Dungeness Watershed Salmon Recovery Planning Notebook

A Response to the Six Questions from the Development Committee of the Shared Strategy for Puget Sound

Submitted by
Clallam County and the Jamestown S'Klallam Tribe
June 30, 2004

Dungeness River Management Team

Cooperative Management of Our Watershed's Resources

Coordinated by Jamestown S'Klallam Tribe and Clallam County

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April 30, 2005

Jim Kramer
Shared Strategy for Puget Sound Development Committee
1411 4th Avenue, Suite 1015
Seattle, WA 98101

RE: Update to Dungeness Watershed Salmon Recovery Notebook and Response to Technical Review Team Feedback

Dear Mr. Kramer:

On behalf of the partners of the Dungeness Watershed, the Dungeness River Management Team is pleased to enclose revisions to the Dungeness Watershed Salmon Recovery Notebook now known as the Dungeness Watershed Salmonid Recovery Notebook and a response to key issues raised by the Technical Review Team. This additional material has been developed through a collaborative effort by staff from Clallam County, Jamestown S'Klallam Tribe, Washington Department of Fish and Wildlife, and Point No Point Treaty Council.

The enclosed response is organized around the six questions posed by the Shared Strategy Development Committee. An Executive Summary serves as a road map to highlight the revisions and steer the Technical Review Team to the response for each key issue.

As you know, the Dungeness River has been the subject of significant watershed planning efforts since the formation of the Dungeness River Management Team in the 1980's. Our June 2004 submittal was largely a compilation of this existing work. Since the June 2004 submittal, the Dungeness River Management Team has devoted time to both the Ecosystem Diagnostic Treatment (EDT) Analysis and to considering local commitments necessary to achieve salmonid recovery.

Last fall, the Dungeness River Management Team reviewed the EDT Analysis with technical staff who contributed to the model development. The Team is pleased that the results largely affirm our current strategy and indicate that our action plan brings us close to achieving the Viable Salmon Population planning targets (noting that assumptions embedded in the planning targets – such as a pristine estuary – make it almost impossible to fully achieve the targets).

Since the June 2004 submittal, the Dungeness River Management Team has discussed Question F: *What commitments (policy level decisions, funding, etc.) will be necessary for implementation, and what conditions need to be in place for the commitments to be made?* Much of this discussion is based on technical recommendations about what will be necessary from local-decision makers to come close to our Viable Salmon Population planning targets. Statements of commitment from local decision-makers were requested by June 30, 2005. Question F is now being considered by local decision makers and will be sent under separate cover.

We are aware that the Shared Strategy Technical Review Team may have questions regarding this submittal. Please contact Cathy Lear, Planning Biologist for Clallam County, (360) 417-2361 if questions arise.

Thank you for the opportunity to contribute to the Dungeness Watershed portion of the Puget Sound salmonid recovery plan. The Dungeness River Management Team will continue to work to ensure broad stakeholder participation and strong citizen and technical involvement in recovery planning and implementation.

Sincerely,

Steve Tharinger, Chair
Dungeness River Management Team

Contributors to 2005 submittal

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- Dungeness Salmonid Recovery Group

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Attachments to Question D:

- *Dungeness Project List Supplement – replace with Table D-1*
- *Excerpt from the North Olympic Peninsula Lead Entity Group - Nearshore Restoration Strategy – replace with Draft NOPLE Nearshore Restoration Strategy.*

E. What are the preliminary estimates for cost of actions (i.e. projects, acquisition, regulations, incentives, etc.) and ongoing operations in the next 5 to 10 years?

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- *2003 Management Framework Plan and Salmon Runs' Status for the Strait of Juan de Fuca Region (Point No Point Treaty Council, WDFW, Makah Tribe)*

Executive Summary

This revision and addendum to the *Dungeness Watershed Salmonid Recovery Planning Notebook* responds to feedback from the Shared Strategy Technical Review Team and incorporates the elements of bull trout recovery and local nearshore protection and restoration.

This submittal is organized around updating the original six questions from the Shared Strategy Development Committee. The revisions to the six questions include: incorporating bull trout recovery, improving cost estimates, additional work on the nearshore, and addressing key issues raised by the Technical Review Team. In some cases, we have addressed key issues from the Technical Review Team separately from the original questions. Those are incorporated into two addendums. The adaptive management plan is presented in the addendums. The following summary provides a road map of where in the submittal to find our revisions.

Background

In the summer of 2004, the Dungeness Watershed Salmonid Recovery Planning Notebook (Dungeness Notebook) was submitted to the Technical Review Team for review. The TRT provided feedback on the Dungeness Notebook in November. The initial state, federal, tribal and county collaborators (Dungeness Group), reconvened to address the questions asked by the TRT in their feedback. Each key issue from the TRT is listed below with an explanation of how the Dungeness Group addressed the issue, and where in this document to find the response.

Habitat Strategy

- **Better document the data, assumptions, and models used as they relate to the VSP characteristics and potential responses of the population.**
  A summary of the Ecosystem Diagnostic Treatment (EDT) Analysis was developed and is included in Question A. A report (Stream Reach Analysis for Species Performance) generated during the EDT modeling has also been included as an attachment to Question A which provides further documentation of the assumptions made during modeling. This is in addition to the EDT Summary (question A attachment) submitted in June 2004 (Key Points in Understanding EDT Action Analysis for Dungeness Chinook) which also describes the assumptions made.

- **Provide a summary of any available empirical support used to relate the flow management regime, land use, ecological processes, habitat conditions,**

and all four VSP relevant to the recovery planning to highlight the strength of the analytical support for the recovery plan.

The Dungeness Group reviewed each action to provide the empirical support behind assumptions made. This new information is presented in Table ES-1 of the Executive Summary.

- **Further integrate the habitat strategy with hatchery and harvest management strategies in the planning area.**

A description of the integration between the habitat strategy, hatchery strategy, and harvest management has been developed. It is not organized around the six original questions from the Shared Strategy Development Committee, but is presented within Addendum A.

- **Provide any available empirical data on the effectiveness of the protection actions described.**

The Dungeness Group reviewed each action to provide the empirical support behind assumptions made. This new information is presented in Table ES-1 of the Executive Summary.

- **Further develop an adaptive management plan for the habitat recovery strategy more explicitly and quantitatively relating the interactions among the flow management regime, land use, habitat forming processes, habitat conditions and population VSP responses.**

An adaptive management plan has been drafted that defines the process to establish habitat recovery priorities and implementation of the priorities. It defines the structure of the Dungeness River Management Team and details the roles and responsibilities of team members in relation to adaptive management. Further, the drafted plan includes monitoring parameters in both the short-term and long-term to evaluate action success. Monitoring and evaluation that is currently performed is presented, as well as the responsible entity.

The Dungeness Group would like to provide more definition in this plan, but that is subject to staff workload and availability this spring and summer. The drafted adaptive management plan for habitat parameters is presented in Addendum B. The adaptive management plan for harvest and hatchery actions has also been developed. However, the decision-making process for the harvest and hatchery strategy is separate from the habitat strategy, and it is presented separately in Addendum A. The integration of the habitat, hatchery and harvest adaptive management Questions needs to be accomplished still.

