pt. Hudson is the eastern boundary of the City of Port Townsend. The shoreline includes the campground/park of Fort

[59] PSCRBT. Discovery Bay Watershed. 1992.
[60] Bums, R. The Shape and Form of Puget Sound. 1985.
[61] Steelquist, R.U. Ferryboat Field Guide to Puget Sound. 1989.

Worden and the Port Townsend Marine Science Center at the north, and the boating /industrial complex at Pt. Hudson at the south. The bluff gradually lessens in height and finally recedes back from the shoreline near Pt. Hudson. Below Pt. Hudson the deep waters of Admiralty Inlet and Puget Sound extend south-southeast past Marrowstone Island, while the shoreline trends southwest and then south to encompass the shallow marginal basins of Port Townsend Bay and Kilisut Harbor between Marrowstone and Indian Islands.

Port Townsend Bay:
The bay is a relatively shallow marginal basin off of Admiralty Inlet, shown in the general pictorial of Figure 2.35. Greatest depths are 90 to 120 ft., off of Pt. Hudson, but typically 40 to 50 ft. in the eastern portion near the harbor developments of the City of Port Townsend. A 30 to 50 ft. depth shoal/bank (Mid-Channel Bank) extending north from Marrowstone Island provides a buffer from Admiralty Inlet.

City of Port Townsend:
A southeast-facing bluff of Vashon lodgement till separates Water Street and the harbor area from the upland portions of the city. Slightly further west the lowland/wetland trough sets the City uplands off from the rest of Quimper Peninsula.

Glen Cove:
The cove, the westernmost head of the wide Port Townsend Bay, is mapped as partially coastal pond and freshwater marsh, but is largely occupied by the Port Townsend Paper Mill.

Kala Point, and uplands south from Old Fort Townsend:
Figure 2.35 illustrates this area. Bluffs of 100 to 200 ft. height extend from Glen Cove southeastward 2+ miles to Kala Point and Kuhn Spit, a recurved spit with lagoon. Uplands rise to about 300 ft. elevation behind these bluffs and between Glen Cove and the Jefferson County International Airport just north of Four Comers on Highway 20. The south edge of these lodgement till uplands bounds the northwestward extension of the recessional outwash glacial sediments and alluvium of West Valley and Beaver/Chimacum Valley. [The Chimacum estuary is discussed below, after a general description of the Chimacum drift plain.]

Port Hadlock:
A south-pointing sand spit partially encloses a small inner lagoon in the embayment. The shoreline bluffs extend east as a small peninsula ending at the Portage Canal that separates Indian Island. Winter storm winds from the northeast did considerable damage here in the early 1990's.

Kilisut Harbor/Indian Island/Marrowstone Island:
The Islands are shown in Figure 2.35. Indian Island, nearest to the Quimper Peninsula mainland, is separated from the mainland by the 3/4-mile long Portage Canal east of Port Hadlock, shown in Figure 2.36. The island, about 4 miles long and nearly a mile wide, is almost completely devoted to a naval reservation, with dock facilities on the north and west sides. Bluffs, typically 100 ft. high, cross the north end of the island with blunt sand spits

Figure 2.34 Terrain depiction of Discovery Bay and the Quimper Peninsula, looking *ENE*.

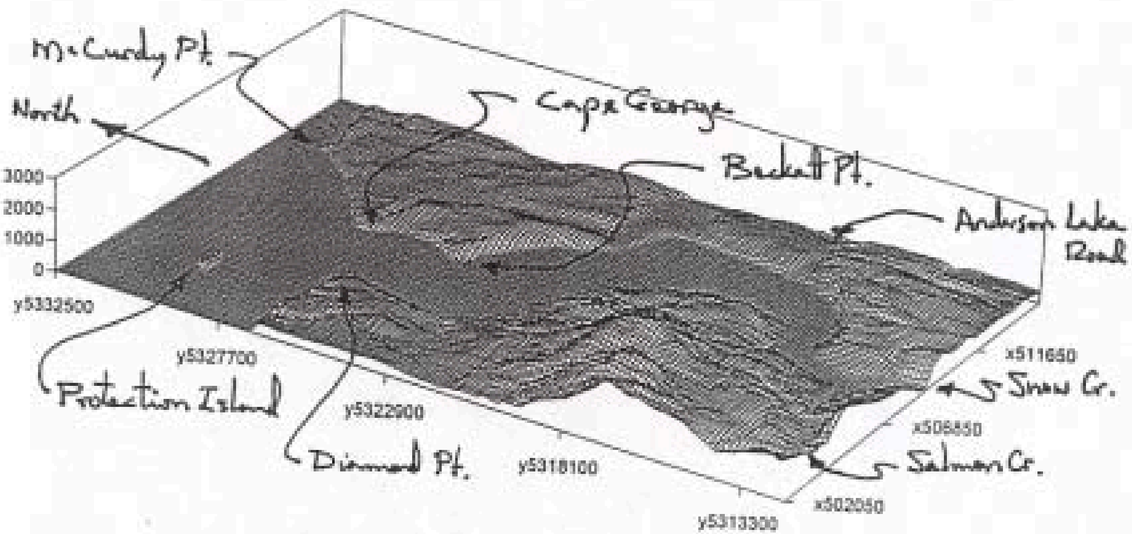


Figure 2.35 Terrain depiction, looking *SW*, of Marrowstone and Indian Islands, the Quimper Peninsula and Discovery Bay.

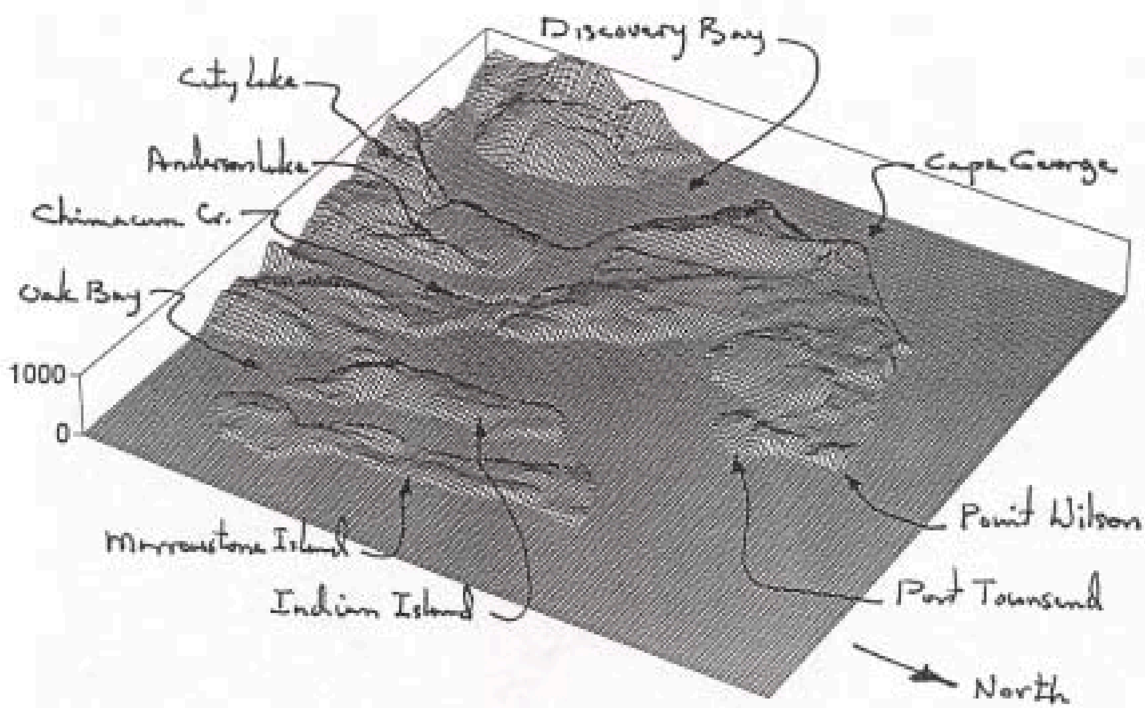
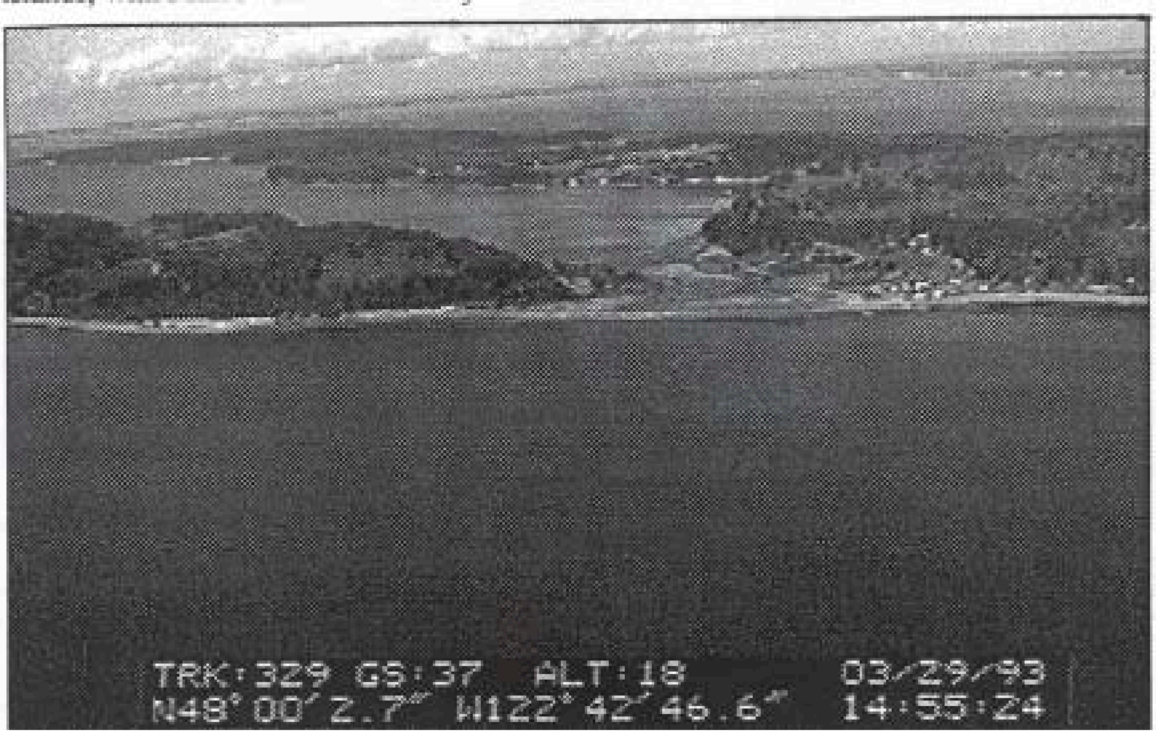


Figure 2.36 View of Portage Canal, looking south, from above the west shoreline of Indian Island.

Figure 2.37 View, looking *ENE*, of the causeway between Indian and Marrowstone islands, with Marrowstone Island beyond.



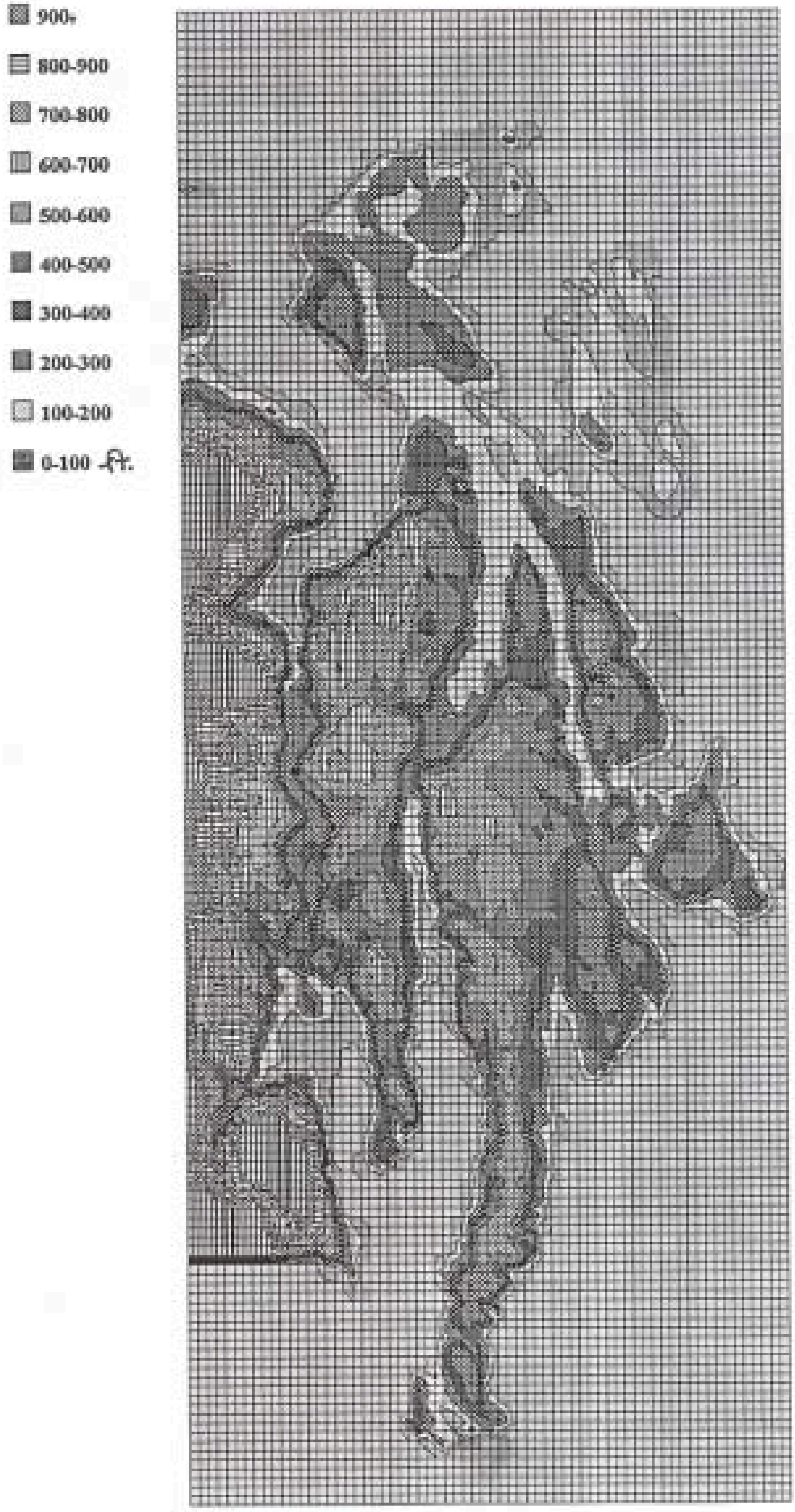
developed at the comers. Lower bluffs line the west side and the east side slopes to water from the 200 ft. elevation at the island's center. The south half of the island rises to nearly 400 ft. at Jorgenson Hill, and ends with sandy beaches and a public tidelands park at the north end of Oak Bay.

The south end of Port Townsend Bay, between Indian Island and the mainland, reaches depths of about 75 ft. Kilisut Harbor between Indian and Marrowstone Islands is nowhere deeper than 40 ft. It is protected from the open waters of Admiralty Inlet by an interrupted sand spit, (Rat Island) off the northwest comer of Marrowstone that extends part way across the north end of Indian Island.

Marrowstone Island is 6 1/2 miles long, and over a mile wide at north and south, narrowing to less than 1/2 mile in the middle at Mystery Bay and the Nordland community. The north end, a former military reservation and now Fort Flagler State Park, terminates in 100 ft. bluffs with sand spits at the comers. The northeast comer is a sandy beach, Marrowstone Point, and is occupied by a Coast Guard reservation and the Marrowstone Lighthouse. The east side of the island has substantial bluffs at north and south, exposed to Admiralty Inlet, and a stretch of low beach in the middle. The southwest comer of the Island is tied to Indian Island by a causeway across tidelands, as shown in Figure 2.37. The bulk of the island is gentle sloping land with elevations up to 180 ft., and has largely low-density residential land use.

The surficial geology of both islands is predominantly Vashon lodgement tills, underlain by other glacial sediments. Jorgenson Hill on Indian Island is of Eocene marine sedimentary rock with dikes of volcanics. Seawater intrusion into water wells is a major problem on Marrowstone Island, as is discussed later in the Plan. The naval establishment on Indian Island and the State park on Marrowstone are provided with water by pipeline from the mainland (City of Port Townsend water supply).

Figure 2.38 Generalized relief map of eastern Jefferson County, illustrating major north-south topographical features.



The Chimacum drift plain:

Grimstad and Carson (1981) in their study of geology and ground water of eastern Jefferson County, described the area south of a Port Discovery-Hadlock line and extending down to Squamish Bay and the head of Tarboo and Quilcene Bays, as a drift plain of extensive surficial deposits of glacial outwash and lodgement tills. The tills, a compact, generally nearly impermeable layer, have protected lower outwash layers from erosion, especially along bluff tops. The surficial tills are covered by developed soils and post-glacial alluvial deposits in many areas, but serve to limit recharge to the more permeable strata below. Many small lakes and wetlands in the area are seated in depressions in the Vashon lodgement tills.

Figure 2.38, a digital relief map illustration of the entire eastern Jefferson County area, illustrates the topography and regional drainage of the area. The descriptions presented in this chapter describe the Chimacum drift plain piecemeal, as parts contiguous to coastal bluffs and drainage areas of streams considered potentially important as fish habitat.

The Chimacum Creek estuary:

Figure 2.39 is a view from Port Townsend Bay of the estuary and lower segment of the stream. [A closer view is presented elsewhere in the Plan in a discussion of wetlands.] The stream terminates in a deep defile extending nearly a mile back in the 100 ft. bluffs, with the tidal estuary extending halfway back and the marsh beyond. The bluffs and uplands north of the estuary are mapped as Vashon lodgement till overlying advance outwash sediments, while south of the estuary the bluffs and slopes occupied by the communities of Irondale and Hadlock are mapped as Vashon recessional and ice-contact outwash.

The Chimacum Creek watershed:

Chimacum Creek is a study in contrasts. Its outflow at Port Townsend Bay is a spectacular tideland estuary of mudflats and bluffs, as shown above. Half a mile farther up it is a meandering stream in the woods, shown in Figure 2.40. A ways further upstream it is a backyard stream among suburban residences, as seen in Figure 2.41, where the stream gaging station is located upstream of the road culvert. Farther upstream the Creek passes gravel pits and more residences, and another culvert near Ness' Comer.

Near the Chimacum Grange and the Community Center the two upstream branches join in a thicket between fields, seen in Figure 2.42. The East Fork represents about 1/3 of the total flow, and the West Fork 2/3, at the confluence.62

The East Fork, seen in Figure 2.43, flows down the flat-bottomed Beaver Valley (Chimacum Valley on the topo maps). It begins about due west from Mats Bay, where small headwater streams drain from the uplands east and west of the 180 ft. elevation valley floor, and flow about 4 1/2 miles north to the confluence.

The West Fork flows toward the Chimacum confluence down the broader West (Center) Valley, also channeled between farm fields, as shown in Figure 2.44. A tributary stream,

[62] Roger Short, personal communication. Short also toured the entire Chimacum Creek watershed and other parts of the Chimacum drift plain with the writer, for perspective.

Figure 2.39 View, looking west, from Port Townsend Bay into the Chimacum Creek estuary.

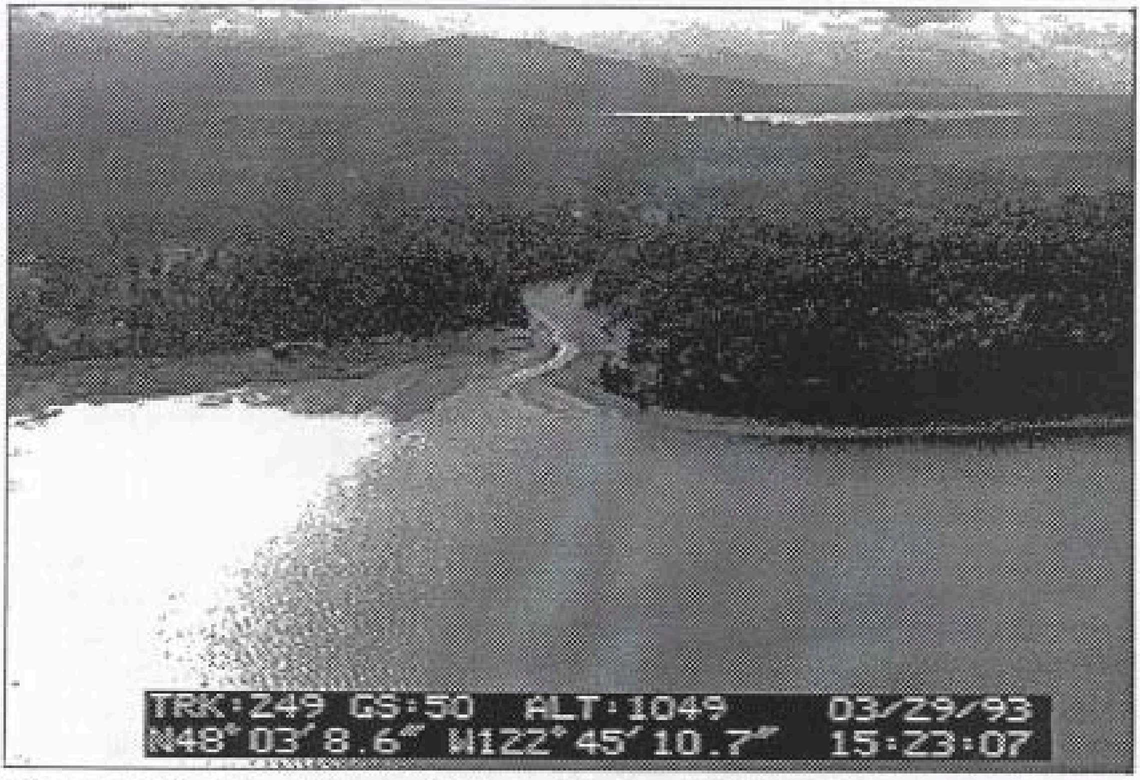


Figure 2.40 View of Chimacum Creek above the estuary, looking west.

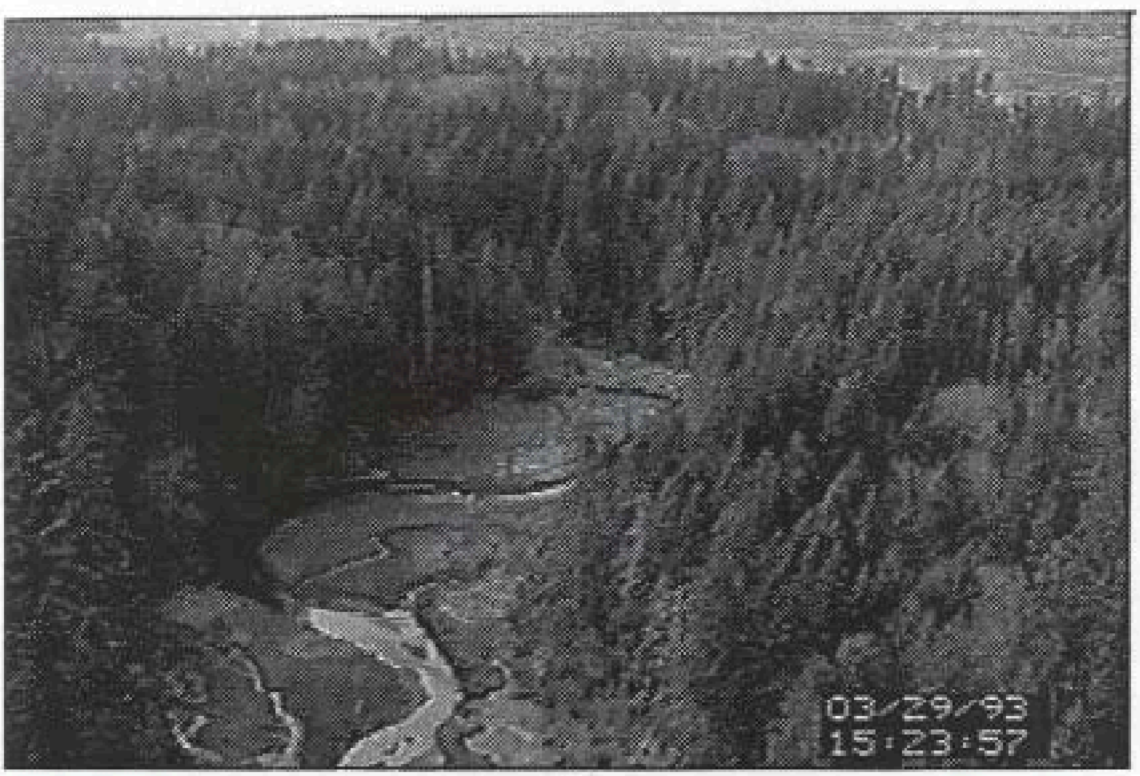


Figure 2.41 View of Chimacum Creek under an Irondale street. The lower stream's gaging station is upstream from the culvert.

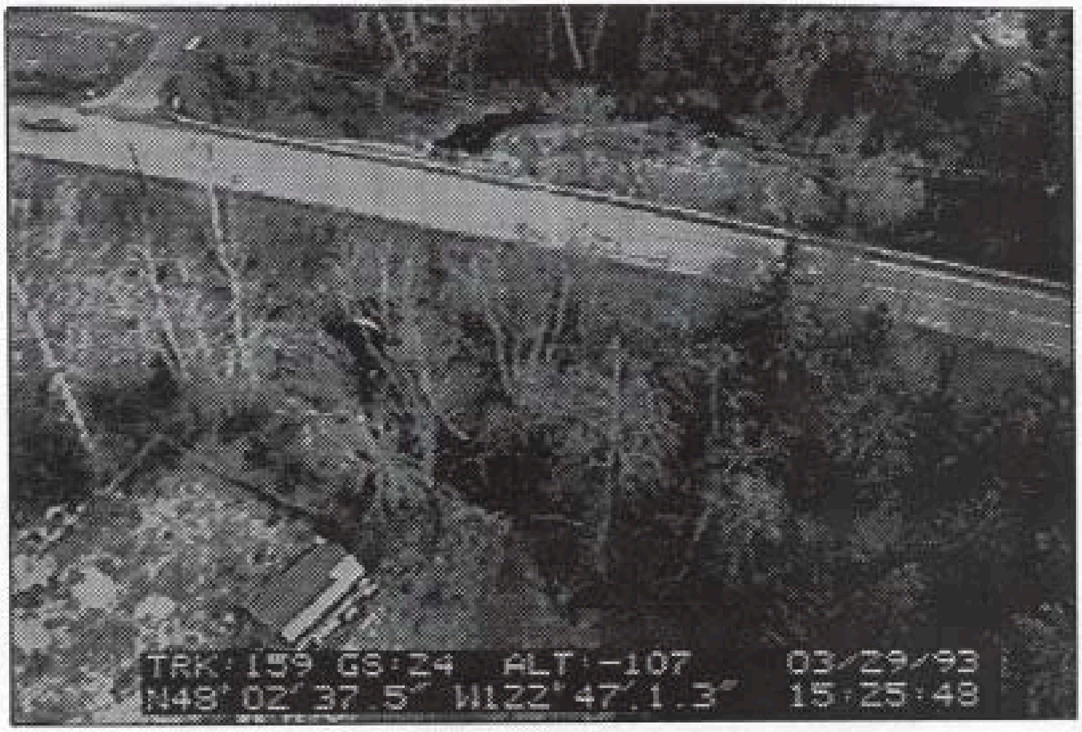


Figure 2.42 View, looking *SE*, of the confluence of East and West forks of Chimacum Creek. The Chimacum Grange building is below and right of the frame.

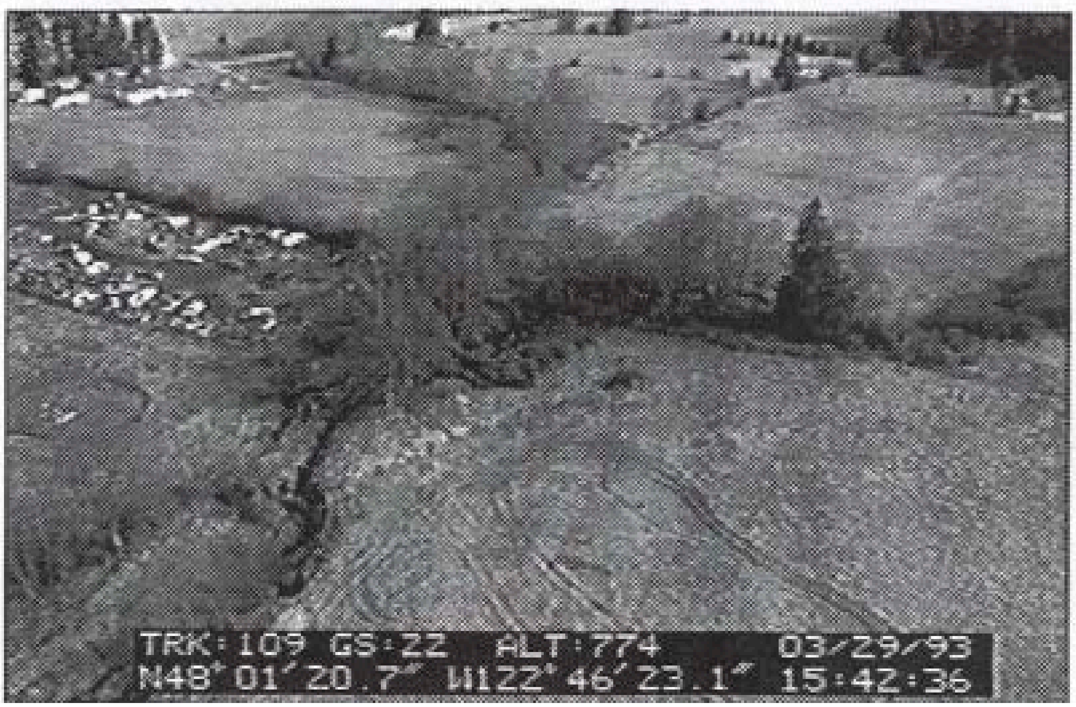


Figure 2.43 View, looking *SSE*, of the East Fork of Chimacum Creek flowing north in Beaver Valley.

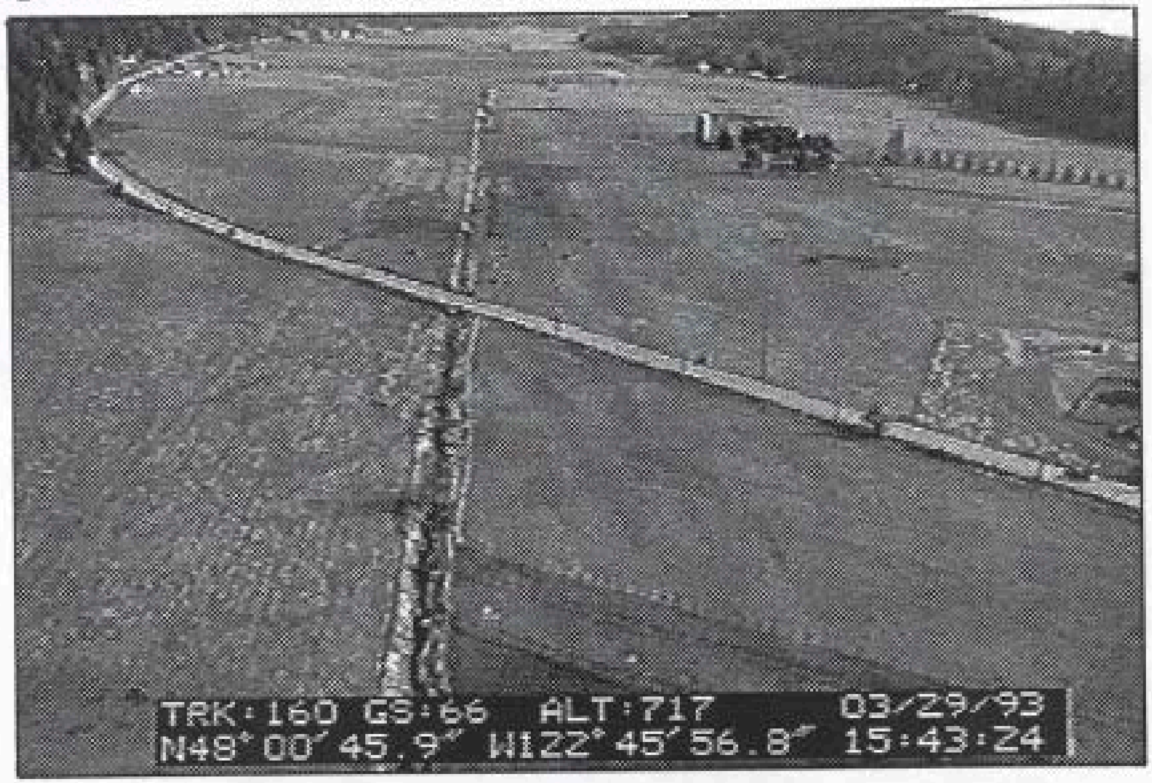


Figure 2.44 View, looking *SSW*, of the West Fork of Chimacum Creek.

Naylors Creek, the outlet from Gibbs Lake, flows out from the uplands to the west to join the West Fork about 2 miles south of the confluence. The location of the upstream gage farther upstream on the West Fork, (placed by USGS for the DQ project), is illustrated in Figure 2.45, just below the West Valley Road culvert, about 1/2 mile north (downstream) of the junction with Eaglemount Road, near Center.

Upstream from Center, the Chimacum West Fork flows eastward out from the uplands. A slide area, apparently resulting from road building and logging, has caused sedimentation in the creek, which is being controlled by a sediment basin.

The west branch of Chimacum Creek begins in the logged-over uplands southeast of Discovery Bay, near City Lake. The general area is illustrated in Figure 2.46, south of Delanty Lake. The stream flows south out of Delanty Lake at about the 500 ft. elevation, 1 1/2 miles south of Discovery Bay along the Eaglemount road. About 2 miles south a tributary from Peterson Lake, also at 500 ft. elevation, joins the stream and it turns east, to drop down toward Center. [It is interesting to note that in this stretch Chimacum Creek is only about 1/2 mile from the headwaters of Tarboo Creek, also originating in these uplands but flowing south to Dabob Bay.]

Figure 2.45 View, looking *SW*, of the upper gaging site where Chimacum Creek crosses under West Valley Road, north of Center.

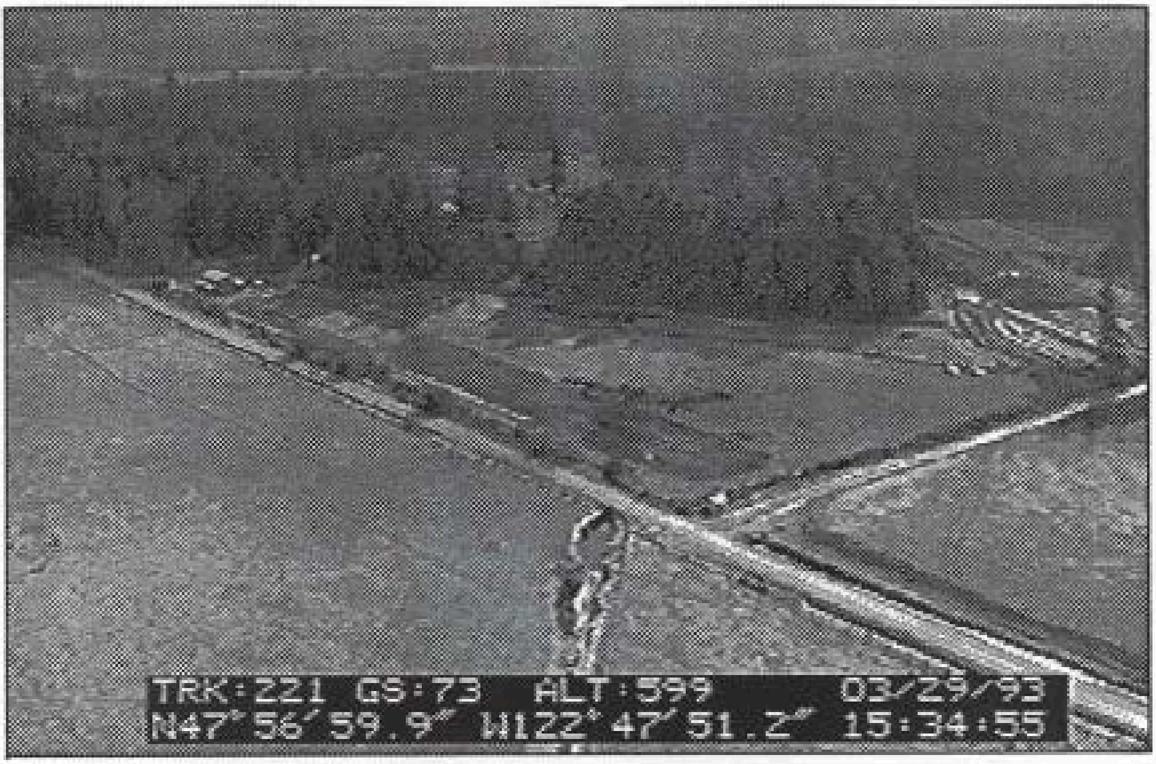
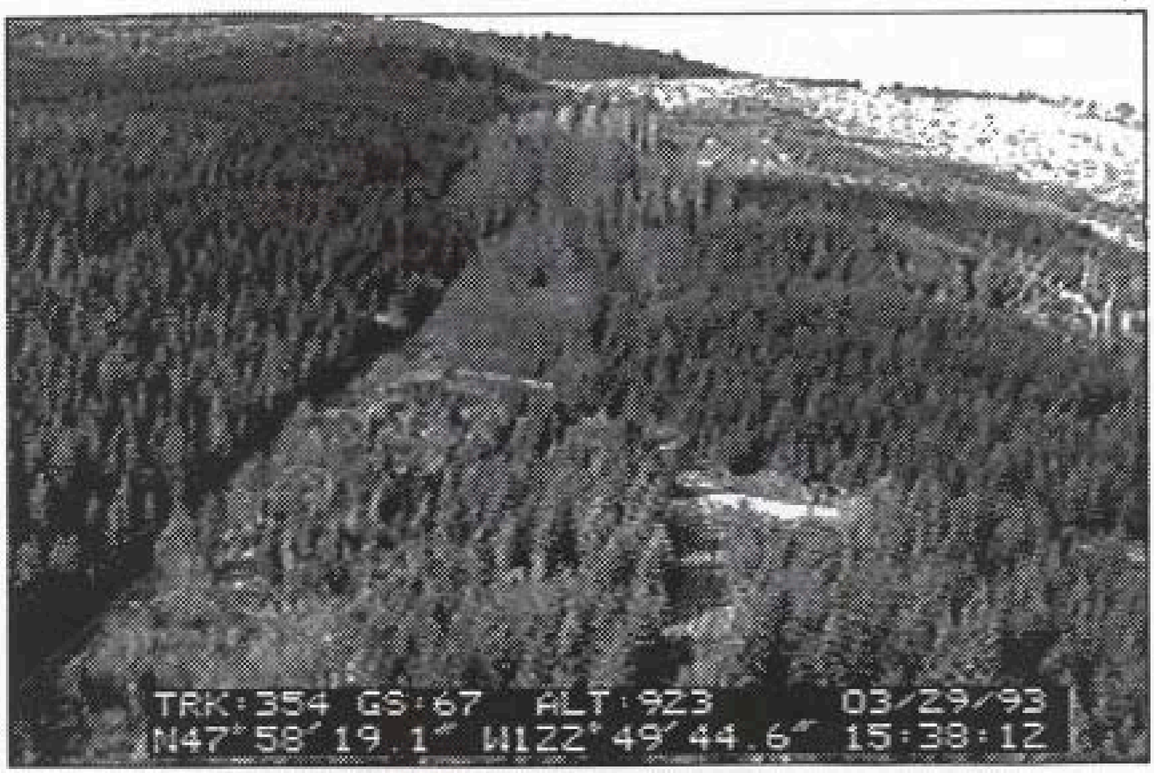


Figure 2.46 View, looking north, near the headwaters of Chimacum Creek in the uplands *SE* of Discovery Bay. Delanty Lake is beyond.



Oak Bay:
The wide open bay extends from Portage Canal at the south end of Indian Island to Olele Point, about 3 miles southeast, and is protected somewhat by Indian and Marrowstone Islands. Oak Bay is visible on Figure 2.47, and on Figure 2.35 above. There are no significant surface water drainages into the bay. The north portion has a low but steep bluff that softens into a gradually sloping shoreline in the southern part. Marine sedimentary bedrock (Eocene sandstone) is exposed along the base of the bluff.

Broad tidelands are protected as parks at the north end of the bay, east of Portage Canal, on Indian Island, and west of the canal below the community of Oak Bay. There is substantial residential development along the shoreline. Bay Road parallels the shoreline at about the 150 ft. elevation.

Mats Mats Bay:
Figure 2.47 shows Mats Mats Bay. A narrow shallow channel leads into the enclosed bay from the northeast, between the basaltic bedrock masses of Olele Point and Basalt Point. The northwest end of the bay is mapped as a mudflat at the outlet of a small stream from the west. The west shoreline of the bay is the base of a moderate hillside slope of glacial tills, rising to 400-500 ft. uplands. The area surrounding the bay is residentially developed, and a basalt quarry occupies the east side.

Port Ludlow and Ludlow Creek:
Figure 2.47 illustrates this area. The entrance to Port Ludlow Bay is over 2 miles wide, from Basalt Point at the northwest to Tala Point at the southeast. A narrow channel around Klas Rock off Basalt Point and between Snake Rock/light and the Colvos Rocks/light is greater than 60 ft. deep. A sill less than 25 ft. in depth stretches from' Colvos Rocks south to Tala Point, Only a low narrow peninsula terminating at Basalt Point separates the outer portion of the bay from Mats Mats Bay to the north. Below this peninsula the east-facing shoreline of the outer Port Ludlow Bay is a continuous rise for 1/2+ mile back to a 400-500 ft. highland, mostly stable Vashon glacial till, rather than a precipitous bluff. Considerable residential community development has occurred on this slope and highland, including the communities of Mats Mats, Swansonville, and Port Ludlow at the south end where the bay turns inward at a point modified with artificial fill.

The north shoreline of the inner bay has somewhat steeper bluffs, mapped as partially unstable recessional outwash glacial sediments. The mudflats estuary of Ludlow Creek occupies the narrow head of the bay. The south shoreline of the inner bay is basaltic bedrock with several small peninsulas and island rocks. Gently sloping glacial outwash terrain east of the basalt peninsula supports residential development around to the steep bluffs of Tala Point.

Ludlow Creek has many branches. One tributary draining the basalt slopes southwest joins the main stream at the estuary. The longest branch mapped as perennial is about 4 miles in length, beginning at 200 ft. elevation in the flat-floored southern Beaver (Chimacum) Valley, with a spring and an intermittent tributary draining the 400-500 ft. elevation plain north of Swansonville through a short, steep-sided canyon. Two short tributaries drain high ground west of the valley, with origins above 400 ft. The main stream continues south in the Beaver

Figure 2.47 Terrain depiction, looking *WNW*, of the East Jefferson County coastline between Oak Bay and Thorndyke Bay.

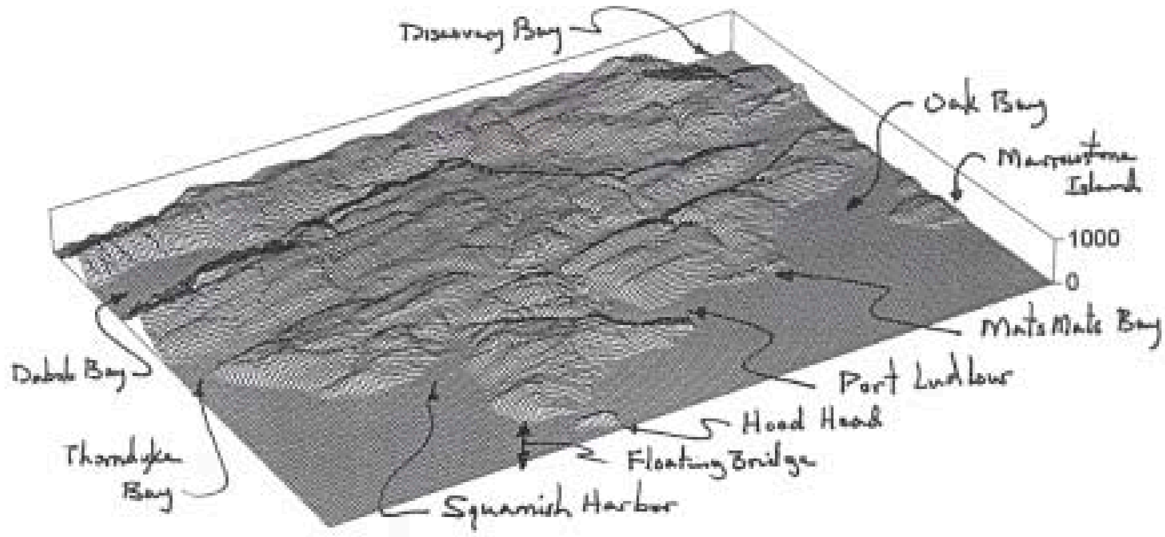
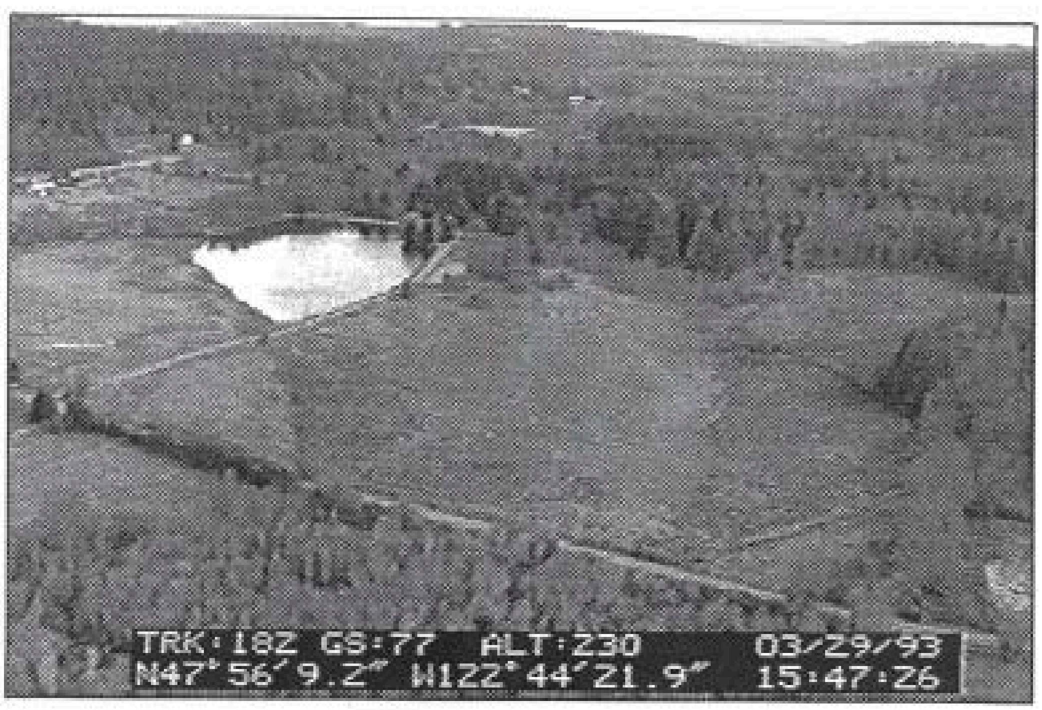


Figure 2.48 View, looking *SE*, of Ludlow Creek in Beaver Valley.



(Chimacum) Valley floor farmland, as in Figure 2.48. A large open water pond (mapped as intermittent), is visible on flyover videos north of Beaver Valley community. Beyond the Beaver Valley community, the creek turns east toward the bay, just past the intersection of the Bay Road (from Pt. Ludlow) with the Beaver Valley Road. A short intermittent stream joins from the south at this intersection, and a longer stream from the west, mapped as intermittent in its lower segment, drains Ludlow Lake, Horseshoe Lake (?) and two other unnamed lakes in the 3 00-400 ft. highland area. The total length of the Ludlow Creek branches is 10+ miles. Flow as measured at the USGS staff-gage was 4.96 cfs on 7/22/93 and 2.87 cfs on 8/18/93.

Hood Canal:
The entrance to Hood Canal, shown on Figure 2.31 and Figure 2.47, is an imaginary line east from Tala Point, the southeast boundary of Port Ludlow, to Foulweather Bluff at the north end of the Kitsap Peninsula. At the entrance Hood Canal is over 300 ft. deep. Farther south at the southern end of Toandos Peninsula the Canal ranges to 360 ft. depth (and south of the DQ region to nearly 600 ft. depth).[63]

Tala Point to Hood Head and Bywater Bay:
A steep 200 ft. bluff of glacial and interglacial sediments at Tala Point, shown in Figure 2.47, is surmounted by gentle rise to 500 ft. to the south, predominantly of Vashon till. [Basalt outcrops to the north and the sharp character of the Point suggest that basalt bedrock is not far below the exposed sediments.] The bluff recedes from the shoreline some 2 miles south, mapped as unstable, and a residential community is located on a low terrace at a basalt bedrock outcrop-

Teal Lake, with no mapped surface outlet, is located on a 400 ft. elevation highland 1 1/2 miles south of the southern shoreline of Port Ludlow. It may provide some ground-water recharge that discharges into several short unnamed streams that drain north into Port Ludlow, and east to Hood Canal between Tala Point and Hood Head, as well as into the upper reach of Shine Creek, I mile west.

Hood Head, a 1/2+ mile long island of Vashon till and earlier sediments with a navigation light on its east side at Point Hannon, is the easternmost feature of the DQ region. [Hood Head is not shown on the pictorial of Figure 2.47, but its position is noted.] An east-west 1/2 mile sandbar connects it with the shoreline bluffs and encloses a triangular mudflat and marsh. Bywater Bay, shown on Figure 2.47, lies south and west of Hood Head, and between it and the Hood Canal floating bridge. A sand spit at its northwest provides a small opening into the mudflat. A small beach lies just north of the bridge end, at Termination Point.

Squamish Harbor, the Shine Creek area, and South Point:
Illustrated on Figure 2.47, Squamish Harbor is a large triangular embayment just south of the Hood Canal floating bridge (reportedly the longest floating bridge crossing salt-water). The bay is a marginal basin mostly less than 60 ft. in depth, compared to the 240 ft. depth of the adjacent Hood Canal. A shoal of 6 to 30 ft. depth occupies a substantial portion of the bay. The estuary of Shine Creek is a mudflat and marsh at the head of the bay, bisected by the road

[63] Burns. 1985

connecting South Point to Highway 104, Highway 104 parallels the south-facing shoreline of the bay, generally 100 to 200 ft. up on the gentle bluff until it descends to the floating bridge. At South Point, 2+ miles south, several long sand spits have formed parallel to the shoreline with open lagoons behind, open to the north. The Lofall ferry operated from South Point, at the base of the outer spit, before the Hood Canal bridge was put into service.

Shine Creek is mapped as 2+ miles in length with no tributaries except within the estuary. It flows south through a shallow valley from its beginning at 150 ft. elevation, between 300-400 ft. elevation highlands 2 miles south of Port Ludlow. The creek crosses under Highway 104 about a mile south of its origin, and then parallels the highway eastward to Squamish Harbor. Flows measured at the USGS staff-gage site were 1.23 cfs on 7/22/93 and 0.64 cfs on 8/18/93.

Residential development in the Squamish Harbor/Shine Creek area is currently leading to concerns about surface and ground-water protection.

Thorndyke Bay and the Thorndyke Creek area:

This area is shown on Figure 2.47. The shallow embayment occurs where the Hood Canal channel turns south at the north end of Toandos Peninsula. A large triangular marsh and lagoon is formed on the south-facing shoreline where the Thorndyke Creek channel and estuary interrupts the 200+ ft. bluffs north and south of the bay. A steep-walled trough extends northward, inland, for 3+ miles, with short tributaries draining the eroded side slopes to the main stream channel. The Thorndyke Creek drainage area is less coherent than that of Tarboo, although highlands separate it from Tarboo on the west and Shine Creek on the northeast, as shown on the relief map of Figure 2.38. A number of wetlands and seasonal lakes are mapped on the highland areas, but except for Sandy Shore Lake, none has a mapped surface outlet.

The mainstem of Thorndyke Creek begins at Sandy Shore Lake (1/2 mile south of I-Highway 104, about 3 miles southeast of the Chimacum/Quilcene West-Valley Road off ramp) and flows mostly south for 6+ miles. Perennial and intermittent tributaries add another 7+ miles of stream length. The flows measured at the USGS staff-gage were 6.95 cfs on 7/22/93 and 4.90 cfs on 8/18/93.

Toandos Peninsula and Fisherman Harbor:

The Toandos Peninsula is illustrated in Figure 2.49. The peninsula is 10+ miles long north to south, averages about 2 miles wide, and is typically 400 to 600 ft. above sea level along its top with steeply sloping bluffs along east and west shorelines. The land and the waters of Hood Canal and Dabob Bay alongside have been sculpted by cordilleran glaciation. Figure 2.50 is a view from the top of the peninsula, above Camp Discovery, looking to the east-southeast across Dabob Bay and the Bolton Peninsula toward Mt. Walker.

Figure 2.49 Terrain depiction, looking west of the southeast portion of the DQ Region. Toandos Peninsula, Dabob Bay, Bolton Peninsula, Quilcene Bay and Mt. Walker are shown.

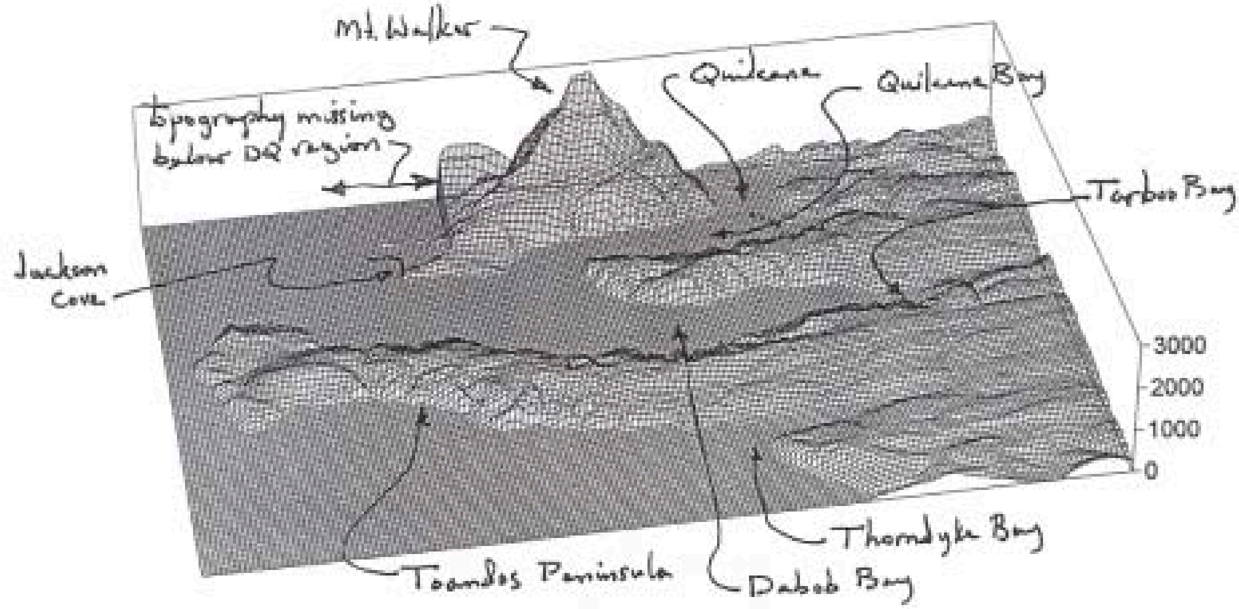
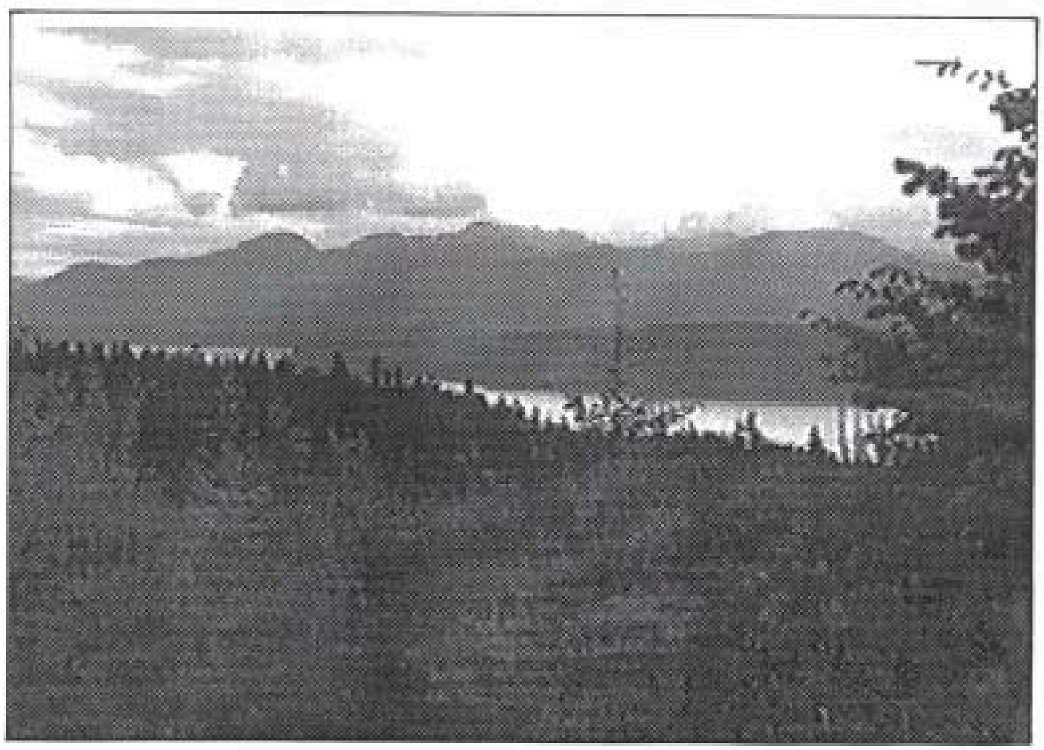


Figure 2.50 Views, looking *WSW* from Toandos Peninsula across Dabob Bay and the end of the Bolton Peninsula.



The surficial geology of the Toandos Peninsula is predominantly glacial till of Vashon age, underlain by other unconsolidated glacial and interglacial sediments. The contact surface between the Vashon lodgement tills and the underlying sediments generally dips to the east [Grimstad & Carson, 198 1]. The shoreline bluffs are typically higher and steeper on the west side, with more frequent short, intermittent drainage channels on the east side. Bluff slopes are indicated to be largely unstable.

Fisherman Harbor is a 3/4 mile long estuary, a steep-sided defile in the 200 ft. high bluffs with a sandspit at the entrance. It is fed by a short intermittent stream draining the uplands behind.

Salt marshes and open lagoons are found just above Zelatched Point on the west shoreline near the end of the peninsula. Silent Lake, located near the 600 ft. elevation at the top of the peninsula, and about 6 miles north of Coyle on Coyle Road, has no mapped inlet or outlet. There are few mapped all-season surface streams on the peninsula; tributaries of Thorndyke Creek drain east from the northern part, and a 1+ mile stream drains west into Dabob Bay at Camp Discovery.

Habitation is sparse, with minor local agricultural and some residential development, and most land cover/land use is forest-related. Part of the east side, opposite Bangor, is a US naval reservation. The community of Coyle is located at the head of Fisherman Harbor at the extreme southern end of the peninsula. Coyle Road, the major improved road, generally traverses the high ground down the peninsula's center. A spur road to Hazel Point serves some development on the southeast shore. Camp Harmony, about 3 miles north of Zelatched Point on the west shoreline, and Camp Discovery, another four miles north, have development along the shoreline.

Dabob Bay and Tarboo Bay:
Illustrated on Figure 2.49, Dabob Bay is the largest and deepest marine embayment within the DQ region. It extends 12+ miles along the west shoreline of Toandos Peninsula, and ranges from 1+ to 3+ miles in width. Toward the south end of the Toandos it exceeds 600 ft. depth, and continues over 300 ft. depth well up beside the Bolton Peninsula, 3 miles from its head at Tarboo Bay. Dabob Bay is considered as the extension of the deep glacial scour that created the main channel of Hood Canal farther SoUth.[64]

Tarboo Bay, the estuary of Tarboo Creek, lies at the head of Dabob Bay and is separated from it by several sand spits extending across from the west shore (visible in Figure 2.5 1), and an elongated spit, Long Spit extending north from the west shore of Toandos Peninsula. The community of Dabob (originally called Tarboo) is situated on the east shore opposite the spits.

The Tarboo Creek area:
The primary drainage channel of Tarboo Creek is clearly visible in the relief map of Figure 2.38, as it flows into Dabob Bay from the north. Parts of the watershed are evident in Figures 2.49, 2.47, and 2.3 5. The Tarboo Creek flow begins -about 5 miles north of the head of

[64] Burns. 1985.

Tarboo Bay and four miles south of Discovery Bay. The mapped stream begins at about 600 ft. elevation. One branch begins about 1/4 mile from, and perhaps 30 ft. lower than Tarboo Lake, which has no mapped inlet or outlet. The total length of Tarboo Creek and its mapped all- season tributaries is nearly 14 miles. Flow measurements of the creek at the USGS staff-gage indicated 4.43 cfs on 7/23/93 and 2.54 cfs on 8/18/93.

The main stream channel flows in a narrow north-south valley with steep sides rising 300+ ft., suggesting continuation of the scoured channel of Dabob Bay and the Hood Canal main channel (and perhaps an outwash channel linkage to the West Valley and continuing on up the Quimper Peninsula). The sediments exposed at Tarboo Bay are mapped as Vashon recessional outwash (later than the till deposits of the peninsula surfaces and the pre-Vashon glacial/ interglacial deposits exposed in the peninsula bluffs). Tertiary marine sandstones are also exposed in the Tarboo Bay area and up Tarboo Creek, suggesting that the cordilleran-glacier- carved channel extended down to sedimentary bedrock where Tarboo Creek now flows, although it is much deeper farther south at Dabob Bay and Hood Canal where the sedimentary bedrock layer is deeper or missing.

Bolton Peninsula:

The peninsula is evident on Figure 2.49 and in the photo of Figure 2.5 1. The peninsula is essentially a smaller version of the Toandos, with comparable surface elevation, surficial geology, and bluffs. It is just over I mile wide and extends about 3 1/2 miles south from the head of Quilcene Bay. The east shoreline extends 2+ miles farther up to Tarboo Bay.

Land use and land cover are comparable here to the Toandos peninsula, mostly forest lands, with residential development along the northeast side of Quilcene Bay. A road across the head of the bay branches, with one road extending down the west side of the peninsula to Fisherman's Point, a recurved spit and lagoon at the southwest comer. The other road extends southeastward on the top of the peninsula, ending at Lindsays Beach, a sand beach and lagoon at the southeast comer, below a defile in the bluff with a small intermittent stream. A spit and lagoon, Broad Spit, and several other small drainage defiles and beach recesses occur up the east shoreline. The bluffs are generally mapped as unstable, [Coastal Zone Atlas]. Several short, unnamed, intermittent streams are mapped as draining to Dabob and Tarboo Bays to the east, and to Quilcene Bay.

Donovan Creek area:

This small stream, traceable on Figure 2.49, ends in an estuary at the head of Quilcene Bay. The mapped perennial stream begins about 2.5 miles north, at an elevation of 400 ft. Several intermittent tributaries are mapped that add an additional 2+ miles, and one of these begins near small Rice Lake that has no mapped surface outlet. The Donovan Creek drainage is small and less well defined than Tarboo to the east or the Little Quilcene drainages to the west. The staff-gage flow measurements by USGS showed 0.73 cfs on 7/23/93 and 0. 1 cfs on 8/18/93.

Quileene Bay and Quileene Rivers estuaries:

Figure 2.27 [presented earlier, in the discussion of the Big Quilcene River watershed] illustrates the area, as does Figure 2.49. Quilcene Bay extends about 3 1/2 miles south from its head to the south end of Bolton Peninsula at Fisherman's Point and is typically about 3/4 mile

Figure 2.51 View, looking *WSW*, across the spit separating Dabob Bay from Tarboo Bay.

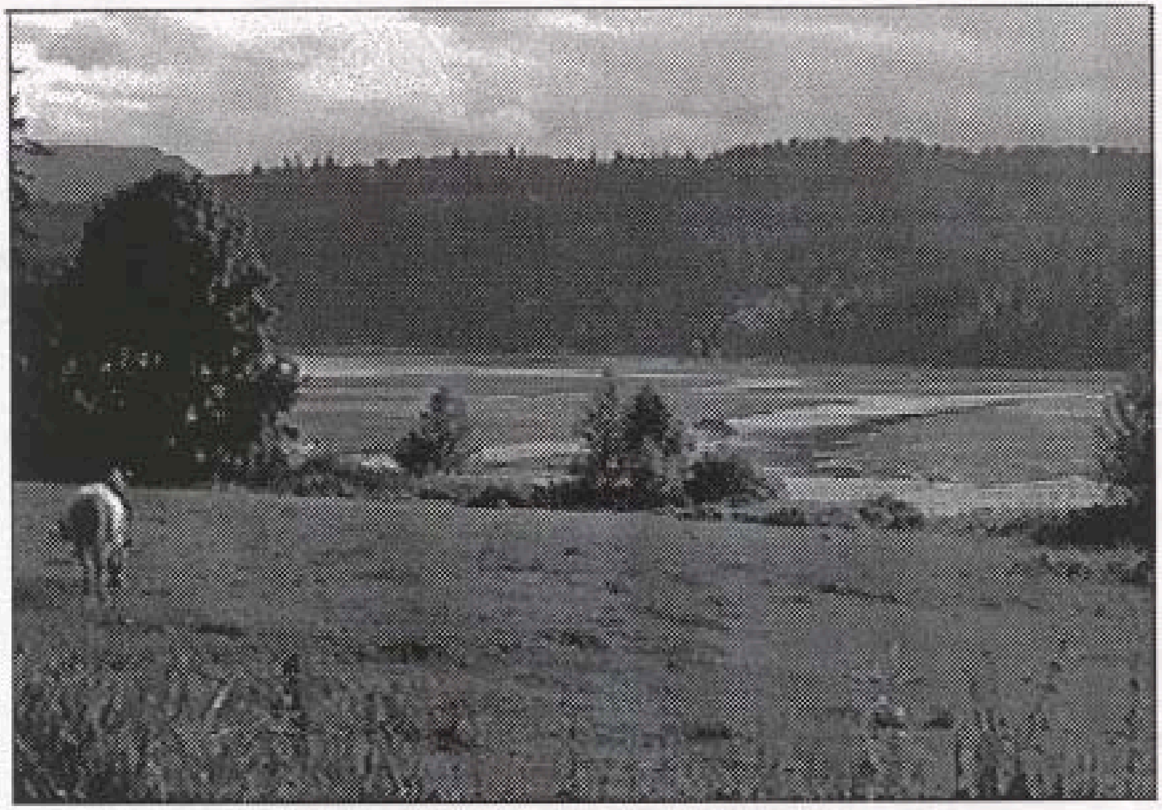
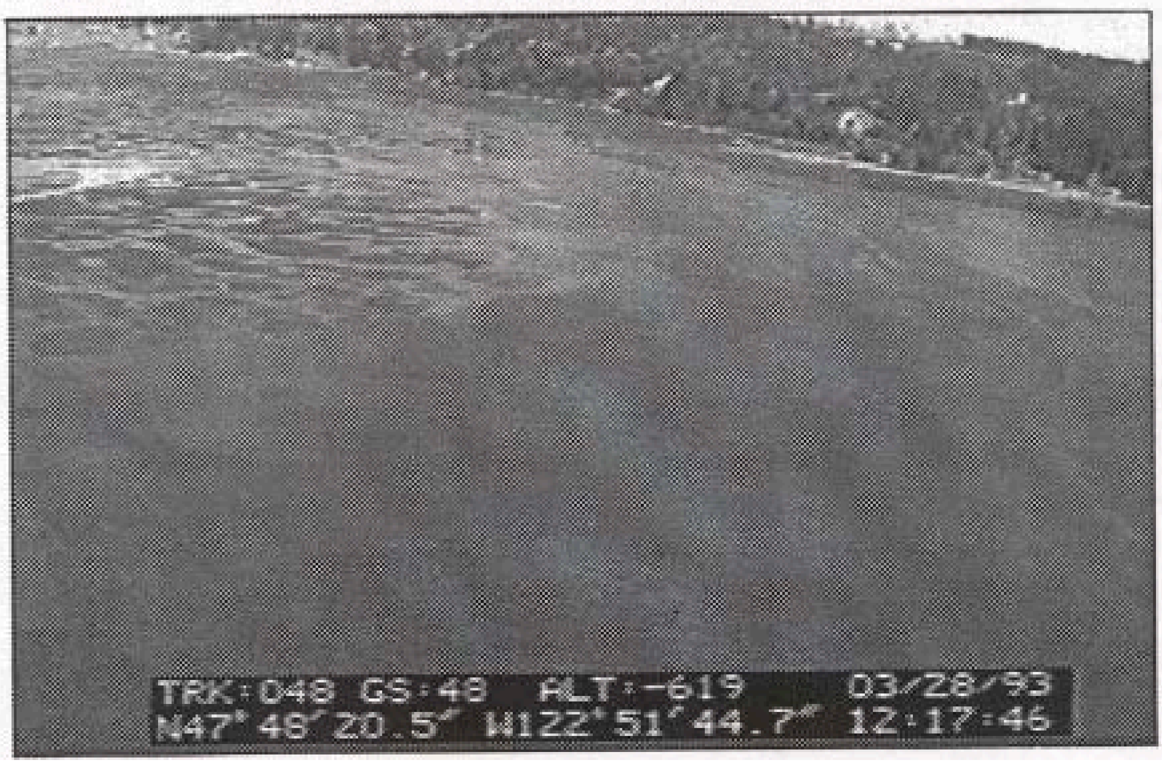


Figure 2.52 View, looking *N* over Quilcene Bay and the Quilcene river estuaries.



wide. The north half of the bay is very shallow, comprising the estuaries of the Big Quilcene and Little Quilcene rivers and Donovan Creek; halfway down the bay, out from the Quilcene Boat Haven the depth is less than 20 ft. The lower half of the bay deepens rapidly, reaching near 200 ft. at the south end, between the steep east flank of Mt. Walker and the bluffs of Bolton Peninsula, and joining Dabob Bay which reaches 600 ft. depth another mile south.

The delta and estuarine area at the northwest area of Quilcene Bay is apparently a shallow basin of unconsolidated glacial and alluvial sediments mixing the outflows of the three surface streams. A geologic cross-section suggests depths of less than 100 ft. to the underlying marine sedimentary and basaltic bedrock.

Coastline south of Quileene:

The bluffs of unconsolidated glacial sediments continue for half a mile below the Quilcene Boat Haven. Beyond, to near Whitney Point, the Crescent Formation basalts are exposed in steep bluffs forming the toe of Mt. Walker. These bluffs are all mapped as unstable. At Frenchman Point, opposite the end of Bolton Peninsula, a small stream drains the east flank of Mt. Walker and Devils Lake.

A sand spit encloses a lagoon on the north side of Whitney Point, and low bluffs of glacial sediments continue around to Pulali Point, a 300 ft. high basalt point enclosing Jackson Cove. Glacial sediments form the bluffs extending down the coast to the (indefinite) boundary of the DQ region. As noted earlier, evidence indicates that the Big Quilcene River once flowed southeast between Buck Mtn. and Mt. Walker and down the present channel of Spencer

Creek, until an ice-age alpine glacier (earlier than the latest, Fraser, glaciation) deposited a terminal moraine between the mountains, re-routing the Big Quilcene to its present outflow at Quilcene Bay.[65]

[65] Long. 1975.

The Water Resources

In this section we attempt to describe and partially quantify the sources of water for the DQ region for which useful data are available. In the preceding characterization of the various river and stream watersheds and the coastal areas we have included, as available, generalized statements about the magnitude of waterflows. In the case of the Quilcene rivers, and of most smaller streams, not enough long-term gaging has been done in the past to provide data for a meaningful historical description or analysis of variations. That situation is being partially overcome by the provision of additional gage sites and short-term gaging by the USGS as part of the DQ project, and by ongoing interagency assessments- Hopefully, gaging of those locations will continue into the future through a combination of volunteer and funded efforts. Some insights into the historical behavior of those rivers lacking long-term instrumental data can be attained by estimating past flow patterns through correlations with weather and other river-flow data for the general vicinity. The USFS-WDNR analysis of the Big Quilcene River watershed includes attempting such an analysis for the Big Quilcene River.[66] Wennekins led a DQ field tour focusing on ground-water topics in the region with an extensive information packet.[67]

In the material that follows in this section we have three objectives:

- To characterize the present-day climate and weather patterns insofar as they identify the amount and distribution of water available to the DQ region.
- To characterize the flows and their variation for the Dungeness River, the largest surface water stream of the region, and the only one for which long-term patterns can be analyzed.
- To explore ground-water sources, their availability and adequacy, and their interaction with surface waters. Again, our characterization is necessarily limited for the most part to the Sequim-Dungeness peninsula area of Clallarn County. For this sub-area of the DQ region, a number of past and ongoing studies have provided useful data.

For the Jefferson County sub-areas, the prior ground-water study data are principally limited to one major overview. On-going investigations separate from the DQ project (by Ecology regarding sea-water intrusion, and by Jefferson County PUD regarding ground-water availability for the east-county areas), will furnish information in the near future. A computerized inventory database of east Jefferson County water wells initiated as part of the DQ project provides data for later analyses of ground-water resources.

66 Stoddard, R. Personal communication. June 1994.
67 Wennekins. M.P. DO field trip and accompanying briefing notes. Fall 1992.

Present climate and weather patterns

Everyone "knows" that the Northwest is a rainy, wet place. Lots of us realize also that we live in, or near to, a "rainshadow. " Forty airline miles from a world-famous rain forest we experience dry summers and desert-like conditions .... How do these conflicting circumstances affect our water resource?

First, in the mid-latitudes, (the DQ region is centered about 48 degrees north), the prevailing wind flow is from the west. This pattern of air masses and weather phenomena moving from west to east is common for much of middle North America. Our location on the west coast exposes us to marine air masses that have been conditioned for extended periods over open ocean. The oceans provide a "flywheel effect" on climate, providing relatively warmer, more moist air masses in winter, and cooler air in summer than air masses moving over continental areas. Thus, irrespective of other factors, we will get more precipitation and less seasonal variation in temperatures than eastern Washington. This translates directly into more water arriving and less evaporation, for a fundamentally wet climate here.

Geographical variation in precipitation:

Most of the precipitation for the DQ area comes from weather systems moving across the Olympic Peninsula from the Pacific Ocean. The annual precipitation increases with latitude along the coast (Aberdeen gets more than Astoria, Quillayute more yet, and the west coast of Vancouver Island and northern BC still more). The weather systems moving onto land begin to lose their moisture as precipitation; as the air mass is forced up over rising mountain terrain it is cooled and loses still more moisture. The result is lessened annual precipitation inland, (Olympia and Shelton get less than Aberdeen) and greatly reduced precipitation in the rainshadow of the Olympic mountains, (Sequim only gets 20% of that at Quillayute or Aberdeen). Quilcene and the southeastern Jefferson County peninsulas have less rainshadow effect, with storm circulation around the south side of the mountains; likewise Elwha ranger station gets circulation around the north side of the mountains. Both get about three times as much precipitation as Sequim and Port Townsend.

The graphs in Figure 2.53 show annual precipitation over a many-year period for several reporting stations. The graphs illustrate that the amount of annual precipitation differs with location, and that all locations tend to change together from year to year since all are from the same weather systems off the Pacific Ocean. The map of precipitation contours shown in Figure 2.54 depicts average annual precipitation for locations in the DQ region. [Note: The contours were constructed three decades back, using data for the prior 30 years and extrapolations for the high-elevation terrain where recorded data were lacking. New isohyetal maps are being prepared, but measured data are still lacking for much of the high-elevation terrain.]

Estimation of water source from precipitation for hydrologic subdivisions of the DQ region:

The map and chart of Figure 2.55 show estimated precipitation, based on the isohyetal contours that Figure 2.54 illustrates, for crudely-approximated hydrologic units of the DQ region. The gross estimates are primarily useful to show the non-uniformity of geographic

Figure 2.53 Graph of annual water-year precipitation for selected sites in and near the DQ region.

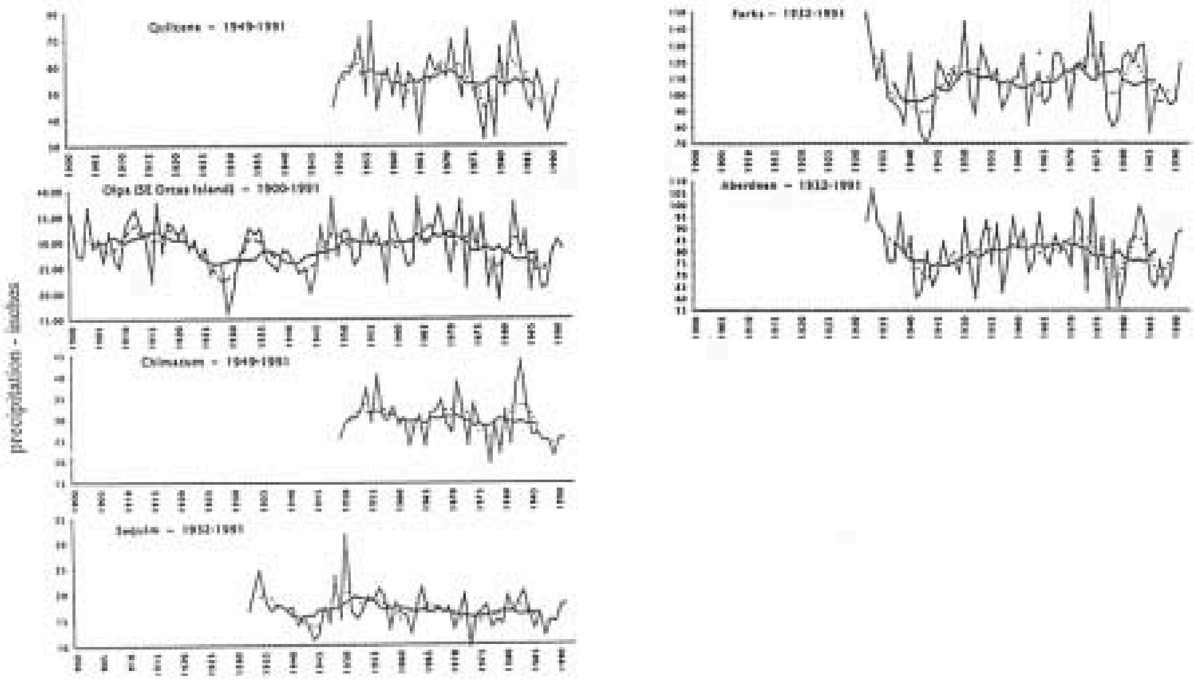


Figure 2.54 Map of annual precipitation (in inches) for the Olympic Peninsula (from SCS 1965).

distribution of water source, and the water-transport function of the mountain rivers and streams. These estimates of (average) annual precipitation are only an indication of the gross amount. They do not attempt to account for variations in interception and in transpiration by vegetation, evaporation from surfaces, sublimation from snowpack, surface runoff, soil moisture capacity, infiltration and ground-water recharge, and hydraulic continuity between surface and ground waters.

Seasonal variation in precipitation:

Because of the tilt in the earth's axis of rotation as it annually orbits around the sun we are angled away from the sun's rays in the winter. As a rough approximation, the boundary between polar and tropical air is over southern Canada in summer, but moves toward southern United States in winter. Thus we see storm tracks across the US Pacific Coast in the winter, moving up to British Columbia and Alaska in summer months, and we experience wet, stormy winters and relatively dry summers.[67] The graphs of Figure 2.56 illustrate this seasonal effect which is generally true across the Peninsula, irrespective of the amount of precipitation.

Snowpack:

Inasmuch as the precipitation in the DQ region occurs largely in the winter season, and tends to be greater in high-elevation areas than lowlands, much accumulates as snowpack that contributes to spring and summer runoff. The snowpack is normally substantial enough for measurement at DQ region monitoring sites from January through April or May. As Figure 2.57 illustrates, the annual snowpack at the Deer Park site used in forecasting Dungeness River flows has shown declines in recent years, apparently related to climate fluctuations.

Weather pattern and climate changes:

We discussed earlier the major climate changes accompanying the ice ages and the transition to the present climate we know. People tend to think of climate as stable and unchanging, or as changing in a simply-defined way ... as toward another ice age or toward global warming. The emerging understanding is that global climate is an incredibly complex dynamic system in which "everything is interconnected with everything else." The climate and weather patterns of a small region of the planet are affected by slowly changing conditions and catastrophic events (volcanic eruptions, for example) occurring elsewhere on the land, in the atmosphere and in the oceans, and even externally with changes in our sun.

We can observe changes in weather patterns that appear to persist over periods of time -- the record of snowpack at Deer Park as an example, or regional droughts, -- talk casually about "trends" or even about "cycles". But for purposes of describing the impact of weather and climate on the water resources of the DQ region, we should at this time recognize that we're dealing with "fluctuations" in a dynamic system, and not with documented "trends" or "cycles."[68] With that caution, we can still learn much of importance by studying these fluctuations as evidence of the variation implicit in our water resource.

Figure 2.58 illustrates the extent of fluctuation observable in our records of weather as it

[67] Neiburger, M., Edinger, J.G., and Bonner, W.D. Understanding our Atmospheric Environment. 1982.
[68] Burroughs, W.J. Weather Cycles: Real or Imaginary? 1992.

Figure 2.55 Estimated annual water resource from precipitation for sub-areas of the DQ region.

Sub-area of the DQ Project region *Upper Watersheds are USFS, NPS lands*	Estimated area in Sq. Miles	Estimated Average Annual Precipitation	Annual Source Water from Precipitation	Quantity
	sq. miles	*inches/yr.*	*acre ft./yr.*	*cfs–equiv. avg. flow*
1. Upper watershed: Dungeness River system	155	63	527000	728
2. Lower watershed: Dungeness River system & west past Bagley Cr. & east to Sequim Bay	116	29	179000	247
3. Big Quilcene River watershed to Quilcene Bay	70	63	238000	329
4. Little Quilcene River watershed to Quilcene Bay	30	49	79000	109
5. Snow/Salmon/Jimmycomelately Crks. watershed to Discovery Bay and Sequim Bays	68	36	131000	181
6. Miller Peninsula to Contractor Pt. & Johnson, Dean Crks. to Sequim Bay	34	24	44000	61
7. Quimper Peninsula & eastern Jeff. Co. Puget Lowlands, east of R1W/R2W boundary	160	31	265000	366
Overall	633	43	1463000	2021

Figure 2.56 Average precipitation by month for several locations in the DQ coastal lowlands.

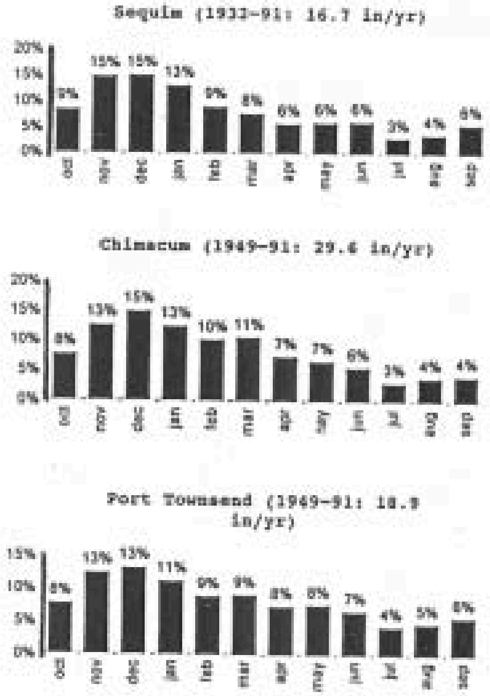


Figure 2.57 Maximum snow depth measured at the Deer Park snow course, by water year.

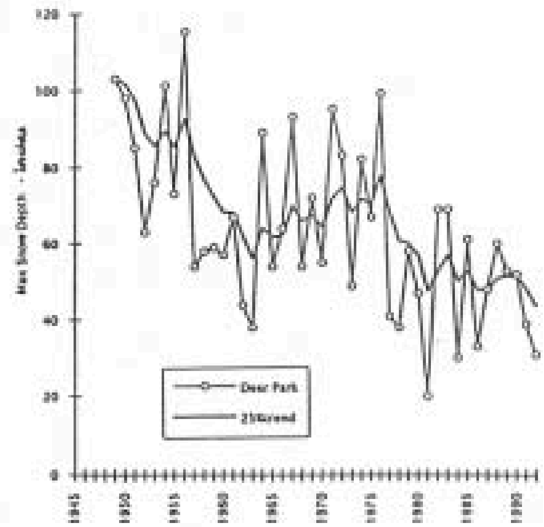
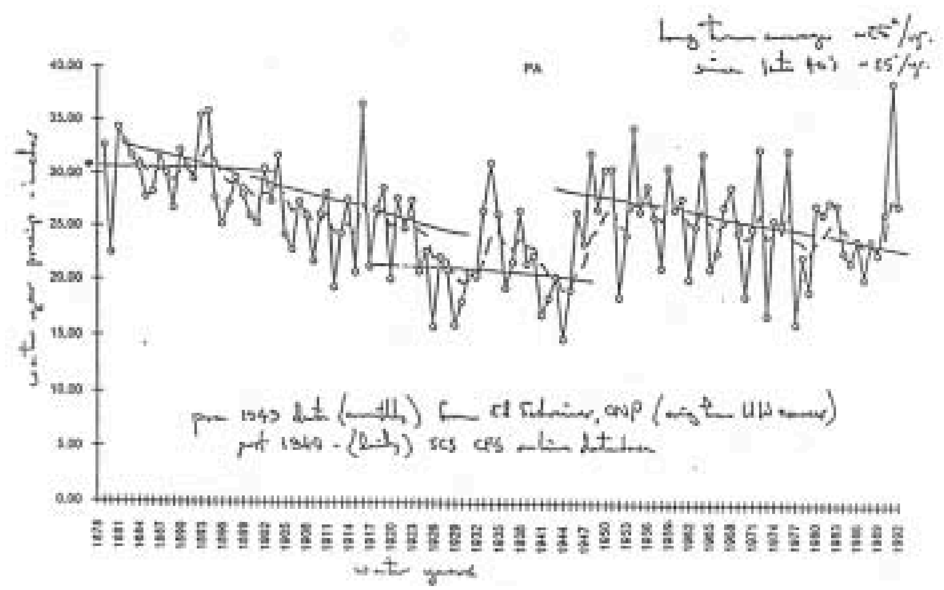


Figure 2.58 Historical precipitation by water year since 1878, with approximate trend lines for various periods. Dates are for Port Angeles, just west of the DQ region.



affects water resources. A simple averaging of the last 45+ years of precipitation records at Port Angeles (available from the Soil Conservation Service on-line database) suggests that average Port Angeles precipitation is 25 inches per year. But data from other research (by Brubaker at the Univ. of Washington[69]) that extended the available precipitation record back to 1878 indicates, as shown on the graph,[70] that the late 1800's were probably "wetter" than the time since, and that significant "dry" fluctuations were experienced in the 1920's and again in the 1940's.

Research on the El Nino phenomenon is improving scientific understanding of the interaction between ocean and atmosphere processes, and is identifying a coupling between the tropical phenomena and weather patterns in northern latitudes. These processes may be an important determinant of our intermediate-term fluctuations between drought and flood, as well as a factor in food-supply for the migrating salmonidS.[71]

Consideration of temperature patterns:

No serious examination of temperature patterns and their variation with geography, and over time is included in this characterization. Clearly, variations in average and extreme temperatures over time have important effects, on the development and persistence of mountain snowpacks, for example. The available instrumental data for higher-elevation portions of the region are not adequate for any detailed inspection at this time.

Air quality:

Another concern with the environment of the DQ region that has relevance to water resources is pollution of the lower atmosphere. Two sorts of water-resource impacts are obvious: direct introduction of air-borne contaminants into the surface waters via precipitation [acid rain and fog, for example]; and long-term damage to the forest and other plant resources that are important to maintain the water resource [as is happening in the mountain forests downwind of urban southern California]. We are spared many of the air-pollution problems that plague other regions: our prevailing air flows are from the west, from ocean and sparsely developed land; we mostly avoid the vehicle-emission pollutants of crowded metropolitan areas; and we are not likely to get refineries or other major sources of air-quality degradation. We do have paper mills, slash bums, trash disposal by burning, and a few other pollutant potentials, and a heavy reliance on wood-burning for domestic heating. The Olympic National Park, in keeping with its designation as a World Heritage Site and Biosphere Preserve, maintains an active air-quality surveillance that can help in monitoring DQ region conditions.

69 Brubaker, L., Univ. of Washington. Monthly precipitation for periods back to the 1870's for Port Angeles and Port Townsend. (provided by Schreiner, E, of Olympic National Park).

70 Both Port Angeles and Port Townsend data are available from the 1870's, but the Port Angeles data is illustrated because it is a more complete record, and also because it is probably more relevant to precipitation in the upper (mountain) Dungeness watershed than data from Port Townsend. A complete daily precipitation record from 1900 for Olga on Orcas Island also shows the 1920's and 1940's periods clearly.

71 Diaz, H.F., and Markgraf, V. Editors. El Nino: Historical and Paleoclimatic Aspects of the Southern Oscillation. 1992.

Figure 2.59 Mean water-year flow for the Dungeness River, as measured at RM 11.8 gage.

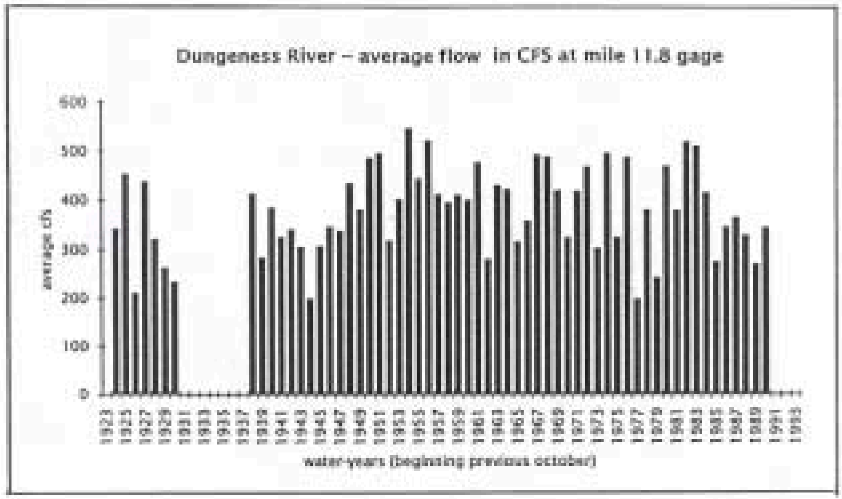


Figure 2.60 Mean flow by month for the Dungeness River, averaged over years shown in Figure 2.59.

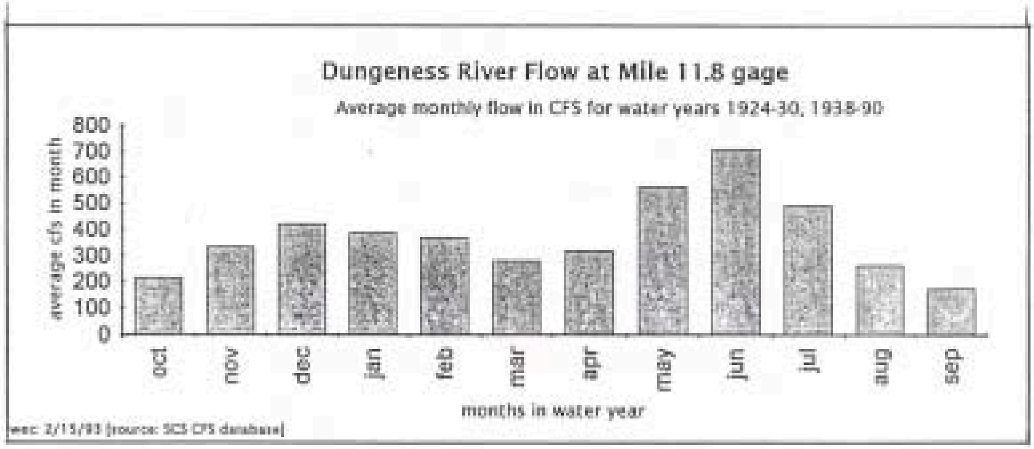
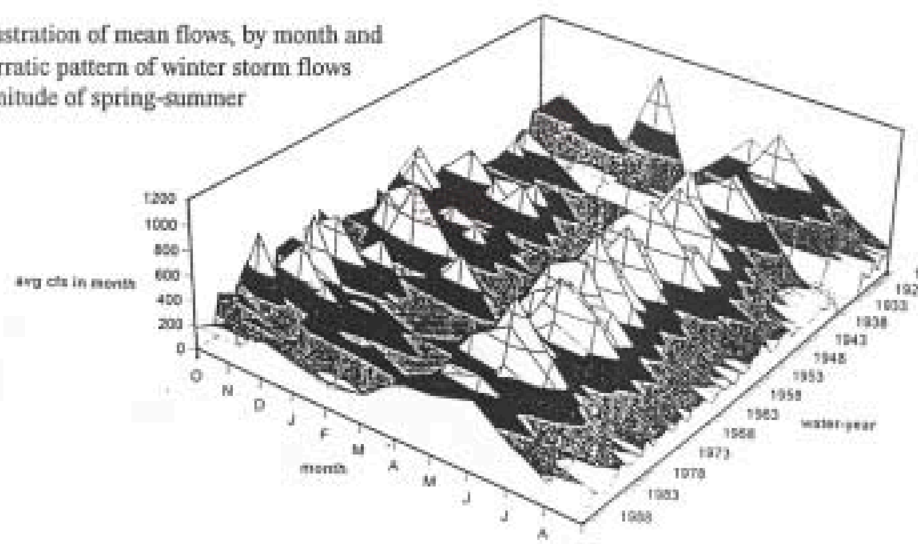


Figure 2.61 Illustration of mean flows, by month and water-year, showing erratic pattern of winter storm flows and variations in magnitude of spring-summer runoff flows.



Surface Waters

River flows in the Dungeness / Gray Wolf River system:

The Dungeness is the largest river system in the DQ region. Fortunately, it is also the river for which extensive flow data are available. It was gaged for a short period (October 1898 through December 1902) 1 mile above the mouth,[72] then from June 1923 through September 1930 at RM 11.3, and from June 1937 to the present at the RM 11.8 site.[73] The gage location is above all diversions and below all tributaries except Canyon Creek, Bear Creek, Hurd Creek, and Matriotti Creek. A second gage was installed in late 1993 at the Railroad Bridge site at RM 5.65.

Figure 2.59 shows yearly average flows for the water years 1924-30 and 1938-93. Note that the highest years are over 2 1/2 times as large as the lowest years. The average flow, computed over the water-years of the gage record, is 379 cfs, corresponding to an annual discharge volume of 274,000 acre feet.

Figure 2.60 shows the average flows by month, averaged over 60 years. Note the two peaks in flow for an average year, showing winter storm flows and spring/summer runoff. The “average” picture is somewhat misleading, however. The winter storm flows are less consistent than the major peaks of spring runoff, and even these vary considerably from year to year. Figure 2.61 is a 3-D representation of flows over the 60-year period, depicting the average flows by month for each year. Here the erratic nature of winter storm flow occurrence is clear, and also the absence of major spring/summer runoff in some years.

Estimated flows from subwatersheds:

An analysis of the upper watershed of the Dungeness system by Amerman & Orsborn[74] estimated the contributions of the various sub-basins above the RM 11. 8 gage, as shown in the table that follows. The allocations between Dungeness headwaters and Royal Creek are from an estimate in Wood's trail guide.[75] [Wood, 1984] The average annual flow estimates in cfs [adjusted slightly here to the 379 cfs long-term average quoted above] are tabulated here:

[72] USGS Water Supply Paper 1316. Compilation of Records of Surface Waters of the United States Through September 1950. Data provided by J. Lichatowich.

[73] The data, computer files of daily mean flows for the complete period of USGS gaging from 1923 to the present have been obtained from three sources: The "CFS" on-line computer database system maintained by the USDA Soil Conservation Service, USGS[Water Resources Division, and Ecology Southwest Regional Office/Water Resources.

[74] Amerman, K.S., and Orsborn, IF An Analysis of Streamflows on the Olympic Peninsula. 1987. 71 Wood. R.L. 1984.

Segment	Increment	Cumulative cfs	
Dungeness above RM 25	54	54	
Royal Creek	53	107	
Copper & Silver Creeks	23	130	
Dungeness to RM 19 (incl. Sleepy Hollow Bungalow, Cougar, Skookum Creeks	13	143	
Gold Creek	13	156	
Dungeness to the Forks (incl. unnamed strewn on left bank, Eddy Creek)	13	169	169
Gray Wolf at Three Forks (incl. Cameron, Grand Creeks)	159	159	
Gray Wolf to the Dungeness (incl. Slab Camp, Slide, Divide, and unnamed creeks)	30	189	358
Dungeness from the Forks to the RM 11.8 gage (incl. Caraco & unnamed creeks)	21	21	379

As noted by Amerman and Orsborn, the distribution of these incremental sub-flows varies throughout the year with snowpack, melt, runoff and infiltration, and with localized storm precipitation.

There are several surface tributaries that flow into the Dungeness River below the gage at river mile 11. 8.[77] The most significant of these is Canyon Creek, entering near the Hatchery with occasional flow measurements as large as 25 cfs, but typically in the 2 to 8 cfs range. Bear Creek has only small flows recorded. Hurd Creek measurements tend to range from 2 to 7 cfs, and probably reflect both irrigation tailwater and hatchery discharges of well-water. Occasional measurements of Matriotti Creek include values as high as 20 cfs in 1952 and 1979, and values of 5 to 10 cfs frequently in late 1980's and early 1990's. No measurements of the effects of channel modifications of Matriotti, including the recent restoration and re-meandering project, are available for this report.

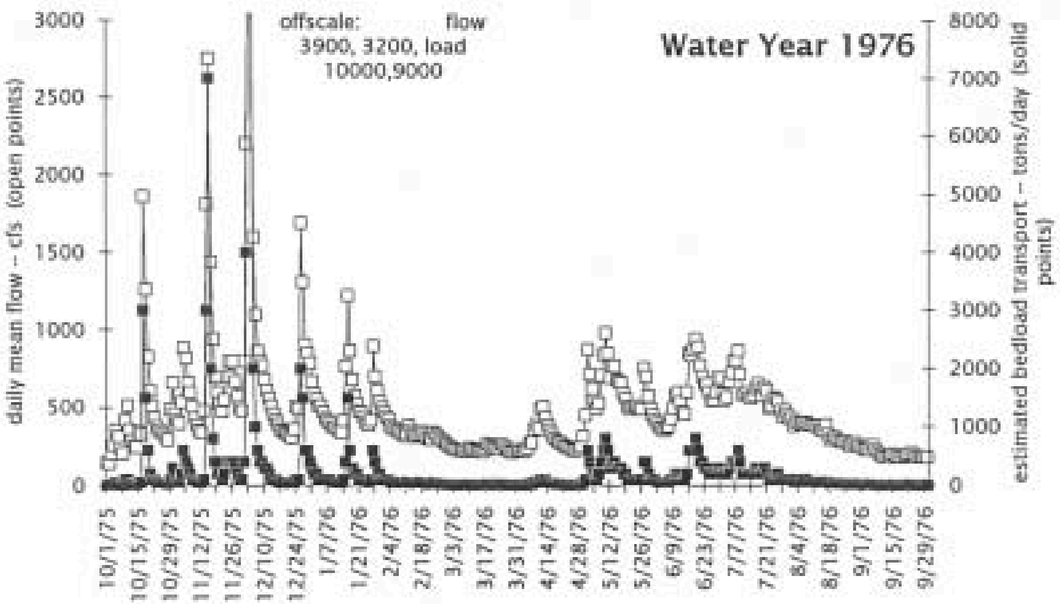
Diversions of flow from the river, at multiple locations below the gage at RM IL 8, and especially the character of the irrigation diversion system, are discussed in the last section of this chapter, Human Habitation: Impacts from human settlement and interventions.

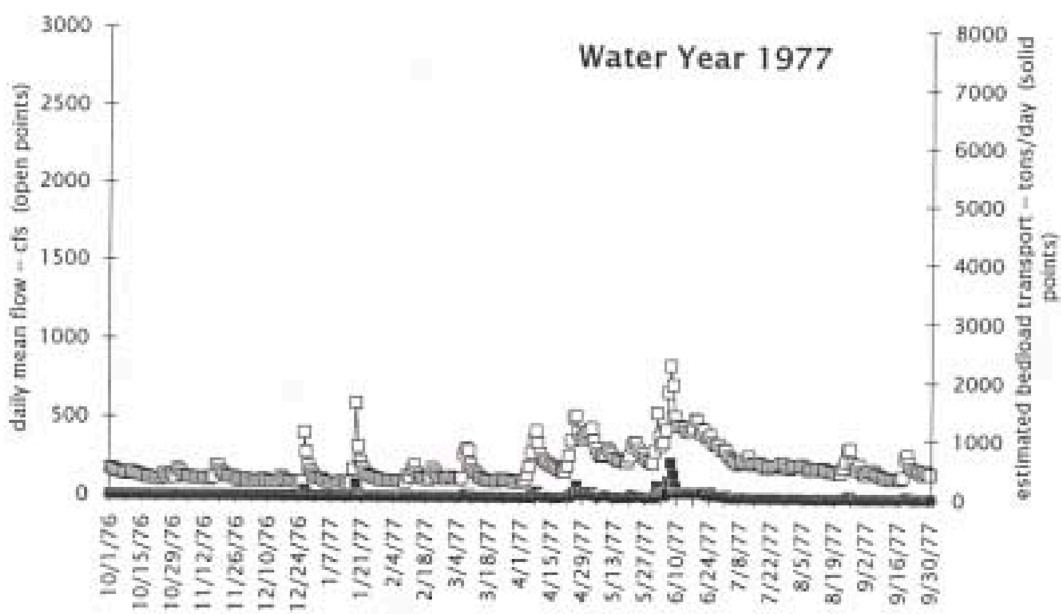
Variation in Dungeness flows from year to year:

The variability of flows is a major problem in the Dungeness River. There is relatively little storage in the upper watershed, so that current-year precipitation directly controls runoff. The river is steep, so that large storm flows have major channel-instability impacts. And the rainshadow location exacerbates late-summer low-flow situations. Figure 2.62 shows graphs of daily flows for two consecutive water years, 1976 and 1977, highlighting the problem of variability of flows. In 1976 many winter storm flows occurred, followed by substantial spring/summer runoff. Average flow for the water year was 487 cfs, for a total volume of

[77] Data on occasional flow measurements are reported by USGS and by Ecology.

Figure 2.62 Dungeness River daily mean flows, at RM 11.8 gorge, high flow and low flow years. An estimate of bedload transport is also shown (see text).





354,000 acre-ft [about 130% of average]. In 1977 there were essentially no winter storm flows, and reduced spring runoff. Average flow for the water year was 197 cfs, for a total water volume of 142,700 acre-ft [only 50% of average].[78]

The black lower graph lines in Figure 2.62 show a very crude generalized estimate of bedload movement corresponding to the daily flows.[79] The implication is that the river channel was very unstable in water year 1976 with brief periods of high-magnitude bedload transport during the winter storm events, and significant transport during the relatively sustained high flows of the spring/summer runoff. In contrast, low bedload transport would not have significantly changed the river channel in water year 1977.

Graphs of daily average flows for water year 1993 and the first 9 months of water year 1994, as measured at the RM 11. 8 gage, are illustrated in Figure 2.63. These graphs are important for perspective, as many DQ participants have focused on the state of the river in the period from October 1992 to the present. In particular, the high-flow event of December 1993 resulted in substantial bedload transport and channel change in the river.

Analysis of variation in the annual river flows:

Although it is not productive to search for climate change indications or weather cycles in the data for the Peninsula or the Dungeness watershed, some attention to year-to-year and multi-year fluctuations is instructive. Figure 2.64 illustrates some analysis of Dungeness flow data[80] from the RM 11. 8 gage. The open circle points on the fine graph shows annual mean flow by water year for the 60+ years of gage data. The fines connecting the points emphasize the flow variations. Drought periods in the late 1920's and again in the mid 1940's are evident, with low-average-flow values not seen again until 1977.

One aspect of interest is the wide year-to-year fluctuation. Burroughs notes[81] that one "weather cycle" that is evident in many kinds of weather data series is a cyclical pattern of 2+ years period, referred to as the quasi-biennial oscillation. This kind of oscillatory pattern is evident in the annual river flow data of Figure 2.64. It is also apparent in the precipitation data of Figures 2.53, 2.57, and 2.58, and raises intriguing questions about a possible relationship to the life-history cycles of salmonids in northwest rivers.[82]

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78 See footnote 10.

79 The function used for the bedload transport was an approximation extrapolated from the 1987 aggradation study report of Northwest Hydraulic Consultants, Inc., with limitations stated in the previously-footnoted DQ Technical Note.

80 Clark, W. and V. Unpublished DQ Technical Note: Notes on Dungeness River System ... Flows and Precipitation. July 1993.

81 Burroughs, W.J. 1992.

82 Schreiner, E. (Olympic National Park). Personal communication. 1993. Schreiner suggested the Burroughs book, and noted the widespread occurrence of the 2+ year periodicity in weather data, and the intriguing near-similarity with the life history cycles of the salmonids in northwest rivers.

Figure 2.63 Dungeness River daily mean flows for the most recent water years. Bedload transport is also shown (see text).

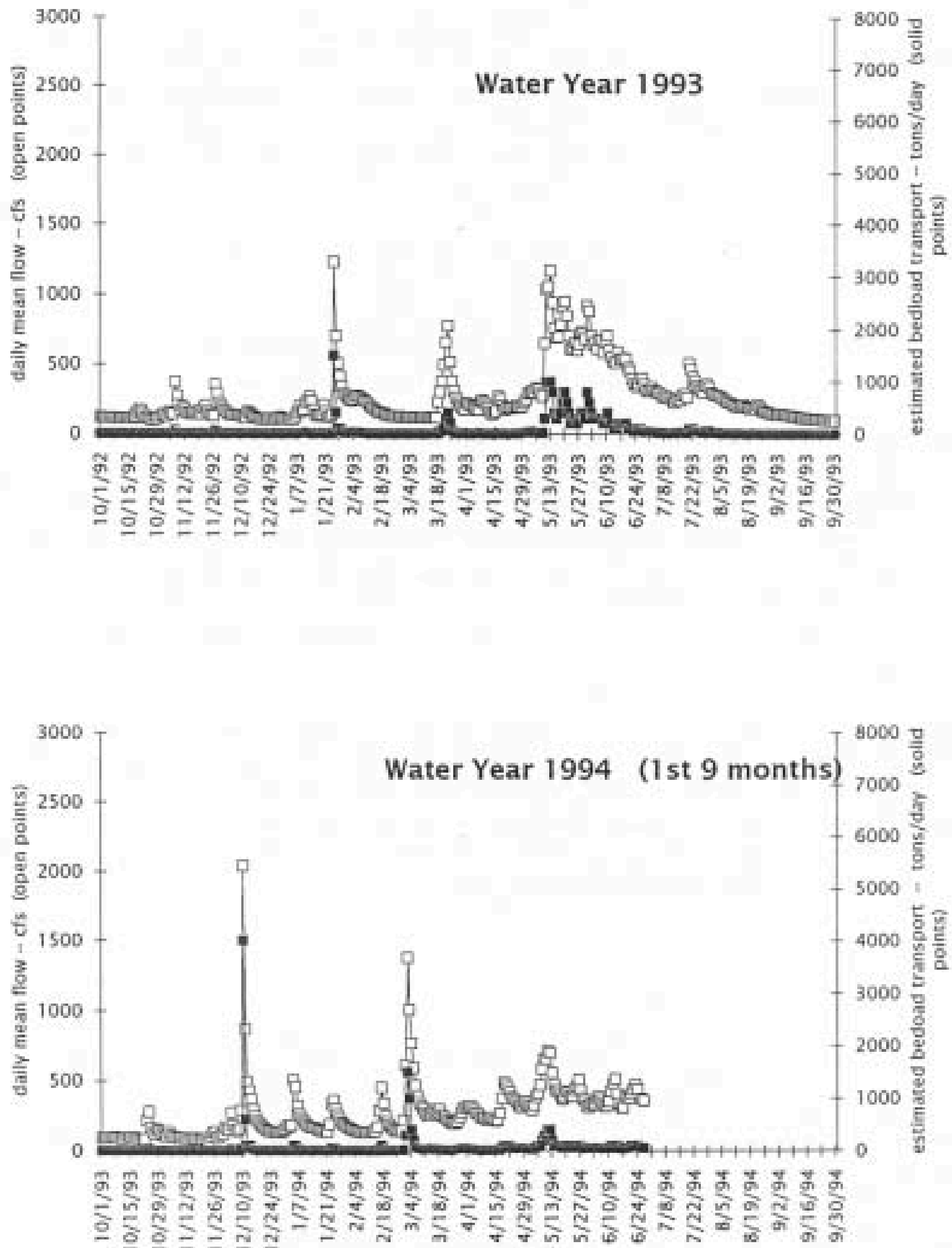

Figure 2.64 Analysis of variation in Dungeness River yearly mean flows and in high-flow events.