<u>**Hatchery Strategy**</u>

Key Issues to Improve Certainty

The most important way to improve the certainty of an effective hatchery strategy in this plan is to:

- **Improve the adaptive management program.**

The adaptive management plan for harvest and hatchery actions has been developed and is presented in Addendum A.

Harvest Strategy

Key improvements to the harvest management portion of the recovery plan include:

- **Developing exploitation rate guidelines based on productivity and abundance estimates of the Dungeness Chinook population**. *In the Dungeness Chinook management unit, there is insufficient spawner-recruit data to develop a recruitment function to serve as the basis for determining a Rebuilding Exploitation Rate. The current coded wire tagging program (see Addendum A, Question on harvest adaptive management) should eventually provide the information needed. Collection of sufficient data may take as long as ten years or more. In the meantime, the Co-managers are using an alternative approach to control the exploitation rate on Dungeness Chinook (See question A, Question 3).*

- **Broadening the hypothesis to include the effects of harvest on diversity and spatial distribution.**
  The harvest management hypothesis was not explicitly described in the June 2004 submittal. The hypothesis is that harvest management will effectively limit harvest effects upon Dungeness Chinook, 1) removing harvest as an impediment to recovery, 2) allowing for the restoration and maintenance of a sustainable, locally adapted, natural-origin Chinook population, and 3) improving the Chinook population's abundance, productivity, diversity and spatial distribution. The harvest management hypothesis is more fully described in Addendum A.

- **Broadening the strategy to also address diversity and spatial structure**.
  Harvest management strategies are described in detail in the Co-managers' harvest management plan for Puget Sound Chinook (PSIT and WDFW 2004) and are summarized in questions A (Question 4) and C (Question 4).

- **Incorporating existing local data pertaining to spatial distribution and diversity to support the expanded hypothesis and the expanded strategy and actions based on it.** *An assessment of EDT results by each river reach, focusing on differences in productivity (recruits per spawner), abundance (escapement) and diversity (life history pathways) is presented in the Addendum A. Implications for harvest management are also addressed in Addendum A.*

(Bulleted key issues above were excerpted from Puget Sound Technical Recovery Team Technical Comments: Combined Template and Probabilistic Network Analysis, November, 19, 2004)

Other identified priorities:

Clarifying policy questions submitted to the Elwha/ Dungeness watersheds in July 2004 were discussed during the August 2004 meeting with members from the Technical Review Team. The immediate priorities from these policy questions were water quantity, nearshore/marine, and protection programs. The water quantity information has been updated and is incorporated into questions B and F. The Draft *Nearshore Strategy for the North Olympic Peninsula* (NOPLE, 2005) is presented as an attachment to question D. Question F focuses on local commitments, protection programs, and recommendations to local decision-makers.

Bull Trout

Bull trout recovery strategies are included at the request of and with funding and guidance from the US Fish & Wildlife Service. Bull trout recovery is integrated into this salmonid recovery chapter using the guidance described in *Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout* (US Fish & Wildlife Service, 2004). Although the species' needs differ somewhat, elements considered essential for chinook recovery are also considered important for bull trout recovery.

These elements include habitat conditions appropriate for spawning, rearing, and migration; water quality, and food production. Suprisingly little is known about Dungeness bull trout, however; it is crucial that bull trout studies continue in the Dungeness and environs to understand this salmonid and its requirements.
The incorporation of bull trout recovery is organized around the initial introduction and six questions, with most of the revisions to the Introduction and Questions A and C and fewer revisions to Questions B, D, and E.

Nearshore

While Shared Strategy Development Committee as a whole recognizes that the entire nearshore area west to Cape Flattery at the mouth of the Strait of Juan de Fuca is vitally important to salmonid populations, the DRMT nearshore focus area includes Sequim Bay west to Morse Creek.

The ESU-level *Regional Nearshore and Marine Chapter for the Puget Sound Salmon Recovery Plan* was developed by Puget Sound Action Team staff in consultation with many others and on behalf of the Nearshore Policy Group. At the watershed level the North Olympic Peninsula Lead Entity has created a conceptual model for its nearshore recovery strategy, *Draft* N*earshore Strategy for the North Olympic Peninsula* (NOPLE, 2005) which addresses the diverse habitats of North Olympic Nearshore areas. This strategy is presented as an attachment to question A. Nearshore areas of particular interest to the Dungeness watershed are bounded by Sequim Bay on the east and Morse Creek on the west. NOPLE has identified ten high priority protection and restoration projects for this nearshore segment. The prioritized projects are expected to restore and protect the nearshore.

Adaptive Management

As the framework for learning and responding during salmonid recovery and other watershed management activities, adaptive management aims to:
- Track the implementation of watershed and salmonid recovery plans.
- Track and evaluate the effects of actions.
- Use the information to set priorities.
- Communicate progress.
- Manage data
- Provide accountability to funding entities and to secure future funding.

Existing management resides with the Co-managers for hatchery and harvest. Management of habitat actions resides with governmental entities that have pertinent regulatory jurisdiction. Most of these governmental entities (Clallam County, Jamestown S'Klallam Tribe, City of Sequim, Washington Department of Ecology, Washington Department of Fish and Wildlife, US Fish & Wildlife Service, and US Forest Service), as well as several additional groups, are members of the Dungeness River Management Team (DRMT). The DRMT facilitates communication between entities and ranks habitat restoration and protection actions. The DRMT serves as the planning unit for the 2514 watershed planning process and has an advisory capacity to each of the regulatory entities, but has no regulatory jurisdiction itself.

Habitat

Dungeness River Management Team was formed in 1988 to provide a forum to resolve watershed issues. Local citizens and governmental agencies meet monthly to coordinate salmonid recovery, water quality and quantity, and flood management activities in the watershed. DRMT has served as the planning and oversight body for major watershed plans and salmonid recovery activities for the area between Jimmycomelately Creek and Siebert Creeks east Clallam County. When considering nearshore issues, the western boundary is Morse Creek.

DRMT-appointed subcommittees provide input to and receive guidance from the DRMT. The DRMT provides input and guidance to the governments participating in management of the Dungeness watershed. The governments in turn provide information to the DRMT on the projects and processes that affect the watershed. The specific habitat-related adaptive management functions of DRMT and the roles, responsibilities and adaptive management functions of the governmental entities with regulatory jurisdiction are shown in chart AB-1 in the Adaptive Management Question of Addendum B.

Hatchery
As with recovery planning on the whole, we view adaptive management as a continuing process subject to improvement. The Eastern Strait co-managers plan to work with the Hatchery Scientific Review Group (HSRG) to refine adaptive management for hatchery programs in the eastern Strait of Juan de Fuca, including the Dungeness Chinook hatchery program.

Addendum A provides a description of the current approach to hatchery adaptive management. It is described in detail, focusing on its rationale, the assessments in process or being called for, and associated monitoring requirements. Also noted is that we expect to further develop the hatchery adaptive management program later this year.

The HSRG will work with the Co-managers to develop a new tool/process now called "Manage for Success," which will assist in the development of a hatchery-oriented adapative management plan while providing integration with habitat recovery and harvest management. As with recovery planning on the whole, we view adaptive management as a continuing process subject to improvement

Harvest
The Co-managers' Chinook harvest management plan (PSIT and WDFW 2004) includes a Question on monitoring, assessment and adaptive management. In that Question it is noted that performance of Chinook fishery management will be evaluated annually to assess whether management objectives were met and identify factors affecting success or failure. This assessment will be documented in an annual document completed by mid February each year so that it may be utilized during the late winter / early spring annual pre-season fisheries planning process.

The nature of harvest management requires that for adaptive management to be effective and efficient, it must be coordinated across all Puget Sound Chinook management units. Recognizing this need, Table 2 in Addendum A includes some widespread adaptive management needs but also focuses on summarizing assessments, tasks, tools and monitoring to be used in adaptive management of harvest for Dungeness Chinook. The general status of funding is also described in the table.

Integrating harvest, hatchery, and habitat elements

The elements of harvest, hatchery, and habitat typically have been treated individually. Conditions outside the watershed's sphere of influence have challenged the notion of integration. In the Dungeness watershed, habitat is the key to recovery of a productive, sustainable natural population of Chinook, with the hatchery and harvest components of recovery complementary to the habitat component.

The Dungeness Group, in discussions with the TRT, has chosen a set of models that may offer the desired integration. Addendum A demonstrates why integration is important and how it may be addressed in two ways. First, a model called the "All H Analyzer" is used to describe several scenarios for Dungeness Chinook in which habitat, hatchery, and harvest conditions may change, showing how interactions occur and how an integrated approach to management can be effective. Second, several questions with answers are provided to help illustrate how Dungeness Chinook habitat, hatchery and harvest strategies are integrated.

Land use

Land use and watershed plans are developed and implemented through an extensive public process.

Since the June 2004 submittal, the Dungeness Group has discussed potential changes in land use regulations. Much of this discussion is based on technical recommendations about what will be necessary from local-decision makers to come close to our Viable Salmon Population planning targets. The land use issues are explored in Question F. Question F is now being considered by local decision makers and will be sent under separate cover.

Watershed plan

The WRIA 18 watershed plan has been approved by the WRIA 18 Initiating Governments Jamestown S'Klallam Tribe, the Elwha Klallam Tribe, the City of Port Angeles and the Agnew Irrigation District and forwarded to the Board of County Commissioners for adoption. The Commissioners have held extensive public hearings and workshops to examine issues raised in the watershed plan. The two watershed councils, Dungeness River Management Team and Elwha-Morse Management Team, are now incorporating that feedback into the plan. The BOCC will review the plan and consider adoption once these changes are made.

Table ES-1

Project Type	Expected Results	Empirical Information
Purchase of land or easements • River's End Road buyout • Properties for Corps Dike setback • Purchase Beebe area (west side) • Purchase Hurd Creek area • Purchase Severson Property • Purchase of land at Dungeness Meadows • Purchase or easements of parcels specified in "Recommended Land Protection Strategies for the Dungeness Riparian Area (2003) • Purchase of land in Kinkade Island area • Properties purchased for removal of Upper Haller Dike • Properties purchased for removal of Lower Haller Dike	Restore floodplain function Protection of riparian vegetation and side channels, which provides salmonid rearing habitat Restoring floodplain allows river access, which increases bed stability by decreasing channel velocities Minimize flood hazard and allow formation of side channel habitat, which provides salmonid rearing habitat Allows dike setback/ removal	Orsborn and Ralph, 1994 Dungeness River Restoration Work Group, 1997 Haring, 1999 Hirschi and Reed, 1998 Hals and DRRWG, 2003
Revegetate with native plants • Estuarine delta restoration • Restoration of lower river floodplain where setback Beebe dike • Restoration of tributary systems (Matriotti Creek) • Revegetate after buyout and removal of Upper Haller Dike • Revegetate after buyout and	Restore floodplain function With time a potential source of large woody debris Decrease flooding Increase refugia for salmonid spawning habitat and provide protection from	Orsborn and Ralph, 1994 Dungeness River Restoration Work Group, 1997 Haring, 1999

removal of Lower Haller Dike • Reforestation of riparian parcels along Dungeness River below Canyon Creek • Riparian restoration at small estuaries along creek mouths including Cooper, Meadowbrook, and Cassalery	predators Increases channel, bank, and floodplain stability Increase in water quality Aid in food and nutrient inputs	
Dike removal, alteration, or setback • Rivers End dike maintenance cessation • Lower portion of Dungeness Meadows dike • Dike removal at Kinkade Island • Upper Haller Dike • Lower Haller Dike • Robinson Dike and armoring removal or setback on scattered parcels • Railroad Bridge dike • Planning/Design analysis for dike setbacks • Corps Dike setback upstream of Schoolhouse Bridge • Setback of Beebe dike • Setback Ward Road	Decrease flooding Energy of flood waters will dissipate by spreading over the floodplain Increased channel and bed stability River will be able to store excess sediment outside of the channel Naturally evolving river channels that flow across landscape in dynamic equilibrium Increased stable side channel habitat and potential for creation of new side channel habitat	Orsborn and Ralph, 1994 Williams, P. and Associates, 1996 Bureau of Reclamation, 2002 Williams, P. and Associates, 2002
Removal of buildings and infrastructure • Rivers End buildings/infrastructure	Increase water quality from removal of septic systems Naturally evolving river channels that flow	Hempleman and Sargent, 2002

	across landscape in dynamic equilibrium	
Large Woody Debris (LWD) Placement • 15 ELJs in lower river floodplain • ELJ project between 101 and Old Olympic Highway • ELJs from Old Olympic HWY. to Woodcock Rd. • ELJs to Dungeness Meadows dike • ELJs from Powerlines to Canyon Creek	Provides good quality pool habitat for spawning and rearing of salmonids Dissipates stream energy and decreases stream velocity which should increase channel stability and decrease bank erosion Stabilize side channel inlets Protect erosive banks Provide a mechanism for sediment and organic sorting Aid in food and nutrient inputs Provide protection of salmonids from predators	Abbe and Montgomery, 1996 Orsborn and Ralph, 1994 Leopold et al., 1994 Dungeness River Restoration Work Group, 1997 Haring, 1999 Scrivner and Anderson, 1982 Shrivell, 1990 Bisson et al., 1982 McMahon And Hartman, 1989 Williams, P. and Associates, 2002
Constriction Abatement • Lengthen Schoolhouse Bridge • Lengthen Woodcock Rd. Bridge • Alter present Railroad Bridge • Lengthen 101 Bridge • Relocation of hatchery infrastructure from floodplain	Restoration of floodplain so decrease flooding, sedimentation, and aggradation Naturally evolving river channels that flow across landscape in dynamic equilibrium Increased stable side channel habitat and potential for creation of new side channel habitat	Orsborn and Ralph, 1994 Williams, P. and Associates, 1996 Dungeness River Restoration Work Group, 1997 Bureau of Reclamation, 2002 Williams, P. and Associates, 2002