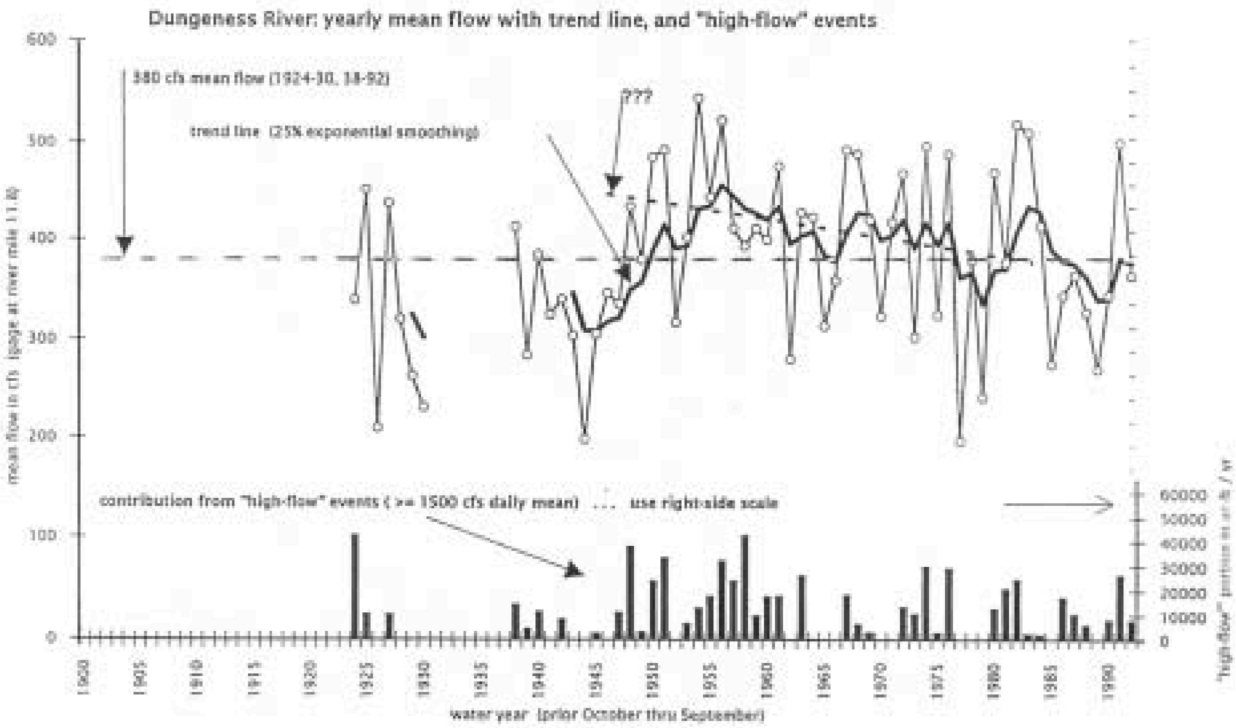

Figure 2.65 (a) Dungeness River mean flows for half-month periods over the water years 1924-30, 1938-present. The data for October through March months are shown in this table, April through September in Figure 2.65 (b). Summaries are shown for years through water year 1992.

	mean flow in cubic feet per second (cfs) at RM 11.8 gage												
	half-month periods in water year												
water year	early oct	late oct	early nov	late nov	early dec	late dec	early jan	late jan	early feb	late feb	early mar	late mar	oct-mar mean
1924	147	206	147	192	463	325	208	519	1571	475	279	190	393
1925	267	484	510	762	559	387	263	420	633	289	273	234	423
1926	123	128	135	161	280	305	237	212	265	218	174	219	206
1927	213	308	160	442	653	384	609	299	376	433	328	285	374
1928	211	273	246	419	347	187	833	400	297	236	210	353	334
1929	206	166	219	193	211	162	148	120	110	101	129	138	159
1930	96	97	83	90	116	253	115	96	207	401	173	247	165
...													
1938	113	197	232	552	386	753	464	327	211	226	290	235	332
1939	148	190	171	149	341	175	648	282	216	186	136	317	247
1940	111	129	153	184	731	748	719	461	471	318	446	358	402
1941	151	533	255	266	400	466	268	510	460	242	255	225	336
1942	217	201	317	410	853	585	245	257	254	174	179	147	320
1943	106	107	196	253	242	317	244	228	233	282	161	224	216
1944	115	182	137	137	264	154	141	246	155	115	168	155	164
1945	98	121	243	231	305	139	323	232	574	236	172	286	247
1946	98	154	178	251	355	268	318	249	165	227	232	172	222
1947	118	147	111	235	436	243	170	362	787	496	257	351	309
1948	205	485	308	223	209	605	385	285	205	369	190	237	309
1949	302	170	189	421	465	209	158	125	106	699	337	301	290
1950	140	149	198	996	597	466	276	347	230	552	531	293	398
1951	292	299	370	731	747	931	501	490	1001	469	310	278	535
1952	228	256	207	250	293	179	131	135	303	194	166	198	212
1953	112	101	109	96	190	159	866	613	596	258	207	210	293
1954	311	270	619	542	663	485	699	301	713	934	479	295	526
1955	400	456	526	1207	499	439	301	219	334	199	164	167	409
1956	193	320	1144	401	412	505	367	335	195	165	153	270	372
1957	194	694	391	298	656	400	235	169	138	811	477	304	397
1958	140	206	187	161	154	332	308	556	274	939	356	229	320
1959	174	243	350	435	691	439	665	474	269	196	188	221	362
1960	179	197	139	636	417	558	204	560	717	335	204	356	375
1961	132	157	193	304	332	296	745	663	634	586	454	452	412
1962	149	146	203	176	182	233	607	220	262	169	138	129	218
1963	372	380	315	806	692	637	493	227	1004	422	290	210	487
1964	176	527	538	593	381	595	610	450	330	221	202	220	403
1965	181	127	179	234	323	155	157	576	568	303	249	193	271
1966	174	147	319	275	378	193	361	223	190	152	191	283	241
1967	138	277	204	386	985	780	359	603	363	228	205	476	417
1968	542	579	471	308	255	713	814	1321	663	688	558	324	603
1969	145	285	260	358	498	399	471	202	274	213	167	337	301
1970	227	150	279	186	334	319	198	501	302	313	242	205	271
1971	112	125	119	267	316	196	255	564	580	422	298	302	296
1972	147	155	327	245	251	190	151	410	225	647	984	665	366
1973	157	117	237	136	93	884	425	433	188	212	203	163	271
1974	132	212	351	343	443	626	524	1005	349	235	241	595	421
1975	152	138	150	234	211	483	243	393	212	206	250	162	236
1976	284	590	757	696	1231	623	459	607	367	309	229	238	533
1977	143	116	114	125	93	139	90	174	118	125	167	104	125
1978	123	198	506	406	736	377	355	276	327	234	227	310	340
1979	169	131	233	155	172	115	75	73	128	243	454	246	183
1980	95	381	200	143	791	1262	521	329	348	787	484	318	465
1981	111	108	381	553	373	975	483	630	365	897	347	263	457
1982	387	308	565	518	960	739	269	524	400	709	369	248	500
1983	121	539	277	192	571	532	567	576	529	747	682	410	479
1984	128	140	874	915	324	233	935	479	388	436	290	376	460
1985	265	204	466	325	238	197	172	203	151	155	136	152	222
1986	101	598	357	152	170	138	205	884	282	615	513	356	364
1987	92	159	191	778	256	288	409	330	537	259	807	285	366
1988	88	74	78	91	588	154	204	318	187	177	230	277	206
1989	146	170	355	220	276	243	209	185	132	146	213	188	207
1990	99	249	405	289	739	252	499	278	246	227	243	260	315
1991	147	260	912	1286	899	333	394	318	1222	664	423	258	593
1992	110	106	174	490	402	193	239	896	762	497	372	294	378
summary through water year 1992													
mean	177	247	310	379	442	404	380	398	398	370	298	271	340
max	542	694	1144	1286	1231	1262	935	1321	1571	939	984	665	603
min	88	74	78	90	93	115	75	73	106	101	129	104	125
most recent water years													
1993	112	121	177	184	138	107	163	314	232	134	117	334	178
1994	91	127	97	96	410	159	238	204	140	216	501	248	

Figure 2.65 (b) Dungeness River half-month mean flow, continued from Figure 2.65 (a). Data for April through September months are shown here, as well as annual water-year mean flows. The data are from the USGS gage at RM 11.8.

	mean flow in cubic feet per second (cfs) at RM 11.8 gage													
	half-month periods in water year													
water year	early apr	late apr	early may	late may	early jun	late jun	early jul	late jul	early aug	late aug	early sep	late sep	apr-sep mean	water-yr mean
1924	200	220	430	547	444	336	337	249	199	154	145	189	288	341
1925	491	548	624	964	506	746	568	412	321	215	193	152	478	451
1926	238	320	283	329	322	255	216	144	128	139	107	102	215	210
1927	255	407	427	602	1018	939	643	606	394	278	267	178	501	438
1928	277	352	442	673	465	412	317	269	169	118	100	87	307	320
1929	148	255	419	624	694	638	535	364	268	191	144	115	366	262
1930	364	385	345	377	550	421	331	240	191	148	139	129	302	233
1938	262	614	521	892	880	877	603	474	265	195	157	146	491	411
1939	309	348	398	495	429	479	412	341	222	161	133	117	320	283
1940	327	362	705	629	585	486	349	269	202	174	165	147	367	385
1941	269	284	349	480	566	450	400	292	191	158	171	133	312	324
1942	256	285	312	631	672	604	575	346	231	177	133	107	360	340
1943	460	461	311	578	556	616	571	423	268	197	152	123	393	305
1944	185	186	304	379	458	366	248	194	143	116	101	116	233	199
1945	181	299	630	588	580	578	489	334	232	169	165	134	365	306
1946	225	411	691	678	690	703	693	572	376	275	191	139	470	346
1947	273	421	602	642	614	489	402	294	217	157	142	118	364	337
1948	191	339	371	1147	1439	953	650	523	368	252	196	235	556	432
1949	301	469	719	822	818	575	528	429	332	259	246	204	475	383
1950	289	352	448	738	1018	1187	931	703	456	370	226	176	575	486
1951	411	471	570	708	691	743	590	419	273	216	164	152	451	493
1952	278	476	487	730	672	531	632	428	324	221	161	136	423	317
1953	191	418	646	701	715	663	942	585	452	337	235	231	510	401
1954	267	355	486	781	642	852	987	702	524	519	399	329	570	548
1955	324	206	280	638	1014	812	711	597	408	297	256	174	476	443
1956	310	707	586	1181	1272	1030	938	743	447	359	239	231	670	521
1957	273	352	814	842	788	496	415	334	265	208	196	164	429	413
1958	215	292	520	1197	923	865	507	363	249	198	166	154	471	395
1959	312	495	634	687	728	727	567	459	286	208	177	218	458	410
1960	420	308	621	513	922	650	561	387	267	195	151	122	424	400
1961	370	339	485	790	1127	1036	775	559	379	274	207	144	540	476
1962	221	300	253	448	592	661	456	385	290	199	150	152	342	280
1963	239	247	305	629	621	565	500	395	308	243	211	170	369	428
1964	279	237	315	502	1059	756	738	479	333	237	163	180	440	422
1965	173	491	376	538	685	537	459	322	253	204	141	116	358	314
1966	473	336	724	612	633	717	674	531	387	257	196	182	477	359
1967	230	214	426	875	1070	1293	872	596	423	315	247	187	562	490
1968	248	206	299	566	648	629	581	354	286	231	200	193	370	486
1969	352	406	731	1043	1268	799	533	374	265	209	157	309	537	419
1970	282	195	309	572	845	754	515	339	230	172	148	147	376	324
1971	304	291	704	631	758	811	623	951	593	343	272	169	537	417
1972	492	332	579	919	1022	859	809	627	448	312	214	224	570	468
1973	175	199	310	633	542	569	425	359	266	176	146	168	331	301
1974	308	293	525	511	915	1148	862	811	564	372	283	186	565	493
1975	150	192	406	526	828	610	764	432	288	341	230	166	411	324
1976	331	263	700	559	455	723	650	540	390	288	213	187	441	487
1977	230	303	313	271	504	404	249	212	198	206	152	184	269	197
1978	259	282	362	443	792	619	575	463	291	262	423	264	420	380
1979	203	244	409	590	540	373	342	262	176	146	209	123	302	242
1980	414	555	632	566	749	737	605	498	316	226	192	184	473	469
1981	241	366	386	471	464	399	330	265	206	165	136	178	301	379
1982	274	288	386	734	883	1332	842	651	440	296	221	146	541	520
1983	267	350	446	1016	1069	771	746	588	464	313	268	192	541	510
1984	254	246	250	415	487	829	601	469	341	223	189	134	370	415
1985	296	261	241	629	671	533	395	285	210	148	142	116	327	275
1986	297	330	353	679	675	428	334	232	192	143	116	104	324	344
1987	295	369	796	500	591	501	409	290	217	158	133	102	363	365
1988	437	480	527	664	585	798	552	467	308	222	165	187	449	327
1989	453	425	539	356	669	393	324	265	199	155	116	96	332	270
1990	377	534	480	485	617	593	438	313	220	174	143	116	374	345
1991	491	335	379	527	538	563	639	445	336	294	255	151	413	503
1992	288	640	618	529	501	469	333	251	185	136	120	126	350	364
summary through water year 1992														
mean	294	354	476	646	727	672	558	427	301	227	187	162	419	379
max	492	707	814	1197	1439	1332	987	951	593	519	423	329	670	548
min	148	186	241	271	322	255	216	144	128	116	100	87	215	197
most recent water years														
1993	195	201	552	738	640	442	276	340	236	176	128	101	335	257
1994	258	365	487	400	373	386								

A second aspect of interest illustrated in Figure 2.64 is the suggestion of longer-term trends in these river-flow data. A 25% exponential-smoothing trendline[83] fitted to the data is shown as a bold solid line that filters out most of the short-term oscillation. This smoothed fine appears to have trended downward for almost 40 years, as suggested by the bold dashed straight line drawn through it. The basis for this long-term fluctuation remains unclear, but it is noteworthy that the records of mountain snowpack also show decline over this period. Crude estimates of annual bedload transport also show a similar downward trend over the period, although bedload transport is more directly influenced by high peak flows (storm events and spring-summer runoff) than by overall annual flow volumes.

The frequency of high-flow events, most often associated with winter storms, appears to have declined somewhat over the past 20-30 years, as indicated in the lower graph of Figure 2.64. A decline in recorded winter snowpacks has also occurred over the past 30-plus years, which would have more bearing on the magnitude of spring/summer river flows. The timing and depth of winter snowpack accumulations may also be important, along with temperature, wind, and other characteristics of storms, in "rain-on-snow" high-flow events associated with winter and spring storms.

Useful Summary Information for Dungeness River flows:
Figure 2.65 presents a table of flow data summarized from the USGS records from the gage at RM 11.8. The values are mean flows in cfs for half-month periods.[84] The data presented this way have been useful in discussions of appropriate allocation of flows among competing uses. The half-month periods represent a practical compromise. They provide more meaningful information about rapid seasonal changes in flow than the usual full-month statistics, while retaining comparability with the monthly historical data. Weekly periods would be more desirable for monitoring and management of diversion practices, but are difficult to reconcile with the monthly statistics.

Dungeness River flows on the Sequim-Dungeness peninsula:
Below the USGS gage the river flow situation becomes much more complex due to irrigation diversions and hydraulic continuity between ground water and surface waters (both river and irrigation ditches). The USGS (Drost) study in 1978-1980 [discussed below, in the Hydrogeology and Ground-water section] provided some information on river flows and diversions during that period, and the model studies provided insight into interactions between ground and surface waters. The situation is not yet well understood, and is part of the focus for proposed future water resource studies that have been scoped by USGS as a part of the DQ project effort.

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83 Exponential smoothing is a variety of moving average for trend-following that successively de-emphasizes the contribution of older data points to the trend line. In the 25% trend, each new trend value is influenced 25% by the latest data point and 75% by the prior period's trend value.

84 The data in the table are simple averages (arithmetic means) of the daily mean flows as reported by USGS. The "early" first half-month periods are considered as days I - 15 of each month, and the "late" periods as the remainder. Thus the number of days averaged into the late periods varies from month to month. The arrangement of data and summaries at the bottom of the table considers the years through water-year 1992 as the historical base record, and displays the data for water years 1993 and 1994 (to date) as "current" information, accumulating during the DQ project discussions.

Hydrogeology and Ground Water

Various ground-water regimes in the DQ region: Fundamentally different ground- water conditions occur in different parts of the DQ region. Four reasonably distinct circumstances are described here, as existing in the DQ region, and examples are discussed for each.

In major river basins:
Past research studies in the Dungeness system have shown that there is a substantial degree of continuity between surface and ground waters. At some locations leakage from surface waters infiltrates to recharge surrounding ground waters, while in others ground waters discharge to supplement the surface bodies, depending on hydraulic gradients, permeabilities, discontinuities in lithology, etc. The patterns of continuity and water flow can be very complex when the basin boundaries are convoluted, and when the subsurface strata are non-uniform.

In lowland areas adjacent to mountain foothills:
The ground waters of the coastal areas where most people live are recharged both from the foothill slopes and from direct precipitation on the uplands and lowlands. There is typically surface runoff from precipitation (especially storm events) in the small, often intermittent, streams of the hillsides, but also infiltration on the slopes leading to shallow subsurface flows and deeper recharge. Precipitation tends to be greater on the foothill areas than in the valleys. hillside vegetation and the typically deeper and more porous soils may enhance the infiltration of precipitation.

In lowland plains remote from mountain rivers or foothills:
In plains areas remote from high-elevation terrain the infiltration and recharge from local precipitation is the principal source of ground waters, at least in unconfined and shallower confined aquifers.

In proximity to tidewater shorelines:
In near-shoreline areas the ground waters near the diffusion zone between fresh and seawater may produce water with unacceptable chloride levels. Construction and pumping of wells near the diffusion zone may increase penetration of the seawater. Low-productivity aquifers in shoreline areas characterized by near-surface bedrock may be particularly prone to seawater intrusion from excessive pumping.

Hydrogeology of the lower watershed -- the Sequim-Dungeness area

As indicated earlier in the geology discussion, the lower watershed of the Dungeness river system is a broad coastal plain/peninsula overlying the oceanic-basalt and marine sedimentary bedrock formations that dip down to the north from their foothills exposures. The lower watershed has large areas of lowlands remote from the foothills and the river channel, that benefit from the amount of water flow in the mountain-river watershed, and the steep gradient of ground waters, as evidenced by emergent streams and wetlands fed by ground-water discharge. The "independent" streams east of the Dungeness: Meadowbrook, Cooper, Cassalery and Gierin creeks are examples of this phenomena.

Figure 2.66 Schematic cross-section from south to north through the Sequim-Dungeness area ground-water system.

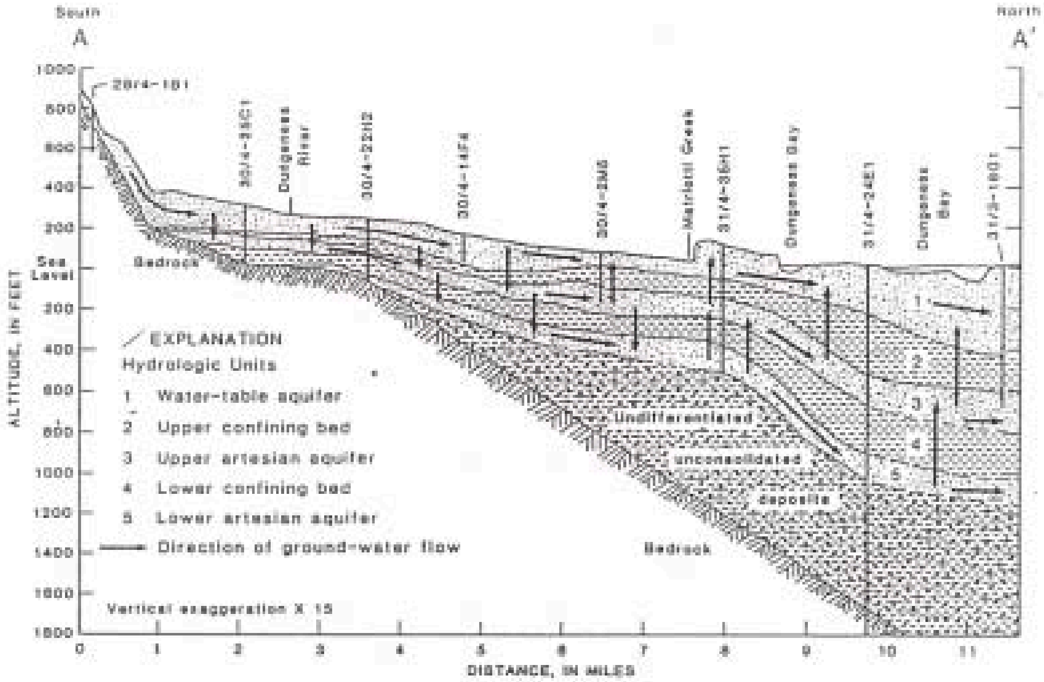
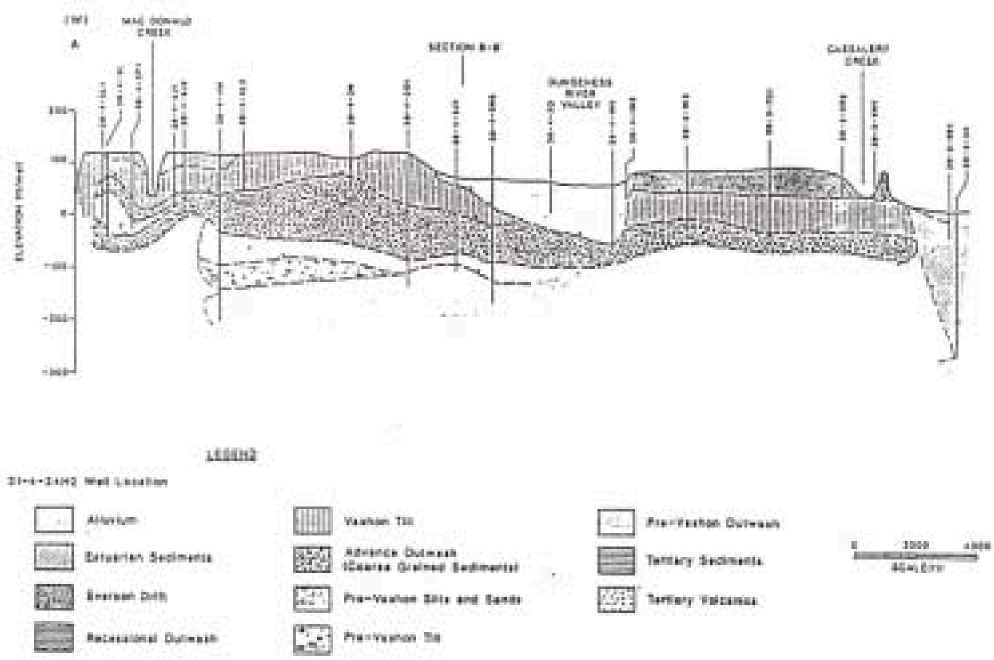


Figure 2.67 Cross-section from west to east through the Sequim-Dungeness area ground-water systems, illustrating the complexity of subsurface conditions (from Sweet-Edwards EMCON Inc. 1991).



The generalized geologic section from the foothills to the Strait shown in Figure 2.66 suggests a layer-cake of unconsolidated sediments, dipping gently northward to the saltwaters, and consisting of alternating water-holding aquifer formations, and more-or-less impermeable confining layers. If the Sequim-Dungeness peninsula were simply a creation of the river, the result would be sediments carried out of the mountains and deposited as fan and delta toward the strait from the edge of the foothills. If the river had exhibited fluctuating flows, storm floods, and drainage of alpine glaciers in the high mountains, then the deposits would have layers of varying composition, some good as water-holding aquifers and others less permeable as confining layers. This kind of fan and delta formation is common in lower reaches of temperate-zone rivers.

But, the reality is apparently more complex than the single generalized section suggests. An additional cross-section, west to east across the area, illustrated in Figure 2.67 shows considerable variability and probable discontinuities in the aquifers and confining layers. The samples obtained during well-drilling do not come neatly labeled as to their geologic history and source, but these variations and discontinuities are understandable if we consider both the well-log lithology evidence and the larger geologic history of the entire region.

Discussions and field explorations during the course of several years of concentrated attention by the Clallam County water-project committee members, DQ technical committee subgroups, and individual investigations have brought a general awareness that the Sequim-Dungeness peninsula ground-water circumstance is unusually complex. Each one of the cordilleran ice sheets from British Columbia, advancing across the San Juan Islands and the Strait, and down the Puget Lowlands trough, would have approached the Dungeness river basin almost head- on, riding up over the pre-existing land surfaces, over the foothills and up the river valley and canyon into the middle reaches of the river system, see Figure 2.3 early in the chapter.

Advance outflows likely created ephemeral lakes and streams at the foothills ahead of the ice front. As ice sheets moved over the land they likely scoured out pre-existing land forms in some places and simply rode over them in others, lubricated by and depositing a layer of lodgement till [perhaps resembling still-plastic concrete] consisting of saturated silts and clays with poorly sorted sands, gravels and larger rocks. The lodgement till, consolidated under the pressure of up to a mile-thick ice sheet, has remained as largely impermeable confining layers often described as hardpan.

Meanwhile, the river, its flow probably both diminished and augmented at different times as a result of alpine glaciers at higher elevations, and dammed by the advancing ice sheet, was ponding in ephemeral glacial lakes. These glacial lakes were also fed by the icy melt waters from the Puget-lobe of the cordilleran ice sheet, and probably by increased precipitation [resulting from the cool, humid glacial climate] that drained off mountains and glacier surfaces. Sediments carried into the quiescent lakes formed clay and silt lake bed deposits.

As the glacial ice-sheets receded (more properly, wasted away), the melt waters would have been enormous. The amount of melt water from jus *t the ice overlying the Dungeness river system watershed and the dammed glacial lakes would have been of the order of 1000 years of current annual river flow. And outwash from the main Puget Lobe of the ice sheet to the east is believed to have flowed north and northwest after the "Leland Spillway" was unplugged. It seems plausible that Texas Valley and Palo Alto/Jimmycomelately were temporary drainage outlets for the impounded glacial lakes while the Dungeness channel was still blocked by the ice sheet. Various channels may have formed, washed out, and re-formed, perhaps both eastward and westward, while the ice sheet still covered the lower portion of the river channel and the glacial melt waters were voluminous.

The outwash flow patterns would have been erratic, but probably trending northwest, to opening tidal waters. The recessional outwash would have left well-sorted sand and gravel deposits, as well as poorly sorted mud flows, on the emerging land surfaces and would have carried great amounts of finer sediments in suspension into open tidal waters. 85 Possible evidence of west or northwest flows into ephemeral glacial outflow lakes in forest-bed deposits is visible in the bluffs near Green Point. Some of the outflows were under, or in contact with, the wasting ice sheet, resulting in deposits of the type known as eskers and kame terraces. The sinuous ridges of well-sorted sands and gravels such as those of the Potholes/Dungeness Estates and Hogback Road could be of such origin.

There is evidence that the late stage of recession of the latest ice-sheet, the Vashon, was catastrophic, with the flotation and breakup of the ice sheet over the Strait resulting in floating bergs that deposited drift over large areas. The deposits are the Everson Drift that is the surface "cliff-forming" layer of glacial deposit in large areas atop the bluffs.116

The land surfaces we see are left from the latest ice sheet, only 12,000 years ago, and from river and surface runoff since. The shapes of the land forms represent the cumulative buildup over time, however, and hide from view the various kinds of deposits from earlier glaciations that contribute to the aquifers and confining layers that define our ground waters. A glimpse of earlier deposits and their ages is provided by studies of the stratification in the bluffs, as described in the section on geology and Figure 2.4, earlier in the chapter.

The important point here, is that as we talk about water-table (unconfined) and confined aquifers, and about hydraulic continuity between surface waters and ground waters, we have much to learn about the natural and imposed patterns of subsurface water flows of the Sequim-Dungeness area and about the limits of its ground water resources. The same can be said for the Jefferson County side of the DQ project area.

Analyses of lower-watershed ground-water resources:

Our present knowledge about the ground waters of the Sequim-Dungeness area comes mostly from the work and well-drilling reports of the drillers working in the area, and from four research efforts: that of Noble for the Washington Division of Water Resources in 1960; that of Drost and co-workers of the US Geological Survey (in collaboration with the Washington

[85] Analyses of underwater surface deposits in the Strait of Juan de Fuca and the continental slope and submarine canyons offshore of the Olympic Peninsula show substantial thicknesses of Holocene (post- Vashon) sediments carried out from Puget Sound freshwater rivers, of which the Dungeness has been one contributor. See Wagner, H.C., et al, Continental Shelf and Upper Continental Slope of Coastal Washington, 1986; and Wagner, H.C., and Tomson, J.H., Offshore Geology of the Strait of Juan de Fuca, Washington and British Columbia, 1987.

[86] Easterbrook. Personal communication. 1992.

Department of Ecology and Clallarn County Departments of Health and Public Works) in 1978-1980; repeated monitoring of selected wells by Ecology, Southwest Regional Office, and an on-going ground-water study by Ann Soule, Clallarn County ground-water specialist.
The Noble study:

John Noble initiated a three-month reconnaissance of geology and ground water with very limited prior research from which to work. 87 His study was initiated, in part, to explore the potential for additional irrigation water sources. The conclusion stated in 1960, in part:

> *The… area has a potential [ground] water supply that will allow liberal and inexpensive irrigation wherever required and yet not deplete the natural water resources. The majority of the present irrigation supply is diverted from the Dungeness River, but the State Fisheries Department has requested that no additional water be diverted so the river can be preserved as a spawning area. Under present conditions, additional irrigation supplies are desirable as there is much land near the extremes of the ditches not receiving a full supply of water, yet these lands are fully assessed for water. Additional supplies may be obtained in two ways: (1) A more efficient distribution system ... [reference to the 1950-51 Bureau of Reclamation study -- see Surface Waters: Diversion of Natural Flows, above] ... and (2) supplementing the existing supply by the use of large quantities of ground water which could be pumped into existing ditches or used to irrigate directly from the wells . ... Also, [the irrigation districts and ditch companies] can transport water from good ground-water areas to the areas where neither present ditch supplies nor potential ground-water supplies are available. In locating new well sites, water-logged lands with wells of large infiltration area should be seriously considered. … .*

The USGS Drost study:

This major effort had several aims: (1) a general assessment of the water resources of the county and identification of present and potential water-resource problems and contamination in developed areas;88 and (2) an in-depth analyses of the effects of irrigation on ground-water recharge in the Sequim-Dungeness peninsula.89 Whereas the 1960 Noble study was responsive to an expanding farm irrigation demand, the 1978-80 Drost studies were reflecting a trend away from irrigated farming and toward increasing residential development. The summary from the general study states, in part:

> *The water resources of the county have undergone (as of 1980) relatively little development . ... Adequate ground water for individual domestic use is available in almost all of the developed areas. In some locations, where thin unconsolidated deposits overlie bedrock (primarily shales), attempts to install individual domestic wells have been unsuccessful... two or three wells drilled before an adequate yield was obtained... in saturated fractures in the bedrock ... southeast of Port Angeles and 3-4 miles inland... and the southwest shoreline of Sequim Bay. Very few wells have*

87 Noble, 1 1960.
88 Drost, B.W., (USGS). 1986.
89 Drost, B.W., (USGS). 1983

> *been drilled in the mountainous interior of the study area, but the available data suggest that there may be large areas of inadequate ground-water to supply even single domestic needs . ... .*
>
> *A few problems of poor ground-water quality are known ... the most serious is salty (chloride concentrations in excess of 250 mg1L) ground water in ... the shoreline from the southwest side of Sequim Bay to the northeast part of the Miller Peninsula (particularly the Diamond Point area) ... encountered in wells that have been drilled into the freshwater-saltwater zone of diffusion. Saltwater intrusion produced by pumping has apparently not been a problem ... [but] pumping of ground water from the freshwater-saltwater zone of diffusion ... could lead to increased deterioration of water quality in existing wells and enlargement of the problem areas . ... A detailed ground-water study would be needed to assess the potential impact of increased stresses on the ground-water system of the Miller Peninsula.*

The USGS (Drost) analyses of irrigation system impact on ground water: The USGS (Drost) studies in the Sequim-Dungeness Peninsula have provided the most detailed available assessment of the ground-water resource.90 The summary and conclusions, quoted in full, follow:

1. *The digital model described in this report simulated the ground-waterflow system within the accuracy of the input data.*
2. *The model confirms that leakage from the irrigation system is the largest source of recharge to the ground-water system. The leakage occurs primarily from the ditch system, not from water actually applied to fields.*
3. *Termination of the irrigation system would lead to lower heads throughout the ground-water system. The ground-water levels in the water-table aquifer could have average declines of about 20feet, and some areas could become completely unsaturated Several hundred wells could go &y [of I 100+ identified in the area by Drost in 1980].*
4. *Ground-water quality, as of June 1980, has apparently not been greatly affected by the use of on-site domestic sewage-disposal systems. The potential for future contamination cannot be assessed with the data presently available.*

Future studies should include the following.

1. *Ground water levels and rates of irrigation diversion would need to be monitored in order to assess the impact of any changes in land use.*
2. *Flow in the Dungeness River would need to be monitored, at least at the gage and at Dungeness*. This information would be required to properly interpret any changes

[90] Drost, B.W., (USGS). 1983.

observed [in ground water levels and rates of diversion].

3. *Water quality would need to be tested periodically and compared with the baseline data (June 1980) presented in this report.*
4. *If a significant increase in development of the artesian aquifers occurs, the new data could be used to update the model and test its ability to accurately simulate flow in these aquifers.*

Monitoring by WA Ecology:

Washington Department of Ecology, Southwest Regional Office staff have continued limited sampling of static water levels and water quality in selected wells from the time of the Drost study to the present. The data are published for reference, a few years at a time, but no definitive analysis of trends in well-water levels has been published.

The current Clallam County ground-water study:

A several-year study jointly funded by Ecology and Clallam County has provided considerable awareness and investigation of ground-water issues (partly in conjunction with the non-point pollution watershed study), contributions to the growth-management planning process, and important research findings on nitrate concentrations, seawater intrusion, and contaminant threats. A computerized well-inventory database has been compiled (in collaboration with the DQ project) and analyses performed to delineate the characteristics of wells and water-use in the Sequim-Dungeness area. Current monitoring will provide important information on well static water levels to evaluate the impact of fifteen years of continuing development since the Drost studies. A study currently being performed by USGS for the County ground-water study will provide additional geologic cross-sections of importance for understanding the configurations of aquifers, confining layers, and presumptions of hydraulic continuity. Assessment of seawater intrusion into wells in proximity to tidewater shorelines has been done in collaboration with the Forbes/CH2M-Hill study for the Jefferson County shorelines of the DQ region.

The Clallam County ground-water study (and concurrent participation in DQ efforts) suggests that:

- Ground-water quality is generally good, although nitrate levels have increased in some areas since the 1978-80 study.
- Seawater intrusion must continue to be monitored, especially along the Sequim Bay shoreline, but is not a broadening concern at present.
- Well water levels have not dropped precipitously, although some wells (particularly shallow ones) have experienced problems, requiring deepening or replacement Changes in some shallow wells are believed to relate to irrigation ditch flows; there is some concern that. changes in deeper wells may relate to increased pumping of large wells.
- The extent of hydraulic continuity between the river and wells, and between ditches

and wells, is not easy to assess, and is difficult to predict in advance because of the complexity and variability of subsurface conditions.

- *The continuing high rate of new well construction, worsened by the construction of multiple single-use wells in new residential projects, to avoid delays caused by the time lag in water-right-permitting for community systems, may jeopardize ground-water quality.*

Puzzles remain ... irrigators are under pressure to make the irrigation ditch system as efficient as practicable, both for legally-mandated "efficient use" of the diverted water, and for enhancing instream flows for fisheries rehabilitation. This implies reduced ditch leakage, identified by Drost over a decade ago as probably leading to reduction in ground-water recharge and potential impact on wells, particularly shallow ones in water-table aquifers. And questions about the extent of hydraulic continuity between ground-water wells and the river (and ditches) remain unanswered.

One alternative frequently advanced is construction of deeper wells, in [presumed] deeper confined aquifers. A number of deep wells in the area perform well, but we know little so far about the structure and capabilities of deeper aquifers. The Drost study assumed that most recharge of deeper aquifers would come from down flow from the aquifers nearer the ground surface -- in other words, that there were no obvious other sources of recharge.

Ground water in the upper Dungeness River watershed:
Much serious discussion, but little empirical evidence has been advanced regarding one possible additional source of recharge to deeper aquifers -- water from the upper Dungeness watershed apart from that measured at the RM 11. 8 surface water gage.

Figure 2.55, presented in the discussion of precipitation, showed that the estimated water source from precipitation was large in the upper watershed. The water that falls as precipitation either returns to the atmosphere as evapotranspiration and snowpack sublimation, enters the surface waters as runoff, or infiltrates into the ground as soil moisture and ground- water recharge. Only about 1/2 of the estimated precipitation source is accounted for in the river surface flow at the gage in the foothill "canyon-narrows" that separates upper and lower watersheds. The gage location was presumably selected as being in a bedrock-based section of the river to ensure that the gage measured the entire flow, but, the structure of bedrock in that area is not well known because of the thick glacial drift left by cordilleran ice sheets, and perhaps also alpine glaciers.

Three conjectural possibilities seem open: 1) the precipitation estimates for the high country are erroneous, and/or the evapotranspiration/sublimation loss is high; 2) some recharge to deeper aquifers occurs through bedrock permeability (fracture and joint systems in the bedrock); or 3) some unknown substantial discontinuities in the bedrock and overlying drifts, faulting, etc., provides for significant ground-water flows from the upper watershed to deeper aquifers in the lower watershed.

Research proposed by USGS Water Resources Division in their scoping of water budget studies for the DQ project should be able to provide more satisfactory answers for the questions that currently hinder planning with confidence for use of Sequim-Dungeness ground waters.

Miller Peninsula ground water:
Ground water in this small peninsula is apparently supplied primarily by recharge from precipitation on the limited peninsula surface and the north flanks of the Blyn Mountain mass to the south. Precipitation is limited in the rainshadow area, evapotranspiration is presumably large from substantial sunshine and winds in the strait, and the upper surficial materials are predominantly glacial tills of low permeability. The peninsula is sparsely populated, and the eastern portion is currently supplied with community-system water from Jefferson County PUD. Concerns about ground-water availability and the prospects of seawater intrusion were heightened when a large resort was proposed for the north portion of the peninsula. The consultant involved in water studies for the resort project reported from geological analyses and well testing of one or more substantial wells, that adequate water was available in a deeper aquifer, below any currently tapped for use, and that existing sources were not in jeopardy.[91] Cancellation of the resort project has left the question unanswered. Current plans to incorporate much of the peninsula into a State park may alleviate concern over the quantity of available ground water and the danger to existing well sources.

Ground water in the coastal plain west of the Dungeness basin:

The situation here is somewhat akin to that of the Miller Peninsula. The small streams (McDonald, Siebert, and Bagley) may not have widespread continuity with area ground waters, which are probably mostly supplied by recharge from precipitation on the northwest face of Blue Mountain and precipitation on the coastal plain. Construction of adequate wells in the area has been problematic, and part of the area is covered by a community water system of the Clallam County PUD. [Note that this water comes, in part, from Port Angeles sources, and is an exception to the general statement of "no water imports from outside the DQ region. "][92]

The extensive forest cover of the southern portion of this plain, and the higher annual precipitation than in the extreme rainshadow areas may partially offset the loss of water through runoff over low-permeability glacial tills.

Ground water in the coastal plains and peninsulas of Jefferson County:
The Jefferson County areas away from direct continuity with substantial rivers or streams have three difficulties in obtaining ground-water supplies: 1) primary dependence on recharge from precipitation, often in rainshadow zones; 2) highly variable subsurface conditions that make difficult the delineation of aquifers; and 3) long stretches of coastline with attendant risks of seawater intrusion.

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91 Associated Earth Sciences, Inc. Cape Discovery Resort: Ground Water Study Summary. June 1991.

92 Some residents of the western, Agnew, portion of the region receive their domestic water supply from the PUD on a system that extends outside of the region toward Port Angeles to the west. It is supplied both by a well within the region and surface water from the Morse Creek water treatment plant outside the region.

A decade-old study of geology and ground-water resources[93] concluded that, overall, adequate ground-water recharge existed to provide for reasonable growth of water use. The study cautioned, though, that the geologic variability made the search for adequate supplies difficult, and that water quality problems (iron, manganese, nitrates, hydrogen sulfide) were apparent in some areas. The study report noted that seawater intrusion problems had been encountered in scattered shoreline areas, but were not deteriorating.

A study recently completed (in draft submission)[94] for Jefferson County PUD #1 provides important analyses in detail of existing data, a plan of action for development of new public ground-water supplies, and recommendations for development of more definitive database resources and field investigations. The study brings together the available geological information and presents a series of cross-sections delineating the complex subsurface conditions as currently known. Analyses of data from existing wells have been used to assess the likelihood of new discoveries of various capabilities. Recommendations are provided for avoidance of seawater intrusion problems and interference with existing wells.

The study authors conclude that, based on present information, additional public water supplies from ground water should be achievable, in the range of 20 to 25 million gallons per day [somewhat beyond the present delivery to Port Townsend and the NEU from the OGWS pipeline from the Quilcene rivers].

Ground water in areas adjacent to tidewater shorelines:
The Forbes/CH2M-Mll assessment of seawater intrusion for the DQ project[95] showed that intrusion is a potentially-serious problem along Jefferson County shorelines, increasing in recent years with accelerating development. The authors suggest ways to minimize impacts by proper choice of well location and construction, and stress that an adequate on-going monitoring program is crucial.

The seawater intrusion problem is particularly critical on Marrowstone Island, aggravated by increased well construction in recent years, as noted by Forbes et al. Ecology has undertaken an extended study of the Marrowstone seawater intrusion, and a final report is due soon, with recommendations for control.

A plan of study for the ground and surface water resources of the DQ region:
The USGS Water Resources Division has developed a scope of research for addressing gaps in information about the water resources. The work, which would emphasize ground-water resources as a major gap, could be performed as a series of related studies over a five-year period, with interim useful results. Support and funding of the studies needs to be addressed by the DQ participants. More can be found on this in Chapters 5, 6, and 7.

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93 Grimstad and Carson. 1981.
94 Economic and Engineering Services, Inc. and Pacific Groundwater Group. Eastern Jefferson County Groundwater Characterization Study. (Draft) October 1993:
95 Forbes, R.B. and CH2Nffbll. Preliminary Assessment of Seawater Intrusion in Coastal Water Wells in Eastern Clallarn and Eastern Jefferson Counties. October, 1993.

The Animal and Plant Communities

Anadromous fish[96]

The waters of the northwest are famous for production of the various species of fish that five out their life cycles partly in terrestrial fresh water streams, partly in tidal and open sea saltwaters. Five species of Pacific salmon and steelhead and cutthroat trout, all of the salmonid family, are indigenous to the waters of the DQ region. Native stocks of these are known in different rivers and smaller streams of the region, and hatcheries have been operated since the early decades of this century to supplement the fisheries. The salmonid fisheries, once abundant beyond description, are in serious decline in the northwest, and specifically in the DQ region. Research into the many factors causing this decline and actions to correct the identified problems are major preoccupations of Federal, Tribal, State and local agencies, volunteer fisheries support groups, and commercial and sport fishing interests.

Salmonid Resources:

Game Fish Found in the DQ Region

Name	Scientific Name
Chinook Salmon	*Oncorhynchus tshawytscha* (Walbaum, 1792)
Chum Salmon	*Oncorhynchus keta* (Walbaum, 1792)
Pink Salmon	*Oncorhynchusgorbuscha* (Walbaum, 1792) Coho
Salmon	*Oncorhynchus kisutch* (Walbaum, 1792)
Cutthroat trout*	*Oncorhynchus clarki* (Richardson, 1836)
Rainbow trout*	*Oncorhynchus mykiss* (Walbaum, 1792)
Bull trout	*Salvelinus confluentus* (Suckley, 1858)
Dolly Varden*	*Salvelinus malma* (Walbaum, 1792)

* Includes both freshwater and anadromous forms (i.e., steelhead (rainbow trout)).
See Chapter 7, Figures 7.3 and 7.4 for more information on salmonid life histories.

Life History Characteristics of Salmon:
Pacific Salmon are anadromous species, migrating as adults from the ocean back to their natal freshwater streams to spawn. Chinook and coho salmon juveniles rear in fresh water up to one year before emigrating to sea. Chum and pink salmon require little to no freshwater rearing, migrating to sea almost immediately upon emerging from the spawning gravel. Development of salmon is directly related to temperature, affecting the timing of hatching and emergence from gravel spawning beds, growth, and migration (route and timing).

96 The sections on Anadromous Fish and on Shellfish and Other Marine Invertebrates have been prepared by Brad Sele, fisheries manager, Jamestown S'Kallam Tribe, with peer review. A variety of reference materials have been used by Sele, with special reference to Hart, U., Bulletin 180, Pacific Fishes of Canada. 1973.

At the appropriate time of their respective life history, salmon migrate down their natal streams and acclimate to saltwater in estuaries and near-shore environments. These marine habitats are an important transition area for young salmon as they undergo physiological changes to adapt from fresh water to saltwater. Survival during this extremely vulnerable stage of their early life history is directly related to the amount and quality of food and shelter available upon entry. Salmon counter high mortality rates through high fecundity and abundance. However, adverse impacts are more detrimental at low population sizes, when population instability may occur.

Most salmon from Puget Sound migrate north after entering saltwater as juveniles, some ranging as far north as the Gulf of Alaska, and return southwardly along the coasts of Alaska and British Columbia. A lesser number of stocks migrate south and return northwardly along the coasts of northern California and Oregon. Exact migration routes vary from year to year and are dependent upon climatic conditions. Salmon have specialized sensors that allow them to return to their natal stream to spawn after spending the majority of their life at sea.

As the adult migration returns to spawn, males dominate the early part of the run, as do the larger or older fish. Eggs per female are positively correlated to size and vary from year to year and species to species. Generally, with the exception of pink and coho salmon, adults return at more than one age over multiple years. This life history trait reduces the likelihood of extinction if for some catastrophic reason an entire brood year is wiped out, plus it allows for interbreeding between brood years, increasing genetic diversity.

Chinook Salmon - Chinook salmon are the largest of the Pacific salmon. They return primarily to major rivers in the spring and summer months to spawn. Females bury about 4,800 eggs in gravel redds in late summer and early fall, the eggs hatch in early winter, and fry emerge from the gravel in the early spring. Usually, juvenile chinook salmon rear for 3-6 months in freshwater before emigrating to sea, though some stocks remain in freshwater for at least a year. After spending 1-6 years at sea, the adults return to their natal river to spawn.

Coho Salmon - Coho salmon spawn in a diversity of habitats, including the headwaters of major rivers and their associated tributaries, but are more noteworthy for occurring in most anadromous streams. Freshwater entry begins in early fall as a prelude for spawning from October to January. Females lay between 2,500 and 5,000 eggs, depending upon their size. The resultant fry emerge around April the following spring and remain in freshwater streams for varying periods, usually one year. During freshwater rearing, coho fry are territorial in behavior, holding select positions in the stream and feeding on drifting insects of terrestrial origin or coming downstream from lakes (Hart, 1973). They usually rear in small streams. Their freshwater survival is dependent upon maintenance of suitable in-stream flows, especially during summer months. Coho salmon smolt after one year (usually) and emigrate to sea in the spring. They generally spend one and one half years in saltwater before returning as adults to spawn as three-year-olds.

Chum Salmon - Chum salmon frequently spawn near the mouths of rivers and most streams, but are known to migrate up large rivers to spawn in the headwaters and tributaries. Summer chum arrive near their natal streams in late summer and spawn in September and October. Fall chum are the latest of the Pacific salmons to spawn, arriving in October through January, with spawning occurring from November through early February. Summer runs have fecundities of 2,000 to 3,000 eggs per female, while fall chum are slightly larger with fecundities of 3,000 to 4,300 eggs per female. Fry emerge from the gravel in the early spring (primarily March and April) and migrate directly to sea, with little time spent rearing in fresh water. Chum salmon spend 2 to 7 years (usually 3 to 5) at sea before returning to spawn as adults.

Pink Salmon - Pink salmon are the smallest of the Pacific salmon. The State of Washington is at the southern most range of pink salmon and only odd-year pink salmon are present here. Like chum salmon, they usually spawn near the mouths of rivers and streams, but are known to migrate up large rivers to spawn. Summer pink salmon (upper Dungeness stock) arrive to spawn in late July and are done by the end of September. Fall pink salmon (lower Dungeness stock) are more typical, arriving in late August and are done spawning by late October. Fecundities vary from 1,500 to 1,900 eggs per female. Fry emerge from the gravel in the spring and migrate directly to sea. Adults return to spawn in the second summer. The 2-year life cycle of pink salmon is so invariable that fish running in odd-numbered calendar years are effectively isolated from even-year fish so that there is no gene flow between them. The two cycles need separate consideration from the points of view of exploitation and conservation (Hart, 1973).

Steelhead Salmon - Steelhead are anadromous rainbow trout. Their preference for an anadromous life cycle versus residency in freshwater is accompanied by morphological differences and is hereditary. Summer and winter running tendencies of steelhead also appear to be inherited. Because of genetic characteristics, steelhead are now classified as a salmon, not trout.

Steelhead spawn in large rivers and their tributaries, and most anadromous streams. Summer steelhead generally enter fresh water from May through October and spawn from February through April. Winter steelhead enter freshwater as early as December and river entry continues through April. Spawning occurs from February through May. Female steelhead have fecundities of about 3,500 to 5,000 eggs. Summer steelhead have a higher fecundity than winter steelhead. After emerging from the gravel in the spring or early summer, steelhead juveniles usually spend 2 to 3 years (range of 1-4 years) in freshwater before emigrating to sea. Steelhead also spend 2 to 3 years (range of 1-4 years) at sea before returning to spawn. Unlike other salmon species, some steelhead return to spawn for a second or third time.

Distribution:

Salmonid inventories have been conducted on anadromous systems in the DQ region at various times, by multiple agencies, and through differing methodologies. The most recent collation of this type of information is summarized in the 1992 Salmon and Steelhead Stock Inventory (SAS SI) which was jointly developed by the State of Washington and the treaty Tribes. In the near future, appendices to the 1992 SASSI document will be published containing detailed summaries of each salmon and steelhead stock in Puget Sound, including the Strait of Juan de Fuca and Hood Canal. The appendices will provide an excellent opportunity to obtain stock specific information for the salmonid resources in the DQ region. Publication of the appendices is expected in the late summer of 1994.

Salmon are indigenous to the Pacific northwest and generally can be found in any accessible anadromous stream or river. Actual distribution is species specific, depending upon their respective basic life history requirements. As an example, chinook salmon are not as widely distributed as coho salmon or cutthroat trout because they primarily inhabit larger river systems. The distribution of salmonids today is not a true representation of their historical distribution. Singular events and the cumulative effects of multiple impacts have changed their distribution patterns over the years. In general, salmonids are not as widely distributed as they once were. In many cases the distribution of salmonids today is not well documented. This may seem surprising considering the inventory assessment surveys that have been done. Nonetheless, information today should not be considered all inclusive.

Salmon are currently distributed in the DQ region as follows:

Chinook Salmon - Morse Creek and the Dungeness River. Hatchery chinook salmon are also found in the Little Quilcene and Quilcene rivers.

Coho Salmon - Bagley Creek, Siebert Creek, McDonald Creek, Dungeness River, Cassalery Creek, Gierin Creek, Bell Creek, Johnson Creek, Dean Creek, Jimmycomelately Creek, Contractors Creek, Salmon Creek, Snow Creek, Chimacum Creek, Thorndyke Creek, Shine Creek, Donovan Creek, Little Quilcene River, and Big Quilcene River. Coho salmon are extremely opportunistic and are probably found in many other unnamed streams and creeks during one or more of their life stages.

Summer Chum Salmon - Jimmycomelately Creek, Snow Creek, Salmon Creek, and Chimacum Creek (this stock may be at, or near extinction), Little Quilcene River, and Big Quilcene River.

Fall Chum Salmon - Bagley Creek, Siebert Creek, McDonald Creek, Dungeness River, Bell Creek, Chimacum Creek, Ludlow Creek, Thorndyke Creek, Tarboo Creek, Little Quilcene River, and Big Quilcene River. Fall chum salmon are poorly documented, particularly in the Admiralty Inlet area, and were undoubtedly more widely distributed in the past.

Pink Salmon - Dungeness River. Like fall chum salmon, pink salmon were undoubtedly more widely distributed in the past.

Summer Steelhead - Dungeness River.

Winter Steelhead - McDonald Creek, Dungeness River, Jimmycomelately Creek, Snow Creek, Salmon Creek, Chimacum Creek, Thorndyke Creek, Tarboo Creek, Little Quilcene River and Big Quilcene River.

The distribution of resident trout and other fishes is even more poorly documented than that of salmon. For the purposes of this report it would be fair to characterize their distribution patterns as similar to that of salmon.

Abundance:

Historical references document the bounty of salmon that was produced in Puget Sound and the Pacific northwest when the non-Indian community arrived. Their numbers seemed endless. Even as late as 1963 the Dungeness River had a pink salmon escapement of over 400,000 fish. Unfortunately, the situation today is much different. Streams that once produced salmon in the tens and hundreds of thousands are struggling to achieve escapements of a few hundred.

Stocks are being petitioned for protection under the Endangered Species Act (ESA). Fisheries are being restricted to unprecedented levels for reasons of conservation. Whole economies have been devastated. Recovery of these once abundant salmon resources will be dependent upon prudent management at all levels of impact, as well as restoration of the habitats upon which they depend.

Not to be overlooked is the cumulative contribution made by many small streams, creeks, sloughs and wetlands to the total abundance of salmon returning each year. These seemingly insignificant aquatic communities collectively produce a notable portion of each annual return. They too must be protected and factored into any recovery efforts.

Contributions made by hatchery coho are significant within the DQ region. The magnitude varies from year to year depending upon funding and release numbers, strategies, and locations.

Status:

Salmon production within the DQ region can generally be described as depressed, below expected levels based on available habitat and natural variations in survival rates. This is due to a combination of factors which are described below in more detail. The 1992 Salmon and Steelhead Stock Inventory (SASSI) lists 9 of the 40 stocks in the Strait of Juan de Fuca as healthy, or 22.5%; 14 as depressed, or 35%; 5 as critical, or 12.5%; and 12 as their status being unknown, or 30%. In Hood Canal, 17 of 36 stocks are listed as healthy, or 47.2%; 11 as depressed, or 30.6%; 1 as critical, or 2.8%; and 7 as their status being unknown, or 19.4%. Of note is the fact that 6 of the 12 critical stocks (50%) listed for the State of Washington are found in the Dungeness, Discovery Bay, and Quilcene watersheds.

The production trend for salmon has continued to decline since the 1992 inventory, and if a snapshot was taken today it is likely the status of salmon and steelhead stocks in the DQ region would be lower than that portrayed above. In fact, the National Marine Fisheries Service (NMF S) has been petitioned by various fisheries interest groups to protect certain salmon and steelhead species under the Endangered Species Act (ESA). This includes, but is not limited to, all coho salmon and steelhead in the Pacific Northwest, Dungeness River chinook salmon, Dungeness fall pink salmon (lower river), Discovery Bay summer chum salmon, and Hood Canal summer chum salmon. What affect an ESA listing of any or all of these stocks would have on the region is currently unknown.

The status of individual salmon and steelhead stocks in the DQ region is best described in the 1992 SASSI and its forthcoming appendices. Relevant sections of SASSI are referenced later is this report under the recommendations for east Clallam and Jefferson counties.

Factors Limiting Production:

Fish production is affected by both natural and man-induced factors. Salmon have evolved to account for a wide range of natural impacts. It is only when they encounter extreme or unnatural conditions that their adaptive processes fail. More information is available on factors limiting the freshwater production of salmon than those limiting production in saltwater.

Factors with the greatest impact on freshwater production include those that reduce the quality or quantity of their environments. Examples include blockages to migration, extreme climatic conditions, excessive or reduced water flows, unstable stream beds, siltation, pollution, loss of food reserves and shelter, and predation. Activities such as logging, urban growth, and agriculture can have direct affects on fish production if not properly planned and regulated.

The Dungeness River is a good example of how human activities can detrimentally affect fish production. Unlike other watersheds in the area, the Dungeness River is located in a rainshadow, and is subject to large irrigation water withdrawals. Historically, the naturally limiting factor for the Dungeness River may have been its steep gradient in the upper watershed, with spawning restricted to limited gravel patches. Today, freshwater production is limited by a combination of human impacts resulting from agriculture, urbanization (including flood control) and forest practices. Five irrigation withdrawals remove as much as 60% of the natural flow during critical low flow periods (August and September), which happens to coincide with chinook and pink salmon spawning in the river. Forest practices, urban growth, and clearing land for agriculture have destabilized the riparian corridor and land base adjacent to the river. The resulting erosion has caused sediments to be deposited in the river at a rate that exceeds the river's ability to transport them, creating extensive gravel aggradation and channel braiding. These production bottlenecks compound the low water flow impacts to fish by reducing the water depth, increasing the water velocity and temperature, and destabilizing the river bedload. An increase in fine sediments reduces the quality of spawning habitat by smothering salmon eggs during their incubation. Flood control measures, such as dikes, funnel the energy of the river into a confined space during high water events, subjecting fish and their habitat to extreme conditions. In combination, these factors adversely impact fish production by impeding both upstream and downstream migration of anadromous salmonids, reducing the quantity and quality of available spawning and rearing habitat, and killing incubating salmon eggs in the unstable bedload during high water flows.

Factors limiting saltwater production are not as well understood as those limiting freshwater production. Some of the more obvious examples would be major climatic events (El Nino), pollution from run-off in the nearshore rearing areas, catastrophic events like oil spills, and predation, including over fishing. Estuaries and other near-shore nursery areas are extremely important to the survival of salmon and steelhead. Any loss of this type of habitat, or reduction in its quality, will undoubtedly affect fish production. With the exception of high seas fishing, limiting factors in the open ocean are usually environmental and beyond the reach of humans.

Salmonid Fisheries:

In 1974, a landmark decision was rendered in Federal court awarding treaty Tribes in the State of Washington co-management of the fisheries resource and affirming their treaty-reserved right to take 50% of the harvestable surplus of salmon and steelhead passing through or returning to their "usual and accustomed fishing grounds and stations." More commonly referred to as the Boldt Decision, the application of principles established in this decision has shaped fisheries in the DQ region as we know them today. In addition, some salmon fisheries in Puget Sound are regulated per international agreements, such as the Pacific Salmon Treaty between the United States and Canada, and within other domestic constraints addressing conservation. Federal, State and Tribal fish managers regulate fisheries in response to varying run sizes and allocate the available resource between fisheries to achieve desired spawning escapement goals and harvest allocation guidelines. Despite improving technology, fisheries management should not be considered an exact science, as there are too many variables influencing the outcome.

Canadian fisheries along the west coast of Vancouver Island, northern shore of the Strait of Juan de Fuca, Georgia Strait, and Johnstone Strait intercept significant numbers of DQ origin salmon as they return to their natal streams. In recent years, 45% to 65% of the harvest on coho salmon from the Strait of Juan de Fuca and Hood Canal has occurred in Canadian fisheries.

Marine fisheries in the Strait of Juan de Fuca, Admiralty Inlet, San Juan Islands, and northern Hood Canal support commercial and recreational fisheries for non-Indian fishermen and commercial, subsistence, and ceremonial fisheries for treaty Tribes and their members. These fisheries intercept both DQ origin fish stocks and other stocks migrating through the region to their stream of origin. Some species are harvested in directed fisheries, others incidentally. Fisheries are annually adjusted to provide fishing opportunity on harvestable surpluses and to protect stocks of concern.

Commercial fisheries in the DQ region are conducted primarily in marine waters, with the exception of a commercial steelhead fishery in the Dungeness River by treaty fishermen. No freshwater commercial fisheries are conducted by non-Indian fishermen. A commercial troll fishery is conducted in the Strait of Juan de Fuca by treaty Tribes for coho and chinook salmon. Sockeye bound for the Fraser River in Canada are harvested by treaty fishermen in a commercial net fishery in the Strait of Juan de Fuca. Treaty fishermen also harvest fall chum salmon in a commercial net fishery in the Strait and San Juan Islands. Commercial net fisheries are conducted in Dungeness and Quilcene bays by treaty and non-Indian fishermen to harvest surplus hatchery coho salmon. A commercial net fishery occurs in Hood Canal by treaty and non-Indian fishermen to harvest chinook, coho, and fall chum salmon. On rare occasions, treaty fishermen conduct commercial hook and line and net fisheries in freshwater to harvest excess hatchery returns. The extent and duration of all commercial fisheries mentioned above is dependent upon annual abundance. Also, these commercial fisheries are a listing of those that occur within the DQ region and should not be considered as all-inclusive when describing the annual fishing plan jointly agreed to by treaty and non-Indian fishermen for allocation purposes.

Recreational fisheries by non-Indian fishermen occur in both marine and fresh waters. Large marine recreational fisheries occur in the Strait of Juan de Fuca, Admiralty Inlet, and to a smaller degree in Hood Canal and San Juan Islands. Freshwater recreational fisheries occur in various streams throughout the region- depending upon stock status and abundance.

Recreational fisheries are regulated for conservation purposes through time and area closures and gear and daily bag limits.

Tribal subsistence fisheries provide Tribal members an opportunity to obtain food reserves for their households. Tribal ceremonial fisheries provide a food source for specific ceremonial events, such as funerals, weddings, First Salmon ceremonies, and other dedicated occasions. Like non-Indian recreational fisheries, Tribal subsistence fisheries are regulated for conservation purposes through time and area closures and gear and daily bag limits.

Hatchery Production:
Three large salmon hatcheries supplement and rehabilitate natural production within the DQ region. Historically, hatcheries have served to mitigate for habitat losses and supplement natural production. More recently, some hatchery facilities have been reprogrammed to assist with the rehabilitation and recovery of stocks at a high risk of extinction. The Washington Department of Fish and Wildlife (WDFW) operates two State hatcheries on the Dungeness River. The Dungeness Salmon Hatchery produces coho salmon yearlings for release into the Dungeness River. A satellite facility on Hurd Creek, a tributary of the Dungeness River, produces fall chinook salmon juveniles and yearlings for release into the Elwha River, and is the support facility for a chinook salmon captive broodstock program on the Dungeness River. In addition to these State hatcheries, the USFWS operates the Quilcene National Fish Hatchery on the Quilcene River. This Federal hatchery primarily produces coho salmon yearlings for release into Quilcene and Port Gamble bays and fall chum salmon for release into Quilcene Bay. An experimental chinook salmon program is being phased out and a summer chum egg banking program was initiated in 1992.

The Port Gamble S'Kallam Tribe operates a small hatchery in Port Gamble Bay to incubate and rear chum salmon. In addition, a net pen complex is operated in Port Gamble Bay for the short-term rearing and release of coho salmon yearlings from the Quilcene National Fish Hatchery. The Port Gamble net pens have also received broodstock from the Dungeness and George Adams hatcheries operated by the State. The Point No Point Treaty Council (PNPTC), a regional Tribal fisheries consortium sponsored by the Skokomish, Port Gamble S'Klallam, Jamestown S'Kallam, and Lower Elwha S'Klallam Tribes, maintains and operates a net pen complex within Quilcene Bay to short-term rear and release coho salmon yearlings from the Quilcene National Salmon Hatchery. Dungeness and George Adams broodstock have also been released at this net pen site in the past.

A cooperative stock recovery program has been implemented at the Hurd Creek Salmon Hatchery to rehabilitate Dungeness chinook salmon. A captive broodstock strategy was selected to preserve the genetic characteristics of the stock and increase the population size so that subsequent long-term rebuilding would proceed quickly once the primary factors limiting the chinook population had been identified and corrected. It is important to emphasize that the captive broodstock approach is, (and should always be considered), a short-term emergency approach to help a stock past a population bottleneck, and not a long-term solution to population problems facing stocks at risk of extinction.

The planning process to rehabilitate Dungeness fall pink salmon (lower river) has been initiated by Federal and State agencies, Tribal governments, and other private and volunteer fisheries interests. The 1993 escapement for this stock was approximately 200 fish, down from a recorded high of 210,000 fish in 1963. Recovery efforts will probably involve some type of egg-banking program at one of the hatchery facilities on the Dungeness River.

A program to restore coho salmon to Thorndyke and Shine creeks in northern Hood Canal was initiated in 1993. The project is a cooperative effort of the WDFW`, treaty Tribes, and the Long Live the Kings organization. Coho salmon runs to these streams have been depressed. Escapements have been minimal and, in particular, few, if any, coho salmon spawners are believed to have escaped to Thorndyke Creek the last two years. Coho salmon fry are being collected from northern Hood Canal streams and reared to adults at a hatchery owned and operated by Long Live the Kings on Lilliwaup Creek. Progeny from the collected fry will be planted into Thorndyke and Shine creeks as part of a restoration program that includes evaluation of stream habitat limiting factors.

There are other educational and cooperative fisheries enhancement projects in the region that are regulated by the State through regional enhancement groups. These cooperative projects consist primarily of very small educational opportunities in local schools, habitat restoration projects, and natural stock recovery efforts. Of note is a cooperative Salmon Creek summer chum recovery project in Discovery Bay that receives contributions from the local regional enhancement group, grassroot fisheries organizations, sportsmen, interested volunteers, and the State.

Shellfish and Other Marine Invertebrates[97]

Intertidal and subtidal areas within the DQ region support a wide variety of shellfish and other marine invertebrates. Some of the more popular commercial and recreational varieties include clams, oysters, shrimp, crab, sea urchins, and sea cucumbers. These marine resources are widespread throughout the region, on both private and public tidelands, and remain sufficiently abundant to support commercial and recreational fisheries for non-Indian fishermen and commercial, subsistence and ceremonial fisheries for treaty Tribes and their members. Shellfish have always been a principal food source for the Indian Tribes in Washington. There is an old Indian saying that states, "When the tide is out, the table is set!" Natural clam production in Sequim and Discovery bays supports business ventures owned and operated by private landowners.

Natural clam production in Sequim and Discovery bays supports business ventures owned and operated by private landowners. In addition, clam, oyster and shrimp resources in Dungeness, Sequim, and Quilcene bays provide Tribal harvest opportunities for commercial, subsistence and ceremonial fisheries.

The harvest of shellfish is regulated not only for resource conservation purposes, but also for public health concerns. Health risks can occur after shellfish are exposed to pollution from marinas and discharge from sewage treatment plants, and marine toxins like paralytic shellfish

[97] Prepared by Brad Sele.

poisoning (PSP) and domoic acid. This health risk is not necessarily to the shellfish themselves but to the humans who may eat them. Extensive monitoring measures are maintained by State, local, and Tribal governments to ensure shellfish are fit for human consumption. Preventative area closures are usually imposed by the Washington Department of Health (DOH) when a potential public health risk occurs. Tidelands from Port Williams south along the west shore of Sequim Bay to just below the John Wayne Marina are closed year-round to the harvest of shellfish because of public health concerns resulting from pollution at the marina and discharge from the City of Sequim’s sewage outfall. DOH has also imposed a seasonal closure of tidelands adjacent to the offshore boat mooring site at Sequim Bay State Park. Other beaches in Sequim Bay, and near the entrance to Sequim Bay, are subject to conditional public health closures, depending on conditions related to the discharge of sewage from the municipal treatment plant. All beaches are subject to closure if the prevalence of marine toxins exceeds public health standards.

WDFW periodically conducts shellfish enhancement projects on tidelands within the DQ region. These enhancement efforts are restricted to clams and oysters and occasionally involve the treaty Tribes. WDFW cultures some clam and oyster broodstock at its Point Whitney Shellfish Laboratory in Brinnon, or buys it from private growers. Clam and oyster enhancement occurs throughout the region to supplement natural production, or create new harvest opportunities.

The Jamestown S'Klallam Tribe owns and operates a commercial shellfish plant in Dungeness Bay. The plant buys and sells oysters, clams, crab, shrimp, and scallops. In addition, the business utilizes Tribal and leased tidelands in Dungeness and Sequim bays to grow oysters for resale.

Other Fish and Wildlife

> **Resident fish (sportfishing):**
> **Marine mammals:**
> **Land mammals:**
> **Birds:**

No detailed characterization of these topics for the DQ region has been done for this project, as a consequence of time and resource allocation constraints. However, considerable information is available through a variety of resources. A partial listing follows:

> Two excellent public marine-science centers are in the vicinity: Port Townsend Marine Science Center (at Fort Worden in Port Townsend), and Art Feiro Marine Lab (at City Pier in Port Angeles).
>
> The Rainshadow Natural Science (Interpretive) Center -- (formerly the Sequim Natural History Museum, now re-locating to the Railroad Bridge Park area on the Dungeness River) provides interpretive programs for adults and school children.
>
> Peninsula College maintains an active fisheries degree program, and an environmental science program in conjunction with Western Washington University.

Volunteer support groups for fisheries and wildlife-related interests are active in the region (for example, Wild Olympic Salmon, headquartered in Chimacum).

Professional consultants and research laboratories (Battelle Northwest, for instance), and local, State and Federal agencies provide programs and expertise regarding fish and wildlife (Clallam and Jefferson County Conservation Commissions, WA Department of Fisheries and Wildlife, WA Department of Natural Resources, various local and State parks, USFWS at Dungeness National Wildlife Refuge and Protection Island, US Forest Service - Quilcene Ranger District, Olympic National Park, as examples).

The school districts provide special classes and field work related to fish and wildlife concerns (for example, the fish hatchery project at Chimacum High School, and the Matriotti Creek restoration learning center at Greywolf School in Carlsborg).

Two local Audubon Society chapters, Admiralty Audubon in Jefferson County and Olympic Peninsula Audubon in Clallam County, maintain active surveillance of bird populations of the DQ region through regular Christmas Bird Counts, spring counts and breeding censuses, and other programs. The Jefferson County critical areas determination for growth management planning (GMA) was aided by Admiralty Audubon determinations of wildlife distribution.

The watershed management planning projects (non-point-pollution control) in the DQ region (especially the Dungeness area watershed and Discovery Bay watershed) have benefited from fish and wildlife assessments in the characterization reports from the Puget Sound Collaborative River Basin Team.

A good inventory of wildlife in the Olympic National Forest is included in Henderson et al, *Forested Plant Associations of the Olympic National Forest*.[98]

A recent publication, *Wildlife of Dungeness National Wildlife Refuge*,[99] discusses the various wildlife species that depend upon the refuge, and the management problems involved.

A comprehensive checklist, *Olympic Wildlife*,[100] covers birds, land mammals, marine mammals, amphibians and reptiles, and fish found on the Olympic Peninsula, providing detail on habitats, abundance, timing of presence and nesting.

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98 Henderson et al. 1989. Pages 71-76.

99 USFWS. Wildlife of Dungeness National Wildlife Refuge. 1994. A resource paper with accompanying questionnaire material prepared for discussions of "Resolving Incompatible Uses ... " of the refuge.

100 Northwest Interpretive Association and Olympic National Park (Fred Sharpe, researcher, and others). Olympic Wildlife. 1991

Forests and Other Plant Communities

No general characterization or research on the forest resources and other plant communities of the DQ region has been done as part of the DQ project, as a consequence of time and resource allocation constraints. Special concerns with riparian habitats and wetlands are covered elsewhere in the Plan.

A major research report, *Forested Plant Associations of the Olympic National Forest*, prepared by a USFS team,[101] provides a valuable reference to the forest areas of the entire Peninsula. Concepts of *environmental zones* relating climate and physiographic factors to vegetation are central to this work. Extensive research into especially subalpine plant communities and the endemic species of the Olympic Peninsula refugia associated with ice-age glaciations has been done at Olympic National Park.

Current watershed characterization studies include a project covering the Big Quilcene River watershed by a collaborative team of USFS and WDNR personnel[102] and a preliminary assessment by a local interagency team.[103] Another study of the Dungeness River watershed, is a collaboration between USFS and the Jamestown S'Klallam Tribe and consultants.[104]

The watershed characterization reports prepared by the river basin team for the Dungeness River area watershed[105] and the Discovery Bay watershed[106] provide much useful information on the forested portions of the area, including maps of land use and land cover, forest land ownerships, and timber stand ages.

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101 Henderson, J.A., Peter, D.H., Lesher, R.D., and Shaw, D.C. Forested Plant Associations of the Olympic National Forest. USDA Forest Service, R6 ECOL Technical Paper 00 1-88. 1989.

102 The Big Quilcene Watershed Analysis is a cooperative venture between the Washington Department of Natural Resources (WDNR) and the USFS Olympic National Forest, involving a multidisciplinary team assembled from the two agencies and other concerned participants. The analysis is anticipated to be completed in September 1994. See Chapter 7, J.4 for more information.

103 Local interagency Team (USFWS lead), Big Quilcene River Basin Preliminary Watershed Assessment, April 1994.

104 The Dungeness Watershed Habitat Inventory project.

105 PSCRBT, Dungeness River Area Watershed (Characterization), June 1991.

106 PSCRBT, Discovery Bay Watershed (Characterization), November 1992. The watershed as defined for this report includes the eastern half of Miller Peninsula with Eagle and Contractors creeks, the mountainous and lower watersheds of Salmon and Snow creeks and their tributaries, and the northern and western portions of Quimper Peninsula. The characterization includes much useful information as well as GIS- based coverages for land coverage and land use, surface waters, geology and soils, etc.

Human Habitation

Early settlement, development patterns, and population

Early settlement:
Archeological excavation at the Manis Mastodon site near Sequim provided evidence that people inhabited the DQ area as early as 11,000 years ago -- not long after the Vashon ice sheet had departed.[107] When the earliest European explorers came into the Strait of Juan de Fuca in the late 1700's they found native villages and camps along the shores and bays indicating that bands of people moved between pre-established sites with the seasons and the availability of food resources. Lichatowich has estimated that perhaps 400 to 2100 native people were subsisting on salmon in the Dungeness River area alone prior to settlement by whites.[108]

Settlement in the DQ region began seriously in the 1850's. The northern Olympic Peninsula was originally part of Lewis County established in 1845 by the Provisional Government of the Oregon Territory. By 1852 the Washington Territory had been separated from Oregon Territory, the territory was officially United States rather than Canadian, and Jefferson County had been created from part of Lewis as one of eight Washington Territory counties. In 1854 Clallam County was established from part of Jefferson County.[109]

Settlement proceeded most rapidly in locations with good natural harbors and where logging and early sawmills could produce lumber for export down the Pacific Coast. Details of development of particular areas have been noted earlier in descriptions of the watersheds and coastal areas.

Land development patterns:
The overall land area of the DQ region is approximately 660 square miles. Roughly half of that is managed by Federal and State agencies, as Olympic National Park, Olympic National Forest, and WA DNR forest lands, as indicated on Figure 2.68. The national forest was established in the 1890's, and the national park in 1938. Of the privately held land shown on Figure 2.68, about 115 square miles is in eastern Clallam County, and about 215 square miles is in eastern Jefferson County. Much of the privately held land is in large holdings for timber production, although in recent years many ownerships have changed and forest lands are being converted to residential and other uses in developing areas. [A land-use map is presented in the Clallam County recommendations chapter of the Plan.]

. **Population and population density:**
The DQ region contains most of the population of Jefferson County and about a third of the population of Clallam County. This amounts to about one-half of the combined population of

[107] Gustafson, C., Gilbow, D., and Daugherty, R. The Manis Mastodon Site: Early Man on the Olympic Peninsula. 1979.
[108] Lichatowich, J. Dungeness River Pink and Chinook Salmon: Historical Abundance, Current Status, and Restoration. October 1993.
[109] Abbott, N.C., and Carver, F.E. (compiled by Helm, J. W.). The Evolution of Washington Counties. 1978.

Figure 2.68 (a) Map showing Federal and State lands and population sub-areas of DQ region.

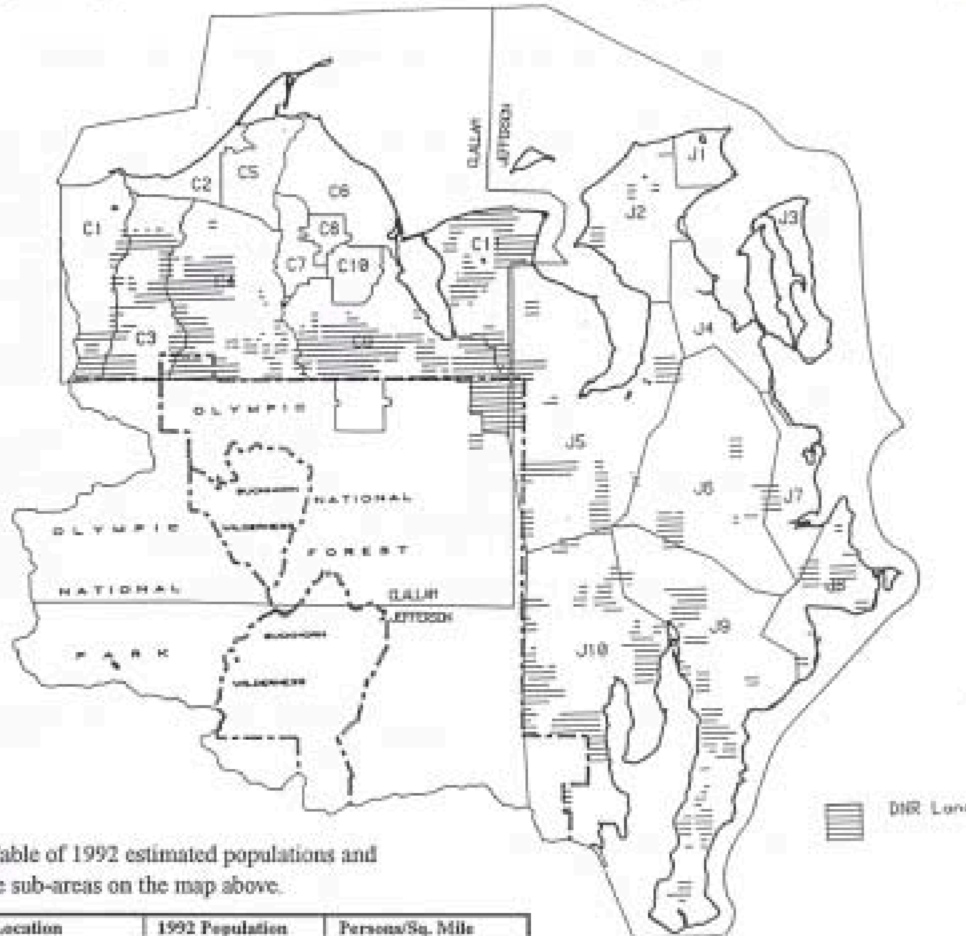


Figure 2.68 (b) Table of 1992 estimated populations and population density for the sub-areas on the map above.

Clallam County	General Location	1992 Population	Persons/Sq. Mile
C1	Fairview	1718	112
C2	Agnew/Spit	1132	189
C3	R Corner	774	72
C4	Lost Mountain	3230	171
C5	Carlsborg	1783	201
C6	Jamestown/WA Harbor	3251	230
C7	West of Sequim	2011	393
C8	City of Sequim	4096	1729
C9	Blyn/Palo Alto	726	42
C10	Bell Hill	572	129
C11	Miller Peninsula	836	79
Total		*20129*	*177*
Jefferson County	**General Location**	**1992 Population**	**Persons/Sq.e Mile**
J1	Port Townsend	7530	1080
J2	Cape George	2431	145
J3	Marrowstone Island	759	162
J4	Hadlock	3652	331
J5	Discovery Bay	923	26
J6	Chimacum	1163	33
J7	Port Ludlow	1444	135
J8	Shine	828	52
J9	Coyle	394	9
J10	Quilcene	1213	35
Total		*20337*	*95*

the two counties together, in less than 20% of the combined area of the two rural counties.

Current [1992] population of the DQ region is estimated to be 40,000+, as shown in the table on Figure 2.68, split almost equally between the Clallam and Jefferson county portions. Thus, the gross density of population averaged over the entire DQ region -- mountains, forests and all -- is currently about 60 persons per square mile, not greatly different from the 73 persons per square mile for the entire State of Washington in 1990.

Considering only the privately held land (ostensibly available for development) shown on Figure 2.68, 40,000+ people on about 330 square miles computes to an average density of about 120 persons per square mile. The table in Figure 2.68 indicates how this density varies. The "urban" settings of Sequim and Port Townsend, with densities of over 1700 and 1000 persons per square mile, are not greatly different in density from the East Seattle census division (including Bellevue, Redmond, Woodinville, etc.) with a density of 1900+ persons per square mile in 1990. Most of the suburban/rural areas have densities averaging about 200 persons per square mile, roughly equivalent to a household for each 5 to 7 acres.

Trends in population growth:

The DQ region portions of both Jefferson and Clallam counties have been developing rapidly in recent years. According to Peninsula Development Association figures[110] Jefferson County population more than doubled between 1970 and 1992, while Clallam County population increased by over 75%. Some population projections have been obtained by DQ staff to aid in forecasts of water use [see Chapter 3 in this Plan]. More detailed data on population for small areas within the DQ region, and additional population projections, should be available in time as growth management planning proceeds in the two counties.

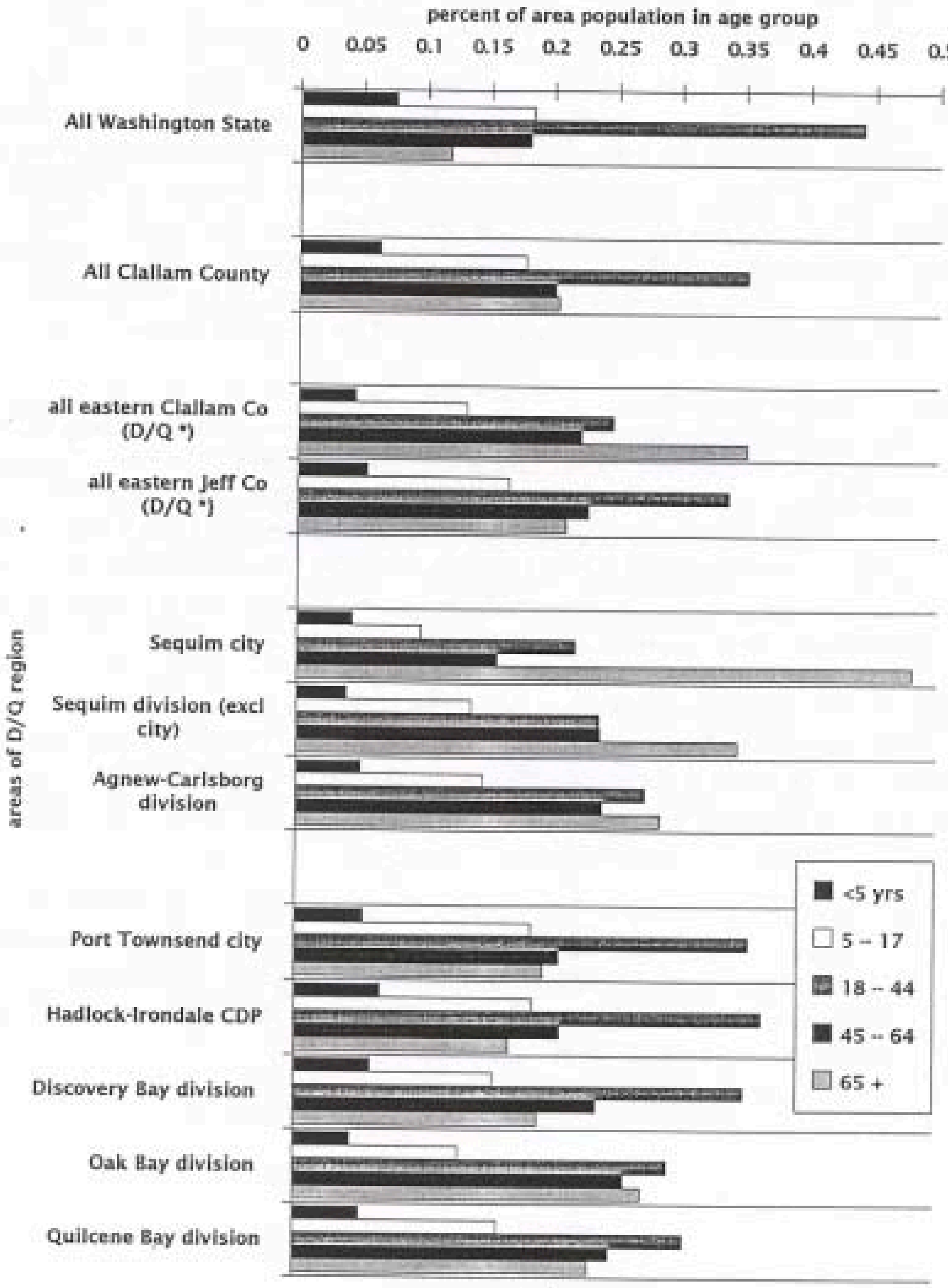
Age distributions of the population in sub-areas of the DQ region:

Differences in average age between populations of different parts of the DQ region are evident. The most obvious differences show up in areas that are considered as particularly attractive retirement locations. These differences will have some bearing on water uses, and perhaps also on attitudes toward water resource issues.

Figure 2.69 illustrates the population age distribution, by five age groups, for subdivisions of the DQ region that are definable using 1990 Census data. Several observations are interesting. Obviously, Sequim has a proportionately greater senior citizen population than other subdivisions. Compared to the All-Washington-State distribution, none of the DQ areas have as large a proportion of 18-44 age persons.

110 Peninsula Development Association. Overall Economic Development Plan (draft). June 1992.

Figure 2.69 Graph showing population age distributions for various sub-areas in DQ region, and for entire Clallam County and all of Washington State. (Data from 1990 census, Report 1990 CPH-1-49.)



Economic and employment base:

No concentration on economic and employment aspects of the DQ region has been included as part of the DQ project, because of time and resource allocation constraints. Reference materials are available for both Clallam and Jefferson counties.[111] Typically, however, such data do not provide detailed geographic breakdowns necessary to characterize just the DQ portions of the counties, and overall descriptions are misleading because of the large extent and diverse nature of the counties. More appropriate data may become available as growth management planning proceeds in the counties.

Lifestyle and recreational opportunities:

Outdoor recreation opportunities are a major feature of the Olympic Peninsula for its present inhabitants and for new arrivees. The combination of low population densities, and freedom from the traffic, crime, and pollution of developed metropolitan areas are magnets. For active recreation or just for scenery, the mountains, and fresh and saltwater bodies are widely known. The influx of retirees into the DQ region is probably largely based on the recreational and lifestyle advantages.

The attraction of the environment is not limited to residents. Tourism is currently considered as an important growth industry, in view of economic difficulties with historical economic pursuits. Many residents have reservations about marketing the recreational advantages of the area for enhancement of a tourism industry, versus attempting to keep the region uncrowded for local use.

A table that identifies important recreational activities accessible in the DQ region is included here, as Figure 2.70. This table has been developed by the DQ Recreation Caucus and widely discussed in planning meetings.

111 Some relevant documents include: (1) Peninsula Development Association. Overall Economic Development Plan (draft). June 1993; (2) Clallam County Economic Development Council. Investor's Guide to Clallam County. (undated); and (3) Economic Development Council of Jefferson County. Jefferson County Relocation and Investor's Guide. (undated).

Figure 2.70 Some current recreational activities utilizing the watersheds and water resources of the DQ region. (Chart prepared by the DQ Recreation Caucus).

Recreation:	Physical Activity Level	Need for Access or Facilities	Need for Roads or Trails
Freshwater fishing	Medium	Access	Trails
Saltwater fishing	Medium	Facilities	
Scuba diving	High	Access	
Kayaking, canoeing & rafting	High	Access on lower portions	Trails/roads
Motor/sail-boating, wind surfing	Medium	Parking and off loading	
Shell fishing	Medium	Access	
Gardening	Medium		
Golf	Medium	Facilities	
Swimming	High	Facilities	
Skiing, snow shoeing	Medium-High	Facilities	Roads/trails
Horseback riding	Medium	Access	Trails
Birding	Low-Medium	Access	Trails
RV/car camping	Low	Facilities	
Picnicking	Low	Access/Fac	
Hunting	Medium	Access	
Bicycling	High		Roads/trails
ATV	Medium	Access	Trails
Hiking, jogging, running	Medium-High	Access	Trails
Backpacking	High	Access	Trails
Photography	Low	Access	
Rockhounding	Low	Access	
Mycology, berry picking	Low	Access	
Scenic driving	Low	Access	

Impacts from human development and interventions

Consequences of settlement of the region:
The size of the pre-white-settlement Native population of the DQ region was relatively small. Considering the Dungeness area, for example, the arrival of settlers about 1850 displaced this native population through spread of new diseases and dispersal, and new activities associated with settlement began to impact the river system. Cutting of forests, both to clear land for settlement and farming, and to provide timber and lumber products for export undoubtedly began to impact river flows. Cutting of riparian buffers of old-growth trees and floating the cut timber down the Dungeness River must have begun, to degrade channel and bank conditions. By late in the 1800's settlement and land clearing had extended into the foothills, with homesteading in Happy Valley, on Burnt Hill, Lost Mountain, Texas Valley, and Palo Alto. A disastrous wildfire in 1890-91, reportedly started from land-clearing activities somewhere south and west of Sequim, destroyed over 45 square miles of Dungeness River watershed.

Similar historic impacts occurred in the Discovery Bay watershed. According to the river basin team report, the settlement and early economy of the area beginning in 1858 was centered around its timber resources, largely for export to the San Francisco Bay area. The old-growth timber was quickly logged, and the majority of the watershed was either harvested or burned by wildfire between 1880 and 1925 (the disastrous Snow Creek and Discovery Bay fires). Only about 1/6 of the forest was harvested again in the 40 years preceding the 1980's, but harvesting has accelerated greatly since the early 1980's. Agricultural and residential settlement has resulted in stream channel changes and in degrading of streams and wetlands by animal pasturing, road-building, and other encroachments of human development.

The upper portions of the Big Quilcene, Dungeness, and Gray Wolf river basins have been protected from development or logging, initially by inaccessibility, and then by establishment of Olympic National Park and the Buckhorn Wilderness of the Olympic National Forest. In some areas of the middle and lower portions of these river basins logging has been fairly intensive into the 1980's. Impacts on the streams have sometimes resulted from road building and hauling, from failure to leave riparian buffer zones, and from post-clear-cut exposure and saturation of unstable glacial drift deposits. In recent years improved forest practices and increased management of portions of the forests for habitat conservation and municipal watershed are working to minimize impacts on the surface water resources.[112]

The lower reaches of the Big Quilcene River have been impacted substantially by settlement, with dike-building, re-channeling of segments, and development impinging on the natural flood plain and channels.[113]

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[112] The Dungeness and Discovery Bay watershed characterization reports of the river basin team (referenced earlier) provide descriptions, tabular data and mappings showing forest status. Forest Plans and aerial photos provide more detail, and ongoing assessments of Big Quilcene and Dungeness will contribute new information.

[113] Collins, B. 1993.

Impact from irrigation diversions of the Dungeness River:
The construction and operation of irrigation diversions from the river, beginning with the first ditch system constructed in 1896, have had an impact on the lower 11 miles of the Dungeness, both in loss of instream flows and in entrapment of ocean-bound fish in unscreened irrigation ditches. (See Chapter 6, Map 6. 1.)

Five diversions provide water for the ditches of 5 irrigation companies and 4 districts. No records are available of diversion amounts until recent years. Monthly measurements by Drost for water year 1979 indicated an equivalent annual average diversion of 76 cfs, peaking at 155 cfs for June.[114] The monthly measured diversions in 1979 in cfs were:

	cfs		cfs
October	46	April	48
November	43	May	145
December	28	June	155
January	23	July	150
February	33	August	115
March	33	September	83

Recent data show that irrigation diversions have been reduced substantially since the Drost data were obtained.

Diversion of Big and Little Quilcene flows for municipal and industrial supply:
The Olympic Gravity Water System, constructed in 1928 by the City of Port Townsend,[115] diverts water from the Big and Little Quilcene rivers for use in the Port Townsend Paper Company mill at Glen Cove and for municipal use in Port Townsend and surrounding communities. A 36 inch diameter steel gravity-flow pipeline system carries the water from the Big Quilcene diversion dam at RM 9.3, past a Lords Lake reservoir, on to the City Lake flow-regulation reservoir, and ultimately to the mill and Port Townsend municipal uses. The diversion is active continuously, except during Big Quilcene storm flow which would introduce excessive turbidity. Water is diverted to a lesser extent at a diversion dam at river mile 7.2 on the Little Quilcene River (9.56 cfs water right) to augment storage in Lords Lake. The Lords Lake reservoir is used as an emergency water source during times of storm flow and excess turbidity in the river flows, and to help provide for summer peak demands. The water right for diversion amounts to approximately 30 cfs from the Big Quilcene and 9.5 cfs from the Little Quilcene. The largest share of the water is allocated for the paper mill operations under an agreement between the city and mill owners.

Diversion of river flows for hatchery operations:
River flows are diverted from the Big Quilcene and its tributary Penny Creek for the Federal fish hatchery at 2.7 RM on the Big Quilcene River. Flows are diverted from the Dungeness for

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114 Drost, B.W. 1983.

115 Parker, J. G. An Analysis of the Water Resource Management of the Big and Little Quilcene River Basins. 1984. Further information was provided during a DQ field tour of the Port Townsend Paper Mill, and in presentations during the Quilcene watersheds field tour.

the State hatchery at RM 10.5 on the Dungeness River. In both cases it is understood that the bulk of the water is re-introduced to the rivers downstream, after processing.

Diversion of Dungeness River flows for City of Sequim municipal supply: The city has a water right for diversion (of 1.4 cfs) from the Dungeness River near the hatchery. The water is taken primarily from a streamside infiltration gallery, supplemented by surface diversion, in the general vicinity of the fish hatchery, and is used in conjunction with a ground-water well-field for municipal supply.

Potential impacts never realized ... :

(1) A study by the Federal Bureau of Reclamation begun in 1946 and terminated in 1951[116] explored construction of a closed-pipe gravity water distribution system for irrigation of the Sequim-Dungeness area, as replacement for the system of open ditches. The system was designed for delivery of up to 180 cf; and calculated to be adequate for sprinkler irrigation of approximately 18,000 acres. An earth-fill diversion dam across the Dungeness River at approximately the location of the Agnew ditch diversion would have had a 260-foot-wide spillway section approximately 9 feet above natural river water level, with levee and diversion-works sections extending to the sides. Fish facilities would include screens and a fish ladder with 25 cfs flow and an 18" pipe into the fish ladder for downstream migration. Open canal sections would have fed small reservoirs located part way along the routes of Highland and Agnew ditches, from which the closed pipe system would distribute the irrigation water. An associated system of 5 drainage canals was proposed to provide for several thousand acres of land having poor drainage. One of the drains would flow to the Strait, two into Dungeness Bay, and two to surface streams. The largest would have consisted of modification of Matriotti Creek. The plan was abandoned because of local expressions of opposition to costs, to lack of adequate provision for year-round supply, and to proposed pooling of water rights.

(2) Explorations were undertaken in the early 1980's for hydropower development on the Big Quilcene River. Under consideration were modifications to the diversion dam to divert water into a pressure conduit to a powerhouse, from which it would be returned to the river. Initial estimates of production of up to 10 megawatts were based on a gross head of 850 feet.[117]

Structures on the major rivers: There are five major bridges spanning the Dungeness River downstream of the mountains: highway bridges at Hwy. 101 (RM 6.4), Old Olympic Highway (Burlingame Bridge at RM 4.0), Woodcock Road (Ward Bridge at 3.25), and Marine Drive (Schoolhouse Bridge at RM 0. 8 5); and a former railroad trestle/bridge now converted to a pedestrian bridge as part of RR Bridge Park at RM 5.65. In addition, a minor bridge spans a braided channel to Kincaid Island, three bridges span the Dungeness mainstem above Dungeness Forks, and one spans the lower Gray Wolf near the Forks.

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116 US Department of the Interior, Bureau of Reclamation. Sequim Project.

117 Parker, J.G. 1984.

Figure 2.71 Count of identified water wells as of mid 1993 in square-mile Sections of eastern Clallam County (N=3060)

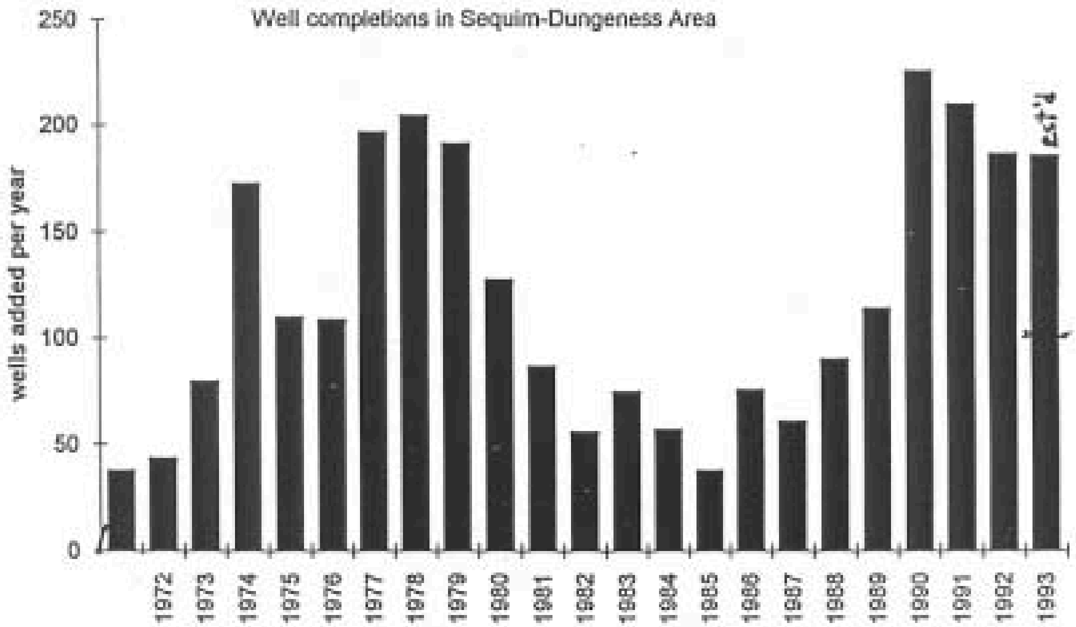
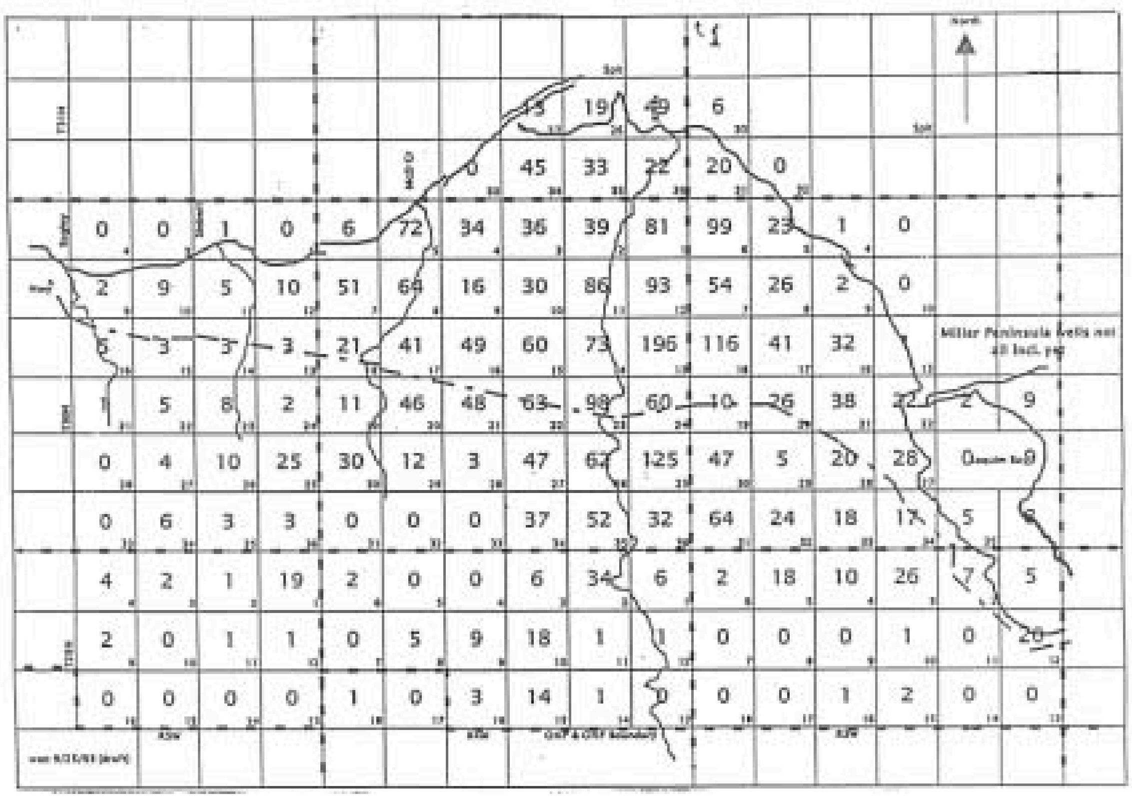


Figure 2.72 New water well completions in the Sequim-Dungeness area, by year.



Two major bridges span the Big Quilcene River: at the Highway 101 crossing near the hatchery, and the Linger-Longer bridge in Quilcene.

A number of dike structures have been constructed on the Dungeness: below the hatchery, at Dungeness Meadows, at the railroad bridge, and below Woodcock Rd. Dikes have also been constructed on the lower Big Quilcene River.

Ground-water withdrawals:

An inventory of water wells in the Sequim-Dungeness area[118] illustrates the rapid growth of residential and other uses of ground water in the area. Figure 2.71 illustrates the count of 3060 water wells, located by square-mile sections, identified in the database. Figure 2.72 shows the pattern of well completions in the years since 1971 when records were first required. The building boom of the late 1970's and the present expansion are obvious.

A similar inventory database for water wells in the DQ-region portion of Jefferson County has been undertaken by project staff. The initial analysis of the data is presented in Chapter 7 as Map 7. 1.

Summary

This characterization has provided a framework of descriptions, illustrations, and references to help focus continuing discourse on the DQ region and its water resources.

[118] Clark, W., and Soule, A. Characterization of the Water Wells of Eastern Clallarn County. September 1993. [Unpublished technical note presenting analysis from a computer-based database of water wells in the Sequim-Dungeness area that was developed in conjunction with the Sequim-Dungeness Ground Water Protection Project (Clallam County and Ecology) and the DQ project.]

Volume 1

Chapter 3

Water Use

Consumptive & Non-Consumptive

Chapter 3
Water Use

Chapter Overview

This Chapter addresses water resources and how they are used in the DQ Project area. Because the meanings of these terms were so critical to the decision-making related to water resources in the DQ Project the legal context of the term "beneficial uses" is described and the differences between consumptive, non-consumptive, and partially consumptive beneficial uses are further defined. This Chapter includes an overview of water use in the DQ Project area which pulls together information on water systems, agricultural and industrial water use, and population and water use projections. A conversion chart for water units is on the back page.

Background on "Beneficial" Uses

Under The Water Resources Act

The Water Resources Act of 1971 was established to promote "public health and the economic well-being of the state and the preservation of its natural resources and aesthetic values" through the proper utilization of the water resources. Water resource policy was developed:

> *to insure that waters of the state are protected and fully utilized for the greatest benefit to the people of the state of Washington and, in relation thereto, to provide direction to the department of ecology, other state agencies and officials, and local government in carrying out water and related resources programs.* t

Under this Act, RCW 90.54.020 *General declaration* of *fundamentals for utilization and management of waters of the state* defines the guidelines for utilization and management of these resources and defines *beneficial uses* to obtain the "maximum net benefits for the people of the state."

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1 Chapter 90.54 RCW WATER RESOURCES ACT OF 1971.

> *Uses of water for domestic, stock watering, industrial, commercial, agricultural, irrigation, hydroelectric power production, mining, ,fish and wildlife maintenance and enhancement, recreational, and thermal power production purposes, and preservation of environmental and aesthetic values, and all other uses compatible with the enjoyment of the public waters of the state, are declared to be beneficial.*

Some of the other elements of the Act delineate protection for: the natural environment, of base flows for perennial rivers and streams and for water quality.

Water Rights and Beneficial Uses

Under RCW *90.14.031 Water Rights, "beneficial use" shall include, but not be limited to, use for domestic water, irrigation, fish, shellfish, game and other aquatic* **life,** *municipal, recreation, industrial water, generation of electric power, and navigation,* basically the same definition as under RCW 90.54.020.

In the Dungeness River, where water rights were adjudicated in State Superior Count in 1924, *"water diverted from the river may be used only for the purposes of irrigation, domestic, and stockwater, " and* may not be put to uses other than those permitted. Further confusing the situation is the consideration of whether the water is being put to a *consumptive* or *nonconsumptive use.* These can both be beneficial uses, but are not always considered so.

General Understandings about Beneficial Uses

In using these definitions, the State indicates that anything that is not a waste of water is considered *beneficial,* but what is meant has not yet been narrowly defined. In same cases, this lack of definition has lead to confusion and the possibility of misuse of waters of the State. An example of this confusion is illustrated in the Dungeness basin by questions about the use of irrigation water for landscape ponds or golf courses under the existing water rights. This confusion has lead to long discussions and some recommendations by the RPG, though no resolution has been reached, because of the status of State laws and water rights.

Consumptive and Non-Consumptive Uses Defined

The following is an excerpt from the Key to Dept. of Ecology's *Water Rights Information System.* This section describes the affect of diversion or withdrawal on the source of supply.

Consumptive

1. Surface Water:

- Where there is a definite diversion of water from a surface-water source and, neglecting transportation losses, the full amount of the diversion is not returned directly to the original source body or any other surface-water body by means of a definite surface-water course, channel or pipe.

- Where there is a definite diversion of water from a surface-water source for a consumptive type of use such as: irrigation, domestic supply, etc.

2. Ground Water:

- All withdrawals shall be considered consumptive unless the full amount of the withdrawal is returned to the source aquifer(s). (Heat pump use will be consumptive if the water is not returned to the source aquifer(s) but is returned to some other aquifer(s). If the water is discharged to a surface drainage system, the use is also consumptive.)

3. Reservoir:

- Where there is a definite diversion of water from a reservoir for a consumptive type of use such as irrigation, domestic supply, etc.

- Where a reservoir stores water for a non-consumptive type of use such as: Hydroelectric power generation, etc; and where a nearly constant volume of stored water is not maintained in the reservoir under normal operating conditions. (This definition will include so called run-of-the-river hydro-plants.)

- Where a reservoir is normally filled once for a non-consumptive type of use such as: fish propagation, beautification, etc.; and where a nearly constant volume of stored water is maintained in the reservoir under normal operating conditions for that use. In most cases, outflow from the reservoir is approximately equal to the inflow.

Non-Consumptive

1. Surface Water:

- Where no water is diverted from the confines of the surface-water source area or channel.

- Where the waters used under a right pass over, through, or around an on-stream project structure without passing outside of the natural confines of the stream channel.

- Where the waters used under a right are diverted (effectively) at the upstream edge of a project structure and the full amount of the diversion (neglecting transportation losses) is returned to the same stream channel (effectively) at the downstream edge of the project structure.

- Where the full amount of the diversion from a surface water source (neglecting transportation losses) is returned to the same surface-water source no farther than 25 feet downstream from the point of diversion.

- Where the full amount of a diversion from a surface-water source is returned to the same source at any location upstream from the point of diversion (neglecting transportation losses).

Partially Consumptive

1. Surface Water:

- Where the full amount of a diversion from a surface-water source (neglecting transportation losses) is returned to the same surface-water source at a point farther than 25 feet downstream from the point of diversion.

- Where the full amount of a diversion from a surface-water source (neglecting transportation losses) is returned to another tributary source within the same drainage system.

- Where the full amount of a diversion from a surface-water source (neglecting transportation losses) is returned to another surface-water source outside the complete drainage system (to salt-water) in question.

2. Ground Water:

- Where the full amount of a withdrawal is returned to the same source aquifer(s).

Water Use Overview: Current and Projected Water Use in the Dungeness-Quilcene Project Area

This section is adapted from a study prepared for the Regional Planning Group by Cindy Young, DQ Project Research Staff. As the charts are the primary products of the study, text is mostly limited to explaining method, information sources, and sources of error. The information in this report varies in accuracy levels due to data sources and time constraints. The report has been reviewed in several drafts by the Technical Committee, however it may contain errors, omissions, or inaccuracies.

Thanks to Welden Clark, Technical Committee Co-Chair, Virginia Clark, Recreation Caucus, and Ann Soule, Clallam County Department of Community Development for reviewing early drafts and contributing valuable comments. Linn Clark, DQ Project Data Management Staff created the DQ Project area map and acreage counts, and Linda Newberry, DQ Project Coordinator helped clarify points and proofread. Comments from other Technical Committee participants were also included in this report. Thanks to the many water users who contributed information to this project. (CY)

Introduction

This water use study is a general overview of current and possible future demands on water resources in the Dungeness-Quilcene Water Resources Planning Project area. This overview report was intended to assist the RPG in their discussions on water resource management in the short term. Rather than a comprehensive inventory, the report was merely a starting point for further study, eventually to be incorporated into a regional water budget.

This section addresses many aspects of current water use: actual examples of water usage in the project area, generalized estimates of overall water use based on current and projected population, distribution of single domestic well users and water systems types, and water use by major water users such as industry and agriculture.

Information sources used in this overview include U.S. Census Data, County Planning Departments, Water Facilities Information, and Water Rights Information. Much of the water use information came from personal contacts with various water users. In order to be consistent, data from 1992 was used whenever possible.

Water Use Overview in Brief

The following tables summarize information discussed in more detail throughout this section.

Table 3.1: Water Use Summary By County
Estimates for 1992 in the DQ Project Area

	Surface Water Mil/Gal/Year	Ground Water Mil/Gal/Year	TOTAL Use Mil/Gal/Year
Clallam County			
Residential / Commercial	57	1045	1102
Agriculture	4277	121	4398
Hatchery	4136	239	4375
Clallam Total:	**8470**	**1405**	**9875**
Jefferson County			
Residential / Commercial	605	508	1113
Industrial	4850	0	4850
Agriculture	158	72	230
Hatchery / Fisheries	4024	257	4281
Navy	27	0	27
Jefferson Total:	**9664**	837	**10501**

Table 3.2: Summary of Residential Water System and Well Users
Percent of DQ Project Area Users From Each Group By County

	Group "A" Water System Users	Group "B" Water System Users	Single Domestic Well Users
Jefferson County	74%	2%	24%
Clallam County	58%	4%	38%

Population Distribution

Current population was based on 1990 Census data extrapolated to 1992 using growth projections from Clallam County Department of Community Development and Jefferson County Planning Department. Population data is broken down into 11 areas within Eastern Clallam County and 10 areas within Eastern Jefferson County. Population data is explained in more detail later in this section. Refer to Map 3.1: *DQ Project Sub Areas Map* and Table 3.3: *DQ Project Population Distribution and Density* for the area names and numbers used throughout this report.