	Reduction in scouring of salmonid redds	
Irrigation Infrastructure Changes • Elimination of Independent outtake • Modifications to other outtakes from HWY 101 to Power Lines (RM 6.4-8.8) • Modifications to outtake facilities and screens from Power Lines to Canyon Creek (RM 8.8-10.8) • Implement irrigation tailwater treatment in nearshore	Increase upstream and downstream migration of salmonids	Haring, 1999 Montgomery Water Group, 1999 Foster Wheeler Environmental Group, 2003 Economic and Engineering Services, Inc., 2003
Barrier Removal • Canyon Creek Dam	Improve salmonid access to good habitat above Canyon Creek Dam	Haring, 1999
Water Conservation/Instream Flow Protection • Details in CIDMP	Increased stream flow an spawning habitat Reduction in side channel habitat being cutoff due to low flow Reduced likelihood of thalweg spawning and vulnerability to scouring of redds Increased water quality (temperature and DO) Easier migration of adult salmonid during higher flows Increase spatial diversity of habitat available for salmonids	Jamestown S'Klallam Tribe, 1994 Orsborn and Ralph, 1994 Haring, 1999 Hiss, 1993 Montgomery Water Group, 1999 Foster Wheeler Environmental Group, 2003 Economic and Engineering Services, Inc., 2003
Sediment Management/Source Control • Upper Dungeness roads	Reduce source of sediment for aggradation of river channels	Dungeness River Restoration Work Group, 1997

decommissioning • Gold Creek Slide remediation	Improve water quality and salmonid spawning and rearing habitat (turbidity)	Golder Associates Inc., 1993 Haring, 1999 USFWS, 2004 Dungeness Area Watershed Analysis Cooperative Team, 1995 Groot and Margolis, 1991 Peterson et al., 1992
Nearshore Habitat Protection and Restoration • Protection of eelgrass beds in nearshore habitat • Restoration of saltmarsh habitat at Graysmarsh/Gierin Creek • Riparian restoration at small estuaries along creek mouths including Cooper, Meadowbrook, and Cassalery • Implementation of Dungeness Bay and Cleanup Plan	Nearshore plays a valuable role because of its rearing and feeding habitat and its use as a transition zone for salmonids	Haring, 1999 Rensel and Smayda, 2001 Rensel, 2002 Groot and Margolis, 1991 Beamer et al., 2000 Beamer et al., 2003
Update habitat protection actions • See Table F-1 in response to Question F section	Protection of functioning viable habitat is critical to salmonid survival and recovery	

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ADDENDUM A
April 30, 2005

Addendum to the
Dungeness Watershed Salmon Recovery Planning Notebook

The Puget Sound Technical Recovery Team (TRT) provided comments on the Dungeness Watershed Salmon Recovery Planning Notebook (Notebook) submitted on June 30, 2004. The TRT comments emphasized "key improvements" for the habitat, hatchery and harvest recovery strategies. The habitat strategy improvements are addressed in the revised April 30, 2005 Notebook and in a separate addendum. Improvements to the hatchery and harvest strategies are addressed in this addendum. This document also includes discussion (beyond what was included in the June 30, 2004 Notebook) of the integration of the three strategies.

Hatchery Strategy

The TRT suggested that improvement of the adaptive management program was the most important way to increase the certainty of an effective hatchery strategy. The following discussion describes more specifically the Co-managers' (WDFW and Jamestown S'Klallam Tribe) approach to hatchery adaptive management.

Current Approach to Hatchery Adaptive Management

The hatchery management strategy is intended to support the hatchery management hypotheses. *The hypotheses are that properly implemented hatchery management will 1) reduce the risk of extinction and 2) help rebuild the population to numbers that will be naturally sustainable without significantly negative effects upon the demographic, genetic and ecological processes that determine productivity, spatial distribution, diversity and abundance levels of the natural population*[1]*.* These hypotheses also describe the hatchery management goals. The adaptive management program should provide the means to test the validity of the hypotheses over time and thus assess progress in meeting the management goals.

Key assumptions underlie the hypotheses. Our current approach to adaptive management is to use these assumptions as the basis for considering tests of the hypotheses. Following is a description of the key assumptions and how adaptive management applies to each of them. In this discussion of adaptive management, the current focus is on the rationale behind adaptive management and on what monitoring is needed to assess progress and test the hypotheses[2]. What is not included here, but we plan to develop later in 2005, is a specific process that describes in detail how assessments will be made, the time frame for review of monitoring results and

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[1] These hypotheses, along with underlying assumption and management strategies, are included in section II.A.3. of the April 30, 2005 Notebook.
[2] The monitoring described below is also presented in section II.D.2.b. of the April 30, 2005 Notebook but in a different context.

assessments, triggers or criteria that lead to decisions and implementation of corrective actions, and what those actions may be. Information on the future development of the adaptive management program is provided at the end of this section. A discussion of each assumption relative to adaptive management follows.

1) *Habitat recovery will be sufficient to support a productive and sustainable natural Chinook population.*[3] This assumption recognizes that habitat improvement is the most important factor in the recovery of natural Chinook salmon to sustainable levels. Adaptive management as it applies to the habitat recovery strategy is at least as important as hatchery adaptive management (see separate description of adaptive management for the habitat strategy).

   Not specifically addressed, but implied, is the importance of harvest management in meeting the recovery goals, and consequently the need for adaptive management of the harvest strategy (see below). Recovery and adaptive management of the hatchery, habitat and harvest strategies must be integrated for recovery to succeed (see below discussion of integration of the three strategies).

2) *The hatchery program will produce Chinook smolts that return as adults at levels sufficient to rebuild the Chinook population, and*
3) *The hatchery program is successful in meeting its objectives and standards with respect to brood stock collection, spawning, incubation, rearing, disease control, and release of Chinook.* These are the assumptions that directly address the effectiveness of hatchery production in producing Chinook spawners within the river. To assess these assumptions, hatchery operation is monitored, to ensure good quality smolts are produced, as is the spawner escapement to the Dungeness River that results from the hatchery production.

   Effective assessment of the hatchery program operation and its fish production requires monitoring of the fish culture process. The fish culture process follows protocol based on established Washington Department of Fish and Wildlife (WDFW) operational objectives and standards addressing broodstock collection, fish spawning and fertilization, fish rearing, transferring fish, releasing fish and controlling fish pathogens.

   Part of the protocol is detailed record keeping of the entire fish culture process. Records are kept of water quality, numbers of adults returning to the hatchery, numbers and sex of fish spawned, numbers of eggs fertilized and their survival to eyed stage and to hatching, timing of adult returns, numbers of eggs hatching and numbers of fish at release. Records also include feeding rates and schedules, fish growth rates and survivals, and the numbers and sizes of fish at release. Detailed information is collected on fish health, including testing for pathogens and recording of disease incidents and treatments. Additional details are contained in the Dungeness Chinook Hatchery Genetic and Management

[3] See section II. A. of the April 30, 2005 Notebook for access to specific information on habitat recovery.