The areas for Jefferson County have been used in planning for many years and are the basis of Community Planning Committees in recent Growth Management Planning efforts. The areas for Clallam County were based on a recent Growth Management transportation study. Ideally, the Clallam County areas used in this report would also be community planning areas rather than transportation planning areas. Community planning areas have been determined for Clallam County Growth Management planning, but census population data and growth projections were not available at the time of this study.

The area names listed may not be the only common names used for these areas. Readers may prefer to refer to the area numbers. The names are given for each area only for the convenience of readers who may not remember area numbers as easily.

Note: Clallam County area 8, "Central Sequim" represents previous Sequim City limits which have been outdated by recent Growth Management Act Urban Growth Area designations.

National Park land, National Forest land, and Department of Natural Resources land, as shown in Table 3.3, was subtracted from the total acreage count for each area. Acreage for Clallam County areas was calculated from the digital map in Map 3.1 using the DQ Project GIS. Acreages for Jefferson County were from a Jefferson County Planning Department report[2] minus DNR land acreage from the DQ GIS coverages. Acreage estimates are helpful for generalized comparisons of densities, but contain inherent inaccuracies because of the methods used.

[2] Cindy Peyser. Build-Out Report on the Optimum Land Use Map. 1992.

Map 3.1: DQ Project Population Sub Areas Map

Refer to Table 3.3 for Area names and numbers used throughout this report

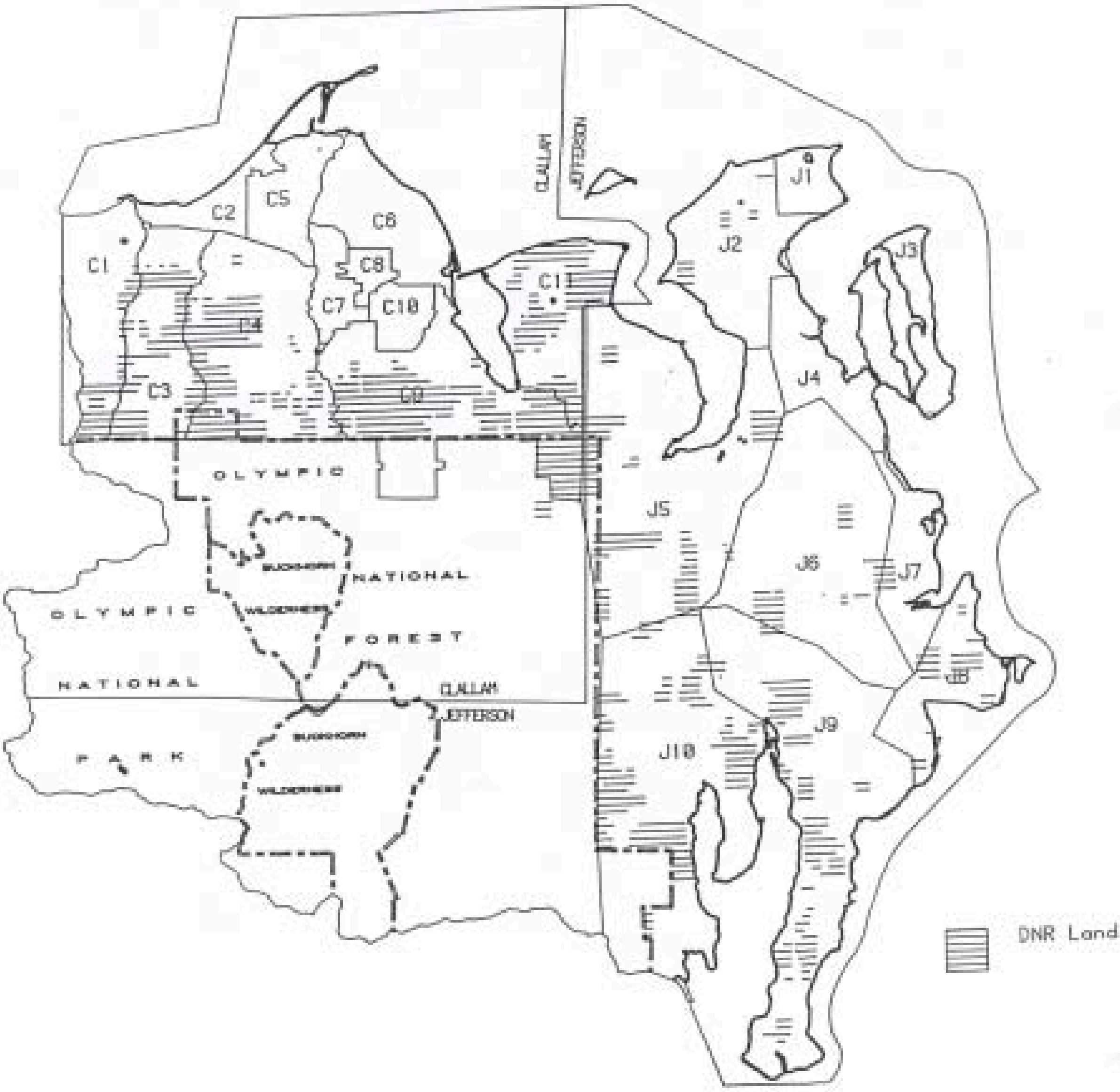

Table 3.3: DQ Project Area Population Distribution and Density

Acreage counts do not include Federal and DNR Forest Lands

	Area	1992 Population	Estimated Acres Private Land	Acres per Person
Clallam				
1	Fairview	1718	9837	5.7
2	Agnew/Spit	1132	3835	3.4
3	R Corner	774	6862	8.9
4	Lost Mountain	3230	12080	3.7
5	Carlsborg	1783	5684	3.2
6	Jamestown/WA Harbor	3251	9037	2.8
7	West of Sequim	2011	3272	1.6
8	Central Sequim	4096	1516	0.4
9	Blyn/Palo Alto	726	11147	15
10	Bell Hill	572	2843	5
11	Miller Peninsula	836	6768	8.1
County Total:			**20129**	**72881**
Jefferson				
1	Port Townsend		7530	44630.6
2	Cape George		2431	10681 4.4
3	Marrowstone Is		759	29543.9
4	Hadlock		3652	70611.9
5	Discovery Bay		923	21641 23
6	Chimacum		1163	21502 18
7	Port Ludlow		1444	55963.9
8	Shine		828	853810
9	Coyle		394	25493 65
10	Quilcene		1213	22067 18
County Total:			**20337**	**129996**
DQ Area Total:		**40466**	**202877**	

Examples of Residential and Commercial Water Use

A partial inventory of 1992 public water system data was undertaken to try to determine whether there were any distinct patterns of water usage (rural vs. urban, etc.) within the DQ Project area which could be the basis of water use estimates. Public Utility Districts, Cities, and some of the larger water systems were contacted for water use information. Early on in the inventory it became apparent that information on residential and commercial water use in the project area is limited because so many of the residents are on unmetered water systems or wells. In the end, it seemed safer to base water use estimates on a generalized daily per capita water use.

1. **Examples of DQ Area Residential** Use: Water systems listed in Table 3.4 show examples of the great variation of residential water use throughout the project area. The amount of residential water used in winter compared to summer use is shown to give a general sense of indoor and outdoor water use. Winter use could be considered to represent year-round indoor use. Summer use could represent outdoor irrigation in addition to indoor use. Household size for each system is estimated from Dept. of Health water system records.

   Some of the factors which may contribute to the variation include whether the area is rural, suburban, or urban; whether the system is metered and how customers are billed; water pressure, leaks, and other structural considerations; differences in accounting systems; parcel size and type of landscaping; climate and soil types; number of people per household; and types of water fixtures.

2. **Examples of Residential Use Outside the DQ Project Area:** It may be of use to compare the DQ area figures to others areas. A study in the late 1970`s concluded that the average American uses 77 gallons/capita/day for indoor residential water use[3]. No comparable studies for the average American outdoor residential use were found. Per person residential water use in the City of Port Angeles is 73 gal/capita/day in winter and 110 gallons/capita/day in summer.[4]

3. **Examples of DQ Area Commercial Water** Use: Table 3.5 shows examples of commercial water uses in the DQ area. Commercial water users are primarily centered in urban areas within municipal or PUD water service areas. Commercial generally includes any non-residential users on water systems or wells including businesses, restaurants, hotels, and churches.

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3 Brown and Caldwell. Residential Water Conservation Projects: Summary Report. 1984.
4 Polaris Engineering. 1993 Comprehensive Water Plan For the City of Sequim. 1993.

4. **Examples of Combined Residential and Commercial Use:** Table 3.6 shows examples of total daily per capita use including both residential and commercial use on the water system.

Table 3.4: Examples of Current Residential Water Use in the DQ Project Area

Includes primarily single family residences

Water System Name	# of Conn- ections	Est. household size	Winter Use gal/house/day	Summer Use gal/house/day	Avg. Use gal/house/day	
Clallarn PUD at Carlsborg		23	2.3	146	285	234
City of Port Townsend	n/a	n/a	138	278	n/a	
City of Sequim	890	3.3	146	327	208	
Clallam PUD at Fairview	808	3.5	179	373	244	
Sunland	565	1.9	224	643	n/a	
Solmar	231	3.2	n/a	n/a	349	

Table 3.5: Examples of Commercial Use in DQ Project Area

Water System	# of Connections	Use/Conn./Day
City of Sequim	304	958
Clallam PUD Fairview	24	981
Clallam PUD Carlsborg	4	836
City of Port Townsend	n/a	n/a

Table 3.6: Examples of Combined Commercial and Residential Use

Water Systems	gal/cap/day	
Hadlock service area	137	(EES, 1992)
City of Port Angeles	157	(Polaris, 1993)
City of Sequim	159	(Polaris, 1993)
City of Port Townsend	194	(EES, 1992)
Clallam PUD Fairview system	115	
Clallam PUD Carlsborg system	169	

Regional Water Use Estimates

Combined residential and commercial water use in this report is based on 150 gal/capita/day. This commonly used figure of combined residential and commercial users is used in Table 3.7 and Table 3.15: *Projected Residential and Commercial Water Use.* Refer to Table 3.6 for examples of actual variations from the 150 gal/cap/day generalization within the DQ Project area. Presumably, in urban areas, more of the 150 gal/cap/day would be used for commercial uses, and in rural areas, more of the water would be used for landscaping. Small-scale residential farm water use is also considered in Table 3.12: *Industry, Agriculture, and Other Water Users.*

Table 3.7: Estimated Current Residential and Commercial Water Use

Based on current population and 150 gal/capita/day throughout the DQ Project Area

Area	1992 Population	Estimated Use Mil./Gallons/Day	Estimated Use Mil./Gallons/Year
Clallam			
1 Fairview	1718	0.26	94
2 Agnew/Spit	1132	0.17	62
3 R Corner	774	0.12	42
4 Lost Mountain	3230	0.48	180
5 Carlsborg	1783	0.27	98
6 Jamestown/WA Harbor	3251	0.49	180
7 West of Sequim	2011	0.30	110
8 Central Sequim	4096	0.61	220
9 Blyn/Palo Alto	726	0.11	40
10 Bell Hill	572	0.09	31
11 Miller Peninsula	836	0.13	46
Clallam Total:	**20129**	**3.0**	**1102**
Jefferson			
1 Port Townsend	7530	1.13	410
2 Cape George	2431	0.36	130
3 Marrowstone Is	759	0.11	42
4 Hadlock	3652	0.55	200
5 Discovery Bay	923	0.14	51
6 Chimacum	1163	0.17	64
7 Port Ludlow	1444	0.22	79
8 Shine	828	0.12	45
9 Coyle	394	0.06	22
10 Quilcene	1213	0.18	66
Jefferson Total :	**20337**	**3.1**	**1113**
DQ Area Total:	**40466**	**6.1**	**2216**

Population on Water Systems

Water Systems Defined: Water system information in this report is based on the State Department of Health Water Facilities Inventory (WFI) Data Base. WAC 246-290 defines Group "A" and "B" water systems and outlines design, operations, and water quality requirements for the two types of systems.

- Group "A" water systems have 15 or more service connections, or serve an average of 25 or more people per day for 60 or more days a year. Group "A" systems are further broken down into community systems, and transient and nontransient noncommunity systems. Noncommunity systems include restaurants, taverns, motels, campgrounds, parks, schools, etc.

- Group "B" water systems have less than 15 connections and serve an average of less than 25 people each year.

In order to compare the population on water systems to the total resident population, the scope of this study was limited to finding the number of residential connections active more than 180 days a year, regardless of whether on a community or noncommunity system.

Possible Sources of Error: Population figures in the following charts are based on two different sources of information, and the accuracy may vary between areas. Total population is an estimate projected from census data, as explained in the *Population Distribution* section. Population served by water systems is based on individual water system manager's estimates of household size. These figures may not reflect actual household averages for each area.

Also, the location of water systems in the sub areas was generally determined from well location, while some systems may actually cross planning area boundaries.

Population figures for the following areas were altered: Port Townsend, Hadlock, Port Ludlow, and Central Sequim. The population estimates provided by the State Department of Health for the water systems in these areas exceeded the population estimates acquired from the County Planning Departments shown in Table 3.3: *DQ Project Population Distribution and Density.* Without this modification, these areas would have shown negative percentages for single domestic well users. Central Sequim system population and residential connections listed in Table 3.8 and 3.9 have been modified to reflect information from the Census on population per household.

Table 3.8: Water System Users: Group "A" and "B" Systems

Connections and Population include residential connections active more than 180 days/year

		GROUP "A" WATER SYSTEMS		(from DOH)	GROUP "B" WATER SYSTEMS		(from DOH)
Area	**Total Area Population**	**# of Systems**	**# of Connections**	**Population on "A" systems**	**# of Systems**	**# of Connections**	**Population on "B" systems**
Clallam							
1 Fairview	1718	1	336	775	0	0	0
2 Agnew/Spit	1132	3	249	460	7	27	69
3 R Corner	774	0	0	0	0	0	0
4 Lost Mountain	3230	9	590	1585	I2	55	139
5 Carlsborg	1783	7	360	964	7	26	63
6 Jamestown/WA Harbor	3251	19	1046	2336	18	97	251
7 West of Sequim	2011	5	307	686	I4	46	121
8 Central Sequim	4096	I	2272	4096	0	0	0
9 Blyn/Palo Alto	726	6	37	I01	6	2I	53
10 Bell Hill	572	2	44	115	4	16	42
11 Miller Peninsula	836	3	278	564	2	11	28
Clallam Total :	**20129**	**56**	**5519**	**11682**	**70**	**299**	**766**
Jefferson							
1 Port Townsend	7530	4	3083	7530	0	0	0
2 Cape George	2431	7	636	1472	10	35	90
3 Marrowstone Is	759	2	6	15	4	9	24
4 Hadlock	3652	2	1522	3650	2	1	2
5 Discovery Bay	923	7	152	332	3	2	5
6 Chimacum	1163	I	0	0	2	4	4
7 Port Ludlow	1444	2	72I	1398	6	19	46
8 Shine	828	4	169	405	9	42	99
9 Coyle	394	3	26	40	2	4	9
10 Quilcene	**1213**	**I3**	**36**	**95**	**15**	**50**	**I29**
Jefferson Total:	**20337**	**45**	**6351**	**14937**	**53**	**166**	**408**
DQ Area Total	**40466**	**101**	**11870**	**26619**	**123**	**465**	**1174**

Table 3.9: Residential Water Summary: Systems and Single Wells
Data Source: "Total Pop." from County Planning Census Data, System Population from DOH

	Area	Population on "A" Water Systems	% of Total Pop.-	Population on "B" Water Systems	% of Total Pop.	Est Pop. on Single Domestic Wells	% of Total Pop.
Clallam							
1	Fairview	775	45.1 %	0	0 %	943	54.9 %
2	Agnew/Spit	460	40.6 %	69	6.1 %	603	53.3 %
3	R Corner	0	0 %	0	0 %	774	100 %
4	Lost Mountain	1585	49.1 %	139	4.3 %	1506	46.6 %
5	Carlsborg	964	54.1 %	63	3.5 %	756	42.4 %
6	Jamestown/WA Harbor	2336	71.9 %	251	7.7 %a	664	20.4 %
7	West of Sequim	686	34.1 %	121	6.0 %a	1204	59.9 %
8	Central Sequim	4096	100 %	0	0 %a	0	0 %
9	Blyn/Palo Alto	101	13.9 %	53	7.3 %	572	78.8 %
10	Bell Hill	115	20.1 %Q	42	7.3 %	415	72.6 %
11	Miller Peninsula	564	67.5 %	28	3.3 %	244	29.2 %
Clallam Total:		**11682**		**766**		**7681**	
Jefferson							
1	Port Townsend	7530	100 %	0	0 %	0	0 %
2	Cape George	1472	60.6 %	90	3.7 %	869	35.7 %
3	Marrowstone Is	15	1.98 %	24	3.2 %	720	94.9 %
4	Hadlock	3650	99.9 %	2	0.05 %	0	0 %
5	Discovery Bay	332	36 %	5	0.5 %	586	63.5 %o
6	Chimacum	0	0 %	4	0.3 %	1159	99.7 %
7	Port Ludlow	1398	96.8 %	46	3.2 %	0	0 %
8	Shine	405	48.9 %	99	12 %	324	39.1 %
9	Coyle	40	10.2 %	9	2.3 %	345	87.6 %a
10	Quilcene	95	7.83 %	129	11 %	989	81.5 %
Jefferson Total :		**14937**		**408**		**4992**	
DQ Area Total:		**26619**		**1174**		**12673**	

Population on Single Domestic Wells

Estimated Single Domestic Well Users: The number of single well users in both Clallam and Jefferson County was estimated by subtracting the number of residents on Group "A" and "B" water systems reported to the Dept. of Health from the total census population figure for each area. The resulting information gives a general idea of the likely distribution of wells throughout the area.

A well log overview data base has recently been developed for Eastern Clallam and Jefferson Counties by Dungeness-Quilcene Water Resources Planning Project participants. It will soon be possible to cross-check these estimates by counting wells logged in each area.

Estimated Well Densities: Single domestic wells were estimated from the single well users estimates and assuming 2.3 people per household. All of these figures are estimations, so the final well densities likely has a substantial margin of error. However, total wells for each County in Table 3.10 are surprisingly close to the preliminary count of wells in the DQ Project well log overview data base.

Table 3.10: Estimated Total Wells and Well Density in the DQ Project Area
Single Domestic Wells based on Estimated Population on Single Domestic and household size of 23

Area		Wells Supplying Water Systems	Estimated Single Domestic Wells (based on 2.3 household size)	Estimated Total Wells serving Permanent Population	Approx. Acres Private Land	Wells per Acre
Clallam						
1	Fairview	1	410	411	9837	0.042
2	Agnew/Spit	12	263	275	3835	0.072
4	Lost Mountain	25	657	682	12080	0.056
5	Carlsborg	17	330	347	5684	0.061
6	Jamestown/WA Harbor	54	289	343	9037	0.038
7	West of Sequim	26	527	553	3272	0.169
8	Central Sequim	1	0	1	1516	0.0007
9	Blyn/Palo Alto	13	250	263	11147	0.024
10	Bell Hill	7	182	189	2843	0.066
11	Miller Peninsula	9	106	115	6768	0.017
Clallam Total:		**165**	**3014**	**3179**	**66019**	
Jefferson						
1	Port Townsend	0	0	0	4463	0
2	Cape George	17	379	396	10681	0.037
3	Marrowstone Is	5	316	321	2954	0.109
4	Hadlock	8	0.87	8.87	7061	0.001
5	Discovery Bay	11	256	267	21641	0.012
6	Chimacum	3	504	507	21502	0.024
7	Port Ludlow	17	0	17	5596	0.003
8	Shine	14	143	157	8538	0.018
9	Coyle	6	150	156	25493	0.006
10	Quilcene	28	440	468	22067	0.021
Jefferson Total :		**109**	**2188**	**2297**	**129996**	
DQ Area Total:		**274**	**5203**	**5477**	**196015**	

Industrial, Agricultural, and Other Water Users

There are many large water users in the DQ Project area. The scope of this study did not allow time to inventory users such as car washes, gravel operations, Laundromats, restaurants, etc. Most of these uses are considered to be included in the 150 gal/cap/day for combined commercial and residential use. However, a few specific large water users are listed separately.

The Port Townsend Golf Course, US Navy base on Indian Island, the Federal Fish Disease Lab, and Port Townsend Paper Mill are all served and metered by the City of Port Townsend Water System. Use figures for Hatcheries are for 1992, although use typically varies greatly A from year to year.

Figures for Clallam and Jefferson County irrigation are "best guesses" by members of each irrigation community. Figures quantifying Chimacum Valley irrigation water use are based on an estimate of typical pump capacity and use for the past several years by known irrigators[5]. Figures in Table 3.12 for irrigation water use in C1alIam County are based on the number of acres under irrigation in a normal recent year and general irrigation requirements. Commercial irrigation assumes 5500 acres under irrigation using an average of 1.25 acre feet of water per acre. Small farm water use assumes 5000 acres under irrigation also using 1.25 acre feet of water per acre.[6] Figures for Grey's Marsh and Waerhauser are based on pump capacity and typical watering patterns.[7]

Another method for calculating agricultural water use by water diversion measurements is not included in the figures in Table 3.12 or in overview Table 3.1, but is listed separately here in Table 3.11. The figures for water diverted in 1992 in Table 3.11 axe based on an average of measurements taken by the Jamestown S'Klallam Tribe.

Table 3.11: Alternative Figures for Sequim-Dungeness Irrigation Water Use

Assumes a 5 month irrigation season (approx. Apr. 15 - Sept. 15).Surface water use only.

	CFS	Mi1/Gal/Yr
Crop Requirements	44	4,276
Water Diverted in 1992	71	6,883
Total Allowed by Water Rights	581	56,326

5 Roger Short, Jefferson Conservation District. Personal communications. November 29, 1993.

6 Roger Schmidt, Water Users Association. Personal communications. January, 25, 1994.

7 Ann Soule, Clallarn County Water Quality. Memo to Cindy Young, DQ Research Staff. March 30, 1994.

Table 3.12: Industry, Agriculture, and Other Water Users
1992 or 1993 Water Use

County	Large User	Total Use Mil/Gallons/Year
Clallam		
	WDFW Upper Dungeness Hatchery	3420
	Sequim-Dungeness Commercial Farms	2240
	Sequim-Dungeness Small Farms	2036
	WDFW Hurd Creek Hatchery	955
	Grey's Marsh Farm	110
	Waerhauser Tree Farm	12
County Total:		**8773**
Jefferson		
	Port Townsend Paper Company	4850
	USFWS Quilcene Hatchery	4277
	Chimacum Valley Irrigation	230
	US Navy at Indian Island	27
	Federal Fish Disease Lab	4
County Total:		**9388**
DQ Area Total :		**18161**

Water Supply Source

Clallam Residential and Commercial: Almost all of Clallam County's 126 water systems serving residences in Clallam County use either a single well or several wells to supply customers. The only surface water source listed by Department of Health data is a recreational system on Sequim Bay. In 1992, 26% of the City of Sequim supply came from an infiltration gallery near the Dungeness River (counted as surface water in Table 2.13), and 74% came from wells[8].

Jefferson Residential and Commercial: Surface water users an the Port Townsend system include the 7530 residents in Port Townsend, 2983 residents in the Hadlock area, and approximately 511 people served by Jefferson County PUD in the Cape George area. Ground water used to occasionally supplement water from the Quilcene River for the Port Townsend water system during summer peaks in demand, is not included in Table 3.13. Other surface water systems include the Moa-Tel system in Discovery Bay, the Shulz system in Shine, and the Falls View Campground in Quilcene. An estimated 43 permanent residents are supplied by those spring-fed systems. The remaining 9278 residents are served by water systems supplied by wells or are likely single domestic well users. Individual surface water rights for domestic use in the planning area were not considered in this study.

Clallam Agriculture: Although at one time several hundred acres of irrigated farmland and 300 dairies used well waters[9], today most of the water used for both commercial and small farms comes from surface water diversions from the Dungeness River. Grey's Marsh and the Waerhauser Tree Farm are two notable exceptions included in Table 3.12.

Hatcheries: Hurd Creek Hatchery figures are based on the general assumption that one quarter of the total water used comes from wells and three quarters from Hurd Creek. 99.4% of the Quilcene Hatchery water use was from surface water in 1992, 75.27% from the Big Quilcene River, and 24.11 % from Penny Creek.[10]

Jefferson Industry: The Port Townsend Paper Mill, the US Navy base on Indian Island, and the Fish Disease Lab on Marrowstone Is. are all served by the Port Townsend system, and use surface water for a combined total of 4881 million gallons annually.

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8 Polaris Engineering. 1993 Comprehensive Water Plan For the City of Sequim. 1993.
9 Ann Soule, Clallam County Water Quality. Memo to Cindy Young, DQ Research Assistant. March 30, 1994.
10 Larry Tellas, NFH. Personal communications. March 2, 1994.

Table 3.13: Water Supply Source

County	Water Use	Surface Water Mil/Gal/Year	Ground Water Mil/Gal/Year	TOTAL USE Mil/Gal/Year
Clallam				
	WDFW Upper Dungeness Hatchery	3420	0	3420
	Sequim-Dungeness Commercial Farms	2240	0	2240
	Sequim-Dungeness Small Farms	2036	0	2036
	Clallam Residential / Commercial	57	1045	1102
	WDFW Hurd Creek Hatchery	716	239	955
	Grey's Marsh Farm	0	110	110
	Waerhauser Tree Farm	1	11	12
County Total:		**8470**	**1405**	**9875**
Jefferson				
	Port Townsend Paper Company	4850	0	4850
	USFWS Quilcene Hatchery	4020	257	4277
	Jefferson Residential / Commercial	605	508	1113
	Chimacum Valley Irrigation	158	72	230
	US Navy at Indian Island	27	0	2?
	Federal Fish Disease Lab	4	0	4
County Total:		**9664**	**837**	**10501**
DQ Area Total		**18134**	**2242**	**20376**

Future Water Use

Residential and Commercial: Projected residential water use depends on 1) projected populations, and 2) projected water use per capita. Assuming per capita water use is 150 gal/capita/day and the population grows as predicted by the Growth Management processes, the yearly water use for the DQ Area will eventually increase by 63% to 3612 million gallons per year in 2020. Demand for residential and commercial water use will be 9.89 million gallons per day in 2020, up from 6.06 million gallons per day in 1992.

Jefferson County Projection: Current and projected residential population information is based on a Planning and Building Department Study.[11] Overall County growth is projected by using a modified exponential growth rate based on 5.18% growth with an upper capacity limit of 45,000 by 2014. Overall growth rates vary yearly from 4.07% in 1993 to 1.05% in 2013. Projected populations, including 1992 population, are distributed to the 10 planning areas based on percentage patterns of building permit distributions. Population figures are adjusted here to match Clallam County's five year intervals and extrapolated to the year 2020.

Clallam County Projection: Current and projected residential population information is based on a transportation study by Clallam County Department of Community Development.[12] A growth rate for each 10 year period is determined for each of the 12 planning areas. The Central Sequim and West of Sequim areas are predicted to grow 2.6% until the year 2000 and 2.43% from 2000 until 2020. The rest of the Clallam County areas are predicted to have 1.3% growth until 2000 and 1.01% until 2020. Population figures for the Fairview area are estimated by halving figures for the planning area from Port Angeles to Siebert Creek.

Industry, Agriculture, and Other Large Users: There are too many unknowns to estimate future large user needs. However, the following are some general indications of future shifts in water use. While there are always economic uncertainties for industrial water users such as the Port Townsend Paper Mill, for an overview like this, one can only estimate industrial water use continuing at its current level for the foreseeable future. Proposed conservation measures will likely help the Clallam Irrigation community to use less water in the future. New large water users might include several new golf courses, a casino, and new recreation and tourism facilities.

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11 James Holland. Population Change in Jefferson County: The Next 20 Years. 1993.
12 Wendy Clark. Clallam County Population Projections (unpublished). 1993.

Table 3.14 DQ Project Area Population Projection
GMA Projections from Jefferson Planning and Clallam Dept. of Community Development

Area	1992	1995	2000	2005	2010	2015	2020
Clallam							
1 Fairview	1718	1737	1769	1784	1799	1890	1985
2 Agnew/Spit	1132	1176	1254	1319	1386	1456	1529
3 R Corner	774	804	858	902	949	996	1046
4 Lost Mountain	3230	3356	3580	3764	3958	4158	4367
5 Carlsborg	1783	1853	1976	2078	2185	2293	2409
6 Jamestown/WA Harbor	3251	3378	3604	3789	3985	4186	4397
7 West of Sequim	2011	2090	2229	2344	2465	2589	2719
8 Central Sequim	4096	4416	5020	5661	6383	7158	8027
9 Blyn/Palo Alto	726	755	806	847	891	936	983
10 Bell Hill	572	617	702	791	892	1000	1121
11 Miller Peninsula	836	869	927	975	1025	1077	1131
County Total :	**20129**	**21051**	**22725**	**24254**	**25918**	**27739**	**29714**
Jefferson							
I Port Townsend	7530	8144	9148	10037	10813	11434	11939
2 Cape George	2431	2952	3527	3862	4149	4215	4383
3 Marrowstone Is	759	865	982	1050	1090	1121	1155
4 Hadlock	3652	4146	4954	5671	6296	6795	7318
5 Discovery Bay	923	972	1025	1056	1074	1089	1105
6 Chimacum	1163	1291	1433	1517	1565	1604	1645
7 Port Ludlow	1444	1934	2733	3440	4059	4552	5069
8 Shine	828	984	1156	1257	1315	1362	1412
9 Coyle	394	431	472	495	509	520	532
10 Quilcene	1213	1344	1489	1574	1624	1663	1705
County Total:	**20337**	**23063**	**26919**	**29959**	**32494**	**34355**	**36263**
DQ Area Total:	**40466**	**44114**	**49644**	**54213**	**58412**	**62094**	**65977**

Table 3.15: Projected Residential and Commercial Water Use

Based on GMA population projections and 150 gal/capita/day Figures rounded

	Area	1992 Use Mil/Gal/Year Mil./Gal/Year	2000 Use Mil./Gal/Year	2010 Use Mil/Gal/Year	2020 Use
Clallam					
1	Fairview	94	97	98	110
2	Agnew/Spit	62	69	76	84
3	R Corner	42	47	52	57
4	Lost Mountain	180	200	220	240
5	Carlsborg	98	110	120	130
6	Jamestown/WA Harbor	180	200	220	240
7	West of Sequim	110	120	130	150
8	Central Sequim	220	270	350	440
9	Blyn/Palo Alto	40	44	49	54
10	Bell Hill	31	38	49	61
11	Miller Peninsula	46	51	56	62
County Total :		**1102**	**1244**	**1419**	**1627**
Jefferson					
1	Port Townsend	410	500	590	650
2	Cape George	130	190	230	240
3	Marrowstone Is	42	54	60	63
4	Hadlock	200	270	340	400
5	Discovery Bay	51	56	59	60
6	Chimacum	64	78	86	90
7	Port Ludlow	79	150	220	280
8	Shine	45	63	72	77
9	Coyle	22	26	28	29
10	Quilcene	66	82	89	93
County Total:		**1113**	**1474**	**1779**	**1985**
DQ Area Total :		**2216**	**2718**	**3198**	**3612**

USGS Summary of Ground- and Surface-Water Use

Table 3.16: Summary of Ground- and Surface-Water Use in Clallam and Jefferson Counties All values in millions of gallons per day[13].

	CLALLAM COUNTY			JEFFERSON COUNTY		
	GW	SW	CU	GW	SW	CU
Public Water Supply (*)	5.91	0.98	--	0.41	13.2	--
Industrial Self-Supply	0.03	0.01	--	0.00	0.00	--
Commercial Self-Supply	0.11	0.06	0.15	0.08	0.00	0.03
Mining	0.04	0.05	0.01	0.04	0.00	0.01
Irrigation (*)	0.43	42.0	17.1	1.71	0.30	1.25
Livestock	0.15	0.06	0.17	0.07	0.00	0.05
Domestic Self-Supply	1.72	0.00	0.90	0.55	0.00	0.36

GW=ground water withdrawal
SW=surface water withdrawal
CU=consumptive use
* = reasonably accurate, all other values estimated by indirect methods

[13] USGS. A Plan of Study for the Ground- and Surface-Water Resources, the Dungeness-Quilcene Water Resource Pilot Planning Project. 1994.

Water Unit Reference

Table 3.17: Conversion Chart

Multiply:	**By:**	**To Obtain**:
Acres	43,560	Square Feet
Acres	43,560	Cubic Feet
Acre-Feet	325,851	Gallons
Cubic Feet/Second	0.646317	Million Gallons/Day
Cubic Feet/Second	448.831	Gallons/Minute
Gallons	0.1337	Cubic Feet
Gallons/Minute	0.002228	Cubic Feet/Second
Million Gallons	3.06933	Acre-Feet
Million Gallons/Day	1.547228	Cubic Feet/Second
Million Gallons/Year	0.0042389	Cubic Feet/Second
Square miles	640	Acres
Divide:	-B y:	To Obtain:
Gallons	325,851	Acre-Feet

Volume 1

Chapter 4

Information Resources
Habitat Projects

Chapter 4
Information Resources and Habitat Projects

Chapter Overview

This is a resource chapter which lists information which was compiled, analyzed, created, or inventoried for Regional Planning Group efforts. Much of the information was organized into the DQ Project library and also was used to create Chapter 2: *Characterization of the Dungeness Quilcene Project Area and Its Water Resources.* These information resources became increasingly important to the Regional Planning Group throughout the planning process.

The Chapter begins with a summary of the types of information collected throughout the process for the DQ Project library. Specifc studies and reports from the library which were created by consultants, agencies, or committee members for the DQ Project are each listed and briefly described. Inventories of the library stream flow data collection and a separate inventory of recent habitat projects in the DQ Project area conclude the Chapter.

Future information needs and data gaps are more thoroughly discussed in the strategies and recommendations for research and data management in Chapter 9: *Technical Support.*

The following is a list of some of the agencies and organizations referred to in this chapter: Hood Canal Salmon Enhancement Group (HCSEG), the Jamestown S'Klallam Tribe (JKT), Jefferson County Conservation District (JCCD), North Olympic Salmon Coalition (NOSC), Point No Point Treaty Council (PNPTC), Washington Department of Ecology (Ecology), Washington Department of Fisheries and Wildlife (WDFW), Wild Olympic Salmon (WOS), U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS), U.S. Soil Conservation District (SCS). These are abbreviated throughout this Chapter.

Information Resources and Habitat Projects 4.1

DQ Project Library Summary

The DQ Project Water Resources Library was created, at the request of the Technical Committee and the Regional Planning Group to: 1) Collect existing information on water resources in the region; 2) Collect information on other planning processes; 3) Make that information easily accessible to project participants and staff by organizing it in a central location and providing staff support. *The DQ Project Water Resources Library is located at the Jamestown S'Klallam Tribal Administration Building in Blyn, Washington.*

Information collection began in Summer of 1992, with more thorough organization in Winter of 1993. At first staff spent considerable time searching out information from participating agencies and from other organizations outside the area. As more DQ Project participants became familiar with the library, more and more new materials were contributed by project participants. At the time of printing, the DQ Library filled over 21 feet of linear shelf space.

The types of materials in the DQ Project Water Resources Library include books, reports, plans, committee working papers, data sheets, current events articles, newsletters, pamphlets, videos presentations to the RPG and Technical Committee, audio tapes of RPG meetings, USGS maps, and maps produced from the DQ GIS. Individual materials are grouped by general subject. Within each general subject, some materials are large enough to stand on their own and other smaller or unbound materials are grouped into topic notebooks. Research Support Staff compiled and updated a library bibliography which lists all materials in the library. The library bibliography and instructions on how to use the library were made available to RPG members, Technical Committee members, and members of the public for individual research. The library has also been a valuable resource for staff support of County work group meetings and the writing of this plan.

The following briefly summarizes the information collected for the DQ Project Water Resources Library. Some types of information which were of particular interest to the DQ Project are described in more

1. Hydrogeologic Characterization

This section contains primarily technical information on surface water, ground water, precipitation, and hydraulic continuity. Flow data for DQ Project area streams and ditches was collected and compiled in one notebook (See flow data inventory section, this Chapter). Several reports characterizing stream-flows in DQ Project area streams are included. DQ committee working papers add to the base of information (see *Studies by Technical Committee Participants,* this Chapter). A series of USGS technical manuals outline procedures for data collection from stream gages and two USGS reports evaluate Washington strearnflow data collection.

There is a small amount of precipitation data in the library including a committee working paper (see *Studies by Technical Committee Participants,* this Chapter) and some local precipitation data. There are several examples in the library of USDA SCS water supply outlook reports which are available regularly.

Information relating to ground water includes soils, geology, and general geographic characterizations. SCS soil surveys have been published for both counties. For Jefferson County, a 1981 Ecology report is the primary source on hydrogeology, and a study by Jefferson PUD, (draft) has additional geologic information relating to water supply. In Clallam County, a 1983 USGS water resources study and cross-sections developed for a recent Clallam County ground-water quality study are some of the primary hydrogeologic information available at this point. Much of this was compiled as a handout for the RPG field trip focusing on ground water.

Several committee working papers and agency reports address hydraulic continuity and ground water vulnerability. Other information includes characterizations of geography and specific river systems in committee papers, coastal shore-drift analysis reports, and general statewide characterizations of ecoregions and hydrology.

2. Fish and Wildlife

Fisheries information includes salmon utilization of streams, the relationship of habitat to fish production, and fisheries management.

Fish utilization and status sources include a 1975 Dept. of Fisheries Washington stream catalog, the 1992 salmon and steelhead inventory, and some additional information in recent reports. The library also contains some stream survey data. Recent and current studies are described in detail later in this chapter. Instream flow studies of varying types have been completed for nearly all streams and rivers in the DQ Project area. A small amount of miscellaneous information has also been collected on shell fish. (JKT has a considerable amount of information on shell fish and related issues.)

3. Habitat

The Habitat section includes information on the river channel structure and riparian and wetlands functions and values. Reports, studies, evaluations, opinion papers, and permits were compiled on gravel traps, aggradation, and sediment transport, primarily for the Dungeness River. Plant association reports cover the Olympic National Forest and the Dungeness watershed. Most of the rest of the information is general in nature, including guidelines and manuals on habitat restoration, values, functions, and management.

4. Water Quality

The Water Quality section includes studies on DQ Project area seawater intrusion, local watershed action plans, educational materials on water quality, and policy and technical reports of state-wide and national scope.

5. Land Use and Management

The Land Use and Management section contains information on best management practices, local forest management plans, population projections for the DQ Project area, and Growth Management planning discussion papers.

6. Agriculture and Irrigation

The Agriculture and Irrigation section includes information specific to the Sequim-Dungeness irrigation systems, and general irrigation information. This includes historical and current newspaper articles, water right certificates, ditch flow records, miscellaneous information on adjudication, and studies on the relationship between leakage and ground water. General information includes demonstration projects, case studies, guidelines, and discussion papers on irrigation conservation.

7. Conservation and Water Reuse

Several manuals geared to the general public, decision makers, and/or utility managers describe techniques and planning options for conservation. Information on storage consists of design options for cisterns and a large-scale storage feasibility study done by the Bureau of Reclamation in the early fifties. The library has a small but growing set of information on water reuse options, case studies, and regulations.

8. Education

The library has a variety of general water resource educational information including pamphlets, brochures, classroom manuals, and catalogues of programs. The DQ Project has also acquired a series of educational software which explain waste-water treatment, drinking water, water conservation techniques, the hydrologic cycle and general hydrogeology, and agricultural best management practices.

9. Water Law

The Water Law section is made up of legislation, water rights information, court rulings, and various policy and issues papers related to water laws. Washington State legislation collected for the library includes WAC's, RCW's, acts and housebills related to water resources and water quality. Water rights source materials include listings for all DQ Project area water rights and water claims from Ecology's Water Rights Information System, and certificates of water rights with lowflow provisions. Adjudication rulings, briefs, memos, and newspaper articles relating to court cases on water rights in Yakima, Sinking Creek, and the Dosewallips were collected for the library. (See 6. *Agriculture and Irrigation* section for information on SequimDungeness irrigation water rights.)

10. Planning, Policy, and Government

Government processes, programs, and management are in this section, including information on collaborative and coordinated planning case studies, techniques, and conflict resolution. Wild and Scenic river designations, ground-water and flood management, and information on the coordination of programs (such as Growth Management with

Coordinated Water Supply Planning or Shoreline Management Act) and Ecology's Trust Water Rights program make up the remainder of this section.

11. Data Management

The Data Management section contains information on the Data Management Task Force activities, Census data guides, and many case study articles on how to use GIS and data bases as decision support systems for water resources.

12. Plans and Studies Within the DQ Project Area

This section is a collection of dozens of reports, plans, and studies done within the DQ Project area. It includes watershed management plans, comprehensive plans, characterization and assessment reports, flood control plans, and other local works. These have provided valuable reference materials on water resources and existing programs and recommendations.

13. Processes Similar to Pilot Project

Processes similar to the Chelan process, either in scope or in structure, were researched in the early stages of the DQ Project. The library includes studies, plans, programs, and case study descriptions for projects in British Columbia, and throughout the western states.

14. Chelan Agreement Planning

The library includes meeting notes, technical and policy papers, and background information on the Dungeness-Quilcene Project, the Methow Valley Pilot Project, and the Water Resources Forum.

15. Video Tape Library

Educational "focus sessions," consultant projects, and Technical Committee research presentations were all video-taped by DQ Project staff or Chimacum High school students. The most popular video set is the DQ/USFS film of helicopter flights over the rivers, streams, and shorelines in the DQ Project area. The library also includes general water education tapes and tapes describing other watershed planning projects.

Listing of DQ Project Studies

This section is divided into studies funded by the DQ Project, studies funded by participating agencies, and studies undertaken by Technical Committee participants.

A. Studies Funded By the DQ Project

The Technical Committee identified a list of short-term studies which filled critical gaps in the existing information. The following studies were funded by the Regional Planning Group and completed in 1993. See Chapter 13: *RPG Committees,* for more information on the selection process. "Fact Sheets" on each of these are available in the DQ Project library.

A-I. **Dungeness River Irrigation Ditch Leakage Assessment:** Montgomery Water Group (MWG) conducted this study with the cooperation of Roger Schmidt, the Water Users Association, and ditch managers from each of the ditches in the system. MWG conducted flow measurements to quantify seepage from main ditches into shallow aquifers. The final report lists potential water conservation measures and addresses potential impacts from conservation on ground water, streams, and wetlands.

A-2. **Preliminary Assessment of Seawater Intrusion in Coastal Water Wells in Eastern Clallam and Jefferson Counties:** Dr. Robert Forbes inventoried wells previously tested by the U.S. Geological Survey for chloride, and other wells throughout the project area. CH2M Hill managed the project and coordinated the well testing team of Blaine Ebersold of CH2M Hill, Chuck Lehotsky and Kirk Sinclair from Ecology, and Ann Soule of the Clallam County Water Quality Department. The report identifies areas of potential risk of seawater intrusion.

A-3. **Sediment Transport and Deposition in the Lower Big Quilcene River and Evaluation of Planned Gravel Removal For Flood Control:** Brian Collins gathered existing data and resurveyed U.S. Army Corps of Engineers cross sections for this analysis and evaluation study. Peter Bahls of PNPTC assisted with the scope of work. Al Latham of JCCD assisted with the field surveys. Funding for this study was provided in part from the HCSEG.

A-4. Instream Flow Recommendations For the DQ Area Salmon and Steelhead Streams: Joe Hiss of USFWS used the Toe Width Method to measure stream width to estimate stream flows for optimum fish habitat. Cooperators included the Jamestown and Port Gamble S'Klallam Tribes, PNPTC, USFS, USGS, NMFS, Ecology, and WDFW.

A-5. The Status of Anadromous Fish Stocks in the Streams of Eastern Jefferson County, Washington: Jim Lichatowich of Alder Fork Consulting discussed the salmon stock concept and life histories as related to genetic diversity and harvest management strategies. The report centers on an overview of the abundance of Pink, Chum, Chinook Salmon, Steelhead and Cutthroat runs in recent years. A variety of sources were used in the report including published data, personal interviews and other community-based information.

A-6. Plan of **Study for the Ground- and Surface-Water Resources of the DQ Area:** Henry Bauer of USGS inventoried existing hydrogeologic information for the project area, identified data needs, and created a work plan for a comprehensive water resource study. The report covers objectives for the study, water quantity and quality information needs and methods, costs, and timelines for suggested work. The results of the proposed 5-year study would provide information on both surface and ground water resources in the region to assist long term regional water supply planning, water rights processing, and land owner decision-making. (For more detail, see also the Proposed Data *and Research Projects* section in Chapter 9: *Technical Support.)*

A-7. Stream and River Gage Installation and Data Collection: Tom Higgins of USGS installed a total of 12 gages throughout the DQ Project area. Site selection considered both fisheries concerns and hydrogeologic information needs. A continuous-record gage was installed on the Dungeness River at the old Railroad bridge. Staff gages were installed on the Quilcene River at the Port Townsend diversion and below the Hatchery diversion, and a wire-line gage was hung from the Highway 101 bridge just below the Hatchery. On Chimacum Creek staff gages were installed on the Main Stem at Irondale Road, lower West Fork at Chimacum High School, and the upper West Fork at West Valley Road. Other gaging sites are Salmon

Dungeness-Quilcene Water Resources Management Plan

Creek at West Uncas Road, Chevy Chase Creek at South Discovery Road, Ludlow Creek above Falls, Shine Creek below State Highway 104, Thorndike Creek at Dabob Road, and Donovan Creek. USGS measured flows monthly from July 1993 through January 1994 and also measured flows in April 1994 at each of the gage sites. Local volunteers were assigned to each gage to take readings between USGS visits. USGS developed stage/discharge relationships to include gage-height data from volunteers. (Funding to continue the flow measurement program is needed.)

A-8. Well Log Data Base: The well log data bases allow general overview analysis, giving insight into development patterns. These may also be used to screen well logs for more in-depth hydrogeological study. Information includes number and location of all logged wells, time of drilling, altitude of well head and depth of well and rated flow with no lithology included. Ann Soule of Clallam County Water Quality Dept. and Welden Clark began entering information from Dungeness area well logs for their work on the Dungeness River Area Watershed Committee. The DQ Project hired staff to complete data entry on well logs for Eastern Clallam County, and to create a comparable data base for Eastern Jefferson County. A preliminary analysis of water wells has been created for both Jefferson and Clallam Counties.

A-9. USFS Flyover Videos: The USFS Quilcene Ranger District filmed helicopter flights over area rivers and creeks, funded in part by the DQ Project. Videos are available for RPG and community members on Dungeness and Quilcene Rivers and tributaries, Little Quilcene River, Chimacum, Jimmy Come Lately, and McDonald Creeks. Also, Marrowstone and Indian Islands coastlines were filmed.

B. Studies Funded Recently By Participating Agencies

In addition to the studies funded by the Regional Planning Group, studies were funded recently by participating agencies which have been useful to the RPG.

B-1. Dungeness River Pink and Chinook Salmon Historical Abundance, Current Status, and Restoration: Jim Lichatowich was commissioned in 1992 by the JKT in preparation for the DQ Project.

B-2. The Status of Pacific Salmon Stocks in the Quilcene Ranger District: Jim Lichatowich was commissioned by the USFS 1993. The study includes several DQ area streams in Clallam County not in the scope of the East Jefferson County study.

B-3. Oral History of Dungeness River Salmon: Jim Lichatowich was commissioned in 1993 by the JKT to record Dick Goin's observations of the Dungeness fishery over a period of five decades.

B-4. Review of the Influence Exerted by Environmental Factors on Spring Chinook Salmon in the Dungeness River: Jim Lichatowich was commissioned in 1993 by the JKT to study the relationship of environmental factors such as river flow peaks, minimums, average flows, and precipitation on salmon abundance.

B-5. East Jefferson County Groundwater Characterization Study: Economic and Engineering Services and Pacific Groundwater Group were commissioned by Jefferson County PUD in 1993 for this study.

C. Studies By Technical Committee Participants

Technical Committee discussions spurred a number of participants to research specific topics for presentation at Committee meetings or RPG meetings. Contributors for these "discussion papers" included: Welden Clark, Technical Committee co-chair, Virginia Clark, Recreation Caucus member, Pat Wennekens, Environmental Caucus member, Ann Soule, Clallam County Water Quality Dept., and Cindy Young, DQ Project Research Staff.

C-1. Description of the Big Quilcene River and Tributaries: Description of landmarks of the entire Big Quilcene system by river miles. W. Clark and V. Clark, September 1992.

C-2. An Overview of the Water Resources of the DQ Project Area: A first cut at quantifying the water "budget" of the project area for early Regional Planning Group discussions. W. Clark and V. Clark, March 1993.

C-3. **Sedimentation Ecology as it Applies to Salmonid Spawning and Development:** Summarization of sediment movement principles and gravel sizes for salmon spawning requirements. P. Wennekens, April 1993.

C-4. **Dungeness River Daily Flows and Bedload Estimates:** Estimation of bedload by year based on flow/transport relationships developed by Northwest Hydraulic Consultants. W. Clark, April 1993.

C-5. Technical Note on Hydrologic Cycle - Hydraulic Continuity -Water Budget: Additional general hydrogeologic information compiled to built on the March Water Resources Overview. P. Wennekens, May 1993.

C-6. Terrain Modeling of the Dungeness River System: Examples of three-dimensional water shed quad maps derived from elevation data. W. Clark, and V. Clark. June 1993.

C-7. Hydraulic Continuity - Focus on Sequim Valley Drainage: Summarization of hydraulic continuity terms, and principles and areas by hydraulic continuity classification based on geology. P. Wennekens, June 1993.

C-8. Hydrologic Cycle - Infiltration / Hydraulic Continuity, A Look at Some Basics: Hydrologic cycle basics and summarization of information on water movement in soil. P. Wennekens, June 1993.

C-9. Notes on the Dungeness River System ...Flows and Precipitation: An exploration of the relationship of flow data, snow pack, and precipitation data to regional climate. W. Clark, July 1993.

C-10. Characterization of the Water Wells of Eastern Clallam County: Preliminary results for the Sequim-Dungeness area from the DQ Project well log data base. W. Clark, and A. Soule. September 1993.

C.11. Graveling the Dungeness: Discussion of the historical gravel environment of the Dungeness River including human's influence. P. Wennekens, November 1993.

C.12. An Overview of Regional Climate and Weather Information Relevant to the Northeast Olympic Peninsula: This outline summarized research collecting data on precipitation, wind, stream flow, and satellite weather patterns showing the degree of variability and the lack of predictable patterns to water quantities. W. Clark, and V. Clark, December 1993.

C.13. Comparison of Recommended Flows to Recorded Flows for Streams of Eastern Jefferson County: Preliminary comparisons of recorded stream flow data to recommended flows for optimum fish production from the USFWS study (Hiss, 1993) for Chimacum Creek and Little Quilcene River. Also included preliminary inventory of water right quantities and flow data for the whole DQ Project area. C. Young, November 1993.

C.14. Comparison of Recommended Flows to Recorded Flows for Streams of Eastern Clallam County: Preliminary comparisons of recorded stream flow data to recommended flows for optimum fish production from the USFWS study (Hiss, 1993) for most Clallam County streams. C. Young, March 1994.

C.15. Characterization of the Dungeness-Quilcene Region and Its Water Resources, Chapter 2, DQ Plan: Summarization of much of the available information on the physical environment of the N.E. Olympic Peninsula, including information created by the DQ Project Technical Committee. The final version of this document comprises Chapter 2. W. Clark, June 1994.

C.16. Water Use Overview: Current and Projected Water Use in the Dungeness-Quilcene Project Area, Chapter 3, DQ Plan: Compilation and analysis of data on population projections, water systems, agriculture and industry water use, single domestic well use, and water sources. Also, a partial water use inventory is included. A final version of this report is included in Chapter 3: Water Use. C. Young, June 1994.

Inventory of Planned and Recent Habitat Studies and Projects

The studies and projects described below add to the body of knowledge about our watershed. In some areas, a great deal of work has been done (such as the Dungeness River), while other areas remain data-poor, calling for comprehensive work in the future. Some of the studies described here are referenced in Appendix A: *References.*

This section is divided by county. Within each county section, projects are grouped by whether the projects are primarily assessment studies,
habitat protection, or restoration and enhancement projects.

- **Watershed assessment** is a problem analysis process to develop and document a scientifically-based understanding of the processes and interactions occurring within a watershed. Components of habitat problem assessments can include hydrogeological and/or biological study and analysis.
- **Habitat protection** is an action taken or a decision made that protects the physical and/or biological environment in a watershed.
- **Habitat restoration** is an action taken to correct specific problems identified through watershed analysis or other full watershed inventory process.
- **Fisheries or habitat enhancement** is an action taken to create conditions in the physical or biological environment that will optimize survivorship of the population in question.

Eastern Clallam County Projects

A. Habitat Assessment

A-1. Dungeness River Habitat Analysis:

- <u>Channel Problem Definition</u>: In 1992 the JKT commissioned a study by Jack Orsborn and Steve Ralph to assess available information and define problems in the Dungeness River basin system. In 1993, phase 2 of the Tribe's study included monitoring channel stability in the lower 10 miles of the river. This has included assessing gravel scour and deposition and potential impacts to chinook and pink salmon redds.

- Stability Assessment: As part of Clallam County's Jobs for the Environment grant, the County will compile new cross sections of the Dungeness River channel in the winter of 1994-95 to assess stability.
- Habitat Inventory: In 1994, the USFS and the JKT are building on previous studies by conducting a comprehensive habitat inventory in the Dungeness River System. The inventory will assess habitat features, temperature, and channel analysis, particularly in the lower 9 miles. The JKT received a Jobs for the Environment grant in 1994 to assist the inventory project. NOSC has also contributed to this project.
- Erosion and Culvert Inventory: In the spring of 1995, Clallam County under the Jobs for the Environment grant will conduct an inventory of erosion sites and culverts on the Dungeness River in order to determine priorities for restoration work. WDFW will also be involved in the inventory work.

A-2. Ambient Monitoring Project: Starting in 1993 and continuing in 1994, the PNPTC with funding from the Centennial Clean Water Act Program will conduct fish habitat inventories, and temperature, sediment, and macroinvertebrate sampling in Siebert, McDonald, and Salmon Creeks.

A-3. Stock Analysis Studies:

- Dungeness Stock Status: Jim Lichatowich was hired by the JKT in 1992 to assess Dungeness River pink and chinook salmon historical abundance, current status, and restoration. In 1993 Lichatowich also completed for the JKT an oral history of Dungeness salmon with Dick Goin, local fisherman.
- Small Stream Stocks Status: In 1993 the USFS Quilcene Ranger District commissioned Jim Lichatowich for a stock status assessment study including McDonald and Jimmy Come Lately Creeks.
- Environmental Factors: In 1993 the JKT commissioned a study by Jim Lichatowich on the influence of natural environmental factors on spring chinook in the Dungeness. Joe Hiss, USFWS, in 1994 is studying the influence of historical factors such as dikes, forest practices, and road

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construction and possible correlation to Dungeness chinook declines.

- Dungeness Pink Outmigration: Joe Hiss, USFWS, is sampling in 1994 and 1996 for juvenile pink salmon to determine timing of out-migration. Results will determine timing for release of hatchery coho to prevent impacts on pinks. USFWS is also planning similar sampling for chinook in August and September, if workload permits.

A-4. Instream Flow Studies:

- Dungeness River: In the late 1980's an Instream Flow Incremental Methodology (HIM) study was started for the Lower Dungeness River. Preferred flows were established in 1990 for the Dungeness River.
- Small Streams: In 1993 USFWS established preferred flows for fish for other Clallam County streams and made recommendations for Bell, Cassalery, Chicken Coop, Gierin, Jimmy Come Lately, Johnson, McDonald, Meadowbrook, and Siebert Creeks.

B. Habitat Protection

B-1. Forest Practices and County Land Use Review: The JKT with funding from the Timber, Fish, and Wildlife Program (TFW) will continue to review proposed logging, water rights, and other land use activities in Clallam County and the N.E. Olympic Peninsula. The goal is to eliminate or reduce negative impact to fish habitat.

B-2. Dungeness River Bank Stabilization: In 1994 Clallam County received a five-year EPA 319 grant for a model bank stabilization project. Dikes upstream of the BPA power lines which constrict the stream channel may be removed to restore channel geometry. Clallam County will address the management of dikes, particularly the Army Corps dike near the Sequim water intake.

B-3. Dungeness Screens Upgrading: The fish screens on the Highland ditch intake were replaced in 1993-94 by the Highland Ditch Company and WDFW.

B-4. Dungeness Gravel Traps: WDFW is continuing assessment of the impact of gravel traps on salmon, in conjunction with JKT habitat inventory studies. Only 2 HPA permits specifically for gravel traps have been approved for 1994 while the assessment continues: a project downstream of the schoolhouse bridge and a project near Dungeness Meadows across from the dike.

B-5. Pollution Prevention: In 1993 CCCD, JCCD, VVSU Cooperative Extension Services contracted with JKT to provide one-on-one outreach and educational workshops on soil protection, water quality protection; and water conservation to landowners in the DQ Project area, funded by a pollution prevention grant from EPA. These contracts have enabled the organizations to integrate their current activities with an expanded outreach program. The Conservation Districts began work with agricultural and forest landowners in December 1993, and Cooperative Extension is now beginning residential landowner education through a "Home*A*Syst" program. The program will continue through spring 1995.

B-6. Habitat Protection in Agricultural Areas: The CCCD in cooperation with SCS in 1990-92 installed 8,188 feet of fencing to protect stream corridors on Casselary and Bell Creeks. Stock water troughs and/or stock crossing bridges were also constructed on Casselary, Bell, Gierin, Agnew, and Chicken Coop Creeks. In 1992-93, CCCD and SCS worked with Clallam County to install 1,700 feet of fencing along Matriotti Creek. In 1993 the CCCD installed 6,510 feet of fencing to protect Gierin, Agnew, Chicken Coop, and Meadowbrook Creeks.

C. Restoration and Enhancement

C-1. Dungeness River Habitat:

- <u>Overwintering Pools</u>: In 1993 a land owner built salmon resting pools/overwintering ponds below the Hatchery and at Olympic Game Farm on the Dungeness River. Clallam County built resting pools on Clallam County property along the River.
- <u>Meadow Creek</u>: In 1994 the Dungeness Meadows Homeowners Association and property owners will work with NOSC, North Olympic Land Trust, and Clallam County to restore the habitat at Dungeness Meadows on Meadows Creek, a tributary to the Dungeness.
- <u>Bank Stabilization</u>: In 1994 1200 feet of shoreline on the Severson property located downstream of the railroad bridge will be restored and stabilized by Clallam County under the Jobs for the Environment grant. Also, in 1994-95 Clallam County will stabilize

the bank and re-establish the riparian zone on the west side of the river, upstream from the schoolhouse bridge. This l+1/4 acre project is associated with the Anderson Road extension project.

- General Restoration: CCCD in 1994 received a grant from Ecology for Dungeness River area stream restoration projects. Over the next two years, CCCD will coordinate with the Clallam County Jobs for the Environment grant projects.

C-2. Dungeness Stock Enhancement: A chinook captive broodstock program seeks to capture juvenile chinook and rear them to adulthood at the Hurd Creek hatchery and area net pens. Juveniles are captured from redds as emergent fry, and in 1994 will be captured in the eyed egg stage in redds at high risk of scour from high flows. The Project began in the spring of 1993 (1992 brood), and first progeny is scheduled for release in 1996. This is a joint project between JKT, WDFW, and NOCS, with technical assistance from USFWS and NMFS. A similar program for lower pink salmon is in the planning stages, with a draft report due in the fall of 1994.

Dungeness Chinook Brood Stock Program

C-3. Johnson Creek Habitat: Highland Irrigation District, the JKT, and Clallam County worked in 1990 on landslide reparation and prevention of associated water quality problems. This trio also worked with the CCCD and Ecology's Youth Conservation Corp to plant several hundred conifer Dungeness Chinook Brood Stock Program seedlings in the riparian corridor of Johnson Creek.

C-4. Matriotti Creek Habitat: NOSC, Clallam County, CCCD, and SCS, working with a local educational program, conducted habitat restoration on Matriotti Creek near Grey Wolf School in 1992-93. Meanders were restored, pools formed, large woody debris placed, and trees were planted. Education programs will continue on this creek. In 1994, CCCD and SCS will work with Matriotti tributary landowners through DNR's Stewardship Incentives Program to fence, install stock troughs, create pools and gravel beds, and build stock bridges.

C-5. Gierin Creek Habitat: Land owners, with funding and technical support from DNR's Stewardship Incentives Program, the Agricultural Stabilization and Conservation Service, CCCD, and SCS began work in 1993 to restore Gierin Creek. A new, meandering channel was dug, pools were created, and rocks were added. Trees were planted along the bank, and some fencing was installed. Over the next four years the landowners hope to restore 5 miles of the creek.

C-6. Meadowbrook Habitat: CCCD and SCS worked with landowners to restore 1100 feet of habitat on Meadowbrook Creek in 1993. Pools were formed, gravel added, meanders restored, large woody debris installed, and trees planted.

C-7. Upper Watershed Habitat Restoration: The USFS has proposed restoration projects in eastern Clallam County in the upper watersheds. If specific project and sites are approved and funded, most will be completed in 1994 and 1995.

- Culvert Fish Passaize: The USFS plans to replace or install culverts to provide fish passage in Gold Creek (tributary to the Dungeness River) and Jimmy Come Lately Creek.
- Riparian Forest Mana eg ment: The USFS plans to plant conifers such as cedars along upper Gold Creek and the lower Gray Wolf (both tributaries to the Dungeness River). Sites have been identified in the Jimmy Come Lately Creek watershed for tree pruning and thinning which will encourage understory development, thus improving habitat diversity.
- Road Obliteration: Road obliteration projects, possibly including culvert removal, restoration of stream crossings, fillslope retrieval, scarification, waterbar construction, and/or erosion control have been proposed for the Jimmy Come Lately watershed.

Eastern Jefferson County Projects

A. Watershed Assessment

A-1. Big Quilcene River Watershed Analysis and Restoration: In 1994 the USFS completed a preliminary watershed assessment under the Clinton Forest Plan FEMAT. In the summer of 1994 the USFWS, Olympic National Forest, USFS Quilcene Ranger District, and DNR will complete the follow-up preliminary watershed analysis, and then begin indicated restoration work on federal and non-federal lands.

A-2. Big and Little Quilcene Rivers Monitoring: The City of Port Townsend has been working with the USFS on several assessment projects including water quality monitoring and watershed-use monitoring.

A-3. Ambient Monitoring Project: Since 1993, PNPTC, with funding from the Centennial Clean Water Act Program has been conducting fish habitat inventories and maeroinvertebrate monitoring in Salmon and Donovan Creeks, and the Little Quilcene River, including Howe and Ripley Creeks. The work is expected to be completed by 1995.

A-4. Stream Water Quality Monitoring: JCCD, with Jefferson County documented water quality in streams leading into Quilcene Bay in 1993. In 1994 the JCCD will be monitoring water quality in streams feeding into Discovery Bay as part of the Discovery Bay Watershed Management planning process.

A-5. Stream Temperature Study: In 1992 and 1993 the PNPTC conducted stream temperature monitoring at 29 sites in Hood Canal including the Little Quilcene River, Leland, Donovan, Ripley, Tarboo, Chimacum, Shine, and Thorndike Creeks. Temperatures were compared to state water quality standards to determine if high temperatures were a factor effecting salmon populations.

A-6. Stock Status Studies: In 1993 the DQ Project RPG and the USFS Quilcene Ranger District, each funded stock status assessment studies by Jim Lichatowich. All of the streams in Eastern Jefferson County were included in the studies.

A-7. Small Stream Spawning Surveys: WOS assisted the PNPTC with spawning surveys on Tarboo, Thorndike, Ludlow, Chimacum, and Shine Creeks in 1993, and will continue to do more surveys in 1994.

A-8. Hood Canal Habitat Inventory: In 1993, the PNPTC and USFWS conducted habitat inventories in Hood Canal streams including Tharndike and Shine Creeks.

A-9. Sediment Transport and Deposition in Lower Big Quileene River: In 1993 The DQ Project RPG, the HCSEG, and the Port Gamble S'HIallam Tribal Fisheries Office funded a study by Brian Collins to discuss sediment depositional patterns in the lower river, and to evacuate the effectiveness of proposed gravel traps and their impacts on fisheries habitat.

A**-10. Snow Creek Coha Study:** Habitat and natural production information on adult, fingerlings, and smolts were collected in Snow Creek in 1993 and 1994 as part of a PNPTC effort to evaluate options for habitat enhancement and supplementation of Hood Canal coho salmon. This information will be used in a limiting-factor analysis to evaluate options for enhancement and supplementation of salmon stocks in Hood Canal. Actual projects may begin in 1995 if funding can be secured.

A-11. Instream Flow Need Studies: In 1985, Jefferson County PUD #1 commissioned Hosey and Associates for an instream flaw incremental methodology (IFIM) study on the Big Quilcene River. USFWS and the PNPTC will review original data from the study in 1994. In 1993, USFWS took toe-width measurements to determine preferred fish flows in streams in eastern Jefferson County. Included in the study were Chimacum, Contractors, Howe, Leland, Ludlow, Ripley, Shine, Tarboo, Donovan, Salmon, Snow, and Thorndike Creeks and the Big and Little Quilcene Rivers. USFWS also determined preferred fish flows for Penny Creek. From these studies, there are now "Instream Flow Needs For Fishery Resources" for all of the rivers and streams in the DQ Project area. In some cases, further analysis of these determinations is needed.

A-12. Culvert Inventory: OPF and WOS with funding from a Jobs for the Environment grant are conducting an inventory of culverts in Eastern Jefferson County in coordination with Jefferson County Public Works Department. The project will evaluate potential fish impasses throughout the county.

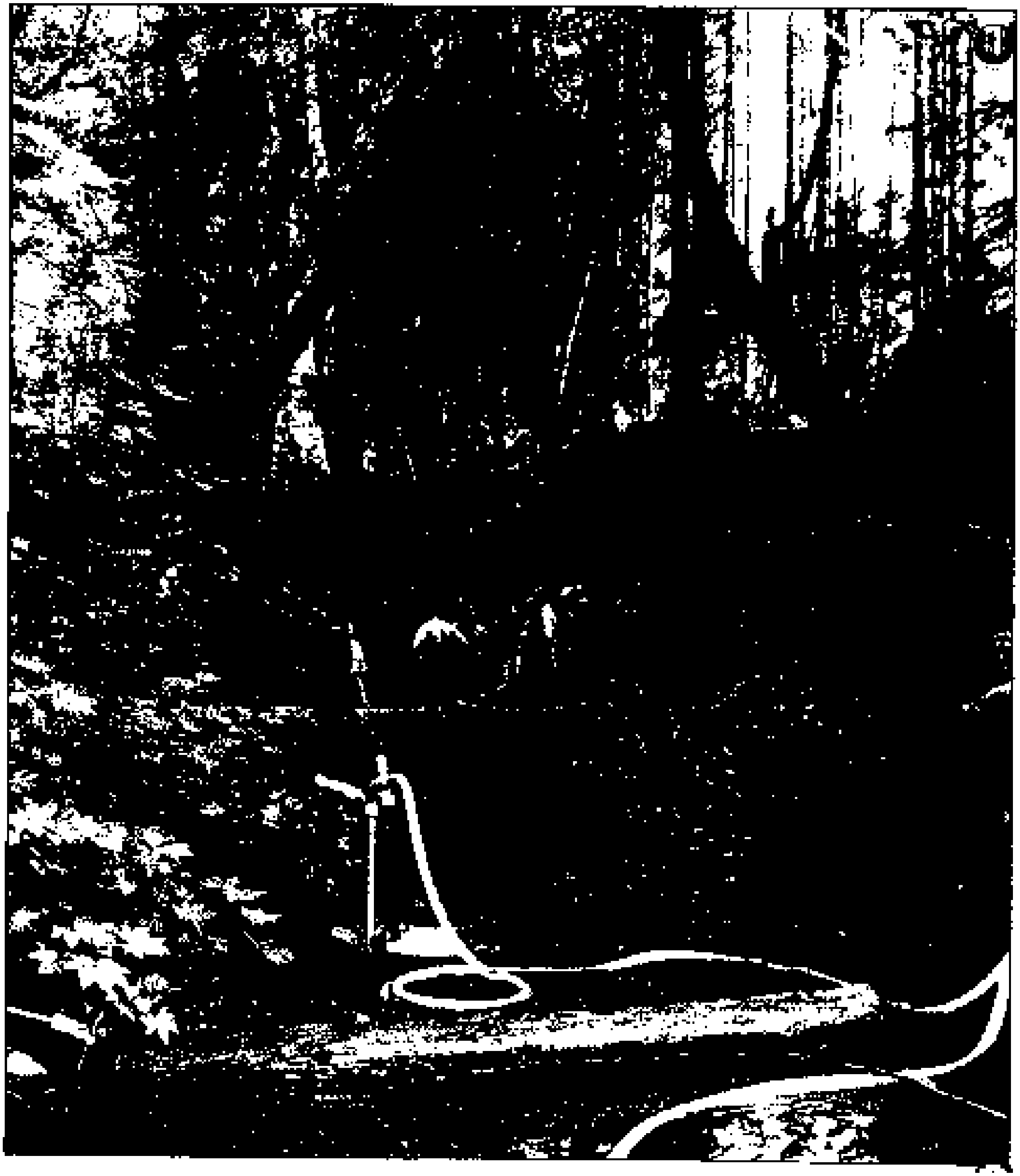
B. Habitat Protection

B-1. Habitat Protection in Agricultural Areas: JCCD, with WOS and NOSC assisted landowners with planning, funding, and labor for stream fencing projects in 1992 and 1993, and will be continuing in 1994. Areas affected by the fencing include Chimacum, Leland Creek, Cemetery Drain (tributary to Quilcene Bay), Hauk Creek (tributary to Salmon Creek), and Tarboo Creek. In 1994 Chimacum and Beaver Valley fencing will be funded by a OPF Jobs for the Environment grant.

B-2. Big Quilcene River Sediment Control: In 1993 JCCD worked with landowners, government agencies, Tribal, State, and Federal fisheries personnel to establish gravel traps to intercept the sediments that accumulate during storm events. Gravel traps successfully filled in December 1993.

B-3. Forest Practices and County Land Use Review: The JKT with funding from the Timber, Fish, and Wildlife Program (TFW) will continue to review proposed logging and other land use activities on the N.E. Olympic Peninsula, in "usual and accustomed" fishing and hunting areas. The goal of the program is to eliminate or reduce negative impacts to fish habitat.

B-4. Pollution Prevention: In 1993 CCCD, JCCD, WSU Cooperative Extension Services contracted with JKT to provide one-on-one outreach and educational workshops on soil protection, water quality protection, and water conservation to landowners in the DQ Project area, funded by a pollution prevention grant from EPA. These contracts enable the organizations to integrate their current activities with an expanded outreach program on pollution prevention. The Conservation Districts began work with agricultural and forest landowners in December 1993, and Cooperative Extension is now beginning residential landowner education through a "Home*A*Syst" program. The program will continue through spring 1995.



Wild Olympic Salmon Volunteers “cleaning” spawning gravels in Jefferson Count (WOS)

C. Restoration and Enhancement

C-1. Andrews Creek Habitat: In 1994, WOS and OPF with funding from a Jobs for the Environment grant, will excavate canary grass, plant trees, and install large woody debris on Andrews Creek, tributary to Snow Creek.

C-2. Big and Little Quilcene Rivers Upper Watershed Restoration: The USFS, in coordination with the City of Port Townsend, has been working on road obliteration projects, erosion control, fish habitat improvements, and the development of Best Management Practices on Forest Service land in the watersheds. These projects are improving water quality and decreasing potential impacts on fish habitat by making improvements in upper watershed conditions. The City will apply for a Centennial Clean Water Fund grant for further water quality projects.

- <u>Quilcene Tributaries Channel Restoration</u>: In 1993 the USFS added woody debris and rocks to create pools, and improved the outlets of culverts in Townsend Creek and the North Fork of Tunnel Creek, both tributaries to the Big Quilcene River. The Forest Service plans to improve fish passage through culverts on the South Forks of Tunnel Creek.
- <u>Erosion Prevention</u>: Work will continue in 1994 to prevent further erosion from the 1993 landslide on the Big Quilcene near the City's water diversion.
- <u>Riparian Management</u>: The Forest Service has identified sites in the Big and Little Quilcene upper watersheds for tree thinning and pruning which will improve the forest habitat diversity by encouraging understory development.
- <u>Dam Improvements:</u> In 1994 the City of Port Townsend will rebuild the Little Quilcene River diversion dam, damaged by a 1993 flood event, to include a fish ladder to provide access to habitat in the upper watershed and a screen to keep fish out of the diversion.

C-3. Big Quilcene Fisheries Enhancement: A captive broodstock program for early chum was started in 1993 as a cooperative effort between USFWS, PNPTC, WOS, and HCSEG.

C-4. Bones Creek Reconstruction: The PNPTC, the HCSEG, Seton Construction, and WOS bypassed 120 feet of culvert and reconstructed the creek bed on Bones Creek in 1993. (Bones Creek is between Shine Creek and the Hood Canal Bridge.)

C-5. **Chimacum Creek Habitat:** WOS volunteers cleaned gravel beds in Chimacum Creek in 1993. WOS plans to place log weirs in Chimacum Creek to create turbulence and pools that will continuously clean the gravels downstream. In 1993 the NOSC funded work with the JCCD, WOS, and landowners to improve habitat in Chimacum Creek including stream fencing, placing rocks in the creek, and stream bank revegetation. In 1994, they plan to create resting "holes" for fish with woody debris and to construct additional fencing. The Conservation District will also be working with irrigators to improve system efficiency.

C-6. Chimacum Tributaries Habitat: In fall of 1994, WOS and OPF with funding from a Jobs for the Environment grant, will plant trees and removing canary grass along Barnhouse, Putaansuu, and Naylors tributaries to Chimacum Creek.

- **Naylors Creek:** In 1993 WOS volunteers cleaned gravel beds in Naylors Creek tributary. In 1994 WOS, OPF, and Peace Trees project with funding from a Jobs for the Environment grant will install large woody debris and an off-stream channel for Coho overwintering on Naylors Creek.

- **Putaansuu Creek:** In 1993 WOS volunteers made necessary changes to fish ladders to promote fish passage on the Putaansuu tributary. WOS will also research and construct subsurface dam-to-pool flows to increase rearing habitats for silver salmon fry. In 1994 WOS and OPF with funding from a Jobs for the Environment grant will repair log weirs and install "Perkins watering troughs" to prevent stream bank erosion from cows.

C-7. Little Goose Creek Fish Passage: In 1993 WOS volunteers made changes to fish ladders to promote fish passage on Little Goose Creek, a tributary to Oak Bay.

C-8. Ludlow Creek Habitat and Fisheries Enhancement: WOS volunteers will remove debris and wash gravels in Ludlow Creek in 1994. WOS will install and monitor in-stream salmon egg incubators.

C-9. Salmon Creek Fisheries Enhancement: WOS is currently working with the NOSC and WDFW to restore Salmon Creek early fall chum to historic levels. WOS will monitor remote site incubators and re-fit an existing hatchery facility to restore the creek's near-endangered chum stock. Salmon Creek stocks may eventually be used to restock Chimacum Creek.

C-10. Salmon Creek Watershed Restoration: The USFS has planned road obliterations and forest thinning and pruning to encourage undergrowth in the upper Salmon Creek watershed in 1994. The USFS also plans to improve fish passage on Salmon Creek.

C-11. Snow Creek Riparian Management: In 1994 the Forest Service plans to improve fish passage through a culvert and has identified sites for tree pruning which will encourage undergrowth in the upper watershed.

C-12. Tarboo Creek Habitat Restoration: In 1993 WOS rebuilt fish ladders to promote fish passage on Tarboo Creek. The JCCD worked to restore the original creek channel. WOS volunteers worked with the JCCD to improve stream channel stability on a Tarboo tributary, and will utilize a pond to provide rearing habitats for silver fry. In 1994 OPF and WOS with funding from a Jobs for the Environment grant will work with PNPTC, Pope Resources, and Jefferson County Public Works to install weirs and repair a culvert to improve fish passage.

C-13. Tarboo Creek Fisheries Enhancement: WOS installed and monitored remote site incubators on Tarboo Creek in 1993.

C-14. Thorndike and Shine Creeks Habitat: WOS is currently working with Pope Resources, HCSEG, and PNPTC to restore fish habitat during timber harvest work on Thorndike Creek. WOS volunteers have planned restorations to help chum salmon pass through beaver dams and reach spawning areas in the upper Thorndike watershed.

C-15. Thorndike and Shine Creeks Fisheries Enhancement: A captive broodstock program for coho on Thorndike and Shine Creeks was initiated in 1993 to assist in rebuilding natural coho stocks in the North Hood Canal. Cooperating organizations for the broodstock program are the PNPTC, USFWS, the HCSEG, WDFW, Long Live the Kings, and the NMFS. WOS volunteers installed and monitored remote site incubators on Thomdike and Shine Creeks in 1993. In 1994 WOS volunteers will also monitor the chum eggs.

Inventory of Stream Flow Data

The amount of stream flow data for streams throughout the DungenessQuilcene area varies greatly. Some streams, such as the Dungeness River have decades a€ continuous records while other smaller creeks may have none or very little data. The following is not a complete inventory of all flow measurements. Many dozens of unnamed or lesser-known creeks or tributaries are not included, even though miscellaneous flow measurements may have been taken at one time. This summary lists both historical and current flow data collection efforts for the larger streams which were included in DQ Project discussions.

Eastern Clallam County

1. **Bagely Creek:** A small number of miscellaneous flow measurements on Bagely Creek were taken by the USGS in the 1940's, 50's, and 60's. More consistent flaw measurements were taken by Ecology from 1988 through 1991, primarily in the spring and summer months. There are no gaging efforts at present.

2. **Bell Creek:** Miscellaneous flow measurements an Bell Creek were taken by the USGS in the early 1940's, 50's, 60's, and late 70's. More consistent flow measurements were taken by Ecology from 1987 through 1991, primarily in the spring and summer months. There are no gaging efforts at present.

3. **Casselary Creek:** Miscellaneous flow measurements on Casselary Creek were taken by the USGS in the 1950's, 60's, and 70's. More consistent flaw measurements were taken both at the mouth and just above at a farm by Ecology. Ecology recorded flaws April through September from 1986 through 1991. There are no gaging efforts at present.

4. **Dean Creek:** Peak flow data only was recorded monthly by the USGS from 1949 through 1970. There are no gaging efforts at present.

5. **Dungeness River:** The Dungeness River has the most extensive data of any in the DQ Project area. Dungeness River flow was continuously recorded from 1898 through 1902. Continuous gaging was recommenced in 1923 by the USGS above all diversions and continues to the present. Over 100 miscellaneous

measurements have been taken at various sites by the USGS from 1898 through 1979, by Ecology from 1986 through 1991, and the JKT in 1992 and 1993. Also, many of the tributaries have been measured at various times. From August 1993 to May 1994, the USGS with cooperative funding from the DQ Project, operated a second continuous gaging site below all diversions at the Railroad Bridge Park. A staff gage will remain at the Railroad Bridge site and USGS will measure flow there every other month until September 1994, funded by Ecology's Water Quality Program. Additional funding is needed to continue gaging efforts at the Railroad Bridge site.

6. **Geirin Creek***:* Several miscellaneous flow measurements were taken on Gierin Creek by the USGS in the 1950's, 60's, and 70's. There are no gaging efforts at present.
7. **Jimmy Come Lately Creek:** A dozen flow measurements were taken on Jimmy Come Lately Creek by the USGS in the 1950's, 60's, and 70's. Ecology took more consistent flow measurements from 1988 through 1992, primarily April through October. There are no gaging efforts at present.
8. **Johnson Creek:** Ecology took over 100 flow measurement on Johnson Creek from 1986 through 1991, primarily April through October. Also, a couple of measurements were taken by the JKT in 1992. There are no gaging efforts at present.
9. **Matriotti Creek:** The USGS took a couple of flow measurements on Matriotti Creek in 1978. Ecology took consistent flow measurements from 1986 through 1991, primarily from April through October. There are no gaging efforts at present.
10. **McDonald Creek:** The USGS took a total of several dozen flow measurements on McDonald Creek at 4 different sites in the 1940's, 50's, 60's and 70's. Ecology took flow measurements from 1988 through 1991, April through October. There are no gaging efforts at present.
11. **Meadowbrook Creek:** The USGS took a small number of flow measurements on Meadowbrook Creek in the 1940's, 5Us, 60's, and 70's. Ecology took consistent measurements from 1986 through 1991, primarily April through October. There are no gaging efforts at present.
12. **Siebert Creek:** A continuous recording gage was operated by the USGS from 1952 through 1969 on Siebert Creek. In addition, a

small number of miscellaneous flow measurements were taken by the USGS in 1949 and the late '70's. Ecology took measurements from 1988 through 1991. There are no gaging efforts at present.

Eastern Jefferson County

13. Big Quilcene River: The USGS took a small number of miscellaneous flow measurements on the Big Quilcene River in the 1920's and in the '50's, and measured monthly peak flow from 1961 to 1968. The USGS operated a continuous gaging station for one year in 1971-72. Jefferson County took monthly flow measurements for a year in 1986-87, and again in 1992-93. Penny Creek, a tributary to the Big Quilcene, was monitored for peak flows only between 1949 and 1968. In July 1993 the USGS, with cooperative funding from the DQ Project installed a staff gage on the Big Quilcene between the Hatchery diversion and the return flow, and a wire-weight gage was installed at the Hwy. 101 bridge just below the NF Hatchery. The DQ Project cooperatively funded monthly flow measurements to calibrate the gages from July 1993 to January 1994. Hatchery personnel began ongoing daily readings of the two gages near the Hatchery in July. Additional funding is needed to continue the data collection at the Hatchery diversion and at Hwy 101. In August 1993 the USGS, with cooperative funding from the DQ Project also installed a staff gage on the Big Quilcene above the City of Port Townsend diversion to be read regularly by City personnel. USGS technicians encountered difficulties measuring the flow at the gage location. The gage was removed and reinstalled at a different location January 1994. Funding is needed to continue calibrating and maintaining the gage at the Port Townsend diversion.

14. Chevy Chase Creek: In June 1993 the USGS, with cooperative funding from the DQ Project installed a staff gage on Chevy Chase Creek (a.k.a. Quimper Creek). WOS volunteers began ongoing collection of gage height data in June. USGS took flow measurements at the sites monthly from July 1993 through January 1994 to correlate gage height to stream flow for the volunteers. In January 1994 JCCD, with funding from the Centennial Program began taking periodic flow measurements and will continue through October 1994. In addition, volunteers will record gage height between JCCD visits. For the ongoing gage height readings to be useful in the future, additional flow measurements are needed to maintain gage-height/stream-flow relationships beyond October 1994.

15. **Chimacum Creek:** The USGS took a small number of flow measurements on the main stem, west fork, and east fork in the 1940's and 50's. The USGS also operated a continuous flow gage on the west fork from 1953 through 1958. Ecology took flow measurements on the main stem and the west fork from 1986 through 1991. The JKT took several measurements on the main stem and the west fork in 1992. In June 1993 the USGS, with cooperative funding from the DQ Project installed staff gages on Chimacum main stem at Irondale Road, and on the upper west fork at West Valley Road. WOS volunteers and JCCD began ongoing collection of gage height data. USGS took flow measurements at the sites monthly from July 1993 through January 1994 to correlate gage height to stream flow for the volunteers. An additional flow measurement was taken by USGS in April 1994 to recalibrate gage-height/stream-flow relationships after winter flooding. A third staff gage was installed on the lower west fork at Chimacum High School in September 1993 by the USGS for Ecology's Water Quality Program. Chimacum High students and JCCDs began ongoing collection of gage height data in September 1993. However funding was cut for flow measurements needed to correlate gage height to stream flow shortly after gage installation. For the ongoing stream height readings to be useful in the future, additional flow measurements are needed to maintain gageheight/stream-flow relationships.
16. **Contractor's Creek:** Ecology took flow measurements on Contractor's Creek from 1986 until 1991. JCCD with funding from the Centennial Program installed a staff gage in January 1994 on Contractor's Creek and will take periodic flow measurements on Contractor's Creek from January through October of 1994. In addition, volunteers will record gage height between JCCD visits.
17. **Donovan Creek:** One flow measurement was taken on Donovan Creek by USGS in 1951. Ecology took several flow measurements a year from 1988 until 1991. Jefferson County took flow measurements for a year in 1986-87 and twice monthly in the winter of 1992-93. In June 1993 the USGS, with cooperative

funding from the DQ Project installed a staff gage on Donovan Creek, 2.5 miles North of Quilcene. WOS volunteers began ongoing collection of gage height data in June. USGS took flow measurements at the sites monthly from July 1993 to January 1994 and an additional measurement in April 1994 to correlate gage height to stream flow for the volunteers. For the ongoing gage height readings to be useful in the future, additional flow measurements are needed to maintain gage-height/stream-flow relationships.

18. **Eagle Creek:** Ecology took several flow measurements a year on Eagle Creek in 1986 and from 1988-91. JCCD with funding from the Centennial Program installed a staff gage in January 1994 on Eagle Creek and will take periodic flow measurements from January through October of 1994. In addition, volunteers will record gage height between JCCD visits.
19. **Little Quileene River:** The USGS took several flow measurements on the Little Quilcene River and several tributaries in 1925-26. The USGS operated a continuous flow gage for one year in 1926-27 and again from 1951-58. Ecology measured flows several times a year from 1987-91. Jefferson County took flow measurements on both the main river and tributary Leland Creek for a year in 1986-87 and on the main river for several months in the winter of 1992-93. In April of 1994 the City of Port Townsend funded the USGS to install a staff gage below the City's diversion and to take monthly stream flow measurements to correlate the gage.
20. **Ludlow Creek:** The USGS took several flow measurements in 1952. Ecology took several flow measurements a year from 198691. Jefferson County took flow measurements for one year in 1991-92. In June 1993 the USGS, with cooperative funding from the DQ Project installed a staff gage on Ludlow Creek. WOS volunteers began ongoing collection of gage height data in June. USGS took flow measurements at the sites monthly from July 1993 to January 1994 to correlate gage height to stream flow for the volunteers. An additional flow measurement was taken by USGS in April 1994 to recalibrate gage-height/stream-flow relationships after winter flooding. For the ongoing gage readings to be useful in the future, additional flow measurements will be needed to maintain the gage-height/stream-flow relationship.

21. **Salmon Creek:** The USGS took several flow measurements on Salmon. Creek in 1952. Ecology took several measurements a year from 1986-91. In June 1993 the USGS with cooperative funding from the DQ Project installed a staff gage on Salmon Creek. WOS volunteers began ongoing collection of gage height data in June. USGS took flow measurements at the sites monthly from July 1993 to January 1994 to correlate gage height to stream flow for the volunteers. An additional flow measurement was taken by USGS in April 1994 to recalibrate gage-height/stream-flow relationships after winter flooding. In January 1994 JCCD with funding from the Centennial Program began taking periodic flow measurements on Salmon Creek and will continue through October 1994. In addition, volunteers will record gage height between JCCD visits. For the ongoing gage readings to be useful in the future, additional flow measurements will be needed to maintain gage-height/streamflow relationships beyond October 1994.
22. **Snow Creek:** Snow Creek was continuously gaged by the USGS from 1953-73. WDFW has operated a continuous gaging station from 1977 to the present day. In addition to continuous gaging, Ecology took several flow measurements a year on both the main creek and tributary Andrews Creek from 1986-91. JCCD with funding from the Centennial Program installed a staff gage in January 1994 on Andrews Creek, a tributary to Snow Creek, and will take periodic flow measurements from January through October of 1994. Volunteers will record gage height between JCCD visits. Funding will be needed to continue maintainance of the gage-height/stream-flow correlation.
23. **Shine Creek:** Jefferson County took measurements on Shine Creek for one year in 1991-92. In June 1993 the USGS with cooperative funding from the DQ Project installed a staff gage on Shine Creek. WOS volunteers began ongoing collection of gage height data in June. USGS took flow measurements at the sites monthly from July 1993 to January 1994 and again in April 1994 to correlate gage height to stream flow for the volunteers. For the ongoing gage height readings to be useful in the future, additional flow measurements will be needed to maintain gage-height/streamflow relationships.
24. **Tarboo Creek:** The USGS took several measurements in 1951. Ecology took several measurements a year from 1986-91.

Jefferson County measured flows for one year in 1986-87. In June 1993 the USGS with cooperative funding from the DQ Project installed a staff gage on Tarboo Creek. WOS volunteers began ongoing collection of gage height data in June. USGS took flow measurements at the sites monthly from July 1993 through January 1994 and again in April 1994 to correlate gage height to stream flow for the volunteers.. For the ongoing gage height readings to be useful in the future, additional flow measurements will be needed to maintain gage-height/stream-flow relationships.

25. **Thorndike Creek:** In June 1993 the USGS, with cooperative funding from the DQ Project installed a staff gage on Thorndike Creek. WOS volunteers began ongoing collection of gage height data in June. USGS took flow measurements at the sites monthly from July 1993 through January 1994 and again in April 1994 to correlate gage height to stream flow for the volunteers. For the ongoing gage height readings to be useful in the future, additional flow measurements are needed to maintain gage-height/streamflow relationships.

Volume 1

Chapter 5

Regional Strategies & Recommendations

Chapter 5
Regional Strategies & Recommendations

General Background

The eastern parts of Jefferson and Clallam Counties were both included in the pilot project to test the concept of water resource planning on a local level in a multi-jurisdictional setting. Although developing a water resource plan for the entire region may make sense from an ecological viewpoint, it is often difficult for governments or individuals to work on such a large project, given defined budgets, timelines and personal priorities.[1] After the Regional Planning Group worked together on issues for over a year, it was apparent that there were County-specific issues and problems that needed to be worked on within each jurisdiction. Thus, the two County Work Groups developed individual recommendations found in Chapters 6 and 7.

Through it all, the RPG found a commonalty of issues that could be jointly agreed upon and developed strategies for those. This Chapter discusses the common ground and the strategies and recommendations developed on a regional-basis. Consensus was reached by the RPG on these recommendations.

The Characterization in Chapter 2 defines and describes the project area, including each watershed, sub-watershed and those areas outside of defined watersheds. Common to much of the region are the rainshadow conditions, though some areas fall outside its effects and receive considerably more rain than the coastal edges. The ground waters and aquifers are contiguous and issues such as hydraulic continuity, as well as possible threats from pollution of seawater intrusion or other human-induced causes are regional. The non-biological, political and governmental boundaries are not meaningful to wildlife or plant life, nor to water or the organisms living in it. Thus, strategies and recommendations for conservation, and management of habitat, flood plains, forest practices, fish, wildlife, and research and data have been developed for the region.

[1] See Chapter 15 for more on this issue.

Regional Use of Water

R1 Use water from within the area, and keen the water resources within the region. The Chelan Agreement says that water resource management decisions should be by hydrologic unit, and that "future conflicts will be reduced if water use needs located in a hydrologic unit first be met from water resources within that unit." The RPG has taken that a step farther and strongly recommends that the water needs be met from within the area and that the water resources be kept within the region.

The Gap

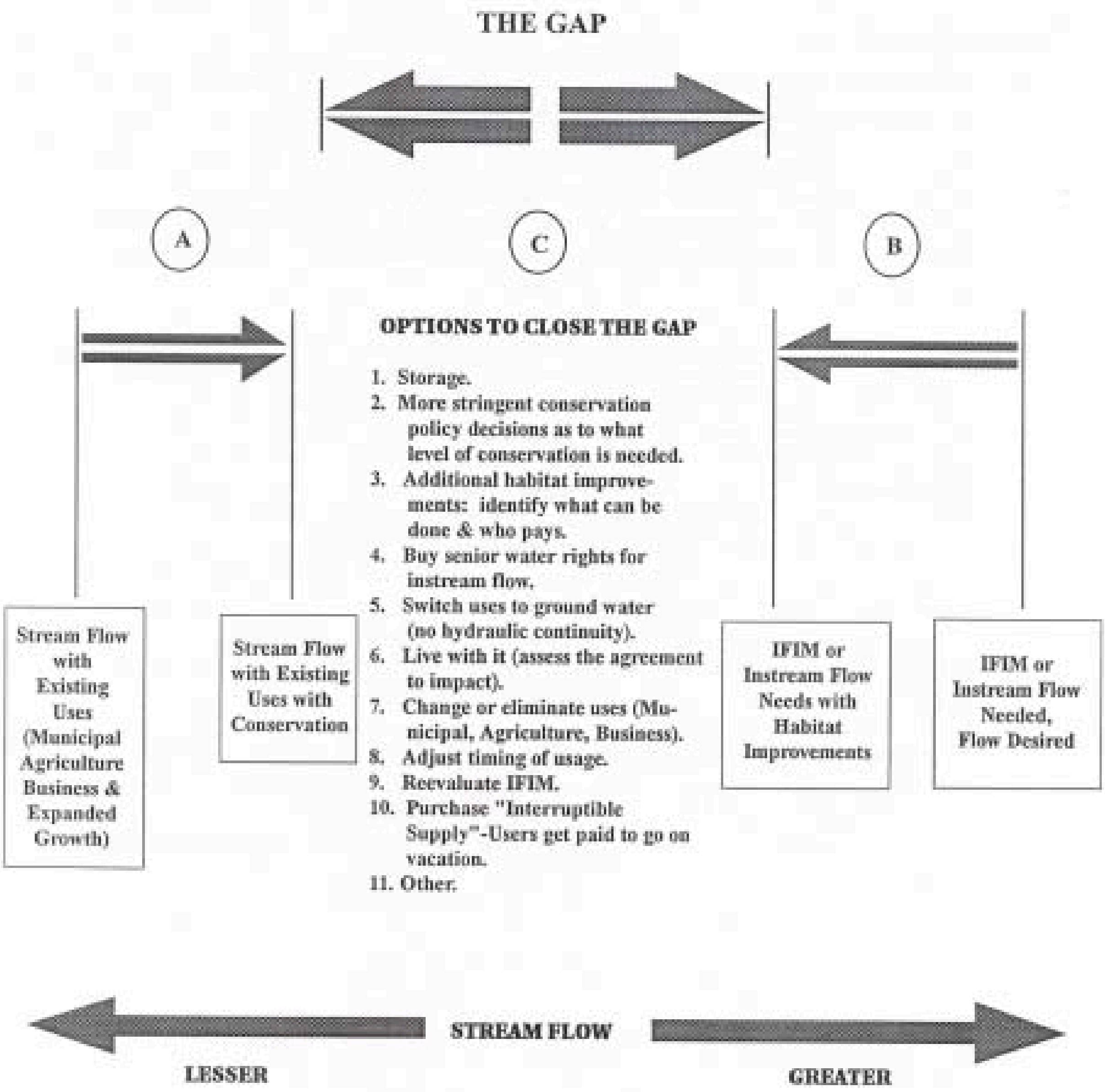
R.2 A gap between biological requirements and out-of-stream uses is likely to persist in perpetuity, but may be narrowed through a series of management actions. Through efficiency of use and restoration of habitat, the water resource needs of both human's use and natural ecosystems may be reduced.

Figure 5.1 (Wheeler) illustrates the concept (known as "the Gap") which acknowledges that a discrepancy exists between the quantity of water needed for optimal fish production and the needs of out-of-stream uses. On the right side the needs of the fish are expressed by a recommended instream flow based on the IFIM,2 and on the left is the present instream flow after withdrawals for agriculture, municipal, business and future growth needs. Currently the gap is substantial due the poor condition of fish habitat, the lack of conservation, and the inefficiency of the irrigation delivery systems and other uses. Under the Gap strategy, the Regional Planning Group agrees to acknowledge that a discrepancy exists, is likely to continue indefinitely, and that to some extent the parties will have to live with it.

However, the parties also agree that the lines reflecting instream and out-of-stream needs may be brought closer together through management actions including but not limited to, conservation, negotiated increased instream flows, physical improvements to the irrigation systems, and the shift to ground-water sources not in close hydraulic continuity with the river. Although the recommended instream flows (from the IFIM and toe width studies) may not change without major channel changes in the rivers or the development of new methodologies for determining instream flows, the level of fish productivity still may be increased substantially through habitat improvements. This would bring the right-hand line towards the center thus somewhat closing the gap.

[2] See Chapter 6 *Problem Definition 3* for an explanation of IFIM.

Figure 5.1 The Gap Concept



The GAP CONCEPT developed by Bob Wheeler, Local Government Caucus, illustrates the gap between biological requirements and out-of-streams uses.

Shared Sacrifice

R.3 All beneficial uses of water will share the burdens and benefits of natural fluctuations in the amount of stream flow annually available.

The concept of a flexible target for instream flows, originally developed for the Dungeness (Schmidt, Seiter), but applicable across the region, is intended to address natural fluctuations in stream flows. Termed "shared sacrifice," its intent is to allow both instream and out-of-stream needs to share the pain of water-short years and the gain of abundant years *(share the pain, share the gain).*

In the Dungeness River, shared sacrifice means that the irrigation community has agreed to manage and limit the amount of water used during low-flow periods, and the Tribe and Fish caucuses have agreed that lower-than optimum flows far salmonids are acceptable for an interim period. These agreements are predicated on immediately implementing habitat restoration projects to improve conditions in the Dungeness River. These improvements may provide mare available habitat for salmonids with less instream flow. A formula is needed to specify future uses and priorities of conserved water between agriculture, instream flow, and residential use. Water requirements to accommodate growth in agriculture over and above the recent land base must be met by conservation. Within 16 years, long-term conservation programs would attempt to secure at least 100 cfs to remain instream when the flow exceeds 160 cfs (the annual average flow). During abundant water years, an ever greater proportion of the total flow would remain instream.

In Jefferson County conflict exists between the needs of the fish resources and other wildlife, and the growing demand for water in the County. The City of Part Townsend, the Port Townsend Paper Mill and the Port Gamble S'Klallam Tribe are currently negotiating in an attempt to *share the sacrifice* on instream flows on the Big Quiicene River.

Conservation

R.4 <u>Conservation is the most cost-effective way to extend limited water supplies for the foreseeable future, and will need to become a way of life for every water user, and be reflected in equipment, landscauin2, re-use and water use, and construction codes, rate structures and other measures</u>.

Problem Definition

The following is a result of many discussions by DQ members on conservation, evolving from an early Conservation and Education Committee which produced an Education Plan and a draft recommendation for a Conservation Plan (not adopted by group). The Jefferson County Work Group developed this statement for the region.

Water conservation is one of those unique public policies where incentives have been created and institutionalized to do the opposite of what is needed or wanted, or may be in the best interest of the community. As a result of early water management history, incentives have been inadvertently institutionalized and form a powerful disincentive far protecting and conserving water, as exemplified in the "use it or lose it" concept of western water law. This results in an arcane legal incentive which permeates all current water policy, even to the detriment of the shared interests involved. Current water conservation rules provide a natural disincentive for all interests to save and protect water supplies.

The risks to individual interests For the agricultural community current laws result in "use or lose" disincentives far water conservation that may result in cut backs or losses of historic water rights. Far the environmental community, the risk lies with having "water savings" be used for further growth and development, which may create more adverse impact to habitat and groundwater supplies. For local governmental entities conservation may mean trying to collect higher rates for the same or lower water use, much as the electrical utilities have had to do in the past decade of energy conservation. For business and industry, the real world incentive is maximum use withdrawals rather than risk loosing today's supplies to future competitors for water.

Water conservation is the one thing that people do because they feel it is right. It can be achieved only if a bigger, more long-term vision reflects the following:

- **Equity for Future Users:** A belief and value that fixture generations deserve to be provided the same opportunity as the present to make their own future, and to have resources available for their use and management.
- **Risk Assessment:** Because there are so many environmental unknowns, actions should minimize risks, conserve options, and attempt to fairly balance risks/benefits among all current and future users.
- **Share the Pain, Share the Gain:** Equal pain and equal opportunity should provide a system that ensures future water supplies.
- **Safety Valve:** Because the current knowledge base or management of water systems are not infallible, water conservation provides the safety valve -- the assurance of some level of future supply, with a shared opportunity to reduce future losses and protect maximum options and flexibility.
- **Protection** as a Better Investment than Restoration: With the current economics and technology, ground-water restoration, desalination, and other high tech strategies to create new supplies are at best, very expensive, and currently beyond the reach of the local communities. The best policy is to protect all known water supplies.
- **Not Enough is Known about Water Management:** Water management, as opposed to water use, is a new challenge for communities. Not enough is known about current water supplies -- recharge and hydrologic rates or continuity, groundwater availability, or surface supplies. The most conservative and reasonable approach is to develop and adopt a water conservation plan for the communities involved.

Definition of Water Conservation
Conservation, by definition includes uses as defined by RCW 98.54.120 as well as withdrawal efficiencies, instream strategies and recharge. Water conservation as defined by the RPG means keeping water where it is, reducing its use, using it efficiently and reusing it when possible with the belief that there is no such thing as "waste water."

Conservation Goats

1. **To manage water conservation based on hydrological cycles and ecosystem principles.** It is not enough to only look at the end of "water tap" use as conservation. The entire hydrologic cycle must be considered for interaction and every opportunity for wise use. It is also recognized that the current economic analysis does not accurately reflect the true cost of today's water management.

Recognizing that water conservation must be done on a watershed basis allows us to work with management considerations and options including:

- wetland restoration to hold and/or slow down flood water for recharge;
- potential impacts of habitat restoration and enhancement;
- timing and management of instream withdrawals;
- ground-water withdrawals and recharge impacts;
- impacts of stormwater, impervious surfaces and runoff;
- new techniques such as gravel filters, retention and storage; and reuse of effluent.

2. **To satisfy our current or future surface water needs within our current water rights, without new or additional water rights, by using conservation and achievable technology.**

R4.I Conservation and efficiency strategies should be developed and implemented region-wide to provide the most efficient use of all water resources. The Chelan policies and recommendations and DQ recommendations should provide guidance for the future development of regional water conservation policies. Specifically they should be used as guidance and be incorporated into the GMA and Coordinated Water System Planning for the region.

8.4.2.1 Develop a comprehensive regional water conservation plan that makes all users responsible for conservation.

8.4.2.2 Develop a system to prioritize water uses for times of critical need. Establish an emergency water conservation program for all users under extreme drought conditions to be used by the City, the Public Utility District and the County, and for voluntary use under all other conditions including cost/benefit aspects.

8.4.2.3 Monitor the use of surface and ground water, as affordable and dependable technology becomes available.

8.4.2.4 Establish principles for all users throughout the area including:

a. Strategies for education and increased public awareness to encourage voluntary conservation, as the primary responsibility of all managers.
b. Targets for water conservation for each user group including achievable technology.
d. Conservation and reduction goals, considering "targeting" by user groups and including consideration of all water sources.
e. A regional water modeling and monitoring system developed to avoid a water crisis in a low-water year. It should provide for an early

warning system and a series of management options; projections should be done and thresholds established for use in times of critical low water/drought to alert the region before a water crisis occurs.

8.4.5.5 Public entities should pursue and provide demonstration or model projects to encourage conservation and reuse. Government grants and programs (State and local) should be sought for surface and ground-water planning, and integration of implementation activities.

8.4.2.6 Enforce new construction standards on plumbing fixtures.

8.4.2.7 Encourage utilities to develop incentives for retrofits for all pre-existing housing offered for sale which meet new water conservation standards for both residential and commercial water users;

8.4.2.8 Petition the State to define "conservation" to promote incentives far efficiency (e.g. no taxes on incentives for conservation like a rebate program);

8.4.2.9 Draft specific measures to be used to conserve in water-short areas, including gray water on plants, using native and xerophytic plants, installing low-water-use equipment and facilities for all users; and requiring special conservation measures for new and existing golf courses.

8.4.2.10 Establish a water resource conservation education program including "life-style" changes;

8.4.2.11 Investigate opportunities for using recharge fees, incentives for saving, and buyback programs.

8.4.2.12 Assess the economics of water conservation strategies including rates, time, "pay back," timelines, and the condition/place of used water.

Legal Mechanisms

R.5 <u>Existing irrigation water right holders will seek legal mechanisms to transfer conserved water to instream flows through leasing, relinquishment or Trust Water Rights</u>. Established under a 1991 provision in Water Law (RCW 90.42), Water Resources Management, an innovative mechanism for temporary or permanent transfer of water rights is called the Trust Water Rights Program (TWR), and is to be administered through the Department of Ecology. Though as yet untested (1994), the Trust is a mechanism for a voluntary change in water allocations which may provide a means to eliminate "paper rights" and change the purpose of use, while maintaining the priority date of the original water right. The Water Users, the Tribe, and the Department of Ecology are seriously exploring this option as a means to both protect water rights and provide much-needed increases to instrearn flows.

Ground Water

R.6 **<u>The Regional Planning Group believes that ground water has the most potential as a residential and municipal source and further technical investigations should be implemented. Ground water is a limited and variable resource which mar be depleted or replenished</u>.** Maintaining its quantity and quality depends upon maintaining the balance between recharge and outflow/withdrawals. See Chapters 6 and 7 for County-specific recommendations on ground water.

R.6.1 **The volume of surface and ground water used should be limited through comprehensive conservation programs, including provisions for emergency restrictions on use, and design standards promoting efficiency.**

R.6.2 **Community wells should be metered and selected wells should be monitored to calculate total ground-water withdrawals from the region and avoid the mining of ground-water resources.**

R.6.3 **The Regional Planning Group encourages the use of community water systems instead of individual wells.**

R.6.4 **Municipal and residential water supplies should be directed to locations and depths so as to minimize the risk of hydraulic continuity.**

R.6.5 **Hydraulic continuity and irrigation conservation: It is acknowledged that the impacts on ground water from irrigation conservation may not be predictable until implemented.** Because of concern over the effects of irrigation conservation measures on wetlands, small streams and the shallow aquifer, the RPG called a series of meetings with local and State biologists, the Tribes, agricultural water users and other interested members. The DQ GIS was used to portray the over-lapping impacts of the irrigation system in Clallam County on the wetlands and streams in the Sequim-Dungeness basin. An informal analysis was performed on hydraulic continuity and the possible results of conservation measures on the ground-water and wetland resources. Although the RPG agrees that it is vital to implement serious irrigation conservation measures, the Water Users Association will not accept the responsibility for the impacts of conservation practices on wetlands, small streams or ground water.

R.6.6 **Mimic Nature: In order to achieve a net gain in productive biological capacity without artificial influence from the irrigation system, existing and potential development should incorporate components to allow recharge and runoff to wetlands, small streams and ground water.** The RPG agreed that wetlands serve important functions for recharge, water retention and habitat. With water use efficiency and conservation, some existing wetlands will probably be changed, but may not necessarily change negatively in terms of maintaining diverse biological functions. It was also agreed that conservation measures should proceed carefully, coupled with habitat restoration, in all cases with an emphasis on *mimicking nature.* Long-term monitoring must accompany these changes recognizing the need to learn from the results for future management efforts. The importance of the educational value of this effort was acknowledged.

Storage

R.7 **No lame on-river storage is proposed due to habitat concerns, cost effectiveness, and lack of demonstrated need.** Storage was discussed early as an option to regulate flows and provide water during critical times on the Dungeness River. Options for small scale storage to assist irrigation management are presented in the Montgomery report on irrigation ditch leakage. The potential for ofd channel storage to assist municipal fire protection reserves is also being considered.

Wetland & Riparian Habitats, Rivers & Small Streams[3]

The RPG realizes the ecological importance of wetlands and the immediate relationship of these aquatic systems to both water quantity and quality. While emphasis throughout the project has been primarily on instream flows, the importance of wetland systems, be they marine, estuarine, riverine, lacustrine or palustrine, has been acknowledged. Because of limited time, emphasis has not been placed on lengthy discussions or recommendations specifically aimed at these habitats, although it is believed that the following recommendations are appropriate to protect and enhance aquatic systems, and thus the water resources of the project area.

*Estuarine wetlands and **marine environments** were included in the original project study area. Because of the main intent of the Chelan Agreement and the RPG emphasis of the DQ work has been primarily on river systems. While the RPG recognizes that estuaries are a vital part of river systems, and often the most endangered component in the aquatic ecosystem, time constraints have not allowed any serious discussions of estuarine or marine environments related to water resources. This does not in any way diminish their importance related to water resources, and estuaries and marine edges need to be included on the "unfinished agenda* " for *future emphasis of concern.*[4]

R.8 It is recognized that rivers (including small streams), riparian and wetland habitats are important to the hydrologic functions of the basin. **In all management actions, strive to retain (maintain) or restore structural and functional characteristics of river, riparian and wetland habitats which are important to native and wild fish and wildlife.** These characteristics include habitat connectivity, vegetation diversity in terms of age, plant species composition and layers, vegetative vigor, abundance of snags and woody debris, natural rather than human-induced disturbance, and irregular shape width and depth. Because these habitats affect and are affected by management activities in upland areas, upland area activities should be conducted in a manner which addresses wetland and riparian area impacts, including adverse impacts from prior upland use.

R-8.1 Identify rivers, riparian corridors and wetlands according to their importance as habitat, and for wildlife and fish values, hydrologic recharge and storage (flood control), and aesthetic and recreational values. Develop and implement a Strategic Wetland Information System in Jefferson County to identify, map and protect wetlands.

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3 Throughout this section the term "river" includes small streams.

4 See further comments on Wetlands from the Environmental Caucus in Appendix E.

R.8.2 Determine the hydrological needs of native and wild fish stocks and work to refine the USFWS/Hiss study's recommended instream flow levels; enhance flows as determined by the hydrologic needs of wild fish.

R.8.3 Protect and maintain or enhance, and in some cases, restore those areas with high values and functions as development occurs to provide the structural and functional integrity of river, riparian and wetland habitat, water quality and quantity, and flood control functions, as a part of long-term habitat management of the region. River, riparian and wetland habitats presently in good condition should receive the highest priority for protection.

R.8.4 Follow the federally defined *Mitigation Hierarchy,* to protect wetlands and other aquatic habitat. Impacts should be approached in this order: 1) avoid impacts, 2) minimize impacts, 3 recd negative impacts, and 4) compensate for impacts.

R.8.5 Condition land use activities such as newly established agriculture and grazing, logging, road and stream crossings, recreation, and urban and suburban development to protect and provide wetland and riparian area functions and values.

R.8.6 Identify and study degraded river, riparian and wetland habitat conditions caused by both natural and human impacts. Assess, maintain, restore and monitor habitat values and related impacts on native and wild fish, by watershed and stream, to determine the needs for these fish resources.

R.8.7 Develop a management plan to increase the values and functions of the habitat and to make better use of the existing water resources.