Plan (HGMP). Such record keeping has for many years been, and continues to be, the standardized approach by which WDFW tracks and evaluates its hatchery programs for all species.

The WDFW estimates annual Chinook escapement throughout the river based on surveys of redds throughout the spawning season (Smith and Wampler 1995). The Chinook escapement estimates, coupled with the counts of hatchery returns, provide estimates of total Chinook spawners returning to the Dungeness River. The WDFW has marked otoliths or coded wire tagged all hatchery Chinook releases (in the current hatchery program, all hatchery Chinook releases are coded wire tagged). The tags are recovered by sampling intercepting fisheries and carcasses are sampled for tags and otoliths at the hatchery and in the river. Sex, scales (for aging), and length of fish are also sampled. The otolith mark and coded wire tag information is used to estimate the proportions of natural origin and hatchery origin Chinook in the spawning escapements.

The hatchery program's success in returning spawners to the river is thus evaluated. When sufficient coded wire tag data have been collected (over several brood years), cohort analysis may be done to improve estimates of run sizes and exploitation rates.

4) *The Chinook population will not become domesticated to the point where genetically, demographically or ecologically it significantly diverges from the original naturally adapted population.* There is a risk that the hatchery program may select genetic, demographic and ecological traits that differ from those of the naturally adapted population owing to the restricted hatchery environment to which the Chinook hatchery population component is subjected. The concern is that this "domestication" will reduce the fitness of the population in the natural environment. The divergence in fitness may result in lower population survival with decreased abundance, loss of some life history pathways, or restricted dispersal of Chinook throughout the watershed.

The proportion of hatchery origin recruits (HORs) has been estimated annually, based on carcass sampling of otolith marks and coded wire tags, beginning with the year 2001. The estimates of HORs are 96%, 82% and 81% for the years 2001, 2002 and 2003, respectively. The relatively high HOR proportions suggest the hatchery program could potentially affect the genetics (and fitness) of the Chinook population.

The Hatchery Scientific Review Group (HSRG), working with the Co-managers, has developed a theoretical model to evaluate the risks of hatchery effects on a natural population. The theoretical model puts forth the concept that if conservation of the natural population is the objective, then the natural environment should drive the adaptation and fitness of a composite population of fish that spawns in a hatchery and in the wild. A hatchery program that operates within this concept is defined as an integrated program. The theoretical model incorporates the following three provisions that allow for an assessment of an integrated hatchery program:

1) The hatchery and wild components must be considered to be two parts of a composite population.
2) The influence of the hatchery and wild environments on adaptation of the composite population is determined by the proportion of natural broodstock in the hatchery and the proportion of hatchery origin fish in the natural spawning escapement. A means of estimating the influence of the natural environment is described by the following equation:

   $$PNI = pNOB / (pHOS + pNOB),$$

   where, pNOB is the proportion of natural spawners in the hatchery broodstock, pHOS is the proportion of hatchery spawners in the natural spawning escapement, and PNI is an index of the level of influence of the natural environment on the composite population.
3) The proportions are meant to be based on long-term average results.

Several guidelines were proposed for use with this theoretical model. Two of these apply most directly to planning and evaluating an integrated hatchery program:

1) The PNI must exceed 0.5 for the natural environment to drive adaptation (and for a hatchery program to be considered integrated) and
2) in the case of stocks of moderate or high biological significance and viability, the PNI should be greater than 0.7 to ensure high levels of natural dominance. It is recognized that the model is intended to help assess program benefits versus risks, given the status and goals of the stock.

The Co-managers evaluated the Dungeness Chinook stock as an integrated program and included the assessment in a hatchery reform progress report for the eastern Strait of Juan de Fuca (Eastern Strait Tribes and WDFW 2005). The evaluation was made using a spreadsheet model developed by the HSRG; the model is called the “All H Analyzer” (AHA)[4]. Consistent with the high proportions of HORs in escapement estimates, described above, the Co-managers found, with the AHA model evaluation, that the current hatchery program did not come near meeting the minimum criterion for an integrated program (that is, where PNI should exceed 0.5).

The spreadsheet modeling indicated that because of the current depressed condition of the habitat, an integrated hatchery program isn’t feasible if we wish to meet the goal of reducing the risk of extinction. However, with improvement of habitat conditions, the opportunity for an integrated program would improve and may be realized (Eastern Strait Tribes and Co-managers 2005).

[4] The HSRG’s AHA model is also used, including a presentation of model runs, in the below section addressing integration of habitat, hatchery and harvest strategies.

The Co-managers will for now continue with the current Chinook hatchery program designed to reduce the risk of extinction, recognizing that the assumption of no significant hatchery domestication is at risk. Assessing and managing the risk will entail monitoring to evaluate the genetic, demographic and ecological characteristics of the population. Monitoring of spawner escapements (natural and hatchery origin) and spawner distribution will continue to be implemented, as will monitoring of juvenile Chinook emigrants using a screw trap on the lower mainstem Dungeness River (project began in 2005) and fence trap in the tributary, Matriotti Creek (continuing project).

Sampling will include fish enumeration, taking fin clips for genetic analysis, collecting marks and tags and recording appropriate biological characteristics (i.e., length, sex and scales for aging). Additionally, monitoring is proposed using a fence trap on Bear Creek, using beach seines and traps in the estuary, and periodic snorkel surveying of index areas throughout the system to determine relative species abundance and record use of rearing habitats. The Co-managers will use these data to look for major changes and trends (or lack thereof) in fish distribution, survival and abundance.

A major consideration will be the success of the hatchery program in producing salmon returns to the river. High hatchery origin survivals may lead us to decrease hatchery production to lower the domestication risk. Also, if there is a trend of increased Chinook natural origin survival, especially if it can be associated with habitat improvements and a reduced risk of extinction, we may lower hatchery production.

5) *The non-Chinook hatchery programs of coho and steelhead are successful in implementing measures intended to avoid negative impacts of predation on Chinook and those measures do avoid such impacts.* Currently, measures that have been taken involve only the delay of steelhead and coho yearling releases in an effort to reduce the likelihood of encounters with and predation on Chinook.

Of course, the primary emphasis is to protect naturally produced Chinook. We may assess the effectiveness of these measures by implementing monitoring projects (ongoing and proposed) that include tracking the emigration of Chinook juveniles at traps in the mainstem and tributaries, snorkel surveying index areas throughout the system to determine relative species abundance, and surveying the estuary with seines and traps to assess distribution and co-occurrence of the species.

Another possible non-Chinook hatchery interaction could be the spawning activity of hatchery origin coho adults disrupting Chinook redds at some locations in the river. The co-managers have proposed but are not yet funded to conduct coho spawner surveys in the late fall / early winter. Results of these surveys, in conjunction with Chinook redd survey data, would provide an initial assessment of this potential interaction. Also proposed is the initiation of steelhead spawner surveys in April and May that would provide information on the distribution of steelhead in the watershed.