R.8.8 Explore the following management strategies for rivers, wetlands and riparian habitats:

a. Managing by watershed;
b. Options for yearly management scenarios;
c. Based on an improved biological criteria, maintaining a flexible approach to setting instream flows, to a lank at yearly adjustments needed to set appropriate instream flow numbers.

Flood Plain Management

R.9 <u>Protect and in some cases restore flood plain and estuarine habitat to provide functions and values necessary for native and wild or hatchery fish and other wildlife resources, as well as provide protection for life, safety and property</u>. A gradual evolution away from flood plain development and occupation and impacts on the ecosystem should be the goal.

Using the FEMA delineation of the flood plains the following is recommended:[6]

R.9.1 Discourage future development in the flood plain. (In Clallam County, refer to the Floodplain Ordinance regarding these regulations.) Review, update and strengthen Clallam and Jefferson County Floodplain Ordinances to make sure they are adequate to protect natural floodplain functions.

***R9.2 East Clallam County:* Continue to implement the Dungeness River Comprehensive Flood Management Plan[7] and begin implementation of the Dungeness River Area Watershed Management Plan[8] and link them to revisions to the County Comprehensive Plan[9] and the DQ plan.** Plans directed at flood control and non-point source pollution have been developed for the Dungeness River during the last five years but have yet to been fully implemented. These plans contain overlapping recommendations with the Dungeness-Quilcene plan which would assist in habitat and river management efforts. Comprehensive planning is also proceeding concurrent with the Growth Management Act and should be linked to other regional resource protection measures.

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5 See Glossary for definition of flood plain.

6 In Jefferson County, the FEMA delineation of the Big Quilcene floodplain should be re-evaluated using the FEMA criteria.

7 Kramer, Chin and Mayo, Inc. for Clallam County Public Works. Dungeness River Comprehensive Flood Control Management Plan. December 1990.

8 Dungeness Watershed Management Committee and Clallam County Dept. of Community Development-Water Quality. Dungeness River Area Watershed Management Plan. May 1993.

9 Clallam County Comprehensive Plan Ordinance 175, Title 31, December 28, 1982, Amended October 5, 1993.

R.9.3 ***East Jefferson County:*** **Implement the Big Quilcene Watershed Analysis Recommendations,[10] and the watershed action plans (Discovery Bay," QuilcenelDabob Bays,t2 Ludlow Watershed[13] and link them to the County Comprehensive Plan, the FEMAT planning and the DQ Plan.**

River riparian corridor

[10] Big Quilcene River Basin Local Interagency Team. Big Quilcene River Basin Preliminary Watershed Assessment. April 1994.
[11] In process: Jefferson County, Conservation District and Cooperative Extension.
[12] Quilcene/Dabob Bays Watershed Management Committee and Jefferson County Planning Department.
[13] Quilcene/Dabob Bays Watershed Action Plan. April 1991. is Ludlow Watershed Management Committee and Jefferson County Water Quality Program. Preliminary Draft Ludlow Watershed Action Plan. March 1992.

Forest Practices

R.10 <u>Evaluate the cumulative impacts of forest practices to short- and lone-term regional hydrology, especially related to at-risk native and wild fish stocks including anadromous species</u>. While timber harvest on State and Federal lands has been reduced substantially from the previous decade, cumulative effects resulting from multiple forest practices over time have resulted in changes in watershed, riparian and channel conditions. Concerns over reduced salmonid stocks and degraded habitat and river hydrology have prompted calls for a new approach. Ecosystem and watershed analyses planning and regulatory processes are currently being designed and/or implemented at the State (Department of Natural Resources) and Federal (FEMAT, US Forest Service and US Fish & Wildlife Service) levels. Forest practices on Federal, State and private lands should retain, restore and protect those processes and land forms and promote high quality habitat conditions for fish and other aquatic and riparian-dependent organisms.

8.10.1 Coordinate watershed analyses processes with all agencies, so that there is not duplication or segregation of efforts but rather integration of staff and programs. A complete analysis of the entire watershed including Federal, State and private lands, should be the goal, with consistency the result of this cooperation.

8.10.2 These agencies should make a high priority a comprehensive ecosystem-based watershed analyses that addresses the goals of the DQ Planning area. Analyses should be conducted in those watersheds where there are suspected water quantity and quality concerns, fish stocks at risk or other concerns expressed by the Regional Planning Group or the public.

8.10.3 Include in the watershed analyses, at a minimum, an analysis of the historical conditions of the watershed (riparian channel conditions, stream flows, species presence, population sites, etc.) in order to set meaningful target conditions for restoration and recovery.

8.10.4 The Port Townsend U.S.D.A: Forest Service cooperative watershed management agreement should be considered as a model for other basins in the planning area. (See Chapter 7, J.5.7 for a description of this agreement.)

TABLE 5.1 The Status of Salmon Stocks in the Northeastern Olympic Peninsula (NOP) Compared to the Statewide Status Inventory. Summary Table.[14] (From WDF et al. 1993).

Status	Number of Stocks in NOP	% Stocks in NOP	Number of Stocks Statewide	% of Total Stocks Statewide
Critical	**5**	**20%**	**12**	**3%**
Depressed	**11**	**44%**	**122**	**28%**
Health	**5**	**20%**	**187**	**43%**
Unknown	**4**	**16%**	**113**	**26%**

NOP includes streams from the Dungeness River to the Dosewallips River in the northeastern corner of the Olympic Peninsula.

3 of the 5 healthy stocks are in the Dosewallips River which is near the edge of the rainshadow.

[14] Lichatowich. The Status of Anadromous Fish Stocks in the Streams of Eastern Jefferson County, Washington. 1993.

Fish Management

R.11 <u>To maintain, protect, restore and enhance native and wild fish stocks including critical, high potential of becoming/being critical, depressed and healthy stocks of salrnonids in the river the following recommendations are made</u>: Table 5.1 illustrates the status of salmonids in the northeastern Olympic Peninsula compared to the statewide status inventory. To understand the categories and designations/definitions of fish stocks, refer to Chapter 7, *Problem Definition* for Stock *Status Categories Defined* and to the Glossary.

8.11.1 Protect and in some cases restore salmonid habitat to provide functions and values necessary for native and wild, and hatchery fish. A diverse and robust population of native and wild salmonids should be the goal. Salmonid habitat is defined as:

The physical environment (stream, rivers, bays and estuaries and the ocean) into which salmonids are born, and where they rear, mature, and reproduce. Salmonid habitat use varies with life history stage. They reproduce (spawn) in freshwater, their off-spring rear for varying periods in freshwater prior to migration and maturation in saltwater, and as adults they return to freshwater to spawn, die and begin the cycle again. For a more complete description of habitat and its importance to salmonids, see Appendix D. For a more complete description of each major salmonid stock's life cycle, see the regional Characterization in Chapter 2.

R.11.2 The proposed Watershed Councils, in association with the proposed ad hoc Habitat Work Group should be involved in implementation of the following approach to the management of native and wild, and hatchery fish habitat and management:

8.11.2.1 Manage harvest levels: determine impacts of terminal vs. mixed-stock fishing, and analyze "high tech" fishing techniques on native stocks; regulate annual and in-season catches to provide protection, restoration and enhancement of *critical* and *depressed* stocks.

8.11.2.2 Analyze hatchery impacts: analyze impacts and cumulative effects of hatchery operations on native and wild fish stocks, and manage fish to protect and provide for wild salmonids and other fish species. a. Fish management actions should reflect the need to protect and rebuild stocks while instream flow and habitat improvement projects are implemented. International, Federal, State and Tribal fish managers should work with the proposed Watershed Council to analyze present hatchery and harvest management practices.

b. Initiate the use of, and continue if warranted, artificial propagation for stocks in jeopardy of extinction as recommended by fisheries biologists.

Wildlife Management

Wildlife habitat related to water resources has been defined as waters of *the* State used by fish, *other aquatic* life and wildlife, for any life *history,* stage or *activity. 85%* or more of wildlife is either directly or indirectly dependent upon the fresh and marine waters, and that dependence requires preservation and conservation of the quality and quantity of the supporting water resources. Loss, degradation and pollution of aquatic systems is directly responsible for the loss of diversity of wildlife species. Although the RPG's direct focus was not on wildlife, as a component of the entire ecosystem of which water is a critical element, the survival requirements of wildlife must be considered in a comprehensive water resources plan.[15]

R.12 <u>Wildlife is recognized as an important component of the bioregional ecosystem and should receive protection on both the local and State level</u>.

8.12.1 **Because wildlife is an essential component of the ecosystem, encourage and support the Washington Department of Fish & Wildlife in its mandate to provide ample protection for wildlife in the State.**

8.12.2 **In the DQ area, support efforts to establish wildlife habitat areas and to maintain intact greenspace corridors which wilt allow protection of water-related habitats and ecosystems.**

8.12.3 **Vigorously support the Public *Benefit Rating System*[16] and market it to maximize opportunities for private property owners to preserve habitat corridors and greenspaces. (See Clallam County's Open Space Ordinance.)**

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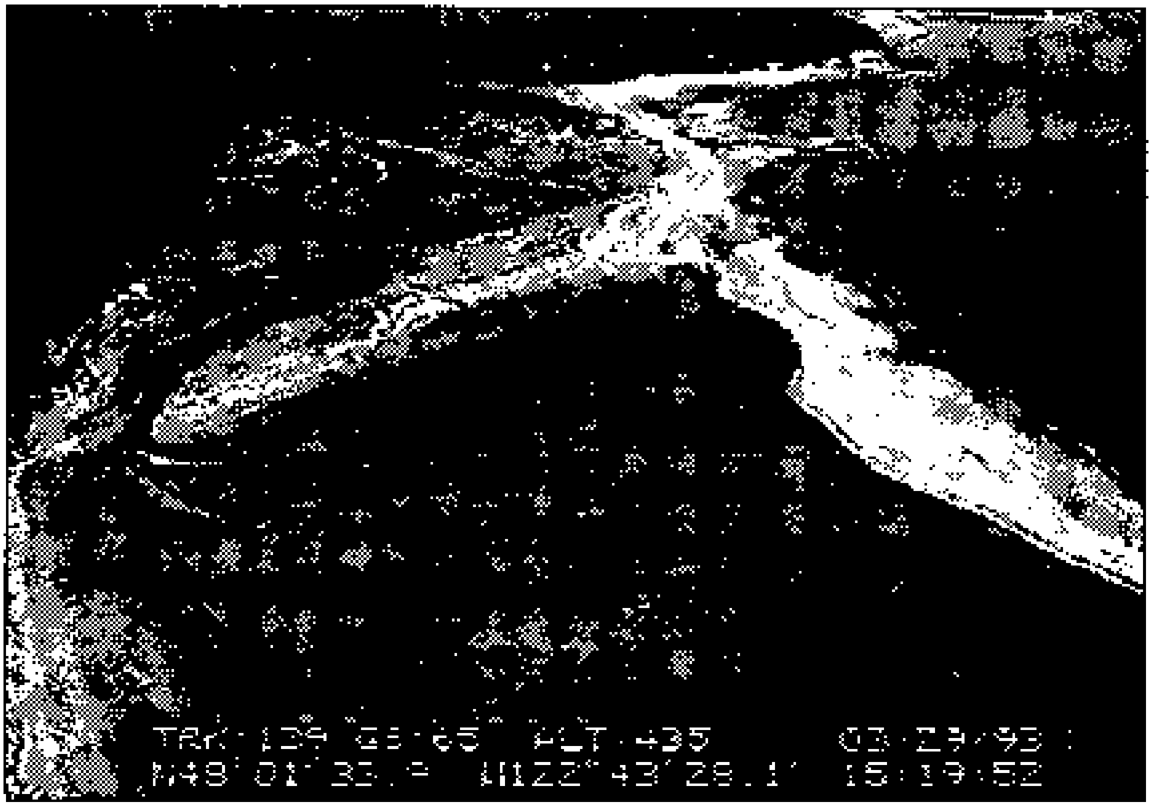
15 See further comments on Wildlife from the Environmental Caucus, Appendix E.

16 The Public Benefit Rating System is defined in the Glossary.

Figure 5.2 Estuarine wetlands on Indian Island at Oak Bay.



WILD and SCENIC RIVERS

Federal **Wild and Scenic Designation** protection is one of many tools available for river protection. To qualify, a river segment must be free-flowing and have one or mare "outstandingly remarkable" values. These include: scenery, recreation, geology, fisheries, wildlife, history and cultural.

3 Classifications of Wild and Scenic Rivers

Wild is the equivalent of a wilderness river. Generally, only the upper section of Olympic Peninsula rivers inside the National Park or designated wilderness are eligible for "wild" status.
Scenic rivers are largely primitive with some evidence of development. This includes road access, cabins, smaller clear cuts, and agriculture.
Recreational rivers must simply be undammed and still have an outstandingly remarkable value.
Wild and Scenic designation is not appropriate on all river sections, but where there are outstandingly remarkable values, it is the strongest protection available to protect the river and its values.

Private Property Rights Under Wild and Scenic Designation

Wild and Scenic designation only allows regulation affecting government land with little, if any, effect an private properly. Section 6(b) specifically prohibits land condemnation for fee if greater than 50% of the riverside is publicly owned. This is true of all Olympic Peninsula river segments currently being considered for Wild and Scenic designation.

A common misconception that the designation would force reversion back to a "primitive" riverside environment is not true. In reality, the intent of the Wild and Scenic designation is to keep the rivers the way they are at the time of the designation. How the river section is classified at the time of the designation will also prescribe how the river section would continue to be managed.

Thanks to the Olympic Rivers Council for this information.

Recreation

R.13 **The RPG agrees that water-dependent or water-related recreation is a beneficial use of water.** Many recreational activities need water. The use of water may be either nonconsumptive, for example simply viewing of rivers or wetlands, or consumptive as it is with gardening or golf. Recreation uses, as with other beneficial uses, must be responsible to conserve water and to preserve good water quality**. The consumption of water for recreation use must share in any sacrifice strategy mandated for low-flow periods**. *The following recommendations were developed by the Recreation Caucus, and have been accepted by consensus by the RPG.*

8.13.1 **Wild and Scenic Designation: Designate the Dungeness/Greywolf Rivers down to Forest Service boundary as Wild and Scenic Rivers**.[17] This designation would help protect habitat. The Forest Service is already managing the land under Wild and Scenic requirements, but it is recommended that the formal designation be pursued to protect the river corridor. Protected would be a 1/4th mile stretch on either side of the river within the designated area, and hydroelectric dams or major diversions would be prohibited.

In order to be designated a Wild and Scenic River requires that 1) the river be free-flowing, and 2) it has at least one "outstandingly remarkable value" (from among nine possible candidates). The Dungeness/Greywolf Rivers clearly meet these two criteria above the diversions due to the anadromous fish present and scenic values. This designation would not change how the river is used in any way below the Forest Service boundary. Water Rights would in no way be affected nor is hunting or fishing changed in any way.

R.13.2 **Access: Provide access to the lower Dungeness River and the lower Big Quilcene River on clearly designated lands that will not interfere with land owners**. Point access is a particularly important issue for fishers, boaters, and shell fishers. Small-scale access areas are envisioned, usable by the physically handicapped. All development should be consistent with habitat protection and restoration management plans.

[17] Several caucuses originally had hoped to secure consensus for Wild and Scenic status down to the first diversion, as the Forest Service had recommended in its 1990 Olympic Forest Plan. However, we were able to get consensus on Wild and Scenic status only down to the Forest Service boundary.

8.13.3 The RPG supports projects such as the Railroad Bridge Park and the Rainshadow Natural Science Foundation's proposed interpretive center on the Dungeness River as examples of opportunities that will provide public access to the river and education to the public on riverine habitat and stewardship. Also supported are Clallam County's and the Tribe's efforts to obtain public land along the Dungeness River, as well as the work of the Olympic Peninsula Land Trust. On the Big Quilcene River, a new opportunity for access should be developed through the recently-acquired Washington Department of Fisheries and Wildlife lands at the mouth of the river.

8.13.4 Both Counties and Cities should find funding mechanisms to take advantage of opportunities for public access to rivers, streams and lakes, and to involve the public in hearings on public access.

8.13.5 Develop riverside management plans to improve the habitat and natural appearance of the river banks below the Wild and Scenic boundary on the Dungeness River, and on the Big Quilcene and other rivers in the region. A good example is the 1990 Olympic National Forest Plan which includes management prescriptions for all the streams that flow through the Forest Service land. 18 Downstream of the Forest Service boundaries, both Jefferson and Clallam Counties should work with property owners to improve the habitat along the lower river corridors, as with the Greenway Project on the Dungeness River. As part of the management plans, assessments of biological, physical, cultural and scenic resources should be continued and developed to provide for compatibility of uses with resource values, including wild and native fish.

[18] "Management Prescription A4A - Wild, Scenic, and Recreational Rivers" and "Management Prescription A4B - River Corridors." U. S. Forest Service. Land and Resource Management Plan. 2990.

813.6 Develop an educational program to encourage responsible use of our rivers and other sources of recreation. A considerable number of goals and actions in habitat stewardship have been presented in the *DQ Education Plan* that should be supported and implemented. 19 Especially, implement #4 *Programs for Realtors, New Residents and Visitors* which mentions recreators as a target audience.

A good example of conservation of water related to recreation is given in the Best Management Practices (BMPs) for Golf Courses Development and Operation written by the King County Environmental Division, January 1993. Local County and City governments within the Pilot area should adopt similar water conservation and water quality BMPs, tailored to local climate conditions. This is especially important if conversion of land from agricultural use results in an increase in water usage.

Hydrologic Research and Data Management

R.14 Future hydrogeologic research is critical to the future stewardship, allocation and management of the water resources of the region. Complete recommendations are in Chapter 4, Information Resources.

R14.1 Complete a water resources study, because additional information is needed for long-term decision making in the DQ region.

R14.2 Include water quality and quantity data management as an essential element of on-going water management and land use planning.

R14.3 Build funding for technical investigations into the rate structure of all large regional water purveyors.

19 see Appendix C, Dungeness-Quilcene Water Resource Pilot Planning Project: *Preliminary Education Plan.*

Volume 1

Chapter 6

Water Use

East Clallam County ୬ Dungeness Watershed Recommendations

Chapter 6
East Clallam County ℘Dungeness Watershed Recommendations

This Chapter reflects issues specific to Clallam County and strategies and recommendations made by the Clallam County Work Group of the Regional Planning Group. Unless indicated consensus was reached by this group on the recommendations in Chapter 6. Refer to Chapter 5, General Background for a discussion on how the RPG worked on the issues aril recommendations.

Problem Definition

Goals 3 and 4 of the Regional Planning Group express the community's desire to achieve the restoration of native and wild fish resources in the Dungeness River while preserving a viable agricultural industry and life-style. These goals result from severe physical, ecological and legal problems which are now evident in the Dungeness River system. Major areas of concern include *critical* and *depressed* runs of salmon and steelhead, degraded fish habitat, insufficient instream flows, the gap between water rights and water availability, and the alterations which almost 100 years of irrigation have made to the ecosystem and social system of the Sequim-Dungeness region. The region is in a state of transition from the agricultural past to a land use dominated by residential and retirement communities, creating different water needs and constraints.

1. **The condition of fish resources in the Dungeness River is severely degraded** Two *critical* stocks may be at risk of extinction, the Dungeness River (Lower) pink and Dungeness spring/summer chinook salmon. Stocks with a *high potential of becoming/being critical* are Upper Dungeness pinks, the Dungeness summer steelhead and the Dungeness winter steelhead. The Dungeness coho is listed as *depressed*.[1] Lower river pink salmon have numbered only a few hundred in the last few years, while chinook have numbered 300 or less fish since 1986.[2] Biologists note a number of

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State of Washington, Dept. of Fisheries, Dept. of Wildlife, Western WA Treaty Indians. SASSI. 1992 & Memorandum. October 1993. Jim Lichatowich. Dungeness River Fink and Chinook Salmon Historical Abundance, Current Status, and Restoration. Revised October 1993.

factors contributing to a decline including degraded habitat, hatchery practices, insufficient instream flows, changes in the ocean resources and commercial fishing activities. Table 6.1 shows the status of stock in the DQ Project area. Table 6.2 illustrates fish utilization in streams in Clallam County. Refer to Chapter 7, Stock Status *Categories Defined,* and the Glossary for definitions of stock status.

Table 6.1 Status of Stocks in Eastern Clallam County (WDF et al., 1993)3

Stream	**Coho**	**Chum**	**Pink**	**Chinook**	**Steelhead**	**Cuthroat Trout**
McDonald, Siebert, Bagel	Depressed	Late - Unknown	nn	run	Winter - Depressed	Special Concern**
Dungeness River	Depressed	Unknown	Lower - Critical Upper - Potentially Critical*	Critical	Summer and Winter - Potentially Critical*	Special Concern**
Jimmycomelately, Johnson, Gierin	Depressed	Summer - Depressed	nm	nm	Winter - Unknown	Special Concern**

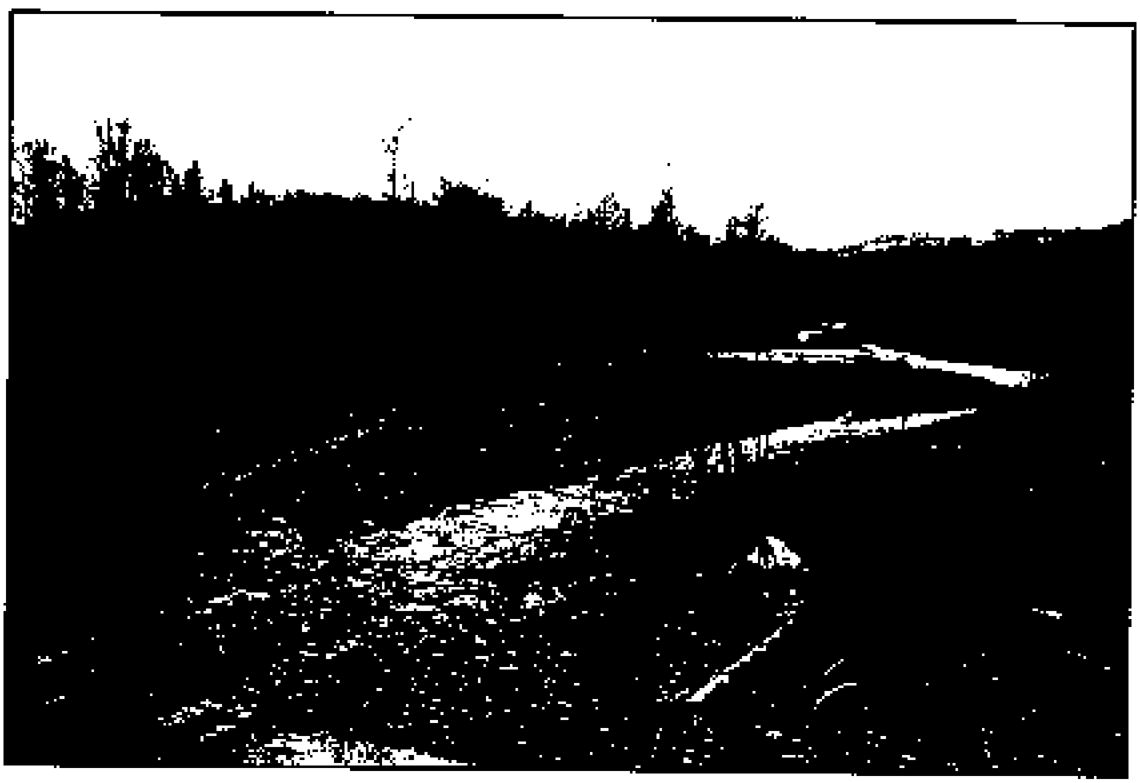
nn Not Mentioned
* Recommended changes for 1994 SASSI
** Nehlsen et al., 1991

Table 6.2 Salmon Utilization in Eastern Clallam County[3] (Williams et al., 1975)
Field work has shown that there are salmonids in other creeks besides what is listed below in the "streams catalog." No updated listing is available. Cutthroat, steelhead, and other fish stocks possibly using many of these creeks were not included in the stream catalog.

Stream	Salmon Utilization
Siebert, Bagley	Coho, Chum,
McDonald	Coho, Chum, Chinook
Matriotti, Meadowbrook, Hurd	Coho, Chum
Dungeness River	Coho, Chum, Pink, Chinook
Cassalery, Gierin, Bell, Johnson, Jimmycomelately, Dean	Coho, Chum

[3] See Lichatowich for further descriptions.

2. **<u>The lower nine miles of the mainstem Dungeness River have extremely degraded and unstable habitat.</u>** Natural, on-going geologic conditions coupled with upstream erosion from human activities have caused large amounts of sediment to be deposited in the lower river. Some streamside development has altered natural overflow channels and caused instability. This has probably increased braiding of the channel with high levels of bedload movement, and created a severely unstable environment unsuitable for fish needs. Constrictions to the channel from several bridges inhibit the river's ability to move gravel out. In addition, the County, the Army Corp. of Engineers and landowners along !, the shoreline have installed rip rap and dikes to control flooding, and have removed large trees resulting in a major loss of productive fish habitat. The private ownership status of I the Dungeness River channel also makes it difficult to implement habitat improvement or channel stabilization projects.4



Dungeness River

4 The Dungeness River is one of the few rivers in the nation with private ownership extending to the mid-line of the river. In most states, the river itself is public land.

3. **<u>Instream flows are insufficient to support fish resources</u>** An instream flow study using the Instream Flow Incremental Methodology (IFIM) was conducted by the U. S. Fish and Wildlife Service.[5] See Figure 6.5 at the end of this Chapter for the recommended flows. Recommendations released in 1993 indicate that a minimum instream flow of 180 cfs. or more for the Dungeness River is advised in the late summer, primarily to accommodate chinook and pink salmon. This is based on the present degraded habitat. A comparison of actual instrearn flows to the IFIM findings shows that in recent low-flow years, 60 to 80 percent of the total flow has been diverted, and as little as 10% of the needed flow for chinook spawning has been available in the reach of the river below diversions.[6] Conditions and factors outside of instream flow could and may make it difficult to attain the levels of production that existed in earlier times. It is hoped that habitat improvements may reduce the instream flow requirements to approach favorable conditions in the river for fish production. Figure 4 illustrates the increase in chinook spawning habitat as the amount of flow rises. At about 100 cfs. the sharp increase starts to level off, and optimum spawning area is reached at about 180 cfs.

IIFIM DEFINED

IFIM stands for Instream Flow Incremental Methodology. It is a tool for assessing the requirements of all fish in a stream. The purpose of the IFIM study was to establish a relationship between stream flow and usable habitat for different life stages of pink, coho and chinook salmon, steelhead and dolly varden in the Dungeness River. The relationship between "weighted usable area" (WUA) used to indicate habitat, and stream flow varies between species and between life stage of a single species. The IFIM uses a series of detailed measurements taken along a number of transects at each study reach. The study focused on those life stages and seasons where flows appear to be a critical bottleneck reducing production of anadrornous salmonids in the Dungeness River. The IFIM does not measure other factors contributing to fish production such as cover, food, predation and

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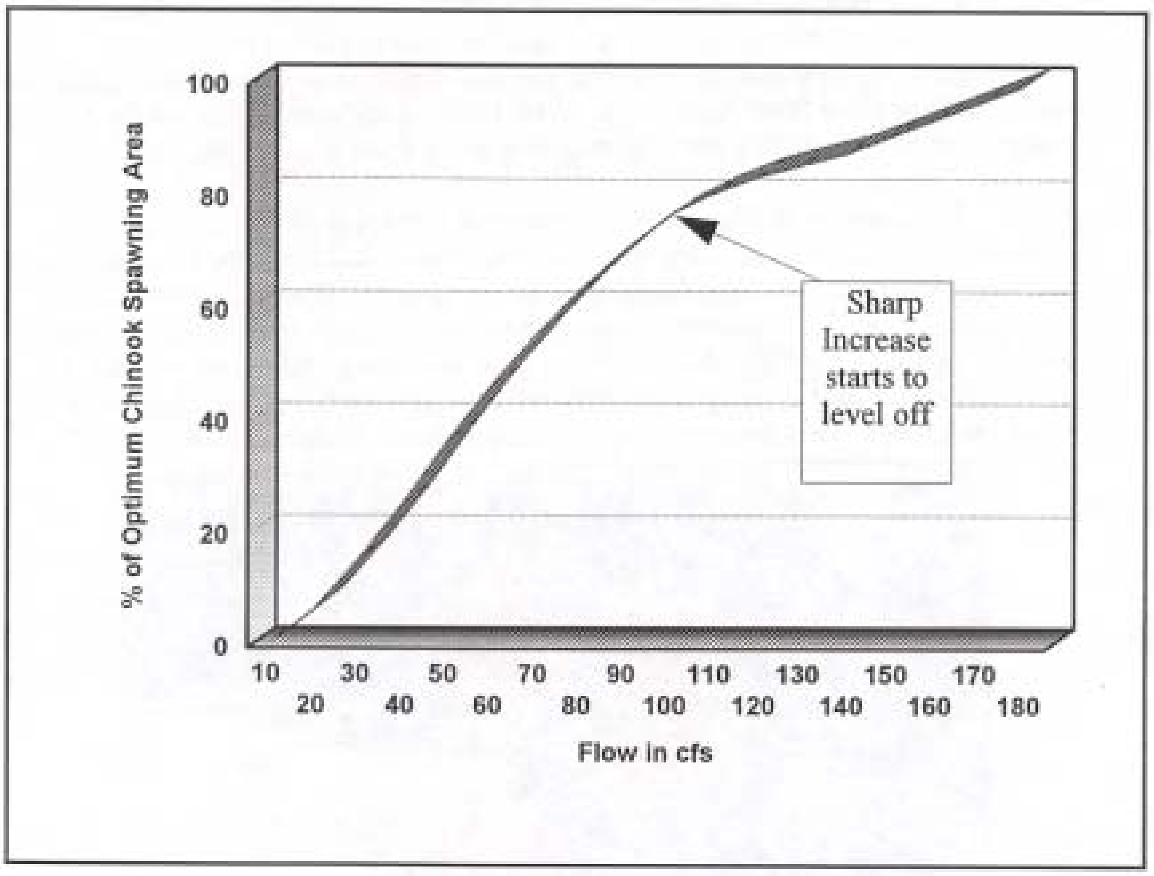
5 Philip Wampler and Joseph Hiss. Fish Habitat Analysis for the Dungeness River Using the Instream Flow Incremental Methodology. U. S. Fish and Wildlife Service, Western Washington Fishery Resource Office. July 1991.

[6] Joseph Hiss and Jim Lichatowich. Executive Summary of the Dungeness River IFIM Study. U.S. Fish and Wildlife Service, Western Washington Fishery Resource Office. September 1990.

Figure 6.1 Increase in Chinook Spawning Area for Given Instream Flow's



[7] From information in: Joseph Hiss. Recommended Instream Flows for the Lower Dungeness River. U. S. Fish and Wildlife Service, Western Washington Fishery Resource Office. May 1993.

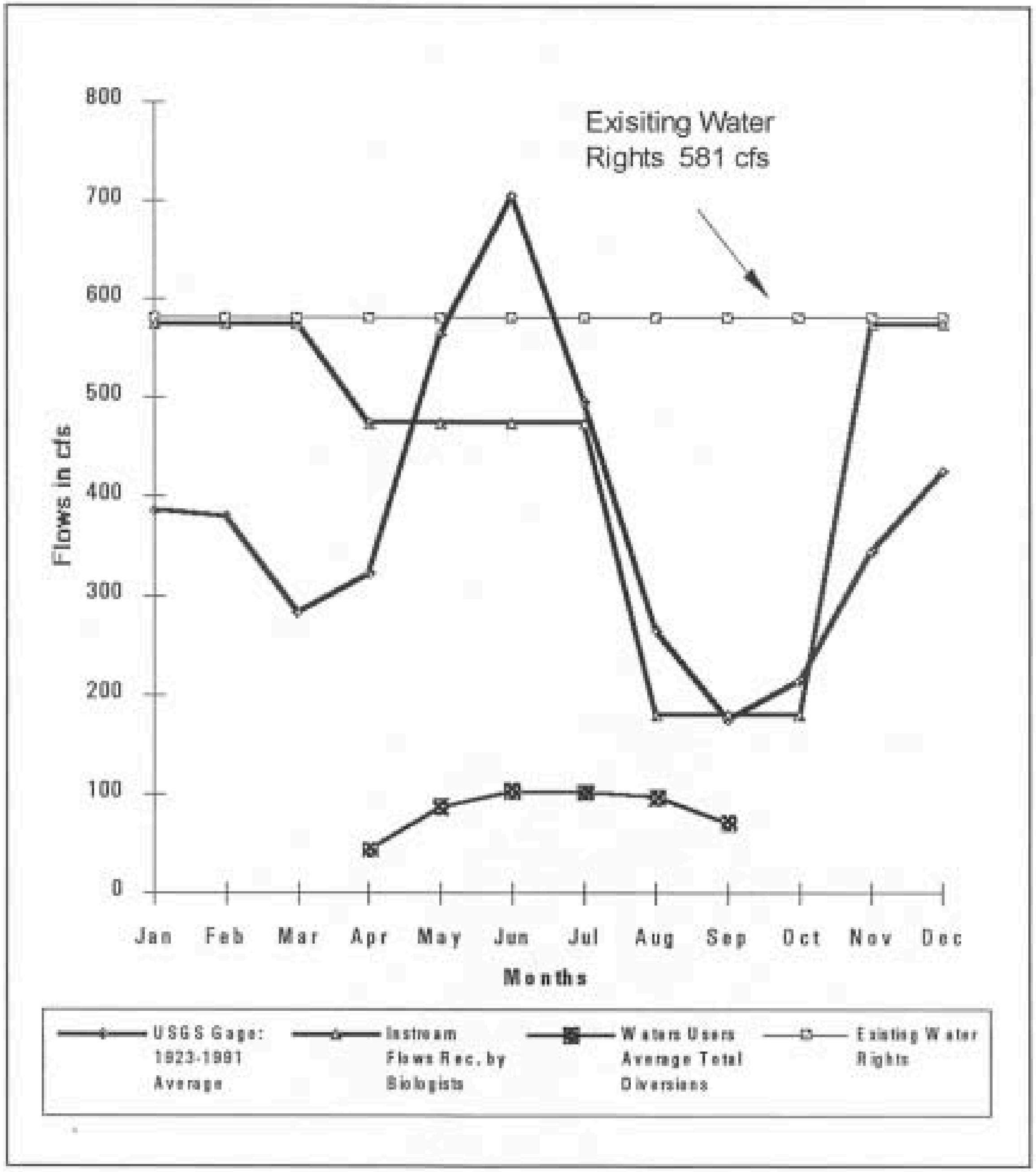
4. **Water rights exceed actual flows and biological recommendations** A total of 581 cubic feet per second (cfs.) have been given out in water rights in the Dungeness River, with the majority for irrigation, while the average flow in late August to early September is 187 to 227 cfs., dropping to as low as 100 cfs. in the first half of September, and even less in the early fall (W. Clark). All of the water rights were adjudicated by the State Superior Court in 1924 based on .02 cfs. per acre. Withdrawals for agriculture have been necessary because the Sequim-Dungeness area is in the Olympic mountains` rainshadow and experiences very dry summers. In order to grow crops, the early residents formed five irrigation companies and four irrigation districts and have organized under the Dungeness River Agricultural Water Users Association (Water Users).[8] The water taken from the river is used for irrigation, stock water and domestic use.

   Figure 6.2 summarizes the relationship between the average flow, biological recommendations, the average amount used in agriculture and the amount of adjudicated water rights. The allowed withdrawal exceeds the mean monthly flow for all but one month of the year. Biological recommendations also exceed mean monthly flows for most of the year, a possible reflection on the degraded state of the habitat and channel instability in the lower river. No minimum instream flow has been established in the Dungeness, and if one were set now, it would be junior to the other users.

Discussions on the Dungeness River

[8] Dungeness River Agricultural Water Users Association: This non-profit association was created as the purveyors of irrigation water in the Sequim-Dungeness area; it is comprised of representatives from nine irrigation companies and districts.

Figure 6.2 Dungeness River Mean Monthly Flows & Recommended Instream Flows

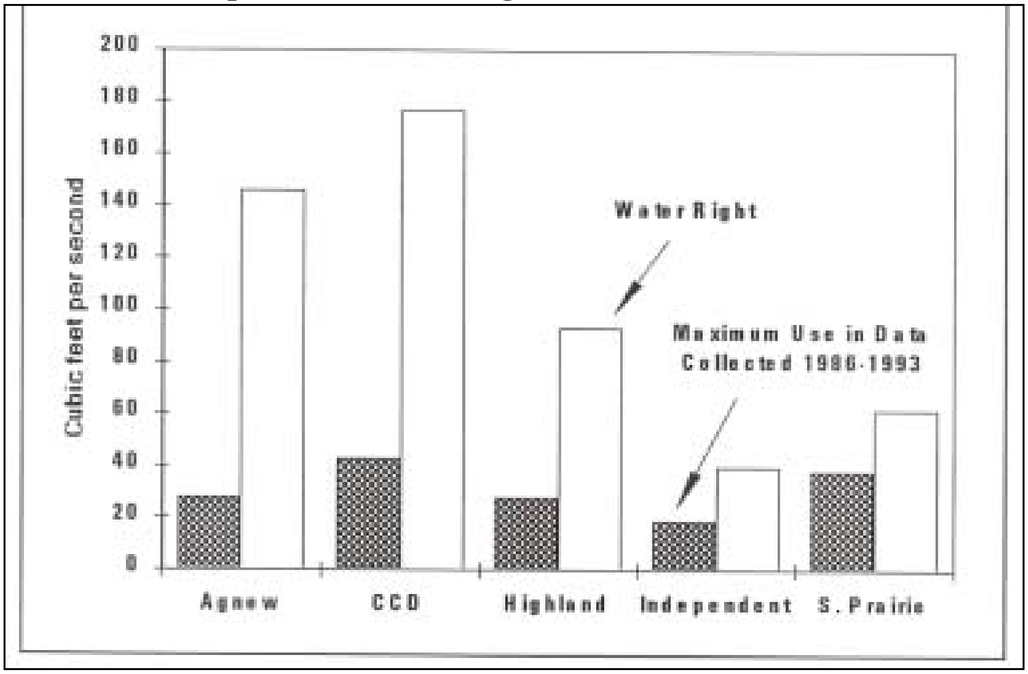


5. **Actual water use by irrigation districts and companies is substantially less than adjudicated water rights, and is not manned on a seniority basis** Despite the entitlement to 571 cfs. by the irrigation districts and companies, (out of the total of 581 in adjudicated rights) the average total diversion among all 9 main ditches is 144 to 11(1 cfs. during the irrigation season.9 Obviously the Dungeness River would have been dewatered if most of the districts and companies used their full entitlement. Even the physical capacity of the delivery system in some ditches is less than their adjudicated amount. Although Washington water law distributes water on a seniority basis, the Water Users have not managed their system on the basis of priority date, and instead have attempted to insure that all users, and the instream flow get at least some water. During the time that fish runs have declined, irrigation withdrawals have also decreased.

6. The ability of irrigation companies and districts to conserve water is hampered_ by legal, educational, financial and physical constraints Because the issues are compounded when more than one district or company works together, the management of water use by all 9 entities is complex. While the Water Users agree that some savings are possible, they identify difficulties in implementing conservation, including: a) the old and inefficient delivery system will be expensive to upgrade; b) the multitude of new, small residential users of irrigation water are difficult to control and educate on beneficial use; c) unclear legal definitions for irrigation and domestic use make enforcement difficult; and, d) they lack authority to prioritize and restrict uses when water is short.

[9] Montgomery Water Group. Irrigation Ditch Leakage Assessment Project. July 1993.

Figure 6.3 Dungeness River Irrigation Withdrawals
Comparison of Water Rights to Actual Use Since 1986[10]



Dungeness River Irrigation Withdrawals
Comparison of Water Rights to Actual Use Since 1986

	Water Rights	Maximum Use
Agnew	146	28
CCD	176.94	43
Highland	93.22	28
Independent	40	19
S. Prairie	62	38

Ditches Combined for Water Rights

Ditch Outtakes	**_Combined Ditches**	**Total Water Rights**
Agnew	Formed McCleary-Lindsay	*Total cfs*. 146
CCD	Clallam Company Cline District Dungeness Company	60 46 _70.94 *Total cfs*. 176.94
Highland	Highland Eureka	70.14 23.06 *Total cfs*. 93.22
Independent		*Total cfs*. 40
Sequim Prairie	Sequim Prairie Dungeness District	20 42 *Total cfs*. 62

[10] The data collected on water use by Ecology, XT and others is generally collected in late summer and thus may not reflect high use during spring and early summer.

7. **<u>Many residences in the Sequim-Dungeness basin depend on wells which tan into a shallow aquifer that is artificially recharged by the irritation system</u>**. With the exception of a portion of Sequim's water supply, coming from an infiltration gallery in the River, most residences, businesses and the City obtain their water from wells. Studies conducted by Drost, U.S. Geological Survey (1980's) documented that a number of these wells depend on leakage from the irrigation system to recharge the ground water, especially in the shallowest aquifer.[11] Availability and quality concerns abound in this area of low rainfall, and (thus low recharge) as wells begin to dry up. Clallam County's Water Quality Department has been developing an inventory of well data to determine both quantity and quality of ground water and is developing a ground-water plan for these resources, but no long term funding to continue this investigation is available Seawater intrusion has been documented in two areas of east Clallam County. A related problem is the regulatory and administrative difficulty in creating community water systems instead of developing a multitude of unregulated individual wells (see number 11).

8. **<u>Irrigation has altered the regional ecosystem, artificially altering recharge patterns</u>.** An entire system of wetlands have developed over the past 100 years as a result of irrigation, and the effect on them of conservation practices is difficult to predict due to their complex hydrological and geological conditions. Whether wetlands arising from, and influenced by irrigation are biologically productive is questionable; at the same time irrigation has also adversely affected certain other pre-existing (and natural) wetlands. Further study is needed. In addition to wetlands, small streams in the area have been artificially supplemented by irrigation. Irrigation ditches have also been used as storm water conduits for new development, altering the natural tendency for runoff to feed wetlands and small streams, and recharge to ground water.

9. **<u>The water supply of the City of Sequim is in hydraulic continuity with the Dungeness River</u>.** In addition to the concern that Sequim is adding to the instream flow problem, the City needs to eliminate the portion of their supply from the infiltration gallery or they may be mandated to install expensive filtration systems. The City is also in need of additional water supplies to meet fire and growth projections. Per capita use of water by Sequim residents is higher than most north Olympic Peninsula communities, and is partially due to a high percent of usage by seasonal residents.[12]

[11] Brian Drost. Impacts of Changes in Land Use on the Groundwater System in the Sequim-Dungeness Peninsula, Clallam County, WA. U. S. Geological Survey. 1983.

[12] Polaris Engineering and Surveying, Inc. Comprehensive Water Plan, City of Sequim, WA. System ID No. 77620-Y. 1993. pg. 243.

10. **The lack of sufficient technical information and the complexity of 2eologica# conditions in the watershed make it difficult to quantify ground-water supplies. and to determine where and how much round water is available for future needs such that existing rights and instream flows will not be adversely impacted**. Clallam County, the City of Sequim, local water purveyors, and the development community are anticipating that ground water can meet the projected needs for future water supplies. However, little is known about the quantity and quality of most of the ground water in the watershed, and the hydraulic interconnection between ground and surface water (hydraulic continuity[13]).

11. **The time required to obtain a permit for ground water discourages the use of community systems**. The Department of Ecology has a several-year backlog of permit applications. Most ground-water applications are further delayed over concerns for hydraulic continuity, and the lack of technical information. Developers find it more expedient to drill individual (exempt) wells than to develop more efficient community systems. Delays in obtaining permits also hold up the development of test wells for exploring more sustainable water resources.

12. **Clallam County lacks a system of management for water resources which links land use planning to the availability of water on a cumulative, region-wide scale**. An estimated total of 30,000 residents are expected to live in eastern Clallam County by the year 2020, compared to the 1992 population of 20,000,'4 making the protection and management of water resources critical. The County presently requires evidence of the availability of potable water prior to the issuance of building permits, but lacks mechanisms to evaluate the cumulative impact of these needs on regional water supplies and instream resources.

[13] See Glossary for a description of hydraulic continuity.
[14] Clallam County Department of Community Development. 1993.

Gravel Trap on Dungeness River

Recommendations and Actions

Water Management Strategies

Regional water management strategies are in Chapter *5, Regional Recommendation* Strategies specific to east Clallam County and the Dungeness River may be found there.

Irrigation Water Management

Discussions and negotiations between the Tribe, the Dungeness River Agricultural Water Users and the rest of the Clallam County Work Group have focused on providing more water to instream flows while maintaining the amount of water needed to keep agriculture viable in the Sequim-Dungeness basin over the long-term. The following actions, strategies and recommendations have been developed to address these pressing needs.

Water Rights

C.1 <u>Water rights should be updated in the Dungeness River to reflect actual and needed beneficial uses by human and natural systems.</u>

C.**1.1 Inventory what amount of water is needed to service the adjudicated uses and what the potential need will be in the future.**

C.1.2 Determine what amount of existing rights are "paper rights" and eliminate[15] or relinquishes them. Refer to Figure 6, Dungeness Irrigation Withdrawals. An estimated 300 cfs. are subject to relinquishment, but remain on paper in Ecology records. These should be removed to reflect actual use, and to protect junior water users and instream flows from activation of senior rights. To protect instream flows, flows must be established by rule, and the priority date of the water right is the date of the rule.

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15 RCW 90.14.160 <u>Relinquishment of right for abandonment or failure to beneficially use without sufficient cause</u>--Prior rights acquired through appropriation, custom or general adjudication. Any person entitled to divert or withdraw waters of the State through any appropriation authorized by enactments of the legislature prior to enactment of Chapter 117, Laws of 1917, or by custom, or by general adjudication, who abandons the same, or who voluntarily fails, without sufficient cause to beneficially use all or any part of said right to divert or withdraw for any period of five successive years after the effective date of this act, shall relinquish such right or portion thereof, and said right or portion thereof shall revert to the State, and the waters affected by said right shall become available for appropriation in accordance with RCW 90.03.250.

C.1.3 Determine what amount can be saved for transfer to instream flow, and implement via leasing or other legal mechanisms. The Dungeness River Agricultural Water Users Association and the Department of Ecology will continue to explore Trust Water Rights or a leasing mechanism to transfer water as savings occur from conservation measures.

C.1.4 Provide an on-going mechanism to eliminate disincentives to conservation (e.g. the *use it or lose it* concept), and allow on-going, orderly transfer of saved water to instream flow needs. Holders of existing water rights may be protected from relinquishment by using Chapter 90.03 RCW to make changes in the purposes of use of their water right, by moving all or part of the water right temporarily or permanently to the Trust Water Rights program, or by making sure they operate within the five year limit on loss of right through non-use. Leases of less than five years duration can be made, or changes in the purpose of use can be made from offstream to instream under Chapter 90.03 RCW. C.1.4.1 Develop a formula to determine priorities for "saved" water.

Dungeness River

Figure 6.4 The Dungeness River Agricultural Water Users Association's MANAGEMENT STRATEGIES for Conservation and Efficiency of Use*

As a part of the on-going effort to change the way that water is used in the Sequim-Dungeness region, the DQ Technical Committee commissioned a report on irrigation ditch leakage. 16 The following is a list of the current measures being taken by the Dungeness River Agricultural Water Users Association to provide a more efficient use of water for agriculture.

1. ***A* Water Use Coordinator and Assistant have been hired and water use inefficiencies are being identified**. The Coordinator will educate and train all the ditch managers in the process of measuring water running through the ditches, in an effort to make sure that water is moving where it is needed in the most efficient manner.
2. **Increased annual ditch maintenance will occur with higher standards. A** schedule for maintenance has been developed. Thorough ditch inspections will continue to identify the areas of greatest need for cleaning. Each District and Company will identify in their budget the dollars needed, and clean as many ditches as funding will allow.
3. **Structural problems that cause water losses are being identified and will be repaired**.
4. **Tail water controls are being installed and will be monitored in the future**.
5. **Lateral controls are being installed to meter and control diversions**. With these control devices in place, ditch managers will be able to monitor the amount of tailwater available, and be better able to limit the amount of water diverted from the river to only that amount needed for efficient irrigation. In addition, in places where a flume is going over a ditch, a weir will be set up to measure the water.
6. **Vegetation is being controlled on banks to decrease evapotranspiration and the wetted perimeter of the ditch.**
7. **A monitoring program has been started to help direct additional conservation strategies.**
8. **Education will be provided to water users in order to develop beyond irrigation management the understanding for the need for "prioritization" and "shared sacrifice." This will include the smaller users.**
9. **The Association will work with the Tribe towards improved mapping of main ditches, laterals, pump stations and return flows.**
10. **Special areas of concern will be identified and lined with short segments of pipes.** Those segments identified as having substantial water losses need to be piped. The amount of lining and piping will be limited by availability of funds. The ditch companies will be looking independently at piping segments of the system.
11. **Field days will be developed to look at current management practices and to share conservation ideas and the need for further improvements.**

*** This. information was provided by Roger Schmidt, head of the Water Users Association.**

[16] Montgomery Water Group. 1993.

Irrigation Water Management

C.2 Management of water in the Dungeness irrigation systems should be improved. As noted in Figure 6.4, *The Dungeness River Agricultural Water Users Association's Management Strategies, for Conservation and Efficiency of Use,* the Water Users are committed to conserving water. The recent and on-going improvements to their conveyance systems, and willingness and awareness of the need to conserve water is expected to show a savings in the quantity of water necessary to service the adjudicated uses and protect area resources.

C.2.1 Improved water management and conservation will be continued so as to provide that no less than 50% of the instantaneous flow as measured at the USGS gage at river mile 11.& from August 1 to the end of the irrigation season (usually September 15), will remain instream.[17]

C.2.1.1 This agreement will begin with a good faith effort in the 1994 and 1995 irrigation seasons. Continuation of this agreement past 1995 is contingent on the ability of the Water Users to protect conserved water from relinquishment by establishing a lease program or other mechanism with the State of Washington.

C.2.1.2 Flows will be based on weekly measurements with a 48 hour adjustment period. Measurements will be made on Monday mornings and the information will be immediately relayed to the water use coordinator for the Association.

C.2.1.3 Irrigators will continue to direct irrigation water to areas where it is most needed and use it most efficiently through the management system which has been developed to implement conservation measures. The following activities/objectives should be pursued by the irrigation districts and companies:

a. Continue to implement voluntary conservation and efficiency of use measures to provide "saved" water for instream flow needs. An assessment of the amount of water saved should be done by the year 2000. If savings are not sufficient to meet the negotiated targets, the Water Users, in cooperation with the Watershed Council and Habitat Work Group should consider developing a detailed water conservation plan with a water management study.

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[17] It is important to note that this agreement is based on the Tribe and the proposed Watershed Council moving forward immediately on habitat improvements to make better use of the available water, see C.7, Habitat Restoration and Enhancement.

b. Over the next several years (by the year 2010), attempt to achieve a target of at least 100 cfs. remaining instream from August 1 to the end of the irrigation season for years in which flows are at average or higher levels. 18 This target is based on the requirements for Chinook spawning habitat and other parameters in the IFIM study, which indicate that greater than 50 percent of the mean annual flow in late summer is needed for fish habitat. After irrigators have implemented conservation and have experienced the impacts of water savings while servicing adjudicated uses, it may be determined whether this is an achievable target.

c. An assessment of water savings and the IFIM recommendations should be conducted after 16 years (the year 2010), with the participation of the Watershed Council, Water Users, the Tribe and regional biologists.

d. Develop and educate users about a system of voluntary prioritization of uses for times when flows are critically low.

CONSERVATION and INSTREAM FLOW STEPS

1. 1994-1995:	Conservation is implemented and the agreement to manage for 50% of late summer flow begins. Habitat work group is formed.
2. By 1996:	Leasing or other agreements with the State must be instituted to protect water users from relinquishment of water rights for conserved water.
3. 2000:	Assess whether conservation measures are working and whether more efforts or detailed conservation plans are needed. Determine if habitat improvements are being implemented.
4. 2010:	Assess whether the IFIM recommendations are correct and if the target of 100 cfs. is appropriate and achievable.

[18] The Water Users want it noted that historic records show there are periodic times when the Dungeness River does not meet the recommended IFIM flows. The Tribal Caucus also notes that a target of 100 cfs is below the IFIM recommendation of 180 cfs in late summer.

C.2.2 Restructure districts and companies for more efficiency. Because of the complexity of water resource issues and management of 9 companies and districts, one Sequim-Dungeness irrigation district is needed.

C.2.2.1 Seek funding for the creation of one irrigation district for irrigation management, maintenance and administration. Include incentives for conservation, tax advantages, grant funding possibilities, and efficiencies in the management of the water system.

C.2.2.2 Explore the possibility of amending subdivision laws so that access or easements are not required.

C.2.3 Explore the possibility of revisions to the irrigation schedule which is currently April 15 - September 15.

C.2.3.1 Terminate most irrigation on September 1.

C.2.3.2 Arrange a special permit system for individual crops that need to continue through September *30.* Identify an efficient method to deliver water to these users without major withdrawal.

C.2.3.3 Quantify the amount of, and define the use for, water withdrawals in the off-season. Incorporate this into the water right.

C.2.3.4 Manage the need for seasonal shifts on a year-to-year basis.

C.2.4 The Dungeness River Agricultural Water Users Association should continue funding a water use coordinator on an ongoing, seasonal basis to record water use, recommend efficiency measures, coordinate cooperation between ditches, and enforce cutbacks in low flow periods.

C.2.4.1 The water use coordinator should have the power to enforce any agreements amongst the districts and companies to limit flow.

C.2.5 As a part of the proposed water resources study, the County, State and Tribe should seek to assess the impacts of reduced irrigation on small streams, wells and ground water using the strategies recommended in the Montgomery report.

C.2.5.1 Perform ditch-specific ground-water assessments. These should focus on an evaluation of potential impacts on down-gradient ground-water users and receptors resulting from the proposed conservation measures.

C.2.5.2 Install stream gages on small streams that may be affected by a reduction in ground-water discharge due to irrigation conservation measures. Compare stream flows to ground-water levels and irrigation ditch flows on a seasonal basis.

C.2.5.3 Develop a regional system of wells for water level monitoring. Select wells best suited to assess impacts from lining ditches and other conservation measures.

C.2.5.4 Maintain the well data base, incorporating well location, depth, water level and geology into a GIS.

C.2.5.5 Install shallow ground-water monitoring wells in wetlands that are of concern. Compare seasonal water levels to ground-water levels and irrigation ditch flows.

Storage

C.3 <u>In order to provide water during low flow periods, the possibilities for off-channel storage of water from irritation diversions should be investigated</u>.

C.3.1 The benefits of off-channel storage to the river system should be studied.

C.3.1.1 Explore both large and small storage reservoirs, in-line reservoirs on ditches and farm ponds.

C.3.1.2 Explore the possibility of these reservoirs being fed by late fall/winter water from diversions, rather than directly from the river, subject to minimum instream flow requirements for those seasons.

C.3.1.3 Water stored should be used only as a supplement for irrigation water, ground-water recharge, and municipal fire flow, allowing water to be "saved" during critical times for instream flow.

C.3.1.4 Water stored should not be released back into the river because of the problems of temperature, disease, and sedimentation.

C.3.2 There should be NO on-channel storage on the Dungeness River.

Conversion of Uses

C.4 **Converted irrigated lands should be carefully planned to improve the availability of water for instream flow and avoid negative impacts on the river ecosystem.** The viability of agricultural lands is critical to the well-being of the community. If future conversion occurs on some irrigated lands, the new uses should be carefully planned to improve the availability of water for instream flows and to avoid negative impacts on the river ecosystem.

C.4.1 Conversion of agricultural land requires and use re-evaluation to provide for efficient water uses.

C.4.1.1 The County should improve ordinances to require best management practices (BMPs), performance standards and total-irrigated-acreage-allowances and adopt their proposed drainage design manual. a. Develop a manual for BMPs incorporating both water quality and conservation components for all golf courses in the DQ project area.

C.4.1.2 Subject any lands converted from agricultural use to any conditions previously established including priority or conservation management strategies developed by the districts and companies.

C.4.1.3 Develop performance standards for lands converted to residential development, specifying design and water efficiency management strategies.

Research and Data Management

As a part of the planning project, the DQ Technical Committee compiled and evaluated existing information on the water resources of the area. It became clear that not nearly enough is known about either the surface or ground-water quantity or quality to make sound planning decisions for protection and management in the future. The RPG commissioned the U. S. Geological Survey to produce a workplan for the investigations needed to determine this information about the resources. The DQ supports the critical importance of pursuing this workplan to provide the region with the missing information to enable decision-making in the future to be based on unquestioned data, and the importance of managing that data in a way that makes it available to both governmental entities and the interested public.

Hydrologic Research and Data Management

C.5 **Hvdrogeoloeic research (the water resources study), should be pursued as a critical component to the future stewardship, allocation and management of water resources of the region.** Data management should be an essential component in the research effort. **Complete recommendations on Research and Data Management are in Chapter 9, *Technical Support.***

Habitat

As a part of the planning effort, both Counties considered setting optimum instream flows for the rivers and streams to protect from increased future withdrawals to the detriment of already over-allocated systems. If the State set by rule (after appropriate public input), flows determined "optimum" by fish biologists, withdrawals from the rivers above that number could not occur, thus protecting instream flows. **It was the consensus of the entire group that no surface water rights should be issued until better data is available on the amount of flows in the rivers, related to fish needs.**

The discussions on setting instream flows revolved around the following concerns: hydraulic continuity with the Dungeness River and small streams, how realistic were the optimum recommended flows given the actual flows in the streams, and how might nature be "mimicked" in water use and habitat restoration efforts. The following recommendations were made to protect instream flows for fish needs during the interim period of the water resources study, arid the development of better criteria to determine fish needs specific to each river.

Instream Flows

Instream Flows

C.6 **<u>Instream flows should be protected and supplemented and improved in the future as possible, to provide minimum flows needed for stocks of salmonids and ether species in the area's rivers and streams</u>**. *See the end of this Chapter for the east Clallam County Instream Flow Needs for Fishery Resources.*

These recommendations imply that water use at all points in the stream system must be managed to ensure adequate flows throughout. Considering the streams for which actual flows have been routinely measured, the actual flows tend to be less than the recommended flows on mast streams. Comparison of recommended flows to hydrologic records suggests that, in many study streams further water appropriation will reduce fish habitat value except during high flow events. Some streams appear more sensitive than others to further withdrawals, based on the number of months during which observed flows are likely to be less than recommended flows (Hiss).

C.6.1 The IFIM numbers established for the Dungeness River as minimum instream flows should be adopted by rule, and given a priority date effective as of the date of the rule, for use in permitting. The IFIM should be reviewed and re-evaluated by the Watershed Council and Habitat Work Group to analyze the appropriateness of the instream flow limits, taking advantage of improvements in newly developed biological criteria for determining instream flow recommendations. NOTE: Records indicate that the River has fallen short of the optimum flows during times when there were no withdrawals for irrigation.

C.6.2 No surface water permits should be issued for small streams in eastern Clallam County. Existing flows should be maintained on these streams until optimum instream flow recommendations based on improved biological criteria are developed. The Department of Ecology in cooperation with other appropriate agencies should refine methods to more accurately represent fish habitat areas on small streams, and biological criteria should be developed for streams where the toe width method or IFIM cannot be used. Specifically, the method should account for the value of woody debris and other non-alluvial features that affect the shape and size of the channel.

C.6.2.1 Off stream water consumption and land use should be managed to maintain existing flows.

C.6.2.2 On streams whose flows come partially from agricultural diversion from the Dungeness River, flows should mimic nature as much as possible.

C.6.2.3 Existing return flow methods for irrigation tail waters must be maintained, except for improved efficiencies.

C.6.2.4 The Water Users want to establish the fact that they will not accept any responsibility for furnishing irrigation waters to any specific use outside their adjudications, including the Hurd Creek hatchery. As recent as March of 1994 a request was made to the Dungeness District for continued supplies of irrigation water for the hatchery.

Habitat Protection and Management

C.7 <u>Habitat Restoration and Enhancement: In order to maximize the biological productivity from available water resources, a habitat management plan should be developed and implemented. Two groups are recommended: a Watershed Council and an ad hoc Habitat Work Group.</u>

Watershed Management

C.7.1 A watershed management council and a habitat work group should be established to achieve on-going continuity of regional habitat management and to coordinate and guide research efforts.

C.7.1.1 An attempt will be made to convene a group to describe the implementation of this recommendation by July 30, 1994.

C.7.1.2 WATERSHED COUNCIL MAKEUP: The Watershed Council should be comprised of a cross section of participants from the Dungeness-Quilcene planning group, the Dungeness River Area Watershed Management Committee, the Dungeness River Management Team and the Dungeness River Flood Advisory Board, since all of these groups inter-relate, and have or will sunset by June 1994. The Council should monitor the implementation of the three plans produced by planning efforts. The membership is to be determined, and should include at a minimum representatives from Federal, Tribal, State, County, and City governments and representatives from the public. Other issue-related groups could be intervened as needed, e.g. landowner's along the river.

C.7.1.3 HABITAT WORK GROUP MAKEUP: The Habitat Work Group should be an ad hoc group of regional biologists with primary concern for the Dungeness River and the area watersheds. In addition, other watershed scientists with expertise in related technical matters should be included, as needed. This Work Group should function as a subgroup of the Watershed Council, and be convened, ad hoc, by June 1994 by the Tribe as a part of an agreement with the Dungeness River Agricultural Water Users Association. Though not active participants, the Water Users should be kept informed of the Work Group's decisions and actions, with the ability to provide input and monitor the process and progress of management efforts.

0.7.1.4 SCOPE: The scope should be broader than habitat alone, and include the area from Seibert Creek to eastern Clallam Boundary, i.e. the west half of DQ project area, with initial/primary focus on the Dungeness River watershed. When issues are investigated outside these watersheds in areas which over lap in both counties, cooperative work with the

Jefferson County Watershed Council should be pursued, e.g. on Miller Peninsula.

C.7.1.5 FUNDING: Funding should be pursued by the governments to coordinate and run this effort.

C.7.1.6 ADVISORY STATUS: The Watershed Council and Habitat Work Group should be advisory in nature and should not have regulatory powers apart from those held by individual government/agency members, except as the member agencies grant it.

C.7.1.7 FOCUS: The Watershed Council should focus efforts on issues including low flows during summer months, lack of good habitat for salmonids and other wildlife species, gravel aggradation and human impacts along the river system. All salmonid enhancement work and habitat review of major projects should be coordinated through the Watershed Council to eliminate negative cumulative impacts of projects.

C.7.1.8 An annual report should be prepared summarizing the Watershed Council's activities and recommendations. The results of all research should be incorporated into the river data management system used by the Watershed Council.

C.7.1.9 The Watershed Council should work with the agencies providing permits for river work to develop a user-friendly system which would allow for habitat improvement projects. The technical expertise represented by the Council should be made available to land owners who want to incorporate river restoration projects into their land improvements.

C.7.1.10 The Watershed Council should investigate a range of options to overcome the obstacle of private ownership of the Dungeness River channel, from donated to purchased or condemned channel easements, access rights, to fee simple acquisition and other opportunities.

C.7.1.11 The Habitat Work Group should develop for Watershed Council consideration a comprehensive habitat management plan, taking into account the natural, historical processes which have and are occurring on the river systems. The plan should include: a. A comprehensive habitat inventory for the Dungeness River to make recommendations to begin to resolve the problem of unstable river channels caused by gravel aggradation; b. A description of why restoration and enhancement are needed and the potential benefits of the projects to the river anti its community; c. An identification of the most critical sections of the river for restoration including what projects are needed and their estimated results, costs and benefits;

d. A definition of the relationship to *critical* and *depressed* stocks to fish and stock recovery efforts;
e. A recommendation for changes in watershed forest practices, including management of riparian corridors, snowpack retention and recharge activities;
f. A recommendation for changes in local critical areas, flood control, and land use ordinances related to habitat and salmonid needs;
g. A recommendation for a program for on-going monitoring of restoration projects, a system for analyzing the results, and a mechanism to re-adjust the restoration efforts as needed.

C.7.1.12 Based on the habitat management plan, the Watershed Council should develop a set of policies or standards for habitat improvement or development projects in the river, especially regarding gravel extraction and traps, in conjunction with permitting entities.

C.7.1.13 Joint funding for the habitat improvements recommended in the habitat management plan should be pursued.

C.7.1.14 Education for river-side land owners and river users should be considered as a vital component of the habitat management planning effort.

Forest Practices

C.7.2 The future impacts of Forest Practices to long- and short-term regional hydrology should be evaluated. Discussions with State and Federal forest managers regarding forest practices indicate that harvest levels are likely to be substantially down from the previous decade, and should have little effect on river hydrology or fish habitat. Given this assumption, forest managers (including those on private lands) should:

C.7.2.1 Consider managing snowpack to encourage maximum retention and thereby extend runoff into area rivers and streams into the later summer;

C.7.2.2 Maintain riparian corridors of at least the minimum width standards applied or recommended by Federal, State and local agencies whose responsibilities are focused on fish and ecosystem health;

C.7.2.3 Develop a corridor plan to maintain the wild and scenic functions of the river corridor, including the section from the USFS boundary to the Dungeness Fish Hatchery;

C.7.2.4 See Chapter *5, Regional Recommendations on Wild and Scenic Designation,* 8.13.1 and 8.13.5.

C.7.2.5 See Chapter 5, *Regional Recommendations on Forest Practices, R.10.*

Channel Stabilization and Gravel Traps C.7.3 A comprehensive approach for bank stabilization and gravel removal should be prepared in the future as a part of a comprehensive habitat restoration and management plan for the Dungeness River to be developed by the proposed Watershed Council. It is agreed by the RPG that gravel aggradation and channel instability is a problem for land owners and native and wild fish and fisheries, and exacerbates low flow problems on the river. There is not agreement on what all the causes of the aggradation are and whether the channel will eventually stabilize on its own, or if human intervention is the best policy. More specific recommendations are in Appendix F, *Stream Modifications.*

Fish Management

C.8 <u>Fish management actions should reflect the need to protect and rebuild stocks while instream flow protections and habitat improvement projects are implemented</u>.

C.8.1 See the Regional Recommendations on Fish Management, R.11.

C.8.2 State and Tribal fish managers should work with the proposed Watershed Council to analyze present hatchery and harvest management practices. Based on that study and other related analyses:

C.8.2.1 Critical, high potential-of-becoming/being critical and *depressed* stocks in the river should be protected, and target schedules should be set for attainment geared to the health and numbers of those wild fish.

C.8.2.2 The status of SASSI stocks currently designated as unknown, and occurring primarily in the Dungeness or eastern Strait of Juan de Fuca should be determined. Appropriate measures should be taken for their conservation.

C.8.2.3 The use of artificial propagation for stocks in jeopardy of extinction, as recommended by fish biologists, should be initiated or continued.

a. Support and continue the chinook captive broodstock program.
b. Initiate a similar program for upper and lower river pink salmon. However, caution is advised in attempting to take pink salmon into a hatchery setting. Responsible agencies must carefully examine past errors to avoid potential failures.

C.8.2.4 The use and water sources of the Dungeness and Hurd Creek hatcheries should be analyzed to determine the production limitations on hatchery stocks (coho) and to assess the impact of hatchery practices on native and wild stocks, particularly with regard to predation of hatchery coho smolts on wild pink salmon fry.

Wildlife Management

C.9 Wildlife is recognized as an important component in the ecosystem and should receive protection on local, State, and Federal levels.

C.9.1 See Chapter S, Regional Recommendations on Wildlife Management, R.12.

C.9.2 In the Dungeness River basin, efforts should be supported to establish wildlife habitat areas and to maintain intact greenspace corridors which will allow protection of habitats and ecosystems.[19]

C.9.2.1 Support Clallam County's Greenspace Program and work to provide funding to protect a greenspace corridor along the Dungeness River.

C.9.2.2 Clallam County and the City of Sequim should encourage land owners with incentives to provide private property for habitat corridors through planning efforts, tax breaks or other programs.

Wetlands, The Dungeness River and Small Streams

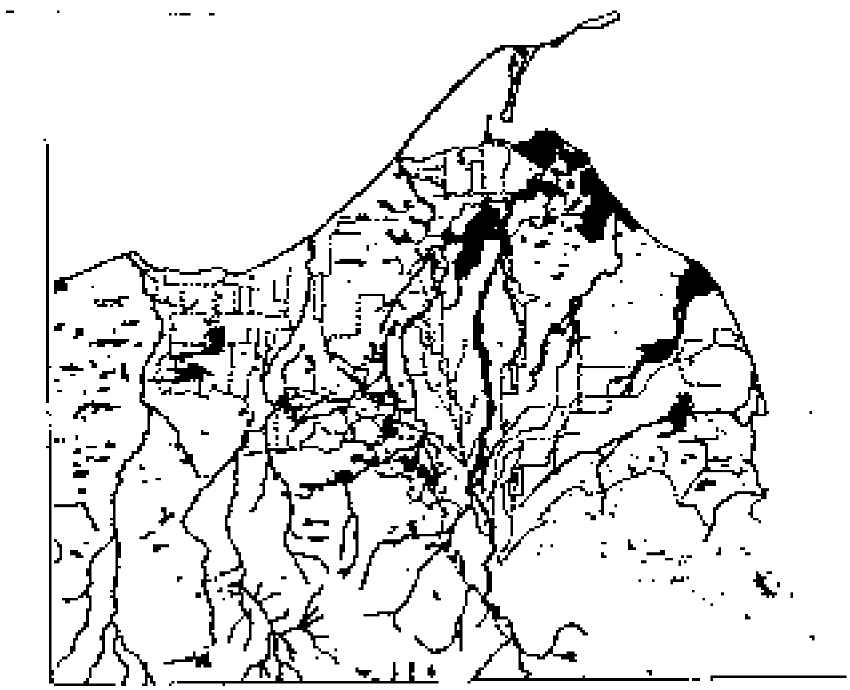
C.10 It is recognized that wetlands are important to the hydrologic functions of the basin and to the wildlife which they support, and that those with high values and functions should be protected and enhanced as a cart of long-term habitat management of the region.

C.10.1 Wetlands should be recognized according to their importance for habitat, wildlife species diversity, hydrologic recharge and storage (flood control), and aesthetic and recreational human values.[20]

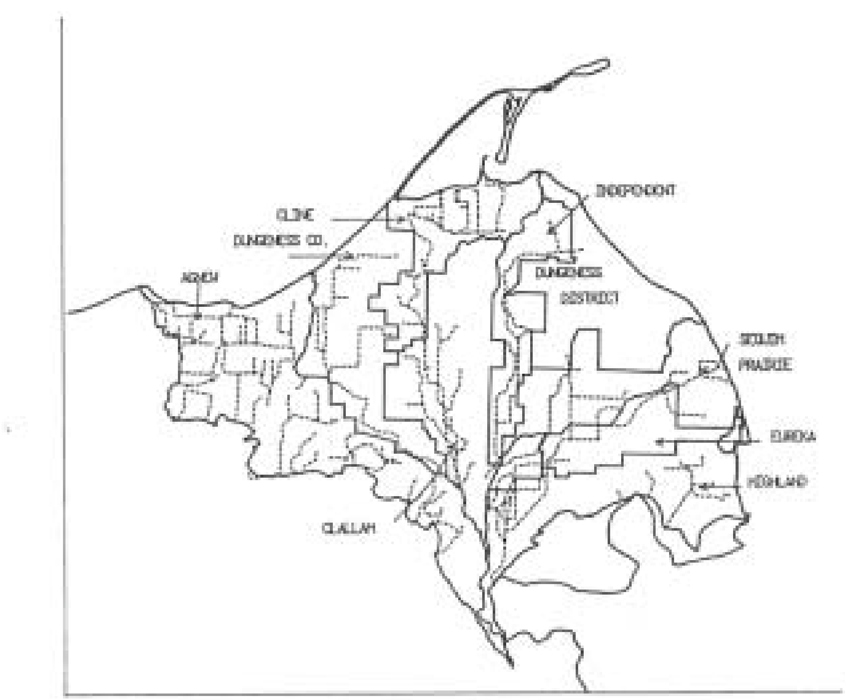
[19] See further comments on Wildlife from the Environmental Caucus in Appendix E.
[20] See further comments on Wetlands from the Environmental Caucus in Appendix E.

MAP 6.1 Wetlands and Irrigation Ditches in Clallam County

Irrigation Systems (dashed lines), Rivers and Streams (regular lines), and Wetlands (shaded areas) in Eastern Clallam County.



Irrigation systems and district and company boundaries.



C.10.2 PART A: Due to the critical status of Dungeness fish stocks, irrigation water should not be used to augment wetlands or small streams. In implementing changes to the irrigation system, an attempt should be made to try to restore a more-natural drainage system through the following measures:

C.10.2A.1 Management of water resources to preserve instream flow in the Dungeness River should take precedence over the intentional diversion of water to augment other streams and area wetlands; e.g. reduced diversions may increase flows in the mainstem of the Dungeness River.

C.10.2A.2 Re-evaluate the use of irrigation water in Bell and Matriotti Creeks in light of the educational and restoration efforts focused there.

C.10.2A.3 Outside the Dungeness River, managed reduction of flow is based on a presumption that native and wild stocks in their natal streams will not be adversely impacted. This recommendation is not intended to discount the importance of small stream habitat and riparian wetlands to the biological productivity of the entire ecosystem, and their protection should be incorporated into all habitat restoration efforts.

C.10.2A.4 Wetlands should be allowed to fluctuate naturally with the season, e.g. remain seasonally dry or wet without the manipulation of additions of ditch water.

C.10.2A.5 Streams should not be used for irrigation ditch conveyance, except where no alternatives exist; no new conveyance agreements should be started. Agreements to use some streams for irrigation water conveyance have been in place since 1902. If the Watershed Council determines that changes to the present system are needed, a joint effort by the Water Users and the Watershed Council should be made to pursue funding for implementation of rerouting waters.

C.10.2A.6 In existing developments, road construction and irrigation systems, as well as in future developments, the concept of *mimicking nature* should be utilized for stormwater runoff and recharge, in order to restore natural hydrological functions to small streams and wetlands. a. Identify and seek implementation of measures to modify existing ditches, particularly on the Agnew and highland system, to direct runoff into existing natural channels rather than into ditches. b. Implement stormwater management and erosion drainage for new development. If the Council determines that changes to the present system are needed, a joint effort by the Water Users and the Watershed Council should be made to pursue funding for implementation of rerouting waters.

C.10.2 PART B: Wetlands should be considered during the planning for and implementation of irrigation system conservation measures. It is acknowledged that with efficiency of use and conservation measures on the irrigation systems, some changes in wetlands and ground water may occur, and cannot always be predicted until measures are implemented over a long period of time.

C.10.2B.1 Identify, where feasible, which irrigation ditches discharge to wetlands and ground water, and which wetlands are providing recharge to the irrigation system.

C.10.2B.2 Identify, where feasible, wetlands which are providing critical wildlife habitat and which may be affected by conservation measures. Determine alternative strategies to protect these wetlands when conservation is implemented.

C.10.2B.3 Develop restoration measures for wetlands that provide critical wildlife habitat and have been impacted by irrigation conservation.

a. Mitigation should be planned, where feasible, as part of the Strategic Wetland Information System, in cooperation with the Watershed Council and funded through interlocal and private-public partnerships.
b. The agriculture community should cooperate, where feasible, with projects to mitigate the loss of wetlands through provision of alternative habitat areas, and water management if recommended by the Watershed Council.

C.10.3 See Chapter 5, Regional Recommendations on Wetlands Management, R8.

C.10.4 The following specific recommendations for wetlands and small streams should be implemented:

0.10.4.1 The rehabilitation of small streams should be pursued even without supplementing flows because: a. Productivity may still be maintained with low water levels; b. Rehabilitated sections of streams may act as "shock absorbers" to protect downstream areas, e.g. by storing sediment, providing flood control, and protecting downstream areas from runoff.

0.10.4.2 Routing ditches through the urbanized areas should be carefully analyzed because of the possibility that these ditches may he vehicles for carrying pollutants/runoff through the system.

0.10.4.3 Recharge should be improved by installing culverts under or over ditches to direct runoff away from ditches in problem areas, so that ditches are not absorbing stormwater. This is especially important in the Agnew and Highland ditches. This would allow runoff to recharge wetlands and small streams and mimic original runoff patterns in the area, while helping solve runoff problems.

0.10.4.4 IIVIPOUNDMENTS: Any dams used to store irrigation water artificially raise the local water table. These should be studied to determine if they are an efficient use of water and what their impacts are to area wetlands and the local water table.

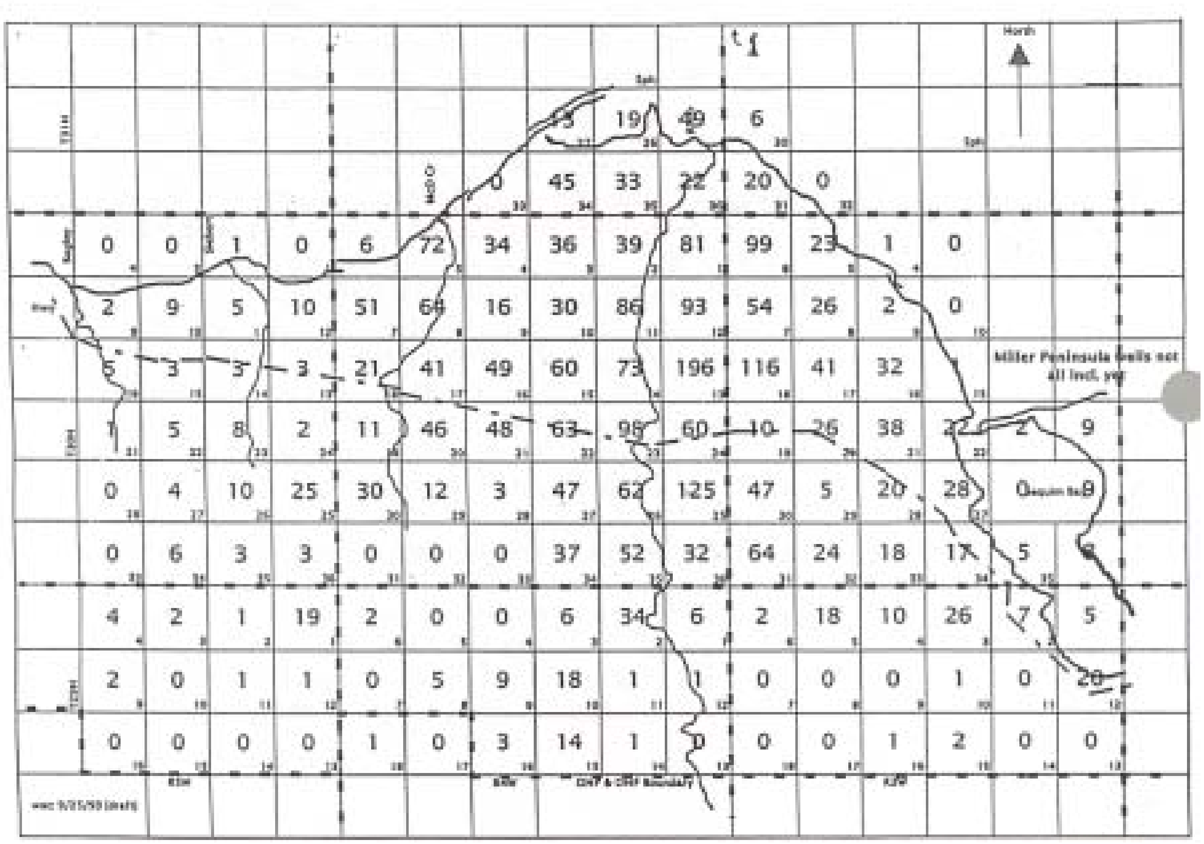
C.10.5 Small streams and tributaries should be studied to determine what needs exist for these ecosystems.

0.10.5.1 Research should be done on the impact of irrigation water on fish imprinting in the streams in the area, e.g. McDonnell Creek.

0.10.5.2 An inventory and stock analysis should be done on the area's small streams, as was done for eastern Jefferson County streams.[21]

21 Jim Lichatowich. The Status of Anadromous Fish Stock in the Streams of Eastern Jefferson County, Washington. 1993.

MAP 6.2 Count of All Identified Water Wells in Square-Mile Sections
Eastern Clallam County (n=3060) (as *of mid 1993)*



Ground Water

Ground water is a big issue in Clallam County. Is there enough water to support a growing population, what is the quality of that water, what are the threats of pollution including seawater intrusion, and why are wells drying up? These are just some of the many questions that have been asked and discussed in the community, during the DQ process, and at the County level as a ground-water program is developed.[22] Preliminary investigations of groundwater resources occurred in the DQ-funded studies on irrigation ditch leakage and on seawater intrusion.[23] Because of a concern over supplying ample water for the community's present needs and for future development, while not drawing from over-allocated rivers (in hydraulic continuity with ground water) or mining unknown amounts of water in the deeper aquifers, the following recommendations were made.

Hydraulic Continuity, Ground Water, Recharge and Wells

C.11 <u>Because little is known about the ground-water resources of the region, the relationship between the Dungeness River and recharge should be a high priority in water resource investigations. It is agreed by the Clallam County Work Group that almost all ground water in the watershed has the potential for continuity with the Dungeness River, however, the extent of continuity and the risk to instream resources will vary significantly with location, proximity, and timing of recharge.</u>

C.11.1 Conduct a water resources study to analyze the regional ground- and surface-water resources. The study should determine the regional distribution of characteristics including ground-water quantity, quality, and hydraulic continuity, along with modeling such that safe, sustainable yields may be estimated. As a part of this study, existing wells in the area such as the Weyerhaeuser well, should be investigated as to quantity, quality, and risk of hydraulic continuity. Based on the results of the study, a comprehensive source of water for use in present and future growth should be developed.

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[22] *Sequim-Dungeness Ground Water Protection Strategies Final Draft 1994,* are currently being produced by the Clallam County Department of Community Development (Ann Soule), and the Sequim-Dungeness Ground Water Committee. This document, combined with the DQ recommendations and those from other planning efforts in the basin, will help guide the way towards a comprehensive ground water strategy for the area.

[23] Robert Forties and CH2MHi11. Preliminary Assessment of Seawater Intrusion in Coastal Water Wells in Eastern Clallam and Eastern Jefferson Counties. October 1993.

C.11.2 An interim strategy should be developed to determine how to protect the quality and quantity of ground water for the next five years, or until more hydrogeologic information is available. (*NOTE: Because of time and budget constraints, an interim strategy has not yet been completed by the RPG; preliminary discussions have started on the topic.)*

As a part of the interim strategy, hydrologists from the County and State should attempt to identify known high risk areas as soon as possible. New wells should be completed in deeper, confined aquifers, where possible. This is a general, interim recommendation pending the results of more detailed water resource investigations and is intended to minimize impacts to instream flows, shallow wells and water quality.

C.11.2.1 In cooperation with the State and Tribes, the County should pursue funding to develop an interim strategy in 1994 to protect ground water and to guide the State's future issuance of permits.

C.11.2.2 Clallam County will convene a "ground water group" to include the County, PUD, Tribe and State ground-water staff to develop a menu of options based on the Water Resources Forum's Hydraulic Continuity and Instream Flow Policies document. These factors will be applied to the local level to develop regional strategy. Next, the eight RPG caucuses will be reconvened to review the recommended interim strategies. This will be completed before September 30, 1994 (within the 90 day review period of the DQ Plan by Ecology).

C.11.2.3 Pending the results of the water resources study (during the next five years), Clallam County and the City of Sequim should enact land use controls limiting density ©f development in areas of high risk for hydraulic continuity or ground-water mining, or require the use of alternative water sources subject to other provisions contained in this plan.

The Water Right Exemption or 5,000 Gallon Exemption

In Washington State, prospective water users must obtain authorization from the Department of Ecology before diverting and using any surface water. For ground-water withdrawals, State water law requires all prospective water users to obtain a water right permit from Ecology before constructing a well or withdrawing any ground water from a well. However, the law does allow a water right Permit Exemption which states that no water right permit is required for the withdrawal of up to 5,000 gallons of water per day (gpd) from a well when the water is being used for:

- Livestock watering;
- Single or group domestic water supply;
- Industrial purposes; or
- Irrigation of no more than I/2 acre of lawn or non-commercial garden.

This exemption to the water right permit process is commonly called the "domestic exemption" or the "5000 gallon exemption."

How the Exemption Works

The Permit Exemption allows certain users of small quantities of ground water (most commonly single residential well owners) to construct their wells and develop their water supplies without first obtaining a water right permit from the Department of Ecology.

- Water users withdrawing ground water under the exemption establish a water right equal to the water right they would establish by obtaining a permit from Ecology. The priority of such a water right dates back to the beginning of beneficial use of the water, as defined by the State Ground Water Code.
- Water users have the option of applying far a water right permit even though their uses fall under the Permit Exemption.
- All wells for a given project apply toward the limits of the exemption. For example, one could not irrigate two acres by installing four wells - each serving I/2 acre, or use 10,000 gallons per day for an industrial purpose by installing two wells. Each of these water uses would require permit authorization from Ecology.
- Ground-water users with "exempt" rights are still subject to regulation in favor of senior water rights. All water users are subject to the rule of "first in time, first in right." Ecology regulates the diversions and withdrawals of junior (more recent) water users when their water uses impair senior water rights. For instance, regulation is necessary when affected senior water rights are no longer able to fully satisfy their rights. These affected senior rights can be senior ground-water rights, surface-water rights or instrearn flows,
- The Permit Exemption is not available to prospective water users in certain water short areas that have been closed to further appropriation.

This information is from the Department of Ecology.

0.11.3 Manage ground-water resources to insure the protection of water quality. Shallow wells should be discouraged in East Clallam County, especially in areas in hydraulic continuity with rivers and streams. The following recommendations are made for wells:

C.11.3.1 Implement a well inspection and sampling program as a part of the water resources study;

C11.3.2 Identify unused wells and decommission them properly according to State standards;

C.11.3.3 Identify wells that are having problems such as seawater intrusion, contamination and declining water levels; investigate the causes; implement corrective measures;

0.11.4 For all new wells drilled in the County, follow and enforce the State Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC) arid the Water Well Construction Act (Chapter 18.104 RCW).

IMPORTANT NOTE: *Considerable discussion was focused on the recommendation to meter wells in east Clallam County* ***. The following recommendations have full consensus of the Work Group. Further recommendations which do not have full consensus support appear at the end of the Chapter****.*

0.11.5 Meter all new community water systems and require that the State, County, City or PUD with jurisdiction record total annual water use.

0.11.5.1 Encourage all new individual and industrial/commercial users to install meters to determine water usage.

0.11.6 The County should develop and establish a S year well metering pilot study on 100 houses with new and existing wells within 1/2 mile of the Dungeness River. As a critical element of the over-all water resources study (USGS workplan) for east Clallam County, a water use inventory of wells must be developed. By choosing a number of wells that are in hydraulic continuity with the Dungeness River, and metering those wells, we will begin to develop a clearer picture of the relationship between ground-water use and instream flows, and of the actual amount used by individual well owners.

In addition, the voluntary participation of well owners in this program will enable them to understand the quantity of water being used, and to compare that to the allowed amount. Through this program, the County will offer the metering equipment and installation, read the wells on a regular basis, and compile the ground-water information. Throughout the 5 year period the information will be fed into the water resource study. The water budget will enable decisions **to be** made about land use based on known use related to known existing water resources.

C.11.7 Encourage community systems by providing quicker, local review of permits,24 to eliminate the need for single exempt wells, to promote efficient, healthful water systems and to enhance monitoring capabilities.

C.11.8 In the interest of the aver-all health of the region, develop low interest loans or other mechanisms to maintain or assure potable water for those areas affected by public health problems related to the water supply or insufficient water.

C.11.9 After the proposed water resources study has been completed, establish a long-term strategy and program for the protection of ground water. Included should be implementation of these recommendations from the Forties! CH2MHill seawater intrusion study and the Washington Department of Ecology Seawater Intrusion Policy, August 1992. C. I I .9.1 Identify areas of risk far seawater intrusion; C. I 1.9.2 Develop sub-regional water management plans for areas where potential seawater intrusion has been documented.

C.11.10 Local water purveyors and Clallam County should consider organizing under "The Public Water System Coordination Act of 1987," Chapter 70.116 RCW and Chapter 248-56 WAC.

C.11.11 Develop an education program to educate well owners on the proper use of well water, including an understanding of the ground-water exemption of 5000 gallons/day and the one-half-acre rule.

C.11.12 Because of the potential cumulative affects on the ground water from on-
. site disposal of salt filters for water softeners, future consideration should be given to their use in the County, and educational materials should be produced explaining their possible negative impacts on ground-water quality.

[24] See Environmental Dissent on C.16 at the end of the Chapter.

C.12.1 The City of Sequim .should develop a long-term source of water, and work to conserve water from the Dungeness River. It should also work to gradually eliminate the use of surface water from the Dungeness River except as a back-up in extreme cases. It is recommended that:

C.12.1.1 The City of Sequim apply to the Department of Ecology for a <u>change</u> in the point of diversion from surface to ground water. This would allow the use of the existing 1.4 cfs. water right on the Dungeness River to be transferred to an alternative ground-water location. This should be subject to the investigation of the ground-water supply adequacy and impacts on neighboring wells.

C.12.1.2 The City of Sequim participate in funding proportionately the proposed water resources study. This will determine if there is a long-term deep-well source of water to provide for the needs of the citizens, current and future.

C.12.1.3 The findings from the proposed water resources study be incorporated into the long-term planning strategies for water resources by the City.

C.12.1.4 The City of Sequim enact and/or enforce regulations protecting sensitive, environmentally-vulnerable areas and aquifer recharge areas.

C.12.1.5 The City of Sequim pursue appropriate alternatives to the construction of a surface water filtration plant, and State and Federal agencies alleviate the deadline of 1998 for filtration.

C.12.2 The City of Sequim should implement a rigorous conservation program to most efficiently use the available water and to reduce the higher-than-average per-citizen use. The City should:

C.12.2.1 Implement the conservation recommendations in the 1993 Comprehensive Water Plan,25 incorporating the DQ's *shared sacrifice* concept of cutting back equally among all users during times of low flow.

C.12.2.2 Adopt regulations enabling them to implement mandatory restrictions during shortages, e.g. alternate-day watering or no outside watering.

C.12.2.3 Implement the Plan's following recommendations with a goal of 15% reduction in demand:

a. INFRASTRUCTURE: Investigate storage possibilities to provide for the current summer season deficiency.

[25] Polaris Engineering and Surveying, Inc. 1993 Comprehensive Water Plan, System ID No. 77624 y, City of Sequim, WA. August 31, 1993. See Appendix for the Conservation chapter.

C.12.2.3 Implement the Plan's following recommendations with a goal of 15% reduction in demand:

a. INFRASTRUCTURE: Investigate storage possibilities to provide far the current summer season deficiency.

b. INSIDE DOMESTIC USE: Adopt an aggressive policy that would: 1) mandate the installation of water-conserving devices on all new and remodel construction as a requirement of permit approval; and 2) require the conversion of existing construction to low flow construction within a specified period of time, such as 5 years. The City should investigate the costs associated with providing financial support to assist with the conversion for persons of low income.

c. OUTSIDE DOMESTIC USE: Establish an inverted rate structure,[26] reducing the current incremental billing unit of 5000 cubic feet to 500 cubic feet, to increase consumer awareness of the total amount of water used through an increasingly larger water bill.

d. COMMERCIAL USES:[27] Undertake the installation of low flow toilets, flow restrictors and pressure regulators. Implement the inverted rate structure for the commercial category.

e. SYSTEM MODIFICATIONS:
   - Provide a competent master meter system to account for "unaccounted waters,"[28] and provide for a meaningful system indicator;
   - Modify the current computer-produced water billing system to provide water use statistics.

f. Consider adopting a seasonal water rate, one for winter and a higher rate for summer.

g. Initiate a water audit program which would provide a voluntary review of owner's water systems and provide information on ways to increase efficiency of water use.

h. Require conformance of all structures to the state Energy Code.

i. Add additional pressure zones to bring average zone pressure dawn from 80 to around 45 psi, resulting in significant water flow reductions for users in all categories.

j. Provide active conservation education programs for water users in the community, including using mailers with the water hills, promotional

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26 An inverted rate structure features an increase charge for billing unit as the water consumption increases.

27 Within this classification are offices, motels, commercial and public facilities.

28 Unaccounted waters are those waters lost in the system due to leaks, evaporation or other means.

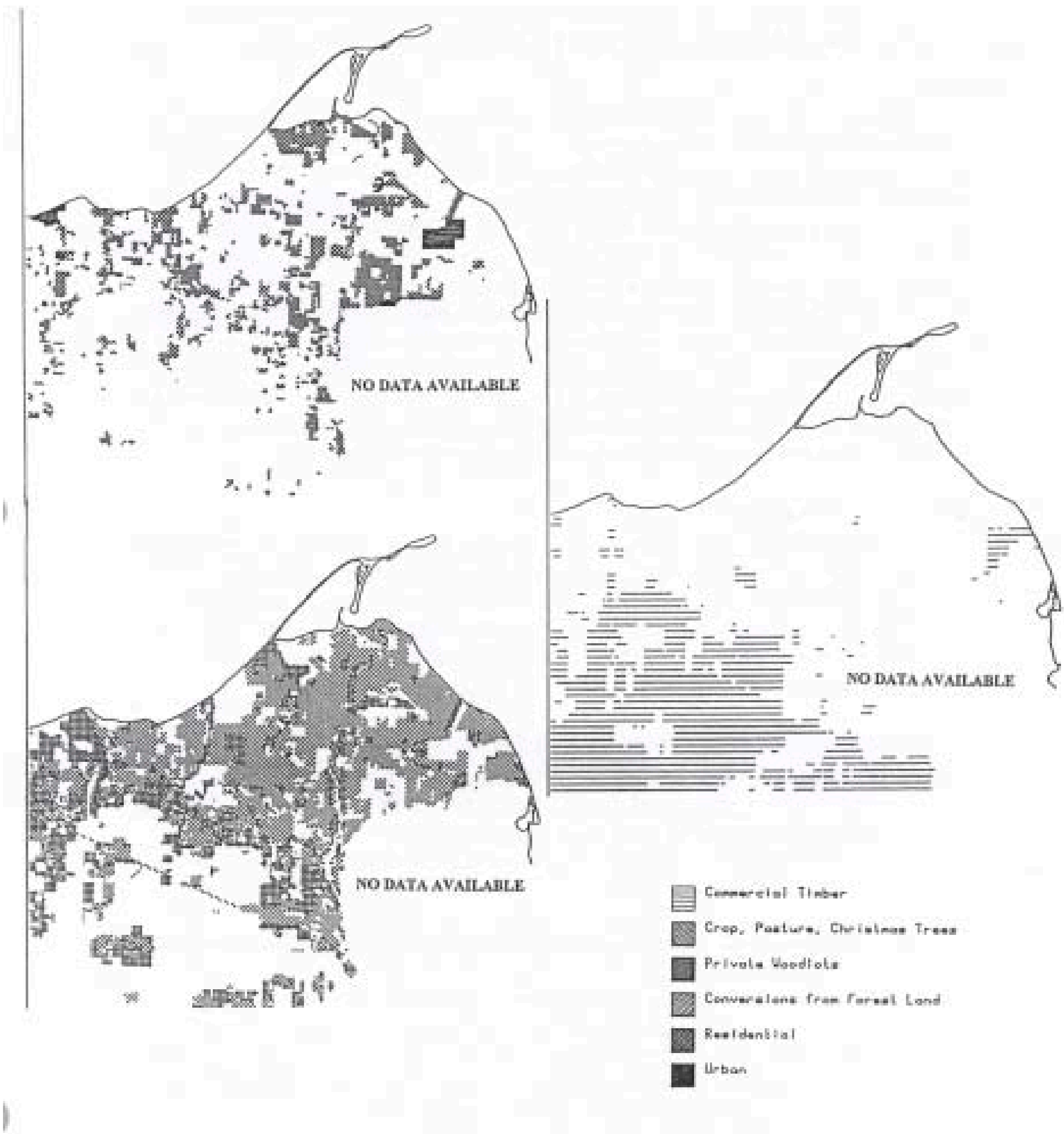
programs, public presentations, technical support for commercial users to install recycling water systems for non-potable water uses, and encouraging water conservation at businesses such as restaurants, motels, etc.

k. Provide storage and fire protection measures that do not require the development of new sources or instantaneous withdrawals in low flow periods.

C.12.3 Prior to the extension of service to additional areas, the City of Sequim should document the availability of adequate water supplies subject to other policies in this plan (e.g. hydraulic continuity).

C.12.4 Interties with other water purveyors within the DQ region may be permitted. It should be demonstrated that interties will cause no negative impacts on instream flows or hydraulic continuity, and that ground-water withdrawals will remain within safe, sustainable levels.

Map 6.3 Land Use of Eastern Clallam County
(Data from the Puget Sound Cooperative River Basin Team 1991)



East Clallam County Regional Water Management System

A great deal of discussion occurred in the Work Group about how to better manage water resources given even greater limits on Ecology's Water Resources Program. DQ looked at existing protection programs at the State level, and generally believed these were not sufficiently effective to protect the resources. These included Ch. 173-100 WAC, Ground Water Management Areas and Programs, Ch. 36.36 RCW Aquifer Protection Areas and Ch. 173-22 WAC Ground Water Quality Standards. Some of the problems include staffing limitations, time these programs take to implement, structures which do not allow for sufficient flexibility, and the current political climate which makes it difficult for local communities to establish new taxes. This discussion came very late in the process. There was consensus that something different needed to be done to make the system much quicker, more efficient and to better protect the resources. *Consensus was reached on the following recommendations* ***Further recommendations which do not have full consensus support appear at the end of the Chapter***.

Watershed Protection District

C.13 **<u>A watershed protection district should be further defined to provide funding for consistent staff support for water quality and quantity protection and management, and aquifer management, and to leverage funding for grants for special projects</u>**. There was not time to develop this idea further. Generally, the caucus members agree with the concept of establishing a comprehensive, regional watershed protection district.

Regional Water Management System for East Clallam County

C.14 **<u>A comprehensive regional water management program for east Clallam County should be developed and implemented, including ground- and surface water quantity and quality, suppliers and use</u>.** Though this program has not been fully defined because of lack of time, some of the elements to be considered in the program include:

C.14.1 Manage public water supplies to encourage efficiency and meet health requirements.

C.14.1.1 Inform water users about State building regulations under the plumbing code concerning the use efficient indoor fixtures.

C.14.1.2 The Clallam PIJD has already implemented a program to retrofit shower heads and faucet fixtures. Determine the feasibility and need for expanding this program to include toilets.

C.14.1.3 Develop a program to train and certify the operators of community water systems and implement it in coordination with County, State, and Federal system requirements.

C.14.1.4 Investigate a water master or other management regime for coordination and management of water systems in the area.

C.14.2 Programs and regulations should be developed for outdoor water conservation. These should include:

C.14.2.1 Restrictions on lawn watering, car washing and other low-necessity uses when supplies are short.

C.14.2.2 The use of efficient low-flow sprinkler heads, pumps and other equipment, and drought-tolerant landscaping when there is no recharge potential.

C.14.2.3 Prudent-practices guidelines and education on vegetative composition and total size of lawns, gardens and plantings.

C.14.3 Water quantity and quality issues should be considered in the planning and siting of new developments and wastewater facilities.

C.14.3.1 Research and analyze the use of wastewater for irrigation under the Ecology/Health Interim Guidelines for Wastewater Reuse, and implement a program on a pilot-basis at trial sites in the region. More information is needed regarding the effect of wastewater-use on streams, wetlands and ground water. This includes what might result from run-off capturing facilities being fitted to any sizable percentage of newly-developed buildings. The use of various types of effluent for agriculture, gardens, golf courses, parks and other irrigation needs should be investigated.

C.14.3.2 Incorporate into water supply plans current and future municipal and public sewage disposal needs.

Public Education and Conservation

Public Education and Conservation
The RPG recognizes that one of the best ways to improve water use efficiency and management is through public education and conservation. Therefore it is recommended that public conservation education take a high priority in the management of water resources in east Clallam County.

C.15 <u>Implement the recommendations on education and conservation covered the DO Water Resources Preliminary Education Plan</u>. See Appendix C.

C.15.1 Public education and conservation programs should be continued and expanded, targeting schools, well owners, riparian and wetland land owners, members of the Planning Commissions and Critical Areas Committee, City Council members, real estate agents, recreators, agriculturists (commercial and hobby), and others. Conservation education may vary by sub-area depending on water use and ground-water conditions.
C.15.2.1 Provide conservation programs appropriate to each sub-region.

0.15.2 See the Regional Recommendations on Education.

Regional Planning Group learning about the river

UNRESOLVED ISSUES

The following recommendations stand as unresolved issues. Late in the discussions on the Plan, dissent was brought formally against these recommendations. At that late point in the planning process, the Work Group was not able to resolve the issues so that consensus could be reached. Because various members of the Work Group interpreted the definition of consensus differently, it was finally agreed that these recommendations should appear at the end of Chapter 6, instead of in the body. **Full consensus has not been reached on these recommendations.** The dissents follow each recommendation.

Metering

C.16 Metering:[29] All new wells should be required to be metered to provide:

a. Land owner education;
b. The ability to measure conservation; and
c. The ability to determine whether use is within the 5,000 gpd exemption or permitted water right. This information may be used for annual reporting in the fixture. NOTE: HB 1309, passed last year by the State's Legislature, requires meters (or other approved measuring methods), on all new surface water rights, all new or existing rights or claims over 1 cfs., and on rivers with *depressed* or *critical stocks;* and may require meters on all surface and ground-water permits.

BUSINESS & ENVIRONMENTAL CAUCUS DISSENT on C.16

We do not object to metering new community water systems. However, to require meters an every new well is an unnecessary cost without a sufficient corresponding ground-water benefit. The meters must be purchased, installed, and periodically checked and maintained The average water use for a single family residence has been estimated It should be fairly evident when people are watering far more than the 112 acre allowed without an official water right. Violators may be reported to the Department of Ecology. Furthermore, much of the water used for domestic irrigation and septic systems in the Sequim Dungeness Valley is returned to the groundwater. The meters will not show the quantity of return.

[29] Refer to 0.11.5 for the rest of the recommendations on metering.

County Participation in Water Resource Management[30]

C.17 <u>PREAMBLE:</u> A Memorandum of Understanding should be developed between Clallam County and the Department of Ecology for a local water resources program to review and make recommendations on water right applications, well drilling and water use. The final decisions on issuance of water rights will still remain with the Department of Ecology. The DQ would like to help expedite the process of applying for water rights and permits for drilling wells and make the system more efficient. Moving the review process, site investigations, and recommendations on water rights applications to the local level has the potential to alleviate some of the work load of the Department of Ecology. This should make the water rights application process quicker, more efficient, and thereby provide ground-water protection by encouraging community systems. This will also allow a move from looking at water rights issues on a case-by-case basis to a more efficient and effective regional approach, based on improved understanding of the local hydrology.

C.17.1 The C1allam County program should include the following major elements:

0.17.1.1 The County should have the responsibility for the review process including site investigations, and make recommendations on water rights applications to Ecology.

0.17.1.2 Ecology should delegate the administration of the well drilling program, including decommissioning to Clallam County.

0.17.1.3 The County should continue ambient monitoring of ground-water quality and quantity.

0.17.1.4 In order for appropriate decision-making an water rights permits, the County should take the lead responsibility for a watershed-wide approach to information collection, and develop a comprehensive water resources data and information base.

0.17.1.5 Procedures to insure scientific and technically defensible decisions far water rights permit decisions.

0.17.1.6 Continuation and enhancement of community-wide education efforts on water use, conservation and protection.

0.17.1.7 The County must have the ability to recover the cost of the water resources program through the establishment of a fee structure or some other mechanism.

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[30] Refer to 0.13 and 0.14 for the rest of the recommendations related to 0.17.

ENVIRONMENTAL CAUCUS DISSENT on C.17

The Environmental Caucus cannot pledge support for, or non-opposition to this measure. The section itself is an unsatisfactory implementation of measures to which we have achieved consensus. We cannot consense with C.11. 7 without the change indicated as follows: Encourage community ~~systems by providing quicker local review of permits, to eliminate the need for single exempt wells~~. . . in order to promote efficient healthful water systems and to enhance monitoring capabilities.

It seems inadvisable to favor turning over to arty county those duties clearly defined in R. C. W. s and WA Cs as those of the State through the Department of Ecology and Health. Each department has a federal line of authority through the Clean Water Act and Safe Drinking Water Act among others Although permitting authority is not requested, the responsibility for permitting includes duties and findings which attach to the permit. Responsibility cannot be shifted The County's assistance should be as called for in other sections -- coordination, research, and, from Chapter 9, Technical Support, data base access should be made available to the public, consultants and agencies.

Those residents wishing to persuade the County Commissioners of the public gain attached to the suggested activities have ample opportunity during the formation of the Annual Budget and its hearing process.

The usual local government complaint against unfunded mandates is strangely lacking. The call for grant money needed as expressed in "Implementation" already includes significant grant needs. The establishment of *fee structures locally must be by ordinance. Indeed it is the lack* of *fee structures at the State level that has reduced the resources expected to be provided by Ecology and Health and other agencies. We would prefer that energy be spent on improvements at the State level.*

There must be equity among the counties as to services provided by the State which only the State is responsible for. It should not came to a question of water supply or water safety by walking across a county line.

We continue to urge the County to utilize existing laws such as WAC 173-100 Ground Water Management Areas and Programs under 90.44 RCW We believe that such a sweeping change in County/State activities must at least await the Final Draft Groundwater Protection Strategy developed under the Sequim-Dungeness Groundwater Protection Project which has yet to receive Groundwater Committee final review and possible revision, a public meeting and public comment (late June, early July), and submission thereafter to Board of Commissioners and Ecology for approval and potential adoption within C.C.C. 27.01.200.

Figure 6.5 Instream Flow Needs for Fishery Resources in Clallam County

General Considerations:[31]

1. Choice of Species: Species occurrence in toe width study area follows the 1992 Salmon and Steelhead Stock Inventory (SASSI), (WDF et al. 1993), except on Big and Little Quilcene, which historically may have supported natural chinook spawning.
2. Flow Protection in Context: Flow protection is an essential part of overall habitat protection, but cannot make up for lost habitat area, access to habitat or diversity of habitat types. For example, riparian and estuarine wetlands provide cover and food for certain salmonid species in the DQ project area .

Stream	Number	Months	Fish flow (cfs)^	Species/ life stage	Source
Bell Creek	18.0001	Oct-Jan	9	Coho spawning	Hiss 1993b
		Feb-Sep	3	Coho rearing	
Cassalery Creek	18.0015	Oct-Jan	4	Coho spawning	
		Feb-Sep	1	Coho rearing	
Chicken Coop Creek	17.0278	Oct-Jan	8	Coho spawning	
		Feb-Sep	3	Coho rearing	
Dungeness River	18.0018	Aug-Oct	180	Chinook, pink, and chum spawning; steelhead rearing	Hiss 1993a
		Nov-Mar	575	Chum, coho, and steelhead spawning	
		Apr-Jul	475	Chinook and steelhead spawning and rearing	
Gierin Creek	18.0004	Oct-Jan	9	Coho spawning	Hiss 1993b
		Feb-Jun	20	Steelhead spawning	
		Jul-Sep	4	Steelhead rearing	
Jimmycomelately Creek	18.0285	Sep-Oct	34	Chum spawning	Data of Beecher (1980a) applied to model of Swift (1979)
		Nov-Jan	16	Coho spawning	
		Feb-Jun	30	Steelhead spawning	Beecher (1980a)
		Jul-Aug	6	Steelhead rearing	

Stream	Number	Months	Fish flow (cfs)[A]	Species/life stage	Source
Johnson Creek	17.0301	Oct	4	Coho spawning	Hiss 1993b
		Nov-Jan	10	Chum spawning	
		Feb-Jun	10	Steelhead spawning	
		Jul-Aug	2	Steelhead rearing	
McDonald Creek	18.0160	Nov-Dec	41	Chum spawning	Data of Beecher (1980b) applied to model of Swift (1979)
		Jan	20	Coho spawning	
		Feb-Jun	35	Steelhead spawning	Beecher (1980b)
		Jul-Oct	8	Steelhead rearing	
Meadowbrook Creek	18.0020	Oct-Jan	7	Coho spawning	Hiss 1993b
		Feb-Sep	2	Coho rearing	
Siebert Creek	18.0173	Nov-Dec	60	Chum spawning	Data of Beecher (1980b) applied to model of Swift (1979)
		Jan	28	Coho spawning	
		Feb-Jun	50	Steelhead spawning	Beecher (1980b)
		Jul-Oct	12	Steelhead rearing	
Unnamed	17.0277	Stream dry; no suitable measurement sites			Hiss (1993b)
Unnamed	17.0276	Stream dry; no suitable measurement sites			
Unnamed	17.0284	No suitable measurement sites			

A. Spawning and rearing flows for the Dungeness River are the "maximum habitat flows" from the IFIM (Hiss 1993a). Spawning flows for all other streams are the "optimum flows" from the toe width method (Swift 1976, 1979). Rearing flows for all other streams are the "preferred flows" from the toe width method (Swift 1986, 1979) See Glossary for definitions.

Volume 1

Chapter 7

East Jefferson County ℘ Quilcene Watershed Recommendations

Chapter 7
Eastern Jefferson County Recommendations

This Chapter reflects issues specific to Jefferson County and strategies and recommendations made by the Jefferson County Work Group of the Regional planning Group. Unless indicated, consensus was reached by this group on the recommendations in Chapter 7. Refer to Chapter S, General Background for a discussion on how the RPG worked on issues and recommendations.

Problem Definition

Goals 3 and 4 of the Regional Planning Group express the community's desire to achieve the restoration of fish resources in the Quilcene watershed while providing water for other beneficial uses. These goals result from severe physical, ecological and legal problems which are becoming more evident as land use issues provide pressure on the system. The region lies in a rainshadow created by the Olympic Mountains, which is reflected in the chronic low summer flows in many streams in eastern Jefferson County. Lichatowich suggests that the salmon populations here survive in ecologically unique habitats, and because these are -marginal habitats, these fish may represent an important component of the genetic resources of the species native to streams in eastern Jefferson County.[1]

Because of low summer flows, salmon habitat in these streams is highly susceptible to degradation from poor land use practices. Major concern includes critical and depressed runs of salmon and steelhead, degraded fish habitat, insufficient instream flows, the gap between water. rights and water availability, flooding, and the alterations made to the ecosystem through significant diversions of water to provide for industrial, municipal and hatchery uses. Concern also exists over harvest management practices.

Table 7.1 illustrates the status of stocks in eastern Jefferson County and Table 7.2 illustrates the utilization of small streams by salmonids. The local conditions may be contrasted to the

1 Jim Lichatowich. The Status of Anadromous Fish Stocks in the Streams of Eastern Jefferson County, Washington. Fall 1993.

entire peninsula in Table 5.1 in Chapter 5 which illustrates the status of salmonids in the northeastern Olympic Peninsula compared to the statewide inventory. The list of critical and depressed stocks in WDF et al. (1993) supports the hypothesis that salmon habitat in Eastern Jefferson County is highly vulnerable to degradation, because of marginal habitat due to rainshadow conditions. There is a higher percentage of salmon stocks listed as critical in the Olympic rainshadow compared to the statewide totals, with almost half of the critical stocks in the State to be found in the northeastern corner of the Olympic Peninsula (5 out of 12). In addition, the percentage of depressed stocks is higher compared to the statewide totals. There are only 5 out of the 25 stocks in the rainshadow area listed as healthy by WDF, (Lichatowich).

In addition, hydraulic continuity between ground water and area streams, lakes and ponds and the impact on these aquatic systems of increased numbers of wells is a concern for area residents. Hydraulic continuity between watersheds via ground water is unknown in the region and may exist in areas of Quilcene Bay, the Big and Little Quilcene, Donovan, Salmon and Snow Creeks and Discovery Bay.

1. **The condition of wild fish resources in the ft and Little Quilcene Rivers is severely degraded**. The Big and Little Quilcene Rivers support part of the Hood Canal summer chum run, which is designated *critical* -- that is, at risk of extinction -- in the 1992 SASSI (WDFW *et al.* 1993). These two streams also support a mix of hatchery and naturally-produced Quilcene Bay-Dabob Bay coho, which the same document designates *depressed* The streams may have historically supported fall-run chinook (Williams *et al.* 1975), although no such runs are recognized today (WDFW *et al. 1993). Puget* Sound cutthroat trout were considered a stock of *special concern by* Nehlsen *et al.* (1991).

2. **The condition of native and wild fish in the other streams in eastern Jefferson County is also severely degraded**. Chum salmon in Chimacum Creek, coho and chum salmon in Thorndyke and Shine creeks, and chinook salmon in the Little Quilcene have already reached, or are on the verge of extinction. Many other salmon populations in eastern Jefferson County are listed as *depressed* or critical. The rich population diversity of salmon in these streams may be irreversibly lost, (Lichatowich). More work on these populations is needed, with a closer examination of the stocks and stock structure of Pacific salmon warranted, as well as human impacts such as poaching. According to Lichatowich, the additional study should examine geomorphic differences in the streams and habitat structure; determine genetic differences between populations through biochemical techniques, and evaluate life history differences between populations.

Table 7.1 Status of Stocks in Eastern Jefferson County (WDF et al. 1993)[2]

Stream	Coho	Chum	Pink	Chinook	Steelhead	Cutthroat trout
Salmon, Snow	Critical	Summer Critical	nm	nm	Winter - Depressed	Special Concern*
Chimacum	Healthy	nm	nm	nm	nm	Special Concern*
Thorndike, Shine	Depressed	nm	nm	nm	nm	Special Concern*
Tarboo, Donovan, Big Quilcene Little Quilcene	Depressed	Summer - Critical Late Fall - Health	nm	nm	Winter - Unknown	Special Concern*

nm Not Mentioned * Nehlsen et al., 1991

Table 7.2 Salmon Utilization in Eastern Jefferson County (Williams et al.,1975)[2]
Field work has shown that there are salmonids in other creeks besides what are listed below in the "streams catalog." No up-dated listing is available. Cutthroat, steelhead, and other fish stocks possibly using many of these creeks were not included in the stream catalog.

Stream	**Salmon Utilization**
Eagle, Contractors	Coho, Chum
Salmon Snow	Coho, Chum
Chimacum	Coho, Chum
Ludlow	Unknown
Thorndyke Shine, stream 0200	Coho, Chum
Tarboo, Donovan, Little Quilcene	Coho, Chum
Big Quilcene River	Coho, Chum, Chinook*
Spencer	Coho, Chum

* Hatchery

____
2 See Lichatowich for further descriptions.

STOCK STATUS CATEGORIES DEFINED*

The DQ commissioned salmon expert Jim Lichatowich to investigate the status of anadromous fish stocks in eastern Jefferson County. An important part of that report is the review and comparison of recent stock status reports, Nehlsen et al. 1991, WDF et al. 1992 and USFWS 1991. Each of the three status reports used different terminology to describe the status of salmon stocks, and the Salmon and Steelhead Stock Inventory (SASSI) also defined terms. The extinct category as used in the reports is self explanatory. The other status categories were defined in the following way:

Nehlsen et ah (1991)

High Risk Populations whose spawning populations are declining. Fewer than one adult fish returns to spawn from each parent spawner. Populations having recent (within the past I to 5 years) escapements under 200, in the absence of evidence that they were historically small, also were placed in this category because of the genetic and environmental risk they likely face.
Moderate Risk Populations whose spawning escapement appears to be stable after previously declining more than natural variations would account for, but are above 200. Approximately one adult per spawner is returning. Populations having larger escapements (around 1000) were more weighted toward the at moderate risk category, while those having smaller escapements were weighted toward the at high risk category.
Special Concern Populations for which:

- Relatively minor disturbances could threaten them, especially if a specific threat is known.
- Insufficient information on population trend exists, but available information suggests depletion.
- There are relatively large ongoing releases of nonnative fish, and the potential for interbreeding with native populations exists.
- The population is not presently at risk, but requires attention because of a unique character.

SASSI Criteria for 1994 Update

High Potential of becoming/being critical: SASSI criteria includes: 1) stocks that have a high potential of becoming critical in the near future, or 2) stocks in the unknown category that in SASSI judgment have a high potential of being designated critical when final resolution of their status is available.

Washington Department of Fisheries et al. (1993)

Healthy A stock of fish experiencing production levels consistent with its available habitat within the natural variation in survival for the stock. Depressed A stock of fish whose production is below expected levels based on available habitat and natural variation in survival rates, but above the level where permanent damage to the stock is likely. Critical A stock of fish experiencing production levels that are so low that permanent damage to the stock is likely or has already occurred. Unknown There is insufficient evidence to rate stock status. Disputed For some stocks, State and Tribal biologists could not agree on status during the development of the inventory. Those stocks are listed as disputed.

Stock Origin

Native An indigenous stock of fish that has not been substantially impacted by genetic interactions with nonnative stocks, or by other factors, and is still present in all or part of its original range. Non-native A stock that has become established outside its original range. Mixed A stock whose individuals originated from co-mingled native and nonnative parents, and/or by mating between native and nonnative fish (hybridization); or a previously native stock that has undergone substantial genetic alteration. Unknown This description is applied to stocks where there is insufficient information to identify stock origin with confidence.

Production Type

Wild A stock that is sustained by natural spawning and rearing in the natural habitat, regardless of parentage.
Cultured A stock that depends on spawning, incubation, hatching, or rearing in a hatchery or other artificial production facility. Composite A stock sustained by both wild and artificial production.

Other Definitions

Endangered Defined through the Endangered Species Act (ESA) as being in danger of extinction throughout all or a significant portion of its range. Threatened Likely to become an endangered species throughout all or a significant portion of its range, identified and defined in accordance with the ESA.

* From Lichatowich, SASSI and FEMAT.

3. **Habitat: The lower 2.8 miles of the Big Quilcene and the lower 0.9 miles of the Little Quilcene have excessively unstable stream channels, and the habitat of other streams already is, or is becoming degraded.** Natural, on-going geologic conditions, coupled with upstream erosion from human impacts have caused large amounts of gravel to be deposited in the lower river, with the Big Quilcene characterized by gavel deposition. Collins *(1993)3* estimated the total deposition from RM 0 and RM 1 between *1971* and *1993* at 50,000 cubic yards (cy) or about *2,400* cy/year. This is about *7* feet between RM 0 and RM 0.5 since *1971,* and about *2* ft. between RM 0.5 and RM 1.0.

   The habitat has been degraded dramatically from both natural causes and human manipulation of the river channel. In some years this has resulted in low flows during critical rearing times for fish, as well as serious flooding. The heavily manipulated lower river exhibits degraded habitat that needs better understanding before restoration is undertaken on behalf of either the natural resources or humans.

   Because the annual production of water per unit of land in these rainshadow-influenced watersheds is less than other areas, the vulnerability and the current status of the stocks of salmon inhabiting these streams call for extreme caution in planning forest and agricultural practices, residential development and restoration projects. According to Lichatowich, given the current condition of the stocks, zero additional impact on salmon habitat must be the target.

4. **Water rights exceed actual flows**. The City of Port Townsend derives the greatest percentage of its domestic and industrial water from the Big and Little Quilcene Rivers. Two wells serve customers in the Tri-area. The City owns rights on *30* cfs. on the Big Quilcene River. Although the average flow of the Big Quilcene is about 200 cfs. there are periods in late summer and early fall when the natural flow of the river can fall below *30* cfs. (This information is based on very limited data.)

   To supplement the City's main water supply, it owns *9.56* cfs. on the Little Quilcene River with a diversion at RM *7.2.* Summer flows on the Little Quilcene have been recorded below 10 cfs. in *1927* and have averaged about 20 cfs. Winter flows averaged above *90* cfs. The Little Quilcene's minimum instrearn flow at the diversion is 6.0 cfs.

   For temporary storage, water is diverted to Lords Lake from the Little Quilcene, and

[3] Brian Collins. Sediment Transport and Deposition in the Lower Big Quilcene River and Evaluation of Planned Gravel Removal for Flood Control. July 1993.

it is possible during times of low-flow or turbidity to divert water from the Big Quilcene to City Lake. In exchange for the management and maintenance of the water system up to the Big and Little Quilcene diversions, the City contracts an average of 13.6 million gallons/day (21.1 cfs.), to the Port Townsend Paper Company. Additionally, some nearby areas receive City water: Hadlock-Irondale-Chimacum, the Naval Annex on Indian Island, Fort Flagler and Fort Worden State Parks, and the U. S. Fish Lab on Marrowstone Island.

5. **Instream flows are insufficient to support biological recommendations for fish resources and other wildlife and habitat needs**. A conflict exists between the amount of water rights held by the City of Port Townsend, and the needs of native and wild fish resources. A gap between biological requirements and out-of-stream uses is likely to persist in perpetuity, but may be narrowed through a series of management actions.

   Instream flow recommendations based on the Toe Width Method have recently determined optimum flows for fish resources. The optimum flows for chinook and chum spawning (Sep. - Jan.) are 198 cfs., for steelhead spawning (Feb. - Jun.) are 165 cfs., and for steelhead rearing (Jul. - Aug.) are 50 cfs. A comparison of actual instream flows to these findings shows that, in recent low-flow years, only a small percentage of the needed flow was available for spawning and rearing some species of fish.

   Summer flows on the Little Quilcene have been recorded below 10 cfs in 1927 and averaged about 20 cfs. Winter flows averaged above *90* cfs. during the same period. The optimum flows for chum spawning (Nov. - Jan.) are 85 cfs., for steelhead spawning (Feb. - Jun.) are 75 cfs. and for steelhead rearing (Jul. - Oct.) are 20 cfs.

   On-going demand on water for development on the smaller streams in eastern Jefferson County is impacting the instream flows and is widening the gap between the biological requirements and what is available instream.

6. **The diversion of water to the hatchery and the program of hatchery releases may have a significant impact on the river and native and wild fish resources**. On the Big Quilcene anadromous fish usage is limited above RM 3.2 (Williams et al. 1975). The steep gradient and confined channel cause a scarcity of gravel for spawning (Hiss *1989),* and lack of winter side-channels for cover (Zajac *1989).* Cascades between RM *4.9* and 6.9

(Boomer 1990) and at RM 7.6 (Williams et al. 1975) may form barriers to fish migration, although some may be only seasonal (Keller, WDFW pers. comm.).

6. a. Fish Passage Policy and the Effects of the Quilcene National Fish Hatchery Operation on Wild Fish Passages Big Quilcene River: The Quilcene National Fish Hatchery (NFH), operated by the U.S. Fish and Wildlife Service is at RM 2.8. The hatchery is managed to pass no adult salmon upstream into Penny Creek or the Big Quilcene River, under an agreement with WDFW and the PNPTC (Boomer 1990). This practice keeps the Quilcene water intake virtually free of salmon diseases. If adult salmon were passed upstream, the hatchery fish might be at risk to certain diseases, and this could alter fish releases under various hatchery programs. Therefore, fish production in the Quilcene is dominated by hatchery releases (Lichatowich).

Quilcene NFH personnel operate an electric weir from May through January to guide chinook, chum, and coho salmon into the hatchery for spawning. The weir also prevents adult salmon from migrating upstream of the hatchery. When operating, the weir creates an electric field that usually stops all fish from moving upstream However, the weir may allow some fish to pass during power outages, since no backup generator is available. Fish blocked by the weir may either ascend the adjacent fish ladder to the hatchery or move downstream to spawn naturally. Fish entering the hatchery are either spawned there or released downstream of the weir. Hatchery personnel have not passed any adult fish upstream since 1990.

The weir operation affects the migration of spring chinook, fall chum, and coho salmon, most of which are spawned in the hatchery, and occasionally intercepts stray pink and sockeye salmon. Of these species, only coho are likely to naturally ascend beyond the weir, given the opportunity. To fully use the river's natural capacity to produce coho above the weir, 24,000 coho fry are released above the hatchery annually (Boomer 1990); the number released was calculated to fully stock the available rearing area. The weir can also direct summer chum into the hatchery, although few Quilcene summer chum ascend this far upriver.

The weir may also affect the early migration of winter steelhead bound for points beyond the hatchery in December and January, but the number of fish is unknown (WDFW et al. 1993). The electrical current is shut off from February through April. Thus, steelhead,

[5] Description provided by Ron Wong, Manager and Larry Telles, Assistant Manager, Quilcene NFH to J. Hiss, USFWS. All remarks are theirs unless another reference is cited.

which normally spawn between February through June (WDFW *et al 1993),* can pass upstream freely during this period. The shutdown period also probably allows most sea-run cutthroat trout to .migrate freely. The WDFW has annually released rainbow trout to create a put-and-take fishery upstream of the hatchery, and has occasionally released cutthroat as well.

Penny Creek Passage: Penny Creek is considered capable of producing only very small number of anadromous fish due to its steep gradient and possible natural blocks to migration near the Quilcene River. The hatchery is constructed to block all fish migration into the Creek; this benefits the hatchery by ensuring a water supply uncontaminated by disease-bearing migratory fish.

6. b. Effects of Quilcene Hatchery Water Diversions on Instream Flow

The Quilcene NFH draws water from the Big Quilcene River at approximately RM 3.1 and returns it to the river below the hatchery. The hatchery has two water rights on the Big Quileene, a senior right certificate for 15 cfs. and a junior right permit for 25 cfs. (Lehotsky *1993).* The senior right was granted in *1946* with no conditions; the junior right permit was provisionally granted in May of *1991* under these conditions:

1. *Diversion shall maintain flow in the bypass reach of 50 cfs from July I to January 31, and 165 cfs from February I to June 30, but at no time shall diversions be required to* fall *below 15 cfs. (Lehotsky 1993). This condition was based only on steelhead spawning and rearing, using Beecher's (1980a) toe width measurements Salmon were not considered, apparently because the hatchery weir blocks their migration into the bypass reach.*

2. *The hatchery must monitor combined flow from the two hatchery intakes, monitor instream flow in the bypass reach, and modify the screens in the hatchery intake structure (Lehotsky 1993); Washington Department of Ecology will grant final water right certificates when they are satisfied with the above changes*

Penny Creek: The hatchery has two unconditional water rights on Penny Creek for a total of 25 cfs. However, this is more than the Creek can supply in drier months. The hatchery depends on Penny Creek as its sole source of water for egg incubation, and as supplemental water for rearing in the raceways when water from the Big Quilcene become more turbid than desirable.

6. c Potential for Dewatering Streams

Several questions have been raised about the potential of dewatering the bypass reach (Volk 1994). Complete dewatering is impossible because the permeable riprap around the hatchery intake ensures some flow downstream. The junior water right permit, in effect since 1993, requires very substantial flow at all times in the bypass reach. In answer to specific questions:

1. Timing of low water problems: The hatchery water supply is likely to become critical as early as June, although a prolonged cold spell could have the same effect in the winter.

2. Location of low water: The bypass reach extends from the hatchery at RM 2.8 to the intakes at RM 3.1.

3. Timing and source of hatchery water supplies: The hatchery draws water from the Big Quilcene River and Penny Creek, depending more on Penny Creek when the Big Quilcene becomes undesirably turbid for fish culture.

4. Resources affected: Flows may drop below levels required for steelhead spawning and rearing in the bypass reach when the senior water right is being exercised. Instream flow is also reduced in the lower 0.1 mile of Penny Creek, which may support small numbers of rainbow trout released to create a put-and-take fishery.

5. Measures to prevent resource damage from hatter/withdrawal: Maintain instream flow as a condition of the junior water right described above.

7. **Although the City withdrawals have been manned when possible to accommodate the needs of the native and wild and hatchery fish in critical low-flow times, a more defined system is needed to protect fish resources**. Although Washington water law distributes water on a seniority basis, the City has shown a willingness to operate to benefit fish resources. Using the *shared sacrifice* concept developed by the Regional Planning Group, all beneficial uses of water should share the burdens and benefits of natural fluctuations in the amount of stream flow available. The concept of a flexible target for instrearn flows in the river is intended to address natural fluctuations in instream flows. The *shared sacrifice* strategy is intended to allow both instrearn and out-of-stream needs to share the pain of water-short years and the gain of abundant ones. Although the City must maintain a sufficient level of water to provide for user's needs, an attempt will be made to reconcile all needs including the Mill; the hatchery; others with water rights; and native and wild salmonids.

8. **Insufficient technical information on both ground- and surface-water has hampered understanding of, and responding to the needs of the native and wild fish in these watersheds, as well as general water planning efforts**. Recent optimum instream flows (Hiss, 1993) for Quilcene area salmon and steelhead streams are accepted as the preliminary levels needed to sustain the resources. Establishing these levels, coupled with information from the DQ-commissioned report showing the status of anadromous fish stocks in eastern Jefferson County, (Lichatowich) will provide preliminary information needed to more effectively manage the resources. Further refinement of the Toe Width Method or other biological criteria developed by the USFWS, on-going water use inventories, habitat capacity studies, and investigations of water rights may help fill the gap between available water and needs.

9. **Wetlands and estuaries are being negatively impacted by land use practices resulting in degraded wildlife, shellfish and fish habitats**. These systems support an incredible diversity of wildlife organisms while providing recharge, water quality and flood control, and are being minimally protected in eastern Jefferson County. Siltation from up-stream land use practices, and filling, dredging and diking are some of the activities impacting these critical ecosystems. The resulting loss in functions and values creates a cascading erect of declining species reaching all levels of organisms, from salmon to oysters, to insects, birds and mammals including the human species. Impacts on humans of the loss or degradation of these ecosystems include the destruction of critical flood protection and water quality for ground water in hydraulic continuity to these systems.

   Areas where these ecosystems are being heavily impacted by development and land use practices include Ludlow and the southern end of the County. These wetlands and estuaries feed into the small bays entering the Puget Sound and directly impact the wildlife, shellfish and fish resources, and the water quality of the entire area. Shellfish contamination caused by land use, (as well as possible contamination from seals and other wildlife), is one of the results. Fecal contamination has caused decertification is some areas, and is an increasing concern in an area famous for its shellfish quality and production.

10. **Ground water: An understanding of both the quantity and quality of ground water in eastern Jefferson County is insufficient to protect this finite resource from both pollution and over-allocation.** There are areas in eastern Jefferson County which suffer from seawater intrusion and other forms of pollution, and there is concern that over-allocation may be occurring due to lack of information and ground-water protection in the County.

In a rainshadow-influenced region with unique areas where no known surface water input contributes to aquifer recharge (i.e. Marrowstone Island and the Miller Peninsula), it is critical to have a comprehensive understanding of the status of the ground-water resource. Although preliminary studies have been done, the existing level of information is insufficient to provide the means for adequate land use planning and protection of ground water. The results of a recent preliminary study showed that there has been a significant increase in the chloride content in four out of nine measured wells over the last fifteen years, and seawater intrusion has become an increasingly pervasive problem in some areas including Shine, Mats-Mats, Oak Bay and Marrowstone Island. Because of increased population growth and land use pressures, more wells are being drilled daily and there is concern for the status of ground water in eastern Jefferson County.[6]

Changing land uses and development, especially in the Tri-area, have increasingly put pressure on the ground water, with wells being dug under the 5000 gallon exemption, and no comprehensive evaluation of the impacts of increased drilling on the resource. Ground water near the Big Quilcene, and in other areas in hydraulic continuity with areas rivers and streams is in danger of over-use, resulting in the possibility of low instream flows. Water quality is also a concern, and no coordinated program exists for its protection in the County.

11. <u>Lack of Data: Not enough is known about the status of the water resources in eastern Jefferson County</u>. A comprehensive water resources study to determine the surface and ground water quality and quantity is needed. Current land use decisions should be made on comprehensive data; a complete study is needed in order for adequate protection and predictability of water resources in the region to occur.

12 <u>There is inadequate water resources and rights administration by the State</u>. Due to budgetary restraints and other problems, the Department of Ecology has an enormous back-log of water rights applications. This has resulted in an increased occurrence of wells which are dug with no permit, and with no understanding of the quantity or quality of the resources. The inadequate management and administration by the State, coupled with the lack of information on quantity or quality, results in the possibility of irreversible over-allocation or damage to the ground-water resources. Compounding this situation is the over-all cloudiness and legal uncertainty consequent to the Sinking Creek case (decided late 1992 by Washington's Supreme Court). Without legislative action on participation,

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[6] Robert Forbes and CH2MHill. Preliminary Assessment of Seawater Intrusion in Coastal Water Wells in Eastern Clallam and Eastern Jefferson Counties. October 1993.

procedure and authority in the water rights issuance process, it appears that delay and uncertainty will prevail.

Winter field trip looking at habitat needs on the Big Quilcene

Recommendations and Actions

Water Resource Management

Watershed Council

J.1 **<u>A council which is representative of all interests (multi-government/ Tribal/agency and public interest groups) should be established</u>**. The general purpose is to continue eastern County water resource discussions and to oversee the implementation of the DQ Plan. The general mission should include issue clarification, continuing conflict resolution, a "watch dog" capacity and education on water resource issues. This should be a public process advocating watershed perspectives in consideration of project proposals on the rivers in eastern Jefferson County.

J.1.1 The Eastern Jefferson County Watershed Council should coordinate with the proposed Eastern Clallam County Watershed Council to combine funding efforts, share experiences, avoid competition and duplication of efforts. The Councils should coordinate activities with other groups such as the Hood Canal Coordinating Council, the Nisqually Council, Kitsap groups, etc.

J.1.2 Representatives from each Council should meet as needed to discuss regional issues or joint actions.

J.1.3 The Watershed Council should be funded locally and supplemented by State and other grants.

WATERSHED COUNCIL
Governments &
Public Interest Groups

↑ ↓

Other sub-groups to be determined
(habitat specialists, public groups, etc.)

HABITAT RECOMMENDATIONS

J.2 General Habitat Recommendations: See General Habitat recommendations in Chapter 5, *Regional Strategies and Recommendations.*

Channel Stabilization and Gravel Traps

J.3 **Gravel aggradation has been identified as a major limiting factor in native and wild fish production and flood control**. Debate and analysis on the use of gravel traps as an interim solution to gravel aggradation in the Dungeness River brought up questions about the appropriateness of their use on the Big Quilcene River. A short-term study was done by Brian Collins focusing on sediment transport and deposition in the Lower Big Quilcene River, and an evaluation of planned gravel removal for flood control. In the summary of that study Collins suggests a monitoring program for the purpose of determining the gravel trap's effectiveness, as well as analysis needed in the context of fluvial geomorphology and hydraulic engineering. He recommends that the feasibility of alternative approaches be evaluated with site- and river-specific geomorphic and hydraulic analysis, in light of the location, size and duration of sediment sources, and with careful consideration of the biological context.

Since the effects of gravel traps on stream channel morphology are poorly understood at present, and such traps do not address the underlying processes causing excess sedimentation, the following is recommended:

J.**3.1** **Coordinate habitat management through the proposed Watershed Council in conjunction with the FEMAT process and other State and Federal watershed planning and assessment processes**. Continue further studies as recommended by Brian Collins and the Geomax study,' to provide the basis for future habitat management strategies and monitoring.

J.**3.2** **Monitor and analyze any cumulative effects of past and future gravel extraction**. A comprehensive approach to bank stabilization and gravel removal should be used as a part of the over-all habitat management scheme.

J.3.3 **Evaluate the feasibility of dredging, and other alternatives with careful consideration of the biological context, including negotiating the purchase of conflicting land use and development rights.**

[7] Geomax. Comprehensive Flood Management Plan for the Big Quilcene and Dosewallips Rivers. Jefferson County Public Works. 1994.

Habitat Restoration

J.4 <u>Habitat which has been destroyed or degraded in eastern Jefferson County should be enhanced and restored, and areas not-yet-impacted should be maintained and protected.</u>

Background *Watershed Assessments on the Big Quilcene River:* Water management on the Big Quilcene River may be affected by watershed plans under the Forest Ecosystem Management Assessment Team (FEMAT).[8] This federal interagency group has created a geographical hierarchy of planning teams, reaching down to the level of individual river basins. The local FEMAT group is the Big Quilcene Local Interagency Team. It includes the Quilcene Ranger District of the Olympic National Forest, the Olympia Ecological Services Office of the USFWS, the Quilcene NFH, also part of USFWS, and the concerned Tribal entities. The Preliminary Watershed Assessment of the Big Quilcene Basin was completed April, 1994. This assessment names the threatened, endangered, and candidate fish and wildlife species in the basin and mentions that instream flows may affect some of these populations. This Assessment will justify resource restoration planning for this fiscal year, leading to a Pilot Watershed Analysis for the Big Quilcene Basin, due October 1994, with follow-up restoration projects in the following years.

Elsewhere in eastern Jefferson County, habitat restoration and enhancement are off to a strong beginning. Locally and regionally-grounded groups (primarily Wild Olympic Salmon, with land owners, and the Jefferson County Conservation District) have applied the conclusions and results of research and studies to a number of streams. Federal, State, Tribal, and County agencies are backing some of the work; many are all-volunteer projects with continuing monitoring and management by Wild Olympic Salmon, et al. In Chapter 4, *Information Resources and Habitat Projects,* restoration works-in-progress or projects recently completed are described, as well as other participants involved in the efforts or the funding of them. Thematically, these activities translate research and survey into improved aquatic habitat, particularly for wild salmonid species native to each river or stream.

In the future, watershed assessments will be needed for each small stream and sub-watershed in eastern Jefferson County.

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8 From C. Amato, USFWS/ES Olympia, Ecological Service Office, pers. comm. with J. Hiss, USFWS.

J.4.1 Restoration Efforts: Develop a pilot habitat restoration project on one stream as an example of what can and should be done on degraded streams and rivers in the region. Seek joint funding and participation by multi-government/agency and interest groups.

J.4.2 Restoration Project Analysis: Analyze past habitat restoration projects to understand their long-term, cumulative impacts, and to aid in planning future projects. This includes analysis of those projects previously considered "unsuccessful."

Restoration Activities of Wild Olympic Salmon (WOS)

Rivers and Instream Flows

Instream Flows

J.5 **Instream flows should be protected and supplemented, and improved in the future as possible, to provide flows needed for stocks of salmonids and other species in the area's rivers and streams.** Refer to the end of this Chapter for the *Instream Flow Needs for Fishery Resources in Jefferson County.*

Discussions on setting instream flows consumed a great deal of the time of both County Work Groups and the RPG as a whole. In Jefferson County the discussions revolved around the following concerns: hydraulic continuity with rivers and small streams, how realistic were the optimum recommended flows given the actual flows in the stream and the lack of long-term stream-flow data, the affect on the City and hatchery of limiting additional water rights on rivers by placing specific flow recommendations in the DQ Plan, and how might nature be "mimicked" in water use and habitat restoration efforts.

The following recommendations imply that water use at all points in the stream system must be managed to ensure adequate flows throughout. Considering the streams for which actual flows have been routinely measured, the actual average recorded flows tend to be less than the recommended flows during some periods of the year on all streams. Comparison of recommended flows to hydrologic records suggest that, in many study streams further water appropriation will reduce fish habitat value except during high flow events. Some streams appear more sensitive than others to further withdrawals, based on the number of months during which observed flows are likely to be less than recommended flows (Hiss).

J.5.1 No new surface water rights or permits should be issued for rivers and streams in eastern Jefferson County, until such time as instream flows for each specific stream are adopted by rule.[9] Improved biological criteria for setting instream flows should be developed.

J.5.1.1 Off-stream water consumption and land use should be managed to protect, supplement, and improve instream flows in the future as possible.

J.5.1.2 The Washington Department of Ecology, in cooperation with other appropriate agencies should refine the Toe Width Method to more accurately represent fish habitat areas on small streams, and biological

[9] RCW 90.22.040 allows Ecology to continue to issue permits in "closed basins" for stockwatering requirements, (out-of-stream watering devices), to improve water quality for the public interest.

criteria developed for streams where the Toe Width Method or the Instream Flow Incremental Method (IFIM)[9] cannot be used. Specifically, the method should account for the value of woody debris and other non-alluvial features that affect the shape and size of the channel.

J.5.1.3 On the Big Quilcene, the Instream Flow study conducted by Hosey and Associates[10] may prove useful in refining the required fish flows. The Hosey study used the IFIM, which is based on far more detailed information than the Toe Width Method applied by Beecher (1980a). The Point-No-Point Treaty Council is currently reviewing the reliability of the Quilcene IFIM report's data and methods. If the report is acceptable, all concerned agencies should jointly interpret the results to refine the instream flow recommendations.

J.5.1.4 First priority for storage from the Big or Little Quilcene rivers should be given to improve the biological conditions of the streamway.

J.5.2 The proposed Watershed Council should establish instream flows for recommendation to the State for adoption by rule, for all streams in east Jefferson County, except the Big Quilcene River.

If the Watershed Council has not accomplished this task in three years, the Department of Ecology should move to establish instream flows based on the best available biological criteria.

J.5.3 Negotiations between the major users and water rights holders on the Big Quilcene River should work towards improving instream flow conditions. The City of Port Townsend, the Port Gamble S'Klallam Tribe, and the Port Townsend Paper Mill have started discussions, which the State has joined in an attempt to better manage instream flows on the Big Quilcene River with the goal to return some flows to instream uses. Others are invited to participate in the discussions. The parties agree to work on moving actual flows closer to the instream flow numbers in the Hiss tables, keeping in mind the concepts of the Gap and *shared sacrifice.*

9 See Chapter 6, Problem Definition 3, for an explanation of IFIM and "usable wetted area."

10 Hosey & Associates, Jefferson County PUD #1. The Instream Flow and Aquatic Mitigation Proposal for the Big Quilcene Hydroelectric Project. FERC Project # 5202-00. 1985.

The group will be working on an agreement on Big Quilcene flow levels, contingency plans, and other river flow issues. They will try to agree on "goals" for the flows, develop a flow model, and work towards a final instream flow program for the Big Quilcene River. It is possible that Trust Water Rights or a Memorandum of Understanding will provide the mechanism to accomplish this agreement. It is hoped that a plan will be completed this summer, for a 5 year interim policy.

J.5.4 At the point that optimum instream flow recommendations using the IFIM, or an improved methodology are established for streams in eastern Jefferson County, the instream flow numbers should be adopted by rule. The IFIM should be reviewed and re-evaluated by the Watershed Council to analyze the appropriateness of the instream flow limits, taking advantage of improvements in newly developed biological criteria for determining instream flow recommendations. An attempt should be made to achieve optimum flows, keeping in mind the concepts developed by the RPG of *the* GAP and *shared sacrifice.* The instream flows that are set will not affect existing water rights.

Using the IFIM and plotting the amount of fish habitat vs. the stream discharge, the "maximum habitat flow" or "optimum instream flow" represents the discharge related to the highest maximum point in the "wetted usable area." What is optimum instream flow in any given month also depends upon the species in question. The Toe Width Method is the other commonly used method to determine flows. With this method, the "optimum instream flow" represents spawning habitat only, by species, and is derived from a linear model which relates the spawning habitat area to the discharge.

J.5.5 Instream flow programs for cooperative agreements for other streams should be pursued. It is hoped that the proposed Watershed Council will develop such programs.

J.5.6 Instream Flows/Water Rights: The following are general recommendations to protect and provide more water for Instream flow:

J.5.6.1 Encourage the establishment of a fund to purchase existing water rights for instream flows.

J.5.6.2 Where applicable, explore the possible transfer of surface water rights to ground water without losing priority dates.

J.5.6.3 Condition future water rights to protect existing water rights and instream flow requirements.

J.5.7 Water Quality: In order to protect the quality of surface and ground water in the region, cooperative agreements such as the Memorandum of Understanding between the U.S.D.A.-Forest Service, Olympic National Forest and the City of Port Townsend should be used as a model in other watershed planning efforts.12 This agreement enhances water quality protection for the watersheds of the Big and Little Quilcene Rivers. This Watershed Protection Program commits both parties to cooperative implementation of the water quality protection measures spelled out in the agreement. This excellent example of multi-jurisdictional responsibility and cooperation should be used in planning for region-wide watershed protection.

Forest Practices and Wildlife Management

J.6 Recommendations for these areas can be found in the Chapter 5, Regional Recommendations. The Jefferson County Work Group focused a great deal of time and energy on these topics. There is great concern about the need for better management in these areas; therefore an effort was made to develop recommendations for wildlife and forest practices which would apply region-wide.

[12] Memorandum of Understanding between the City of Port Townsend and U.S. Department of Agriculture, Forest Service, Olympic National Forest. May 1993.

Fish Management

J.7 Fish Management
General Recommendations are found in Chapter 5, *Regional Recommendations. R. 11*

J.7 <u>Fish management should protect *critical, high potential of becomine/being critical* and *depressed* stocks of salmonids and other native and wild fish in the rivers in the region</u>. See Figures 7.3 & 7.4, Life History Periods (Quilcene River), Run Timing & Fishing/Quilcene Bay.

J.7.1 *Analyze hatchery impacts:* analyze impacts and cumulative effects of hatchery operations on native and wild fish stocks, and manage to protect and provide for native and wild salmonids and other fish species. See Table 7.3 for information. on the permitted diversion from the Big Quilcene River into the National Fish Hatchery (NFH).

J.7. 1.1 Quilcene NFH Water Use and Fish Passage Practices: The hatchery is managed to pass no adult salmon upstream into Penny Creek or the Big Quilcene River, under an agreement with WDFW and PNPTC (Boomer, 1990). This practice keeps the Quilcene water intake virtually free of salmon diseases. If adult salmon were passed upstream, hatchery fish might be at risk to certain diseases, and this could alter fish releases under various hatchery programs, including those specified under the Hood Canal Salmon Management Plan.

J.7.1.2 See the Problem Definition 6 for the complete description of the fish passage policy, effects of the hatchery operation and a description of the hatchery water supply.

Table 7.3 Permitted diversions from Big Quilcene River into Quilcene NFH, & required instream flow in hatchery bypass reach. Source: Lehotsky (1993)

Months	Flow (cfs) in Big Quilcene River above hatchery intakes	Maximum hatchery diversion (cfs) permitted from Big Quilcene	Required flow (cfs) in hatchery bypass reach of river
Feb-Jun	Greater than 205 cfs	40 cfs	165 cfs
	180 to 205 cfs	15-40 cfs (Flow above intakes minus 165 cfs)	165 cfs
	Less than 180 cfs	15 cfs	No requirement
Jul-Jan	Greater than 90 cfs	40 cfs	50 cfs
	65 to 90 cfs	15-40 cfs (flow above intakes minus 50 cfs)	50 cfs
	Less than 65 cfs	1 15 cfs	No requirement '~

Flood Plain Management

J.8 **Protect and in some cases restore flood plain and estuarine habitat to provide functions and values necessary for native and wild or hatchery fish and other wildlife resources, as well as provide protection for life, safety and Property**.

R.8.1 As can be accomplished, remove development already in the flood plain, providing both protection for human lives and property, and habitat renewal opportunities. Residents already occupying the flood plain should be able to live there as long as they want, acknowledging the possibilities of flooding threats. Evaluate alternatives to maintaining dikes. R8.2 Establish a fund to purchase flood plain properties and residences as they become available.

Hydrologic Research and Data Management

J.9 **Because data is needed to more fully understand and plan for the water resources in the region, hydrogeologic investigations should be pursued in Jefferson County to determine what the surface and ground-water resources are and will be in the future.**

See the research and data management recommendations contained in Chapter 9, *Technical* Support.

Chimacum Estuary

Ground Water

J.10 Ground Water Recharge Preservation

(Adapted from the Water Resource's Forum Policy.)

Preamble

In many areas, the ground-water reservoir is critical to maintaining stream flow during dry periods. It is also an important source of water for domestic and other uses. In the process of development, recharge to ground water is typically reduced by land disturbance and increased impervious surfaces. It is often the only source of supply in areas not in continuity with streams. As a result of loss of recharge dry-period hydrologic base flows may become inadequate to provide aquatic habitat and/or fish passage. Increased direct surface runoff during wet periods causes flooding and damage to stream channels.

Policies to maintain both the quality and quantity of ground water are needed. To protect hydrologic base flows and existing water rights, such policies must provide for reasonable maintenance of the natural water resources processes.

These ground-water recharge preservation policies require funding of programs at the local level. It is recognized that funding mechanisms or authorities need to be exercised or developed to fully implement the range of identified mandates.

The Problem

Ground water is a limited and variable resource which may be depleted or replenished. Maintaining its quantity and quality depends upon maintaining the balance between recharge and outflow/withdrawal. Recharge depends upon the capacity of the land surface to capture and infiltrate water and of the immediate substrate to permit its percolation.

Because infiltration and recharge depends upon detention of water by vegetation and its litter, and upon soil and drainage characteristics which are easily disrupted, land and subsurface disturbance nearly always adversely impacts the quantity of infiltration and recharge.

Urbanization and other land surface disruptions generally have an impact on groundwater recharge, and may affect water rights. Historically land use decisions and other allocations of water resources have not considered the disruption of runoff and recharge relationships. For example, water availability may change over time as urbanization and other land surface disruptions alter ground-water recharge. Decreased ground-water recharge and changes in the seasonal discharge to surface waters can have marked effects on seasonal stream flow regimes, the amount of ground-water storage, and existing ground and surface water rights.

Not only does recharge have to be maintained, manuals need to be reevaluated. For instance, stormwater drainage manuals stipulate that peak flows must be limited to some historically occurring value but do not stipulate the maintenance of any given level of ground-water recharge for protection of hydrologic base flows and water rights. (Studies are lacking too, that quantify what recharge is necessary to maintain hydrologic base flows.) Evaporative losses from surface and subsurface disruptions need to be taken into account.

The potential for property rights and water rights conflicts exists. Landowners want to be free to convert their land to other than a pristine or existing conditions while water rights holders depend upon the existing relationships that deliver the water to which they have rights.

J.10.1 Principles

J.10.1.1 Ground water and surface water within most basins are in a natural interrelationship and should be managed as an integrated hydrologic system.

J.10.1.2 Ground water is the essential storage link between precipitation and most summer stream flow, hydrologic base flows and well water supply, aquifer stability, and ground-water resources (except the flow from glaciers and snow melt). Local recharge is often the only source of hydrologic base flow in small basins.

J.10.1.3 Infiltration recharges the ground-water reservoir which is critical to maintaining stream flow, hydrologic base flow and well water supply, aquifer stability, and ground-water resources especially during dry periods.

J.10.1.4 Recharge is not limited to small areas of a watershed.

J.10.1.5 Protection of infiltration characteristics must be an integral part of resource management plans.

J.10.1.6 In those basins where recharge has been significantly impacted resource management plans must consider methods to increase ground-water recharge.

J.10.2 Policy Purposes to Guide Regional Planning

J.10.2.1 To maintain and enhance hydrologic base flows and well water supply, aquifer stability, and ground-water resources through recharge management.

J.10.2.2 To encourage education and coordination between government agencies responsible for permitting.

J.10.2.3 To elevate the importance of maintaining and where appropriate restoring recharge through growth management planning policies.

J.10.2.4 To manage the quantity of ground water in any basin to: a. Maintain hydrologic base flows to sustain instream and riparian habitat; b. Satisfy existing ground-water withdrawal rights including exempt wells; c. Provide stream flow to satisfy surface water rights.

J.10.2.5 To identify and institute socially and economically cost effective means to restore and maintain ground-water recharge.

J.10.2.6 To encourage the State to provide necessary technical and financial assistance to local governments, to assist in evaluation of recharge impacts.

J.10.3 Policies

J.10.3.1 **All** areas should be considered as significant to the recharge of ground water.

J.10.3.2 Recharge needs to be addressed at all levels of government in a coordinated planning effort to maintain recharge.

J.10.3.3 In all cases, plan and design land uses to prevent adverse impacts on recharge quality and quantity.

J.10.3.4 Maintain clean water to the ground water.

J.10.3.5 In basins with hydrologic base flow problems and where BMP's alone are not sufficient to address the problems, further measures must be used which may include direct enhancement to levels sufficient to maintain hydrologic base flows and provide for good water quality.

J.10.3.6 Water quality and quantity must be considered in the evaluation of recharge protection and enhancement activities.

J.10.4 Application of Policies

Policies to assure protection of ground-water quality and adequate recharge should be addressed in all land and water management plans, programs, and in regulations at all stages of planning; and in development, project execution and long-term maintenance activities by all levels of government. Recharge should be addressed through land use planning, resource management planning, and implementation of those plans.

J.10.5 Needs at the Local Level

The following are needed to implement the policies:

J.10.5.1 Technical and financial resources for addressing recharge, which are inadequate for the DQ Area.

J.10.5.2 Development of programs to provide assistance for addressing recharge in the DQ area, especially in Eastern Jefferson County where technical and financial resources are inadequate.

J.10.5.3 Development of a recharge guidance manual to aid in the assessment and resolution of infiltration/recharge issues.

J.10.5.4 Recognition that ground-water recharge is always important, especially: a. where hydraulic continuity is likely; b. in areas impacted by saltwater intrusion; c. in sole-source aquifers that are isolated, and may be fed only through rainfall.

J.10.6 Implementation Tools

The following are implementation tools that should be considered. The appropriateness of specific practices to promote recharge will depend on local site conditions.

J. 20.6.1 Specific consideration should be given to the effects of development on infiltration and recharge quantity and quality when developing or reviewing comprehensive land use plans, and in the development of regulations promulgated as a result of the Growth Management Act and/or other regional or local planning initiatives. Design manuals should be developed reflecting these impacts. Development regulations should provide a method for assessing proposed actions against adopted performance standards.

J.10.6.2 State agencies, Tribes, and other proponents should provide technical assistance/guidance in identifying: 1) when recharge impacts adversely impact hydrologic base flows and other existing water rights (through hydraulic continuity); 2) the means of limiting and/or mitigating those impacts. Small basin and site specific programs should be developed to gather data regarding rainfall, runoff, evapotranspiration, and recharge. The database should be maintained and updated on a 5 year cycle, or when substantial changes take place.

J.10.6.3 A manual should be developed by the Department of Ecology, in conjunction with the Department of Fisheries and Wildlife and the

Department of Health, to assist local governments and others in their planning and permitting processes. The manual should address development impacts on the aquifer, recharge, and stream flow. The importance and value of preserving and promoting infiltration and recharge for summer flows, by reducing winter losses in the surface runoff generated by disturbed surfaces, should be emphasized. Items J.10.6.4-7 listed below should be considered as separate tools, prior to completion of the manual as well as after. In addition to the above, a locally developed plan should be included in the next CWSP update.

J.10.6.4 Specific considerations of the effects of development on infiltration and recharge quantities should be applied to project review under the SEPA process. When development regulations are based on the goals and objectives established under comprehensive plans which address recharge, SEPA review at the project level then becomes the final evaluation of plan implementation.

J.10.6.5 Project level review and the performance based standards should consider but not be limited to the following: a. Avoiding the disruption of the natural soil drainage channels to the maximum extent feasible and encouraging natural vegetation; b. Mitigation that provides for a range of options such as the retention and slowing of runoff, the redirection of clean storm water to remaining pervious surfaces, and artificial recharge; c. Options for small parcels, including actions taken at the individual single home site level. These often provide the best opportunities for maintaining effective recharge. Outside the SEPA framework, education mechanisms, incentives, and such measures as landscape codes should be developed and encouraged for individual home site development.

J.10.6.6 The SEPA Environmental Checklist on Earth, Water, Wildlife and Plants should address probable impacts on infiltration capacity, surface runoff and ground-water recharge.

J.10.6.7 Consideration must be given to appropriate State surface and ground-water quality standards and local regionally developed watershed plans, as well as those established by local or regional wellhead protection, aquifer protection or sole source aquifer regulations, or other local ground-water management programs.

J.10.6.8 Stormwater management programs may be one of the best methods for mitigating serious impacts on recharge. These could include infiltration maintenance and/or enhancement and should be promoted where possible. Local governments should be encouraged to support the Puget Sound Water Quality Plan or equivalent planning efforts, and should adopt the PSWQA "manual" or equivalent by the date of the completion of the comprehensive plans, December 31, 1994. Where applicable, other provisions may include:

a. Avoiding removal of native vegetation and surface disruption in construction and subsequent land use practices;
b. Using and enhancing native vegetation and landscaping for habitat that exploit the natural contours and surfaces which will promote infiltration;
c. Diversion and spreading of runoff from rooftops, patios, and other clean impervious surfaces onto preserved pervious surfaces, or for other beneficial uses;
d. Terracing and other means of detaining runoff on-site to promote infiltration over as large an area as possible. (More than forty percent of rainfall in the Puget Sound area comes in daily amounts of less than one-half inch, 70 percent in daily amounts of less than one inch.);
e. Using infiltration systems when appropriately designed and maintained;
f. Using BUIP's as mechanisms to prevent adverse impacts on quality and quantity of recharge.

110.6.9 Provide more public education on the importance of recharge maintenance to the health of streams. This would be a four part effort:

a. Educate the general public on the importance of preserving recharge as a key to the protection of wildlife and instream resources;
b. Educate governments on the issues and opportunities to coordinate their actions to preserve recharge. (This is of particular concern in the rural areas and urban fringe areas of the County);
c. Encourage local government to develop and provide education to home owner associations that have infiltration-based stormwater management systems that need to be maintained, and;
d. Educate and provide information to building contractors, landscape designers, land clearing operations personnel, and others in the building industry about the importance of maintaining recharge characteristics, and the range of options that may be available for limiting impacts on recharge.

110.6.10 Long-term resource management programs, such as watershed and ground-water management programs/plans and drainage manuals, should include as a goal and/or policy the maintenance and promotion of recharge sufficient to maintain hydrologic base flow, and should include means for implementation.

J.10.6.11 The DQ encourages, through the Coordinated Water Supply Plan process, that local governments support a detailed data acquisition and analysis program (that furthers already completed work) on ground water yields, quality, hydraulic continuity, and seawater intrusion. This could include implementation of the USGS work plan, see Chapter 9, *Technical Support.*

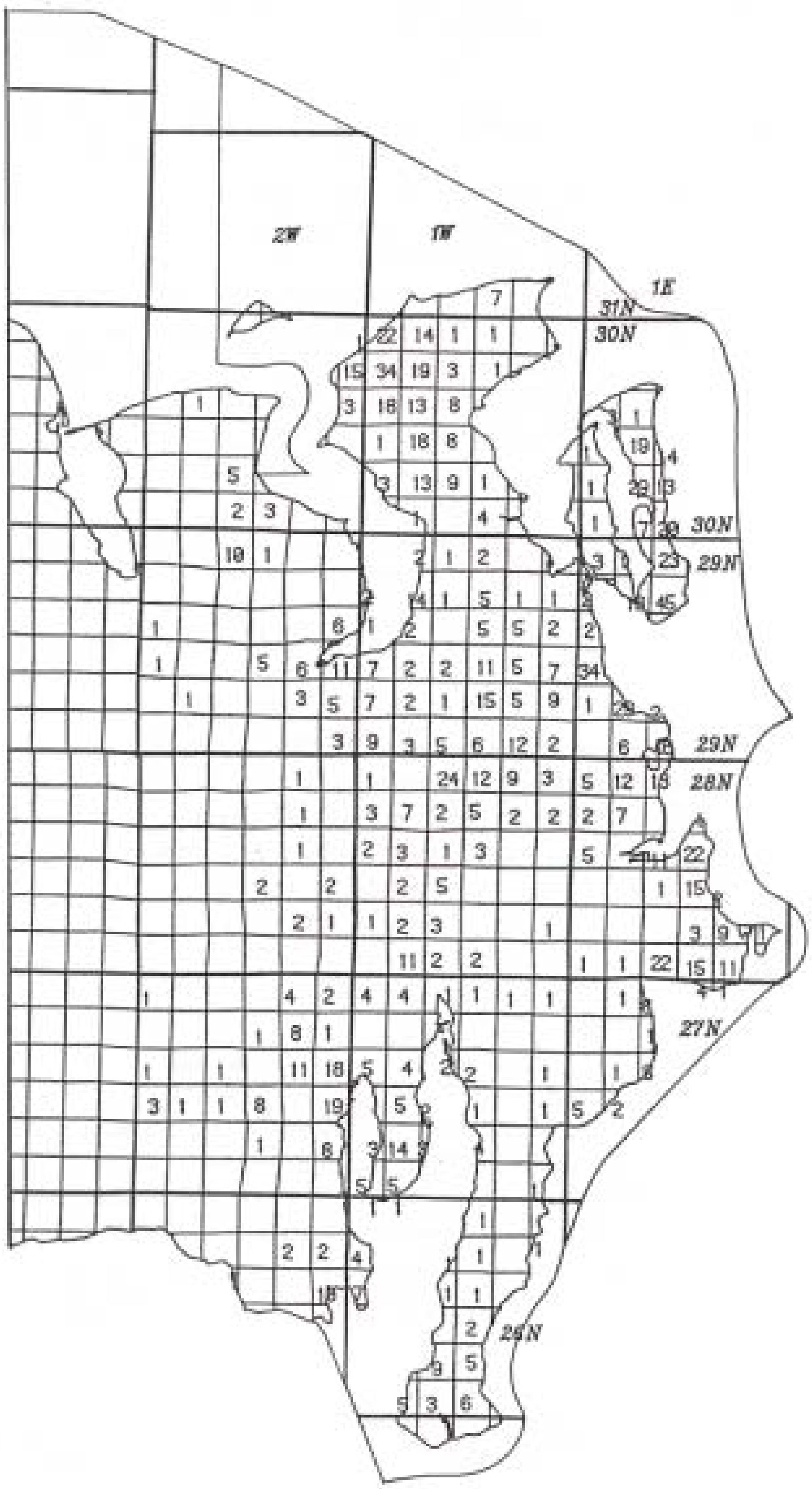
J.11 Ground-water Management

Preamble

As a finite resource, ground water in the region needs protection from both pollution and over-allocation. Although preliminary studies have been done to identify the resources, much remains unknown about the aquifers, the hydrologic interconnections with instream flows (hydraulic continuity), and what amount of sustained-yields are available for future uses; this information is critical to future planning, as each new well drilled may have an impact on the area aquifers, instream flows and pollution from seawater intrusion or other sources. Because seawater intrusion was recognized as a threat to some water wells over 20 years ago, a preliminary assessment was completed of seawater intrusion in coastal wells in eastern Clallam and Jefferson Counties.[13] The results showed that unlike Clallam County, there has been .a significant increase in the chloride content in four out of nine measured wells over the last fifteen years, and seawater intrusion has become an increasingly pervasive problem in some areas including Shine, Mats-Mats, Oak Bay and Marrowstone Island. Because of increased population growth and land-use pressures, more wells are being drilled daily and there is concern for the status of ground water in eastern Jefferson County.

[13] Robert Forties and CH2MHill. 1993.

Map 7.1 Count of all Identified Water Wells in Square-Mile Sections, E. Jefferson County



J.11.1 Because of these concerns the following recommendations are made:

J.11.1.1 The Department of Ecology should develop standards and assure that wells will not detrimentally impact instream flow, contribute to seawater intrusion, adversely affect existing uses or hydraulic continuity.

J.11.1.2 New legislation should be established requiring permits for all new wells.

J.11.1.3 All future wells should be required to obtain a Department of Ecology water permit.[14] Ecology should propose legislation and develop a water permit system for all future wells which includes standards that can be used to provide proof that these wells are not:

a. in hydraulic continuity with any stream or river;
b. contributing to seawater intrusion concerns; or
c. adversely affecting existing uses.

After such standards are developed, all future wells should be required to comply with such requirements.

J.11.1.4 The Driller's reports for all existing wells with less than 5000 gallons/day use should be logged by the local health department and the information entered into the DQ and Ecology databases. All wells should be logged and records kept at a local public agency.

J.11.1.5 In recognition that ground water may be relied upon in the future for municipal supply, land-use plans and actions by governments (County and City) should recognize and protect aquifer recharge critical areas. In areas where development occurs around community wells, well head protection programs should be implemented.

J.11.1.6 Incentives should be developed by Ecology, the DOH and other agencies to encourage community water systems. Such systems should be metered. The consequences of joining a community system should be made financially advantageous without subsidies. The community systems should be affordable and have sufficient infrastructure to provide adequate maintenance and management services.

J.11.1.7 A complete ground-water study should be done, adding to the information from the Eastern Jefferson County Ground-Water Characterization study, to determine the ground-water resources, their status, and to describe the aquifers and areas of risk accurately. A comprehensive hydraulic continuity investigation should be completed to determine the impact of the management of the streams on ground water.

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[14] There was a lot of discussion about the results of this recommendations. Concerns included costs of implementation and timeliness of issuing permits.

J.11.1.8 Land use patterns should be designed to encourage and influence the development of community well systems.

Water Rights

J.12 Determine what amount of surface water can be saved for transfer to instream flow, and implement via trust water rights or other legal mechanisms. Abandoned water rights should be evaluated and spare water rights returned to instream flows when possible.

J.12.1 The State should redefine "beneficial uses" to allow for return of unused water to augment instream flow, with no losses of water rights (e.g. the "use it or loss it" concept).

Storage

J.13 Storage and surface water runoff should be considered, especially in areas where no surface or ground-water availability exists. Storage has been discussed as an option to regulate flows and provide water during critical times. It was agreed that there would be no on-river storage, though options for both large and small-scale, oil-channel storage should be investigated as a part of the over-all management of the system.

J.13.1 Conduct a survey of available storage opportunities.

J.13.2 Complete a cost analysis of storage options, and compare it with a similar analysis of other possible solutions. This should be done as a part of the update to the Coordinated Water System Plan.

J.13.3 Conduct a complete environmental analysis of preliminary storage options and sites.

J.13.4 Identify current "mini" storage systems or practices which could be applied elsewhere for family or small multi-family use.

J.13.5 Restore the natural sponge capacity in wetlands and other vegetated areas and provide incentives to reforest and retain existing resources, to provide additional storage of water resources. Complete a study of the effectiveness of employing incentives for property owners for restoring the natural storage capacity of their land. The BMP's as outlined in the PSWQA manual, especially those relating to constructed wetlands and infiltration systems, should be considered to provide storage and ground-water recharge in the area.

Conservation

General Recommendations: See the general recommendations on Conservation in Chapter 5, Regional Strategies and Recommendations.

Conservation

J.14 <u>Practices should be implemented to provide conservation and better water efficiency for eastern Jefferson County</u>.

J.14.1 The Port Townsend Paper Company Mill should further establish and continue to implement water conservation strategies, and should establish water usage goals.

114.2 The City of Port Townsend and the Jefferson PUD should continue conservation strategies, and should establish water usage goals.

J.14.3 Jefferson County should establish conservation strategies, and establish water usage goals through sub-division regulation and land use policies, including vegetation management strategies.

J.14.4 All new development in the City and County should require water conservation measures and devices to provide the most efficient use of water resources. The City and County should also promote conservation retrofit measures on already built homes.

J.14.5 A process should be devised related to agricultural water use to eliminate disincentives to conservation and to allow on-going, orderly transfer of saved water to instream flow needs, (e.g. eliminate the "use it or lose it" obstacle to conservation).

Indian Island and Portage Canal

Figure 7.1 Instream Flow Needs for Fishery Resources in Jefferson County

General Considerations:[15]

1. Choice of Species: Species occurrence in toe width study area follows the 1992 Salmon and Steelhead Stock Inventory (SASSI), (WDF et al. 1993), except on Big and Little Quilcene; which historically may have supported natural chinook spawning.
2. Flow Protection in Context: Flow protection is an essential part of overall habitat protection, but cannot make up for lost habitat area, access to habitat or diversity of habitat types. For example, riparian and estuarine wetlands provide cover and food for certain salmonid species in the DQ project area.

Stream	Number	Months	Fish Flow (CFS)[A]	Species/Life Stage	Source
Big Quilcene River	17.0012	Sep-Jan	198	Chinook and chum spawning	Data of Beecher (1980a) applied to model of Swift 1979)
		Feb-Jun	165	Steelhead spawning	Beecher (1980x)
		Jul-Aug	50	Steelhead rearing	
Chevy Chase Creek	17.0215	Stream intermittent no suitable measurement sites			Hiss 1993b
Mainstem Chimacum Creek	17.0203	Nov-Jan	58	Chum spawning	Data of Beecher (1980x) applied to model of Swift 1979
		Feb-Jun	50	Steelhead spawning	Beecher (1980x)
		Jul-Oct	12	Steelhead rearing	
East Fork Chimacum Creek	17.0205	No suitable measurement sites			Hiss (1993b)
West Fork Chimacum Creek	17.0203	Nov-Jan_	8	Coho spawning	
		Feb-Jun	17	Steelhead spawning	
		Jul-Oct	3	Steelhead rearing	

A. Spawning and rearing flows for the Dungeness River are the "maximum habitat flows" from the IFIM (Hiss 1993x). Spawning flows for all other streams are the "optimum flows" from the toe width method (Swift 1976, 1979). Rearing flows for all other streams are the "preferred flows" from the toe width method (Swift 1986, 1979). See Glossary for definitions.

[15] From Joe Hiss. Letter to DQ Project. March 8, 1994.

Figure 7.1 contd.

Stream	Number	Months	Fish Flow (CFS)[A]	Species/Life Stage	Source
Contractors Creek	17.0270	Oct-Jan	4	Coho Spawning	Hiss (1993b
		Feb-May	8	Steelhead spawning	
		Jul-Sep	1	Steelhead rearing	
Donovan Creek	17.0115	Nov-Jan	35	Chum spawning	Data of Beecher (1980a) applied to model of Swift (1979)
		Feb-Jun	30	Steelhead spawning	Beecher (1980a)
		Jul-Oct	7	Steelhead rearing	
Eagle Creek	17.0272	Stream Intermittent; no suitable Measurement sites or anadromous spawning reaches accessible by public road			Hiss (1993b)
East Squamish Creek	17.0183	No suitable measurement sites			
Howe Creek	17,0090	Nov-Jan	9	Coho spawning	
		Feb-Oct	3	Coho rearing	
Leland Creek	17,0077	Nov-Jan	22	Coho spawning	
		Feb-Jan	40	Steelhead spawning	
		Jul-Oct	9	Steelhead raring	
Little Quilcene River	17,0076	Nov-Jan	85	Chum Spawning	Date of Beecher (1980a) applied to model of swift (1979)
		Feb-Jun	75	Steelhead spawning	Beecher (1980a)
		Jul-Oct	20	Steelhead rearing	

Figure 7.1 contd.

Stream	Number	Months	Fish Flow (CFS)[A]	Species/Life Stage	Source
Ludlow Creek	17,0192	Nov-Jan	16	Chum spawning	Hiss (1993b)
		Feb-Jun	16	Steelhead spawning	
		Jul-Oct	3	Steelhead rearing	
Penny Creek	17,0014	Nov-Jan	B	Coho spawning	B
		Feb-Jun	B	Steelhead spawning	
		Jul-Oct	B	Steelhead rearing	
Ripley Creek	17,0089	Nov-Jan	4	Coho spawning	Hiss
		Feb-Oct	1	Coho rearing	(1993b)
Salmon Creek	17,0245	Sep-Oct	43	Chum spawning	Data of Beecher (1980a) applied to model of swift (19790r
		Nov-Feb		Coho spawning	
		Mar-May	40	Steelhead spawning	Beecher (1980a)
		Jun-Aug	9	Steelhead rearing	
Shine Creek	17,0181	Nov-Jan	14	Chum Spawning	Hiss
		Feb-Oct	2	Coho rearing	(1993b)
Snow Creek	17,0219	Sep-Oct	66	Chum spawning	Data of Beecher (1980a) applied to model of swift (1979)
		Nov-Jan	33	Coho spawning	
		Feb-May	63	Steelhead spawning	Beecher (1980a)
		Jun-Aug	8	Steelhead rearing	

Figure 7.1 contd.

Stream	Number	Months	Fish Flow (CFS)[A]	Species/Life Stage	Source
Mainstem Tarboo Creek	17,0129	Nov.-Jan	42	Chum spawning	Date of Beecher (1980a) applied to model of swift (1979)
		Feb-Jun	40	Steelhead spawning	Beecher (1980a)
		Jul-Oct	8	Steelhead rearing	
East Fork Tarboo Creek		Nov-Jan	3	Coho spawning	Hiss (1993b)
		Feb-Jun	8	Steelhead spawning	
		Jul-Oct	1	Steelhead rearing	
Thorndyke Creek	17,0170	Nov-Jan	50	Chum spawning	Data of Beecher (1980a) applied to model of swift (1979)
		Feb-Jun	45	Steelhead spawning	Beecher (1980a)
		Jul-Oct	10	Steelhead and coho rearing	
Unnamed	17,0116	Stream flow seasonal.			Hiss (1993b)
Unnamed	17,0200	Nov-Jan	6	Chum spawning	
		Feb-Oct	1	Coho rearing	

Figure 7.2 USFWS Letter on Penny Creek Flows

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Western Washington Fishery Resource office
2625 Parkmont Lane SW, Bldg. A
Olympia, Washington 98502-5799

Phone: (206) 753-9460
Fax: (206) 753-9407

April 28, 1994

Ms. Linda Newberry
Dungeness-Quilcene Pilot Project
1033 Old Blyn Hwy.
Sequim, Washington 98382

Dear Linda:

On April 1, 1994 Joe Hiss of this office took stream width measurements on Penny Creek, tributary to the Big Quilcene River. From these he derived stream widths as follows:

Site	Stream Width at bank toe (ft)
1	29.0
2	20.4
3	20.2
4	20.1
5	18.9
Mean	21.7

He judged from the size of the stream that it would support coho salmon and steelhead trout if these fish had access to it. He assumed that spawn timing would match the Quilcene-Dabob coho and steelhead runs, and that the stream would have enough summer flow to support coho and steelhead rearing. Our 1993 Toe Width Report provided the formula for calculating optimum spawning flow and preferred rearing flow. Applying this formula to the Penny Creek width values results in flows for each period as follows:

Species	Life Stage	Months	Optimum or preferred flow (cfs)
Coho	Spawning	Nov-Jan	31
Steelhead	Spawning	Feb-Jun	55
Steelhead	Rearing	Jul-Oct	13

No coho rearing flow was calculated because coho rearing coincides with steelhead rearing but requires slightly less instream flow than steelhead according to the Toe Width models.

Figure 7.2 contd.

This information complements the flows we derived for other streams of the Dungeness-Quilcene area, and comes at no extra cost to you.

Our providing this information does not indicate we wish to change the present use of Penny Creek, which is now primarily managed for hatchery water supply, and not for natural production of anadromous fish. The Quilcene National Fish Hatchery depends on Penny Creek as its sole source of water for egg incubation, and for supplemental rearing water in the raceways when the Big Quilcene becomes more turbid than desirable. Penny Creek is considered capable of producing only very small number of anadromous fish due to its steep gradient and possible natural blocks to migration. The Hatchery is constructed so that no adult salmon pass upstream into Penny Creek. This keeps the Penny Creek water intake virtually free of salmon diseases. If salmon were passed upstream, the hatchery fish might be at risk to certain diseases, which could reduce fish releases to levels below those specified under the Hood Canal Salmon Management Plan.

We plan to continue to assist in the water use planning process by attending key meetings and reviewing documents as needed.

Sincerely,

Ralph S. Boomer
Project Leader

Figure 7.3 Sal

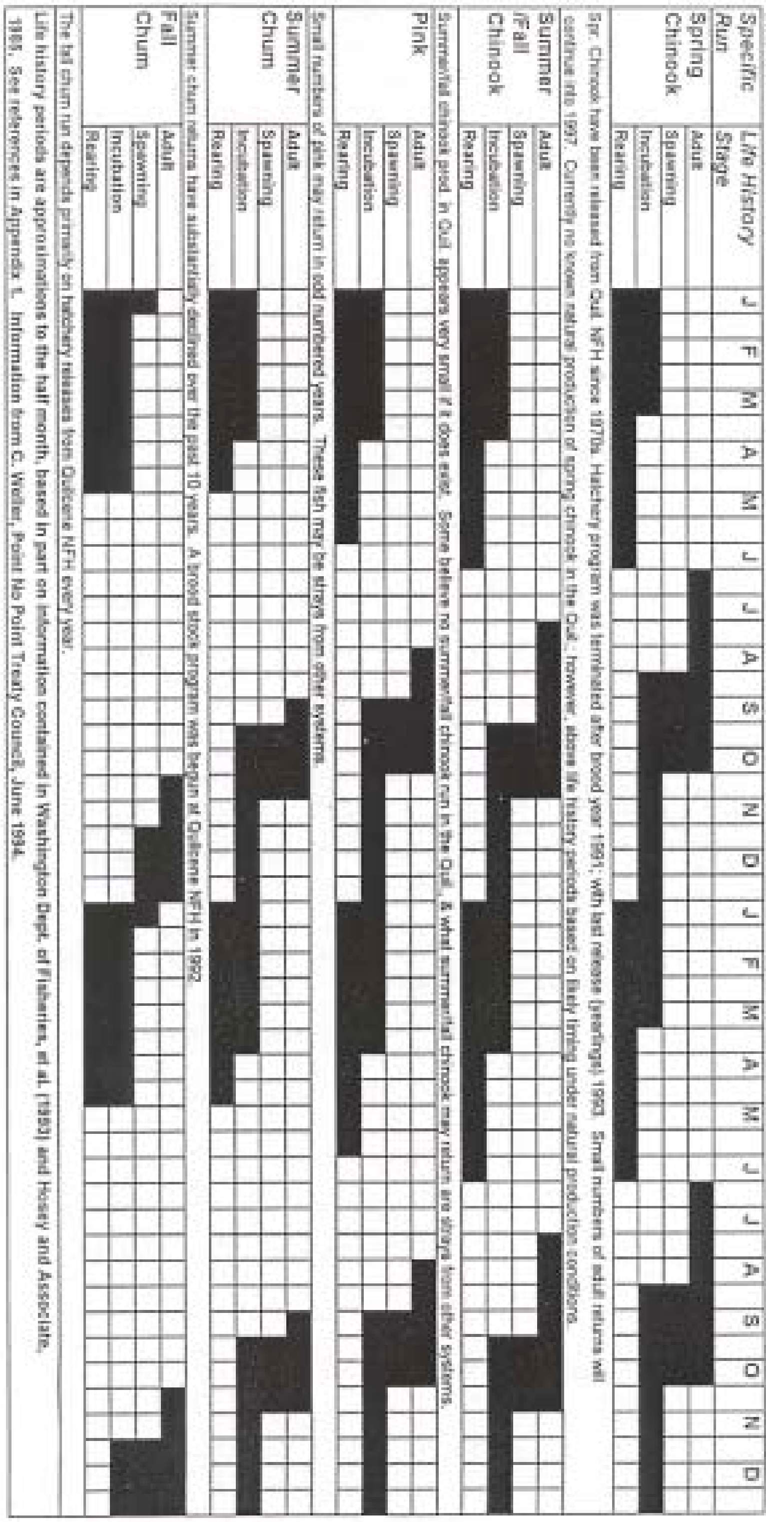


Figure 7.3 contd.

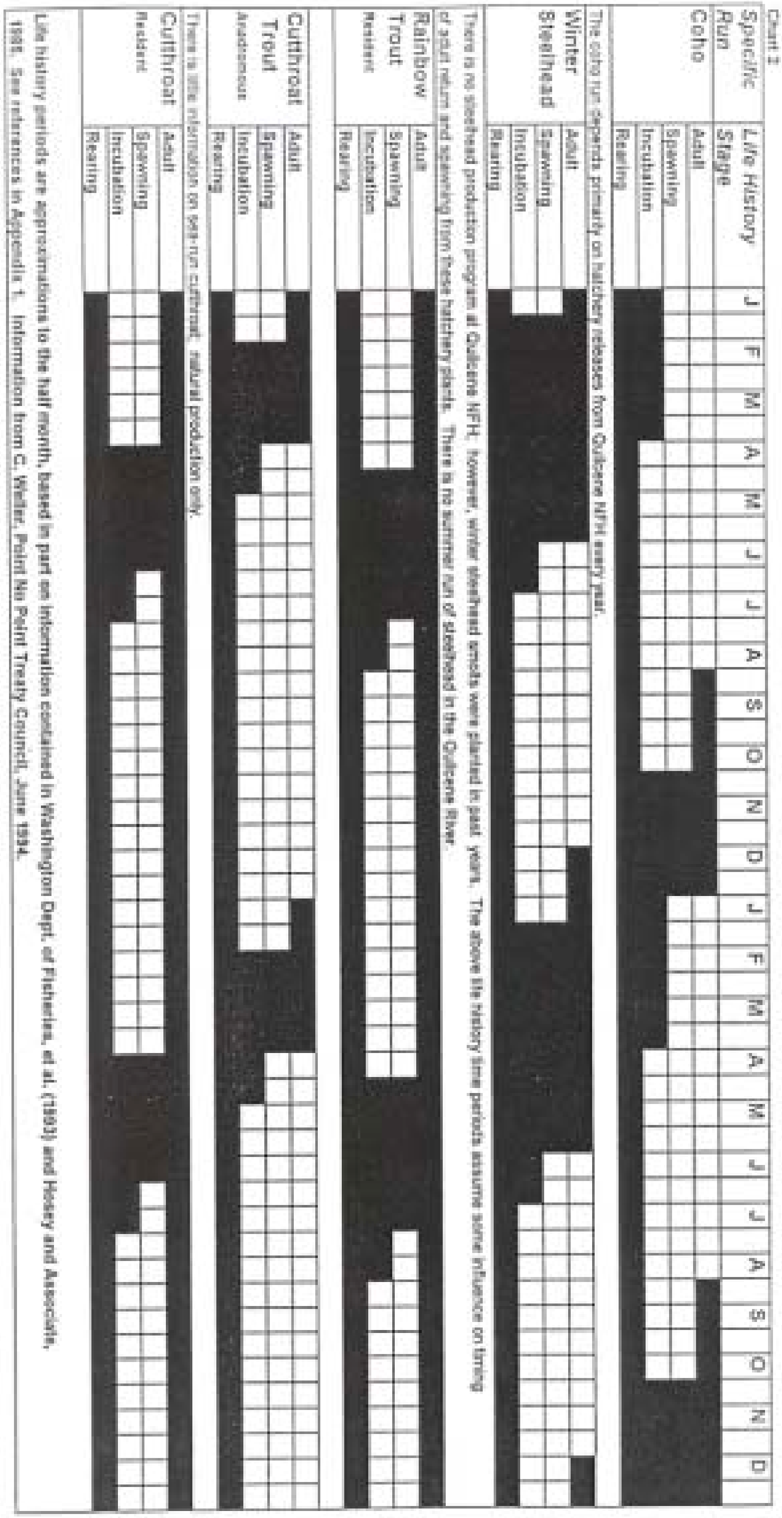
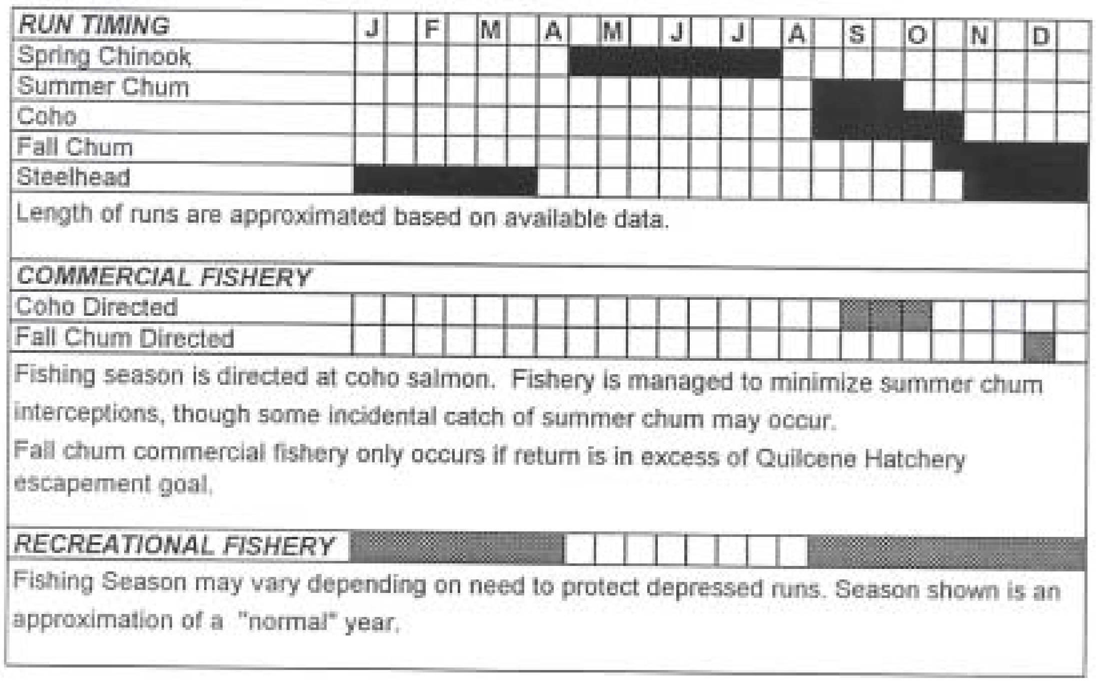


Figure 7.4 Salmon and Steelhead Run Timing and Fishing Seasons in Quilcene Bay (N. Lampsakis and C. Weller 1994)



Volume 1

Chapter 8

Implementation Strategies

Chapter 8
Implementation Strategies

Introduction

Under the Chelan Agreement, the goals of the regional planning efforts were generally described, and Regional Planning Guidelines were developed to give the pilot planning groups broad parameters within which to work. Unlike watershed action plans, the plan's developed by each of the two pilots were not created under any State law, and therefore do not have an automatic implementation mechanism or rule. This has concerned some of the RPG members, and caused questions about the out-come of the Plan, and what will happen to it after it is presented to the Department of Ecology to "approve or remand." Because the planning period and funding, and therefore the Regional Planning Group "dissolves" after June 30, 1994, there is no automatic, on-going entity or mechanism to implement the recommendations which were developed with so much dedication, perseverance and hard work by the planning group members. What follows are the *possible strategies for implementation,* given that there is not a legislated mandate to implement the Plan upon its completion.

Chapters 5, 6 and 7 as presented define the issues, problems and solutions reached by the Regional Planning Group, regarding the status and management of the water resources in the region. Chapter 5 represents broader regional issues and concepts as well as some specifics. Chapter 6 defines issues, problems and solutions for the Sequim-Dungeness prairie and watershed in east Clallam County, and Chapter 7 defines issues, problems and solutions in the Quilcene watershed, including Miller and Quimper peninsula and areas in the south east county. This Chapter describes *in outline form* the possibilities for implementation of the strategies presented in those chapters in the entire region. A draft Work Plan and Timeline is also included here for future consideration by the proposed Watershed Councils.

Important Caveats to Consider

While the Regional Planning Group was not able to define in-depth implementation strategies which would be most effective to link the goals of the effort to the possible solutions to the problems as defined in Chapters 5, 6, and 7, the following implementation charts are *a starting point* for consideration by each County. Because of time limitations, these have been drafted by staff, and little consideration has been given to them by the RPG. Consensus has not been reached on the "possible implementing agencies;" these are subject to revision and will be visited in the future by the appropriate groups.

Transition Period Strategies

Under ideal circumstances transition period strategies would have been spelled out to bring this Plan to life in the region. Because the intensity of the effort has focused all of the RPG's attention on the issues and recommendations, very little time was available for considerations of either the transition period or future implementation strategies. A few things are clear:

- The proposed Watershed Councils, including local governments and Tribes, are the main key to carrying out the recommendations;
- Funds are needed to implement many of the recommendations of the Plan and to provide the Watershed Councils with the ability to coordinate these efforts;
- There is a strong commitment on the part of the participants in the regional planning effort to continue to carry forth at least the major recommendations in the DQ Plan.

The members of the DQ have been determined from the start to not create a Plan which would "sit on the shelf' after completion. To this end, discussions are starting to formulate the most effective way to proceed. In each County, preliminary meetings will be held in July 1994 to further define the concept of the Watershed Council, as the main mechanism for implementation of the strategies in the Plan. Funding will be sought by local governments and the Tribes to implement major categories of the Plan.

The Watershed Councils

The Watershed Councils will be the main coordinating entity bringing all concerned participants together to plan for and implement strategies and actions spelled out in the Plan. Composed of local, Tribal, State and Federal governments and agencies, along with other community and public interests, these groups will best represent both the needs and expertise existing in each County. This broad-spread representation will enable the Council to most effectively implement the recommendations of the Plan, work on the "unfinished agenda" items and further extend the strategies just started during the short planning process. Grants and other funding mechanisms are being sought, along with Legislative support, to implement the major components of the Plan through the Council. This includes the water resources study needed to determine the quantity and quality of surface and ground water in the region. It is estimated that it will take 5 years to complete this study.

Summaries of Some of the Actions Proposed

In Clallam County: Already, some of the irrigation "Conservation and Instream Flow Steps" (C.1-2) have started and will be continued, in cooperation with the Dungeness Watershed Council. Restoration and enhancement projects have also started through Centennial Clean Water grants and the Forest Plan "Jobs for the Environment," and funding will be sought to continue to restore degraded river habitat to further help with instream flow and wild fish needs, as well as for the water resources study. The proposed Habitat Group will work in conjunction with the Watershed Council to develop improved biological criteria for setting instream flows, and will advise the Council on other issues related to water resources and river management, restoration, enhancement and land use practices impacting the resource. A "ground water group" will meet to further define the "interim strategy" for protection of ground water for the next five years (C.11.2), and to begin to look at long-term needs and solutions for ground-water quantity and quality protection,

In Jefferson County: Discussions have started between the City of Port Townsend, Jefferson County, the Port Gamble S'Klallam Tribe and the State on instream flows on the Big Quilcene River (1S). The Jefferson County Work Group gave itself (in the new Watershed Council format) three years to determine numbers for instream flows for the small rivers and streams that all participants could agree on for recommendation to Ecology for rule setting. During that time period, it is expected that USFWS and the State will work together on improving biological criteria for establishing flows on small streams in the region.

After its formation, the proposed Watershed Council will be working to further define implementation strategies in Jefferson County under the CSWP and GMA planning in process there. Funding will be sought for the water resources study, and restoration efforts in coordination with existing FEMAT and State and Federal watershed assessment and planning processes. Ground-water issues will continue to be of major importance, (J.10), with the finalizing of the PUD plan, Ecology's seawater intrusion study, the proposed water resources study, and increased emphasis on single domestic wells and community systems, protection of recharge and management of the finite water resources.

Regional Recommendations (R.)

Regional Use of Water R.1

Use water from within the region, and keep water within the region.

The Gap R.2

Reduce the water resource needs of both human's and natural ecosystems through reducing the gap between the amount of water needed and that amount which is available.

Shared Sacrifice R.3

Share the burdens and benefits of natural fluctuations in the amount of stream flow annually available.

ACTION CHART

	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
R 1	Use water from within the area, and keep water within the area	*****	*****	*****	Counties, Cities, PUDs, State	
R2	Narrow the GAP.	*****	*****	*****	Watershed Council including Cities, Counties, PUD's, Tribes, public interests	
R3	Share the pain and share the gain.	*****	*****	*****	Watershed Council including Cities, Counties, PUD's, Tribes, public interests	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Conservation R.4

Institute conservation as a way of life for every water users as the most cost-effective way to extend limited water supplies for the foreseeable future.

FURTHER:

A. Develop a comprehensive regional water conservation plan.
B. Develop a system to prioritize water uses for times of critical need. Establish an emergency water conservation program.
C. Monitor the use of water.
D. Establish principles for all users throughout the area.
E. Pursue and provide demonstration or model projects to encourage conservation and reuse.
F. Enforce new construction standards on plumbing fixtures.
G. Encourage utilities to develop incentives for retrofits for all pre-existing housing.
H. Define conservation to promote incentives for efficiency.
1. Draft measures to be used to conserve in water short areas.
J. Establish a water resource conservation education program.
K. Investigate opportunities for using recharge fee, incentives for saving and buyback programs.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COS T
	PROJECTS and ACTIONS					
R4	Conserve water resources to extend limited water supplies.	*****	*****	*****	Everybody	
R.4.1	Develop and implement region-wide conservation and efficiency strategies.	*****	*****	*****	Watershed Council including Cities, Counties, PUDs, public interest.	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

LEGAL MECHANISMS R.5

Seek legal mechanisms to transfer conserved water to instream flows.

Ground Water R.6

Pursue technical investigations on the status of ground water, to maintain its quantity and quality and to protect recharge and quantities for outflow /withdrawals.

FURTHER:

A. Limit water use through conservation programs.
B. Meter community wells, and monitor selected wells to calculate the total ground-water withdrawal from the region and to avoid the mining of ground-water resources.
C. Encourage the use of community water systems.
D. Direct municipal and residential water supplies to locations and depths so as to minimize tile risk of hydraulic continuity.
E. Acknowledge that the affects of irrigation conservation on recharge may not be predictable.
F. Mimic nature to allow recharge and runoff to wetlands, small streams and ground water.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
R.6	Pursue technical studies on the status of ground water to protect ground water from Pollution or over-allocation and use.	*****	*****		Watershed Council: including Cities, Counties, PUDs, Tribes, public interests	
R.6.1	Limit volume of water use through conservation.	*****	*****	*****	Watershed Council: including Cities, Counties, PUDs, Tribes, public interests	
R.6.2	Meter community wells, and monitor selected wells.	*****	*****	*****	Cities, Counties, PUDs	
R.6.3	Encourage the use of community water systems.	*****	*****	*****	Watershed Council: including Cities, Counties, PUDs, Tribes, public interests	
R6.4	Direct municipal and residential water supplies to locations and depths so as to minimize the risk of hydraulic continuity,	*****	*****	*****	Cities, Counties, PUDs	
R.6.5	Acknowledge the impacts of irrigation conservation practices on recharge may not be predictable.	*****	*****		Watershed Council: including Cities, Counties, PUDs, Tribes, public interests	
R.6.6	Mimic nature to allow recharge and runoff to wetlands, small streams and ground water.	*****	*****		Watershed Council: including Cities, Counties, PUDs, Tribes, public interests	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Storage R.7

No new storage is proposed due to habitat concerns, cost effectiveness, and lack of demonstrated need.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	six TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
R.7	No large on-river storage is proposed.	*****				

Habitat R.8

Retain or restore structural and functional characteristics of wetland and riparian, river and small stream habitats which are important to fish and wildlife.

FURTHER:

A. Identify wetland, riparian and river and small stream habitat according to their importance for habitat, wildlife and fish values, hydrologic recharge and storage, and aesthetic and recreational values.

B. Determine hydrologic needs of wild stocks and work to regain instream flow level recommendations.

C. Protect and maintain or enhance, and in some cases restore areas with high values and functions.

D. Follow the Mitigation Hierarchy to protect wetlands and other aquatic habitat: avoid impacts, minimize impacts, rectify negative impacts, and compensate for impacts.

E. Condition land use activities as needed to protect and provide wetland and riparian area functions and values.

F. Identify and study degraded river, small streams, riparian and wetland habitat conditions caused by natural and human impacts.

G. Develop a management plan to increase the values and functions of these ecosystems.

H. Explore management strategies for wetlands, riparian habitats and small streams.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
R.8	**Retain or restore structural and functional characteristics of wetlands and rivers.**	*****	*****	*****		
R.8.1	Identify wetland, riparian and river habitat.	*****	*****	*****	Cities, Counties, State	
R.8.2	Determine hydrologic needs of wild stocks and work to refine instream flow recommendations.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest, State.	
R.8.3	Protect, maintain or enhance, or restore areas with high values and functions.	*****	*****	*****	Watershed Council including Cities, Counties, PUDs, public interest, State.	
R8.4	Follow federal Mitigation Hierarchy	*****	*****		Cities, Counties, PUDs, State	
R.8.5	Condition land use activities to protect these ecosystems.	*****	*****	*****	Cities, Counties, State	
R.8.6	Identify and study degraded aquatic ecosystems caused by natural and human impacts.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest, State.	
R.8.7	Develop a management plan to increase the functions and values of habitat and to make better use of water resources.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest, State.	
R.8.8	Explore management strategies for aquatic ecosystems.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest, State.	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Flood Plain Management R.9

Protect and in some cases store flood plain and estuarine habitat to provide functions and values necessary for wild or hatchery fish and other wildlife and protection of life safety and property.

FURTHER:

A. Discourage future development in the floodplain.

B. Implement flood and watershed management plans, and the DQ Plan.

ACTION CHART

	PROPOSALS FOR ACTION	1999 /1995	NEXT FIVE YEARS	SIX TO 2Q YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
R-9	Protect and in some cases restore flood plain and estuarine habitat functions and values.	*****	*****	*****	Watershed Council including State. Tribes, Cities, Counties, PUDs, public interest.	
R.9.1	Discourage development in the flood lain.	*****	*****	*****	State, Cities, Counties	
R.9.2	East CI. County-continue to implement water-shed and D plans.	*****	*****		County, Tribe, State, Cities	
R.9.3	E. Jeff. County-continue to implement water-shed plans-, link to Co. Comp. Plan, FEMAT, DQ	*****			State, Cities, Counties	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Forest Practices R.10

Evaluate the cumulative impacts of forest practices to short- and long-term regional hydrology.

FURTHER:

A. Coordinate watershed analyses with all agencies.
B. Analyze the watershed on an ecosystem-based scale, addressing the goals of the DQ planning area as a high priority.
C. Include in watershed analysis the historical conditions of the watershed.
D. Use the Port Townsend-Forest Service cooperative watershed management agreement as a model in other watersheds in the region.

ACTION CHART

	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	**COST**
	PROJECTS and ACTIONS					
R.10	Evaluate cumulative impacts of forest practices.	*****	*****	*****	Watershed Council including Cities, Counties, PUDs, public interest and State.	
R.10.1	Coordinate watershed analyses.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest.	
R.10.2	Base analyses on ecosystem-based goals.	*****	*****		Watershed Council including Cities, Counties, PM, public interest.	
R.10.3	Include historical conditions in watershed analyses.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest.	
R.10.4	Use the Port Townsend-Forest Service agreement as a model in other watersheds.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest.	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Fish Management R.11

Restore, protect and enhance fish stocks including critical, high-potential-of-becoming/being critical and depressed stocks of salmonids.

FURTHER:

A. Protect and restore salmonid habitat.

B. Implement the approach to management of wild and hatchery fish and fish management in 8.11.2.

ACTION CHART

	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
R.11	Restore and protect and enhance fish stocks in the regions rivers and streams.	*****	*****	*****	Watershed Council including USFWS, WDFW, Cities, Counties, PUDs, public interest	
R.11.1	Protect and in some cases restore salmonid habitat to provide functions and values necessary for wild and hatch fish.	*****	*****		Watershed Council including USFWS, WDFW, Cities, Counties, PUDs, public interest	
R.11.2	Implement the recommendations in 8.11.2 in the management of wild and hatchery fish.	*****	*****		Watershed Council, including USFWS, WDFW, Cities, Counties, PUDs, public interest.	

The projects, programs and regulations listed are a starting place. AS studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Wildlife Management R.12

Protect wildlife as an important component of the bioregional ecosystem.

FURTHER:

A. Encourage and support WDFW in its mandate to provide ample protection for wildlife.

B. Establish wildlife habitat areas and maintain intact greenspace corridors.

C. Support the Public Benefit Rating System.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
R.12	Protect wildlife as an important component or the bioregional ecosystem.	*****	*****	*****	Watershed Council including Cities, Counties, PUDs, public interest and State.	
R.12.1	Encourage and support WDFW protection of wildlife.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest.	
R.12.2	Support efforts to establish wildlife habitat areas and intact greenspace corridors.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest.	
R.12.3	Support the Public Benefit Rating System.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest.	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Recreation R.13

Support recreation as a water-related or dependent beneficial use. Any consumption for recreation must share in any sacrifice strategy in times of low-flows.

FURTHER:

A. Designate the Dungeness/Greywolf Rivers down to the Forest Service boundary as a Wild and Scenic River.

B. Provide access to the lower Dungeness River and the lower Big Quilcene River on clearly designated lands.

C. Support projects such as and including the Railroad Bridge Park and the Rainshadow Natural Science Foundation's proposed interpretive center as examples of opportunities providing the public access to the river and education on the river.

D. Find funding to take advantage of opportunities for public access to rivers, streams and lakes and involve the public in hearings on public access.

E. Develop riverside management plans to improve the habitat and natural appearance of the river banks below the Wild and Scenic boundary on the Dungeness and on the Big Quilcene and other rivers in the region.

F. Develop an educational program to encourage responsible use of rivers and other sources of recreation.

ACTION CHART

	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
R.I3	Support recreation as a water-related or dependent beneficial use. Any consumption for recreation must share in any sacrifice strafe in times of low-flows.	*****	*****	*****	Watershed Council including Cities, Counties, PUDs, public interest and State.	
R.13.1	Designate the Dungeness/Greywolf Rivers down to the Forest Service boundary as a Wild and Scenic River.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest.	
R.13.2	Provide access to the lower Dungeness River and the lower Big Quilcene River on clearly designated lands.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest.	
R.13.3	Support river interpretive and education projects as examples of opportunities providing public access to the river and education on the river.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest.	
R.13.4	Find funding to take advantage of opportunities for public access to rivers streams and lakes and involve the public in hearings on public access.				Watershed Council including Cities, Counties, PUDs, public interest.	
R.13.5	Develop riverside management plans to improve the habitat and natural appearance of the river banks below the Wild and Scenic boundary on the Dungeness and on the Big Quilcene and other rivers in the region.				Watershed Council including Cities, Counties, PUDs, public interest.	
8.13.6	Develop an educational program to encourage responsible use of rivers and other sources of recreation.				Watershed Council including Cities, Counties, PUDs, public interest.	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Hydrologic Research and Data Management R.14

Pursue hydrologic research and use local data management systems critical to future stewardship, allocation and management of water resources in the region.

FURTHER:

A. Determine the water resources information needed for long term decision making.
B. Build finding for technical investigations into the rate structure of all large regional water purveyors.
C. Include water quality and quantity data management's an essential component for on-going water management and land use planning efforts.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
R.14	Pursue hydrogeologic research as a critical component to the future stewardship, allocation and management of the water resources of the region.	*****	*****	*****	Watershed Council including Cities, Counties, PUDs, public interest and State.	
R.14.1	Complete a study to determine the water resources information needed for long term decision making.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest.	
R.14.2	C. Include water quality and quantity data management as an essential component for on-going water management and land use planning efforts.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest.	
R 14.3	Build funding for technical investigations into the rate structure of all large regional water purveyors.	*****	*****		Watershed Council including Cities, Counties, PUDs, public interest.	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Clallam County Recommendations (C.)

Irrigation Water Management CA - C.4

Improve the efficiency of the Sequim-Dungeness Irrigation system through conservation measures and better management procedures. Refer to Chapter 6, Figure 6.4 for information on Management Strategies for Conservation and Efficiency of Use being implemented by the Dungeness River Agricultural Water Users Association.

FURTHER:

A. Update water rights in the Dungeness River to reflect actual and needed beneficial uses by human and natural systems.
B. Improve the management of the Dungeness irrigation systems.
C. Investigate off channel storage of water from irrigation diversions.
D. If agricultural lands are converted, the conversion should be carefully panned to avoid negative impacts on the river ecosystem.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
C.1	Update water rights in the Dungeness River		*****			
C.1.1	Inventory amt. water needed to service adjudicated uses and potential need in future.		*****		Water Users Association	
C.1.2	Determine "paper rights" and eliminate.				Ecology	
C.1.3	Determine amt, that can be saved for transfer to instream flow and implement.		*****		Ecology and Water Users	
C.1.4	Provide on-going mechanisms to eliminate disincentives to conservation, and allow transfer of saved water to instream flow needs.		*****		Ecology/Water Users	
C.2	Continue improvement of the management of Dungeness irrigation s stems.	in process	*****			
C.2.1	Improve water management/conservation to provide no less than 50°fo of instantaneous flow from 8/1 to end of irrigation season to remain instream.	*****	*****		Agreement between Water Users and Tribe	
C.2.2	Restructure districts and companies for more efficiency.		***** .		Water Users Help with funding	
C.23	Explore revisions to irrigation schedule.	*****	*****		Water Users	
C.2.4	Water Users continue funding water use coordinator to record water use/efficient measures.	*****	*****	*****	Water Users	
C.2.5	Assess impacts of reduced irrigation on small streams, wells, groundwater.	*****	*****		County, Ecology, Tribe	
C.3	Investigate the possibilities for off channel storage of water from irrigation diversions.		*****			
C.3.1	Study the benefits to river systems of off-channel storage.	*****	*****		Water Users	
C.4	If lands are converted, carefully plan the conversion to improve the availability of water for instream flow and avoid negative impacts on river ecosystem.		*****			
C.4.1	Re-evaluate land uses to provide efficient water use in conversion of ag. lands.	*****	*****		County	

* If the Dungeness River Agricultural Water Users Association decides to develop a conservation plan, costs are estimated to be between $50 -100,000. The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Research and Data Management C.5

Complete a comprehensive water resources study to determine the quantity and quality of both surface and ground water in east Clallam County.

FURTHER:

A. Pursue hydrogeologic research as a critical component to the future stewardship, allocation and management of water resources in the region.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
C.5	Complete hydrogeologic research to determine the quantity and quality of surface and ground water in east Clallam. Based on the USGS Workplan, a 5-year study is proposed. USGS cost-shares 50% of the total costs.	*****	*****		Watershed Council: County, City of Sequim, PUD, Ecology, public interests.	TOTAL COST: $1,081,146 LOCAL COST: $540,574 or approx. $110,000/ .

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Instream Flows C.6

Protect, supplement and improve in the future, instream flows, to provide minimum flows needed for stocks of salmonids and other species in the area's rivers and streams.

FURTHER:

A. Set instream flows by rule for the Dungeness River.

B. Issue no surface water permits for the small streams in eastern Clallam County, until optimum instream flow recommendations based on improved biological criteria are developed.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX T020 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
C.6	Protect, supplement and improve instream flows.	*****	*****	*****		
C.6.1	Set instream flows based on IFIM on the Dungeness River	*****			Ecology	
C.6.2	Issue no new surface water permits on small rivers and streams in east Clallam County.	*****	*****		Ecology	
C.6.2.1	Manage off stream water consumption and land use	*****	*****	*****	Water Users County	
C.6.2.2	On flows partially from a diversions, mimic nature.	*****	*****	*****	Water Users County	
C.6.2.3	Maintain existing return flow methods, except for roved efficiencies.	*****	*****		Water Users in coop. with County/Tribe	
C.6.2.4	Water Users not responsible for furnishing irrigation waters outside adjudicated uses.	*****	*****	*****	Water Users	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Habitat Restoration and Enhancement C.7

Develop and implement a habitat management plan to maximize the biological productivity from the available resources.

FURTHER:
A. Establish a watershed management council (Watershed Council) and ad hoc habitat work group to achieve on-going continuity of regional habitat management, and to coordinate and guide research efforts.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
C.7	Develop a habitat management plan, and achieve on-going continuity of regional habitat management and coordination of research efforts.	*****	****		County, Tribe, City, PUD	
C.7.1	Establish a Watershed Council and Habitat Work Group.	*****	*****		County, Tribe	
C.7.2	Evaluate the future impacts of forest practices to long and short term regional hydrology.	*****	*****		Watershed Council, County, including USFS, Olympic National Park	
C.7.3	Develop a comprehensive approach to bank stabilization.	*****	*****		Watershed Council, including the County, and Tribe	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Fish Management C.8

Manage fish stocks to protect and rebuild stocks while protecting instream flows and implementing habitat improvement projects.

FURTHER:

A. Implement the regional recommendations on wildlife.
B. Analyze present hatchery and harvest management practices.
C. Protect critical, high-potential-of becoming/being critical, and depressed stocks.
D. Determine the status of SASSI stocks occurring primarily in the Dungeness or eastern Strait of Juan de Fuca currently listed as unknown, and implement appropriate measures for their conservation.
E. Initiate the use of artificial propagation for stocks in jeopardy of extinction.
F. Analyze the use of the Dungeness and Hurd Creek hatcheries to determine the production limitations on hatchery stocks, and to assess the impact of hatchery practices on wild stocks.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
C.8	Manage fish to protect and rebuild stocks while protecting Instream flows and improving habitat.					
C.8.1	Implement regional fish recommendations.	*****	*****	*****	Watershed Council	
C.8.2	Analyze present hatchery and harvest management practices.	*****	*****		Watershed Council, including WDFW, Tribe, County	
C.8.2.1	Protect critical, high-potential-of-becoming/ being-critical, and depressed stocks, and set target schedules for attainment geared to the health and numbers of those wild fish.	*****	*****		Watershed Council, including WDFW, Tribe, County	
C.8.2.2	Determine the status of SASSI stocks currently unknown.	*****	*****		WDFW, Tribe, County	
C.8.2.3	Initiate or continue the use of artificial propagation of stocks in jeopardy of extinction.	*****	*****		W DFW, Tribe, County	
C.8.3.4	Analyze the use of the Dungeness and Hurd Creek hatcheries.	*****	*****		Watershed Council, including WDFW, Tribe, County	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Wildlife Management C.9

Protect wildlife as an important component of the ecosystem on the local and state level.

FURTHER:

A. Implement the regional recommendations on wildlife.

B. Establish wildlife habitat areas and maintain intact greenspace corridors to allow protection of habitats and ecosystems and provide human amenities.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
C.9	Provide wildlife protection**.**					
C.9.1	Implement regional wildlife recommendations.	*****	*****	*****	Watershed Council, including the County, City, State, and Tribe	
C.92	Establish wildlife habitat areas and maintain intact greenspaces.	*****	*****	*****	Watershed Council, including the County, City, State, and Tribe	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Wetlands and Rivers C.10

Protect and enhance the important hydrologic functions of rivers and wetlands, as a part of long-term habitat management of the region.

FURTHER:

A. Identify wetlands according to their importance for habitat, wildlife species diversity, hydrologic recharge and storage, and aesthetic and recreational human values.

B. In implementing changes to the irrigation systems, attempt to restore a more-natural drainage system.

ACTION CHART

	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
C.10	Protect the hydrologic functions of rivers and wetlands.	*****	*****	*****		
C.10.1	Identify wetlands according to their importance for habitat, wildlife diversity, hydrologic recharge. storage, aesthetic and recreational values.	*****	*****		Watershed Council, Habitat Work Group, including the County, City, State, and Tribe, public interests.	
C.10.2	A. Attempt to restore a more natural drainage system in changes to the irrigation system.	*****	*****		Water Users, County, City, State, Tribe	
C.10.2	B. When planning for and implementing changes to irrigation system, consider the impacts on nearby wetlands.	*****	*****		Water Users, County	
C.10.3	Implement Regional Recommendations on Wetlands.	****•	*****	*****	Watershed Council, Habitat Work Group, including the County, City, State, and Tribe, public interests	
C.10.4	Pursue the rehabilitation of small streams.	*****	*****	*****	Watershed Council, Habitat Work Group, including the County, City, State, and Tribe, public interests	
C.10.5	Study small streams and tributaries to determine what needs exist.	*****	*****		Watershed Council, Habitat Work Group, including the County, City, State, and Tribe, public interests	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Ground Water C.11

To protect ground-water resources, investigate the quantity and quality of ground water in east Clallam County.

FURTHER:

A. Investigate the relationship between the Dungeness River and recharge. Conduct a comprehensive ground-water resources study.
B. Develop an interim strategy to determine how to protect ground water for the next five years.
C. Manage ground-water resources to insure protection of water quality.
D. Enforce state standards for drilling and well construction.
E. Develop a well-metering program, (not consensus recommendation).
F. Develop a 5 year pilot metering study.
G. Encourage community systems.
H. Develop low-interest loans/potable water, in areas needing them.
I. Establish a long-term strategy after water resources study is completed.
J. Develop an education program for well-owners on the proper use of well water.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
C.11	Determine the relationship between the Dungeness River and recharge.					
C.11.1	Conduct a water resources study to analyze the regional ground- and surface water resources.	*****	*****		Watershed Council: including the County, City of Sequim, PUD, and Ecology	TOTAL COST: $1,081,146 LOCAL COST: $540,574 or approx. $110,00or .
C.11.2	Develop an interim strategy to protect and water.	in process	*****		County, Tribe, PUD Ecology	
C.11.3	Manage ground-water resources to insure protection of water quality.	*****	*****		County, City, PUD, State	
C.11.4	Follow and enforce state standards for well construction.	*****	*****		County, City, State	
C.11.5	Meter all new community wells & record uses.	*****	*****		County, City, State, PUD	
C.11.6	Establish a 5-ear well metering pilot study.	*****	*****		Count	
C.11.7	Provide quicker, local review of permits.	*****	*****		County in cooperation with State.	
C.11.8	Develop low-interest loans or other mechanisms to maintain or assure potable water in areas of need.	*****	*****		County, City, PUD, State	
C.11.9	After water resources study, establish a long-teen strategy and program for protection of ground water.		*****		Watershed Council: including the County, City of Sequins, PUD, and Ecology	
C.11.10	Local purveyors should consider organizing under PWSCA.		*****		County, City, PUD	
C.11.11	Develop an education program for well owners.	*****			Watershed Council: including the County, City of Sequim, PUD, and Ecology	
C.11.12	Consider the impacts of salt filters on ground water.	*****			County	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

City of Sequim C.12

A long-term source of sufficient water should be determined for the City.

FURTHER:

A. City should develop a long-term source of water, and work to conserve water from the Dungeness River.

B. City should implement a conservation program to more efficiently use available water, and to reduce the higher-than-average per-citizen use.

C. Prior to extension of service to additional areas, City should document availability of adequate water.

D. Interties may be permitted if no negative impacts are caused.

ACTION CHART

	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
C.12	Develop a long-term source of water for the City.					
C.12.1	Develop a long-term source of water and work to conserve water.	*****	*****		Watershed Council, including the City, PUD, County & State	
C.12.2	Implement a rigorous conservation o	*****	*****	*****		
C.12.3	Document availability of adequate water supplies prior to extension of services.	*****	*****		City	
C.12.4	Demonstrate that any permitted interties have no negative impacts.	*****	*****		City	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Watershed Protect District C.13

Further define a watershed protection district to provide funding for consistent staff support for water quality and quantity protection and management and aquifer management, and to leverage funding for grants for special projects.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEAR S	SIX T020 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
C.13	Further define a type of protection district to provide support for water quality and quantity and aquifer protection and management.	*****			Watershed Council including County, City, PUD, State and Tribe, public interests	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Regional Water Management System C. 14

Develop and implement a comprehensive regional water management program for east Clallam County, including ground- and surface water quantity and quality, suppliers and use.

FURTHER:

A. Manage public water supplies to encourage efficiency and meet health requirements.

B. Develop programs for outdoor water conservation.

C. Consider water quantity and quality when planning and siting new developments and wastewater facilities.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
C.14	Develop and implement a comprehensive regional water management program for east Clallam County,	*****	*****	*****		
C.14.1	Manage public water supplies to encourage efficiency and meet health requirements.	*****	*****		City, PUD, County and State	
C.14.2	Develop programs for outdoor water conservation.	*****			City, PUD, County and State	
C.14.3	Consider water quantity and quality issues in planning and siting new development and waste-water facilities.	*****	*****		City, PUD, County and State	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Public Education and Conservation Programs C. 15

Pursue public education and conservation programs to provide a better understanding and use of the region's water resources.

FURTHER:

A. Implement the DQ Regional Recommendations on Education.

B. Continue and expand public education and conservation programs, appropriate to each sub-region.

ACTION CHART

	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
C.15	Public education and conservation should take high priority in water resource management in east Clallam County,	*****	*****	*****	Watershed Council including County, City, State, Tribe, PUD.	
C.15.1	Implement the DQ Education Plan.	*****	*****		Watershed Council including County City, State, Tribe, PUD.	
C.15.2	Implement the DQ Regional Recommendations on Education.	*****	*****		Watershed Council including County, City, State, Tribe, PUD.	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

County-Wide Water Management System C.17

Clallam County should pursue participation in water resource management to review and make recommendations on water rights applications, well drilling and water use, with Ecology maintaining the final decisions on issuance of water rights. (Not a consensus recommendation-in *Unresolved Issues.)*

FURTHER:

A. A Memorandum of Understanding should be developed for a local water resources program to review and make recommendations on water right applications, well drilling and water use.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	six TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
C.13	Develop a local water resources program to review and make recommendations on water right applications, well drilling and water use.	*****	*****		County in cooperation with State	One FTE plus continuation of existing water quality staff.*
C.13.1	Program should include review, on-site investigations, and recommendations to Ecology on water rights.	*****	*****		County/State	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

* The Community Development Director estimates that the following positions are needed to implement this program, which includes participation in implementation of other recommendations related to water resources, water quality protection, water management and watershed restoration:

1 FTE: lab/tech
1 FTE: field/tech
1 FTE: clerical
1 FTE: planning/administration/management
1/2 FTE: political/management

Given the existing staff, one new full-time employee, (FTE) is needed, approximately $50-40,000/year plus support. The existing positions will need to be maintained after those currently on grant-funding expires.

Jefferson County Recommendations (J.)

Habitat J. 1

Establish a watershed management council (Watershed Council) representative of all interests to better manage the water resources in the County.

FURTHER:

A. A Watershed Council should be established to achieve on-going continuity of regional habitat management, and to coordinate and guide research efforts. It should coordinate with the proposed East Clallam County Watershed Council, to combine funding efforts, share experiences, and to avoid competition and duplication of efforts.

B. Representatives of each Council should meet as needed to discuss regional issues or joint actions.

C. Locally fund the Watershed Council with State and grant-assistance.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
J.1	Establish a Watershed Council	*****			CWSP, including County, City, PUD, Tribe, public interests	
J.1.1	Coordinate with the proposed East Clallam County Watershed Council.	*****	*****	*****	Watershed Council	
J.1.2	Meet to discuss regional issues or joint actions.	*****	*****	*****	Watershed Council	
J.1.3	Funding for Watershed Council should come from local resources, in cooperation with the State and possible grants resources.	*****	*****		Watershed Council	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Habitat -General J.2

Protect habitat functions and values and species diversity to provide protection of the water resources in the region. General Habitat recommendations are found in Chapter 5, Regional Recommendations and the Implementation chart in this Chapter.

Habitat and Gravel Traps J.3

Channel Stabilization and Gravel Traps: Coordinate habitat management through the Watershed Council in conjunction with the FEMAT process and other State and Federal watershed planning and assessment processes.

FURTHER:

A. Monitor and analyze any cumulative effects of past and future gravel extraction.

B. Evaluate the feasibility of dredging and other alternatives considering the biological context.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
J.3	Coordinate habitat management with existing processes.	*****	*****		Watershed Council	
J.3.1	Coordinate management through Watershed Council, FEMAT and other existing processes.	*****	*****		Watershed Council	
J.3.2	Monitor cumulative effects of gravel extraction.	*****	*****		Watershed Council	
J.3.3	Evaluate the feasibility of dredging and other alternatives.	*****	*****		Watershed Council	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Habitat Restoration J.4

Enhance and restore habitat which has been destroyed or degraded, and protect areas not yet impacted.

FURTHER:

A. Develop a pilot habitat restoration project on one stream as an example of what can and should be done on degraded streams in the region. Seek joint funding and participation

B. Analyze past restoration projects to understand their long-term, cumulative impacts, and to aid in planning future projects.

.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	Six TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
J.4	Enhance or restore habitat which has been destroyed or degraded, and protect un-impacted areas.	*****	*****		Watershed Council: CWSP, including County, City, PUD, Tribe, public interests.	
J.4.1	Develop a pilot restoration project.	*****	*****		Watershed Council	
J.4.2	j Analyze past habitat restoration projects.	*****	*****		Watershed Council	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Rivers and Instream Flows J.5

Protect, supplement and improve in the future as possible instream flows to provide flows needed for salmonids and other species in the area's rivers.

FURTHER:

A. Do not issue any new surface water rights or permits for rivers and streams in eastern Jefferson County except the Big Quilcene River, until instream flows are adopted by rule.

B. Establish instream flows for recommendation to the State for adoption by rule, for all streams in eastern Jefferson County.

C. Improve instream flow conditions through negotiations between major water users and water rights holders on the Big Quilcene.

D. Adopt by rule instream flow recommendations on streams and rivers except the Big Quilcene, after numbers are established based on improved biological criteria.

E. Pursue cooperative agreements for instream flow programs on other streams in eastern Jefferson County (similar to that on the Big Quilcene).

F. Protect and provide more water for instream flows.

G. Protect the quality of surface and ground water.

ACTION CHART

	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
J.5	Protect, supplement and improve instream flow conditions.	*****	*****		Watershed Council: CWSP, including County, City, PUD, Tribe, public interests	
J.5.1	Issue no new surface water rights until instream flows are adopted b rule.	*****	*****		Ecology	
J.5.2	Establish instream flows for recommendation for adoption by rule.	*****	*****		Watershed Council. If this has not been accomplished in 3 years, Ecology should adopt instream flows b rule.	
J.5.3	Improve instream flow conditions on the Big Quilcene River by continuing negotiations between major water users.	in process	*****		City, County, State, Tribe, in cooperation with Watershed Council.	_
15.4	Adopt instream flows recommended on small streams, after numbers are established by improved biological criteria.	*****	*****		Ecology in cooperation with Watershed Council.	
J.5.5	Pursue cooperative agreements on small streams similar to one on Big Quilcene.	*****			Watershed Council, Ecology	
J.5.6	Protect and provide more water for instream flow.	*****	*****		Watershed Council, Ecology	
J.5.7	Protect water quality.	*****	*****		Watershed Council Ecology, PSWQA	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Wildlife Management and Forest Practices J.6

General recommendations for this area of concern are found in Chapter 5, Regional Recommendations and the Implementation chart in this Chapter.