6) *The rebuilt Chinook population will distribute throughout the known range within the Dungeness watershed (this assumption is also dependent on habitat protection and recovery).* This assumption implies that successful recovery includes utilization of the available habitat, consistent with what occurred historically. It also addresses two of the viable salmonid population (VSP) parameters, diversity and spatial distribution (McElhany et al. 2000). The aforementioned Chinook spawner surveys (including identifying HORs and NORs), fence trapping of juveniles on tributaries and snorkel surveys would provide information to serve as the basis for assessing Chinook distribution over time.

7) *The natural population will ultimately meet the abundance and productivity recovery goals[5] (this assumption is also dependent on habitat protection and recovery).* This assumption reflects the desire of the Co-managers to see Chinook recovery pointing to the recovery goals described in II.C.1. of the April 30, 2005 Notebook. As the Chinook population approaches the goals, Chinook would become abundant enough to provide harvest opportunities as well as a sustainable population.

   Effective measurement of progress toward the goals will require cohort analysis and new run reconstruction so that the abundance levels and productivity can be estimated. Information needs depend on spawner surveys to estimate Chinook escapements (NORs and HORs) to the river, effective collection of age data, and effective coded wire tagging and sampling of the hatchery Chinook. Assessment would be a long-term effort because estimates of productivity and abundance would be needed for at least five and likely more Chinook brood years (Chinook adults of up to six or seven years of age would be expected to return for each brood).

Table 1 summarizes assessments and monitoring to be used in adaptive management of hatchery programs in the Dungeness River. The general status of funding is also described in the table.

[5] See section II. C.1. of the April 30, 2005 Notebook for a description of the recovery goals.

Table 1. Descriptions of hatchery adaptive management assessments and associated monitoring requirements, time frames and funding status.

Assessment	Rationale/ Direction	Monitoring Required	Time Frame: Implementation/ Results	Funding	Funding Availability
Integration & interactions of hatchery with habitat and harvest (all parties involved in recovery).	Adaptive management must be integrated to succeed. HSRG's "Manage for Success" procedure/tool may be helpful.	Some monitoring applies to all Hs; e.g., escapement numbers and distribution, runsizes and productivity.	Continuing. Short & long term.	To be determined in course of completing adaptive management plans.	To be determined in course of completing adaptive management plans.
Chinook culture operations.	Hatchery Chinook production (juv. & adults) depends on effective hatchery operations.	Broodstock collection, spawning & fertilization, incubation, rearing, release, disease control. Collecting data on water quality, feeding rates, survival, growth, etc., as described in HGMP.	Continuing. Short & long term.	WDFW	Currently available.
Returns to river from Chinook hatchery production.	Look at major changes & trends. Direct estimates of in-river hatchery effectiveness.	Spawner surveys to estimate HORs and NORs.	Continuing. Short & long term.	WDFW	Currently available.
Dungeness Chinook cohort analysis and new run reconstruction.	Estimates runsizes for complete picture of hatchery effectiveness. Looks at major changes & trends.	Coded wire tagging and sampling. Actual cohort analysis and run reconstruction in future.	Continuing. Long term.	WDFW and Tribe	Coded wire tagging and sampling covered. Addit. funding for future analysis.

Table 1 (cont.) Assessment	Rationale/ Direction	Monitoring Required	Time Frame	Funding	Funding Availability
Genetic, demographic and ecological characteristics of population.	To check for possible major changes or trends attributable to hatchery domestication.	Spawner surveys (for escapement estimates, escapement distribution, NOR/HOR ratios, genetic profiles, biol. character.), juvenile trapping (for hatch & wild emigrant estimates, genetic profiles, life hist. info. & biol. character.), snorkeling surveys for juvenile distribution and habitat use.	Continuing current programs, need to initiate new programs. Short and long term.	Currently WDFW.	WDFW covers spawner surveys, genetic sampling and some juvenile trapping. Funding needed for genetic analysis, additional trapping and snorkel surveys.
Non-Chinook hatchery program interactions with Chinook.	Evaluate effect of delayed release of coho & steelhead yearling releases. Assess possible disruption of Chinook redds by coho spawners and distribution of steelhead.	Trapping juvenile salmonids in mainstem and tributaries, juvenile surveys in river and estuary, coho and steelhead spawner surveys. Data collected to assess overlapping abundance with Chinook.	Continuing current programs, need to initiate new programs. Short and long term.	Currently WDFW.	WDFW covers spawner surveys and some juvenile trapping. Funding needed for additional trapping, and snorkel surveys.

Table 1 (cont.) Assessment	Rationale/ Direction	Monitoring Required	Time Frame	Funding	Funding Availability
Distribution of Chinook throughout watershed.	To determine extent of distribution and signal the need for new actions.	Spawner surveys, juvenile trapping in tributaries, snorkel surveys.	Same as immediately above	Currently WDFW.	Same as immediately above.
Progress toward recovery goals – productiv. & abund.	From cohort analysis and run reconstruction (see above).	Coded wire tagging and sampling.	Continuing. Long term.	WDFW	Currently available.

Newly Available Tools for Hatchery Adaptive Management

The Co-managers used a qualitative model called the Benefit Risk Assessment Procedure (BRAP) in the development of the Chinook hatchery resource management plan. The BRAP model was the basis for a new model, developed recently by Ken Currens, Craig Busak and Lars Mobrand, that extends and improves upon the original. The new model, called the Risk Assessment Modeling Project (RAMP), provides for assessment of risks from hatchery domestication, hatchery predation/competition and hazards associated with hatchery facilities/operations. The RAMP model should be available to the Co-managers in the near future for use in assessing risks as a part of adaptive management.

Another new model, currently known as the EDT-population model, has been developed as an extension of EDT; it also is expected to be available in the near future. The EDT-population model incorporates harvest and hatchery applications with the EDT's habitat-based functions and, with alternative input scenarios, simulates outcomes over a defined period of years. Stochastic functions are incorporated in its simulations. This model is another tool the Co-managers may use in adaptive management planning.

Continuing Development of Hatchery Adaptive Management

To complete a hatchery adaptive management plan for Dungeness Chinook, the Co-managers still need to develop a process for the periodic review of monitoring information that accounts for short term and long term expectations. The process should include criteria or triggers for actions to be taken based on the results of assessments and monitoring. For example, if adult returns are less than or more than set criterion levels, production may be increased or decreased, or if distribution of natural spawners remains limited (i.e., no indication of geographic expansion) over a span of years, an alternative action (e.g., change in hatchery fish release strategy) may be implemented. The hatchery adaptive management process would need to accommodate interactions with habitat and harvest conditions.

The HSRG will be working with the Co-managers to develop a new tool/process currently called "Manage for Success". This tool is intended to assist in the development of a hatchery-oriented adaptive management plan but should also provide for integration with other processes such as habitat recovery and harvest management. The eastern Strait Co-managers plan to work with the HSRG in 2005 to refine adaptive management for hatchery programs in the eastern Strait of Juan de Fuca, including the Dungeness Chinook hatchery program. As with recovery planning and implementation on the whole, we view adaptive management as a continuing process subject to improvement over time.