Fish Management J.7

Protect *critical, high potential of becoming/being critical* and *depressed* stocks of salmonids and other fish in the rivers in the region. General recommendations for this area of concern are found in Chapter 5, Regional Recommendations and the Implementation chart in this Chapter.

FURTHER:

A. Analyze hatchery impacts and cumulative effects of hatchery operations on wild fish stocks. Manage to protect and provide for wild salmonids and other fish species.

ACTION CHART

	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
J.7	Protect wild and other fish stocks in the region's rivers.	*****	*****	*****	Watershed Council, in cooperation with USFWS, WDFW	
J.7.1	Analyze hatchery impacts.	*****	*****		Watershed Council in cooperation with USFWS, WDFW.	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Flood Management J.8

Protect and restore flood plain and estuarine habitat.

FURTHER:

A. As can be accomplished, remove development already in the flood plain.
B. Establish a fund to purchase flood plain properties and residences as they become available.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
J.8	Protect and restore flood plain and estuarine habitat.	*****	*****	*****	Local Govt., Watershed Council, in cooperation with USFWS, WDFW	
J.8.1	Remove development in flood lain.	*****	*****	*****	Local Govt., State	
J.8.2	Establish a fund to purchase flood plain properties as become available.	*****	*****		Local Govt., State, land trusts	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Hydrologic Research and Data Management J.9

General recommendations for this area of concern are found in Chapter 5, Regional Recommendations and the Implementation chart in this Chapter.

Ground Water J.10 - J.11

Maintain both the quality and quantity of ground water, through policies and protection of hydrologic base flows and existing water rights which provide for reasonable maintenance of the natural water resources.

FURTHER:

A. To protect ground-water recharge, consider and implement the principles, and policies using the Implementation Tools in J.9.6.

B. Ground Water Management: Protect ground water from pollution and over-allocation, using the recommendations in J.10.1.

ACTION CHART

	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
J.10	Protect and preserve ground water recharge.	*****	*****		Watershed Council, CWSP, especially, County, City, PUD.	
J.10.1	Consider the principles in J.I0.1.	*****	*****		Watershed Council, especially County, City, and PUD	
J.10.2	Consider the purposes of the policies in J.10.2.	*****	*****		Watershed Council, especially County, City, and PUD	
J.I0.3	Implement the policies in J. 10.3.	*****	*****		Watershed Council, especially County, City, and PUB.	
J.10.4	Address policies to protect ground-water quality and adequate recharge in all land and water management lens, programs, and regulations.	*****	*****		County, City, PUD	
J.10.5	Provide for the "Needs" in 3.10.5.	*****	*****		County , City, PUD	
J.10.6	Consider the implementation tools in J.I0.6.	*****	*****		County, City, PUD.	
J.11	**Protect ground water in the region.**	*****	*****			
J.11.1.1	Develop standards for wells to assure there will be no detrimental impact to instream flow, seawater intrusion or affect existing uses.	*****	*****		Ecology	
J.I 1.1.2	Establish legislation to require permits for all new wells.	*****			Ecology, Legislature	
J.11.1.3	Require permits for all future new wells.				Ecology	
J.11.1.4	Log drillers reports locally and enter in data bases.	*****	*****		Watershed Council, including County, City, PUD, Health Dept., Ecology	
J.I L L5	Protect aquifer recharge areas in future land use actions.	*****	*****	*****	City, County, State.	
J.11.1.6	Develop incentives to encourage community systems; meter community system.	*****	*****		Ecology, DOH, City, County, PUD	
J.11.1.7	Complete a comprehensive ground-water resources study.	*****	*****		Watershed Council in cooperation with State	
J.11.1.8	Design land use patterns to encourage and influence the development of community well systems.	*****	*****		City' County, State	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Water Rights J.12

Determine the amount of surface water that can be saved for transfer to instream flows and implement the changes when appropriate.

FURTHER:

A. Redefine "beneficial uses" to allow for return of unused water to augment instream flow, with no losses of water rights.

ACTION CHART

	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
J.12	Determine amount of surface water rights can be saved for transfer to instream flows, and implement change	*****	*****		Ecology in cooperation with Watershed Council	
J.12.1	Redefine beneficial uses to allow for return of unused water to augment instream flow, with no loss of water rights.	*****	*****		Ecology	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Storage J.13

Consider storage and surface water run-off, especially in areas where no surface or groundwater availability exists.

FURTHER:

A. Complete a cost analysis of storage options.
B. Conduct a complete environmental analysis of preliminary storage options and sites.
C. Identify "mini" storage systems or practices.
D. Restore natural sponge capacity of wetlands and other vegetated areas. Complete study of effectiveness of incentives for properly owners for restoring natural sponge capacity of their land; consider BMP's in PSWQA manual to provide storage and ground-water recharge.

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

ACTION CHART

#	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
J.13	Consider storage and surface water runoff	*****	*****		CWSP, including County, City, PUD	
J.13.1	Complete a cost analysis of storage options	*****	*****		CWSP, including County, City, PUD	
J.13.2	Conduct a complete environmental analysis of storage options and sites.	*****	*****		CWSP, including County, City, PUD	
J.13.3	Identify "mini" storage systems or practices.	*****	******		CWSP, including County, City, PUD	
J113.4	Restore natural sponge capacity in wetlands and other vegetated areas.	*****	*****		Watershed Council with CWSP, including County, City, PUD	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Conservation J.14

Implement practices to provide conservation and better water efficiency. General recommendations for conservation are found in Chapter 5, Regional Recommendations and the implementation chart in the Chapter.

FURTHER:

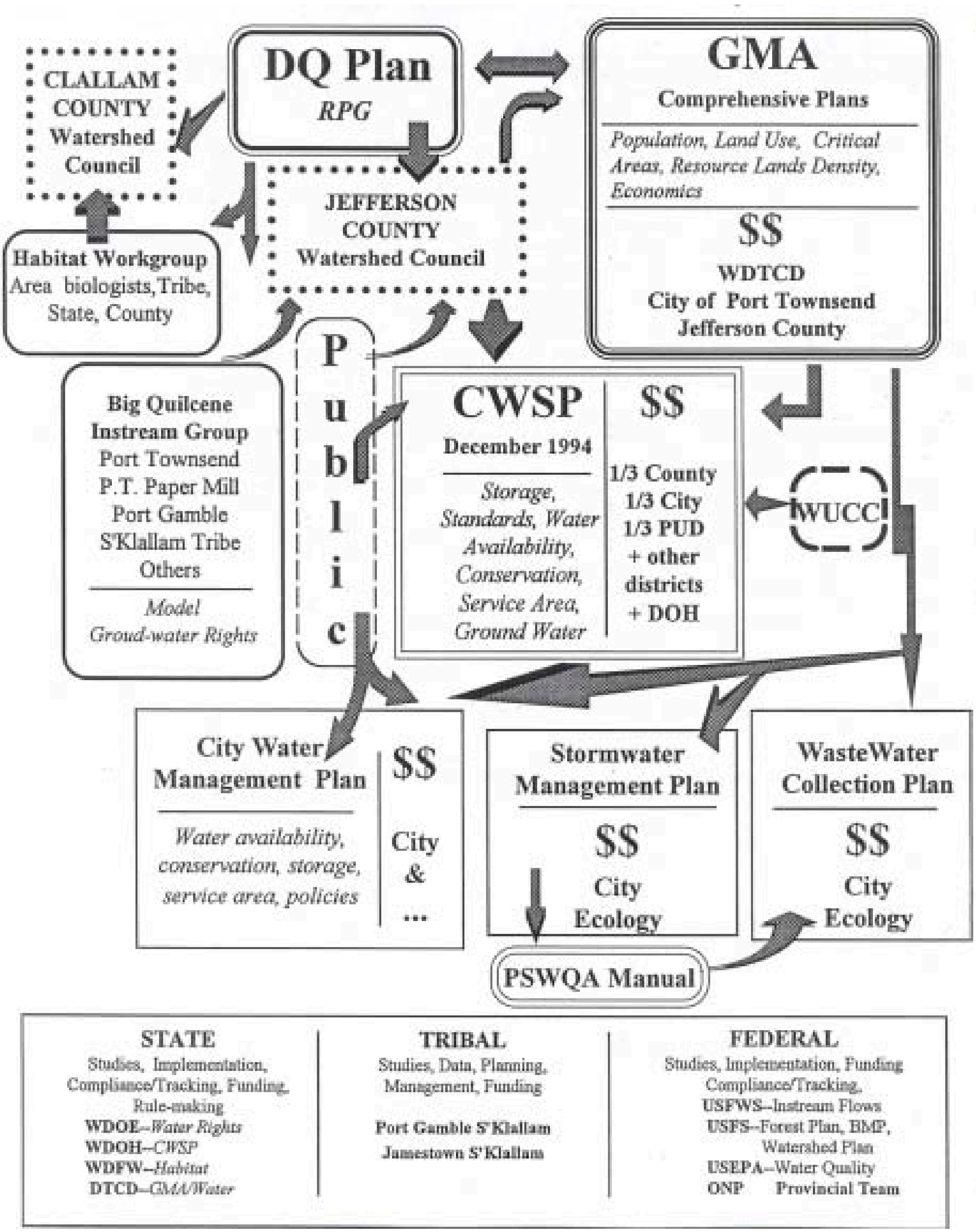
A. Establish and continue water conservation strategies and the Port Townsend Paper NMI.
B. Continue conservation strategies and establish water usage goals in *Port* Townsend and the PUD.
C. Establish conservation strategies and water usage goals through sub-division regulations and land use policies.
D. Require water conservation measures and devices to provide the most efficient use of water resources. Promote conservation retrofit measures on already built homes.
E. Eliminate disincentives to conserve agricultural water and allow on-going, orderly transfer of saved water to instream flows.

ACTION CHART

	PROPOSALS FOR ACTION	1994 /1995	NEXT FIVE YEARS	SIX TO 20 YEARS	POSSIBLE IMPLEMENTING AGENCY	COST
	PROJECTS and ACTIONS					
J.14	Implement practices to provide conservation and better water efficiency.	*****	*****		CWSP, including County, City, PUD, Watershed Council	
J.14.1	Establish and continue conservation strategies and establish water usage goals.	*****			Port Townsend Paper Company	
J.14.2	Continue conservation strategies and establish water usage goals.	*****	*****		City and PUD	
J.14.3	Establish conservation strategies and water usage goals through sub-division regulation and land use policies.	*****	*****		Jefferson County	
J.14.4	Require all new development in City and County to use conservation measures and devices to provide the most efficient use of water. Promote conservation retrofit on existing structures.	*****	*****		City and County, PUD	
J.14.5	Eliminate disincentives to conservation and allow on-going, orderly transfer of saved water to instream flows.	*****	*****		Watershed Council in cooperation with Ecology/Legislature	

The projects, programs and regulations listed are a starting place. As studies are undertaken, and changes made, some actions will need to be amended, in or some cases, replaced with other proposals found to be better or more feasible.

Figure 8.1 Suggested Strategy for Implementation for Jefferson County



Volume 1

Chapter 9

Technical Support

Chapter 9
Technical Support

Chapter Overview

Sound decisions for water resources planning must be based on the best available information. Technical support in the form of staff, equipment, and data was an important aspect of the DQ Project and will be increasingly important to ongoing implementation of the *DQ Water Management Plan.* This Chapter describes DQ Project in-house data management and GIS efforts to date, and strategies and recommendations for future data integration including research projects recommended by the Regional Planning Group (RPG).

For more description on Technical Committee activities, see Chapter *14: RPG Committees.* For more detailed description of existing information and the DQ Project library see Chapter *4: Information Resources and Habitat Projects.*

In-House Data Management

Purpose

Data Management efforts were begun for DQ Project in March of 1993 to consolidate data from available sources, manage the data for the unique purposes of the DQ Project, and provide staff support for Technical Committee and RPG meetings and research. Linn Clark, Data Management Staff working at the Jamestown S'Klallam Tribe were able to pull together data from agencies that normally do not have reason to share data.

Summary of Existing Digital Data

Most of the GIS data used for the DQ Project came from other agencies. GIS data was collected from Clallam County Department of Community Development, the Puget Sound River Basin Team, Jefferson County Integrated Data Management System, U.S. Forest Service Quilcene Ranger District, Olympic National Park, and the Jamestown S'Klallam Tribe Natural Resources Program. Other computer data was provided by U.S. Geological Survey.

Ecology provided coverages for the entire area including streams, DQ Project boundaries, and county lines. The River Basin Team provided more in-depth data for the Dungeness River watershed which was particularly useful when studying the Sequim Prairie area. These coverages ranged from roads and streams to land use and updated wetlands information. Many of the coverages are for only a portion of the DQ area, such as data from the Quilcene Ranger District, Clallam, and Jefferson Counties. Staff updated the irrigation ditch data and created population areas coverage. Other coverages acquired for the project included USGS digital elevation model data (DEM) for the entire DQ area, which was used for many of the figures in Chapter 3.

Most of the GIS data used in this area originates from a few sources, and has already been used by a number of different groups which often change or update the data along the way. Very little or no documentation exists for any of the digital data.

On-going RPG Technical Support
One of the main functions of the data management position was to provide support to the DQ process. This support included creating graphs and charts from spreadsheet data, providing maps, and providing interactive data analysis with work groups.

Data Management staff used Arcview software to present interactive GIS data; produced contour maps using USGS DEM data and PC/Tin; produced overhead slides of wetlands, ditches, and roads for a talk on irrigation conservation measures and the possible impacts on wetlands; and produced a variety of maps using data from a nitrate study to analyze a possible link between well depth or location and nitrate levels in areas of concern.

Data Management Equipment and Software
In order to begin long-term water resources data management for the DQ Project area, the following equipment and software was purchased

and installed at the Jamestown S'Klallam Tribe Administration Building:

Equipment:	Gateway 486-66 PC HP DraftPro pen plotter Summagrid III digitizer Toshiba T4400C laptop computer In Focus LCD Projection panel
Software:	PC ARC/INFO (GIS) PC/TIN (elevation modeling) WORD (word processing) ACCESS (database) EXCEL (spreadsheet)

DQ Participation in DMTF Projects
The Data Management Task Force (DMTF) was created by the State Legislature to plan for compatibility of data state-wide, including water resources information. DQ Project staff have been in contact with the DMTF since fall of 1992. The DMTF demonstrated to the DQ Technical Committee the use of Arcview GIS on water resources information in December 1992, before DQ Project GIS equipment was purchased. DQ Project has participated in the following DMTF projects:

1. Water Resources Studies Clearing House: DMTF created a structure using MS ACCESS for a PC database. After each participating agency contributed their information, the database would contain information about published or unpublished documents, papers, studies, or any other material that relates to water resources. In May 1993 Data Management Staff input selections from the DQ Project Water Resources Library to the DMTF data base and critiqued the data base as requested.

2. Improved Water Allocation Data: This DMTF project was planned in two parts. The first part is a broad-brush analysis to identify which areas need detailed analysis. The second part is to do the detailed analysis of the areas identified. DQ Project staff

have not been contacted as of this date to complete work on this project.

3. Washington Surface Water Information System (WASWIS):
   DQ Data Management Staff volunteered to participate in this project as a BETA Test site. Apparently this project is delayed, and staff is still awaiting the data.

Strategies and Recommendations

Background
The strategies and recommendations in this section come from both RPG recommendations and Technical Committee discussions. Many of the projects and data management strategies were proposed because of a perceived need for improved information and integration for future decision making.

Accessible, compatible, and comprehensive water resources data has become an increasingly important part of long-term water management in the DQ Project area. This section includes the RPG "wish list" for future research and data collection, strategies for coordination between agencies and organizations active in this area, and specific ideas improving existing data. These lists have been compiled by staff, based on RPG and Technical Committee recommendations and input throughout the planning period.

T.1. Proposed Data and Research Projects

Many new water resource data collection, management, and analysis projects have been recommended by the RPG as a critical component to the future stewardship, allocation, and management of water resources of the region. These projects offer additional opportunities for further agency and government coordination. The purpose of this section is to show the extent of work proposed by outlining possible future data and research development projects.

T.1.1 Comprehensive Water Resource Study

Immediate work has been recommended based on the work plan and priorities developed by the USGS in the *Plan of Study for the Ground- and Surface- Water Resources, the Dungeness-Quilcene Water Resource Pilot Planning Project.* The result will be information about land use in an area with both complex geologic history and extremely low rainfall conditions. The study should be updated every five years, documenting changes in water conditions over time.

The following work for the study is proposed and considered to be the most important and urgent by the USGS: T.1.1.1. <u>Flow Data Collection</u>: At least 10 years of stream flow data collection (until 2003), continuously for the Dungeness River down stream of the irrigation diversions and the Big Quilcene River below the Port Townsend diversion, and monthly on Upper and Lower Chimacum, Tarboo, Thorndyke, Shine, Ludlow, Chevy Chase, Donovan, Salmon Creeks and on the Big Quilcene at U.S. 101.

The following work for the study is proposed and considered to be critical by USGS:

T.1.1.2. <u>Aquifer Recharge Studies</u>: Estimate ground- water recharge to the unconsolidated water-table aquifers in the lowland areas using movement using low-flow analysis, soil-moisture budgeting, and a tritium tracer technique.

T.1.1.3. Geohydrology Studies: Inventory wells, map geohydrologic units showing thicknesses and hydraulic continuity, measure and map water-levels in selected wells.

T.1.1.4. Withdrawal Quantification: Locate and quantify surface- and ground-water withdrawals by collecting public water-use data including location and depth of ground-water withdrawals, return flows, withdrawal rates, and prior-use categories on an ongoing basis.

The following work for the study is proposed by the USGS and it is considered that it **will eventually be a critical element of study** after the above studies have been undertaken:

T.1.1.5. Cross-Sectional Ground-Water Flow Modeling: Construct and calibrate cross-sectional groundwater flow models to determine recharge potential of uplands.

T.1.1.6. Regional Ground-Water Flow Modeling: Quantify various components of ground-water budget (vertical flow, discharge, horizontal flow) and assess the effects of changes in withdrawals and/or recharge due to development.

Other work proposed by the USGS includes:

T.1.1.7. Water Quality Inventory: Limited sampling in areas where little or no ground- and surface-water sampling has been completed, mainly the interior lowlands of eastern Jefferson County, to supplement current water quality sampling by Dept. of Ecology, Jefferson County, Clallam County, to be coordinated with the Puget Lowlands NAWQA study. Address water quality issues such as contamination.

T.1.1.8. Runoff-Simulation Modeling: Construct runoff models for two watersheds where fish habitat is important and suburbanization is likely.

T.1.1.9. Precipitation Monitoring: High altitude precipitation data collection to improve isohyet maps for the region.

In addition to work proposed by USGS, the RPG has identified the following specific research efforts for the comprehensive water resource study:

T.1.1.10. Regional Stream Flow and Ground-Water Modeling: Develop models to determine water resource potentials from the northeast Olympic region. Specifics include:

a. Create an adaptive modeling system to predict and analyze stream flows in the Big Quilcene River.

b. Investigate the potential ground- and surface-water interconnection (hydraulic continuity) on the Dungeness River.

c. Determine the best locations and depths for municipal and residential water supplies. Consider exploratory wells to determine deep aquifer resources.

d. Assist Clallam County and the City of Sequim investigate alternative ground-water sources for future expansion. Avoid adding to instream flow shortages on the Dungeness River or extraction of groundwater below safe, sustainable levels.

T.1.1.11. Water Budget: Develop a regional water budget.

T.1.1.12. Watershed Analysis: Analyze historical conditions of the watershed.

T.1.1.13. Water-Use Data Collection: Counties and Cities begin ongoing collection of data from metered developments.

T.1.1.14. Forest Hydrology Evaluate cumulative impacts from forest practices to short and long-term regional hydrology.

T.1.1.12. Quality/ Quantity Relationships: Investigate quantity and quality relationships such as flows and turbidity, temperature and dilution impacts, and other ecosystem functions.

In preparation for the comprehensive water resources study, the following is recommended by the Clallam County Work Group of the RPG:

T.1.1.13. The County, State, City, Tribe, and utility personnel should meet with USGS to further define the data needed to answer the most critical water availability questions.

T.1.1.14. Pursue grant funds to administer the project.
T.1.1.15. Build funding for technical analysis and data management into the rate structure of local governments and water purveyors.
T.1.1.16. Investigate setting aside a portion of the water right permit fees for future water resource investigations and management within the area of application.

T.1.2. Dungeness River Irrigation Studies

The Regional Planning Group has recommended studies to improve water management of the Dungeness irrigation system. These include:

T.1.2.1. Ditch Flow Monitoring: Based on the -recommendations of the Montgomery Water Group report, installation of measuring weirs and meters on the ditch system, data collection, and a water budget for a conservation plan.
T.1.2.2. Water Withdrawals: Quantification and defined use of water withdrawals in the off-season.
T.1.2.3. Ground-water Assessments: A ground-water resource assessment focusing on feasibility of supplying a portion of the irrigation demand with ground water. Also, a ditch-specific groundwater assessment prior to implementing conservation measures.
T.1.2.4. Ground-water monitoring: Shallow-well water-level monitoring to assess impacts from irrigation conservation measures. Monitoring will include domestic wells and monitoring wells in wetlands.
T.1.2.5. Impact Assessment: An assessment of impacts of reduced irrigation on small streams, wells, and ground water. Includes installation of gages on small stream that may be affected by conservation measures.

T.1.3. River Habitat Studies

T.1.3.1. Gravel Trap Information: Collection of information by-county from gravel trap monitoring, including map of existing projects, hydraulic permit documents, and recording of use of gravel traps by juvenile and adult fish.

T.1.3.2. Gravel Studies: Gravel aggradation and stream stability analysis for the Dungeness and Big Quilcene Rivers, including cumulative effects of past and future gravel extraction.

T.1.3.3. Stream Assessments: Habitat assessments by stream to update the optimum fish flow needs and to determine other habitat needs.

T.1.3.4. Habitat Identification: Development of a Strategic Wetland Information System for Jefferson County for identification of wetland, riparian, river, and stream habitat according to importance for habitat, wildlife, fisheries, recharge, flood storage, and aesthetic and recreational values.

T.1.3.5. Restoration Analysis: Analysis of past habitat restoration projects including those considered "unsuccessful."

T.1.4. Well Data Development

T.1.4.1. Well Log Overview Data Base Maintenance: Update the well log overview data base established for the DQ Project area on an ongoing basis.

T.1.4.2. Well Log Lithology Data Base Development: Develop a data base including the best available lithology information (soils, rock removed during drilling) from existing well logs. Best available information includes: 1) complete geographic information, 2) deep wells, 3) thorough lithology information. Use the lithology data base in aquifer analysis studies. .

T.1.4.3. Well Data GIS: Develop GIS layers from existing well log data, accuracy-checked if possible. In Clallam County, update USGS well GIS to include all wells. Map aquifers, and perform spatial analysis with well data.

T.1.4.4. Well Data Expansion: Update, expand data, and check data for accuracy for well log entries through routine and specific site visits and data base integration. Include other data such as location and elevation (using Global Positioning System technology if possible), address, county parcel number, Ecology unique well I.D. number, and water quality data.

The well data projects are further described in T.4: *Well Data Management Strategies,* this Chapter.

T.2 Coordination Strategies

Information and data collection and management by all agencies active in the DQ Project area should be coordinated to encourage effective and appropriate information management. There are many jurisdictions with complex and related data collection efforts ongoing in the DQ Project area, including Jefferson and Clallam Counties and Public Utility Districts, the Cities of Port Townsend and Sequim, State and Federal agencies, Tribes, and other organizations involved in research activities. An effort should be made by agencies and organizations involved in the DQ Project to develop a loose forum for keeping others informed about current and planned data management efforts. This forum should include Federal, State, Tribal, local governments and agencies, educational, and other interested organizations. Structure and extent of coordination should be decided on by the participants in the forum. Ongoing, active participation in discussions and participation in the implementation of strategies is needed by participants to make such an effort successful.

T.2.1. Goals of the Research and Data Management "Forum"

The mission of the forum will be discussion on regional data issues and to encourage agency and government coordination in data collection, management, and analysis. The following objectives outline the mission:

T.2.1.1. Integration: To facilitate data compatibility and integration of data between agencies and governments at the local, State, Federal, and Tribal level, related to water resources on the N.E. Olympic Peninsula. To develop solutions for obstacles to data integration.

T.2.1.2. Coordination: To avoid duplication of efforts; to enhance and coordinate regional awareness of current and planned data management efforts.

T.2.1.3. Data Standards: To develop water resource data standards to enhance data integrity and facilitate data integration.

T.2.1.4. Data Sharing: To develop regional guidelines for data sharing issues such as MOU's, cost sharing, and rights and responsibilities of data users and developers.

T.2.1.5. Data Gaps: To identify and address gaps in data collection and management.

T.2.1.6. Funding Partnerships: To establish interlocal partnerships to fund studies.

T.2.1.7. Other Discussions: To continue technical discussions and inventory work begun by DQ Project participants.

T.2.2. Standards and Communication

Data will likely become increasingly compatible as technology develops in the future. In the interim, however, communication between data managers should be increased and standards should be developed to facilitate data exchanges for the foreseeable future. Data standards to be developed may include:

1) Development of documentation format for data dictionaries;
2) Development of a regional base map or mapping standards to facilitate compatibility, of GIS data;
3) Designation of watershed and political planning units;
4) Development of water quality data formats;

5) Development of standard stream and water data formats including stream type maps and classification systems;
6) Development of data reporting requirements for well logs and construction information;
7) Development of water use reporting formats;
8) Development of wetland data formats;
9) Development of other data standards as appropriate.

T.2.3. Potential Initial Coordination Project

The comprehensive water resources study recommended for immediate implementation will provide an opportunity to begin work on regional data coordination goals. Data collected related to the water resources study should be organized with the goal of setting the standards for future water resources information in the DQ Project area, and ensuring the data is usable by as many interested parties as possible. The data coordination forum, including at least the agencies interested in the results of the water resources study, should begin discussions prior to the start of the study in order to reach agreement on an appropriate data structure and format for the study.

T.2.4. GIS /Data Management

Establish and maintain a coordinated data management system with GIS capability. Continuously update the GIS/data management system.

Coordination between area organizations should include a users group to develop standards specific to GIS. In the short term, Federal Province planning under the President's Forest Plan should be pursued as a process for beginning a N.E. Olympic Peninsula GIS users group.

T.3 Strategies for Data Access

Information should be organized and managed to be available on a regional basis to all interested parties: local governments, agencies, and interested groups or individuals. In order for data to be accessible, residents and professionals must first know what information exists and then must be able to use that information in a way that is convenient to both the data user and the data manager. The strategies for data access discussed by Technical Committee and RPG members include both consolidation and networking as means to accomplish the goal of public access.

T.3.1. Local Information Consolidation

Several central locations for consolidation of interagency information should be developed locally for specific focuses. Agencies should coordinate long-term management of the information maintenance and should contribute appropriate information on local water data to consolidation points. Possible local consolidation points include:

T.3.1.1. Water Resources Library: The DQ Project Water Resources Library should be maintained as a long-term resource for regional public education and agency use. Agencies in the DQ Project area should supply copies of all new reports pertaining to water resources to the Jamestown S'Klallam Tribe for the library.

T.3.1.2. County Data Management: Jefferson and Clallam Counties should develop and/or maintain the following data bases: the well log overview data bases, water use data, stream flow data, water quality data, wetland data bases, ditch flow data, lithology data bases, G.I.S. well data layers.

T.3.1.3. River Activities Information: The local WDFW office should compile and maintain the following: gravel trap design information including use by fish, maps of river gravel projects, gravel trap implementation information, data from gravel extraction monitoring, hydraulic permit documents, County shoreline permit documents, habitat inventory data and river ecology data.

Agencies may consider creating manuals describing available information and how to access specific information as an alternative to the physical consolidation of records.

T.3.2. Data Networking

The Internet, local electronic library systems, and other computer networks should be considered as means of establishing a non-centralized, non-hierarchical integrated data system. Direct access to area data bases, reference lists and locations of data, and descriptions of how to access information should be made available throughout the N.E. Olympic Peninsula through a computer network.

T.4 Well Data Management Strategies

DQ Project discussions have shown the need to improve knowledge of complex geology and aquifers. Extensive data on hydrogeology from well drilling has been collected on paper logs since 1970. DQ Project funding helped to create a new data base of information on all wells logged in the DQ Project area. Participants and staff have discussed the many undeveloped opportunities to link well data to other types of information, making existing data much more valuable (see T.1.4: *Well Data Development).* Coordinated efforts to maintain, update, and expand this data base as outlined in this section will create an invaluable information resource for ongoing water studies and decision-making.

These discussions have indicated a need for a coordinated well log data management program, requiring a broader vision of data collection by the Counties, Ecology, DOH, well drillers, well owners, and data users in order to enhance valuable well information. The management program would include the following components:

T.4.1. **Maintenance**

New well logs should be updated into the well log data base by Clallam County Water Quality and Jefferson County Dept. of Environmental Health at least monthly. Missing well logs should be collected from Ecology and entered into the data base.

T.4.2. Data Base Access

The well log overview data base should be made available to the public, consultants, and agencies for overview studies and as a reference to the well log files. Any guidelines for using this information, such as well owner privacy, should be developed by the County in conjunction with the data forum. County staff should be responsible for notifying users of any well owner privacy issues and guiding any contact with well owners.

T.4.3. Accuracy Improvement

Sanitariums, inspectors, researchers, field technicians, or consultants working for County, State, or Federal agencies making field visits to sites regarding wells should collect new, more accurate data on the location and elevation of the well for inclusion in the data base. The Counties should acquire adequate Global Positioning System (GPS) hardware, and should provide training for employees doing site visits.

T.4.4. Well I.D. Participation

The State should encourage participation by County, Federal governments, and Tribes in the Well I.D. program. Local and Federal governments will benefit from the unique well identification information created by Dept. of Ecology's Well I.D. program. Therefore, local and federal governments should participate in Ecology's Well I.D. program when field checking any wells in the DQ Area by tagging the well. Ecology should make I.D. tags and tagging training and/or instructions available to local and Federal agencies, consultants, and other field workers. Ecology should consistently enforce requirements for well drillers to tag new wells and include the Ecology unique well I.D. numbers on well logs.

T.4.5. Well Driller Education

The Dept. of Ecology should develop educational materials for well drillers so that accurate information will be obtained from new well logs. The educational programs should include location and elevation determination using section maps and topographical maps and lithology standards. New technology such as GPS hardware should be encouraged as standard equipment for well drillers.

T.4.6. Well Log Form Modification

The required well construction form (well log) for the N.E. Olympic Peninsula should specify that depth of completed well reflect depth below ground surface rather than from the top of the well casing. The form should also include the following additional information:

1) County parcel number;
2) Dept. of Ecology unique well I.D. number;
3) Address of well location and/or sketch map of well location in relation to geographic features (such as roads, buildings, terrain, etc.);
4) GPS location and elevation;
5) Standard lithologtic terms.

T.4.7. Dept. of Ecology Review

Ecology should carefully review each new well log for completeness, and should develop a demerit system and/or impose fines on well drillers for incomplete well logs.

Volume 1

Chapter 10

Public Comments
Unaddressed Agenda

Chapter 10
Public Comment and Unfinished Agenda

Chapter Overview

This Chapter includes summarization of oral comments, responses to public questionnaires, and other written comments on the April 1994 Draft of the DQ Plan. Oral comments are from the May 1994 public meetings in Chimacum, Jefferson County, and Sequim, Clallam County. This Chapter also includes the "unfinished agenda" to be considered in the future.

Clallam Questionnaire Responses

Questionnaires were made available to the 110 attendants of the May 1994 Clallam County public meeting on the Draft DQ Plan. A total of 5 questionnaires were returned from Clallam County attendants.

1. Did you hear any recommendations you strongly support?

Instream Flows/Fish Habitat and Habitat Restoration -- Small streams are an important habitat for salmon and trout. Several of these small streams have been "charged" by irrigation ditch tail waters for many, many years and the chemistry of the water is largely determined by the source of the irrigation waters.

Population growth limitations. What is the rush now -- this implementation can wait six months.

1. Irrigation Conservation -- Chapter 6: E. Clallam Recommendations: Figure 7: Management Strategies for Conservation and Efficiency is well stated and implemented ASAP.
2. Ground Water --Chapter 6: E. Clallam Recs: 011.1, 011.2, 011.2.1, 011.2.2, and 011.2.3 / C11.3, C11.4, C11.5 are acceptable: Lack of consensus removes from consideration by State. 011.6 is of importance by also lack consensus. Hopefully County can use data to implement or restrict development to protect quantity and quality of water available. Over development could lead to very bad results for all of us.

1. Irrigation Conservation -- Well thought out.
2. Ground Water -- Must complete Water Resource Study while holding development in abeyance -- Reference Chapter 6 C.11.2, 0.11.2.1, 0.11.2.2, and 0.11.2.3. We encourage metering C.l 1.5 and study 0.11.2. Re: East Clallam Water Mgmt Sys. C.13, etc..

Implementation could be a plus if county uses data to "lead" decisions permitting growth. However, if development request drive water permit decisions, it's all a loss.

Strongly support water resource study. Recommendations should be made on the basis of fact, rather than speculation. How unfortunate water resource study and inventory could not have preceded the planning process rather than following.

2. Did you hear any ideas you strongly oppose?

Meters on wells area waste -- find the aquifers and their size.

A comment was made that irrigation ditch tail waters are to be managed to "zero" water into streams/creeks. This could be disastrous to the fish habitat restoration projects being promoted to farmers who have small streams on their farms.

Not at 5/16/94 meeting. Would like to know final draft contents.

Overall, no strong objections.

Strongly opposed to recommendations requiring additional well permitting or reducing exempted well status without solid hyro-geological data. Also, encouraging community wells rather than single family wells is designed for bureaucratic control and does not appear to benefit the watershed.

3. Are there any recommendations you did not hear that the RPG has not dealt with in the planning process?

At this meeting there was no information on aquifers -- spend money on finding that.

I really didn't hear much about the water quality management efforts to improve river water for fish habitat.

4. How would you rate Regional Water Planning as an aid to your community's over-all planning efforts?

It is mandatory.

Since Plan has identified a number of problems and set guidelines to remedy same, it should help. We need more data for future reference.

Has identified and set basics for action, overall good start, even though late.

Regional water planning must be based on hard data. To the degree the planning is based on reality, we have a useful aid. To the degree the planning is based on speculation we have a tool to control the populace which can be expected to lead to abuse.

5. How did you hear about this meeting?

Sequim Press Flier from Meeting attended by neighbor. Newspaper and personal contacts. Word of mouth.

6. Is there anything you can tell us to help produce a better Regional Water Plan?

The second draft had several paragraphs with incomplete information. Example page 35 (top), see page 15.

Will bear in mind and if discover anything to help, will contact you.

Not yet.

Use water from Sequim Wastewater and Sewer Plant to irrigate as much farmland, parks, golf courses, and timberland (tree farms) as possible to case river withdrawal.

Clallam Oral Comments

The following comments were made by attendants of the Clallam Public Meeting May 1994. All comments are summarized.

1. The issue of the cost of the DQ Project is not big factor when distributed over all Washington residents.
2. Ecology lay-offs will result in delays.
3. Management should be based on science.
4. Rehabilitated runs of salmon in small streams may be affected by the Plan.
5. Thanks for the work on the Plan.

Regarding meters on exempt wells, in water-short times, people will cooperate. Try to get voluntary compliance, rather than regulatory. Community wells should be metered; but not singles. People want to do right, they just don't know. Roger Schmidt explained that exempt wells supplying multiple houses can be used for a total of 5000 gallons per day, including irrigation of 1/2 acre total -- not irrigation of 1/2 acre for each house on the system.

People need scientific data in order for a plan to have credibility. Much work has been done and is still being put together.

1. Need to stop stock transfers of fish.
2. Allocation of water is happening during a drought year, not an optimum year.

3. Concerned about the affect of "ditch seeping" -- where does the water go? Adjudication said they were to use water for ag., stock, and domestic use. It didn't say anything about groundwater recharge.

Tailwaters at Greysmarsh have been re-routed to a pond with cutthroat and coho, as an example of "working" tailwaters. The habitat group needs to happen immediately. It also needs more ecological factors. Consider end product analysis: What's the goal? 20 years isn't long term when it comes to water resources. Putting tailwaters back into the river needs to be based on biology. Evaluate on a case-by-case biological need. Regarding the term "dredging" in the glossary: it can be positive. In the DQ Plan, distinguish between wild and native fish.

Need a broader outlook than just environment and the region. Look at total systems; don't let one part of the system get out of hand.

Have single domestics well head protection problems. Community systems may be harder on the system, but they are harder to control. Spreading out with more wells makes it so you don't work one area too hard.

As a member of a community system which would have a meter, there may be another way of getting at water use such as through electrical use. This would eliminate the need for meters.

Regarding a watershed protection district: what happens at the end of June when funds run out -- there will be a library, but there needs to be funding to keep it going: garnering new information and knowledge of deep aquifer recharge. We need to know relationships between growth and recharge. Strong support of a watershed protection district to knowledgeably build plans.

Concerned about small streams and their habitat. Stream chemistry is determined by the water's origin. One of the comments was to eliminate tailwater -- which could affect stream chemistry and fish. Zero tailwater needs analysis for fish habitat improvement projects, especially by schools.

There was no mention of upwelling of fresh water in the straits.

Need to build in incentives for meters and conservation. If you use over X amount, then...

Gierin Creek (fed by Sequim Prairie Ditch, shallow ground water, and springs) and its environs are worth preserving. Other similar creeks also worth preserving.

Jefferson Questionnaire Responses

Questionnaires were made available to all 17 attendants of the May 1994 Jefferson County public meeting on the Draft DQ Plan. A total of 3 questionnaires were returned from Jefferson County attendants.

1. Did you hear any recommendations you strongly support?

Water Resources Study

Ground Water - Further the data collection and interpretation. This is not a "plan" it is an outline for planning. A "plan" has clear goals with defined objectives and a specific time line with real due dates.

The "Gap"

2. Did you hear any ideas you strongly oppose?

Watershed Council -- will duplicate several layers of ineffective government, i.e. Ecology, WUCC, PUC. Also the idea of transferring surface water rights to groundwater with the same date: that creates more problems than it solves. People's needs carry more weight that the needs of fish.

1. Ground water cannot be identified as "most potential" for use when so little is known in East Jefferson County. New uses are in conflict with single domestics.
2. Ground water should be protected when it is in continuity with single domestic wells -- as well as when in continuity with streams.
3. Transfer of surface water rights to ground water "without losing dates" puts those users in direct conflict with single domestic users and in some cases will deny them their current status in time -- and may negatively impact those single domestic wells.
4. Community systems are suggested instead of single domestics -- without involving single domestic users for input. Not all areas are suited to community systems. In fact, the PUD suggested in their study that "large well" findings are unlikely in East Jefferson County.
5. PUD study says most groundwater appears to be in SOUTH East Jefferson County. We should move development there or face high costs for long distance pipes. What about single domestics already there? and current exemptions?
6. "Start cards" are not required for single domestic wells -- only reports -- and only from "drillers." Many single domestics still drill their own -- there is no requirement for them to report.

1. Metering wells
2. Doing away with 5000 gallon exemptions
3. Drying up wetlands because of better irrigation ditches
4. Instream Flows

3. Are there any recommendations you did not hear that the RPG has not dealt with in the planning process?

Groundwater -- has not been dealt with adequately. The project was mostly about rivers but the boundaries included much more area than the river drainage. So it should have addressed all the water problems in the designated area.

There seemed to be a lot of concern that there water not enough water. How we use it (water) should be the issue.

4. How would you rate Regional Water Planning as an aid to your community's over-all planning efforts? Essential Minimally useful - if strategies get implemented. Useless if not. Poor

5. How did you hear about this meeting?

Flier
Mailing

6. Is there anything you can tell us to help produce a better Regional Water Plan?

You must involve single domestic users in the process.

Use more of information already in community instead of developing studies and collecting data that had a very high dollar cost.

Jefferson Oral Comments

The following comments were made by attendants of the Jefferson Public Meeting May 1994. All comments are summarized.

Regarding using streams for livestock: if livestock is currently in a stream, and the landowner builds a fence to protect the stream banks, would livestock watering fall under the moratorium on stream withdrawals, or could the landowner pump the same amount that the livestock had been drinking directly from the stream? Need to clarify.

Regarding the recommendation to keep water resources within the region: does "the region" mean within political jurisdiction but means within watershed. Need to clarify.

There are probably aquifers under timber land that could be used, but perhaps that use would be prohibited by the DQ Plan because it would mean removing it from the region. The option remains for those areas to be developed.

The County has received a proposal from person with commercial business planning to use a water catchment system. What about rain collection systems in regard to aquifer recharge? Should this be allowed in aquifer recharge areas?

Regarding standardized form for well drillers: standards for the data itself are needed to make well logs more useful.

The sum of 8 caucuses' thoughts is not a plan. Implementation is the critical part of the plan. Can't comment now since implementation section is not done.

Other Written Comments

Several members of the public wrote more formal comments on the DQ Plan. The following comments were both written by Clallam County residents.

Dianne Kirst, Port Angeles April 28,1994
In regard to Section R.12, "Wildlife Management," I agree with the premise that wildlife should receive protection on the local and state level, and also that there should be certain designated protected habitat areas.

However, I strongly object to the DQ Project getting involved in areas outside the scope of its purpose, which was to develop a water resource management plan. Greenspace corridors, as referred to in 8.12.2 infers that the DQ Plan is getting involved in open space and greenbelt areas away from the streams and rivers. The DQ Water Resource Management Plan should deal with the Dungeness and Quilcene Rivers and nearby streams.

Our state and region already has in place numerous laws and agencies dealing with habitat and open space protection issues. The Growth Management Act, for instance, deals with these issues in depth. Therefore, I reiterate that the DQ Project should stick to its original goals as outlined in the Executive Summary: "...to increase instream flows and improve salmon runs, to provide more efficient management use of water, and to protect the area's groundwater resources."

On page 7 of the Executive Summary relating to Jefferson County, one of the recommendations is that "ALL future wells should receive permits and proof should be provided they are not in hydraulic continuity with any stream or river---" etc. This appears to be a back door effort to completely stop any new growth in that area, since it is now taking two years for the State to process a water rights application and that time is projected to be increased to 5 years. Until the State of Washington develops a more expedient method of issuing water right permits, it would be unfair to the people of Jefferson County to require a permit for every private well.

Dan Moriarity, Sequim June 5,1994
I am concerned that this document does not recognize inherent values of native fish populations. Fortunately, hatchery technology provides the means to reestablish wild fish ---there are currently wild (self-sustaining) populations in the watershed, and throughout Puget Sound, due to hatchery outplanting.

Nevertheless, the field of conservation genetics recognizes the significance of undiluted genetic structuring in localized populations. The RPG could consider an experimental design for monitoring genetic diversity of fishes over time. Starch gel electrophoresis has been a valid technique (see Allendorf, F.W., and R.F. Leary, 1988. Conservation and distribution of genetic variation in a polytypic species, the cutthroat trout. Conservation Biology 2: 170184; and Loudenslager, E.J., and G.A.E. Gall. 1980. Geographic patterns of protein variation and subspeciation in the cutthroat trout. Systematic Zoology 29: 27-42). This along with other plan elements, would be expensive and require creative approaches to secure funding sources. Perhaps, though, offering scientific evidence of the yet unimpacted resources which this plan intends to protect would be helpful in this respect.

What are the definitions of 'endangered', 'threatened`, and 'of special concern'? Why is the searun cutthroat classified as 'of special concern' throughout its Washington range, yet as 'threatened' along the Oregon coast (Frissell, C.A: 1993. Topology of extinction and endangerment of native fishes in the Pacific Northwest and California. Conservation Biology 7:342-354)? How arbitrary is this terminology? Extinction, of course, designates finality. But as ambitious as this plan is, it is not likely that the fish and wildlife populations in question will reach that point, assuming that unreasonable marine/high seas mortalities will be dealt with and averted federally. Whether they will again reach historic levels is possible, but certainly another issue.

For background and case studies of western US non-salmonide fish extinctions, see Minckley, W.L., and J.E. Deacon, eds. 1991. Battle against extinction; native fish management in the American west. Univ. of Arizona Press, Tucson.

C.10.2 Part A, is a policy recommendation which, biologically, would be difficult to justify on an across-the-board basis. Also, I do not understand the relationship between this item and the broader C.10 statement. Habitat maintenance in small streams has resulted in measurably positive responses in salmonid utilization. A heightened sense of responsibility to the land is occurring among landowners and users, cooperating agencies and schools due to these successes. And some regional landowners have demonstrated that recycling irrigation tailwater has without question contributed to "an overall net gain in the productive capacity of fish and wildlife habitats" (Chelan Agreement, Appendix 4).

I feel that when the proposed USGS study is completed, there will be further opportunities to formulate scientifically justifiable conclusions and priorities regarding water distribution and management of aquatic habitats.

R.11.2.1 and R.11.2.2, should receive a lower action priority than ensuring that optimum habitat structure is in place region-wide. Optimum habitat structure can be visualized only after the magnitude of respective ecological limiting factors have been identified.

The Olympic National Forest and Washington DNR are cooperating in the Big Quilcene Interagency Watershed Analysis. What is the potential for duplications and/or conflicts between the DQ Project and the above? I would expect that all government agencies involved in watershed planning, for example, are fully aware of each other's intent, goals, and objectives.

The Plan should address invasions and introductions of exotic species, particularly when exotic animals are introduced to 'fix' human-induced problems. Grass carp (Ctenopharyngodon idella) is an example; they were removed from the State's list of deleterious exotic wildlife several years ago by the Wildlife Commission. Instead of correcting the causes of premature eutrophication leading to excessive macrophyte biomass in water bodies, they only mask them, and can produce unforeseen ecological complications. The goal of protecting aquatic habitats from exotic species seems just as appropriate as the second Chelan Agreement goal (Chapter 2, and R.1., Chapter 5).

The proposed regional water budget development strategy is essential (C.5.2., Chapter 8) RCW 89.08, Section 220(7) authorizes Conservation Districts in Washington to take active interest in, among other topics, "water for agriculture and minimal flow ...watershed stabilization ...control of soil erosion ...flood prevention and control ...outdoor recreation ...restriction of development in flood plains... protection of fish and wildlife ...and prevention or reduction of sedimentation and other pollutants in rivers and other waters." Because 1) the USGS study will result in "information critical for area decision-makers to provide long-term policy determinations about land use...", and 2) a large number of constituents of the Clallam Conservation District reside within the proposed study area, the District has an interest in participating in the study's organization and design, and in tracking and contributing to its progress. I currently chair this Board of Supervisors.

This process has been successful in generating dialogue among divergent interests. A variety of carefully and, apparently, tediously constructed goals, objectives, and policy recommendations follows a very well done characterization segment. The result is a comprehensive approach to solving water management problems.

From the standpoint of a planning document designed to provide means to attain ends, the DQ report largely deals with defining and categorizing the former. I feel there is a need to further define the end points of water resources planning. For example, although this is a 20 year document (scoping statement, Chapter 2), the year 2015 will certainly not represent the end point of regional water management problems. It is also possible that "the goal of the State is to accommodate growth in a manner which will protect the unique environment of the state" (Environmental Protection MOU, third paragraph), is an oxymoron.

R.1 (Chapter 5) should be approved by the Department of Ecology, as well as by the legislature, and required as an interjurisdictional conservation/planning goal. Water supplies in the Western US have too often met their demise; this region should grab the opportunity to avert the misfortune.

Unfinished Agenda

Due to time and budget constraints, the following Regional Planning Group goals and objectives were not considered, and should be considered in the future under the "unfinished agenda:"

1. Goal 3, c: under this goal, "protect, maintain and enhance estuarine ecosystems for the benefit of nearshore marine life" was not seriously considered. Though the direct linkages between the rivers, wetlands, and estuarine and marine systems were acknowledged, ample time was not available to fully consider these ecosystems.

2. Goal 6, objective C: "implementation measures ...legislation and funding mechanisms" were not addressed, except as in a general way, or as is indicated in this Chapter.

3. Goal 11: "To perform a realistic economic evaluation of program and plan elements" was not considered by the RPG.

Volume 2

Chapter 11

DQ Goals & Objectives

Chapter 11
Goals and Objectives

Mission Statement

Our mission in the Dungeness-Quilcene Water Resources Pilot Planning Project is to work cooperatively to meet water quality and quantity needs of human and natural systems in a manner that will insure the sustainability of both.

Scope of Project

Recognizing that water is a variable and limited resource; the regional planning effort has addressed both immediate and foreseeable water needs and resources for the next 20 years in the Dungeness and Quilcene pilot planning areas, and has based it's work on the goals of the Chelan Agreement and the goals developed by the Dungeness-Quilcene Regional Planning Group.

The Chelan Agreement Goals and Principles:

- That water resource management decisions be by hydrologic unit or regional planning area as defined in the "boundary" section in this document *(the Chelan Agreement).*

- That future conflicts will be reduced if water use needs located in a hydrologic unit first be met from water resources within that unit.

- The recognition that actions will be guided by the tribes' objective to achieve an overall net gain of the productive capacity of fish and wildlife habitats and the state's related objective to accommodate growth in a manner which will protect the unique environment of the state as those goals have been identified in the Memorandum of Understanding on Environmental Protection. The participants understand the achievement of an overall net gain of the productive capacity may, in addition to instream flows, include a variety of other means.

- That the water resource planning process described in this Agreement shall in no way affect existing water rights without the consent of the water rights holder. Nor shall this planning process necessitate, require or limit any formal determination or resolution of any legal dispute about water rights under state or federal law or Indian treaty. This process is an alternative process, voluntarily designed by the affected parties to build on the existing system of water rights through a cooperative, flexible process to plan and manage the uses of Washington's water resources.

- To develop and implement a program providing for conservation, efficiency, elimination of waste, water reuse, and restoration of riparian habitat areas for water retention, including the development of legislation and/or regulations where appropriate.

- To assist the Department of Ecology in locating the resources for compliance, enforcement and administration of existing laws and regulations.

- That the participants remain fully committed to the planning process described in this agreement.

Dungeness-Quilcene Regional Planning Group Goals and Objectives

GOAL 1
To define the regional planning project area.

Objective A: Agree that the location of the study falls within the boundaries of the hydrological units in the regional planning area.
Objective B: Prioritize the planning within those areas.

GOAL 2
To assess water uses and needs within the hydrological units of the planning area and determine if those needs can be met within the available water resources of the area.

Objective A: Inventory and record all established uses and needs.
Objective B: Determine the total water resources of the areas.
Objective C: Analyze the study results in relation to existing and minimum needs and available water resources of the area.

GOAL 3
To achieve the assurance of the quantity and quality of water that is needed in the planning area to:

a. Protect, maintain, and enhance the physical and biological integrity of the rivers, stream corridors, groundwater and associated wetland and marine systems;
b. Achieve an overall net gain of the productive capacity of fish, shellfish and wildlife habitat by protecting, maintaining, and enhancing these habitats;
c. Protect, maintain and enhance estuarine ecosystems for the benefit of nearshore marine life.

Objective A: Collect and assess available data/information to determine the needed quantity and quality of water.
Objective B: Provide the means to fill the data/information gaps so that the RPG may determine the needed quantity and quality of water.
Objective C: Design and implement procedures and strategies to provide for the needed quantity and quality of water.

GOAL 4
To achieve the assurance of an adequate supply of water to sustain current and future agricultural needs.

Objective A: Investigate all possibilities for water conservation, including innovative measures to optimize water supplies.
Objective B: Based on the actual needs, design funding mechanisms for conservation projects.

Objective C: Design and implement conservation measures within the regional planning boundaries.
Objective D: Develop and implement educational programs for agricultural water users.

GOAL 5
To identify and resolve water use conflict through a cooperative process.

Objective A: Develop a voluntary process for water resource planning which includes all affected parties.
Objective B: Develop and maintain an understanding of the need to stay flexible and open minded during the water resource planning process.

GOAL 6
To develop and implement a program providing for:

a. conservation,
b. efficiency,
c. elimination of waste,
d. water reuse,
e. restoration of wetlands and riparian habitat areas for recharge, water quality and water retention,
f. recommendations for legislation and/or regulation where appropriate.

Objective A: Investigate alternatives for water conservation and efficiency.
Objective B: Analyze each alternative relative to the needs of the individual hydrologic unit, comparing:

1. efficiency and amount of savings,
2. appropriateness of scale,
3. future growth projections,
4. cost effectiveness,
5. environmental impacts.

Objective C: Recommend implementation measures including conservation, legislation and funding mechanisms.

GOAL 7
To encourage compliance, enforcement and administration of existing laws and regulations affecting water resources.

Objective A: Design and implement a water resource plan in a timely manner consistent with the Water Resources Forum's guidelines.
Objective B: Encourage:
1. Coordination of policies, plans, and management systems, with those of other jurisdictions and governmental agencies within the regional planning boundaries.
2. Compliance with and enforcement of regulations relating to habitat protection and land use within the planning area.
3. The development of regulations that are consistent, predictable and equitable region-wide.

Note: there needs to be the clear understanding that there are different concerns in each county, though some are shared. Also that this a pilot plan for adaptation across the state (at least west side).

GOAL 8
To build public understanding of and responsibility for water resource issues, and opportunities for conservation, stewardship and improvement of water quality and quantity.

Objective A: Support already existing educational and conservation programs in both Counties.
Objective B: Encourage funding and implementation of programs for public education about conservation of water resources and habitat protection in the regional planning area.
Objective C: Link together the water conservation information throughout both Counties as a means of information dissemination.
Objective D: Encourage the development of water conservation education programs for the general public, policy makers and appropriate interest groups. Objective E: Encourage incentives for and public recognition of water conservation and restoration projects.

GOAL 9
To assure an adequate supply of water to support sustainable economic and community development for current and future residents of the regional planning area.

Objective A: Determine the current level of residential, commercial and industrial water use within the planning area.
Objective B: Analyze the future requirements for residential, commercial and industrial use based upon projected and potential population growth, and economic and community development objectives of the planning area.
Objective C: Investigate the feasibility and costs for residential, commercial and industrial water conservation. Define and estimate the amount of water resources that could be saved for alternative purposes using various conservation scenarios.
Objective D: Promote the design and implementation of conservation measures and incentives within the regional planning area.
Objective E: Promote the planning and implementation of conservation education programs for residential, commercial and industrial water users.

GOAL 10
To achieve the assurance of adequate quantity and quality of water and habitat to provide for the preservation of scenic and aesthetic values, to sustain current and future recreational needs, and to encourage responsible use of public recreation areas.

GOAL 11
To perform a realistic economic evaluation of program and plan elements.

GOAL 12
To track the process and lessons of the pilot project and submit this information to the Department of Ecology, the Water Resources Forum, and the Washington State Legislature.

Volume 2

Chapter 12

Guidelines & Framework for the Project

Chapter 12
Technical Support

Chapter Overview

The cooperative water resources management process which produced the *Dungeness-Quilcene Water Resources Management Plan* developed out of a long history of planning efforts. This Chapter includes materials which have formed the foundation for work in the DQ Project.

The *Memorandum of Understanding on Environmental Protection* outlined a major commitment by Tribes and State to increase production of the fisheries resource through cooperative efforts. The *Chelan Agreement* further developed the process for implementing the objectives of the MOU, including establishment of regional water resources planning. The DQ Project RPG *Groundrules* provided guidelines for behavior both in and out of meetings and helped participants adhere to the spirit of the Chelan process.

Other pertinent materials which are not in this Chapter include the *Regional Planning Guidelines* developed by the Water Resources Forum.

Tribal/State Environmental Protection MOU
MEMORANDUM OF UNDERSTANDING BETWEEN
FEDERALLY RECOGNIZED TRIBES OF WASHINGTON STATE
AND
THE STATE OF WASHINGTON

ENVIRONMENTAL PROTECTION

1. Preamble
Fisheries and wildlife resources are of great value and importance to Washington citizens. Protection of these resources is a matter of high priority for Washington's Indian tribes and the agencies and departments of Washington state government.

The state and the Tribes are interested in making a major commitment to protecting the habitat and increasing production of the fisheries resource. Cooperative efforts between state agencies and Tribal governments will assure protection of habitat and full success of enhancement programs.

Each of the parties desires to restore, where appropriate, habitat that has been degraded through prior activities and to enhance potentially productive habitat. The parties agree that the development of a cooperative plan to protect, restore, and enhance habitat is an essential element of the discussions outlined in this memorandum. The parties agree to use good faith efforts to jointly seek funding necessary to carry out the activities contemplated in this agreement.

2. **Summary of United States V. Washington Tribal** governments in 1970 brought suit in *United States v. Washington* against the State seeking a declaration and enforcement of their treaty fishing rights. There were two distinct segments in that lawsuit. *Phase* 1 involved the determination of the nature and extent of the fishery harvest rights. Those basic harvest rights were affirmed by the United States Supreme Court in 1979 and the federal court has retained jurisdiction to fully implement those fishing rights.

In *Phase 11,* the Tribes allege that state agencies have been unsuccessful in properly protecting the habitat. The Tribes seek a declaration that the treaties guarantee habitat protection and have alleged first, that state agencies have an obligation to protect the supply of fish and second, that agency actions which damage, degrade, or destroy habitat or current levels of harvestable fish violate treaty rights.

The parties of *United States v. Washington* recognize the potential for litigation of the *Phase II* issues in either the general or specific sense. However, the parties have learned that the benefits of cooperative resolution of disputes may exceed those obtainable through litigation. The Tribes have expressed an interest in working cooperatively with the state in habitat and water protection matters, rather than pursue this expensive and time consuming litigation.

Further, the parties recognize that prior efforts of the State and the Tribes to resolve issues of mutual concern have been enhanced by the active cooperation and participation of non-parties representing private interests. The parties recognize that the State will seek to cooperatively involve these private interests in achieving the objectives State in the *Preamble* to protect natural resources, improve where appropriate degraded habitat, and enhance potentially productive habitat.

Accordingly, the parties join in this memorandum of understanding for the purpose of initiating a cooperative approach to protection, enhancement, and restoration of fisheries habitat.

3. General Principles

The State recognizes the Tribes as sovereign entities under federal law with certain governmental authorities and responsibilities. Accordingly, discussions under this Memorandum will be conducted between the parties on a government-to-government basis. While the parties agree to pursue the cooperative approach outlined in this Memorandum, they recognize that the litigation was initiated for the' purpose of establishing Tribal rights to habitat protection.

3.1 Tribal Concerns and Goals: The Tribes believe and contend that this right obligates the state to protect the supply of fish, and actions which damage, degrade, or destroy habitat, such that the rearing or production potential of the fish will be impaired or the size or quality of the run will be diminished, violate Tribal Treaty fishing rights.

The Tribes contend that the State does not give enough priority to protection of the fish habitat and therefore subordinates treaty-protected rights to other interests. The Tribes believe that the State's legal and fiscal authorities should be used to ensure that activities undertaken, managed, regulated, or permitted by the State shall result in a net gain to the productive capacity of the fish and wildlife habitats.

The Tribe's general long term policy objective of this Memorandum is the achievement of an overall net gain of the productive capacity of fish and wildlife habitats. Achievement of this objective shall occur through the acts of protection and conservation of the productive capacity of habitats, the restoration of damaged habitats, enhancement of potentially productive habitats, and where appropriate, proper mitigation techniques.

3.2. State Concerns and Goals: Within the context of the litigation, the State has contested the nature and extent of the treaty environmental rights alleged by the Tribes. The State however acknowledges the benefit of attempting to address and resolve the underlying problems in a non-litigative context.

The parties further recognize that, although they may have differing views of the legal theories, the State shares interest and concern about protecting the fishery habitat. Therefore, the State enters into this Memorandum committed to cooperatively resolving environmental concerns raised in the litigation and to further protecting fisheries resources.

Washington has unique physical characteristics which support a variety of interests. Washington benefits from a multi-faceted economy with diverse fishing, agriculture, and timber industries, as well as industrial, retail and commercial entities. Washington's natural features make the state a highly desirable place to live. Because of these characteristics, the parties anticipate increases in population and economic growth. The goal of the State is to accommodate growth in a manner which will protect the unique environment of the State.

Local governments exist under legal and fiscal authorities which create a government-to-government relationship between them and the State. The Tribes recognize the importance of relationships with local governments throughout the State. The parties recognize the State will afford an opportunity for local government to properly represent their authorities and responsibilities within discussions contemplated by this Memorandum of Understanding.

3.3 Habitat Protection and Water Use: The parties agree that they must increase their understanding of the laws, regulations, ordinances, and jurisdictional system currently used that affect Washington's habitat and regulated use of water within the State.

The Chelan Agreement

A retreat was held at Lake Chelan November 8-10, 1990. Officials of Tribal, State, and Local government interacted with representatives of agriculture, business, environmental organizations, recreation, hydropower, commercial fishing, and other water-related interests in plenary sessions, caucuses, mixed groups, and one-on-one meetings and discussions. Over 200 officials attended day and night sessions. Many facets of the issues were discussed. Every opportunity was pursued to explore the pros and cons of various approaches. The result was a water agreement named the "Chelan Agreement, "finalized March 8, 1991.

1. Preamble The purpose of the Chelan Agreement is to establish procedures to cooperatively plan for the management of water resources in Washington State to best meet the goals and needs of all its citizens. In additions to forming the basis for state water resource planning, the Chelan Agreement serves as a process for implementation of the general objectives set forth in the Memorandum of Understanding on Environmental Protection.[1]

[1]Tribal governments in 1970 brought suit *United States v. Washington, 384 F. Supp.* 312 (W.D. Wash. 1974); affd in *Washington v Passenger Fishing Vessel Ass'n,* 443 *U.S. 658* (1979) against the State seeking a declaration and enforcement of their (continued on next page)

2. Goals and Principles

The Chelan Agreement recognizes that water is a finite resource. It further recognizes that the goals and principles of this agreement include, in no particular order:

- That water resource management decisions be by hydrologic unit or regional planning areas as defined in the "boundary" section in this document.
- That future conflicts will be reduced if water use needs located in a hydrologic unit first be met from water resources within that unit.
- The recognition that actions will be guided by the Tribes' objective to achieve an overall net gain of the productive capacity of fish and wildlife habitats and the State's related objective to accommodate growth in a manner which will protect the unique environment of the State as those goals have been identified in the *Memorandum of Understanding on Environmental Protection.* The participants understand the achievement of an overall net gain of the productive capacity may, in addition to instream flows, include a variety of other means.
- That the water resource planning process described in this Agreement shall in no way affect existing water rights without the consent of the water rights holder. Nor shall this planning process necessitate, require or limit any formal determination or resolution

(continued from previous page)
treaty fishing rights. Litigation which ultimately could interpret or lead to the quantification of certain Tribal claims to water currently is pending before the United States District Court in *Phase II, U.S. v. Washington, 506 F. Supp. 187* (W.D. Wash. *1980),* vac'd *759 F* 2nd. 1353 (9th Cir. 1985).

In *Phase* II, the Tribes allege that the State agencies have been unsuccessful in properly protecting the habitat. Within the context of this litigation, the State has contested the nature and extent of the treaty environmental rights alleged by the Tribes. The parties to U.S. v. *Washington* recognize the potential for litigation of the *Phase* 11 issues in either the general or specific sense and have developed a *Memorandum of Understanding on Environmental Protection* for the purpose of initiating a cooperative approach to protection, enhancement, and restoration of fisheries habitat. Neither this agreement or the Environmental Protection MOU is a settlement of *Phase II, U.S. v. Washington,* nor shall either be construed to limit the right of any party to act in any administrative, judicial or legislative forum to protect its rights.

of any legal dispute about water rights under State or Federal law , or Indian treaty. This process is an alternative process, voluntarily designed by the affected parties to build on the existing system of water rights through a cooperative, flexible process to plan and manage the uses of Washington's water resources.

- Develop and implement a program providing for conservation, efficiency, elimination of waste, water reuse, and restoration of riparian habitat areas for water retention, including the development of legislation and/or regulations where appropriate.
- Assist the Department of Ecology in locating the resources for compliance, enforcement and administration of existing laws and regulations.
- That the participants remain fully committed to the planning process described in this agreement.

Planning Guidance: Planning guidance to local/regional planner is provided by the goals and principles of this agreement, and the fundamentals of State water resource policy as listed in the Water Resources Act of 1971, as set forth in RCW 90.54.020. The perspectives of each caucus on water resource management are attached.

Because this cooperative planning process stands in contrast to judicial determination of conflicting rights or claims to water, it will not result in the allocation of water among competing interests. This cooperative process will not "allocate" water in this sense.[2] However, implementation of plans developed through this cooperative process could result in the identification of quantities of water available for specific purposes. Because of its cooperative nature, the results of this planning process will maximize the net benefits to the citizens of the state.

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[2] Any test currently found in any state law used to allocate, determine, or prioritize water rights (such as the "maximum net benefits" test) has no application to tribal governmental interests in this cooperative process, unless they determine otherwise. Neither the participation by all governments and other organizations and individuals nor their concurrence in generally applicable water resource guidelines, standards or criteria shall be deemed a waiver of any federal law obligations in regard to the rights of any of those parties or their members.

3. Water Resources Forum
The Chelan Agreement recommends the creation of the Water Resources Forum (Forum). The Forum will have the same number of representatives from each caucus as the Interim Team: 6 Tribal, 3 State, 3 Local Government, 3 Business, 2 Fisheries (1 sports and 1 commercial), 1 Recreational, 3 Environmental, and 3 Agriculture. Each caucus will select its own representation. Each caucus will assure its own internal communication. Each participant will have his/her own voice in decision making.

General Function: The general function of the Forum will be to: Shape state policy. Clarify existing terms and policies. Recommend statutory changes as needed. Provide policy guidance, if necessary, in addressing critical issues.

Generally, the Forum will perform the following functions and tasks in a prioritized order which recognizes that work related to specific regional planning processes shall be secondary to policy guidance:

I . Serve as a mechanism to review water resource planning and implementation.
2. Continue the cooperative nature of the Chelan process.
3. Provide creative solutions and options on issues of state-wide significance, such as policies guiding the processing of pending water right applications or issues determining hydraulic continuity.
4. Develop criteria for selection of pilot projects.
5. Monitor, evaluate, report on and recommend changes to the pilot planning process.
6. Make interim modifications and amendments to the pilot planning process.
7. Reconvene a plenary body as represented at the Lake Chelan retreat, if significant changes are needed for the continued functioning of the planning process.
8. Assist in making the transition from pilot projects to systematic planning state-wide.
9. Provide assistance and support to the regional planning process.

Decision Making: The Forum shall make decisions by consensus. Consensus is defined as no negative votes, with abstentions allowed. If no consensus is reached, such will be noted and all the information generated during the process will be collected and made available to all participants.

The Forum will make recommendations to the State agencies. There is a commitment from the Department of Ecology and other relevant State agencies to give substantial weight to the consensus agreements reached. The Forum will have discretion in setting its own agenda. Items for consideration can come from:

1. The Forum's own initiative.
2. Response to agencies' requests.
3. Response to requests for specific policy guidance from other organizations (particularly regional planning groups).

The Forum's charge shall be on issues of state-wide policy or guidance, NOT day-to-day management.

Review and Evaluation: The Forum will review and evaluate the implementation of the Chelan Agreement, including the Guidelines developed for this process. (See Section XI.) Participants in regional planning processes and other water projects shall be provided the opportunity to participate in this review. The Forum will prepare a report for use in review by legislative bodies. The Forum will report on progress by December 31, 1992, and submit a final report at the completion of the pilot projects. (See section IV.)

The Washington State Legislature shall review the pilot projects, the effectiveness of the Forum and the effectiveness of water resource planning and management in the State of Washington.

In conducting the review of the pilot projects, the Chelan participants recommend that the legislature use the following to measure success/failure:

- Were the goals of the pilot projects satisfied? How many? Which ones?

- How efficient and cost effective were the pilot projects?
- Was adequate funding provided for an effective planning process? If not, what was the impact?
- Do the plans satisfy the needs and interests of all of the caucuses?
- Did the plans meet the schedules and deadlines?
- Did the plans provide for broad-based participation?

Funding for the Forum is essential, but the level and mechanism is yet to be determined. Travel and per diem will be provided for Forum members (which will require a statutory authority). Staff for the Forum is essential so as not to deplete the time of State staff. If there are subgroups of the Forum, they should also be funded. The Interim Team will serve as the Forum until such time as the Forum is convened.

4. Pilot Planning Process

To Initiate Water Resource Planning:

1. The water resources planning process may be triggered by either of the following methods:
   a. Petition by an individual. Any State resident may petition a general purpose local government (city or county), Tribe, or the State Department of Ecology to initiate planning. One of those levels of government must agree for the planning to begin.
   b. Any of these governmental entities may convene preliminary discussions to begin the planning process.

2. The Forum will recommend criteria for selecting pilot projects. The Department of Ecology, in cooperation with the Forum, will select at least two projects for *planning to* be conducted over the next three years, to field test the planning process.

1. The petitioner may direct its request to initiate a planning process to a general purpose local government, Tribe or the Department of Ecology.

2. The general purpose local government or tribe, in consultation with the Department of Ecology, or Ecology itself, will be called

an initiating entity, The entity at this stage may consult with other governmental agencies, including affected special purpose local governments, to determine their willingness to participate in and pay for the planning process. The government entities may prepare an intergovernmental agreement addressing the proposed planning process. The governmental entities will also conduct the public process and outreach to inform other interested parties of the opportunity to participate in the regional planning process in order to facilitate the formation of caucuses. If mutually agreeable, the entity and the Forum may jointly conduct these activities.

3. An invitational meeting will be called, and at that meeting the caucuses and expected agencies will be identified, and a time line will be set for the Scoping Process.

4. During the Scoping Process, the boundaries, time frames, caucuses and representatives of those caucuses will be identified, and a coordinating entity will be chosen.

5. Participation in the Regional Planning Effort: Opportunity to participate in the regional planning effort must be extended to representatives of affected state and local governments and Indian Tribes. It must also be extended to representatives of the following interests:
    - Agricultural
    - Environmental
    - Fisheries, both sport and commercial
    - Recreational
    - Business

6. Additional caucuses may be added by consensus of the existing regional planning participants. If a group is not granted caucus status, it may petition the Department of Ecology for caucus status. The petition shall justify the need for the new caucus based on the existing caucuses' goals. In reaching its decision, the Department of Ecology may consult with the Water Resources Forum.

7. Representatives will be chosen by each caucus. Government and interest groups who have responded affirmatively shall determine whether the number of parties participating is enough to allow the planning effort to commence.

8. Coordinating Entity: For the purpose of regional planning processes, any participating government entity or combination of governmental entities chosen by a consensus of the participating caucuses may be the coordinating entity. The coordinating entity role is more appropriate for a general purpose government due to their broad perspective. However, some flexibility and collaboration is needed regionally since local governments may lack the capacity to conduct a water planning process.

   The coordinating entity will be responsible for administering the process and entering into contracts agreed to by the planning group. The coordinating entity shall also be responsible for coordinating intergovernmental agreements among the participating entities, as necessary.

10. Those federal agencies that have an impact or would be impacted by regional planning should be invited to participate in whatever manner is dictated by that region.

11. In regional planning, all appropriate State agencies shall participate, including the Department of Ecology. Ecology's role in finalizing planning projects will be to approve or remand. (See section on *State Review of Completed Plans.)* The reasoning for this is that the final rule-making role of Ecology on approved plans is informed by intervening steps (i.e. State Environmental Policy Act and Administrative Procedures Act) and is therefore legally appropriate.

Dispute Resolution: Policy disputes will be resolved, where possible, through mediation. The Water Resources Forum may also provide assistance to resolve disputes at the regional planning level.

Technical disputes may be resolved through the use of a technical advisory team or by retention of an agreed upon outside technical expert.

Boundaries: Boundaries will be selected during the original scoping process and submitted to Ecology for review and approval. The planning region will be one or more Water Resource Inventory Areas (WRIA's), unless there is a specific need for a smaller area within a WRIA. which is a specific hydrologic area. Larger planning units/regions will be one or more contiguous WRIA's or other contiguous hydrologically justifiable units. If there is no need for coordination among more than one WRIA, one WRIA can constitute a "region."

Other than planning by an Indian Tribe within its reservation, any water resource planning activities within the exterior boundary of a reservation can only be done by mutual agreement of the affected Tribe and the State.

For the purposes of the pilot regional planning processes, the Department of Ecology will select the regions, based on the recommendations of the Forum.

All planning boundaries will be determined by using resource- and user-based factors. A checklist incorporating the following factors should be developed by the Forum to ensure their consideration in determining boundaries:

Resource Based Factors:

1. Hydrology: Planning boundaries should primarily reflect hydrological, rather than political boundaries. This may include groupings of watersheds which have several characteristics in common such as geological conditions, gradient, precipitation pattern, etc.
2. Fisheries Management: Areas containing stocks which are managed under similar fisheries allocation and enhancement goals should be grouped together. Major watersheds have specific enhancement goals and often have fisheries rebuilding strategies which would be affected by water

resource planning. Some regions are already grouped for harvest management purposes; for example, Hood Canal is considered a "region of origin." It should be noted that watersheds can have extended areas management. For example, the depleted coho runs of the Skagit system impact management in all intercepting fisheries including the Strait of Juan de Fuca and Ocean.

User Based Factors

1. <u>Similar Out-of-Stream Uses</u>: Watersheds exhibiting similar types of uses can be planned collectively more easily than diverse uses. Also, the broader geographical planning base gives planners greater flexibility of methods to achieve their goals. Examples of dissimilar uses would include municipal, industrial and agricultural, since these uses have different seasonal patterns and distribution systems. An area containing several similar uses should probably constitute a single planning unit.
2. <u>Similar Land Use Patterns</u>: Characteristics would include rural/urban, agricultural, forest based, industrial, municipal, growth pattern and rate.
3. Water Supply Linkages: Watersheds which involve out-of basin transfers need to be linked for planning purposes. For example, Dungeness River water is transferred to the Sequim watershed, even though the two areas are in different WRIA's.
4. <u>Manageability of the Process</u>: Factors which may lead to grouping or splitting areas include the population base, size of area, availability of a key governmental and affected interest groups, and other public education efforts. Some areas which have been involved in water quality plans may already have formed active watershed management committees. Areas which cover wide geographic territories with sparse populations may need to group WRIA's since key jurisdictions would be required to participate in several forums.

Linkages: Regional planning efforts need to recognize the existence of and relationships between a variety of other planning activities. In scoping and developing regional plans, participants should avoid duplication. In developing a water resource plan:

- There is recognition that water withdrawals can impact water quality. Therefore water quality, both potability and environmental quality issues, when related to water use and availability, should be integrated into the planning process. Local land use planning and permit decisions which will protect the water resource or create demands for water shall be compatible with water resource planning.
- Local governments shall provide for the protection of the water resource and shall link development and land use planning and zoning to water availability.
- Consideration should be given to what, if any, linkages between on-reservation and off-reservation water use and management exist or should be incorporated into a water resource plan. Reservations are legally distinct units with a different body of applicable laws.
- Other Federal, State and local programs which impact water resource use and availability should be integrated with the water resource planning process.

The following are examples of such processes or programs:

* U.S./Canada Pacific Salmon Treaty
* Columbia River Systems Operation Review
* FERC licensing of hydropower facilities
* Forest Service Planning
* U.S./Canada Flow agreement on Columbia River
* Bureau of Reclamation Operations/Contracts
* Court Approved U.S. v. Oregon Columbia River Fishery Management Plan
* Northwest Power Planning Council's Fish and Wildlife Program
* Various Wild and Scenic River proposals and related planning processes
* Columbia Gorge National Scenic Area planning process
* Watershed planning process by the Department of Fisheries
* Watershed planning required by the Puget Sound Water Quality Authority
* Comprehensive Hydroelectric planning process

* Growth management process
* Coordinated water system planning process
* Game Fish 2000 plan by the Department of Wildlife
* State Scenic Rivers program
* Groundwater Management area program
* Priority Species and Habitat Project (WDW)
* U.S. v. Washington Fisheries Management Plans
* Water System Comprehensive Plans
* Land Use Plans
* Threatened and Endangered Species Act

Proposal/Scoping: The regional planning group will complete the scoping process by determining the following:

1. Participation and workplan

a. List of participants to be included, name, affiliation, and alternates
b. Designated coordinating entity(ies)
c. Intergovernmental agreements necessary to implement planning process
d. Milestones and workplan
e. Public involvement and SEPA compliance
f. Public education elements

2. Identification of resources needed for planning process from state and regional participants

a. Staffing requirements
b. Technical expertise
c. Funding
d. Other commitments

3. The scoping process shall consider and determine at a minimum which of the following elements shall be addressed in the plan:

a. Groundwater
   i. water quality protection
   ii. conservation
   iii. recharge
   iv. inventory of current and exempted uses/data collection/methodologies

v. out of area distribution

b. Surface Water
   i. water quality
   ii. conservation
   iii. minimum instrearn flows
   iv. inventory of current and exempted uses/data
   v. collection/methodologies
   vi. habitat
   vii. out of area distribution
   viii. peak flow management

c. Consumptive Needs i. Domestic ii. Agricultural iii. Hatcheries iv. Hydroelectric v. Industrial

d. Non-Consumptive Needs
   i. Instream Flows
   ii. Recreational
   iii. Aesthetics
   iv. Ecosystem
   v. Cultural
   vi. Rivers assessed as eligible for designation as state scenic rivers
   vii. Rivers assessed as eligible for designation as Federal Wild and scenic rivers
   viii. Fish and Wildlife
   ix. Hydroelectric

e. Relationship between surface and ground water

4. Description of relationship to other planning processes (see above).

The completed scoping document will be submitted to the Department of Ecology.

State Review/Approval of Scoping: The Department of Ecology will review the scoping document for completeness and compliance with applicable State and Federal laws and regulations, and water resource planning guidelines. In reaching this decision, the Department of Ecology shall have the responsibility of involving other State agencies where their participation is necessary to the success of the proposed planning effort. This will ensure the involvement of State agencies necessary to assist in the planning effort and to implement the plan. If found satisfactory, the regional planning process may begin. If not in compliance, Ecology will remand the scoping document to the regional planning group for modifications.

Plan Development and Decision-Making: The regional planning group will construct a plan that addresses the elements identified through the approved scoping process. The plan must be consistent with applicable State and Federal laws and guidelines. The plan development process will be integrated with the SEPA process.3 Throughout the plan development process, the regional planning group will receive public comments as required by State law and the plan document will be written as the SEPA document. In addition to the appeals processes detailed herein, plan development will be required to be integrated with the SEPA process.

Each caucus will have one voice in decision-making. The planning group will attempt to reach consensus whenever possible. In cases where consensus is not possible, decisions will be made by a consensus of the government caucuses and a majority of the interest group caucuses. Minority reports, if prepared, shall be included in the plan document.

Where consensus among the governments (Tribal, State, and local governments) and/or a majority of the interests is not achievable, the Department of Ecology shall assume the lead role in assuring that the

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3 This agreement will not result in SEPA being made applicable to tribal water planning within Indian reservations nor will SEPA compliance necessarily satisfy federal law in regard to treaty and other reserved rights.

plan is completed for the pilot projects in a timely fashion, not to exceed twenty-four (24) months.

State Review of Completed Plans: The Department of Ecology shall review the completed plans for compliance with applicable Federal and State laws and regulations, including the State Administrative Procedures Act and SEPA, and conformance with Ecology's water resource planning guidelines developed under this process. (See Section XI.) In conducting such a review, Ecology shall give substantial weight to the regional plan in meeting the fundamentals of the Water Resources Policy Act of 1971 (RCW 90.54), Memorandum of Understanding, and the agreed-to goals. All plans shall recite "nothing herein authorizes the impairment of any treaty or other right of an Indian tribe or member under Federal law."

The State shall approve or remand the plan within 90 days. Extension may be recommended by the Water Resource Forum. Public comment will be taken throughout the review of the plan. A petition for review on process grounds may also be made to the Department of Ecology when it reviews the final plans for consistency with state guidelines. The Department may approve the plan as written or it may remand the plan to the regional planning entity for revisions. The Department may not make changes to the plan.

Appeals Process: There will be no appeal of the planning effort during the planning process. The appeals mechanisms available to challenge a completed regional water resources plan will be those currently available under existing law. Current rights and standing to appeal are not diminished in any way by the proposed planning process. Appeals of a plan can be made to the appropriate court. In addition, actions taken by the State or local governments to implement the plan, such as permits, regulations, or local ordinances can be appealed to the Pollution Control Hearing Boar, or the appropriate appeals body.

Implementation: Once a regional plan is completed, the Department of Ecology will prepare and adopt implementing regulations as required by law. Local governments will prepare and adopt any ordinance needed to implement the plan at the local level. Once adopted, the regulations and ordinances would be binding on the State and local jurisdictions in their related planning and permit activities. The Department of Ecology will be the State entity that reviews the regional plans for compliance with state law and state standards. The Department of Ecology, in cooperation with other State agencies, relevant Federal agencies, Tribal governments, and other interested local governments, will also perform the preliminary basin inventories that precede the regional planning processes.

Evaluation, Guidance, and Adaptation of Process: The planning process described in this Agreement is intended to be applied to all regions of the State in need of water resource planning and will be implemented in at least two regions within the next three years. It is the intent of the Forum to evaluate the process periodically, identify improvements, and adapt the process accordingly for future applications.

While the interests and organizations who developed this planning process sought primarily to achieve a cooperative process for water resource planning, they recognized that the broad goals of this effort should also be integrated by the Department of Ecology into it ongoing water resource management activities. Further, local governments recognize that their ongoing land use or water resource activities also could be affected by the goals of this cooperative process.

Notwithstanding the commitment to cooperation, the interests and organizations supporting this Agreement recognize that disputes may arise in regions where a cooperatively developed plan has yet to be implemented. The cooperative nature of the planning process described in this Agreement is intended to encourage resolution of such disputes, where possible, through mediation or other assistance.

5. **Organized Response to Critical Situations Which Require Action Now** In watersheds other than those involved in the two pilot projects, there will need to exist a mechanism to address issues and disputes over water. This mechanism established the ability to deal with critical situations and lists some of the tools for resolving issues in these areas. It is intended to take advantage of existing laws and governmental structures and is explicitly intended to notify and inform the parties of

actions which may have an impact on the resource. It is not intended to expand on existing law, or otherwise alter the rights and responsibilities of the governmental entities. An emergency regulation, followed by a permanent regulation, shall be enacted establishing the mechanism to deal with critical situations.

This mechanism will be used when one of the following actions occurs:
1. Any of the three governmental entities (State, Tribal, General Purpose Local Government) find that a need exists to apply the mechanism. Such a finding can include the need to facilitate communication and coordination on issues relating to water quantity and related water quality concerns.
2. Any of the governmental entities applies their respective permitting processes to a basin or WRIA which has been designated as "critical situations" on the basis of limitations as to water supply and related water quality concerns.
3. 3. If a special purpose local government requests that the mechanism be initiated to deal with the critical situation, the general purpose local government, which includes a portion of the special purpose district service area, shall initiate the mechanism on their behalf.

The mechanism shall permit the affected governmental entities to evaluate existing conditions or proposed actions which might have an impact on the resource. Under this mechanism, a basin or WRIA. could be classified by agreement of the governmental entities into one of two categories:

1. <u>Critical Resource Impact</u>: Designating the water resource as being over-appropriated or adversely impacted by water quality issues. Any action in such a basin or WRIA which will likely have an adverse impact on the instream resources as expressed in the planning guidance of this Agreement would likely be delayed or denied if such action might further harm the resource.

2. <u>Probable Resource Impact</u>: Designating the water resource as being in need of further evaluation to determine the nature and extent of the impacts resulting from existing conditions or proposed actions. After full evaluation, the

water resource shall be reclassified as having either a critical resource impact or no impact, depending upon the findings.

When a proposed action or existing condition requires further evaluation or data collection, a number of tools shall be applied as necessary to protect the resources. These include, but are not limited to, targeted conservation efficiency, re-use, compliance and enforcement; dispute resolution assistance; Memoranda of Understanding and other agreements; local government restrictions on permit issuance or moratoria; basin withdrawal by adoption of administrative regulations under RCW 90.54.050 or limited state permit issuance. The Forum shall review the need for guidelines to assist in the implementation of this section.

6. Water Resources Planning and Growth Management
Recognizing the need to integrate the planning process outlined in the Chelan Plan with other land and water resource planning processes, the Chelan Plan recommends:

1. Amending HB 2929 to include a water resource component. This component shall include, among other provisions:

    a. Local planning efforts shall recognize water availability and quality as key factors in an area's "carrying capacity."
    b. Wherever State, Tribal, or Federal authorities believe there to be problems with water availability or quality that will affect a local governments permitting process under Section 63, these cases will receive first access to funding for technical data analysis. Such technical data analysis shall be completed in a timely manner.

2. Amending HB 2929 to include specific provisions whereby a model intergovernmental agreement, similar to the "Centennial Accord," between local (including special districts) and Tribal governments is developed and adopted.

    The Chelan Plan also recognizes that water resource planning, as outlined in this document, will not take place on Tribal reservations without the consent of the appropriate Tribes.

7. Data Management
The Chelan Agreement recognizes the importance of data to water management. The Chelan Agreement supports the continuing efforts of the Data Management Task Force in the development of a data management plan and the collection of essential data necessary, among other things, to commence the pilot planning process. The Chelan Agreement also supports open access to any information collected and managed by all state agencies pursuant to State law. For efficiency, the collection, analysis, and management of water resource data will be done cooperatively with State, Tribal, local and Federal governments.

8. Conservation
The Chelan Agreement recommends that a task force, composed of representatives appointed by the caucuses, be created to develop legislation for the 1991 legislative session. In developing the legislation, the task force should consider:

1. Removing impediments to conservation, including the effect on wetlands loss due to improved efficiencies.
2. Providing incentives to promote conservation, water use efficiency, and re-use of water.
3. Providing funding for incentives, particularly for problem areas.
4. Determining how this program fits within the Department of Ecology's compliance effort.
5. Determining the relationship of conservation to the waste of water.
6. Removing impediments such as taxation on water use efficiency improvements.
7. Restoration and enhancement of instream flows through, among other mechanisms, conservation and more efficient management of the water resources.

In developing the legislation, the task force should utilize prior studies, legislative committee work, and draft Department of Ecology legislation.

The task force will attempt to make consensus recommendations. When consensus recommendations cannot be reached, the task force will present the alternatives considered and propose additional work, if appropriate.

The task force will complete its effort by January 31, 1991. The task force should be prepared to provide a briefing before the January 31, 1991, deadline to appropriate legislative committees.

The public will be informed throughout the development of this legislation.

9. Public Information and Education
The Chelan Agreement supports building a framework for on-going information process to build public support for cooperative water resource planning and management. The Chelan Agreement recommends development of an information strategy, to be reviewed and approved by the Water Resources Forum. The strategy shall identify and utilize existing information dissemination processes and integrate with and possibly delegate to, the Environmental Education Council established pursuant to the Environment 2010 Executive Order. The education strategy should emphasize cross-cultural training for all water resource planning participants.

10. **Funding Requirements and Strategies** (Reserved)

11. **State-wide Guidance** The development of guidelines and principles is essential for the State to fulfill its stewardship role for resources. Guidelines should be developed as soon as possible. Guidelines will speak to the actual outcomes sought in plans. It is accepted that the 1971 Water Resources Act, and Memorandum of Understanding on Environmental Protection (attached) are the starting point for this planning process, but they need clarification.

These general guidelines must be developed before the pilot projects begin. The Interim Team should consider guidelines or pass the responsibility on to the Forum.

Guidelines will be in place during the duration of the pilots, but will be reviewed at the end of the projects. It is recognized that they will probably need refinement. The guidelines will be applicable to all water resource planning subject to State jurisdiction and control.

RPG Groundrules

The following groundrules for planning were developed by the Regional Planning Group for the Dungeness-Quilcene Water Resource Pilot Project and adopted June 2, 1992.

1. Consensus
To use the Water Resource Forum's definition of consensus as the basis for decision-making by the Regional Planning Group (RPG). That definition reads as follows:

> *The Regional Planning Group shall make decisions by consensus. Consensus is defined as no negative votes, with abstentions allowed. If no consensus is reached, such will be noted and all the information generated during the process will be collected and made available to all participants.*

- Any issue may be revisited again in an attempt to reach consensus.
- Each party should state in writing why consensus was not achieved.

2. Adequate Response Time
All members of the Regional Planning Group represent organizations and agencies interested and involved in water issues. For this reason, each member will be allowed time between meetings to determine their response to major issues in front of the group for decision.

3. **Public Participation**
Public participation will be encouraged by adequately publicizing meetings and setting aside time for public comment at each meeting.

4. Chelan Agreement
The primary mission of the RPG is directed to the goals and issues of the Chelan Agreement.

5. Respect
RPG members commit to respect one another, listen to each other's views, and maintain positive candor. Representatives commit to negotiating in good faith, and not to work against the process outside the negotiations.

6. Information Will Be Available
Information such as technical reports, meeting minutes, maps, etc. will be available to every caucus in a timely manner in as understandable and consistent format as possible.

7. Accountability
The RPG will conduct itself in a way to be accountable to funding sources, participating caucuses and the general public.

8. Orderly I Open Meetings
Meetings of the RPG will be conducted in a orderly manner to provide ample opportunity for all representatives to participate, and maintain open discussion of the issues.

9. Encourage Group Creativity and Flexibility
Members are committed to searching for opportunities to develop group solutions and to focus on the resolution of substantive issues.

10. **Responsible Representation** Every caucus should ensure that their representatives possess the ability to: a) speak for the interests of the caucus; b) maintain a broad and flexible perspective; and c) communicate with people of different viewpoints. Delegates have an obligation to review existing data relevant to the process. Delegates are responsible for keeping their alternates and caucuses informed.

Volume 2

Chapter 13

RPG Committees

Chapter 13
RPG Committees

Scoping Committee

The Scoping Committee acted as a work group to outline goals and objectives for Regional Planning Group activities, create a work plan, and provide guidance to the Project Coordinator as to the content of the Scoping Document required by Dept. of Ecology. The Committee consisted of one representative for each caucus. The Scoping Committee was formed in the fall of 1992, met bi-weekly, and then was sunsetted at the completion of the Scoping Document in January 1993.

Advisory Committee

The Advisory Committee, consisting of one representative from each caucus, met as needed to advise the Project Coordinator on policy issues, procedures, and process questions. This Committee often met jointly with the Budget Committee, since so many "advisory" decisions were directly linked to Budget questions.

Budget Committee

The Budget Committee, consisting of one representative from each caucus, met as needed to make recommendations to the Project Coordinator and the Coordinating Entity on the DQ Project budget.

Education And Public Involvement

Purpose

The educational goals of the Dungeness-Quilcene Water Resources Planning Pilot Project are to include the concerns of members of the public and to educate members of the public on water resources and their impacts on them. To reach these goals, efforts have focused on:

1) Educating the RPG on important information needed for decision-making;

2) Allowing channels for public involvement throughout the planning process;
3) Filling short-term gaps in educational programs;
4) Creating a long-term educational plan;
5) Promoting conservation;

Process and Participation
The Education Committee was first formed in August 1992 to plan and organize several field trips for RPG members and other participants. The make-up of the Committee was primarily caucus members. The field trips generated more questions among RPG members about water resource issues. RPG members and other participants volunteered to organize topic focus meetings consisting of presentations by two or more experts on a topic. The "focus" meetings helped to answer questions from DQ Project participants, and to identify specific topics for Regional Planning Group discussion. The RPG also had one educational meeting focusing on the process aspect of cooperative planning.

Because some of the planning members wanted to do some *on-the-ground* educational activities, the Committee introduced the idea of using DQ Project funds to begin educational activities for the general public. There was, however, no consensus on where efforts should be focused or how to proceed. In February of 1993, an Educational Advisory Team, comprised of local professional educators, began to meet to address the issue of water resource education for the general public. In March 1993 the Educational Advisory Team proposed to the RPG a list of short term educational activities to be completed by June 30, 1993. It was accepted by the RPG. The Committee funded some already existing high-quality (and known to be effective) short-term educational programs where funding gaps existed. In addition, new conservation materials were developed, and a preliminary education plan for longer-term activities was written (see Appendix C).

Regional Planning Group Education

1. Field Trips
A series of educational tours for Regional Planning Group members began with a tour of the Dungeness River watershed in August 1992. RPG members also visited the Quilcene River, areas of interest concerning ground-water issues, and the Port Townsend Paper Mill. Evaluations from participants were used to help plan later trips. The Dungeness River and the

Quilcene River were revisited when discussions on gravel removal policies began.

2. Topic Focus Presentations
After attending the various field trips, RPG members had additional questions about water resource issues. RPG members volunteered to organize topic focus sessions consisting of presentations by two or more experts and involved parties. Educational "Focus" presentations were made as needed to answer the most pressing questions by RPG members. Topics included Department of Ecology's *Trust Water Rights Program,* hydraulic continuity principles, the agriculture community's relationship with water, the principles of ground-water, Quilcene River fisheries and hatchery issues, and forest practices effects on water resources. The sessions were video taped for members who could not attend the meetings. The Chimacum High School Multi-media Club filmed 2 of these sessions, combining these students' interest in film with education about water resources.

3. **Water Policy Research** In coordination with W.S.U., Evergreen State College intern David Hutsell researched existing laws and regulations which apply to water resource management and conservation and summarized water management history leading up to the Chelan Agreement.

4. Regional Planning Group Interviews
In March 1992, facilitator Emmett Fiske, and in May 1993 Evergreen State College intern David Hutsell interviewed key DQ participants, summarizing their needs, expectations of, and concerns about the project. The reports provided two separate "snapshots" in time to reflect on the process as a whole.

5. **Process Education Work Shop** In August 1992, part of a regular RPG meeting was devoted to a presentation by Kathrine Baril, W.S.U. Cooperative Extension on solutions to common group process problems. The attendants split into smaller groups to discuss individual perspectives on critical issues. Many participants felt that this meeting was the first time RPG members were really "talking" to each other.

In September 1993 the RPG participated in a special workshop by facilitators Bob Ness and Kathrine Baril on collaborative problem solving in a consensus process. The participants spent considerable time learning about how to develop effective communication skills, and how to turn conflict into opportunities for mutual agreement.

Channels for Public Involvement

1. Caucus Membership
Several caucuses were comprised in part or completely of members of the public. The Recreation, Business, Agriculture, and Environmental caucuses each have a broad range of members from the public who are regularly involved in the DQ Project. Caucus members often attended committee meetings, special educational focus meetings, and RPG meetings. Caucus members were actively recruited at public meetings in October 1991, March 1992, and January 1993.

2. Regional Planning Group Meetings
In addition to opportunities to be involved through a caucus, Regional Planning Group meetings were open to the public. Throughout the DQ Project process, RPG meetings were announced in the three local newspapers. Members of the public often attended RPG meetings and took advantage of the public comment periods at each meeting. All public comments in meetings were included in the meeting notes which are distributed to over 100 participants.

3. **Publicity** Members of the public have learned about water resource issues and DQ Project activities regularly through articles in the local newspapers. Staff has kept the newspaper editors informed about progress in the DQ Project and articles have been published on DQ Project-funded educational activities, public meetings, technical studies, and recommendations, as well as more general information an water resource issues.

4. Public Forums
Two sets of public meetings were held during the planning process. Several newspaper articles were published in local papers both before and after each of the events. Also, fliers were distributed, and caucus members were encouraged to invite people to the meetings. Local, State, and Tribal government representatives were also invited.

- In January and February of 1993 the RPG held public meetings in each county to present the completed DQ Project *Scoping Document* to the public. Other than RPG members, 24 people attended the Sequim / Clallam County meeting, and 63 people attended the Chimacum / Jefferson County meeting. RPG members spoke on the background of the Chelan Agreement, the regional planning process, and the goals of the DQ Project. Then several smaller groups were formed where people could express their hopes and concerns for the planning effort. Facilitators wrote people's comments on easels throughout the discussions. The easel notes were later summarized and distributed to RPG members.

- In May 1994, the RPG again held public meetings in both counties. This time the final draft of the DQ Water Management Plan was presented to the public. Other than RPG members, 110 people attended the Sequim / Clallam County meeting and 17 attended the Chimacum / Jefferson County meeting. RPG members explained some of the key recommendations in the plan and answered questions from the audience. Written and verbal comments are included in Chapter 10: *Public Comment.*

Short-Term Education Program Support The **RPG** and the Education Committee both stressed priority interest in not "reinventing the wheel," and encouraged support for already existing and proven educational programs. They stressed working with the schools and supporting classroom programs. This was because of the understanding of the impact of youth education, and the multiplier impact it has on families and other adults who are affected by the children in the programs. In addition, there are a lot of successful models of programs to offer students, and many gifted programs and teachers in the area. The Regional Planning Group funded the following activities between March and June 30, 1993:

Jefferson County Student and Teacher Training Activities
Katherine Baril of W.S.U. Cooperative Extension provided oversight to the Jefferson County Educational Programs including Student and Teacher Training, Water Conservation Materials for DQ Project Area, and Water Policy Education for the RPG. A total of 88 hours were contributed in-kind and $610 by W.S.U. A summary report of the activities performed was produced.

1. Quilcene School District Watershed J Shellfish Program Members of the local shellfish industry, the U.S. Forest Service, 60 students, and 3 teachers were involved in this Shellfish Education Program. Equipment was purchased to set up a shellfish aquarium in the classroom. The curriculum focused on watershed awareness, study of water temperature and salinity, and the life cycle of the local shellfish resources. This was the first successful grass roots water program in the Quilcene community, and was a model for local interest in the shellfish industry's need for water quality.

2. Chimacum School District Watershed Activities and Tour This program included watershed awareness activities, education on the life cycle of the salmon, and tours of Chimacum Creek. As an offshoot of continued involvement of the community in education on Chimacum Creek, a high-school class has taken on the responsibility of monitoring a new stream gage installed by the U.S. Geological Survey for the DQ Project.

3. Port Townsend School District Wetland Instruction Over 72 hours of classroom instruction and field trips was completed by Middle and High School students on subjects such as wetland metaphors, watershed awareness, drinking water, conservation, and the role of wetlands as contaminant filters. A watershed slide show was produced.

4. Port Townsend Marine Science Center A Ground-water Model, which uses types of sand and colored dyes to show the normally invisible underground, was purchased to show the dynamics of ground-water movement to Marine Science Center visitors, and is available for use in the local school district.

Clallam County Educational Programs
Educational writer Tim McNulty, formerly of Clallam County Department of Community Development provided oversight to the following Clallam County activities.

5. School Student and Teacher Training Activities Funding to continue Sequim School District's existing *Salmon in the Classroom* program was provided. Equipment was purchased for the existing salmon egg tanks. Funds also helped continue a program of salmon releases into Bell and Matriotti Creeks. Two, 2-day *Clam Camp* sessions were held at Camp Ramblewood in Sequim Bay State Park. Sixth graders learned about the food chain in the bay, proper techniques for harvesting, and to use fecal coliform kits to learn how land activities affect shore resources.

6. Irrigation Users and Ditch Residents
Clallam County Conservation District and the Water Users Association worked cooperatively to produce a direct mailing newsletter to members of the irrigation district members and 10,000 residents on irrigation districts. The newsletter focused on irrigation techniques to protect water resources. Also, funding was provided to the Clallam County Conservation District for the Model Farm Program.

7. **Water Awareness For New Residents and General Public** Clallam County Water Quality Department reprinted the following water resource and water quality education brochures: *Living Along Irrigation Ditches, Protecting Water Quality at Home, Yard Maintenance and Water Quality, Understanding Your Septic System.* The water brochures will be included with informational packets and brochures to realty office visitors. The information was presented to Sequim Association of Realtors and homeowners associations.

8. Ground-water Education
The DQ Project co-sponsored Clallam County's ground-water education activities for National Drinking Water Week. Two articles on ground-water protection were written for local newspapers. Ground-water education sessions were conducted in elementary schools. A open house on ground-water information was conducted.

Long-Term Education

1. **Preliminary DQ Project Education Plan**
   A preliminary plan for Water Resource Education for the DQ Project Area has been developed by Tim McNulty under the coordination of the Educational Advisory Team and Education Committee. The Plan outlines a range of educational activities aimed at increasing the public's awareness of water resource issues in the Clallam and Jefferson County planning area. The plan targets a large variety of water users in the area. See Appendix C.

2. **Pollution Prevention Outreach Program**
   As part of an EPA Pollution Prevention grant to The Jamestown S'Klallam Tribe, Clallarn and Jefferson County Conservation Districts, and W.S.U. Cooperative Extension have started a program to conduct landowner pollution prevention education, especially focused on agricultural practices and water resources.

Promoting Conservation

1. **Conservation Brochures**
   As part of the short-term educational work, a consultant was hired to compile existing water conservation brochures applicable to the DQ area. With the cooperation of adjacent counties, agencies, and resources, brochures on the following topics were created for distribution throughout the area at public meetings, presentations, and by request: *Conserving Water an the Home, Conserving Water in the Yard, Conserving Water: Rainbarrels, Cisterns and Graywater*

2. **Conservation Manual**
   Also, as part of the short-term educational work, the mare in-depth information collected for the brochures was compiled in a water conservation training manual for citizens called *Conserving Water For the Fish, the Farms, and the Future.* This package may be used as a PUD, Agency or citizen/volunteer training package.

3. **Conservation Plan**
   In March 1993 a draft *Water Conservation Plan* was prepared by the City of Part Townsend Public Works Department for the DQ Project Area. The plan included a telephone survey to increase public

awareness and assess people's willingness to participate in a conservation program, and a procedure to elicit participation is conservation. Available and recommended methods of conservation were described and example ordinances for local jurisdictions were included. The final plan would have specified conservation goals and emergency plans. Neither the Technical Committee nor the Education Committee reached agreement on the need for regional conservation plan. No further work on a DQ Project Water *Conservation Plan* was done.

Recommendations
The DQ Project Education Plan in Appendix C contains the recommendations from this Committee.

Technical Committee Activities

Purpose
The Technical Committee was created in October 1992 to:
1) Investigate what information and data exists on the water resources in the region;
2) Identify gaps in existing information needed for effective planning;
3) Recommend how to address data gaps within time and budget constraints;
4) Provide and disseminate information and overviews to assist Regional Planning Group decision making. The committee meetings have served as a forum for education and discussion on recent studies of interest to Regional Planning Group members.

Participation
Technical Committee participation has evolved throughout the stages of activities and cannot be limited to a simple list of members. Participants have included Regional Planning Group members, Caucus members, and Local, State, and Federal agencies, Tribal governments, consultants, and interested citizens. All Regional Planning Group members and all committee attendants received a monthly newsletter describing the latest activities. Equal caucus representation was not a criteria for the make-up of the Committee, and was only an issue during decisions on which technical projects to fund.

The Technical Committee met every other week for a total of 31 meetings. Approximately 900 volunteer hours were contributed for Technical Committee meetings alone. Also, many undocumented volunteer hours preparing information for meetings were contributed by participants.

Activities

One of the first goals of the Technical Committee was to inventory and collect existing data and studies in the project area and identify any information gaps. Participants were each given assignments to inventory specific areas. Duplication of effort proved to be a problem both with efficiency and community relations (calling the same agency more than once by different members), and few participants could commit to ongoing assignments. The Committee recommended in November 1992 that two new staff positions be created to assist with the activities of the Committee.

In March of 1993, a Research Staff member and Data Manager were hired. By request of the Committee, staff collected and organized existing information into the DQ Project Water Resources Library, and compiled a library bibliography for use by DQ Project participants.[1] Data Management / GIS staff consolidated data from available sources, managed and analyzed the data for the unique purposes of the DQ Project, and provided additional staff support for technical discussions in the Technical Committee and Regional Planning Group.[2] The Technical Committee also encouraged staff to participate in the Department of Ecology's Data Management Task Force (DMTF) projects.[3]

Beginning in November 1992, and continuing through March 1993 the Technical Committee developed and refined a comprehensive list of both long-term and short-term information needs for regional water resources planning. In April 1993, the Committee recommended that the RPG fund several of the short term studies to provide information where more was needed for upcoming RPG discussions.

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1 For more information on the contents of the DQ Project Water Resources Library, see Chapter 4: Information Resources and Habitat Projects

2 For mare information an DQ Project data management efforts, see Chapter 9: Technical Support.

3 For more information on DQ Project involvement in DMTF activates, see Chapter 9: Technical Support.

The following studies and projects were funded by the Regional Planning Group.[4]

- Dungeness River Irrigation Ditch Leakage Assessment
- Preliminary Assessment of Seawater Intrusion in Coastal Water Wells in Eastern Clallam and Jefferson Counties
- Sediment Transport and Deposition in the Lower Big Quilcene River and Evaluation of Planned Gravel Removal For Flood Control
- Instream Flow Recommendations For the Dungeness-Quilcene Area Salmon and Steelhead Streams
- The Status of Anadromous Fish Stocks in the Streams of Eastern Jefferson County, Washington
- Plan of Study for the Ground- and Surface-Water Resources of the DQ Area
- Stream and River Gage Installation and Data Collection Well Log Data Base
- River, Creek, and Shoreline Flyover Videos

The studies were completed and reviewed through the summer and fall and circulated in the RPG and among local agencies. A public presentation was made on each study, which were video-taped and are available in the DQ Library. Additional analyses, overviews, summaries, and studies have been undertaken by volunteers participating on the Committee. Several of the short term projects done by the Committee have the potential to develop into longer term data collection and studies.

[4] For more information on technical projects, see Chapter 4: Information Resources and Habitat Projects.

Volume 2

Chapter 14

Description & Analysis of the Pilot Project

Chapter 14
Description and Analysis of the Pilot Process

Chapter Overview

In this Chapter, many of the individuals involved in the Dungeness-Quilcene Water Resources Planning Pilot Project reflect on the project as a whole. Collected and compiled in this Chapter are problems encountered, lessons learned, successes, and ideas for future regional planning efforts. Viewpoints in this Chapter include that of the Coordinating Entity, DQ Project Staff, and RPG members. The Chapter begins with a brief overview of various stages, events, and processes throughout the planning project.

Overview of the DQ Planning Process

Background: The Chelan Agreement

The 1990 Chelan Agreement was developed as a cooperative response to the history of water conflict which has escalated in recent decades in Washington State. The Agreement brought together diverse groups with major interests in water resources including State, Tribal and local governments, agriculture, business, environmentalists, recreationists and fishermen. The Agreement emphasizes cooperative water resource planning on a regional basis as an alternative to litigation for scarce water resources. Legislation passed the same year supported the cooperative planning effort, and provided funding for two pilot areas to develop regional water use plans.

The Chelan Agreement also established the Water Resources Forum, a 24-member body composed of the aforementioned eight groups, which would act as a sounding board on State water issues for the Department of Ecology. Additionally, the Forum was charged with selecting the pilot planning areas, establishing guidelines for the development of the regional plans, and monitoring their progress.

During the Spring of 1991, the Water Resources Forum and the Department of Ecology solicited nominations of watersheds for the two pilot planning projects, one on the west side and one on the east side of the State. Over 30 watersheds were nominated. The selection was narrowed by placing emphasis on those watersheds which had substantial support from both Tribal and local governments. Based on the Forum's recommendation, Ecology designated the Methow as the eastern project, and the Dungeness-Quilcene for the western pilot project.

Nomination and Selection of the DQ Project

The Jamestown S'Klallam Tribe originally nominated the Dungeness watershed as one of the pilot projects, and was supported by Clallam County. The project boundary was eventually expanded by the Water Resources Forum and Ecology to encompass the entire northeastern Olympic Peninsula, including the Quilcene watershed. The intention was to expand the breadth of water use issues including irrigation, municipal and industrial use, and surface-groundwater interaction. It was also an attempt to test the process in a multi-governmental setting. The project involves local and Tribal governmental entities consisting of Clallam and Jefferson Counties, the Cities of Sequim and Port Townsend, the Jamestown and Port Gamble S'Klallam Tribes, and the Clallam and Jefferson Public Utility Districts, the State Department of Ecology, and Department of Fish and Wildlife, as well as Federal agencies including USFWS, USDA Forest Service, Olympic National Park, and USGS. Due to a lack of information on the Chelan process, it took several months to undertake the education on the Chelan Agreement which was necessary to convince all of the local and Tribal governments to participate.

Regional Planning Group Formation

Local, State, and Tribal governments began meeting in 1991. Government resolutions to participate were passed, government caucuses were formed, the Jamestown S'Klallam Tribe was selected as the interim Coordinating Entity, and the interim facilitator, Emmett Fiske was hired.

An initial public information meeting moderated by the Northwest Renewable Resource Center was held at Carrie Blake Park, Sequim, on October 15, 1991. Attendees were informed about the pilot project and were asked to sign up if interested in participating on a caucus. Based on that meeting, local mailing lists, and word-of mouth, a new mailing list was developed of all persons interested in participating. Individual caucus formation meetings occurred in the early Spring of 1991. In some cases, the Coordinating Entity was needed to convene caucus meetings to facilitate formation of the caucus, representative selection, and development of caucus goals. In other caucuses the Coordinating Entity attended to answer questions or was not involved at all.

In March of 1992 the next public meetings to introduce the project were held at the Jamestown S'Klallam Tribal Community Center. Interim caucus leaders were chosen to be contacts for the formation of the citizen caucuses. Each of the final eight caucuses chose two delegates and two alternates to serve on the Regional Planning Group.

At the first two public meetings, RPG structure and composition was discussed. Many potential participants were very concerned about the definition contained in the Regional Planning Guidelines which states:

> *In cases where consensus is not possible, decisions will be made by a consensus of the government caucuses and a majority of the interest group caucuses. Minority reports,* if *prepared, shall be included in the plan document.*

It was during this early formation period that the participants involved decided to adopt the Water Resources Forum's definition of consensus:

> *Consensus is defined as no negative votes, with abstentions allowed. If no consensus is reached, such will be noted and all the information generated during the process will be collected and made available to all participants.*

Early discussions also included development of caucus goals, adoption of RPG groundrules (see Chapter 12) and general procedures, the role of Federal agencies and ground-water users in the project, and review of the Regional Planning Guidelines.

Early Regional Planning Group Activities
In May 1992 the Regional Planning Group began meeting every third Tuesday at the Tribal Center. Emmett Fiske from Washington State University facilitated the early RPG meetings. The Jamestown S'Klallam Tribe's role as the Coordinating Entity was formalized by the RPG. Early projects included creation of a DQ Project budget, planning of educational field trips for the RPG, and beginning the Scoping process. In Summer and Fall of 1992 the RPG formed work committees including the Conservation/Education, Budget, Advisory/Facilitation, Technical, and the Scoping Committees. For more information on the details of committee activities, refer to Chapter 13: RPG Committees.

In August 1992 Community Design Exchange was hired to facilitate Regional Planning Group meetings through June 1993, per Advisory Committee recommendations. The Coordinating Entity hired Linda Newberry as DQ Project Coordinator and Cindy Young as DQ Project Assistant.

The RPG approved the Scoping Document prepared by the Scoping Committee in January 1993, and it was approved by Ecology shortly after submittal. In Winter and Spring 1993 the RPG began early issue discussions primarily through a series of educational field trips, presentations, and "Focus Session" informational work shops, intended to bring all of the RPG members to a common level of understanding about the water resource issues.

Two new positions were added to the DQ Project Staff. Linn Clark was hired as Data Management staff and Cindy Young was promoted to the Research Support position. These two new positions were created to assist the ongoing Technical Committee efforts to prepare information for RPG discussions and policy/recommendation formulation. The new positions allowed the coordination of technical consultants, development of the Tribe's GIS, compilation and maintenance of the Water Resources Library, technical support for work groups, and additional staff to compile the DQ Plan. Nancy Kovach was hired to fill the Project Assistant position.

The Regional Planning Group approved a proposal by the Education Committee to fund several existing educational programs for school kids and the general public. For a more detailed description of the projects, refer to Appendix C: DQ *Water Resources Education Plan.* A series of technical studies were funded Spring 1993 based on a proposal by the Technical Committee. The studies were completed in the summer of 1993 and the findings presented to the RPG, see Chapter 9: *Technical Support.*

Funding

In June 1993, at the end of the State fiscal biennium, the original funding from the Legislature was approximately two-thirds spent and the planning was only now beginning. The Legislature allowed $200,000 of the unspent funds to be carried over into the following fiscal year. At this point in the process, the Coordinating Entity met with the Advisory and Budget Committees to decide how the remaining funds should be used to best complete the project. It was decided that the work should continue full speed ahead until June 1994, rather than spreading the funds out until June 1995, and to use the funds primarily for staff support, rather than facilitation or additional technical studies.

Creation of the Plan

The RPG temporarily suspended regular RPG meetings in July 1993, in order to meet weekly in County Work Groups to focus on specific issues. A special workshop in September 1993 by facilitators Bob Ness and Katherine Baril on collaborative problem solving in a consensus process was intended to give RPG members new skills to begin forming recommendations. The weekly County Work Group meetings were continued until May 1994 with formal RPG meetings every two months. Work Groups discussed specific topics each week.

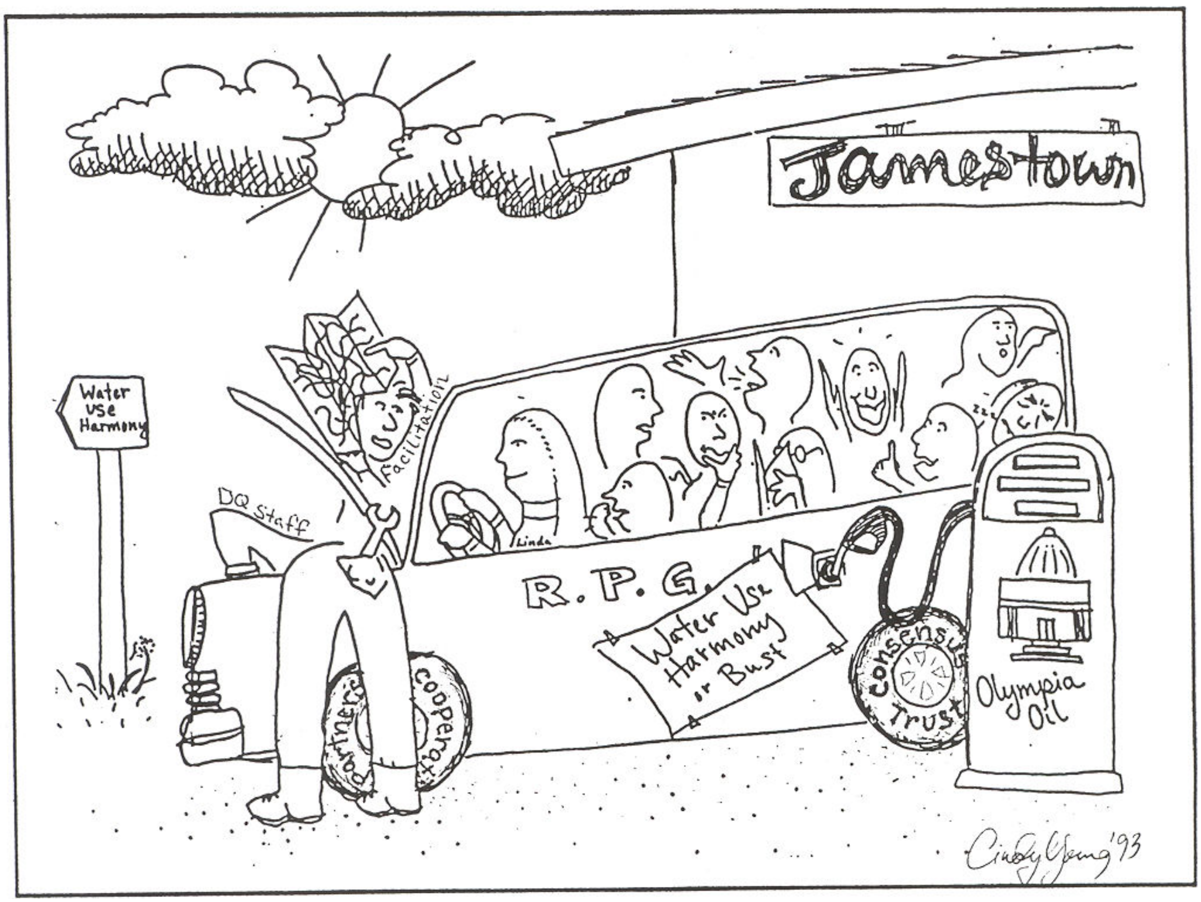
In December 1993, staff compiled early problem definitions, issues of concern, and recommendations into a "straw man" preliminary draft plan. Work Groups then focused on revising the recommendations. Staff prepared a semi-final draft plan in April and distributed it to RPG members, other active participants and to public libraries. May was dedicated to working out the last few "fatal flaws" which might prevent caucus support of the Plan as a whole. The final Plan was finished June 30, 1994.

The Regional Planning Group sees the DQ Water Resource Management Plan as a resource for on-going planning rather than a one-time plan "written in stone." Many elements of the Plan will require periodic re-evaluation. Also, many issues were never fully addressed. Implementation, in particular, is a major portion of the Plan which will require a continuing dialog between participating groups and agencies. See Chapter 8: *Implementation Strategies.*

Pilot Process Analysis Introduction

Over-all, the Dungeness-Quilcene planning process has been a positive one. With great efforts extended by all parties involved, progress has been made. Some great steps have been taken, and others, though very small, open the door to future opportunities, wise choices and better management of the water resources. Paraphrasing what one planning member said, *this is only the first step towards effective management of the resources.* It is a good one, a positive one, and one which may be modeled by other regional planning efforts in the future.

Figure 14.1: Early Depiction of RPG Process



As a State pilot project, there are many lessons to be learned, and the DQ planning group and staff hope that these messages will be listened to carefully. It is a long, hard road, with many obstacles, but it still appears to be one of the best ways to include all parties in a community-based planning effort. The local community took on the responsibility of looking at their resources and attempting to plan for them, and the DQ Plan and follow-up implementation is the result.

The perspectives presented in the Chapter are divided in the following way: Coordinating Entity, Staff, *and RPG/Caucus Members.*

Coordinating Entity Perspective

The following was contributed by Ann Seiter, Natural Resources Director, Jamestown S'Klallam Tribe.

1. Introduction
The Dungeness-Quilcene Water Resource Pilot Project provided a reasonable test of the Chelan process in a multi-governmental, multiissue setting. The major goals of the Chelan Agreement were addressed within the regional project, and regional planning guidelines were followed. The Plan has produced many substantive results, including valuable technical information, clearly recommended courses of action in water management, and positive relationships among water users, citizens and agencies. Community commitment to the project has been enormous, including in-kind services from Federal, State, and local agencies and Tribes, and invaluable contributions from interested and skilled citizens.

Although the following summary of problems or questions encountered, recommendations and observations may be redundant to staff and caucus perspectives, the Tribe as Coordinating Entity sees the following as the most relevant to future processes.

2. Selection of Coordinating Entity
Early phases of the project took a long time due to the need to educate all parties before they could participate, including local government and

the caucuses. Under Chelan, no Coordinating Entity can be selected until the RPG is formed.

Recommendations/Observations:

- Coordinating Entity should be chosen by the participating governments (State, Tribal, local).
- Initial scoping of the project should be done as a separate process from the plan development.
- The desire of the Jamestown S'Klallam Tribe to be the Coordinating Entity may have slowed the process for a few months due to the need to build trust. However we believe that we have adequately demonstrated Tribal capability to carry out this role.

3. Government Participation Process

The Chelan Agreement does not specify course of action if one of the participating governments says no.

Recommendations/Observations:

- Process should allow for a mechanism for a government to opt out if they so choose (abstention from process). Participating governments, including those abstaining, should be able to specify what issues and/or geographic areas can still be addressed without total participation. However, active opposition by a participating government would make planning impossible.

4. Caucus Formation and Representation

Some caucuses had difficulty in determining who should be their representative. There were many complaints about caucus representatives and no means to address problem.

Recommendations/Observations:

- If caucuses cannot choose own representatives, Coordinating Entity or a panel of 3 governments should be able to do so.
- Representatives should be approved or removed by a panel of the 3 governments..-Also see staff suggestions on this issue.
- Financial support for all caucuses is necessary, even beyond postage, mileage and phone, and should include a stipend of some kind to allow professionals to participate.

5. Boundaries
The project expansion to include both the Dungeness and Quilcene watersheds increased the project complexity enormously. These watersheds were too different, with different water resource issues and levels of readiness.

Recommendations/Observations:
- Planning areas should be defined into more cohesive units or broken into smaller units as early as possible in the scoping and planning process.

6.Consensus
Consensus is slow by nature. The group chose to attempt full consensus rather than the Chelan decision-making structure.

RecommendationslObservations:
- Stick to the Chelan model of decision-making.
- Use smaller work groups.

7. Scoping Issues
Planning effort was complicated by the linkage to other related processes such as GMA and PSWQA planning. Additionally, the group spent considerable time on administrative issues and process issues until two thirds through the project.

Recommendations/Observations:
- Important to build on work which has been done in other processes without being redundant. Consult regularly with, or get representatives who have familiarity with these other processes.
- Regional planning guidelines should narrow the focus of Chelan projects to some key issues so that the group can be more focused.
- An advisory/budget work group should be formed immediately to address administrative and process issues, so that the RPG can focus on substantive issues. The RPG should not be involved in administrative and budgetary decisions as it takes up valuable planning time -- leave this to the Coordinating Entity with input from the advisory group and Ecology.

- An analysis of available technical information was needed earlier in the process to help frame the issues and identify information gaps.

8. Unclear Implementation
Although the plan has managed to identify some actions which can be achieved under the initiative of the participants, funding sources to implement some of the plan elements are unclear.

Recommendations/Observations:
- Amend CCWF to indicate that water quantity projects are clearly eligible as well as quality, subject to an approved plan.
- Some financial resources should be reserved for project coordination after plan completion. We need another year of staff time to put some recommendations in place, prepare financial packages for the various components, and continue public education.
- Ecology must have the resources to implement the Plan. This was one of the goals in Chelan.

9. Uncertain Law
The Legal ground changes continually during the planning. Many RPG members were frustrated that their efforts were potentially wasted due to changes in legal interpretations or proposed legislation.

RecommendationsfObservations:
- Regional planning groups need assurance that their planning effort is supported through recognition in the Legislature.

Staff Perspective

The following was contributed by DQ staff members Linda Newberry, Project Coordinator, Linn Clark, Data Management Staff, and Cindy Young, Research Support Staff. Much of it is based on RPG input throughout the planning period.

1. Introduction
The issues, as in all basins, are complex, not easily solved, and their resolution is vital to protect the water resources, allow future growth which is coming to the peninsula whether planned for or not, and to maintain the high quality of life that we are blessed with on the Olympic peninsula. Staff does not want to indicate that we know all there is to know about how to do basin planning on this scale, but these valuable lessons have been learned, and may be critical for future basinplanners to understand.

Most of the lessons have to do with the fact that this is not a legal process, *rather it is a human process.* The needs of the humans involved, whether they are from governments, agencies, private landowners or interest groups or individuals must be considered, must be accommodated and must be respected in order to make the final plan meaningful, useful, and implementable. The expenditure of funds, in our case over $600,000 from the State added to local government inkind and direct funding, plus over 12,000 documented volunteer hours from non-governmental caucus members would have come to nothing if the human side of the project had been ignored.

On the whole, the staff found many positive results from the process. Some of these results include:

- Education of participants on water resources information, issues, and interests.
- Collaboration between traditionally conflicting water interests. A notable example is the Clallam Agricultural Caucus and the Tribal Caucus.
- The completion of a Water Resources Management Plan to provide guidance for future water management in the region.

There were also many aspects of the process which were not ideal and which may have caused a lower quality final product:

- A consistent level of frustration for all participants.
- Quick criticism which discouraged risk-takers, innovative ideas, and long-term thinking.
- General inefficiency of the use of time at meetings.
- Inconsistent caucus participation.
- The use of the consensus process to create one-vote veto power.

The ambiguity of the Chelan Agreement and the Regional Planning Guidelines was both a source of frustration, and a provision for flexibility allowing local customizing of the process. There were many aspects of the Chelan Agreement process which were interpreted along the way. Rules were created as needed, along with structure, process and definitions of consensus. Even to the last consensus decision, some members the RPG defined the word "consensus" differently than others, leading to major conflict and misunderstandings. A carefully developed and defined process at the beginning will help future planning groups function much more smoothly and effectively, with less frustration for the members.

2. Trust and Respect Issues

Maybe the biggest one element which is needed, and which has the possibility of destroying a planning, or any kind of effort, is the ability to trust and treat with respect the individuals involved in such an intense project. Initially groundrules were developed by which the RPG was supposed to function, and generally members have abided by those rules. But simply writing rules does not mean that anyone will pay attention to them. Certainly the educational efforts (field trips, focus sessions, etc.), helped the group start to develop trust in each other, and in the process. The Coordinating Entity and staff constantly has to provide the right circumstances to allow the group to feel comfortable enough to treat each other with respect. This means everything from providing comfortable meeting spaces, to keeping everyone well informed of all aspects of the project, to providing mechanisms which will "force" individuals to pay attention to the needs of the group.

There's nothing that will disturb the fragile "trusts" that have been built faster than misinformation, or information given to one party, and inadvertently not to others. Things which are simple and reasonable quickly become complicated and unreasonable when entities with very different goals and views are put together to do a major project. And by respecting each other, we do not mean simply not yelling names at another party. The showing of respect or disrespect can come in many forms, from showing disrespect by continuously dominating conversations at meetings, or consistently coming late and holding up the start of meetings, to more blatant forms which are obvious to us all. Though the members may never finally embrace each other, or each caucus viewpoint, in taking on this project, they agreed to consider of equal importance each of the caucuses goals and needs, and work towards a plan that will satisfy the whole.

A help towards building new trust and respect came unexpectedly through the dedication of the support staff from the State and Federal agencies to the DQ. These agencies were willing to free up time for employees with the expertise and background needed to help the planning members explore the resources and develop recommendations. New relationships between previously antagonistic parties were forged, while at the same time, vital information was given precisely when it was needed. Staff and many of the DQ believe that this consistent participation throughout the planning process enabled the work to go much farther than it would have without that support.

3. Defining the Planning Area

Because the local characteristics of the resources and issues are so complex, it is important to be careful about putting too many jurisdictions together. As originally conceived the western pilot project was focused on the Dungeness watershed, under the sponsorship of the Jamestown S'Klallam Tribe. Partly to make a "more interesting pilot project" which would be different than the Methow project, the Quilcene watershed was added, to form the Dungeness-Quilcene project. While on a regional level it may seem to make sense to do this sort of large-scale planning, in reality putting together two counties, two cities, and two watersheds with many sub-watersheds together creates many serious problems. In our case, Clallam County was much farther ahead in the GMA process. In addition, over 8 years of planning had already occurred on the Dungeness River through previous watershed planning efforts. That means that not only more was known about the resources and issues involved in Clallam County, relationships between the key parties --the Tribe, the County and the Agricultural Water Users -- had already been well established.

We added to that mix Jefferson County, which was lagging far behind in GMA planning, had relatively little experience in successfully sitting down with other vested interests to plan for its resources, resulting in a sometimes explosive atmosphere, and had little data known about water resources, except in the case of the City of Port Townsend's water supply from the Quilcene rivers. The parties in Jefferson County have had to work extra hard to come together to successfully plan, and some feel time was lost during a too-short planning effort. While it was agreed that there were definitely regional issues of concern, and that over-all planning should seriously consider neighboring watersheds, the issues turned out to be so County-specific, river-specific, and individual- or human-specific that the split into County work groups improved the planning effort immediately. Many feel that this should have been done at the very beginning, and have voiced that far too much time was "wasted" trying to make an, at best uncomfortable fit, work.

4. Time and Resource Issues

With all the best intentions, and all the best leadership and interpersonal skills, without sufficient resources and a long-enough timeline, a planning effort of this scale cannot be successfully accomplished. In our case, most of the first year was spent putting together the "structure" of the project: choosing the Coordinating Entity, caucusmember selection, establishing budgets and timelines, and developing goals and objectives.

It was realized early in the process that in addition to educating the RPG about the resources and issues, knowing the status of the water resources, with the identification of the gaps in that knowledge, was critical. The Technical Committee developed and refined a comprehensive list of both long-term and short-term information needs for regional water resource planning, and the GIS and data management system developed for the planning effort will be useful for future regional use. DQ support for already established and successful educational activities in the counties "spread the word" to the local community, and an educational plan which was written awaits future implementation.

All of these endeavors took a lot of time and resources. Without the information from the studies, the RPG would have been basing recommendations on poorly understood information, and sometimes faulty assumptions. Because the initial funding from the Legislature was for two years, an inordinate amount of time was spent worrying about, and trying to deal with the consequences of a too-short time to complete the plan. Sufficient time and resources, known from the beginning, would have alleviated un-needed stress on the RPG, and allowed productive work to proceed more efficiently.

5. The Planning Environment

One of the keys to success in the Chelan process is the creation of a constructive atmosphere. The contentious history and complexity of water resource issues facing society requires growth in an understanding of needs and problems, and a willingness to think beyond norms of the day.

In the DQ Project, the members of the RPG began collaborative problem solving after working together for over 18 months. A September, 1993 work shop by Katherine Baril and Bob Ness on consensus building, though late in the process, helped participants communicate constructively during on-going refinement of the recommendations. Both the Jefferson and Clallam Work Groups showed great progress in resolving conflicts during their year of intense work, though some conflict remained through to the last meetings.

Consensus decisions produced by cooperative planning and the atmosphere of trust are very fragile. Either can be entirely destroyed by the cascade effect of relapses between conflicting interests. The general level of stress and frustration caused by habitual antagonism or seemingly petty conflicts was a hindrance to bold efforts by members trying to develop innovative solutions. While to some degree this may be an unavoidable part of the process, staff agree that a better and easier process could be created by a more careful selection of caucus representation. This is imperative, to actively prevent the mistreatment of individuals and unnecessary frustration for those individuals taking risks. Participants must agree to respect other people's time, the finite funding resources, and the limited time available for planning.

6. Caucus Formation and Maintenance
The caucus structure is the backbone of the Chelan Agreement process. The differing view points brought be each member add valuable elements to the planning process. Each caucus must be a valid and functioning network of people to be effective in the spirit of the Chelan Agreement.

In the DQ Project, caucuses varied greatly in their size, representation, level of continued participation, knowledge of resources, communication skills, caucus decision-making structure, and ability to function constructively. There was concern throughout the process as to whether all caucuses truly represented their supposed interests. For example, the Business Caucus and Fish Caucus each had very few members, and may not have fully represented all of the concerns intended under the Chelan Agreement.

It is staff s view that each caucus should be responsible for proving to the other caucuses, and to the Coordinating Entity that it is fulfilling it's proper role in the process.

Each caucus should have:
- At least seven active members (2 delegates, 2 alternates and 3 others) from diverse backgrounds. If at any point in the process membership dwindles, the existing caucus members should actively recruit new or inactive members, although it is preferable to maintain the same core group for the sake of the level of common educational experiences and relationships developed throughout the planning process.
- Regular communication between delegates and caucus members.
- Regular communication between caucus members and other related organizations.
- Meetings together at least once each month.

- Representation from interests outlined in the Chelan Agreement. If the caucus does not represent the intended interest, then the name of the caucus should be changed to reflect it's true interest.
- Delegates who represent the interest of the caucus adequately, and not just their own concerns.
- The willingness to operate in good faith and to work within the process.

7. Delegate Selection and Responsibilities
The selection of caucus delegates is a crucial part of the planning process. Delegates must be able to spend a great amount of time at RPG meetings, committee meetings, communicating with other caucuses, and doing additional research and preparation. Delegates must possess leadership qualities, and while they should represent their caucus interest, they should not be ruled by opinions of individual caucus members. It is desirable to select delegates who are active community members, but they should not already be overwhelmed with other commitments. Also, conflicts of interest which interfere with; A discussions, such as participation in pending lawsuits against other participating agencies or individuals, should be considered in the selection, and at least openly acknowledged. Delegates should understand at the beginning, that as a planning participant they will be obligated to sign the "signature page" in the final Plan.

In the DQ Project, selection of delegates was left almost entirely up to the caucuses. However, staff would like to suggest that the Coordinating Entity, facilitator, staff, or some other neutral party participate or approve the selection of delegates. Selection of delegates should be taken as seriously as the selection of staff or facilitation. Caucuses should supply the Regional Planning Group with resumes and/or statements of qualifications including information on:

- Proven ability to work constructively in a collaborative process.
- The standing of the individual within caucus interests and as a community member.
- The interest of the individual to learn about complex issues.
- A willingness to be supportive of other delegates' efforts.

A limiting factor in the selection of delegates for interest groups was the volunteer status of the delegate positions. Although delegates were reimbursed for mileage, phone, and copying expenses, not every one was able to contribute the immense amount of time required to participate as a delegate. This caused hardships for some of the many dedicated DQ delegates. Funding should be considered as an essential element in future regional planning effort. Funding to compensate delegates for the long hours of meetings would allow more professional, and perhaps more representative individuals to participate in the process, and alleviate hardships on some parties.

Caucus delegates have the responsibility of consistent participation. It was very destructive and discouraging to have delegates who had not been involved in discussions to oppose decisions in the last hour. Recommendations to avoid this problem include:

- Voting privileges for delegates should be lost after missing 3 meetings in a row;
- Voting privileges should be reinstated at the third meeting after a delegate has attended 2 meetings in a row.

8. Delegate Review

The Coordinating Entity, facilitation, staff, or a committee of RPG members should review all delegate performances quarterly, or at least semi-annually. Delegates should enter the process knowing these evaluations will occur. These should include performance of delegate responsibilities to caucuses and contributions to the planning process. Staff, the Coordinating Entity, or a neutral party should keep records on complaints from other delegates for this purpose. If a delegate is thought to be breaking any groundrules or is severely lacking as a representative, and does not show sufficient willingness to improve, the delegate should be replaced to prevent deterioration of the process. It would be preferable to have the removal happen at the initiative of the caucus. However, if the caucus fails to act, the Coordinating Entity should fill this role.

In the DQ Project, no review of delegates took place or formal record-keeping of complaints to staff about delegate behavior, in part due to a reluctance by all members to name names and confront individuals. Also, there was concern that bringing replacement delegates or caucus members up to speed would delay the process. However, a new delegate did, in fact, join near the end of the process with no negative effects. In retrospect, a higher standard applied to delegates, regardless of possible replacements, would have been beneficial to the process.

9. Coordinating Entity Selection
Staff feel that the Jamestown S'Klallam Tribe was an ideal choice for the role of Coordinating Entity for the Dungeness-Quilcene Project. The Tribal facilities for meeting space and equipment, and office space and equipment were excellent. The Tribal Center's location was centrally located, making travel time to RPG meetings similar for both Clallam and Jefferson County participants -- about 30 to 40 minutes. The management at the Tribe also encouraged staff to meet very high standard of quality for all project activities.

10. Regional Planning Staff
In the DQ Project, staff played an active role in the DQ Project. Hired by the Coordinating Entity, at the peak of planning activity there were four positions: Project Coordinator, Project Assistant, Research Support Staff, and Data Management Staff. Their activities included meeting preparation and coordination, process guidance, consultant management, information preparation, and the writing of the Plan. Miscellaneous duties were assigned to staff to fill in any gaps left by facilitation, the project participants, and consultants.

Although originally it was hoped that a facilitation team would play an active role in on-going dispute resolution, keeping meetings on track, and guiding the process, the facilitation generally lacked the skills, the energy, or the familiarity with the participants and the issues to fill this role. Also, as more and more of the real work was done in small, frequent committee meetings, it became apparent that even when facilitation was effective, the RPG could not afford professional facilitation in addition to staff for all meetings. RPG member committee "chairs" were successful in guiding meetings to a point. But the bulk of the responsibility for guiding the process and keeping meetings on track quickly fell to staff.

11. Defining Staff Roles
A more defined role for staff would provide more effective meetings and leadership for the RPG. It was often unclear to staff members how

strong a role to play. On one hand, RPG members expected staff to lead meetings, and on the other hand, staff initiatives often were criticized.

Project Coordinator
The Project Coordinator was responsible for the primary coordination of all activities during the DQ planning process. This included hiring two positions, managing and coordinating staff functions, working with the Coordinating Entity within the structure of the Tribe, and general management of the project. More specifically, the scope of work ranged from interface with the public and media, to keeping meetings running smoothly (including, as it turned out, primary facilitation of meetings), to setting agendas, developing public meetings, developing and managing the budget with the Coordinating Entity, to major work with DQ individuals and caucuses, to the designing and writing of much of the DQ Plan. The last year of work entailed twice-weekly County work group meetings developing the draft Plan and working with the RPG members to re-write it until it met the needs of each caucus, while fitting within State and local governmental guidelines.

Project Assistant
The Project Assistant took care of the unending list of details requiring immediate attention including setting up meetings, publicity, preparation of meeting notes, mailings, caucus reimbursement accounting, file maintenance, and photocopying. Having this secretarial position allowed the other staff to attend to other important projects.

Research Support Staff
The Research Support Staff spent a considerable amount of time on various Technical Committee activities including management of technical consultants/contracts and compilation and maintenance of the DQ Water Resources Library, and acted as the general technical support for the DQ. After the Technical Committee activities slowed down, the position provided research support for committee meetings, and worked with the Coordinator on the DQ Plan.

Data Management Staff
The Data Management job could be divided into three main sections: GIS, computer support, and other technical support. The GIS work included setting up the hardware and software, learning the system, collecting data, and producing maps and analyses. This included data sharing arrangements with local governments, PUD's, and State and Federal agencies, as well as interpretating data into formats usable by the RPG. Computer and technical support was mainly for the DQ staff, though support necessary for the DQ caucuses and volunteers was provided, especially at meetings. Other technical support ranged from setting up and operating electronic equipment (ie. the video camera), to providing maps, literature, and educational materials. Because funding limitations caused the Project Assistant to be eliminated for the last 6 months of the planning period, the data management staff also helped with setting up meetings (including refreshments); one of the planning members labeled her as responsible for *the bits and bytes!*

12. Information and Planning Water planning involves many complex issues and requires a broad understanding of local hydrogeology, biology, human land uses and many other related topics. It is difficult even to define the problems without this knowledge.

There were two field trips at the beginning of the process, but most of the in-depth education of RPG and caucus members took place primarily after the Scoping Document was completed. General-topic "focus sessions" were held for the full RPG on subjects such as the principles of ground water, fisheries issues, agriculture issues and forest practices. RPG members and outside experts presented information on the topics and answered questions from the audience. While these were very popular at first, the list of topics needing coverage was never-ending, and interest by both attendants and organizers of the focus sessions seemed to wane after several months. Participants at that time had to attend frequent RPG meetings, many on-going committee meetings, technical consultant presentations, and caucus meetings in addition to the focus sessions. Also, many attendants complained that the general nature of the presentation often did not adequately address all issues relevant to specific areas within the project boundaries (though many of the sessions were very issue-specific).

An example of the most successful use of "focus sessions" is series of very specialized field trips and smaller ad-hoc work group meetings called to address Dungeness River aggradation issues. Experts and relevant agency representatives were invited to attend as participants and information resources, rather than as speakers. The group discussed the history and possible reasons for aggradation, types of gravel traps, fish habitat needs, and permitting processes on the lower Dungeness River. The first beginnings of recommendations for the DQ Plan came from this series of meetings. These meetings, which combined information and solution-oriented brainstorming in dynamic discussions, served as a model for the County Work Group meetings.

RPG members should be exposed to both general information on a broad range of topics early on in the process, and in-depth information when the group is ready to begin problem solving. The first six months of the process should be devoted solely to general education, allowing RPG members time to focus on understanding the "big picture" of water resources, do outside research and homework, share their knowledge with caucus members, and discuss and refine the issues with other RPG members. During this knowledge-building process, RPG members should also think of what additional information will be needed for planning which staff can prepare, or hire consultants to prepare.

Ideally a prioritized list of issues would come out of this understanding of the "big picture;" then staff could begin to organize work groups on specific topics. The RPG did not have consensus on the idea of prioritizing issues early in the scoping process. But in practice, the issues with the highest priority were dealt with first, because RPG members were most motivated to define these problems and pull together appropriate people for discussions.

Research Support and Data Management Staff worked with the RPG for the last 18-20 months of the project. Both the RPG and staff felt that it would have been helpful to have the both the research staff and data management position from the beginning, to begin early the long task of compiling water resources information and data into a useful form for the planning group.

13. Planning Work
Early County Work Group meetings tended to be general brainstorming meetings. Staff translated generalized ideas and miscellaneous comments into draft recommendations for the December 1993 draft plan. Once the Work Groups had "recommendation language" to work with, meetings generally became more focused and productive. Full translation from brainstorming to recommendations took a good deal of work by both staff and the Work Groups, which often revisited revisited the recommendation several times. Work Group "word smithing" was extremely time-consuming and frustrating to group members and staff, but seemed to be, for some, a necessary step towards full consensus on each recommendation. RPG inputs and suggestions were much easier for staff to compile, and saved great amounts of Work Group time, if they were already somewhat thought-out and in "recommendation language."

The Recreation Caucus was to staff, an example of a very constructive caucus, which took responsibility for fulfilling their own goals and helping the RPG make progress towards the creation of recommendations. The whole caucus participated in the preparation a set of recreation recommendations which were brought to each County's Work Groups. Recommendations which did not reach consensus were modified by the Recreation Caucus and brought back to the Work Groups for final approval. The Work Groups seemed to appreciate having such well-thought-out recommendations to work on, and, although the Work Groups did make some substantive changes to the proposed recommendations, the process was relatively painless and productive.

14. The Human Elements of Planning Consensus planning is a long, intensive process which demands extraordinary performance from participants. It is important to recognize environmental factors which affect people's behavior and help people cope with the stresses of the process. Elements such as fatigue, nutrition, the feel of meeting spaces, and other factors should be considered in the coordination of the planning process. The role of staff in the DQ Project was, in part, to help the RPG members and other active participants keep their "sanity," health, and some measure of balance through the process.

The many, many meetings in this consensus process were unavoidable. The switch to County Work Groups to concentrate on each watershed with regularly scheduled meetings (i.e. Monday and Tuesday nights) was successful, and the 5 PM to 7 PM time-slot worked well as a compromise time between the schedules of people who attended meetings as part of their jobs and those volunteers who had other day jobs.

RPG members and staff alike tolerated too much tardiness from meeting participants. It was recently estimated that by starting each meeting 15 minutes late (a conservative estimate), a total of 24 hours of meeting time was wasted in the Jefferson County Work Group alone. Meetings often finished late, going as late as $:00 to 8:30 PM. At times it was a great benefit to have a time limit on the room rental space in order to facilitate coming to conclusions on issues.

Refreshments were an important part of keeping meetings civil, and tiding participants over until their late supper. At the beginning of the process, refreshments were limited to coffee and store-bought cookies. By the end of the process the fare expanded to vegetable cuttings, fruit, fruit juice, tea, and home-baked goods, mostly thanks to a few generous individuals.

Meeting rooms should be large enough to avoid any sense of crowding. Other elements to consider when selecting a room are adequate natural light, the quality of the air, and past associations with the room (i.e. controversial, heated meetings held in the room). *(There did seem to be a connection between disastrous meetings and full moons...)*

15. Staff-Perspective Conclusions

People come together in community or regional planning efforts for various reasons: 1) it's their jobs to be there; 2) they care enough about their resources or special interests to invest their time in the effort; or 3) they have knowledge or expertise that is needed. We participate in these efforts for other reasons too which have to do with empowerment and fulfillment. Whether through continuing education about our environment and the needs of our communities, or by developing personal relationships with others, or by being able to help craft a plan which will provide for the water resources and the environment we work and live in for the next twenty years, our participation in projects such as the Dungeness- Quilcene and the Methow provides the opportunity to both educate and empower us, while expanding our horizons.

The intelligence, diligence, good-humor and dedication of many of the RPG has inspired staff throughout the process, and taught us all a great deal. It is hoped that future planning efforts will take into consideration the above ideas, so that more meaningful, and less frustrating work can be accomplished in this much-needed area of natural resources planning.

Caucus Perspectives

The following section was compiled by staff from a variety of sources. Some comments represent caucus points of view and others represent individual opinions, and these were identified whenever the difference was clear-cut. The primary source is from a May 1994 RPG survey on the process[1] *Not all members responded to the survey and so not all caucuses are represented. The Environmental Caucus submitted comments directly to Ecology and the Water Resources Forum. Other comments were pulled from letters to the Project Coordinator.*

In the May 1994 RPG survey, delegates were given a list of different aspects of the project under the categories of project structure, budget, planning work, and adherence to ground rules, and asked to rate them as poor (1), fair (2), good (3), very good (4), or excellent (5). In addition to rating different aspects of the project, many respondents included written comments. A total of nine surveys were returned, representing Local Government (2 responses), Tribal Government (2 responses), Fisheries (2 responses), Agriculture (1 response), and Recreation (2 responses) caucuses.

1. General Process

On the May 1994 RPG survey, all of the respondents rated the effectiveness of the overall process good (3) or very good (4), except one who rated it fair (2). Steve Moddemeyer, Tribal Caucus, felt that "Good solid progress was made toward goals." Also, most of the survey respondents rated the overall quality of the final plan very good (4) and a few rated it good (3). Marguerite Glover, Business Caucus, wrote in a letter to Linda Newberry:

> "The Business Caucus feels that this pilot project and the Plan is of importance to the communities within the Dungeness and Quilcene watersheds. Water is vital to all life, whether it be human, plant, or animal. Just like the fact that people of such diverse interests sat down, talked, tried to understand and accommodate each other, is noteworthy. Within our given time, we were not able to solve all issues, nor to conduct all studies. More needs to be done. We feel certain that, somehow, the five-year study of groundwater resources and hydrology will be

[1] The DQ RPG survey was based in part on the Methow Pilot RPG survey by Bob and Marianne Archey, Roundtable Associates.

accomplished. This will guide further implementation of the Plan. The Plan is a place to start. It is a good beginning."

Walt Blendermann, Fisheries Caucus, wrote:
"I was pleased that we were able to accomplish so much in the way of water conservation and awareness. We felt that the technical committee was particularly effective in identifying and working the right issues. The ability to identify pink salmon pools and actually implement habitat work in the river south of the 101 bridge with everyone cooperating was wonderful. The ability to stay within the scope of the Chelan Agreement was difficult, but attainable. We had a distinct feeling that at times it was ourselves, Tribal representatives, and irrigation facing a vocal real estate, business, and local government pro-development group."

Julie McCulloch, Local Government Caucus, wrote:
"From the Local Government perspective, the process was a step forward, although, as is often the case with government in general and public processes in particular, progress can be painfully slow and feel like two steps forward, one step back -- played over and over again. The time commitment was intense, especially for organizations and individuals already over-loaded with commitments. The effectiveness of the process cannot properly be measured at the current time because it is only the foundation of the work ahead. The capacity for implementation will be the true measure. The ability of all levels of government and agencies to work together and coordinate efforts without duplication is part of the over-all challenge of government in the 1999s and is critical for government effectiveness. Overall, the effort has been worthwhile as a viable starting point toward solutions for an extremely complex set of problems."

"...In spite of [consensus training and disappointing facilitation] slowdowns, relationships were built which will further the work. The technical studies are useful, and the progress made in assembling data on the DQ planning area is a significant step forward. It will be important to the future of this work that the equipment and resource base which exists with the Coordinating Entity be made available for continuing water resource planning. The commitment of all of the individuals involved is really what generated the successes we have achieved, and it is the brightest hope for the continuing challenges ahead for water resource planning."

Representing his own view, Steve Moddemeyer wrote: "We could have achieved great things and will settle for achieving something. A good overall effort, although its long-term benefits are still emerging."

2. Early Process

The process and structure for caucus formation was called good (3) by nearly all RPG respondents to the May 1994 survey, although one each called it very good (4) and fair (2). All of the respondents called the staff/facilitation selection process very good (4), except for the Agriculture Caucus who felt the facilitation selection process was poor (1). RPG respondents rated delegate selection from fair (2) to very good (4), with the majority calling it good (3). The Recreation Caucus commented that the selection was "excellent in some cases."

Many of the comments received by staff included suggestions for getting the process off to a better start. Carol Volk, Recreation Caucus, wrote:

> "Having Linda [Newberry] (Project Coordinator) from the beginning or near-beginning would have been desirable. Seems like we did a lot of "flailing around" before she came on-board. Ditto also Nancy [Kovach, Project Assistant] and Cindy [Young, Research Staff]."

Bob Wheeler, Local Government Caucus, representing his own view, wrote:

> "The early project completion time restriction hurt rather than helped. My guess is that many of us will still be at it 5 years from now."

Virginia Clark, Recreation Caucus, representing her own views wrote:

> "[There needs to be] administration planning and coordination by Ecology so future RPG projects can get off to a faster start. This includes getting staff and facilitators hired and available. Perhaps Ecology should assign a person to the project for the first two months to get it started."

Bob Wheeler, Local Government Caucus, representing his own view, wrote:

> "I think the group should have worked to achieve some early 'successes.` We should have agreed to focus on a few projects that could be accomplished quickly. With good support, both guidance and facilitation, we could have accomplished them. Early successes and celebration of

them would have helped us all, and guided us through the more difficult problems that came next."

"...I think the fact that we didn't focus immediately and closely with the Jefferson County Coordinated Water System Plan (CWSP) wasted a lot of time, effort, and resources for both projects. There are too many close ties between the Pilot and the CWSP to not have pursued this closer."

3. Scope of Work
From a September RPG exercise on **the pilot process, an opinion was** recorded on the easel: "The distinct difference between the 2 major watersheds and the 2 sets of jurisdictions made joint planning difficult. Limit future planning efforts to one watershed or area with significant commonalties."

Carol Volk, Recreation Caucus, wrote:

"The DQ Project was wastefully slow to focus because we did not have a clear initial outline of the Project scope and priorities. Early-on, participants must define the scope of the Project. In the Jefferson County workgroup, for instance, there are individuals who feel our work must be focused largely on instream flows, and other individuals who feel our work must encompass every single detail of water management in the County! This difference of opinion has been a frustration for many participants! If participants can not agree on the scope of their work, we should, early-on, at least agree to prioritization of our work. Prioritization would help us do the most important things first. Then, if we had time, we could address the less important issues. The extremely wide scope has at times kept us from addressing the most basic of issues."

Ann Seiter, Tribal Caucus, wrote:

"Focus the issues: In my mind the Chelan Agreement was clearly intended to primarily address water quantity issues, while recognizing that quality is an important component. Many peripheral issues were dragged into the process which precluded us from coming to grips with water quantity, instream flows and water supply and demand at a depth which was originally intended. While everything is related to water at some level, this process was not intended to solve all regional issues on growth management, water quality, wildlife habitat and flood control. Alternative funding sources and processes exist to address these, even if you don't like the results. Until the State comes up with a more comprehensive way of

> doing watershed planning to address the entire range of issues, future 'Chelan' projects should be more focused."

4. Project Structure
Nearly all respondents to the May 1994 survey called the effectiveness of the caucus structure good (3), although one called it very good (4) and the Fisheries Caucus commented that there is a "wide range between different caucuses." The effectiveness of the RPG structure ranged between fair (2) and very good (4).

Bob Wheeler, Local Government Caucus, representing his own views, wrote in December 1993:

> "I felt from the beginning that two separate groups, the Quilcene/East Jefferson and Dungeness/Clallam regions, should have formed with a loose tie to coordinate studies and efforts. It was just too big of a group to bring together easily. I think the split approach and then work to coordinate common issues would have been a much better approach."

5. Committee Structure
A comment written at an October 1993 brainstorm session on process said: Much of the real "work" in the DQ Project has taken place in Committees, topic work group meetings, by-County work groups, and other informal work groups. Work on specific issues outside formal RPG structure has been a necessary part of the process. Respondents from the May 1994 survey rated the effectiveness of the sub-committee structure between good (3) and excellent (5), the majority rating it very good (4).

Bob Wheeler, Local Government Caucus, representing his own views, wrote in December 1993:

> "I have a problem always falling into the traditional 'committee' routines. I think we should have learned about optional organizational structures and made conscious choices on what we wanted to do up front."

6. Facilitation
Facilitation was obviously a point of frustration for many RPG members throughout the process. All four Tribal and Local Government respondents rated the effectiveness of facilitation as poor (1). Both Recreation respondents, one Fisheries, and Agriculture respondents rated facilitation as good (3). One Fisheries respondent

rated facilitation as excellent (5). Comments attached to the ratings included "too costly" and "varied by facilitator." The number of comments regarding facilitation shows that it was very important to the RPG members.

Carol Volk, Recreation Caucus, wrote in March 1994: "Good facilitation would be very helpful! Often whole, valuable discussions have been 'lost' because a single participant redirected the flow of thought. There have been many instances, at least in the JeffCo group, where a facilitator could have kept us on track, to the completion of a discussion. It is difficult, as a member of the discussion, to recognize and/or re-direct stray talk. At the least, each meeting should be opened with a clear description of intended results. The agenda should set maximum time available for each agenda item. Good facilitation would have made the process fairer. The power of consensus has been tremendous, and at time we cowered to it. One person from one caucus, for instance, objects to the word 'prioritization,' ---and that effectively takes care of any prioritization we may have been able to accomplish."

Bob Wheeler, Local Government Caucus, representing his own views, wrote in December 1993:

"Good facilitation is crucial to the success of this type of project and I feel we were unlucky here. It just seemed that we could not get good facilitation, with the exception of when Katherine Bard facilitated one session. That was the first time people actually talked with each other."

Ann Seiter, Tribal Caucus, wrote on Facilitation:

"This was probably the biggest waste of funds in the project. Facilitation is a valuable element in these processes, but was not helpful here. The benefit was that the group learned largely to facilitate itself, but it was very hard on staff. In the future, a facilitator must be knowledgeable about the substantive issues as well as understand group dynamics, and must be able to work individually with caucuses to negotiate compromises,"

Steve Moddemeyer, Tribal Caucus, wrote in May 1994: "For the NW's leadership in consensus processes, we still seem to have a severely restricted pool of facilitators."

Julie McCulloch, Local Government Caucus, wrote in May 1994:

"The facilitation was a big disappointment, especially with 2 attempts, but it made us all more self-sufficient."

7. Process Work

When asked to rate the RPG's understanding of collaborative problem solving and consensus, respondents to the May 1994 RPG surveys were mostly split between fair (2) and good (3). One respondent rated it as very good (4) but followed with the qualifying comment that it "varies by caucus." Funding for fulfillment of RPG education/information needs was rated very good (4) by most respondents.

Bob Wheeler, Local Government Caucus, representing his own views, wrote in December 1993:

"There was no early training on consensus and collaboration skills which hurt us a lot. Since the whole process really hinges on trust, consensus, and collaboration, it is imperative for future projects to recognize this up front and deal with it early and often. I would equate this to a new process that is really taking hold in the construction industry and a process that the City of Port Townsend has successfully used in several projects. It is called 'Partnering.' It is a process that brings all the different factions together early on in the process to understand that if one party is not successful, then all parties fail. A group exercise was used at one of the City's Partnering workshops that I think would have helped us here. Each group (caucus) met and wrote out their goals, desires, and needs. Each group also wrote out what they thought the other groups goals, desires, or needs would be. Through group discussions in comparing these lists, a lot of understanding, teamwork, and consensus of goals was realized."

Julie McCulloch, Local Government Caucus, wrote:

"As we have all discussed many times, early training in consensus process with a capable teacher would have been extremely valuable. In reality, I recognize that such a person (teacher) is hard to find and we are blazing new trails."

On the issues of process work versus planning work, Roger Short, Agriculture Caucus, wrote that the "RPG spent too much time on process rather than trying to solve problems."

Ann Seiter, Tribal Caucus, wrote:

"While some individuals felt the process is the product, I believe that the opportunity for substantive decisions was often wasted due to endless discussions on the process. More structure in the regional planning guidelines would help, although it would remove some local flexibility. Many RPG members felt that we needed consensus training at the onset. I am not opposed to this concept, but doubt its value. Consensus training in the abstract is just that (abstract). More field trips or practical projects would teach consensus in a real sense. And all the training in the world will not change those individuals who fail to listen or offer solutions."

8. RPG Education and Information
Respondents to the May 1994 RPG survey rated the availability of information as either very good (4) or excellent (5). Also, the adequacy of information provided to the RPG was mostly rated as very good (4), in addition to a couple of good and excellent ratings. Roger Short, Agriculture Caucus, wrote: "I enjoyed all of the focus sessions." Funding for fulfillment of RPG education and information needs was rated as very good (4) by five respondents, and one each for excellent (5), good (3), and fair (2) with the comment that we "needed a consensus workshop."

Carol Volk, Recreation Caucus, wrote in March 1994:

"The watershed tours and focus sessions -- largely organized by volunteers -- were invaluable in getting to know the watersheds and each other ....The DQ Technical Committee has provided the RPG with technical information so we can carry on intelligent discussions with each other. Concentrating on this technical information early. in the process is important."

9. Planning Work
When asked to rate both the effectiveness of RPG meetings and use of time at meetings in general, respondents varied from poor (1) to very good (4), with a majority having selected fair (2). Ratings on the planning work's success in meeting schedules and timelines varied from fair (2) to very good (4). Achievement of the orderly and open meetings groundrule was split between good (3) and excellent (5), with one rating of very good (4). Ratings of staff write-ups of RPG discussions were evenly split between very good (4) and excellent (5). Regarding the groundrule on encouraging group creativity and flexibility, RPG members rated it either good (3), or very good (4), with a slight majority calling it "good." An additional comment was made

by the Fisheries Caucus that "sometimes, [there was] a bit too much 'flex!'"

Bob Wheeler, Local Government Caucus, representing his own view, wrote in December 1993:

> "This project has only moved as far as it did because individuals and sometimes caucuses, were willing to take risks. The general group approach to this tended to be negative when a risk was taken. I think the group attitude should be positive to risk-taking, even if in the end the idea changes or drops out. Tied in with risk-taking is the need for some flexibility and allowing for 'mistakes' to be made. There is no 'set' pattern as to how to do this type of project, so flexibility and mistake-making are going to happen and are actually necessary learning steps toward ultimate success of a project of this type."

Roger Short, Agriculture Caucus, wrote:

> "The group spent too much time 'word smithing' I think that should be left to staff."

Ann Seiter, Tribal Caucus, representing her individual point of view, wrote:

> "I'm not certain that I would recommend this exact structure to the Tribe again for future watershed planning. While it is good in providing recognition for tribes as governments, and has excellent opportunity for public participation, it is a time sink unless the caucuses all send good representatives who are willing to work constructively on a defined range of issues."

10. Use of Consensus

When asked to rate the RPG use of consensus in adherence to the original groundrules, survey respondents to the May 1994 RPG varied from fair (2) to very good (4). RPG success at achieving consensus in planning work was also rated from fair (2) to very good (4).

Carol Volk, Recreation Caucus, wrote in March 1994:

> "Following the definition of 'consensus' as outlined in the Chelan Agreement may have given us more flexibility than the more restrictive definition the RPG adopted."

Carol Volk, representing her own views, added in May:

> "Since Draft #2 has been available, we have especially felt the power of our restrictive definition of 'consensus' The RPG definition of consensus

has led to minority rule -- which could have been prevented by adopting the Chelan definition of consensus."

Ann Seiter, Tribal Caucus, wrote in May 1994:

"We should have held to the Chelan Agreement decision-making structure. It was not appropriate for one caucus to continually be able to oppose recommendations, particularly when their objections were not clear."

Virginia Clark, Recreation Caucus, wrote:

"Stick to the Chelan Agreement definition of consensus. We had minority rule, not a real planning process, on many occasions in the RPG general meetings. Need a way to level the playing field so members with disparate agendas do not waste meeting time and play dictator."

11. Goals

Achievement of and adherence to goals includes Caucus goals, RPG goals, and Chelan Agreement goals (see Chapter *11: Goals and Objectives).* Regarding adherence to Chelan Agreement goals and issues, respondents to the May 1994 survey were spread between fair (2), good (3), very good (4), and excellent (5). The Fisheries Caucus commented that the adherence was "thin on implementation details." Regarding achievement of RPG goals, respondents were spread between fair (2), good (3), and very good (4), with a slight majority calling it "good." RPG respondents to the May 1994 survey rated achievement of caucus goals somewhat evenly between fair (2), good (3), and very good (4).

Dana Roberts, Fisheries Caucus, wrote in May 1994:

"My opinions on this Question [Caucus view point] aren't too solid; having joined Fish Caucus half-way through the game, I'm unsure of what our Caucus's initial goals were. That said, it seems as if we did get considerable acceptance of our views and urgings. However, along the way, Fish Caucus did lose the participation of a strong-willed proponent, due in good part to medical necessity. Had his time allowed, we may not have been able to conclude as I just did in my second sentence in this paragraph."

Ann Seiter, Tribal Caucus, wrote:

"The project generally met caucus goals of 1) working towards a net gain of productive fish habitat; and 2) demonstrating tribal leadership and a cooperative role in the community. The Tribe remains concerned over the lack of certainty that the Plan will actually be implemented, and the lack of binding agreements for future water use in times of shortage and in the face of significant growth and transition from agriculture. If the major implementing parties (Water Users, Ecology, County and Tribe) cannot deliver on these actions, we are back to square one. However, the Tribe recognizes the strength of the Plan in that we do not need 100% cooperation to achieve positive results, the gains are immediate, and implementation can be largely achieved through local efforts and is not completely dependent on outside funding or agency action."

12. Delegate and Caucus Participation

RPG respondents to the May 1994 survey called the commitment of participants to the planning process fair (2), good (3), very good (4), and a majority called it excellent (5). Regarding the commitment of participants to implementation, RPG members called it fair (2), good (3), unknown, and a slight majority called it excellent (5). Responses to the question of adherence to the RPG groundrule on responsible representation by delegates varied from fair (2) to excellent (5), with a majority calling it very good (4). A comment was made by the Tribal Caucus that the representation was "generally good, with a few notable exceptions."

Several issues were addressed by comments from RPG members in the May 1994 survey: the great commitment of time by delegates required for participation and the adequacy of funding for caucus participation. Carol Volk, Recreation Caucus, wrote in March 1994: "Participation is an issue. We had incredible, full-time volunteers on one hand, and empty RPG seats on the other hand. We also had individuals who thought they were making an initial volunteer commitment of about-once-monthly meetings for two years. We are meeting on a weekly basis now, and the process will be closer to 2 112 years. This can (and has?) eliminated important individuals from the process when we most need them. Especially with the volunteer members of the RPG---it is difficult to commit to full participation in a Process when the commitment needs change half way through. Again, early-on, perhaps participants should agree to a particular level of commitment throughout the two-year process."

Roger Short, Agriculture Caucus, representing his own view, wrote:

> "It's not fair for me to devote the time that I have devoted without compensation. Not only did I not get paid, but I had to hire an employee to replace me at the dairy for every hour I was gone. Plus there were production losses."

Dana Roberts, Fisheries Caucus, wrote:

> "Wish I could speak accurately as to other caucuses; particular instance: Pope has apparently laid back from JeffCo's Business Caucus, yet we know they're a major, major landowner-developer-forestry (=business) interest."

Steve Moddemeyer, Tribal Caucus, wrote:

> "Funding for Tribal participation was not sufficient. It forced other work of the Tribe to be held back due to time commitments of the DQ Process. I was unable to contribute the time and energy necessary due to funding constraints of caucus representation."

Ann Seiter, Tribal Caucus, representing her own individual point of view, wrote on the selection of representatives:

> "The Chelan Agreement allows every caucus to select their representatives, a very democratic notion. However, more structure is needed to help caucuses through this phase. Additionally, a mechanism is needed to allow the group to remove representatives that are obstacles to the process . This does not mean they should be removed because they don't agree with substantive decisions, but individuals who continually waste the group's time, have personal problems or lack commitment to the project's goals should be replaced. On the other hand, I don't know what we would have done without the contributions from some of the caucus representatives, particularly agriculture and recreation."

13. RPG Member Relationships

RPG relationships covered in this section include relationships within and between Caucuses, and between the RPG, the Coordinating Entity, and Staff. Regarding the interaction and communication within caucuses, a comment was made by the Tribal Caucus that it "varies a lot depending on the caucus." The Local Government and Recreation Caucus respondents called the inter-caucus relationships very good (4) and the remaining caucuses called it either fair (2) or good (3). The interactions and communications between caucuses are rated from fair (2) to very good (4). The caucus interaction between the DQ Project and the WRF was split fairly evenly between fair (2), good (3), and very good (4).

Adherence to the RPG groundrule on respect and good faith between RPG members was rated between fair (2) and excellent (5), with most calling it good (3). Level of trust between caucuses in planning work ratings ranged from poor (1), to excellent (5), and everything in between. The written comments listed below also exhibit a wide range of opinions and view points. Steve Moddemeyer, Tribal Caucus, wrote: "Increased quality of interaction between points of view was achieved. A lot of growth by different caucuses was noticed."

Dana Roberts, Fisheries Caucus, representing his own views, wrote: "For my own part, it has felt as though my own perspective and outlook 'sold' pretty well and I can't complain."

Roger Short, Agriculture Caucus, wrote: "There was always the feeling that our rights were being threatened. The finger was pointed at Ag., logging, and development as being the main reason for lack of fish. 'Roger' you are just doing the homework for the Tribes before they go to court. I do hope we don't end up in court though."

Roger Short, representing his own views, wrote: "I thought we had learned to trust and cooperate. But the last meeting destroyed all of that. I do not think the Environmental Caucus came to the table to work out a solution. I feel their mission was to stop anything I wanted."

Carol Volk, Recreation Caucus, representing her own views, wrote: "Through this ever-frustrating 'process,' I have learned much from some very good people!"

Bob Wheeler, Local Government Caucus member, representing his own view, wrote: "Overall, the project will be a success because personal relationships were developed that will allow for continued plan development after the official project ends next July. The whole process really comes down to a trust, consensus, collaboration building exercise and its ultimate success will be contingent on how well we built this trust."

The aspects of the projects which seemed to have the most agreement between respondents of the May 1994 RPG survey are the RPG relationships with Ecology, Staff, and Coordinating Entity. Respondents called the RPG/Ecology working relationship either very good (4) or excellent (5), with a clear majority feeling it was "excellent." RPG members felt similarly about the RPG/staff working relationship, although "very good (4)" was a slight majority over excellent. Coordinating Entity/staff communication with DQ participants was also called very good (4) or excellent (5), with a slight majority feeling it was "excellent."

14. Funding and Accountability The adequacy of State funding for the DQ Project ranged from fair (2) to excellent (5), with a majority rating it very good (4). An additional comment from the Agriculture Caucus was that it was "too much." Responses on the question of the adequacy of the budget for caucus support ranged from fair (1) to excellent (5). Nearly all respondents rated the budget for fulfillment of staffing needs as very good (4); one person each called it good (3) and excellent (5).

There was great variation in responses on the question of the overall cost effectiveness of the DQ Project, from poor (1) to excellent (5) to unknown and no response. Responses on the question of the cost-effectiveness of DQ-funded educational projects varied from fair (2) to excellent (5), the majority being good (3). Responses on the question of the cost-effectiveness of DQ-funded technical projects varied from fair (2) to excellent (5), the majority feeling that they were excellent. A comment was added from the Fisheries Caucus that they "varied somewhat: Lichatowich's work was superb!!"

Respondents to the May 1994 RPG survey rated RPG accountability to funding sources, caucuses, and general public between good (3) and excellent (5). Most of the respondents felt both the Coordinating Entity's management of funds and the RPG relationship with the Coordinating Entity on budget issues was either very good (4) or excellent (5), although one person called it good (3).

15. Staff / Coordinating Entity
Respondents to the May 1994 RPG survey called both the effectiveness of the Coordinating Entity and the effectiveness of staff positions either very good (4) or excellent (5), the majority calling them very good (4). Steve Moddemeyer, Tribal Caucus, wrote: "Excellent staff, excellent and professional job of Coordinating Entity." Roger Short, Agriculture Caucus, also commented that the project "had a good staff." The RPG/staff working relationship was rated either very good (4) or excellent (5), with a slight majority on the very good (4) side.

Volume 2

Chapter 15

Linkages: Regulatory Programs & Local Influences on Water Resources

Chapter 15
Linkages: Regulatory Programs and Local Influences on Water Resources

General Background

This Chapter summarizes the DQ responsibilities under the Chelan Agreement, the Environmental Protection M.O.U. and the Linkages considerations of the Agreement and the Regional Planning Guidelines, (see Chapter 12). Familiarity, if not understanding of the laws, regulations, ordinances, and jurisdictional systems currently used was attempted. The DQ Library serves as the repository of a rather extensive working collection of documents and commentary, (see Chapter 4, *Information Resources.)* The initial collection from Ecology's *Laws and Regulations - Water Resources* (Revised December 1991), has been updated as codes have been revised 1992, 1993 and the coming 1994. WACs have been secured. Caucus members have contributed materials from their various files, and various agencies and divisions, and local and federal branches have contributed on requests made. At this time, the collections have not been computerized, but have been available in the Library under the Policy, *Law and Government* file. The (what some would call) "unorganized" nature of this file had in itself "linkage" potential as caucuses pawed their way through other unfamiliar disciplines.

From time to time there was impatience and dissatisfaction with "the law," perhaps because the group had insufficiently realized the difference between statutory and case law. We had no attorney at the table or available to the project. Several specific requests were made to Ecology for enlightenment, but in general, the DQ project proceeded on its own.

1 This Chapter was prepared by Betty Joyce Enbysk, PhD, who is an alternate delegate of the Environmental Caucus.

It is our understanding that the Plan will be reviewed, and approved or remanded by Ecology, Water Resources under *applicable State and Federal laws and* regulations, and that Ecology, Water Resources is the SEPA applicant and lead agency issuing a DNS. There remains the question of a possible remand to a project which sunsets within the 90 day review period.

Ways to Look at Water Law

During the course of this project, several compendia of water law have been produced: a *vertical look* -- Federal to State to local; *a topical look* -- water rights, water conservation, water quality, ground water, estuaries, shellfish protection, storm water, NPDES, SEPA, NEPA, wellhead protection, public health; and *planning law -- public* water supply, state land use RCW's, Shoreline Management Act, GMA and ramifications thereof. Also considered were: various enabling legislation allowing for districts or protection areas at the discretion of the county or city; permits, aquatic lands and forest practices, and the leasing regulations of DNR; the FDA-DOH shellfish protection connection with Ecology's ambient monitoring and surface water regulations; wetlands regulations; Ecology/DOH water re-use (for what and where); and on the fringes, the scenic and public access issues; as well as public information rules, and State and local budget requirements -- all dealing with WATER. It had been suggested early on that we produce a diagram for this Chapter, e.g. for the DQ area, far each County, and for each City. What resulted were five plates of spaghetti, with a sauce of *case law,* seasoned with *property rights,* and a dash of the *public trust doctrine.*

Perhaps the best presentation we could make far this Chapter is to suggest to borrow or buy a copy of the Water Resource Conference "The Sinking Creek Decision: Water Rights in the 21 st Century," sponsored by the University of Washington School of Law, and the Institute for Environmental Studies (Washington Law School Foundation, 1994). There is something in it for each caucus of the Regional Planning Group.

In summary, the DQ did the best it could with the morass of laws, regulations, ordinances, etc., as time and talent permitted.

Linkages in the DQ Project

This section speaks to DQ Goal 7: *To encourage compliance, enforcement and administration of existing laws and regulations affecting water resources.* Various RCWs are footnoted in the Recommendations Chapters, and international/national and state wildlife regulations are detailed in the Appendix E, *Habitat/Wildlife/Wetlands* discussion.

An Example of Linkages at the Local Level A more intense consideration of *legal* linkage was necessitated by the on-going attempt to negotiate the examined real needs of irrigators and salmonids in the Dungeness River (see Chapter 6). All parties needed to really understand the implications of the Public Trust Doctrine, beneficial uses, riparian rights, adjudicated and non-adjudicated rights, the differences between Irrigation District RCWs and Irrigation Company statutes, Trust Water Rights pros and cons, water leasing concepts, and costs and pricing connections. Also important to consider were the actuality of consumptive, partially consumptive and non-consumptive classifications, and the over-riding complications of the Point No Point Treaty interpretations.

This DQ negotiation in the Clallam County Workgroup is a miniature of that with which the Chelan Agreement was supposed deal. That it could be done at all required an act of faith. Unanticipated linkages were often introduced by You can't do that!, followed by Well, maybe there's a way. This hard-working group insists on "ground truth," not hypothetical diagrams or garbled third-party, mixed message opinions. A somewhat exasperated statement was offered early on in the DQ process: Eschew paper water rights. They do not float fish or skippers or kayaks, do not grow hay or broccoli or water the herd, do not make the water taps flow on 'on, 'and in fact, do not provide for milling the paper they are written on! But the group perseveres with implementation strategies through the suggested Watershed Councils proposed in Chapters 5, 6 and 7, and continues the "ground truth" efforts set out in Chapter 8, Implementation Strategies.

The Link from Estuary to Headwaters: Some Agendas Not Addressed

A major linkage residing in the Clean Water Act was not addressed (see Chapter 14, *The Unfinished Agenda).* This linkage concerning estuaries, both actual and jurisdictional, has yet to be explored, as RPG priorities led in other directions. The basic connection to recognize comes from the Clean Water Act as amended by the Water Quality Act of 198'7, Public Law 100-4 Section 320 (March 1988), NATIONAL ESTUARY PROGRAM - Puget Sound:

> *The term estuarine zone shall also include associated aquatic ecosystems and those portions of tributaries draining into the estuary up to the historic heights of migration of anadromous fish or the historic head of tidal influence, whichever is higher.*

The link also was missing the input of DNR Aquatic Lands Division and the requirements of Chapter 332-30 WAC dealing with aquatic land planning, public use and access, aquatic land environmental protection, marine aquatic plant removal and river management.

The actual implementation of Washington Forest Practices Rules and Regulations Title 222 WAC (which had resulted from Timber Fish & Wildlife negotiations), was a neglected agenda. The 9/1192 edition produced by the Forest Practices Board and Ecology was not consulted for its potential to the proceedings. Discussions/recommendations on the lacustrine environment, and the Coastal Zone Management Act and its re-authorization as CZARA Section 6217 Guidance was also missing from the deliberations, as was the Shoreline Management Act manual for local master program preparation.

Linkages Under the Chelan Agreement

The Chelan Agreement describes linkages to be considered by the Regional Planning Projects: *Regional planning efforts need to recognize the existence between a variety of other planning activities In scoping and developing regional plans, participants should avoid* duplication: The following **Parts A - D** address linkages required under the Chelan Agreement.

Linkages -- Part A
There is recognition that water withdrawals can impact water quality. Water quality should be integrated into the planning process. The DQ Goal 3, Objectives A, B, and C speaks to this integration: To *achieve the assurance of the quantity and quality of the water that is needed in the planning area... All* DQ work has included both quantity and quality. At this time there is a need to integrate point and non-point pollution sources and monitoring; a need to integrate surface and ground water, and reuse considerations in quantity and quality terms; and a need to define aquatic life needs in both qualitative and quantitative terms. Although the environmentalists have long declaimed that *dilution is not the solution to pollution,* reasonable persons will also agree that *the poison is in the dose. Justice* Sandra Day O'Connor deemed a distinction between water quality and quantity "artificial," in the Supreme Court ruling that allowed the State to set a minimum river flow standard for a proposed hydroelectric plant on the Dosewallips River insofar *as necessary to enforce a designated use contained in a state water quality* standard.[2]

The Department of Ecology is attempting a water quality, watershed approach utilizing the "total maximum daily loads," (TMDLs) process required under Section 303(d) of the Federal Clean Water Act. The watershed approach involves coordination on a geographic basis, the issuance of wastewater discharge permits and nonpoint source controls, with water quality assessments required by the Clean Water Act. Unfortunately for the DQ area, barring the triggering of an emergency response, the area is far down the list for incorporating into this process

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2 Peninsula Daily News. *High Court rules on Power Plants to Protect Fish.* May 31, 1994.

(at least 5 years). This negates the preventative approach which DQ finds important.

Linkages -- Part B
Local land use planning and permit decisions should be compatible with water resources planning. This section has produced, and continues to produce stormy discussions away from the RPG tables. The ramifications of the Growth Management Act (GMA) relative to DQ goals and agencies' responsibilities occupy the 10 *foot shelf of proverbial concern.* That the DQ process was concurrent with GMA provided initial distrusts and continuing distrusts among some of the participants. It is through the required comprehensive plans' reaching the zoning ordinances stage, that the DQ recommendations will be put in place. Each agency has been forthcoming with *notes* of their duties and planning for GMA. The DQ hopes that this planning process has at least contributed to enlightened self-interest, as the various caucuses return to GMA finalization processes occurring locally in each County.

Agency Participation at the Local Level Linkage face to face (or muddy boot to muddy boot), with the various agency specialists was perhaps the mast valuable activity of the project. 7KT, PGKT, PNPTC, USFS, USFWS, USGS, USSCS, WDOE, WDFW, WDOH and other acronyms assumed human shapes. Presentations and field trips and public meetings brought together people actually doing their jobs, rather than just talking about it. The DQ ended up knowing local experts on County and City staffs, consultants, local scientists, engineers, farmers and fishermen, real estate agents, shellfish growers, planners, water system employees, streamside residents, well drillers, ditch walkers, hatchery managers, educators, paper mill personnel and folks with a water resources *concern. This* sort of linkage can be maintained through the informal group envisioned in Chapter 6. Linkage had to take place to produce Chapter 2, the Characterization of the area, and Chapter 3, *Water Use.*

Information Resources The library collection centered at the Jamestown S'Klallam Tribe provides another kind of linkage, whereby agency regulations and best practices advice, and various how to do its become readily available far perusal or copying. Topics include biology, bioengineering, conservation, education, history, hydrology, geology, planning, water loss calculations, GIS presentations, wetlands, stream flow rates, (see Chapter 4 for information on the DQ Library). We hope the collection can be maintained and expanded.

A specific kind of linkage developed, through data collection and presentation efforts -- the electronic link to the world. Technical Committee people, Welden and Virginia Clark and *staffer Linn* Clark, by using shared and purchased equipment, were able to secure and massage data, making it fit for DQ consumption. We hope that County and City cooperation through GIS will continue and extend these efforts for continued planning efforts, (see Chapter 9, *Technical Support).* Would that knowledge and stewardship could be so readily transmitted, but that is the linkage for the educators (see Appendix C).

Other Chelan Planning Processes

Linkage with the Water Resources Forum (WRF), and our fellow pilot in the Methow was variously maintained. WRF activities and minutes were always made available through member Ann Seiter (JKT and PNPTC), as were official Methow progress notes and the final Plan. Consideration by RPG of either can be characterized as *modest.* However, WRF's "Groundwater Recharge Preservation Policy," (12/9/93) was examined and adopted for the DQ Plan by the Jefferson County Work Group, (see Chapter 7, Ground Water J.6). The visit by the Forum in September, 1993 to the RPG was considered very valuable to both the DQ and the WRF members.

Legislative Linkages

Linkages to the Legislature and the Congress was maintained through individual caucuses' normal networks, and registered lobbyists. Staff also sent regular reports to the Legislature and Ecology, and was available to answer questions from interested Legislators. As indicated in Chapter 10, *Unfinished Agenda,* suggesting and working for RPG project-specific recommendations was not a part of this project. (Several members remarked that we had enough trouble interpreting linkages to existing "laws on the books.") However, *what's happening* and *what's going to happen* information was shared through newsclips (the Library contains a notebook of water-related articles for the entire planning period), copies of pending bills (the Business Caucus was especially generous with this sharing), and requests to staff for specific items of interest.

Financial Considerations Not altogether in jest, the need for a linkage to Fort Knox was suggested from time to time. The exigencies of local, State, Tribal and Federal budgets cannot be ignored in appraising linkage possibilities. Plans created by agencies and former Memoranda of Understandings may become inoperative under present and future budget constraints. These memoranda and plans should be reviewed realistically and without recrimination, as they were entered into in good faith. According to the National Congress of State Legislatures, there are present (1994), 185 State and Federal mandates coming down for implementation by local governments. This puts all governments in a mad scramble far grants and revenue allocations from whatever sources are available at the moment's need. Citizen and local governments scream over unfunded mandates, and MOAs echo up and down the linkage tracks.

From SOUNDWAVES/PSWQA, Sept. Oct. 1993

Integrated planning and funding necessary for effective water quality protection

Sound Off is devoted to issues of concern to Puget Sound citizens and leaders. In each issue of *Sound Waves*, the Authority features citizens and community leaders expressing them views on water quality issues. This issue we feature Paul Parker an associate with the Washington Association of Counties. He specializes in environmental, land use and resource issues.

Counties need the financial ability and incentive to coordinate planning and management of water resources with cities, tribes, special districts and state agencies on a watershed basis. Successful coordination of water-related programs and their integration with land use planning should reduce costs and assist in eliminating or consolidating some programs. Coordination is key to creating the efficient and effective government that citizens are demanding.

Unfortunately, ordination is discouraged by limitations on funding sources to specific activities. A county wishing to address water quality and water supply issues must draw upon at least two or three different statutes creating different authorities to plan, manage and fund water-related activities. Greater flexibility in raising funds and using them for managing and coordinating watershed activities should not only result in wiser expenditure of public dollars, but increase public confidence in efforts to protect the environment.

Although the Department of Ecology is undertaking a coordinated watershed management approach, it is logical for coordination to begin at the focal level since water supply and water quality are so intertwined with land use, to addition to the need for greater flexibility in raising and using money, the state could encourage coordination by providing counties, cities, tribes and special districts participating in a coordinated effort a priority for state grant and loan funds.

Linkages -- Part C

What, if any, linkage exists between on-reservation and off-reservation use and management? This presented no problem to the DQ. The focus was maintained on the subjects spelled out in the Scoping Document, and the XT and PGKT holdings and business dealings were their own, and handled by other star than were involved in this project. The Natural Resource Departments of the Tribes contributed heavily to the project, especially on Dungeness River issues, since these occurred in their usual *and accustomed areas of use.*

Linkages -- Part D

Other Federal, State, and local programs impact the water resources in the DQ region. In the list described in *Linkages* in the Chelan Agreement, the DQ considered all except those specifically focused in other areas of the State, e.g. Columbia *River Systems Operation Review* (see Chapter *12, The Chelan Agreement).* The following listing of Federal watershed programs are derived from the *Significant Watershed Activity Survey.*[3] More complete descriptions of each program and project may be found in that document, or in each plan.

Federal Watershed Programs

Clinton Administration Forest Plan: The Forest Plan seeks to prevent further degradation, and to restore habitat over broad landscapes as opposed to individual projects or small watersheds. Watersheds containing the best habitat, or with the greatest potential for recovery will receive increased protection, and be prioritized for restoration programs. Four key components of the Strategy involve the establishment of (1) riparian reserves; (2) key watersheds crucial for at-risk fish and water quality; (3) a watershed analysis program; and (4) a comprehensive, long-term program of watershed restoration efforts, (often referred to as the FEMAT[4] process). See Chapter 4 for a complete listing of the restoration/enhancement projects occurring in the Quilcene and Dungeness Rivers key watersheds.

[3] Lloyd Moody. Significant Watershed Activity Survey. Executive Policy, Office of the Governor. Draft August 1993.

[4] FEMAT: Forest Ecosystem Management Assessment Team.

National Marine Fisheries Service (NMFS): NMFS has proposed a major west coast salmon restoration initiative. While still in the discussion stage with the State, Tribes and the USFWS, the goal is to provide for the coordination of, and support for watershed-based strategies to protect and restore natural stocks of salmon, steelhead and sea run cutthroat trout. The initiative involves a coordinating council comprised of the entities named above, led by a high-level federal coordinator.

Environmental Protection Agency (EPA): EPA has designed a "Watershed Protection Approach" to refocus existing water pollution control programs to operate in a more comprehensive and coordinated manner. EPA has established an interagency workgroup with representatives from 6 other Federal agencies to identify watersheds as priorities; the approach also includes wetlands, estuaries and ground water protection.

Federal Clean Water Act Reauthorization (CWA): This key legislation provides for water quality in the Nation's waters. The CWA grants the EPA authority to regulate surface and ground water quality. The proposed Senate CWA reauthorization bill would encourage the Governor of a state to designate watershed management units; the designation would identify waters not meeting water quality standards, and the entity responsible for developing and implementing a management plan for the watershed. The EPA administrator may approve a comprehensive watershed management plan; approved plans are eligible for the funding provisions in the bill, Also, an interagency committee is established to support comprehensive watershed management and planning.

U.S. Forest Service (USFS): USFS is part of the Watershed Alliance on the Olympic and Mt. Baker-Snoqualmie National Forests which emphasizes public outreach, interagency and Tribal involvement along with interdisciplinary planning to assure an ecological approach to watershed restoration work. The USFS Integrated Ecological Watershed Assessment and Analysis program features an integrated resource analysis, a desired future conditions evaluation, and implementation of specific watershed improvement needs and monitoring. USFS (Quilcene Ranger District) has been an integral part of the DQ planning process, sitting on the Local Government Caucus. The relationship is best expressed in Chapter 7, J.4 and J.5 :7.

U.S. Fish and Wildlife Service (USFWS): USFWS has two major watershed initiatives. First, with WDFW, the Ecosystem Conservation Program is a statewide effort to work on a cost-share, partnership basis with private landowners to restore and enhance fish and wildlife habitat on private lands. Second, with USFS, USFWS has formed the Watershed Alliance (see above) to work on restoration projects. The National Forests work at the headwaters of various watersheds, and USFWS works with private, State, Tribal owners on restoration projects in the lower watershed (such as in the Dungeness River). Biologists from USFWS have been active participants on the DQ Technical Committee, and contributed in various places in the Plan, e.g. see Hiss, lnstream Flows, Chapters 6 and 7.

U.S. Conservation Service (SCS): The SCS "Total Resource Management Planning" program is divided into two parts: watershed planning and treatment. The watershed planning staff responds to field office requests for developing watershed plans with involvement from Ecology, USFWS, Washington State Conservation Commission, and local conservation districts (CD). The land treatment side of the plan focuses on creating and implementing plans for individual farms with water quality, erosion control and secondary fishery benefits incorporated. The SCS/CD personnel have been active participants on both the DQ Technical and Education Committees.

State Watershed Programs

Chelan Agreement: See Chapter 12:

Washington Department of Fish and Wildlife (WDFW): Recently combined as one agency, WDFW has several watershed-related programs. The Integrated Landscape Management program focuses on identifying, with local individuals the objectives for watershed-based wildlife protection, and to tie agency workplans and budgets to those publicly identified goals and objectives. The Priority Habitat and Species Program identifies management objectives. WDFW works with

DNR on watershed projects on the Olympic Peninsula, as well as with the local County projects. WDFW, with the Western Washington Treaty Indian Tribes is sponsoring the Wild-stock Restoration Initiative which will involve significant watershed-related work (see Chapter 7, *Stock Status Categories Defined, SASSI* and the Glossary). Biologists from the former WDF were active participants on the DQ, and provided the *Habitat* information in Appendix D.

SHB 1785 Jobs and the Environment Legislation: *A* 1993 bill established an interagency program to create employment opportunities in watershed restoration work, particularly for displaced timber workers in rural communities. An eight-member interagency task force was established, with $3.25 million each to Ecology and DNR to fund environmental restoration work. Funding for work under this bill in both counties was received by JKT, Clallam County and the Olympic Peninsula Trust.

Department of Natural Resources (DNR): DNR in partnership with WDFW and USFS, runs the Washington Forest Landscape Management Project. The project is watershed-based, and its goal is to determine whether it is possible to integrate forest management across Federal, Tribal, State, and private land ownerships for fish and wildlife protection. In addition, the Forest Resources Plan (adopted 1992) guides DNR's management of it's forested lands.

SHB 1309 Fish and Wildlife Management: This 1993 bill established a several-pronged effort to protect and enhance wild salmon stocks. In particular, it requires Ecology to establish a statewide list of priorities for evaluation of instrearn flows; in establishing these priorities, Ecology shall consider the production of wild salmon as its primary goal. (See DQ Recommendations on *Instream Flows,* Chapters 6 & 7.)

Puget Sound Water Quality Authority (PSWQA): The Puget Sound Plan calls for local communities to prepare watershed action plans to reduce non-point pollution in the Puget Sound Basin. To date, 12 watershed plans have been completed and are being implemented; 22 plans are in the planning and development stage (1993). (See below for Watershed Management Plans in the DQ area.)

Department of Ecology (Ecology): Ecology's primary watershed-related role has been funding components of water quality plans developed under the Puget Sound Plan, and other plans, and has provided primary support for the two pilot projects under the Chelan Agreement. (See Linkage Part A.) Staff from the Water Resources Department has given critical, on-going support to the DQ planning effort, including active participation on the Technical Committee and County Work Groups.

Forest Practices Board (FPB): The Board in 1992 adopted rules regulating cumulative impacts of forest practices on a watershed basis. The Long-term objective of these regulations is to protect public resources such as water quantity and quality, and fish and wildlife habitat. Analyses are conducted on watershed administrative units, generally between 10,000 and 50,000 acres within a basin, and for each resource sensitivity identified, prescriptions are developed to minimize or prevent impacts on certain public resources. (See Chapter 12, *Environmental Protection MO U.)* There has been no linkage between the DQ and the FPB, except when expertise about forest practices was brought to the table by DQ participants.

State Conservation Commission (SCC): The Commission encourages the use of a Coordinated Resource Management and Planning (CRMP) process to implement a resource management plan for a given local area. An objective of the process is to work with private citizens, conservation districts and local governments in developing coordinated resource plans.

Puget Sound Cooperative River Basin Team: This is an interagency, multidisciplinary team which assists local governments carrying out the PSWQA Management Plan. The team provides technical assistance directly to local governments and watershed management committees. The team began in 1987 and has to date (1993) provided assistance to all 12 Puget Sound counties in 26 watersheds. Much of the GIS data used by the DQ came from the River Basin Team. (See Watershed Plans below.)

Northwest Ecosystem/Watershed Workgroup (NEWW): This is an is informal workgroup consisting of local, State, Federal and Tribal resource managers from Oregon, Washington and Idaho. The group _has been meeting since the fall of 1992 to formulate a conceptual framework and action strategy for promoting coordinated ecosystem/watershed management in the Pacific Northwest.

Local Watershed Plans and Projects

Linked from the Clean Water Act, to EPA, to the Puget Sound Water Quality Authority and the Department of Ecology, Watershed Action Plans are developed in Water Resource Inventory Areas (WRIAs) under Chapter 400-12 WAC. The Plans deal only with non-point source pollution affecting surface waters, and are the major guidelines for local land use activities and protection, leading the way to enhancement and restoration activities for water quality and quantity protection.

The following are planning efforts and projects, including Watershed Action Plans in the DQ area:

WRIA 17

🕮 **Sequim Bay Watershed Management Plan**
Activities include the coordination of widespread public education/involvement through community projects and the development of farm plans for bacteria control, septic tank information, a marine inventory, and clean up and repair of landslides. Includes Bell Creek, Johnson Creek, "A", "B", "C" and "D" Creeks, Dean Creek, Jimmy Come Lately Creek and Chicken Coop Creek.

🕮 **Discovery Bay Watershed Management Plan (in process)**
Includes streams entering Discovery Bay covered by the Puget Sound Cooperative River Basin Team prior to the end of the planning effort: Eagle Creek, Contractors Creek, Salmon Creek, Snow Creek, Andrews Creek, Chevy Chase drainage.

🕮 **Draft Ludlow Watershed Action Plan**
In Jefferson County's number one priority watershed, an extensive monitoring program established with emphasis on storm water, sediment, septic and shellfish. Includes three creeks entering Mats Mats Bay, Ludlow Creek and two smaller streams entering Port Ludlow, and a small stream to Squamish Harbor west of Shine (upper Squamish Harbor Basin, Feb. 1992).

🕮 **Quilcene Management Plan**
Developed by the Quilcene Ranger District, Olympic National Forest, the interim plan provided guidelines for management practices, protection and rehabilitation measures to protect and improve water quality, to be in effect until the Forest Plan was approved. Includes the Big and Little Quilcene Rivers.

🕮 **Cooperative Watershed Protection Program for the Big and Little Quilcene Municipal Watershed**
Developed by the USFS and the City of Port Townsend to provide protection for the water sources for the City. (See Chapter 7, J.5.7.)

🕮 **Tunnel and Townsend Creek Subwatersheds - Big Quilcene River Basin**
Part of USFS "Watershed Restoration Initiative," specific actions include erosion control, road obliteration, road stabilization, dispersed recreation site evaluation, culvert passage, and public education. A combined effort of City of Port Townsend, USFS, the S'Klallam Tribes, Jefferson County Cooperative Extension, and *Water Watchers* (volunteers trading time for training).

🕮 **Quilcene/Dabob Bays Watershed Action Plan**
Project implemented agricultural components of the Plan and reduced agricultural impacts on water quality throughout the County. Commercial and non-commercial farm operators were educated about water quality protection and riparian habitat enhancement. Includes Thorndyke Creek, an un-named creek entering at Camp Discovery, Tarboo Creek, Donovan Creek, and streams draining the Mount Walker area east to Quilcene Bay.

WRIA 18
🕮 **Dungeness Watershed Habitat Inventory (in process)**
Cost sharing project between the Olympic National Forest, the Jamestown S'Klallam Tribe, and the Point No Point Treaty Council to conduct habitat inventories both in the tower and upper Dungeness. Habitat monitoring and fisheries distribution data will be collected to aid in assessing restoration efforts for declining runs of pink and Chinook.

🕮 **Dungeness River Area Watershed Management Plan and Project**
Coordinates three year watershed management effort to inventory and evaluate the water quality in the watershed including potential sources of nonpoint pollution and possible effects on drinking and ground water. Includes Bagley Creek, Siebert Creek, Agnew Creek, McDonnell Creek, an un-named creek entering SW end of Dungeness Bay, Dungeness River, Meadowbrook Creek, Cooper Creek, Cassalery Creek and Gierin Creek.

🕮 **Port Angeles Urban Watershed Project**
Clallam County is attempting to coordinate several planning activities together in this endeavor including water quality, growth management, and stormwater management. The Puget Sound Cooperative River Basin Team is providing the County with information on agriculture, forestry, wetlands, and stream corridors as well as helping the County assemble a comprehensive GIS data base. The Port Angels sub-area plans being created for GMA Comprehensive planning include the development of a Watershed Management Plan. Clallam County PUD supplies water from this area to the western edge of the DQ area.

In both WRIA 17 & 18
🕮 **Sequim-Dungeness Groundwater Protection Project**
Nearly completed, under the direction of Clallam County Water Quality Division, it is to be submitted to the Board of Commissioners and Ecology in late July *1994.* DQ members have worked closely on this project and have shared JKT, DQ and County resources.

Partial List of Projects in Adjoining Watersheds, by Water Resource Inventory Area
WRIA 15 Kitsap: Port Gamble Bay Plan, CCWF Ambient Monitoring Project, Evaluation of Natural Stock Improvement Measures for Coho Salmon, Hood Canal Restoration Project. WRIA lb Skokomish-Dosewallips: Upper Hood Canal Watershed Plan, Hood Canal Summer Chum Restoration Project, Lower Hood Canal Watershed Management Plan, Port Angeles Urban Watershed project.

Additional Locally-based Programs and Councils Affecting Water Resources

Growth Management Act (GMA)
The *1990-91* GMA provides a basis for comprehensive planning in watersheds. Specifically, the GMA requires all counties and cities to designate certain lands as critical areas, defined as wetland, areas critical for aquifer recharge, fish and wildlife conservation and frequently flooded areas; each planning jurisdiction is required to adopt regulations to protect critical areas. In addition, comprehensive plans in

GMA areas must have a land use element which, among other, requirements, provides for the protection of the quality and quantity of ground water used for public water supplies, and where applicable, to provide for corrective actions mitigating discharges which pollute waters of the State. GMA requires consistency and coordination with the comprehensive plans of neighboring jurisdiction. Watershed planning is a logical approach to satisfying these mandatory requirements of GMA. (see Linkage Part B.)

Hood Canal Coordinating Council (HCCC)
HCCC is an intergovernmental body dedicated to the protection and enhancement of the natural resources of the Hood Canal Region through coordinated watershed management. HCCC is composed of a Policy Body with members including local and Tribal governments, Federal and State agencies, as well as representatives from local watershed management committees.

Tribal Watershed Programs
Coordinated Tribal Water Quality Programs: federally-recognized Indian Tribes in Washington have developed and are implementing a watershed-based program, in cooperation with local, State and Federal governments, to address water quality issues affecting Indian reservation communities and oil reservation treaty-protected resources. Both PGKT and JKT are active participants in these programs.

A partial list of other programs working in the watersheds includes:
Private watershed projects/councils/organizations -- Pacific Rivers Council, Project Green, Adapt-A-Stream Foundation, Trout Unlimited. In the DQ region, very active and successful programs/projects come from the Wild Olympic Salmon, North Olympic Salmon Coalition, Olympic Environmental Council, Washington Environmental Council, League of Women Voters, Peninsula Trails Coalition, and each County's local Land Trusts and Audubon Societies, as well as the myriad of citizens participating in individual stewardship activities.

Final Linkages Establishing a linkage through the current thrust for *regional planning* or *coordinated watershed-based natural resource planning,* we refer to the Bill and Executive Order approved by the Governor, April 1, 1994.

STATE OF WASHINGTON

OFFICE OF THE GOVERNOR

P.O. Box 40002 • Olympia, Washington 98504-0002 • (206) 753-6780

April 1, 1994

To The Honorable Speaker and Members,
The House of Representatives of the State of Washington

Ladies and Gentlemen:

I am returning herewith, without my approval as to section 5, Engrossed Substitute House Bill No. 2741 entitled:

"AN ACT Relating to coordinated, watershed-based natural resource planning;"

Increasingly, attention is being given to watersheds as a basis for natural resource management and environmental protection. While the term "watershed" connotes comprehensiveness, much of the natural resources planning, implementation, and restoration work in state watersheds is done in a piecemeal, uncoordinated basis often based on functional interest or land ownership. This lack of coordination is a problem, and the legislature is to be applauded for its attempt to deal with this problem through the provisions in Engrossed Substitute House Bill No. 2741. It is a concern I share.

Section 5 of Engrossed Substitute House Bill No. 2741 establishes a watershed policy task force charged with making recommendations to the legislature on statewide goals and objectives for watershed planning and implementation efforts and facilitating watershed planning and implementation efforts on a local level. Section 3 of Engrossed Substitute House Bill No. 2741 establishes the watershed coordinating council. While the majority of tasks set out for the watershed policy task force are important, the task force itself unnecessarily duplicates the watershed coordinating council established in section 3. For this reason, I am vetoing section 5 of Engrossed Substitute House Bill No. 2741, and by Executive Order, I will ask the watershed coordinating council established by this bill to perform the functions listed in section 5(2)(b), (c), (d), and (e) of Engrossed Substitute House Bill No. 2741.

Section 5(a) requires the task force to develop recommendations for goals and measurable objectives for watersheds on a statewide basis. There are many initiatives currently underway attempting to establish goals and objectives on a local watershed-by-watershed basis. This is an extremely difficult and time-consuming process, but goals and objectives must be established on a local watershed-by-watershed basis if they are to be real and meaningful. For this reason, I am also asking the watershed coordinating council to identify those watersheds where goals and objectives have already been established and to provide recommendations to facilitate the development of goals and objectives for the state's other watersheds.

For the purpose of these section 5 tasks to be performed by the watershed coordinating council, the council should work with an advisory committee consisting of interested parties including tribes, affected landowners, the timber industry and the environmental community.

With the exception of section 5, Engrossed Substitute House Bill No. 2741 is approved.

Respectfully submitted,

Mike Lowry

MIKE LOWRY
Governor

WSR 94-08-088
EXECUTIVE ORDER
OFFICE OF THE GOVERNOR
[EO 94-04]

COORDINATED WATERSHED PLANNING, IMPLEMENTATION, AND RESTORATION FOR FISH AND WILDLIFE

WHEREAS, the 1994 Legislature found that there is a compelling need to provide coordinated planning, implementation and restoration of natural resources, and environmental protection on a watershed basis; and

WHEREAS, the 1994 Legislature found that watershed coordination should, to the greatest extend possible, build upon work that is already being performed by federal, state, tribal, and local governments, private landowners, and other groups; and

WHEREAS, the 1994 Legislature appropriated $10 million for watershed restoration projects, to be selected by the Department of Fish and Wildlife and the Department of Natural Resources, to protect and restore critical or depressed fish stocks and there is a compelling need to immediately focus on coordinated restoration in priority watersheds for fish and wildlife:

NOW, THEREFORE, I, Mike Lowry, Governor of the state of Washington, by virtue of the power vested in me, do hereby direct:

I. State agencies under my direction which are involved in watershed-based natural resource management and environmental protection efforts shall coordinate their watershed planning, implementation, and restoration processes.

II. Watershed planning and implementation efforts shall have as a first priority the restoration and enhancement of habitat, including water quality, for healthy, high priority fish and wildlife populations.

III. State agencies under my direction, in coordination with the Watershed Coordinating Council established by Engrossed Substitute House Bill No. 2741 of the 1994 Legislative session, shall work under the direction of my office and provide regular reports to me on the status of their coordination efforts relating to watershed-based planning, implementation, and restoration.

IV. The Watershed Coordinating Council to prepare a report for me and the legislature by December 15, 1995 which (a) identifies those watersheds in the state where goals and objectives have been established and recommends how to facilitate establishment of goals and objectives for other state watersheds, including specific goals and objectives for fish and wildlife; (b) identifies strategies for establishing and funding locally or regionally-based watershed planning, implementation, and restoration activities; (c) identifies barriers and incentives to encourage local government, tribal, and private landowner cooperation in watershed planning, implementation, and restoration activities; (d) recommends how to integrate fish and wildlife habitat protection with land-use planning and regulation by local governments under the Growth Management Act and Puget Sound Watershed Plans; (e) recommends how to establish a statewide student and citizen watershed protection network; and (f) recommends how to establish a "river keeper" system for Washington watersheds. For the purposes of this section, the Council should work with an advisory committee consisting of interested parties including tribes, affected landowners, the timber industry and the environmental community.

V. By January 1, 1995, in conjunction with the report required in Section 3 of Substitute Senate Bill No. 6243 of the 1994 Legislative session, the Department of Fish and Wildlife with the Department of Natural Resources (a) shall develop a prioritized list of watersheds needing restoration for fish and wildlife; (b) in conjunction with the State Watershed Council, shall develop a coordinated habitat protection strategy for the top ten percent of priority watersheds which identifies local, private, state and federal roles and, where possible, builds upon already existing locally-based watershed efforts consistent with the state priority list; and (c) develop a process for prioritizing and protecting the remaining watersheds.

VI. Starting January 1, 1995, and every year thereafter, the Department of Fish and Wildlife in consultation with Department of Natural Resources, and in coordination with the State Watershed Council, shall provide a brief report to me and the appropriate legislative committees on the status of implementing watershed habitat restoration and protection efforts in priority watersheds. These reports shall also include an evaluation of the effectiveness of these protection and restoration efforts.

IN WITNESS WHEREOF, I have hereto set my hand and caused the Seal of the State of Washington to be affixed at Olympia this 1st day of April, A.D., nineteen hundred and ninety four.

BY THE GOVERNOR:

Mike Lowry
Governor of Washington

Ralph Munro
Secretary of State

Perhaps through real linkage the DQ Mission Statement will be achieved:

> *Our mission in the Dungeness-Quilcene Water Resources Pilot Planning Project is to work cooperatively to meet water quality and quantity needs of human and natural systems in a manner that will insure the sustainability of both.*

We offer the following good advice from NOAA for inter-agency linkage activities:

> *Given the number* of *participants working to* fulfill *their own mandate to provide protection for (water) resources, it is necessary to begin designing a management structure that combines the strengths of all. Studying models for collaboration provides some direction for creating a new structure specific to the task of long-range planning and management for the protection of the resource. A true collaboration involves working toward a common objective that no single participating organization can accomplish alone. Collaboration needs to take place within a local context to be effective. Agencies' management objectives can benefit by promoting locally-based and shared decision-making... This partnership must be founded on a shared vision. The needs and interests of the different agencies must be determined, and the contributions of each partner must be clear. Funding, staffing and contributions of agency expertise are investments to ensure the success of the common objective. Ultimately each member organization must see a way to achieve success in its resource protection mandate in exchange for its investment in the partnership. (from NOAA, Sanctuaries and Resources Division, 1992).*

Appendix

Appendix A

References

Appendix A
References

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Appendix B
DQ Budget

Appendix B
DQ Budget

Dungeness-Quilcene Water Resource Pilot Planning Project
BUDGET OVERVIEW
July 1, 1991- August 30, 1994 (Prepared 6/30/94)

Washington State appropriated approximately $600,000 to the DQ Project, which has been spent as follows:

Technical Studies	$125,000
Development of GIS	$ 72,500
Coordination and Staffing*	$234,000
Facilitation	$ 42,500
Caucus Support	$ 49,000
Education	$ 25,500
Other (overhead, audit, meeting space)	$ 43, 500
	$592,000

*Coordination and Staffing (other than GIS project):

Wages/benefits	$169,000
Travel	$ 2,000
Supplies	$ 10,000
Equipment	$ 15,000
Copies/Printing	$ 36,000
Postage	$ 2.000
	$234,000

We estimate volunteers, many of whom are technical and professional experts, have contributed more than 12,000 documented hours to the Dungeness-Quileene Planning Process, with many mare undocumented. This level of volunteer commitment is expected to continue during the DQ Plan implementation.

Other funds/projects which have been leveraged directly as a result of this project or indirectly to coordinate with this project include:

EPA - Water Conservation and Pollution Education	$125,000
PIE/PSWQA - Manual of Dungeness Natural History Information and Education	$ 25,000
CCWF/USGS & Clallam Co. - Hydrogeological analysis	$400,000
USFS/DNR*/JKT - Dungeness Habitat Inventory and Stock Restoration	$200,000
Federal Timber Plan/LTSFWS - Quilcene Watershed Assessment	na
Sequim/Dungeness Water Users - Ditch Improvements 1994	$ 50,000
Clallam County/DNR*/EPA Dungeness Bank Stabilization and Restoration	$525,000

*Jobs for the Environment

Summary of Immediate Implementation Needs

The following items represent the most critical elements for implementation which need funding during the next few years:

1. Water Resources Study: Hydrogeological investigation of quality and quantity of surface and ground water in the DQ region, and streamflow monitoring, based on the 5 year work plan completed by the U.S. Geological Survey.

   Costs:

Clallam County:	Total	$1,081,147
Commitments:	USGS	$540,573 (50%)
	CCWF	$187,000
	Clallam Cnty.	$150,000 est.
	UNMET NEED:	**$200,000**
Jefferson County:	Total	$1,607,202
Commitments	USGS	50%
	City/PUD	possibly 25%
	UNMET NEED:	**$400,000 (25%)**

2. Agricultural Water Users Irrigation Ditch System Conservation Improvements: Technical studies and user analysis during the DQ project identified a number of ditch improvement measures. Water users have spent approximately $54,000 this year to implement some of these measures, and have agreed to fund a Water Use Coordinator seasonally. However, further improvements to the system are hampered by the difficulty in accessing Referendum 38 funds. Two areas of need are identified:

   a. Complete detailed conservation plan far Ref. 38 eligibility. Based on other plans around the State, this could range from $250,000 to $500,000 depending on whether plans are done on a consolidated basis for the whale system, or separately for each individual district. Additionally, our ditch companies and districts are intertwined, and the Water Users would like to incorporate these into a single conservation plan.

AND/OR

b. Begin ditch improvements already identified, e.g. pipe leaky sections, improved turnout structures, pipe laterals, etc. Cost of $250,000 for initial improvements is estimated, however Ref. 38 cannot be tapped until a conservation plan is completed.

3. **Staff Support for the Watershed Council:** Continue 2+ staff positions for one year to assist in Council formation, completion of funding packages, data management and tracking plan implementation. Applications have been submitted to federal and private sources, but no funding has yet been identified.

2.25 FTE's: $125,000 for salaries and benefits. Office space, supplies and equipment, and some data management staff salary to be provided by Tribe.

4. **Department of Ecology:** Adequate funding for the Department of Ecology to fulfill the recommendations mandated in the DQ plan, including rule making, establishment of minimum flows, completion of trust water rights agreements, relinquishment, and enforcement. At least one FTE for the DQ plan is needed.

5. **Other:** Other major needs for implementation include habitat restoration and conservation education. We are seeking funding sources such as the Jobs for the Environment program and federal sources for these components. However, this need will probably continue for a 5 year period, and funding is coming in one-year increments.

Appendix C

DQ Education Plan

Appendix C
DQ Education Plan

Introduction

The education goals of the Dungeness-Quilcene Water Resources Pilot Planning Project are: to listen to the concerns of the public about their water resource, and to educate the public about their water resources and their impacts on them. This Education Plan outlines a range of educational activities aimed at increasing the public's awareness of water resource issues in the Clallam and Jefferson county planning area, providing information on how members of the public can better protect and conserve water, and instilling in the public a widespread sense of stewardship for water resources in their watersheds. Ultimately, the intent of this plan is to change attitudes and behavior among identified target audiences resulting in increased conservation of water and greater protection and enhancement of water quality within the planning area.

This plan offers a comprehensive program of education activities aimed at a number of target groups. Many of the activities described herein are presently being carried out by resource and educational agencies, governments, and school districts in the two-county area. Others have been identified as needed programs agencies are willing to undertake if funding could be secured. The plan also contains programs specifically designed to meet the needs of the Dungeness-Quilcene planning process. The planning process offers the unique opportunity for assessment and long-term coordination among water resource educational efforts in the two-county area. Action 3.2 provides the groundwork for this, and it should be seen as a high priority.

In planning education programs for a diverse, two-county area, it is often necessary to take advantage of educational opportunities as they arise. An effective plan must be dynamic and flexible enough to adapt to changes and new opportunities. Therefore, the specific activities and programs listed here are not intended to define the allowable limits of educational activities, rather they are intended to provide a working baseline from which activities can be selected or adapted to meet identified needs.

The Resource Planning Group understands that stewardship requires a long-term commitment to education about water resources. Education must be an ongoing effort carried out by multiple agencies and reaching every facet of the population. The messages, target audiences, action steps, and appropriate evaluations listed below assume an active, long-term commitment and investment in the protection of water resources in Clallam and Jefferson counties.

1. Educational Messages

1. Rationale behind water resource planning; purpose of Dungeness-Quilcene Pilot Planning Project, how to participate in process, and what to do to conserve and protect water resources.
2. Water conservation practices in the home, yard, and business.
3. Nonpoint pollution, nature and prevention.
4. Habitat protection and enhancement.
5. Watershed dynamics: "We all live downstream."

Goal A: To listen to the concerns of the public about their water resource.

Target Audience:	General public
Message:	Solicit input (concerns, level of awareness, desires)
Desired Outcome:	Awareness of process, how to participate, and need to change behavior; data on current levels of awareness

Action:

1.1 Initiate an informational campaign on the D-Q process stressing public involvement; provide regular press releases and informational mailings to interested parties and key audiences.

1.1a. Develop a survey questionnaire designed to solicit concerns and ideas as well as gage levels of knowledge

C.2 DQ Education Plan

and behavior regarding water resource issues. Offer voluntary participation through newspaper advertisements.

Evaluation: Resurvey in 3-4 years.

Goal B: To educate the public about their water resources and their impacts on them.

2. Programs for general public

Target Audience: *Civic* groups and organizations
Message: *#1*
Desired Outcome: Understanding of process, participation, desire to learn more.

Actions:

2.1 Develop a 15-20 minute slide presentation outlining the background, planning process, issues, potential solutions, and role of public: in process participation, water conservation, and prevention of nonpoint pollution.

2.1.a. Develop a speakers bureau in both counties to offer presentations to civic, environmental, and sportsman's, and water user's associations, businesses and church groups.

2.1.b. Develop two sets of educational displays (to be housed in each county) describing the planning project and showing how people can conserve water and protect water quality. Set up displays at fairs, festivals, and expositions like the home show. Provide a staff person or volunteer to answer questions and distribute informational materials.

Target Audience: Municipal and PUD water users
Message: *#2 & 3*
Desired Outcome: Reduction of water use & nonpoint prevention.

Action:

2.2 Initiate educational mailings to municipal and PUD customers stressing: 1) ways to conserve water in and around the home, and

2) ways to prevent nonpoint pollution in and around the home. May require separate mailings. Support PUD water conservation programs with educational materials specific to watersheds.

Evaluation: Evaluate behavior change through second survey.

Target Audience: **Community water system users**
Message: #2 & 3
Desired Outcome: Reduction of water use and nonpoint prevention.

Actions:

2.3 Initiate educational mailings to community water system customers stressing: 1) ways to conserve water and 2) ways to prevent nonpoint pollution, in and around the home. May require separate mailings.

2.3.a. Meet with small community water system operators and stress same educational message.

Evaluation: Evaluate behavior change through second survey.

Target Audience: *Homeowners served by wells & septic systems*
Message: *#2, 3 & 5*
Desired Outcome: *Watershed stewardship, reduction of water use and nonpoint prevention.*

Actions:

2.4. Distribute educational information and brochures through realtors, septic designers and installers, well drillers, and city and county agencies.

2.4.a. Conduct technical workshops for well drillers and septic installers,

2.4.b. Conduct septic system maintenance and well/groundwater protection workshops for septic and well owners.

2.4.e. Distribute septic system stickers (type of system, map, "do's and don't's") to new home owners and those repairing septic systems; make them available to general public.

2.4.d. Install video monitors in city and county permit desks for public review of septic, well protection, and other water resource protection programs. Develop or adapt programs as needed.

Evaluation: Survey workshop participants; monitor numbers of average yearly septic repairs (counties) before and 2 years after initiating program; evaluate septic and well attitudes and behaviors over 3-4 year survey period (Action I.lb).

Target Audience: **Volunteer groups**
Message: *#4 & 5*
Desired Outcome: Improved water quality and habitat.
Actions:

2.5. Offer workshops, technical assistance, and agency coordination for groups to participate in habitat enhancement, pollution prevention, and education projects on local streams, wetlands, and coastal areas. 2.5.a. Train volunteers to conduct home water efficiency tours and demonstrate water conservation practices in the home to interested participants; develop a self-guided home water conservation kit.

Evaluation: Monitor water quality/habitat use and level of public participation before and after projects.

Target Audience: General public
Message: #1, 2, 3, 4 & 5
Desired Outcome: Keep public abreast of planning developments; reinforce positive attitudes and behaviors regarding conservation and nonpoint prevention; share successes and publicize events.
Actions:

2.6. Keep the general public informed about water resource issues.

2.6.a. Develop and update a mailing list of interested parties and related agencies; produce a quarterly newsletter to be distributed by mail, at public meetings and community events.

Evaluation: Include occasional feedback (clip and mail) forms in newsletter; tabulate results, and make adjustments in content.

2.6.b. Provide regular press releases on planning-related items and water resource issues to newspapers, radio, and cable-access television stations, as well as to organizational and agency newsletters.

2.6.c. Produce a three to five part series of newspaper articles on the planning process, critical water resource issues, and what actions individuals can take to protect water resources.

2.6.d. Install travelling water conservation display and informational materials at home shows, fairs and other community events as well as in public spaces such as libraries and city halls.

3. Programs for irrigation water users and farmers

Target Audience: Commercial farmers
Message: #l, 2 & 3
Desired Outcome: Reduction of water use & nonpoint prevention.
Actions:

3.1. Sponsor a workshop for irrigation water users emphasizing current water conservation strategies; provide technical assistance far conversion to more efficient irrigation methods, and provide cost sharing or subsidy programs to facilitate conversion for commercial operations.

Evaluation: Meter water use before and after installing conservation practices.

3.1.a. Coordinate with Dungeness Agriculture Water Users Association to distribute a regular newsletter to commercial and hobby farmers containing information on conservation and nonpoint best management practices (BMPs) and technical assistance programs, reports on BMPs undertaken by landowners, and updates on water resource planning processes.

3.1.b. Establish a model demonstration commercial farm in each county incorporating water conservation and nonpoint BMPs; publicize it, and arrange workshops and tours for commercial farm operators.

Evaluation: Keep records of groups visiting site, media coverage, and conservation plan/technical assistance requests resulting from site.

3.1.c. Continue "Conservation Farm of the Year" awards for commercial operations and promote recognition in newsletters and media.

Target Audience: Small (noncommercial) farmers
Message: #l, 2, 3, 4 & 5
Desired Outcome: Reduction of water use, nonpoint prevention, and habitat improvement.

Actions:

3.2. Establish a model demonstration small farm incorporating state of the art water conservation and nonpoint prevention best management practices; publicize it, and arrange workshops and tours for small farm owners.

Evaluation: Keep records of groups visiting site, media coverage, and conservation plan/technical assistance requests resulting from site.

3.2.a. Develop programs for horse groups (4-H, Back Country Horsemen, etc.) involving presentations and demonstrations of BMPs for pasture and waste management and stream protection; make informational materials available at tack shops.

Target Audience: Landscape and design companies, nurseries, and home landscapers

Message: #2, 3 & 4
Desired Outcome: Reduction of water use, nonpoint prevention, and habitat protection.

Actions:

3.3.a. Utilize Master Gardeners demonstration garden to conduct low water use, native plant and landscaping for wildlife workshops for commercial landscapers, landscape designers, and home landscapers; incorporate drip irrigation system from model farm.

3.3.a. Conduct brief presentations to store owners and managers and make educational brochures on landscaping available at nurseries and garden supply stores.

4. Programs for Decision Makers

Target Audience: Elected officials, advisory commissions and agency representatives
Message: # 1
Desired Outcome: Awareness of process; RPG goals reflected in management decisions; knowledge of existing water law and policies.

Actions:

4.1. Conduct workshops on the D-Q planning process: issues, concerns, and opportunities for county commissioners, planning and shoreline advisory boards, city officials, city councils, and state resource agency professionals working in both counties.

Evaluation: Note if invited back.

- 4.1.a. Develop a water policy briefing booklet and distribute to all key decision makers.
- 4.1.b. Keep government officials apprised of developments and policy recommendations of the RPG.

Target Audience: Resource educators
Message: # 1
Desired Outcome: Cooperation and coordination among agencies regarding water resource programs; awareness of D-Q project, design and implementation of programs that encompass D-Q goals.

Actions:

4.2. Arrange for an intern to carry out a comprehensive survey of agencies, entities, school districts, and non-governmental organizations engaged in water resource education in the two county area; conduct a complete assessment of projected educational programs and funding needs for each agency, and develop a long-term strategy for interagency coordination of programs, funding mechanisms, and evaluation.

- 4.2.a. Conduct regular planning sessions for water resource educators in both counties to coordinate activities and share resources; schedule annual or semiannual one-day conferences for water resource educators to plan long-range educational strategies, share successes, and coordinate funding requests.

5. Programs for Real Estate Agents, New Residents, and Visitors

Target Audience: Realtors
Message: #1, 2, 3 & 4
Outcome: Understanding of process, issues, willingness to transmit information to clients.
Actions:

5.1. Conduct presentations to Realtor associations outlining planning process, goals and issues, and request assistance in getting informational materials to new residents; fallow up with scheduled visits to offices to distribute educational materials and provide additional information to agents.

Target Audience: New residents
Message: #2, 3 & 5
Desired Outcome: Reduction of water use and nonpoint prevention.
Actions:

5.2. Prepare information packets for new home buyers containing educational materials on water conservation, septic systems, nonpoint prevention in homes and yards, and septic system stickers; distribute through realtors, title companies, or homeowners associations.

5.2.a. Establish model water conservation homes in both counties and prepare tours demonstrating how to install low-flow fixtures, inspect toilet for leaks, landscape with drought-resistant native plants, etc.; train volunteers to conduct tours.

Target Audience: Visitors to area

Message: #2 & 3
Desired Outcome: Conserve water use and prevent pollution while boating/recreating.

Actions:

5.3. Work with tourism and visitors' bureaus to develop informational displays and materials on the need to be mindful of water conservation while visiting the area.

5.3.a. Promote water conservation programs for guests at area hotels and bed and breakfasts; develop water conservation information materials for use in these businesses.

6. Programs for School groups

Target Audience: Teachers
Message: #2, 3 & 4
Desired Outcome: Understanding of issues and desire to include water resource education into curricula.

Actions:

6.1. Sponsor inservice trainings on water resources curricula for teachers, and provide follow up in-class assistance and materials to utilize curricula units and tie-in to new and existing stream and habitat restoration projects; develop or adapt existing curricula to stress life cycle and habitat needs of wild salmon.

6.1.a. Develop a Mentor Teacher Network involving local, state and federal agencies which will provide workshops, training sessions and classroom support and materials for teachers, as well as funds for substitute teachers, transportation, and coordination for one teacher from each school in both counties to participate in intensive curriculum training, then serve as mentors for other teachers in their schools.

Evaluation: Survey teachers and school administrators yearly.

6.1.b. Develop a locally based integrated K-12 watershed curriculum allowing teachers to tie course elements to components of students' home watersheds and nurture a broad-based sense of stewardship.

6.1.c. Make watershed relief models and groundwater models available for use in classrooms and provide in-class assistance for teachers to incorporate these into curricula programs

6.1.d. Support agricultural programs in local high schools and assist with water resource protection and conservation programs in Ag. tech. classes.