Harvest Strategy

The TRT suggested that developing exploitation rate guidelines and addressing effects of harvest on diversity and spatial distribution were the key areas of improvement for the harvest management portion of the recovery plan. The following discussion considers rebuilding exploitation rates, spatial distribution and diversity, the harvest management hypothesis, and adaptive management.

Rebuilding Exploitation Rates

Rebuilding exploitation rates (RERs) can be an effective tool for controlling harvest risks during recovery of a salmon management unit. Ideally, the RER is used as a ceiling exploitation rate in the planning and implementation of fisheries affecting the management unit. The RER is set at a level low enough to assure stable or increasing escapement. It is derived from a recruitment function (e.g., the Ricker spawner-recruit curve) that recognizes the inverse relationship of abundance (escapement) and productivity (recruits per spawner); that is, as abundance decreases, productivity increases and as abundance increases, productivity decreases. The RER is derived using the recruitment function and based on the current condition or performance of the management unit. Additional detail about the RER and an example if its application are provided in section 6.4 of the Co-managers' harvest management plan for Puget Sound Chinook (PSIT and WDFW 2004).

Because the RER depends on the recruitment function and current performance of the management unit, information about the management unit's spawner-recruit relationship is needed. Normally, this information is developed over time by monitoring the numbers and ages of fish harvested and escaping to the spawning grounds, so that brood years may be reconstructed and numbers of recruits may be related to numbers of spawners. With a sufficient number of reconstructed brood years, a recruitment function may be derived to serve as the basis for determining an RER.

In the case of the Dungeness Chinook management unit, there is insufficient spawner-recruit data to develop a recruitment function. The current coded wire tagging program (see below section on harvest adaptive management) should eventually provide the information needed[6], so that the Co-managers can determine a Dungeness Chinook RER and may use it as a management tool (the coded wire tagging program would also lead to improved exploitation rate estimates, a substantial improvement on the indirect approach currently used). But collection of sufficient data may take as long as ten years or more. In the mean time, the Co-managers' are using an alternative approach to control the exploitation rate on Dungeness Chinook (see section II.A.3. of the 4/30/05 Notebook).

[6] Coded wire tag information useful for this purpose is only now becoming available.

Another approach would be to use the recruitment function derived through EDT analysis to consider an RER estimate and its possible application. This indirect approach is not based on actual performance of the Chinook management unit and may not be appropriate. Nevertheless, the Co-managers plan to explore this approach. An RER may be helpful in negotiations with Canada (regarding its high Chinook exploitation rates) over the renewal of the Pacific Salmon Treaty annex in 2009.

Diversity and Spatial Distribution

The TRT suggested diversity and spatial distribution be addressed as part of harvest management and also suggested the EDT analysis be incorporate in harvest planning. Following is an assessment of EDT results, focusing on differences in productivity (recruits per spawner), abundance (escapement) and diversity (life history pathways) between river reaches. The implications for harvest management are also addressed.

Figure 1 describes the EDT model results. Five model analyses are shown; each applies to a specific river reach where the model assumes spawning only occurs in that reach. In this way, a spatial breakdown of productivity, abundance and diversity is presented by reach and comparisons can be made on that basis. What are not shown are results for the composite or overall total Dungeness; i.e., with no partitioning of reaches. For comparison, the composite results for current conditions without harvest are productivity = 3.7, capacity = 959, equilibrium abundance = 699 and diversity index = 70% of historical.

In the table at the top of Figure 1, the reaches are described in the “Population” column. The first two reaches are called “Lower Dungeness” and “Upper Dungeness”. In combination, these two reaches encompass the entire river; the Dungeness River is divided into these two reaches at Canyon Creek (approximately at river mile 10). The next three reaches in the “Population” column are a breakdown of the “Upper Dungeness” reach; that is, they are encompassed within the watershed above Canyon Creek. The first of these three upstream reaches extends from Canyon Creek to the fork or confluence with the Gray Wolf River. The second of these reaches extends from the fork the rest of the way upstream on the Dungeness River. Finally, the third of these reaches extends from the fork to the upper reaches of the Gray Wolf River.

Again in the table at the top of Figure 1, focusing on the Scenario, “Current without harvest” (i.e., current conditions assuming no harvest effects), it is apparent that the reach with the lowest diversity index, lowest productivity, and lowest capacity and abundance relative to historical (approximately 4%) is the “Lower Dungeness”. This is not surprising since it is well understood that the “Lower Dungeness” is the most severely impacted reach on the river. The “Upper Dungeness” overall shows much better performance across the board when compared to the “Lower Dungeness”, though it is still substantially below the historical levels of productivity and capacity. Within the “Upper Dungeness”, the Dungeness River from Canyon Creek to the fork and the Dungeness River above the fork are shown to have lower performance values than the Gray Wolf River, indicating they are at greater risk.

The EDT results shown in Figure 1 suggest that some reaches, the “Lower Dungeness” in particular, are at greater risk than may be implied by considering only the results for the total river (see second paragraph of this sub-section). Habitat improvements affecting productivity are critical to addressing the problem. Planning of habitat recovery has taken these reach differences into account in the ranking of restoration projects (see II.A.1. of April 30, 2005 Notebook). But habitat recovery is long term. In the short term, the indicated greater risks for individual reaches point out the importance of effectively controlling harvest effects where possible to account for these spatial distribution differences.

Population	Scenario	Diversity	Productivity	Capacity	Abundance
Lower Dungeness	Current without harvest	38%	2.3	445	250
	Current with harvest	37%	1.4	295	89
	Historic potential	100%	16.2	6,076	5,701
Upper Dungeness	Current without harvest	90%	4.4	491	380
	Current with harvest	80%	2.9	325	211
	Historic potential	100%	12.6	2,164	1,992
Dung. - Canyon Cr. to G. Wolf	Current without harvest	93%	2.9	122	80
	Current with harvest	76%	1.8	82	37
	Historic potential	100%	12.8	891	822
Dung. above Gray Wolf	Current without harvest	66%	2.9	92	60
	Current with harvest	52%	1.9	62	28
	Historic potential	100%	9.9	364	327
Gray Wolf	Current without harvest	100%	5.3	271	220
	Current with harvest	95%	3.6	182	131
	Historic potential	100%	11.4	873	796