Target Audience: Students, Grades K through 8
Message: #2,3,4,& 5
Desired Outcome: Basic understanding of watershed process and awareness of the need for conservation, pollution prevention, and habitat protection and enhancement; set examples for parents.

Actions:

6.2. Support existing "Salmon in the Classroom" programs for elementary and middle schools in both counties; seek funding to initiate programs in schools wishing to participate; sponsor programs for students in each school stressing the need to preserve wild salmon runs and protect and restore habitat.

- 6.2.a. Support shellfish and watershed educational program in Sequim and establish a similar program for 3-8 grade in Quilcene.
- 6.2.b. Support school-sponsored stream and wetland habitat restoration projects in both counties.
- 6.2.c. Coordinate inter-school district and inter-county exchanges so students can experience the types of environmental programs developed in other schools and broaden their water resources education opportunities for all students in the planning area. Fund transportation and cost associated with teaching assistants or volunteers.

Evaluation: Students can write reports, create artwork, or give presentations on what they learned.

Target Audience: Students, Grades 9 through 12
Message: #1,2,3, & 4
Desired Outcome: An overall sense of water resource stewardship and active participation in conservation,

pollution prevention, and habitat restoration programs.

Actions:

6.3. Support the Conservation District's "Envirothon" environmental education competition, and publicize students' participation.
   - 6.3.a. Provide speakers and technical assistance to high school environmental clubs like Sequim's "Blue Sky," and assist high school science classes and other groups with water conservation, habitat restoration and monitoring projects; provide faculty advisors with information, technical assistance and coordination among agencies.
   - 6.3.b. Work with high school science teachers to incorporate water resource education into 9-I2 science curricula.

Target Audience: Youth groups
Message: #2, 3, 4 & 5
Desired Outcome: Direct group activities into water resource protection projects.

Actions:

6.4. Coordinate with scout groups, 4-H, church groups and others to provide education and technical assistance for groups to take on stewardship and restoration projects; seek funding to cover materials and transportation costs and facilitate permitting process.

Evaluation: Develop evaluation standards on a project-by-project basis.

7. Programs for Area Businesses

(Also see actions 2.3 and 2.3A)

Target Audience: Restaurants
Message: #2
Desired Outcome: Restaurant owners and customers conserve water while using restaurant facilities.

Actions:

7.1. Develop posters for display in restaurant restrooms illustrating the need to save water (make connection with fish and wildlife) and stressing simple bathroom conservation practices. Posters can also be used in other businesses. 7.1.a. Develop attractive stand-up cards for restaurant tables with a simple water conversation message and phone number for information.

Target Audience: Vendors of garden and landscape chemicals, plumbing fixtures, and automotive products
Message: #2 & 3
Desired Outcome: Vendors understand conservation and nonpoint issues, and dispense education materials to customers.

Actions:

7.2. Develop or adapt informational materials for home landscapers, do-it-yourself home repairers, and those who maintain their own vehicles.

7.2.a. Conduct brief presentations to store owners and managers and make educational brochures on the above topics available at nurseries, garden and landscape supply, pluming supply and automotive supply stores.

Target Audience: Businesses (general)
Message: #2 & 3

Desired Outcome: Foster a sense of water resource stewardship among area businesses; enlist businesses to promote water resource protection.

Actions:

7.3. Encourage chambers of commerce to initiate award programs for water resource stewardship (ie: "Environmental Business of the Year") to recognize outstanding stewardship practices by area businesses.

- 7.3.a. Conduct workshops for environmentally regulated businesses informing them of their requirements and offering information and technical assistance in meeting water quality requirements.
- 7.3.b. Work with local businesses and festival committees to integrate water resource awareness into area festivals (Irrigation and Rhododendron festivals, Hadlock Days, Quilcene Fair, Discovery Bay Salmon

Appendix D
Habitat
Definition & Description

Appendix D
Habitat – Definition and Description

The following was written by Steve Keller, WDFW, for the DQ Project Jefferson County Work Group, 1994.

Salmon Habitat - Freshwater
In freshwater, highly productive salmon streams exhibit the following characteristics:

- unobstructed access to spawning and rearing areas as adults and similar free passage to the sea as juveniles;
- stable winter streamflows and abundant summer streamflow;
- clean, cool, well-oxygenated water;
- an instream abundance of food;
- relatively sediment-free stream bed gravel for spawning and insect production;
- stable stream configuration;
- resting and hiding cover from predators and competitors.

Habitat quality and quantity is affected naturally by weather, streamflow, and geologic events. Human's activities also have profound effects upon habitat.

Fish are also reared in artificial facilities, "hatcheries." However, these facilities are no substitute for productive habitat. Water quality requirements are more stringent at hatcheries and rearing ponds than in nature. Regardless, these facilities depend upon good natural habitats because ultimately the fish are released to the wild for the remainder of their life cycle.

Salmon Habitat - Marine Waters

In marine water, productive salmon habitats include:

- unobstructed shallow nearshare migratory pathways, especially for juvenile fish during seaward migration;
- clean, cool, well-oxygenated, unpolluted water;
- access to shallow nearshore beaches and marine wetlands for feeding and avoidance of predators;
- an abundance of food;
- clean, uncontaminated bottom sediments or gravel.

These habitat characteristics are the result of the shoreline vegetation, coastal erosional processes and tidal currents and are also influenced by our upland and in-water activities.

Riparian Areas

In freshwater, riparian areas playa major part in providing and maintaining suitable habitat for salmon. Riparian areas are the bands of vegetation bordering a body of water, usually a stream, which influence the water and are in turn influenced by the water. Riparian vegetation varies with climate. In wet climates it is a mixture of conifer (cedar, hemlock, fir, spruce) and deciduous (alder, maple, cottonwood) trees, intermingled with shrubs and grasses. In drier climates trees are found in higher numbers in riparian zones than on the uplands, or the riparian zone will be comprised only of grasses or grasses and shrubs. Loss of any one layer of vegetation impacts the functional ability of the other layers, and eventually the corridor itself. Riparian zones have been altered, and in many cases obliterated by man's activities. Protection and enhancement of these zones is necessary for the protection of fish life.

Riparian Area Contribution to Salmon Habitat

Riparian areas create and maintain salmon habitat by stabilizing stream banks from erosion, by contributing hiding and resting cover in the form of undercut banks and instream woody debris, by affording access to habitat, by moderating stream temperatures, by capturing sediments, by moderating flood flaws and metering summer low flows, and by providing or contributing to food items.

1. Bank Stabilization:
Large trees, especially conifers such as cedar, fir and hemlock in riparian zones provide local channel stability and contribute to erosional resistance, which allows other shrubby vegetation to establish. Soil binds to the complex root structure of riparian plants resulting in improved bank stability. The deeper and more extensive the root system, the greater the stability.

2. Hiding and Resting cover:
Large organic debris (LOD) in the form of trees, tree parts, branches, and root wads, is recruited to the stream from bank vegetation. Pools (deeper, slow-moving waters) in which fish rest, hide and feed, are typically formed by LOD. Off-channel habitats are often created and maintained by LOD. LOD and overhanging bank vegetation provide structural cover to protect juvenile salmonids from predators, and to allow separation from other competing or predator fish.

3. Access:
LOD provides "stair-steps" along steeper gradient streams, which allow fish to access upper stream reaches by a series of small jumps as opposed to swimming long distances against swift currents.

4. Spawning Gravel:
LOD in channels helps to sort, clean and stabilize spawning gravels.

5. Sediment and Water Quality Control:
Water quality and spawning gravel is improved as sediments are trapped by bank vegetation. The riparian zone acts as a buffer strip between polluted run-off from upland areas and the stream. Phosphorous and nitrogen, typically from fertilizers, and heavy metals or other pollutants which attach to sediments, are carried by surface run-off to the stream. Velocity of surface run-off is reduced as it flows through riparian vegetation, particularly root masses and grasses. As velocity is reduced, sediments settle out before flow enters the stream, and phosphorous and nitrogen are utilized by plants in the flow path. Consequently, water quality of surface run-off is improved prior to discharge into the stream.

6. Energy Dissipation:
Bank vegetation and instream LOD dissipate stream energy. During overbank flows energy is dissipated as water collides with riparian shrubs and trees. LOD incorporated into the channel forms obstructions to flow and slows velocities locally. The flow lose energy while scouring the bed or banks lateral and/or downstream of the obstructions. When energy is dissipated gradually along the stream course, downstream erosion is minimized.

7. Streamflow:
Vegetation helps to attenuate flood flows by reducing velocity and trapping sediments. As sediments are deposited, stream banks are built resulting in mare channel stability and a medium upon which more vegetation can take root. Riparian corridors effectively increase groundwater discharge as well as subsurface groundwater recharge. As sediment deposition and bank building continues to occur, and vegetation continues to be established, the water table is effectively raised. Increased water storage can be achieved during wet seasons, and therefore, more flow can occur during the dry season. Perennial flow can subsequently be reestablished or maintained with adequate riparian vegetation.

8. Stream Temperature:
Riparian vegetation, particularly upper and middle story height shrubs, brush and trees, helps attenuate both winter summer stream temperatures. Lethal or near lethal water temperatures are already a serious problem in many of our salmon streams. The effects of disease and infection are magnified in higher water temperatures which result in increased moralities for both adult and juvenile fish. Warm temperatures can block migration. Delays to either the downstream smolt migration or to adults returning to spawn leads to increased mortality either directly or indirectly. Adults which cannot reach preferred spawning beds will spawn in sub-standard reaches contributing to lowered egg and fry survival

9. Food Source:
Terrestrial insects, a key prey item far juvenile salmomids, fall into the stream from bank vegetation. Leaf litter and large organic debris also support terrestrial and aquatic arthropods. As the leaf litter and larger

organic debris decompose, a nutrient base is provided for other prey organisms. This process provides a vital link in the food chain and the lack of it can be a limiting factor in fish production.

Streamflow

Although stream flows vary from season to season, they must remain fairly constant to support a healthy stream. Very low water levels during salmon runs and spawning season make travel difficult or impossible. Juvenile fish rearing streams are dependent upon stable abundant flows for growth and survival. Water levels which are too high damage or destroy habitat and displace, strand or cause fish moralities. Eggs deposited within the streambed during spawning can be scoured out or stranded by shifting channels. During heavy rains, even a healthy riparian zone and stream system will not prevent flood erosion. However, under natural stream conditions flood erosion creates good in-stream habitat. Flood waters wash out gravel banks creating spawning beds. They wash trees, logs, and stumps into the stream creating hiding, resting and feeding places. Finally, they wash out banks, causing trees to lean out over the water cooling it and creating feeding and hiding places. Under natural conditions a stream may have any or all of the following: side channels, meanders, ox bows, associated wetlands and flood plains. These features slow and temporarily store flood waters coming down the stream and offer fish and other water dwellers a refuge from rushing flood waters. So, the stream can flood and cause some erosion without destroying habitat and killing stream dwellers.

Alteration of a watershed from forestry, agriculture or urbanization can impose dramatic changes to stream hydrology, often overwhelming the buffering ability of the riparian zone to protect the stream Increases in channel width and depth, increased bank erosion and downstream sediment loading, instability of LOD, and loss of summer flows are all attributable to altered hydrology. In response we often take protective measures such as armoring stream banks with rock rip-rap, straightening the channel, in the process eliminating riparian vegetation which reduces or eliminates the stream's natural flood control abilities. Under these conditions, flood waters rush down the stream with unnaturally high volume and force. The stream transfers this energy to any part of the stream which is not armored, causing severe bank erosion, washing out spawning beds and in-stream habitat (such as woody debris and even over hanging vegetation) and killing in-stream animals. Flood waters may also wash armoring along the bank into the main channel. This decreases the channel capacity and creates greater erosion forces on the bank.

Wetlands

Wetlands serve several major functions in a stream ecosystem. Wetlands provide substrate for the production of preferred food organisms and shelter from predators for juvenile salmonids during their spring out-migration. In the case of coho salmon, which rear in freshwater for up to 18 months before migrating seaward, wetlands serve as critical aver wintering habitat. Lack of over winter habitat can limit coho salmon production. Wetlands also provide groundwater recharge and help maintain water quality when wetland plants filter and settle out pollutants.

Shallow Water Habitat in Large Streams and Marine Waters

Each spring, after completion of their freshwater incubation and rearing stages, juvenile salmon begin a journey (outmigration) to the marine waters. Some stocks remain in yr near to Puget Sound, many travel hundreds or thousands of miles primarily into the north Pacific Ocean, feeding and maturing prior to their return to their stream of origin to spawn and die. While in lower stream reaches and brackish estuarine waters they undergo a physiological adaptation to saltwater. Juvenile salmonids migrating downstream stay very close to shore. This behavior affords them maximum survival opportunity. The behavior of your salmonids is designed to hold the fish in nearshore shallow water areas where they can simultaneously maximize their growth and be physically removed from offshore predators. Intertidal wetland vegetation also provides both substrate for the production of preferred food organisms and shelter from predators. These intertidal wetlands also provide both ground water recharge and help maintain water quality through biofiltration.

When food resources are abundant, young salmonids attain very high growth rates. High growth rates are especially important since increasing body size decrease the number of predators that can prey upon these fish. Consequently, structures and activities that disrupt this growth strategy affects their survival. Since the inception of development along the shores of Washington streams, considerable amounts of critical habitat have been lost due to bulk heading (hardened bank protection), filling, dredging, overeater construction, and other impacts associated with growth and development, and agricultural from crops to livestock grazing. These impacts have reduced:

- the reproductive potential of those species dependent on this habitat for spawning;
- the area available for juvenile salmonids to rear, feed, and migrate;
- and the area available for juvenile salmonids to physiologically adapt from fresh to saltwater.

Shading

Although shade cast by bankline vegetation is usually beneficial, the shadow cast by overeater and floating structures, as narrow as eight feet in width, located in the nearshore shallow water habitats can be detrimental, especially when it results in the loss of important aquatic vegetation. This shadow can reduce the productivity of food organisms important to juvenile salmonids and other fish, by reducing or eliminating the primary productivity that these organisms depend upon. In addition, this shadow disrupts juvenile salmonid migration along the shoreline. These small fish avoid dark areas under overwater and floating structures, and are forced offshore into deeper waters. If young salmonids are forces into offshore areas before reaching an appropriate size, their growth rates are expected to decline because of the lack of suitable food. Besides reducing growth, and therefore survival, forcing small salmonids out of their preferred nearshore shallow water areas increases their exposure to potential predators. Diving ducks, and a number of fish species that prey on juvenile salmonids, such as squawfish, bass, and larger salmonids, including juvenile coho and steelhead, are typically found in offshore deeper water areas. If small salmonids are forces offshore before they reach sufficient size, they will become more available to such predators.

Appendix E

Environmental Caucus Comments
Wetlands & Wildlife

Appendix E
Environmental Caucus Comments
Wetland and Wildlife

The following two documents were written by and represent the views of M. Pat Wennekens, PhD, of the Clallam County Environmental Caucus, June 1994. These have been referenced in Chapter 6: East Clallam County Recommendations, C9 and CIO.

Wetlands

Wetlands together with riparian, riverine, streams, estuaries and shore habitats encompass the greatest expanse of the surface waters of the D/Q Pilot study area.

- There is no single, correct, indisputable, ecologically sound definition for wetlands, primarily because of the diversity of wetlands and because the demarcation between dry and wet environment lies along a continuum (USFWS, Classification of Wetlands and Deepwater Habitats of the US, I979).

- Ecologically wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plants and animal communities living in the soil and on its surface.

- Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water.

- Wetlands are "Waters of the State" and as such require full consideration to maintain and protect the quality - quantity of their waters.

- Wetlands are one of the most important component of the aquatic resources of the D!N area For example, within the Dinginess River lower watershed proper, wetlands alone occupy 2.5% (4,574 acres) of the watershed (USFWS National Wetland Inventory [1981], Clallam County selected coastal wetlands inventory [1985] and River Basin Team, July 1991). The Dungeness River lower reaches has the greatest acreage of wetlands (15°10 or 1.236 acres); Gierin Creek sub-watershed has the highest percentage of land covered by wetlands (16%).

- Wetland hierarchical classification subdivides into five major systems (Fig. 1):

Marine, Estuarine, Riverine, Laeustrine, Palustrine.

- Wetland classification is based solely upon emergent and hydrophytic vegetation. Classification does not account for the' submerged vegetation which provides a critical food supply, shelter and reproduction substrates for a large variety of invertebrates. Wetland degradation and losses cannot be accounted solely on the basis of emerged hydrophytic vegetation. The D/Q document must underscore that fact.

- The D/Q document fails to address two of the most important wetlands systems of the D/Q area, the marine and estuarine systems. It also lacks reference to the lacustrine (important in Jefferson County system. The document cannot be considered complete until extensive coverage of these very important wetlands is added.

- The "no net loss" necessitates that wetland water quality - quantity requirements be fully maintained when mitigation, restoration, creation of "new wetlands, minimization of impacts, compensatory mitigation measures are being acted upon. The D/Q program needs to address how a "no net loss" of wetland water quality - quantity can be achieved whenever water conservation and other water "saving" measures involve wetlands.

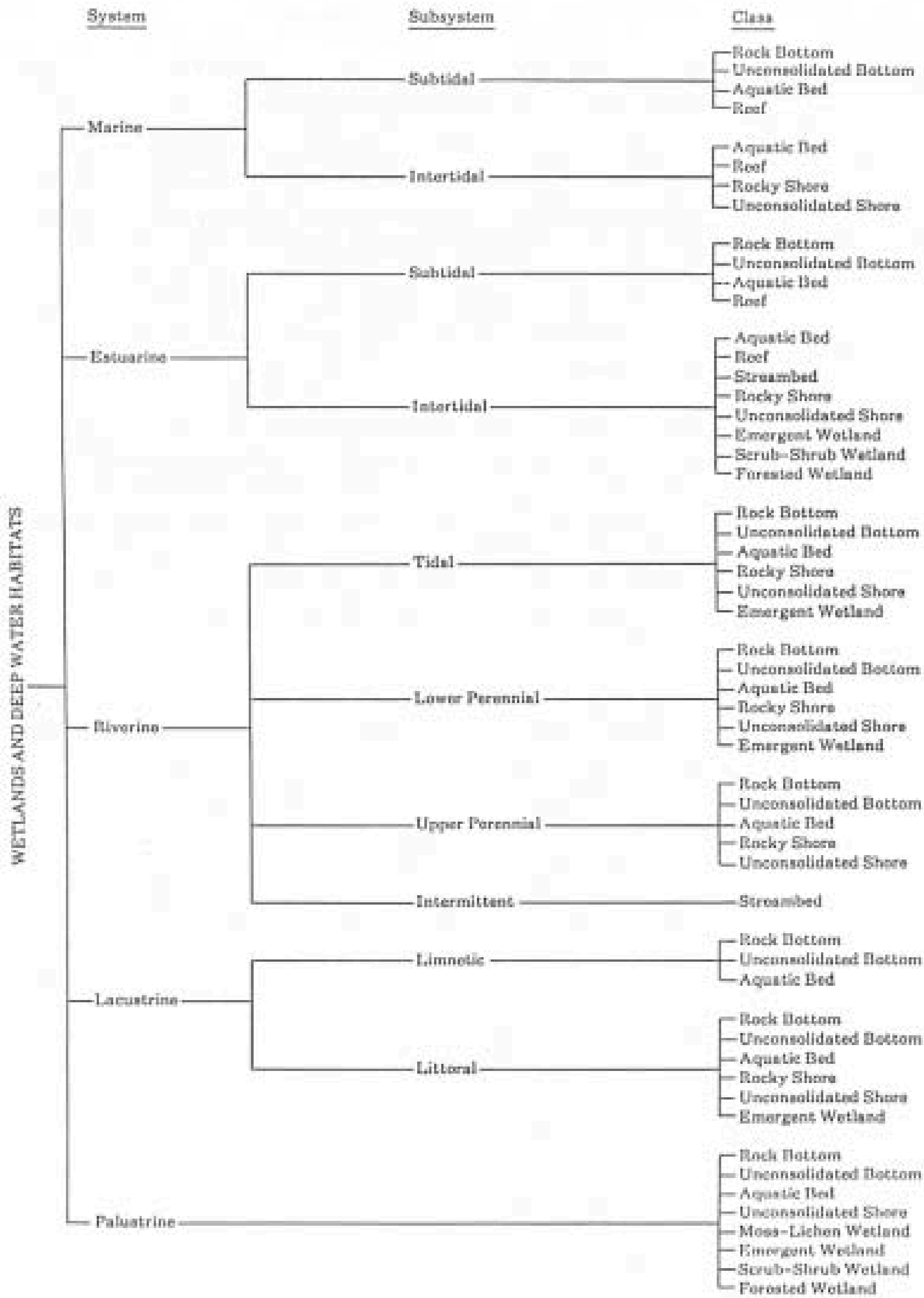


Fig. 1. Classification hierarchy of wetlands and deepwater habitats, showing systems, subsystems, and classes. The Palustrine System does not include deepwater habitats.

USFWS - FWS/OBS - 79/31 - DEC. 1979

- "Mimicking Nature" corresponding to natural cycles of wetness, flooding, drying of wetlands is an overriding requirement whenever corrective or compensatory measures are taken to protect "no net loss" of wetlands aquatic resources. The D/Q document needs broadening to address the kinds of compensatory - corrective measures mandated to protect the quality - quantity of wetlands waters beyond those resulting from irrigation ditches flow manipulations.

- Identification and classification of wetlands is based upon three criteria: water saturation, degree of soil wetness and presence of hydrophytic vegetation. The water/soil/hydrophytes classification was devised as convenient "regulatory" tool (Plants are sedentary in contrast to roaming wildlife). Apart from the physical attributes attached to wetlands (flood control, sediment traps, etc.), the overwhelming wildlife functions of wetlands become mired in the regulatory maze.

- Water dependent and water related wildlife cannot survive without wetlands. The lost and degradation of wetland habitats, locally as well as nationwide accounts for the lost and disappearance of hundreds of species. In the D/Q area, the sum total of all wetlands, from fraction of acre to tens of acres comprised the aquatic ecosystem supporting the high diversity of resident and migratory wildlife (taken in its broadest meaning). For example, wet meadows during their cycles of wetness support spawning and rearing amphibians (the disappearance of salamanders is being looked at as long term indicator of environmental deterioration).

- Wetlands are critical to the survival of migratory wildlife. Wetland protection must integrate the biological protection requirements of the Migratory Birds Act (MBTA) and associated UK, Japan, USSR international treaties for "the protection of migratory birds <u>and their habitat.</u>"

- Wetland protection also means wildlife protection. Whenever permits to develop in wetland environment are considered, both the permittee and the regulator have the responsibility to account for the resident - migratory wildlife functions of a given wetland.

- Times are changing and the D/Q as a pilot program needs to take the lead in counseling for wildlife inventories in wetland management. The present wetland classification practice must include the wildlife functions and values of the wetlands.

- The wildlife agencies usually act in an advisory rather than in a regulatory capacity to protect wetlands aquatic resources (except for endangered species and WDFW hydraulic permit to protect fish). As a "Pilot Program", the D/Q water resources management plan needs to emphasize that preservation of wetland water quality -quantity and address the "beneficial uses of water essential to the survival of water dependent/water related diversity of "wildlife" (as defined in WDFW Title 77 RCW, Chap. 77.08.010).

- The D/Q Pilot program needs to stress the importance to implement the WDFW "Priority Habitats and Species" recommendations underscoring the broad diversity of "non-game species of the State requiring special attention to preserve their welfare and longevity.

- As a "Pilot Program", the D/Q water resources management plan needs to underscore that the preservation of the quality - quantity of wetland "Wildlife Habitat defined as:

Waters of the State used by fish, other aquatic life and wildlife for any life history stage or activity. [Chapter 173 - 173.201.025 (17) WAC] is essential.

- While application of "Buffer Zones" rests primarily with land-use and property rights considerations, application of "Shoreline and Critical Area" planning must consider that a number of species of water related/dependent wildlife utilize a larger area than that delineated by "regulatory" buffer zones (eg. eagles, blue herons, tree ducks, etc.). The D/Q plan should address the "Buffer Zone" expanded land use needs for water dependent/water related wildlife.

- The critical ecological importance of wetlands cannot be overemphasized. The D/Q Water Resources Education Plan, must include an objective and proactive education program that will educate on the broader context of all facets of wetlands aquatic resources.

Wildlife: Present and Future -- an Overview

The onset of the 21st Century is only less than 6 years away. As a "pilot project", the D/Q water resources management program gives us the opportunity to reflect upon from our past, learn from our mistakes and plan for the future. Public pressure for a healthy and biologically fruitful environment is forcing re-examination of our "traditional" practices of habitat/wildlife management. Program such as the GMA spurs the needs to divest from the past and implement new approaches to land and natural resources conservation and management.

Wildlife is a unique natural resource. Under western managerial and conservation standards, its great diversity and wide ranging life requirements, does not readily adapt to the maze of strict boundaries and land "rights" imposed by western ownership practices.

Wildlife entities by themselves have no "rights" within the context of western property "right" practices. It is however held in common for the good of both national and international citizens. Being held in common however means that only an overseeing national, state and local entities must take the responsibility to manage and protect the biological entities.

Only under specific circumstances (e.g. parks, refuges) is the wildlife habitat held in common for the enjoyment of the citizens. Apart from regulations and statutes for the management of species of interest, the habitat essential to wildlife survival (taken in its broadest connotation), is given less than marginal protection.

As initially promoted by the D/ Chelan Pilot Project, major environmental - biological considerations were given to the endangered plight of salmonid ecosystems and to the urgency to restore the health of fish habitats and stocks

Grossly underplayed however was consideration of the water needs to maintain and protect the welfare of wildlife and its habitat. Better than 85 % of wildlife in the Pilot Study area is either directly or indirectly dependent upon the marine-fresh water ecosystems of the D/Q area.

Under "Wildlife Management, (Chapter 5 - Regional Strategies and Recommendations, p. 52), the Plan states under R. 12: "Wildlife is recognized as an important component of bioregional ecosystems and should receive protection on both local and state level". Recognition of the importance of wildlife is a recurrent theme and the desire to maintain and protect "Wildlife" is readily acknowledged. Lacking however is an insight of the processes by which such "desire" will be accommodate.

Wildlife is a highly mobile and biologically diverse natural resource. The high species diversity, mobility and biological demands placed by wildlife upon the environment makes it difficult to define wildlife holistically.

The management and regulatory mandates of the natural resource agencies (e.g. **US-DOI, DNR are** in an almost constant "conflict of interest" whenever resource extraction must be balanced against wildlife habitat protection. Such conflict have led to weak or ineffectual habitat protection and large scale demise of wildlife habitats. Similarly, under development pressures habitat usually gives ground to "growth" to satisfy human endeavors.

Defining Wildlife and Wildlife Habitat
The term "wildlife" is variously defined and often includes reference to habitat. The language of its definition depends upon the missions and regulatory mandate of a particular resource agency.

1- Washington Department of Fish and Wildlife (WDFW) Title 77 RCW - Game and Fish - Chap. 77.08.010 defines "Wildlife" as:

- All species in the animal kingdom whose members exist in Washington in a wild state.
- It includes but is not limited to mammals. birds, reptiles, amphibians, fish and invertebrates.

- The term "wildlife" does not include feral domestic mammals, the family Muridea of the order Rodentia (old world rats and mice),
- nor those fish, shellfish and marine invertebrates classified by the director of fisheries.
- The term "wildlife" includes all stages of development and the bodily parts of wildlife members.

The definition is primarily utilitarian, reflecting the traditional mission of the agency to manage harvestable wildlife as individual species.

2 - **Washington Department of Ecology (WDOE) Wildlife Habitat Definition**
Chapter 173-201 WAC - Water Quality Standards for Surface Waters of the State of Washington - Section 173.201.025 (17) defines WILDLIFE HABITAT as: *Waters of the State used by fish, other aquatic life and wildlife for any life history stage or activity.* The DOE definition only considers water as the habitat, not the aquatic environment as a whole. It reflects the Department of Ecology authority to protect both the quality and quantity of water necessary to maintain water dependent and aquatic related wildlife.

3 - US Fish and Wildlife Coordination Act (USFWCA)
Under the Federal US Fish and Wildlife Coordination Act (16 U.S.C. & 661 et sea) the terms "wildlife" and "wildlife resources" are defined as:

- Fish, birds, mammals and all other classes of wild animals and
- All types of aquatic and land vegetation upon which wildlife is dependent.
- The inclusion of aquatic and land vegetation incorporates an holistic habitat - ecological entity to the definition of wildlife.

The USFW Coordination Act specifies that wildlife resources must be given equal weight with those socio-economic and economic values whenever a Corps of Engineers 404 permit is requested. The recommendation is however advisory and its implementation left to the discretion of the COE.

Wildlife and Changing Times

1- "Tradition" in Wildlife Management
Traditionally Wildlife management had emphasized a species approach to management and conservation. Main focus has been upon population husbandry of "hook-shoot and trap "harvestable species. Protection of habitat, while usually mandated as part of the wildlife agencies mission was mostly relegates to the care of agencies with environmental protection mandates (e.g. EPA, DOE).

2 - The WDFW Hydraulic Permit (HP)
The Washington Department of Fisheries and Wildlife (WDFW) Hydraulic Permit (HP) serves as a WDFW regulatory tool to protect fresh and marine habitats from disturbance and degradation. Under current WDFW regulations however, HP applies only to fish preferably salmonids habitats. The HP does not protect "non-fish wildlife habitats. Attempts to include wildlife into the HP have been so far unsuccessful.

3 - Migratory Bird Treaty Act (MTBA) - International Treaties for the Protection of Migratory Birds <u>and Their Environment</u>.
The Migratory Bird Treaty Act implements domestically a series of treaties providing for protection of international migratory birds and their habitat. The migratory birds to be protected fall into three distinct categories - migratory game species - migratory non-game species and migratory insectivorous species (C. Coggins and S.T.Patti - The Resurrection and Expansion of the Migratory Bird Treaty Act - U. of Colorado Law Review, Vol. 50, pp.165-206, 19'79).

Treaties as well as federal statutes are the"' supreme law of the land and override contrary administrative practices of state (and local) laws (ibid).

The MTBA is a conservation statute protective of not merely birds but also public health and welfare (environment). The conservation of migratory birds promotes ecosystem integrity and germplast conservation (Germplast conservation refers to the necessity of maintaining a large pool of genetic characters from diverse species for the purpose of providing variations for evolutionary change and adaptation); [S. Margolin - Liability Under the Migratory Bird Treaty Act - Ecology Law Quarterly, Vol. 7, pp.989, 1979].

Seen primarily as a "superhunting" law throughout most of its history, the MTBA is now being viewed in an environmental protection context, being implemented more broadly The environmental implication of the MTBA becomes most important when protection of aquatic quality-quantity of wetlands and other aquatic habitats utilized by water dependent and water related migratory species becomes a land use and property rights issue.

4 - Governor's Executive Order (EO 94-04)
Changing times are reflected in the I April 1994 Governor's Executive Order (EO 94-04) - WSR 94-08-088 - on "Coordinated Watershed Planning, Implementation and Restoration for Fish and Wildlife'". EO 94-04 reflects the finding of the 1994 Legislature of a "compelling need to provide coordinated planning, implementation and restoration of natural resources and environmental protection on a watershed basis".

EO 94-04 sanctions "whole system - ecosystem" approach to manage aquatic, wildlife habitats, land and the broad mix of natural resources.

4 - WDFW "Priority Habitats and Species," (PHS)
On October 1993 the WDFW updated its Summer 1991 "Species of Concern List" non-game program document into a "Priority Habitats and Species management document. The addition of "Habitats" as a critical criteria for the management of wildlife shows the WDFW shift from traditional species management to the broader "Habitat-Ecosystem" management of wildlife. Designating habitat and species as priority represents a proactive action to help prevent species from becoming threatened endangered or eventually extinct.

The WDFW document underscores the necessity to proactively and urgently address and counter the accelerating degradation and loss of aquatic habitat (especially wetlands) and interdependent wildlife in the D/Q area.

5 - Water dependent - water related "Non-game" species –
Water dependent and water related "Non-Game" wildlife are a crucial .local, national and international resources. The aquatic ecosystems (wetlands, riparian, shorelines and estuaries) are utilized by diverse assemblages of marine and land flora and large populations of resident and migratory wildlife (taken in its broader context).

The majority of the wildlife species fall within the "non-game" category. While the Dungeness - Quilcene water resources management stresses the rehabilitation of salmonid stocks in the Dungeness and other streams, the pilot project status of the program provides the impetus to promote for a proactive protection and conservation for all water dependent and water related wildlife.

"Growth Management" mandates that special considerations be given to protect, conserve and maintain the aquatic quality/ quantity of wildlife habitats. "Growth Management" also mandates that new imaginative land, water and natural resources management planning and thinking be proactively applied to prevent and redress the "growth" impacts upon wildlife and associated habitat.

6 - "Urban" Wildlife
Growth and urbanization brings major changes in the wildlife composition of "unnatural" lands and shores. Urbanization favors influx and settlement of urban tolerant or adapted wildlife. The D/Q Plan needs to insure that Growth management gives prime consideration to the aquatic needs of water related/water dependent urban wildlife Riparian/reverine habitat protection and restoration, wetland protection, shoreline parks and green belts, etc. can compensate from the impacts of growth upon the "quality of life".

The Dungeness - Quilcene Water Resources Management Pilot Study Program is at the threshold of the 21st Century. It is formulated within an era in which the citizens want departure from the traditional practices of husbanding wildlife. The D/Q pilot program must recognize that wildlife has "rights" to clean and plentiful water to perform its mufti biological functions.

Recommendations:
The Dungeness - Quilcene Water Resources Management Plan, as a Pilot Program must address:

- Within the context of "Shared Sacrifice the quality/ quantity "rights of water dependent/water related wildlife must be preserved.
- "Wildlife" and "Wildlife Habitats" values must be socially, economically and environmentally considered as important as those of forestry and agriculture.
- The fact that 85 % of the wildlife in the D/Q area is either directly dependent or closely inter-related to the water resources of the area.
- "Non-game" wildlife as a dominant resource mandates full protection and conservation of aquatic quality/ quantity for its habitat.
- Inventories and census of water dependent/water related species and their habitats must be performed to create a "Wildlife Data Base" as biological component of the "Data Inventory and Management" program for the D/Q area.
- Research on the seasonal and spatial distribution, habitat preference, concentrations, staging of wildlife" in the D/Q area must be performed and the results entered as a " Biological Research and Data Management" component of the Pilot study.
- The D/Q program must insure that the WDFW "Priority Habitats and Species" recommendations are proactively applied to preserve and maintain wildlife and associated Habitat resources in the D/Q area.
- Specific curricula on "Wildlife Biology and Wildlife Habitat Ecology" be instituted in the schools to educate and train . individuals in ecosystem wildlife/habitat management. Prime emphasis to be placed upon "non-game" and "Priority Habitats and Species".

Appendix F

Stream Modifications

Appendix F
Stream Modifications

Gravel Traps

Refer to Recommendation C.7.3: *Channel Stabilization and Gravel Traps* in Chapter 6: *East Clallam County Recommendations* for the RPG recommendations. The following are important areas that should be considered related to channel stabilization and gravel trap projects.

1. Further analysis of the causes for channel instability should continue. Causes may include geological events, historical natural landslides, forest practices upstream, low flows caused by irrigation uses and other human impacts.

2. Grave: Because gravel aggradation and channel instability is a problem for land owners and fisheries and may exacerbate low flow problems on the Dungeness River, various types of "gravel traps" have been built or proposed on the river. The on-going gravelextraction and building of traps should be carefully considered beforethey continue to be used to mitigate gravel buildup on the river.
   a. Research currently being done on their use should be continued to gain a better understanding of the use and effects of gravel traps. (Tribe, Wennekens and Enbysk.)
   b. The proposed watershed council should investigate the use and impacts of gravel extraction/gravel traps and determine if their use should be continued.
   c. The proposed habitat management plan should include monitoring of existing and future gravel traps as a component.
   d. A complete map and notebook with gravel trap information should be prepared as a part of on-going monitoring of existing and future projects.
   e. A program should be established for fisheries experts to monitor and record the use of gravel traps by juvenile and adult fish and possible deleterious impacts on spawning. The current

use of gravel traps is experimental and the RPG recommends further study on the effectiveness and impact of gravel trap projects on the Dungeness River. There is no consensus in the RPG about whether the use of gravel traps should be continued.

3. A meeting should be called at least annually amongst fisheries experts, the watershed council and people involved in building and permitting gravel traps to provide an:
   a. Evaluation of gravel traps and their impacts on the river and fisheries.
   b. Evaluation of the cumulative effects of these projects.

4. The following should be considered when allowing or designing gravel traps in the Dungeness river:
   a. Implications on long-term channel stability including width to depth ratio, erosion rate, and pool/riffle ratio;
   b. Habitat requirements;
   c. Sediment impacts with traps separate from flowing streams and egress placement;
   d. The need for woody debris for cover to protect juvenile fish from predation and adults from human harassment;
   e. Time of gravel extraction, related to activities of fish cycles; f. An effective redd marking system to protect spawning areas;
   g. Requirements for cross sections on river sections with traps at the time of construction and continuing on a yearly basis; h. Placement and proximity of traps (e.g., not a long series which might turn into a channel);
   i. Amount of gravel removal and effects on the river system;

5. The Washington Department of Fisheries & Wildlife (WDFW) should take an active role in managing and monitoring the use of gravel traps in the river.
   a. WDFW should become the central repository for gravel trap information for use in the Hydraulic Permit application process;
   b. WDFW should make this information available to interested parties as needed;

c. Gravel removal should be monitored by WDFW via permit requirements for cross sections and an estimation of volume removed per project.

6. Information and expertise on the design and implementation of gravel traps should be made available to land owners and operators at all phases of permitting, design and construction.

7. Gravel traps and other gravel removal projects should be coordinated with the implementation of the comprehensive flood management plan.

8. Implementation of other bank and channel stabilization measures as outlined in the Dungeness Flood Management Plan should be pursued.

a. Funding for a model bank stabilization projects should be sought.

b. Education should be provided to riparian land owners an permitting requirements and fish-friendly bank stabilization techniques.

The following is an excerpt from the Shoreline Management Guidebook, Volume 2: Shoreline Master Program Handbook, .1994 Edition, by Department of Ecology.

Bioengineering

Applicability
Bioengineering is the term given to the practice of using natural vegetative materials to stabilize shorelines and prevent erosion. This may include use of bundles of stems, root systems, or other living plant material; soft gabions, fabric or other soil stabilization techniques; and limited rock toe protection where appropriate. Bioengineering projects often include fisheries habitat enhancement measures such as anchored logs or root wads in project design. Such techniques may be applied to creeks, rivers, lakes, reservoirs, and marine waters. Bioengineering may also be applied in upland areas away from the immediate shoreline.

The use of bioengineering as a shoreline stabilization technique is seen as an alternative to riprap, concrete and other structural solutions. It provides habitat while maintaining and preserving the natural character of the shoreline. Bioengineering is the preferred "best practices" choice when considering shoreline stabilization. Combining bioengineering techniques with armored revetments is also encouraged over singularly employing riprap or other types of armored revetment. Many jurisdictions are considering enhancement of existing riprap shorelines to restore lost riparian/shoreline habitat and public values.

Policies

1. All bioengineering projects should ensure that water quality, fish and wildlife habitats and flood holding capacity are not degraded**.** Bioengineering projects should be designed and scheduled to minimize impacts to natural resources and to optimize survival of new plantings.

2. Whenever possible, the design of bioengineering projects should incorporate self-maintaining vegetation and materials over those requiring routine maintenance.

3. Bioengineering projects should extend no further waterward than is necessary to achieve intended results.

4. Shoreline stabilization through bioengineering should use native vegetation wherever possible.

5. Bioengineering projects should include buffers, fencing and/or other measures to avoid disturbance of the project site by livestock and vehicles.

6. Structural soil stabilization components including riprap, should be kept to a minimum in such projects and designed to last only until vegetation is well established. Bioengineering projects do not typically rely on long-term structural (bank hardening) measures.

7. Bioengineering projects should follow recommended best management practices for establishing/restoring vegetation in shoreline and riparian areas. Guidance from the Soil Conservation Service, the State Departments of Wildlife, Fisheries, and Ecology and local Conservation Districts should be considered in project designs.

Regulations

1. The City/County shall require and utilize the following information, in addition to the standard permit information requirements contained in WAG 173-14-110, in its review of all bioengineering projects.

   a. proposed timing of all construction phases of the project,

   b. flow analysis, addressing hydrology and hydraulics and identifying expected flood flows compared with proposed timing of construction activities,

   c. existing soil types, bank materials and analysis of slope stability,

   d. proposed materials that will be used on-site including rack size, shape and quantity, plant materials, soil preparations that provide optimal planting mediums for the vegetation proposed, areas to be seeded, and fencing,

   e existing and proposed slope profiles, including location of ordinary high water mark,

f. design of transition areas between bioengineering site and adjacent properties (both up and downstream of project),

g. documentation (including photos) of existing pre-construction shoreline characteristics.

2. All bioengineering projects shall use a diverse variety of native plant materials including trees, shrubs and grasses, unless demonstrated infeasible for the particular site.

3. All cleared areas shad be replanted following construction and irrigated (if necessary) to ensure that within three years time all vegetation is fully reestablished. Areas which fail to adequately reestablish vegetation shall be replanted with approved plant materials until such time as the plantings are viable.

4. Bank protection in the form of a buffer zone shall be provided for a minimum of three years. The buffer zone shall exclude livestock, vehicles, and/or other activities that could disturb the site. The most effective buffer zone protection measure is fencing.

5. All bioengineering projects shall be monitored and maintained as necessary. Areas damaged by pests and/or the elements shaft be promptly repaired.

6. All construction and planting activities shall be scheduled to minimize impacts to water quality and fish and wildlife aquatic and upland habitat and to optimize survival of new vegetation.

Revetments (Riprap)

Applicability

A revetment is a sloped shoreline structure built to protect an existing eroding shoreline or newly placed fill against waves, wakes, currents, or weather. Revetments are most commonly built of randomly placed boulders (riprap), but may also be built of sand-cement bags, paving or building blocks, gabions (rock filled wire baskets), or other systems and materials. The principal features of a revetment, regardless of type, are:

1. Heavy armor layer;

2. Filter layer; and

3. Toe protection.

This section deals specifically with the modification activity of revetments. For additional policies and regulations see Shoreline Stabilization, "General Shoreline Modification Provisions" in this chapter.

Policies

1. The use of armored structural revetments should be limited to situations where it is demonstrated that nonstructural solutions such as bioengineering, setbacks and buffers or any combination thereof will not provide sufficient shoreline stabilization.

2. The construction and maintenance of revetments should not result in the loss or reduction of shoreline environmental resource values. If a loss or reduction cannot be avoided, mitigation should be provided.

3. Revetments should be designed, improved and maintained to provide public access whenever possible.

Regulations -- General

1. All forms of revetments shall be constructed and maintained in a manner that does not reduce water quality and/or fisheries habitat.

2. Design of the proposed revetment shall incorporate proper consideration

   a. Data on local geophysical conditions;

   b. Data on stream flow, velocity, and/or flood capacity; and

   c. Effects on adjacent properties.

3 Bank revetments, where permitted, shall be placed at the extreme edge or bank of the shoreline.

4. Design of revetments shall include and provide improved access to public shorelines whenever possible and appropriate.

5. Revetments must be in support of an allowable shoreline use that is in conformance with the Provisions of this master program, unless it can be demonstrated that such activities are necessary and in the public interest far the maintenance of shoreline environmental resources.

6. All shoreline development must conform to the General Provisions (see Chapter 5) and the Environment Designation Provisions (see Chapter 6) stated in this master program.

Regulations -- Riprap

1. Riprap shall be constructed using techniques and materials that will enhance natural shoreline values and functions, including fish and wildlife habitat, water quality, vegetation and aesthetics. The following techniques and materials shall be used:

    a. Riprap material shall consist of clean quarried rock, free of loose dirt and any pollutants, and shall be of sufficient size and weight to prevent movement by wave or current action. Tires, automobile bodies, scrap metal, paper products and other inappropriate. solid waste materials, shall not be used for riprap.

    b. Use of downed logs, snags or rock work to enhance habitat and to provide a more natural appearance to the shoreline shall be incorporated into the design where appropriate.

    c. Where on-site environmental conditions allow, vegetation shall be integrated into the riprap design to reduce erosion, provide cover, shade and habitat and improve the natural appearance of the shoreline, consistent with the applicable vegetation management provisions of this master program.

Regulations -- Design

1. When permitted, the siting and design of revetments shall be performed using appropriate engineering principles, including guidelines of the U.S. Soil Conservation Service and the U.S. Army Corps of Engineers.

2. If an armored revetment is employed the following design criteria shall be met (see Figure 8-1):

    a. The size and quantity of the material shall be limited to only that necessary to withstand the estimated energy intensity of the hydraulic system;

    b. Filter cloth must be used to aid drainage and help prevent settling; and

c. The toe reinforcement or protection must be adequate *to* prevent a collapse of the system from river scouring or wave action for the anticipated life of the project.

3. The area shall be restored as nearly as possible to preproject *condition* including replanting with native species and maintenance care until the newly planted vegetation is established.

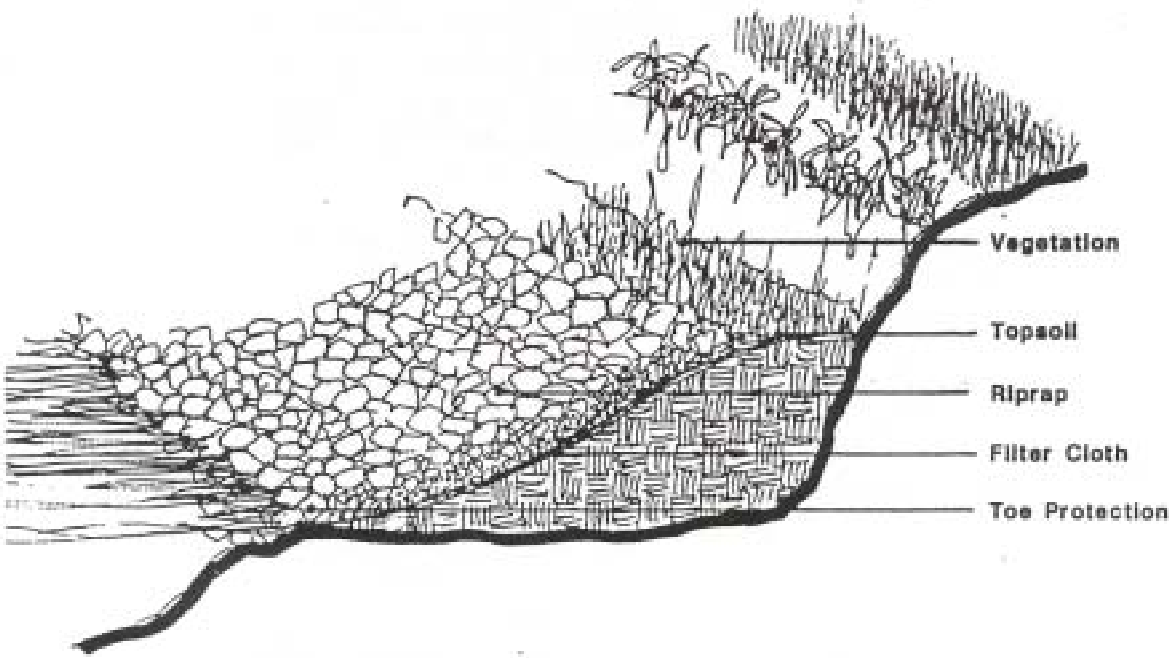
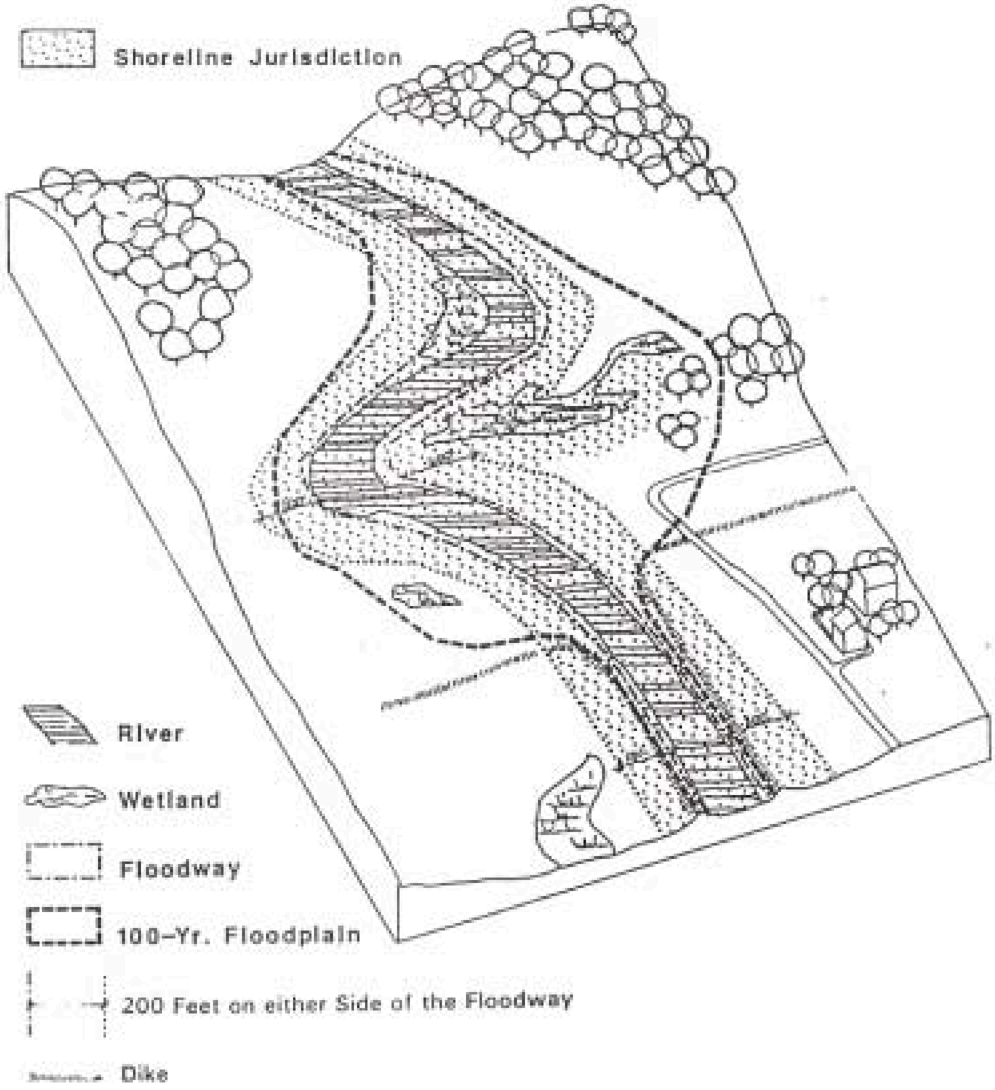


Figure 8-1. Example design criteria for riprap revetments

OPTION 3



Shoreline jurisdiction includes all lands within 200' of floodway or OHWM (whichever is greater), all marshes, bogs and swamps in the 100-year floodplain, plus other portions of the 100-year floodplain as designated by the local government.

Figure 2-2. Options for Setting Shoreline Jurisdiction (Page 4 of 4)

Appendix G

Sequim Water Plan
Conservation Section

Appendix G
Sequim Water Plan Conservation Section

The following is an excerpt from: 1993 Comprehensive Water Plan for City of Sequim by Polaris Engineering and Surveying, Inc. It is included here as an example of a water conservation plan.

Conservation

Infrastructure

Infrastructure such as production sources, distribution systems, and storage are sized on the basis of predicted demands for service. System enlargement increases construction costs and places additional demands on limited production resources. Suitable conservation measures can reduce the overall system demand with corresponding decreases in construction costs. Available production sources can then be more efficiently utilized. Although conservation will not eliminate the need for new infrastructure, it can be viewed as a means to extend the use of existing production resources and to possibly defer the need to develop new production facilities.

The report section on storage (Table 31) indicated a current summer season deficiency of storage of 1,170,600 gallons and a deficiency of 2,162,30(1 gallons in the year 2013. This amounts to a need to construct from $1,035,300 to $2,174,000 (page 56) in new tankage in the next 20 years. New production facilities and elements to the distribution system will also be needed to accommodate the increased water demand. Table 31 is based on the adoption of a fire sprinkler ordinance. Storage requirements for the system without a fire sprinkler ordinance are shown on Table 31, and are high still. Consideration of conservation measures for both domestic and commercial uses is warranted.

Domestic Water Use

The present average water demand is 199 gallons per capita day (Table 20) or 661 gallons per connection per day. This is 74 gallons per day higher than the average, per capita, suburban demand in Jefferson County (Table 14). During the summer peak, the domestic demand is 708 gallons per capita per day, 3.23 times higher than the 219 gallon per capita per day average demand in Jefferson County. The water demand in the City of Sequim is high compared to national and regional standards during the low water months; and, higher than regional demands during the peak summer season. The data suggest that there is a good potential for the reduction of water demands through conservation measures. The following sections discuss the main domestic uses of water; inside domestic uses and outside domestic uses.

Inside Domestic Water Uses: There is a direct relationship between water consumption and waste water generation. A breakdown of inside domestic uses showing nationwide averages is shown at Appendix D [of the Sequim Plan]: *Typical Wastewater Flows From Selected Sources.* Approximately 90%a of inside domestic water used ends up in the waste water system, therefore, the average national inside domestic water use is 51 gallons per capita per day. A number of the component uses shown in the Appendix can be affected by conservation measures such as the installation of low flow toilets and sink and shower flow restrictors. The following table shows what economies can be attained.

Table 33: Domestic Conservation Measure Effects

Activity	**Current Use GPCD**	**Anticipated** Use **GPCD**	**Anticipated Reduction GPCD**
Toilet Flush	16.2	7.4	$.8
Bathing	9.2	6.4	2.8
Clothes Washing	10.0	10.0	0.0
Dish Washing	3.2	2.6	0.6
Garbage Grinding	1.2	0.8	0.4
Miscellaneous	6.6	4.6	2.0
TOTAL	45.6	31.8	13.8

Economies of the order of 30% in internal domestic use can be attained by the installation of water conserving devices. An aggressive policy would need to be adopted that would mandate the installation of water conserving devices on all new and remodel construction as a requirement of permit approval. The policy would also require the conversion of existing construction to low flow construction within a specified time period such as 5 years. The City should investigate the costs associated with providing a financial policy to assist in the conversion costs to persons of low income. The costs of providing an assistance program should be more than offset by the benefit of not needing to construct additional infrastructure.

High density residential classification is composed of high density residential buildings, residential care facilities and mobile home parks. Table 15 shows only minor increases in water consumption in the summer for high density residential users. This is primarily due to the limited percentage of landscaping per unit within this category. The percentage of overall use within this category is high (51% of the total demand) with an average monthly usage of 51,126 cubic feet per month. Because the majority of the water used within this category is inside domestic in nature, this residential category should be targeted as having significant potential for conservation savings.

As stated above, mobile home parks are contained within the high density residential category. This category has the greatest increase in seasonal water use (40.9% summer increase per Table 15). The increase is chiefly due to the increased number of occupied units the summer season. No practical conservation measure is anticipated that could address plumbing modifications within each trailer coach since coach construction is not regulated by City building codes. Conservation measures within this group will be generally ineffective. This will tend to limit but not eliminate the effectiveness of conservation measures within the high density residential classification.

Outside Domestic Water Uses: The principal outside domestic water use is irrigation (lawns, trees, plants, etc.). Domestic consumption of irrigation water is greatest in the summer. Two recognized means of controlling outside domestic water uses are: pressure control and water rates. Available water pressure affects water usage in that the higher the pressure, the higher the potential for water wastage. Major portions of the City have water main pressures in excess of 80 psi; and some areas have pressures above 100 psi. Services in these areas are required to have pressure reducing valves in order to prevent damage to domestic water system components. In an ideal system, pressure would be lower and these valves would not be necessary. One goal of this report is to redefine the distribution system so that there are a sufficient number of pressure zones, each zone having a maximum line pressure of 80 psi. This goal will not be attainable in all instances. Where individual pressure regulators must be used, the set pressure of these must be less than 80 psi. The preferable set pressure range is 40-60 psi.

The most potent means of controlling outdoor domestic water use is through an inverted rate type water billing system. The City currently charges a base rate with additional billing for water units used. An inverted rate structure features an increase charge for billing unit as the water consumption increases. The current incremental billing unit is 5000 cubic feet. This will need to be reduced to a lesser unit such as 500 cubic feet. The effect of increasing the cost per billing unit is to increase consumer awareness of the total amount of water used through an increasingly larger water bill. The desired outcome will be a reduction in total water used.

Commercial Uses

Uses within this classification are offices, motels, and commercial. Public facilities will also be considered under this classification. The office category shows only a 10.1 % increase in use during the summer. This is primarily due to the fixed occupant load and minimal landscaping requirements.

The motel and commercial categories experience respective increases of 36.7% and 24.3%. These classifications are characterized by considerable interior domestic uses and minimal landscaping. The seasonal increases are primarily due to increased occupant loading. only.

The public facilities category includes users such as the City of Sequim, the school district, and the federal government (post office building). Public facilities comprise 5.1 % of the total yearly water demand. The demand does not appear to have large seasonal changes.

The nature of the commercial demands are principally interior domestic uses. As such, conservation measures should cause significant reductions in water demand. Installation of low flow toilets, flow restrictors, and pressure regulators are active measures that should be undertaken. An inverted rate structure may not have a major effect within this classification. The majority of the accounts within this classification, except the commercial category, are already at or near the baseline level. The commercial category is the exception. The majority of these accounts are at the current maximum level These accounts would be most affected by an inverted rate structure. The method of establishing appropriate rate structures for these accounts is complicated and will need to be addressed by the City prior to the adoption of a conservation ordinance.

System Modifications
Several system modifications have been identified as areas for water conservation. The first of these is reporting of unaccounted waters, water produced but not measured on individual water meters. The city has had water meters for all connections since 1978. Since that time, there has been a discrepancy between the volume of water measured at the master water meter and the volume reported on the individual water meters. The records have consistently shown more water sold than produced. This is due to the inaccuracy of the present master meter.

Unaccounted water are those waters lost in the system due to leaks, evaporation, or other means. In a normal system, they total around 5%. The percentage of unaccounted waters is a test of the integrity of a system. As the percentage gas up, the need for maintenance is indicated. High priority should be placed in providing a competent master meter system in order to provide for a meaningful system indicator.

The current computer produced water billing system will require modifications in order to provide water use statistics. In addition to current billing information, the bill will need to show the billing amount for the same period of the previous year as well as the relative use of water (decrease or increase). Consideration should also be given to a seasonal water rate, one for winter and a higher rate for summer.

The City should initiate a water audit program. Under this program, a city inspector would, with the request of home owners, review the owner's water system and provide information on ways to increase the efficiency of water utilization.

Mandatory water conservation measures for new and remodeled structure are specified in the Washington State Energy Code (Chapter 51-I 1 WAC). The City should consider an ordinance that requires conformance of all structures to the state Energy Code. Uniform compliance to the code would greatly reduce the required volume of storage. A portion of the cost savings in tankage could be reserved to help citizens comply with the ordinance. Areas of support could be no cost, City supplied flow reducing devices for sinks and shower heads, and partial rebates on low flow toilet cost.

As stated in previous sections, the average water main pressure with the City distribution system is around 80 psi. Additional pressure zones must be added to bring the average zone pressure to around 45 psi. This pressure reduction will result in water significant reductions flow based uses in all user categories.

Conservation Goals
The water demand per capita in the City of Sequim, is the highest in the north Olympic Peninsula - at least double that of Port Townsend and the City of Port Angeles. The high demand places a severe burden on production and storage facilities as well as natural resources. The five year conservation goal is a fifteen percent reduction in demand.

Public Participation
The success of any conservation will depend on the degree of participation by the residents of the City. In addition to mandatory ordinance requirements, the City will need to convince its residents of the desirability of complying with the ordinances. Possible means of accomplishing this goal are:

a) Mailers with water bills
b) Promotional programs
c) Public speaking engagements
d) Technical support for commercial users to install recycling water systems for non-potable water uses.
e) Encourage water conservation at businesses such as restaurants, motels, etc.

Experience has shown that public participation is necessary for the success of a water conservation program. The public needs to know that a problem exists and that it is in their beneficial interest to become involved in solving the problem. Mailers with water bills reach directly into the consumer's homes. The most effective mailer is to have historical water use statistics included as a part of the regular statement along with a computation of savings. Customers will normally ignore flyers; but, will read their statements. Promotional programs to both raise awareness of water use and promote conversion to low flow devices have been highly successful in other municipalities. Public speaking engagements are targeted at schools and service clubs. These engagements can be combined with promotional programs. The advantage of a good public speaking program is that it conveys information to organized groups. This will tent to optimize the effectiveness of the contact. These groups have been effective in the continued dissemination of the conservation information in other municipalities.

Appendix H

Resolution &
Letters of Support

Appendix H
Resolutions and Letters of Support

Participants on the Local Government Caucus (including State, Federal, Tribal, Local Government and PUD's) were contacted for resolutions of support for the DQ Plan. The short turn-around time between the completion of the recommendations and the printing of the final DQ Plan made this task difficult. Included in this appendix are the resolutions or letters of support from the participating agencies and governments.

JAMESTOWN S'KLALLAM TRIBE
1033 Old Blyn Highway, Sequim, WA 98382 206/683-1109 FAX 206/681-4643

RESOLUTION # 32-94

WHEREAS, the Jamestown S'Klallam Indian Tribe (hereinafter referred to as "the Tribe") has been Federally acknowledged by the Secretary of the Interior of the United States of America on February 10, 1981; and

WHEREAS, the Jamestown S'Klallam Tribal Council (hereinafter referred to as "the Council") is the governing body of the Jamestown S'Klallam Tribe in accordance with its Constitution adopted on November 19, 1983, and conducted by the Bureau of Indian Affairs following Part 81 of the Code of Federal Regulations; and

WHEREAS, the health, safety, welfare, and education of the Indian people of the Jamestown S'Klallam Tribe is the responsibility of the Jamestown S'Klallam Tribal Council; and

WHEREAS, the Jamestown S'Klallam Tribal Council previously adopted Resolution #2190 on May 4, -1990, supporting cooperative planning of water resources with the State of Washington on a government-to-government basis, and Resolution #32-9I on June II, 1991 pledging its commitment to the Dungeness-Quilcene Wafer Resources Pilot Project; and

- WHEREAS, a Dungeness-Quilcene Water Resources Management Plan has now been written which outlines regional water management strategies for the future to provide far a net gain in productive fish habitat in the Dungeness watershed; and

WHEREAS, the Dungeness-Quilcene Water Resources Management Plan does not quantify tribal rights to water resources, nor preclude the Jamestown S'Klallam Tribe from seeking adjudicative relief in the future regarding water resources for tribal use and the needs of treaty-reserved resources;

NOW THEREFORE BE IT RESOLVED, that the Jamestown S'Klallam Tribal Council hereby states its support for the, Dungeness-Quilcene water Resources Management Plan and pledges its commitment to work towards plan implementation; and

BE IT FURTHER RESOLVED, that the Tribal Chairman or Vice-Chairwoman are authorized to sign the plan and recommendations to the Washington Department of Ecology for the protection and management of .the quality and quantity of the region's surface and groundwater.

W. Ron Allen

W. Ron Allen, Tribal Chairman

CERTIFICATION

I, Ann J. Balch, Secretary of the Jamestown S'Klallam Tribal Council of the Jamestown S'Klallam Tribe, do hereby certify that the foregoing resolution was formally adopted at a meeting held on the 2nd day of June 1994, at the Jamestown S'Klallam Tribal Office in Blyn, Washington, and where a quorum was present and approving the resolution by a vote of 5 FOR and 0 AGAINST with 0 ABSTAINING.

Ann J. Balch

Ann J. Balch, Tribal Council Secretary

PORT GAMBLE S'KLALLAM TRIBE
Post Office Box 280 • Kingston, Washington 98346

June 28, 1994

Ms. Carol Fleskes
Water Resources Program
Department of Ecology
PO Box 47600
Olympia, WA., 98504.-7600

Dear Ms. Fleskes:

The Fort Gamble S'Klallam Tribe supports the Dungeness/Quilcene Water Resources Management Plan anti pledge our commitment to work toward its implementation. The Tribe endorses the intent of the plan to provide for a net gain in fish habitat and will assist the state and local cooperators to protect the quality and quantity of the region's waters.

Our support of the plan is based upon the understanding that this support does not quantify Tribal rights to water resources nor preclude the Tribe froze seeking adjudicative relief in the future regarding water resources for tribal use and the needs of Treaty reserved resources.

The Tribe wishes to thank the many participants and staff who labored together to develop this plan. We appreciate the cooperative spirit and government to government relations that allowed us to *bring this plan forward.*

Respectfully,

Gerald J. Jones

(206) 297 2646 Kingston *(206) 473.583* Bremerton *(206) 464-7281* Seattle (206) 297-7097 Fax

RESOLUTION NO. 94-A-112

THE)
PORT GAMBLE)
S'KLALLAM)
BUSINESS COMMITTEE)
OF)
PORT GAMBLE)
S'KLALLAM)
COMMUNITY COUNCIL)
________________________________)

I.

WHEREAS. the Port Gamble S'Klallam Indian Community is organized under the Indian Reorganization act of Tune 18,1934; and

II.

WHEREAS, under its Constitution and Bylaws adopted August 5,1939, the Community Council was designated as the governing body of the Port Gamble S'KlaIlam Indian Community; and .

III.

WHEREAS, by resolution dated April 22,1956, the Port Gamble S'Klallam Community Council delegated the authority to conduct the business of the Port Gamble S'Klallam Indian Community to the port Gamble S'Klallam Business Committee; and

IV.

WHEREAS, the Tribe has cooperated in the development of the Dungeness/Quilcene Water Resources Management Plan*,* and

V.

WHEREAS, the intent of the plan is to provide far a net gain in fish habitat and will assist state and local governments to protect the quality and quantity of the region's waters; and

VI.

WHEREAS, our support of the plan is based upon the understanding that this support does not quantify Tribal rights to water resources nor preclude the Tribe from seeking adjudicative relief in the future regarding water resources for tribal use and the needs of Treaty resources; and

VII.

WHEREAS,, the Tribe appreciates *the* cooperative spirit and government to government relations that allowed us to bring this plan forward,

VIII.

NOW THEREFORE BE IT RESOLVED, that the Port Gamble S'Klallam Business Committee supports *the* Dungeness/Quilcene Water Resources Management Plan and pledges our commitment *m* work towards its implementation.

CERTIFICATION

WE HEREBY CERTIFY that on this date there was a regular meeting held of the Port Gamble S'Klallam Business Committee on the Port Gamble S'Klallam Indian Reservation, ***at which*** time a quorum was present;

WE FURTHER CERTIFY, that the a numbered resolution, was at said meeting introduced, evaluated, and was passed by a vote of 4 FOR 0 AGAINST, dated this .12TH day Of Juy,1994.

Gerald J. Jones
Gerald J. Jones
Chairperson

Marie Hebert
Marie Hebert
Secretary

BEFORE THE BOARD OF CLALLAM COUNTY COMMISSIONERS, STATE OF WASHINGTON

IN THE MATTER OF:	}	
Support of the Dungeness-	)	RESOLUTION NO. *102 . 1994*
Quilcene Water Resources	)	
Planning Project	)	

THE BOARD OF CLALLAM COUNTY COMMISSIONERS finds as follows:

1. On June 11, 1991, the Board of Commissioners approved Resolution No. 199, 1991 pledging support and commitment to the Dungeness-Quilcene Water Resources Pilot Project under the terms of the Chelan Agreement as required by the Washington State Department of Ecology.

2. For nearly three years the Dungeness-Quilcene Water Resources Pilot Project has been underway. The work involved local governments, state government, tribes, fisheries, recreational, agricultural, business and environmental interests.

3. The Dungeness-Quilcene Water Resources Management Plan has now been written which outlines regional water management strategies for the future to provide for a net gain in productive fish habitat in the Dungeness watershed.

1N CONSIDERATION OF THE ABOVE FINDINGS OF FACT, IT IS HEREBY RESOLVED BY THE BOARD OF CLALLAM COUNTY COMMISSIONERS:

I. Clallam County hereby stales its support for the Dungeness-Quilcene Water Resources Management Plan and pledges to work toward implementation of the plan.

II. Clallam County Commissioner Dave Cameron is authorized to sign the plan for recommendation to the Washington Department of Ecology far the protection and arrangement of the quality and quantity of the region's surface and groundwater.

PASSED AND ADOPTED THIS 21 DAY OF June, 1994.

Lawrence Gaydeski
Lawrence Gaydeski, Chair

Dorothy Duncan
Dorothy Duncan

Dave Cameron
Dave Cameron

ATTEST:

Karen Flores
Karen Flores
Clerk of the Board

cc: Jamestown S'Klallam Tribe
Minutes
Files

STATE OF WASHINGTON
County of Jefferson

IN THE MATTER OF AUTHORIZING COMMISSIONER RICHARD E. WOJT TO VOTE IN SUPPORT OF THE DRAFT PLAN OF THE DUNGENESS/QUILCENE PILOT PROJECT	}	RESOLUTION NO. 74-94

WHEREAS, Jefferson County has participated in the Dungeness/Quilcene Pilot Project since the Spring of 1991, and

WHEREAS, a Draft Dungeness/Quilcene Water Resources Management Plan has now been written which outlines regional water management strategies for the future, and

WHEREAS, Jefferson County hereby states its support for the draft Plan and pledges to work toward Plan implementation, and

WHEREAS, County Commissioner Richard E. Wojt has been the County's representative and has been actively involved in the project, now, therefore;

BE IT RESOLVED, that the Board of County Commissioners authorizes Richard E. Wojt to sign the draft Plan and recommendations to the Washington Department of Ecology for the protection of the quality and quantity of the region's surface and groundwater.

APPROVED this 20th day of June, 1994.

JEFFERSON COUNTY
BOARD OF COMMISSIONERS

SEAL:

(excused Absence)
Robert Hinton, Chairman

Glen Huntingford, Member

ATTEST: Julie Matthes, Deputy
Lorna L. Delaney
Clerk of the Board

Richard E. Wojt, Member

RESOLUTION NO. 94- 73

A RESOLUTION *OF* THE CITY COUNCIL *OF* THE CITY OF PORT TOWNSEND AUTHORIZING JULIE MCCULLOCH TO VOTE IN SUPPORT OF THE DRAFT PLAN OF THE DUNGENESS/QUILCENE PILOT PROJECT

WHEREAS, the City has participated in the Dungeness/Quilcene Pilot Project since Spring of 1991, and

WHEREAS, the City has been actively involved in the project and has provided substantial input into the Plan, and

WHEREAS, the Plan makes recommendations related to many water concerns including instream flow, habitat, groundwater, water storage, date development, conservation, fish hatchery operation, and

WHEREAS, the Plan will provide an overview direction for the Coordinated Water System Plan and the City's Water Comprehensive Plan, and

WHEREAS, the Plan provides far a progressive approach to dealing with water,

NOW THEREFORE BE IT RESOLVED that the City Council authorizes its representative, Julie McCulloch to vote in support of the draft Plan or Plan in substantially the same form.

Passed this 16th day of May, 1994 John Clise, Mayor
Attest:

Dave Grove, Clerk-Treasurer

Approved as to Form:

Dennis McLerran, City Attorney

(see original for signatures)

United States Department of Agriculture	**Forest Service**	**Olympic National Forest**	**Quilcene Ranger District P. O. Box 280 Quilcene, WA 98376**

Date: June 17, 1994

Reply to: 2510

Linda Newberry
Jamestown S'Klallam Tribe
1033 Old Blyn Highway
Sequim, WA 98382

The purpose of this letter is to express my support for the Dungeness-Quilcene Water Resource Management Plan. The Dungeness Quilcene Water Resource Pilot Planning Project (the Chelan Agreement) brought together a wide variety of diverse interest to address the concerns of many different parties. With leadership from the Jamestown S'Klallam Tribe, funding from the Washington State Department of Ecology, and over 10,000 hours of volunteer time, the Regional Planning Group has 'investigated the status of resources, defined the problem and issues, gathered information and supportive data, crafted solutions to the problems, negotiated agreements, and developed strategies and recommendations...' The planning process has been an open process, and has resulted in a plan that addresses the water needs of fish and wildlife, as well as human inhabitants.

The 'visionary' process used to develop the plan provides a model that may have application in many areas of public land management. The process focused cooperation, community, interests, and ecosystems. The results were recommendations that will help provide guidance for management of National Forest lands within the Dungeness-Quilcene area, as well as the adjacent non-Federal lands. t congratulate you and your staff, as well as those who participated in the process, for the excellent work that has been done.

Sincerely,

RONALD HUMPHREY
Forest Supervisor

United States Department of the Interior

NATIONAL PARK SERVICE
Olympic National Park
600 East Park Avenue
Port An0geles, Washington 98362-6798

IN REPLY REFER TO:

N16(OLYM-SM)

June 21, 1994

Ms. Carol Fleskes
Project Manager
Water Resources Program
Washington State Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

Dear Ms. Fleskes:

I am pleased to recommend the Dungeness/Quilcene Regional Plan to the Washington Department of Ecology for the protection of the region's water resources. Olympic National Park will support the regional plan, as this project nears completion and all stakeholders in the planning area prepare to move ahead. .

The plan outlines regional water management strategies for the future to benefit salmon and other anadromous fish of the watershed. All stakeholders share responsibility for resource stewardship. Through this planning process, we have learned how to work together to resolve difficult issues.

As a participant in the planning process through the Local Government caucus, we have formed a new awareness of the needs of the Peninsula communities we serve. Equally, we have had many opportunities to emphasize the value of our park to our neighbors, both socio-economically and environmentally. In short, we have become betted neighbors.

Sincerely,

Maureen Finnerty
Superintendent

cc:
Ms. Linda Newberry, Project Coordinator, Dungeness/Quilcene WRPPP,
Jamestown S'Klallam Tribe, 1033 Old Blyn Hwy., Sequim, WA 98382

RESOLUTION NO. R-94-4

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SEQUIM, WASHINGTON
IN SUPPORT OF THE DUNGENESS/QUILCENE WATER RESOURCES PILOT
PLANNING PROJECT

WHEREAS. The City of Sequim has actively supported the Dungeness/Quilcene Water Resources Pilot Project since early 199 1, and

WHEREAS, The City has provided representation to nearly all the meetings of the Regional Planning Group since its inception, and

WHEREAS, The Pilot project has many benefits for the people of Sequa and the Dungeness valley in evolving the water resources savings and protection of the area, and

WHEREAS, The efforts and consistency of all the persons who participated in development of the plan has resulted in benefits to all the citizens,

N0W THEREFORE BE IT RESOLVED that the City of Sequim states its support of the plan and authorizes its representative David Johnston to sign the document,

PASSED AND ADOPTED THI 20 DAY OF JULY, 1994

Edward Beggs

Edward Beggs, Mayor

Attest:

Lonna L. Muirhead

Lonna Muirhead - City Clerk

Public Utility District #1

Of Jefferson County
July 27, 1994

Linda Newberry, Project Coordinator
Dungeness-Quilcene Pilot Planting Project
% Jamestown S'Klallam Tribe
1033 Old Blyn Highway
Sequim, WA 98382

The Jefferson County PIJD wishes to commend the participants in the Dungeness-Quilcene Water Resource Pilot Planning Project (Chelan Agreement), for their perseverance in creating the framework for an ongoing water resource management process for the eastern Olympic Peninsula region outlined in the Water Resource Management Plan.

All the parties having diverse interests as to water use and allocation in the region were able to *end* enough common ground to create a set of recommendations and strategies designed to prated and manage the water resource by voluntary, yet concerted actions.

The Regional Planning Group and other supporting committees have compiled a substantial set of technical data on the water resource. Their work has only emphasized the need for further ground and surface water investigations, more exacting information in such areas as stream flow data and hydraulic continuity as well as the development of a meaningful all encompassing water conservation program

We hope that the legacy of the Dungeness-Quilcene Pilot Project will be that the citizens and governments at the local and regional level were able to successfully address their water resource problems, without imposition of state or judicial mandates.

Sincerely,

Richard M. Shipman
President of the Board

24 Colwell Street / P.O. Box 929, Port Hadtock, Washington 98339 (206) 385-5800 FAX (206) 3853945

Glossary

Appendix I
Glossary

acre-foot: A measurement of water. The volume of water required to cover I acre of land to the depth of 1 foot.

adjudication: A determination by the State Superior Court of the relative rights of the various claimants to use water from a water source.

aggradation: The active build up of riverborn sediments in stream reaches of lower elevation river gradient, creating broad, shallow, braided river channels.

alluvial: Originated through the transport by and deposition from running water. An example is a deposit of sand or mud.

allocation: Designation by Dept. of Ecology of specific amounts of water resource for specific beneficial uses. (WAC 173-500-050)

ambient monitoring: Monitoring that is done to determine existing environmental conditions, contaminant levels, rates, or species in the environment, against which future conditions can be compared.

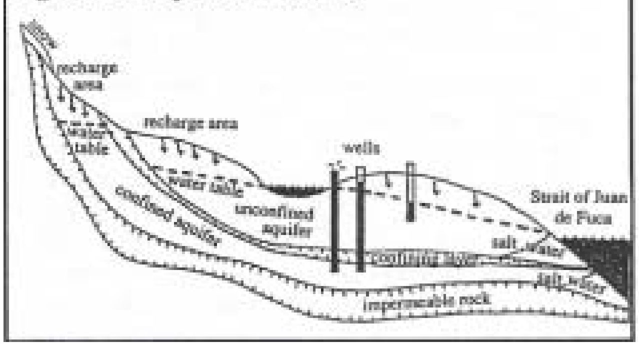
anadromous fish: Species, such as salmon and steelhead, which hatch in fresh water, spend a large part of their lives in the ocean, and return to fresh water rivers and streams to reproduce.

appropriation: The process of legally acquiring the rights to specific amounts of water for application to beneficial uses. (WAC 173-500-050)

aquatic ecosystem: Any body of water, such as a stream, lake or estuary, and all organisms and nonliving components within it functioning as a natural system.

aquifer: The underground layer of rock or soil in which groundwater resides capable of yielding a significant amount of water to wells or springs. Aquifers are replenished or recharged by surface water percolating through soil.

Figure I.1: Aquifer Schematic



Aquifer Protection Areas: A special district allowing monthly fees on water withdrawals or on- site sewage disposal to finance the protection, preservation, and rehabilitation of ground water. Aquifer Protection Areas are created when County legislative authorities resolve to submit a ballot proposition to registered voters within the proposed protection area and voters approve the measure by a simple majority.

bar scalping: Removal of gravel from river gravel bars to prevent bed aggradation for flood control and/or as a source of commercial gravel.

basalt: A fine-grained, dark-colored rock, formed by solidification from a molten or partially molten state.

base flow: 1) Regulatory base flow: A level of streamflow established in accordance with provisions of Ch. 90.54 RCW required in perennial streams to preserve wildlife, fish, scenic, aesthetic, and other environmental, or navigational values. (WAC 173-500-050) 2) Hydrologic base flow: That portion of stream flow sustained by ground water seeping into stream rather than directly from storm runoff. (see also hydraulic continuity)

bedload: A description of a process whereby stream flows, channel shape, and sediments are in constant interaction working to come to an equilibrium. Where additional levels of sediment are put into a stream (i.e. through landslides, road construction) bedload can mean the amount of material being transported through the system. Sediments moving through the system causing changes in channel shape until sediments are flushed out of the system or deposited in stable areas are called bedload.

beneficial uses: Uses of water for domestic, stock watering, industrial, commercial, agricultural, irrigation, hydroelectric power production, mining, fish and wildlife maintenance and enhancement, recreational, and thermal power production purposes, and preservation of environmental and aesthetic values, and all other uses compatible with the enjoyment of the public waters of the state. (WAC 173-500-050)

best management practices (BMP): Methods, measures, or practices designed to prevent or reduce water pollution. Not limited to structural and nonstructural controls, and procedures for operations and maintenance. Usually, BMP's are applied as a system of practices rather than a single practice.

candidate species: Those plants and animals that are being considered by the USFWS for listing as threatened or endangered under the Endangered Species Act.

casing: A metal or plastic pipe installed in a well to maintain the well opening, especially in loose or unconsolidated formations.

Chelan Agreement: An unsigned agreement in 1990 between State government, the Tribes, and other water resource interests outlining a consensus-based approach to water resource issues. The agreement called for the creation of a state-level Water Resources Forum and 2 pilot planning projects to test the approach and was funded by the Washington State Legislature.

cistern: A large, permanent structure designed to catch, filter, and divert rain water into a storage area. Catchments include house, barn, and shed roofs, parking lots, paved surfaces or specially: constructed impervious surfaces. Stored water is generally used for irrigation.

community water systems: Water distribution structures. Group A water systems have 15 or more service connections or serve an average of 25 c more people per day for 60 or more days a year Group B water systems have less than I connections and serve an average of less than 2 people each year. (WAC 246-290)

consumptive use: Use of water where there is diversion or diminishment of the water source. (WAC 173-500-050) (see also Chapter 2: Water Use)

critical areas: A category of land for protection under the Growth Management Act of 1990 including aquifer recharge, critical fish and wildlife habitat, seismic hazard, wetland, and flood hazard areas.

critical stocks: Stocks of fish experiencing production levels that are so low that permanent damage to the stock is likely or has already occurred. (SASSI)

Coordinated Water System Plan (CWSP): plan for public water systems within a critical water supply service area which identifies the present and future water system concerns and sets forth a means for meeting those concerns in the most efficient manner possible. (Ch. 248-56-200)

cordillera: A group of mountain ranges including valleys, plains, rivers, lakes, etc., having one general direction.

cumulative effects: Those effects on d environment that result from the incremental effect of the action when added to the past, present, at reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

depressed stocks: A stock of fish whose production levels are below expected levels based on available habitat and natural variation in survival rates, but above the level where permanent damage is likely. (SASSI)

deposition: The accumulation of riverborn sediments when energy of the stream decreases below the level required for sediment transport.

discharge: The release of wastewater or contaminants to the environment. Direct discharge of wastewater flows directly into surface waters, while an indirect discharge of wastewater enters a sewer system.

doctrine of prior appropriation: The right to use water acquired earlier in time is superior to a similar right acquired later in time. "First in time, first in right."

drainage basin: The land area that gathers water and contributes it to a body of surface water. Also called the watershed of the receiving water body.

dredging: Any physical digging into the bottom of a water body. Dredging can be done with mechanical or hydraulic machines and either changes the shape and form of the bottom or removes sediment which has been deposited over the bottom.

Dungeness Water Users Association: Purveyors of agricultural water comprised of 9 representatives from irrigation districts and companies. The association functions by consensus agreement.

ecosystem: A community of living organisms interacting with one another and with their physical environment. A system such as Puget Sound can also be thought of as the sum of many interconnected ecosystems such as the rivers, wetlands, and bays. Ecosystem is thus a concept applied to communities of different scale, signifying the interrelationships that must be considered.

effluent: The liquid waste of sewage and industrial processing.

embayment: An indentation in a shoreline forming an open bay.

endangered species: Any species of plant or animal defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range, and published in the Federal Register.

Endangered Species Act (ESA): A 1973 Act of Congress that mandated that endangered and threatened species of fish, wildlife, and plants be protected and restored.

Environmental Impact Statement (EIS): A document that discusses the likely significant impacts of a development, project, or a planning proposal, ways to lessen the impacts, and alternatives to the project or proposal. EIS's are required by the National and Washington State Environmental Policy Acts.

Eocene: 1) Second geologic epoch of the Tertiary Period, 37-54 million years ago. 2) The series of strata deposited during that epoch.

erosion: Wearing away of rock or soil by the gradual detachment of soil or rock fragments by flowing water, wind, freeze/thaw cycles, landslides, bedrock decomposition, and other weathering.

escapement: The number of adult fish that survive or "escape" fishing gear to migrate upstream to spawning grounds.

esker: 1) Eskers or kames are rudely stratified accumulations of gravel, sand, and waterworn stones which occur in long ridges, mounds, and hummocks. 2) Serpentine ridges of gravel and sand, believed to mark channels in the decaying ice sheet through which streams washed much of the finer drift, leaving the coarser gravel between the ice walls.

estuary: A coastal water body where ocean water is diluted by out-flowing fresh water.

evapotranspiration: That portion of the precipitation returned to the air through direct evaporation and by transpiration of plants.

exempt wells: Domestic water wells not requiring a water right from Dept. of Ecology. Under current law use from one well must be less than 5000 gpd and used for domestic purposes and/or the irrigation of no more than one-half acre of lawn or non-commercial garden.

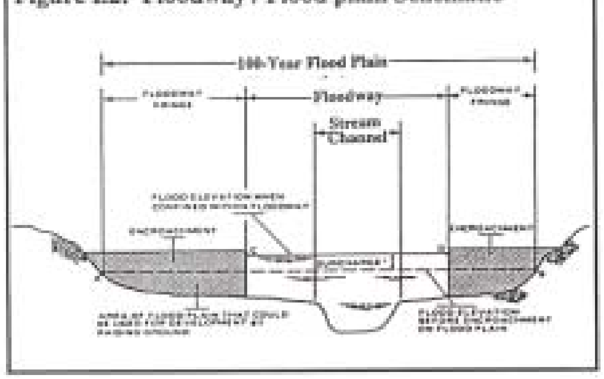
extinct stock: A stock of fish that is no longer present in its original range, or as a distinct stock elsewhere. Individuals of the same species, but different stock, may be observed in very low numbers in the extinct stock range, consistent with straying from other stocks. (SASSI)

fish-bearing streams: Any stream containing any species of fish for any period of time.

fisheries enhancement: Fisheries enhancement is an action taken to create conditions in the biological environment that optimizes survivorship of the fish population in question.

flood plain: Land bordering a stream or river and subject to flooding.

Figure 1.2: Floodway / Flood plain Schematic



floodway: The channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment, such as artificial fill, in order that the 100-year flood be carried without substantial increases in flood heights.

fluvial: Of or belonging to rivers.

geomorphic: Pertaining to the form or shape of those processes that affect the surface of the earth.

glacier: A mass of ice with definite lateral limits, with motion in a definite direction, and originating from the compaction of snow.

glaciation: Alteration of the earth's solid surface through erosion and deposition by glacier ice.

gravel trap: Holes of almost any size dug along side the river during a low flow period in areas of excessive bedload movement. In times of high water the holes fill with sediment moving down stream, thereby lessening bed aggradation.

grey water: Waste water from clothes washers, dish water, and bathing.

ground water: All waters that exist beneath the land surface or beneath the bed of any stream, lake, or reservoir, or other body of surface water, whatever may be the geologic formation or structure in which such water stands or flows, percolates, or otherwise moves. (Ch. 173-100 WAC) Ground water is created by rain which soaks into the ground and flows down until it is collected and stored at a point where the ground is not permeable, forming natural underground water supplies. Ground water then usually flows laterally toward a river, lake, or the ocean, where it discharges.

ground water advisory committee: A committee appointed by the Department of Ecology to assist in the development of a ground water management program. (Ch. 173-100 WAC)

ground water area: A geographic area designated pursuant to RCW 90.44.130 (Regulation of Public Ground Waters) (Ch. 173-100 WAC)

ground water management area: A specific geographic area or subarea designated pursuant to this chapter for which a ground water management program is required. (Ch. 173- 100 WAC)

ground water management program: A comprehensive program designed to protect ground water quality, to assure ground water quantity, and to provide for efficient management of water resources while recognizing existing ground water rights and meeting future needs consistent with local and state objectives, policies, and authorities within a designated ground water management area or subarea and developed pursuant to Ch. 173-100 WAC.

ground water management zone: Any depth or stratigraphic zone separately designated by the Department of Ecology in cooperation with local government for ground water management purposes within a ground water management area. Ground water management zones may consist of a specific geologic formation or formations or other reasonable bounds determined by Ecology consistent with Ch. 173-100 WAC.

habitat: The specific area or environment in which a particular type of plant or animal lives. An organism's habitat must provide all of the basic requirements for life and should be free of harmful contaminants. (see Appendix D: Habitat)

habitat assessment: Habitat assessment is a problem analysis process to develop and document a scientifically based understanding of the processes and interactions occurring within a watershed which affect fish habitat.

habitat protection: Habitat protection means an action taken or a decision made that protects the physical and/or biological environment in a watershed.

habitat restoration: Habitat restoration means an action taken to correct specific problems identified through watershed analysis or other full watershed inventory processes.

habitat enhancement: Habitat enhancement is an action taken to create conditions in the physical environment that optimize survivorship of the population in question.

healthy stock: A stock of fish experiencing production levels consistent with its available habitat and within the natural variations in survival for the stock. (SASSI)

Hood Canal Salmon Management Plan (HCSMP): A 1980 agreement between WDFW and PNPTC, which sets production levels, release programs, and harvest levels on fish produced in Hood Canal.

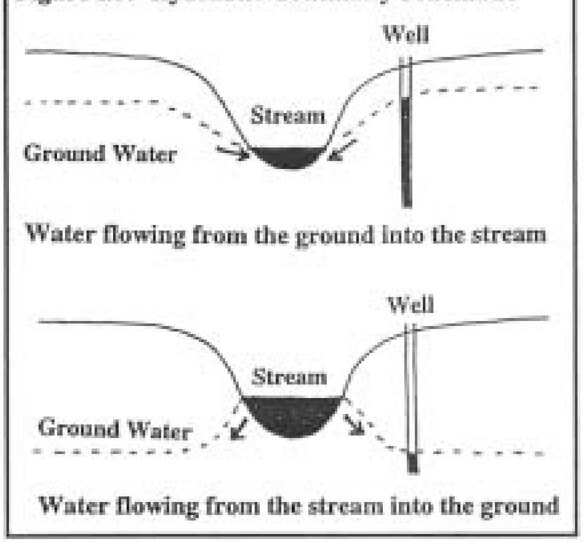
hybridization: The interbreeding of fish from two or more different stocks.

hydraulic conductivity: A measure of the rate at which water will move through soil or a rock layer.

hydraulic continuity: The natural interconnections between ground water and surface waters.

Hydraulic Project Approval (HPA): Under the Hydraulic Code Rules, approval is required from WDFW for certain activities in state waters that support fish life. A project approval is required for such activities affecting state waters such as certain forest practices; culvert construction, bridge, pier, and piling construction; bulkheads; boat launches; dredging; and gravel traps.

Figure I.3: Hydraulic Continuity Schematic

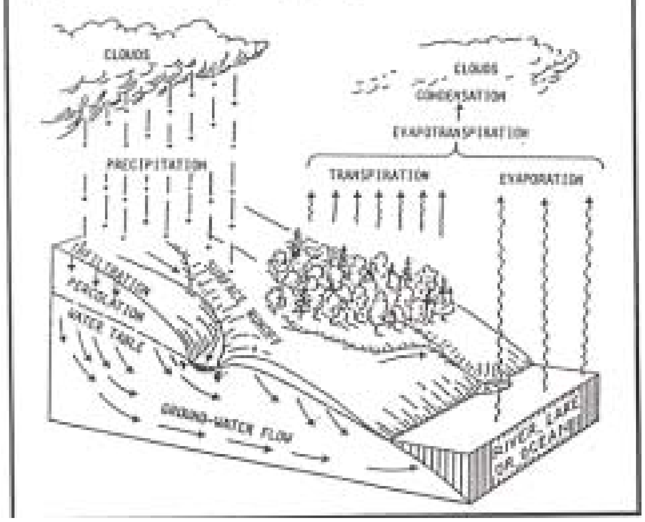


hydrogeology: The study of the interrelationships of geologic materials and processes with water, especially ground water.

hydrologic base flow: See baseflow.

hydrologic cycle: The continual cycling of water between the land, the sea, and the atmosphere through evaporation, condensation, precipitation, absorption into the soil, and stream runoff.

Figure I.4: The Hydrologic Cycle



hypsithermal period: Postglacial warm interval extending from about 7000 to 600 B.C. responsible for the last 6-foot rise of world-wide sea level.

impoundment: Generally, an artificial collection or storage of water, as a reservoir, pit, dugout, or sump.

infiltration: The downward entry of water into the soil.

infiltration gallery: A horizontal well or subsurface drain that intercepts underflow in permeable materials or infiltration of surface water. Infiltration galleries are used when surface water is not suitable for direct pumping because of silt load, shoreline slope, presence of inert contaminants, or rapid and unpredictable changes in water level, for example.

infrastructure: Streets, utilities, parks, and other elements that support residential development and other human activities.

in-fine reservoir: Water storage requiring a blockage or dam in the main channel of a river, stream, or ditch.

interbed: A typically thin bed of rock material alternating with contrasting thicker beds of rock.

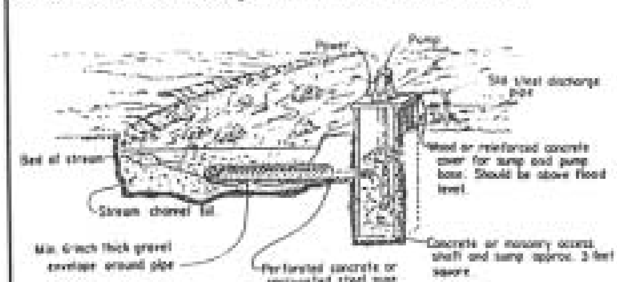
irrigation: The application of water to soil for crop production or for turf, shrubbery, or wildlife food and habitat. Provides water requirements of plants not satisfied by rainfall.

irrigation district: A cooperative, self-governing public corporation set up as a subdivision of the state, with definite geographic boundaries, organized to obtain and distribute water for irrigation of lands within the district; created under authority of the state legislature with the consent of a designated fraction of the landowners or citizens and having taxing power.

irrigation return flow: The part of applied water that is not consumed by evapotranspiration and that migrates to an aquifer or surface water body.

isohyetal: Marking the amounts of rainfall.
Instream Flow: A base flow adopted into Washington State regulations used to condition water rights. A water right for instream. resources such as fish, wildlife, recreation, esthetics, navigation, stock watering, and water quality with a priority date set when the instream flow rule was adopted.

Figure I.5: Schematic of Infiltration Gallery
Constructed to Intercept Infiltration From a Stream



Instream Flow Incremental Methodology (IFIM): A method of quantitatively relating stream flow to fish or wildlife habitat area. The IFIM combines curves describing the suitability of certain velocities and water depths for selected species and life stages, with measurements of current, depth, and wetted channel width in the area of study, to produce a table relating usable habitat area to stream flow.

intermittent stream: Any non-permanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet both criteria.

junior right: A water right that is more recent in relation to other water rights, and in times of limited water is legally able to be satisfied only after other senior rights have been fulfilled.

key watershed: As defined by USFS and BLM fish biologists, a watershed containing: 1) habitat for potentially threatened stocks of anadromous salmonids or other fish, or 2) greater than 6 square miles with high-quality water and fish habitat.

lithology: 1) The study and description of rocks. 2) '17he physical character of a rock as determined by observations made with the naked eye or with the aid of a low-power magnifier.

low flow: Stream flow level limitations appearing as provisions on permits and certificates issued by the Department of Ecology or its predecessors. (WAC 173-500-050)

mixed stock: A fish stock whose individuals originated from commingled native and non-native parents, and/or by mating between native and non- native fish (hybridization); or a previously native stock that has undergone substantial genetic alteration.

maximum habitat flow: See optimum instream flow.

native stock: An indigenous stock of fish that has not been substantially impacted by genetic interactions with non-native stocks or by other factors, and is still present in all or part of its original range. In limited cases, a native stock may also exist outside of its original habitat (i.e. captive broodstock programs).

nonconsumptive use: A type of water use where either there is no diversion from a source body, or where there is no diminishment of the water source. (WAC 173-500-050) (see Chapter 2: Water Use)

nonpoint source pollution: Pollution that enters water from dispersed and uncontrolled sources, such as surface runoff, rather than through pipes. Nonpoint sources, such as forest practices, agricultural practices, on-site sewage disposal, and recreational boats, may contribute pathogens, suspended solids, and toxicants.

off-channel habitat: Channels or ponds in a floodplain, at least seasonally connected to the primary channel, that are in addition to and frequently parallel the primary flowing channel. These generally occur in unconstrained reaches.

one-half acre rule: No water right permit is required for the withdrawal of up to 5000 gallons per day from a well when the water is being used for one of several uses including the irrigation of no more than 1/2 acre of lawn or noncommercial garden. (see Groundwater section C. 11)

outcrop: The exposure of bedrock or strata projecting through the overlying cover of weathering rocks and soil.

outwash: Rock material transported by a glacier and deposited by melt-water streams beyond active glacier ice.

optimum instream flow: The amount of stream flow determined by IFIM to be needed to provide maximum usable fish habitat. What is optimum instrearn flow in any given month also depends upon the species in question.
Also called maximum habitat flow. If Toe Width Method is used instead of IFIM, optimum instrearn flow represents spawning habitat only.

overwintering ponds: Off-channel ponds linked to the river or slow-moving side channels, either naturally occurring or artificially created. Overwintering ponds offer protection from floods for any juvenile salmonids that winter over before migrating out to sea, spawning, and for primary rearing areas.

palustrine: A geologic term pertaining to material deposited in a wetland environment.

peak flow: The highest amount of stream or river flow occurring in a year or from a single storm event.

perennial stream: A strewn that typically has running water on a year-round basis.

perfected water right: A water right to which the owner has applied for and obtained a permit, has complied with the conditions of the permit, and has obtained a water right certificate.

production type: The method of spawning and rearing that produced the fish that constitute a stock.

Public Benefit Rating System: A point system to determine the current use value of lands classified as open space lands in the Jefferson County Open Space Tax Program. The system considers prioritization of resources, access, transfer of development rights, and fulfillment of County policy goals.

Public Trust Doctrine: A judicial doctrine under which the state holds its navigable waters and underlying beds in trust for the public and is required or authorized to protect the public interest in such waters. All water rights issued by the state are subject to the overriding interest of the public and the exercise of the public trust by state administrative agencies.

reach: The length of stream channel from a riffle into a pool, usually 1 to 1 1/2 times the width of the channel. (See figure 1.7)

recharge: Surface water which enters into a ground-water system. This can be natural recharge, such as from precipitation, or artificial recharge, such as from irrigation or dry wells.

recurved spit: A spit with the end strongly curved inward.

redd: The spawning area or nest of salmonids. The nest is dug into stream gravel to allow water to provide oxygen to the developing embryos and flush out biological wastes.

Referendum 38: (Ch. 43.99E RCW and Ch. 173- 170 WAC) Approved by voters in 1980, this measure provides financial assistance to public bodies operating agricultural water supply facilities to assist in improving their efficiency of water use beyond current levels. Before implementation of a conservation project the public body must develop a Comprehensive Water Conservation Plan, which evaluates the current system for alternative managerial or structural water conservation improvements. Planning and implementation grants and loans are administered through the Dept. of Ecology.

regulatory base flow: See base flow.

relinquishment: water rights reverting to the State for reappropriation because of failure to beneficially use all or part of the right for a five-year period. (see RCW 90.14.160)

resting / holding pools: Slow-water off-channel pools which adult salmonids use to rest while migrating upstream to spawn. Resting pools occur naturally or are artificially created as a temporary measure during habitat restoration.

return flows: That part of diverted water which returns to the source through seepage, spills, deep percolation, or discharge.

riffle: A segment of the river channel which has moderate to steep gradient, shallow depth, and has higher flows.

riparian area: The terrestrial areas immediately adjacent to a stream or river where the vegetation complex and microclimate conditions are products of the presence and influence of water. Riparian areas can vary in width from as little as 20 feet to more than 300 feet from the water.

riparian doctrine: The system of law dominant in Great Britain and the eastern United States, in which owners of lands along the banks of a stream or water body have the right to reasonable use of the waters and correlative right protecting against unreasonable use by others that substantially diminishes the quantity or quality of water. The right is appurtenant to the land and does not depend on prior use.

river mile (RM): a measurement of river corridor length beginning at the mouth of the river.

run: Fish stocks grouped together on the basis of similar migration times.

runoff. The portion of precipitation or irrigation water that moves across land as surface flow and enters streams, ditches, drains, or other surface receiving waters. Runoff occurs when the precipitation rate exceeds the infiltration rate.

salinity: Concentration of dissolved salts in water or soil water.

salmonid: A fish belonging to the family Salmonidae, including salmon, trout, char, and allied freshwater and anadromous fishes.

seamount: A submarine mountain rising more than 500 fathoms (915 meters) above the ocean floor. Generally, a volcanic cone.

seawater / saltwater intrusion: The migration of salt water into fresh water aquifers as a result of pumping water from aquifers that are in hydraulic continuity with the sea.

sediment: Materials in streams or other bodies of water including boulders, cobbles, gravel, sand, silt, and clay. Sediment may suspended in water, transported by water, or settling to the bottom of the water.

senior right: A water right that is older in relation to other water rights, and is legally able to be satisfied before others in times of limited water.

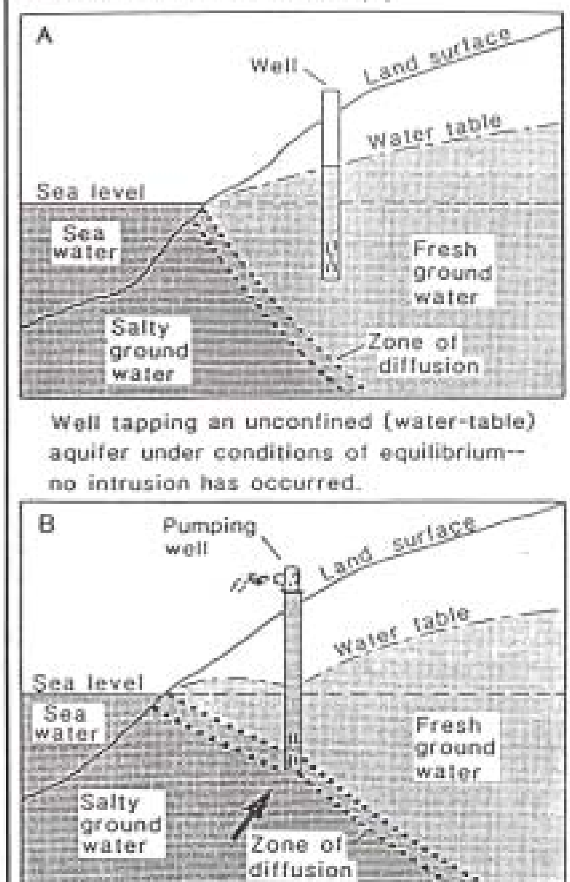
siltation: The process by which a river, lake, or other water body becomes clogged with sediment. Silt can clog gravel beds and prevent successful salmonid spawning.

smolt: A seaward migrating juvenile salmonid, silvery in color, that has become thinner in body form and is physiologically prepared for the transition from fresh to saltwater.

spawning population: Synonymous with the term "stock."

species: Includes any subspecies of fish, wildlife or plants, and any distinct population segments which interbreeds when mature. Sec. 3 (15) Endangered Species Act (as ammended by the 100th Congress).

Figure I.6: Hydraulic Conditions Before (A) and After Seawater Intrusion (B)



Well tapping an unconfined (water-table) aquifer under conditions of equilibrium--no intrusion has occurred.

The same well under conditions of intensive pumping--intrusion has reached the well.

stock: The fish spawning in a particular lake or stream(s) at a particular season, which fish to a substantial degree do not interbreed with any group spawning in a different place, or in the same place at a different season.

stock origin: The genetic history of a stock.

stock status: The current condition of a stock, which may be based on escapement, run-size, survival, or fitness level.

storm water: Water that is generated by rainfall and is often routed into drain systems or irrigation ditches to prevent flooding.

streambed: That part of the channel usually not occupied by perennial terrestrial plants, but including gravel bars, and lying between the base or toe of the banks.

subduct: In plate tectonics, the depressing and passing of one plate margin of the earth under another plate.

subduction: The process of descent of one techtonic unit under another.

subduction zone: An elongated region along which a crustal block descends relative to another crustal block. Deep oceanic trenches occur along subduction zones.

techtonic: Pertaining to, or designating the rock structure and external forms resulting from the deformation of the earth's crust. As applied to earthquakes, it is used to describe shocks not due to volcanic action or to collapse of caverns or landslides.

thalweg: The deepest part or middle of the river or stream channel. The thalweg remains constant through both low and high flows, until it is changed by gravel movement in high flows.

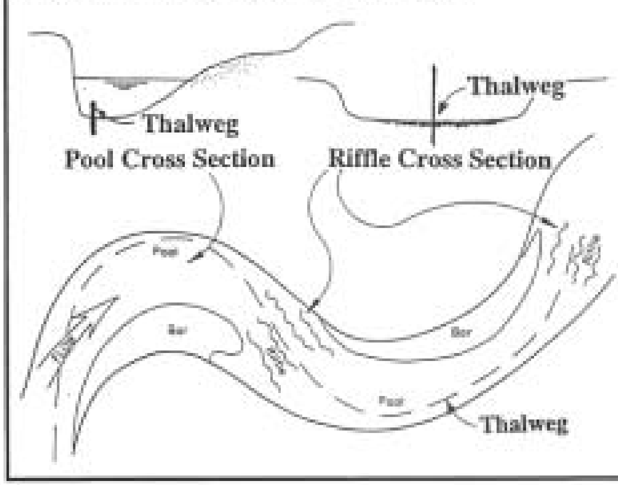
threatened species: Those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future. A plant or animal identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.

Timber/Fish[Wildlife Agreement: A 1987 cooperative agreement between Tribal, Forestry, and State interests. The agreement establishes a natural resource management process for forest practices on state and private lands in Washington State.

transfer: A movement of water or water rights that involves a change in point of diversion, a change in type of use, or a change in location of use.

Trust Water Right program (TWR): A Dept. of Ecology program created by the Washington State legislature in 1991 to facilitate the voluntary transfer of water and water rights, including conserved water, to provide water for presently unmet and emerging needs. Possible methods for transfer include dry year lease options, temporary or permanent changes in the place or type of use of a water right (i.e. from off-stream uses to instrearn flows), water banking managed by the state, the transfer of water conserved by a water conservation project or by gift.

Figure I.7: Typical River Cross Section



toe width method: A method to predict spawning and rearing flows preferred by Salmon and Steelhead. The width of the stream between banks is measured and is entered into statistical models developed by the USGS.

topographic: refers to physical relief features or surface configuration of land.

turbidity: A measurement of the amount of material suspended in the water. Increasing the turbidity of the water decreases the amount of light that penetrates the water column. High levels of turbidity are harmful to aquatic life and fail federal water quality standards.

usual and accustomed area: A provision of the treaties between Indian Tribes and Isaac Stevens, Washington Territorial Governor, which allowed the Tribes the continuing right to take "fish at usual and accustomed" areas "in common with all citizens of the United States." These areas were further delineated based on historical information for each Tribe in 1974 after State Supreme Court Judge Boldt reaffirmed and clarified the treaty rights.

unknown stock: This description is applied to stocks where there is insufficient information to identify stock origin or stock status with confidence. (SASSI)

water table: The upper surface of ground water, or the level below which the soil is saturated with water.

Water Resources Forum (WRF): Designed by the 1990 Chelan Agreement and funded by the Washington State Legislature, the Water Resources Forum is a planning group representing the State- wide interests of agriculture, business, the environment, fisheries, local government, recreational users, state government, and the tribes. The Forum's task was to address the issues ground- water recharge, instrearn flow, and hydraulic continuity and write policy applicable State-wide.

wetlands: Habitats where the influence of surface or ground water has resulted in development of plant or animal communities adapted to aquatic or intermittent wet conditions. Wetlands generally require the following three conditions: hydric plants, hydric soils, and hydrology. Wetlands generally include, but are not limited to, swamps, marshes, bogs, and similar areas.

Water Resource Inventory Areas (WRIA): In the early 1979s Washington State was divided by Dept. of Fisheries into 62 watershed areas which have since been used by state agencies to organize water-related information and define planning projects. Eastern Jefferson County (WRIA 17), and Eastern Clallam County (WRIA 18) comprise the DQ Project area.

water right: The legal right to use a specific quantity of water on a specific time schedule, at a specific place and for a specific purpose. In 1917 legislation was passed providing that all surface water (and in 1945 all ground water) within the State belonged to the State, and any right to use the water could be obtained by filing an application and being granted a permit for the development of the water system.

water right application: An application by a prospective water user to the Department of Ecology for a water right permit. It is required to divert any amount of surface water or withdraw ground water in amounts greater than 5000 gallons per day or to irrigate more than a half acre of land. The application requires publication of legal notice to announce application, a 30-day public protest period, and a field examination by Ecology recommending approval or denial of the permit.

water right certificate: The final stage in establishment of a water right under state law after filing an application, receiving a development permit, and putting the water to a beneficial use. The certificate states the quantitative and locational parameters of the water right. Certificates are also issued at the conclusion of an adjudication. Once a certificate is issued or perfected, no further expansion is allowed under that water right.

water right claim: A water right claim is not a water right. It is a registration with the State by the property owner regarding water use not authorized by a permit or certificate. A claim may represent a valid water right if it describes a water use existing prior to water codes: 1917 for surface water and 1945 for ground water. Claims registered are evaluated for sufficient evidence to satisfy the Dept. of Ecology that a valid water right would be confirmed if the claim were adjudicated.

water right permit: An approval of an application by the Dept. of Ecology, allowing construction of a water system and use of water.

watershed: The geographic region within which water drains into a particular river, stream, or body of water. A watershed includes hills, lowlands, and the body of water into which the land drains. Watershed boundaries are defined by the ridges of separating watersheds.

wetland: Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface and the lands covered either seasonally or permanently by shallow water.

Wild and Scenic River System: Those rivers or section of rivers designated as such by Congressional action under the Wild and Scenic River Act, or those sections of rivers designated as wild, scenic, or recreational by an act of the legislature of the state or states through which they flow. The Act establishes procedures for studying and protecting outstanding rivers.

wild stock / fish: A stock that is sustained by natural spawning and rearing in the natural habitat, regardless of parentage (includes natives).

wildlife: Species of the animal kingdom whose members exist in the wild state. This includes mammals, birds, reptiles, amphibians, fish and invertebrates. (see RCW 77.12.020 / RCW 77.16.120 for classifications on predatory and game birds and protected wildlife.)

wildlife / wildlife resources: Birds, fishes, mammals, and all other classes of wild animals and all types of aquatic and land vegetarian upon which wildlife depend. (Fish and Wildlife Coordination Act)

wildlife habitat: Waters of the State used by fish, other aquatic life, and wildlife of any life history, stage, or activity. (see WAC 173-205-025)

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Love this river, stay by it, learn from it. Yes, he wanted to learn from it, Yes, he wanted to listen to it. It seemed to him that whoever understood this river and its secrets, would understand much more, many secrets, all secrets.

Hermann Hesse