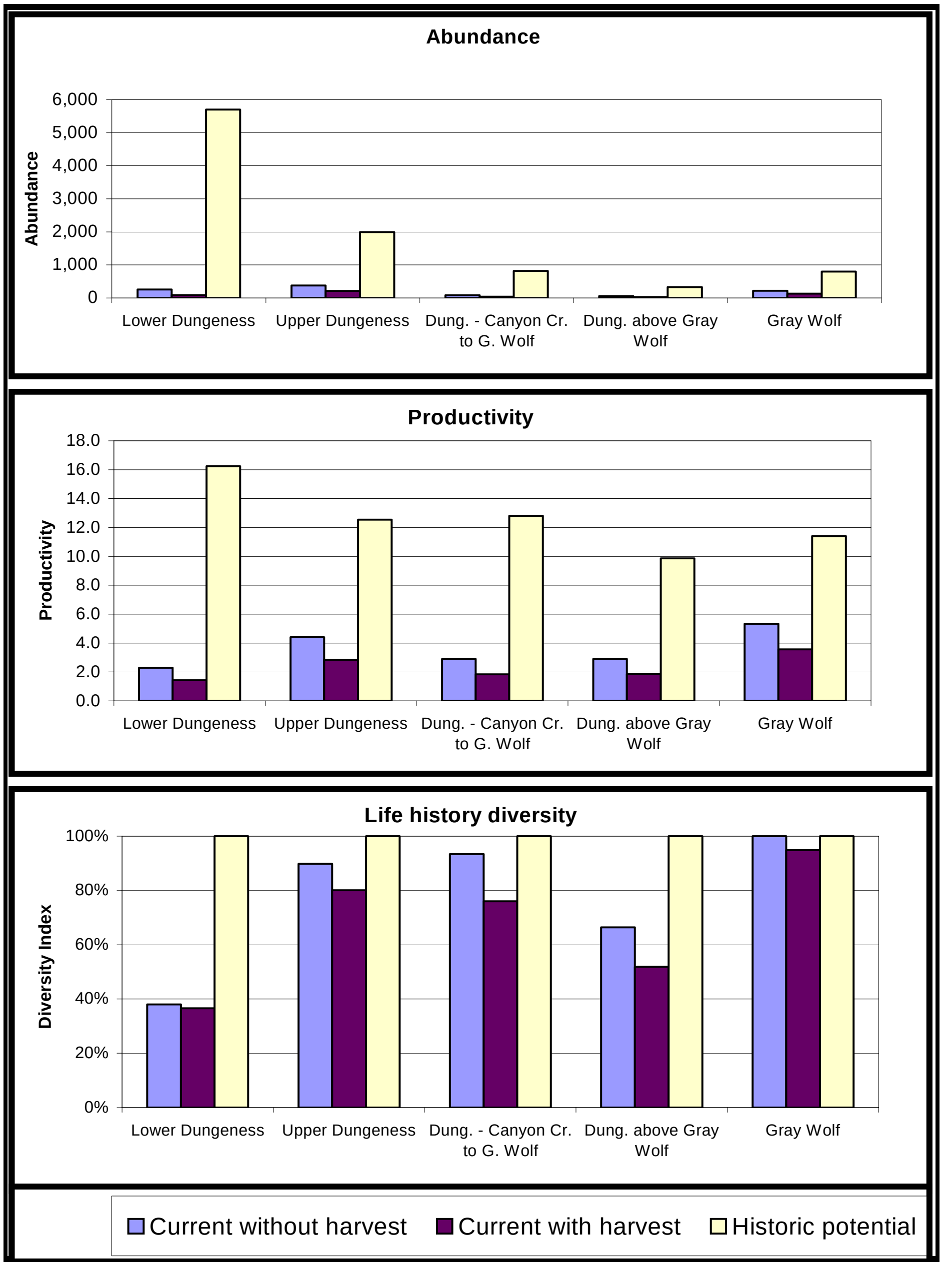

Figure 1. Results of EDT model runs by river reach.

In the table of Figure 1, the Scenario, "Current with harvest" (i.e., current conditions assuming harvest effects) results for productivity would be helpful in assessing the risk from harvest. Unfortunately, the values in the figure for that scenario do not represent current harvest conditions because they incorporate an exploitation rate of 33%[7]; current rates actually are likely to be at percentages in the lower to mid twenties (see section II.A.4. of the April 30, 2005 Notebook). This error can be seen, for example, where productivity of the "Lower Dungeness" reach for the "Current with harvest" scenario is shown in the figure's table to be 1.4 recruits per spawner, whereas the actual value should be approximately 1.8 recruits per spawner. Figure 1 is therefore not useful for evaluating the "Current with harvest" scenario.

Recognizing this problem with the figure, we can compare the corrected "Current with harvest" productivity value of 1.8 recruits per spawner for the "Lower Dungeness" to the same scenario productivity value of 2.8 recruits per spawner for the river as a whole. Based on this comparison, there appears to be a substantial difference in current productivity with harvest (these values show the "Lower Dungeness" productivity to be 36 % lower than the river's composite productivity), again indicating the importance of incorporating risk assessment at the reach level into harvest planning.

Given a current estimate of the Dungeness Chinook exploitation rate and the EDT "Current without harvest" estimate of productivity for the "Lower Dungeness", a simple assessment of risk under current harvest conditions may be made. Assuming a total exploitation rate of 23% (section II.A.4. of April 30, 2005 Notebook) and current "Lower Dungeness" productivity without harvest of 2.3 recruits per spawner (Figure 1), the recruits per spawner after harvest would be 1.77 (2.3 x (1.0 - .23) = 1.77). This value exceeds 1.0 by a fair margin, indicating more adults would be returned to the stream than had parented them and suggesting that current harvest management planning would not impede recovery in the "Lower Dungeness" reach.

The aforementioned Co-managers' exploration of the use of an EDT derived recruitment function in developing an RER should consider reach level differences of spawning recruit parameters. The new EDT-population model, described near the end of the above Hatchery Strategy section, may prove to be an effective tool for incorporating reach assessment into harvest planning.

Harvest Management Hypothesis

The harvest management hypothesis was not explicitly described in the June 30, 2004 Dungeness recovery planning submittal. Following is a brief description of the hypothesis, underlying assumptions and management strategies.

[7] This exploitation rate was developed as part of a previous analysis to approximate past rates; it was not updated for the present model runs.

The hypothesis is that harvest management will effectively limit harvest effects upon Dungeness Chinook, 1) removing harvest as an impediment to recovery, 2) allowing for the restoration and maintenance of a sustainable, locally adapted, natural-origin Chinook population, and 3) improving the Chinook population's abundance, productivity, diversity and spatial distribution.

Assumptions underlying this hypothesis include:

- No directed harvest on Hood Canal Chinook will occur until the there is sufficient recovery to accommodate harvest.
- Incidental harvest of Hood Canal Chinook in mixed stock Chinook fisheries and fisheries directed at other species can be controlled so as not to impede recovery.
- There is coincident and effective protection and restoration of properly functioning Chinook habitat in the watershed and estuaries.
- Hatchery management actions effectively support and not impede recovery.
- Harvest removes fish randomly from the population of returning adults; i.e., there is little to no bias in selection of fish by size, sex or timing, and there is no geographically selective bias affecting spatial distribution.
- Harvest management is effective in limiting takes of fish.
    - Preseason forecasting (or in-season updating – a possible future management tool) is sufficiently effective in managing fisheries.
    - Regulation and enforcement of fisheries meets objectives for controlling fisheries.
    - Harvest monitoring and record keeping are accurate and complete.
    - Escapement estimates are accurate and complete.
    - Adaptive management is an effective learning tool that improves harvest management over time.
- Effective coordination amongst the various fisheries management entities (international, federal, state and tribal) exists.

Harvest management strategies are described in detail in the Co-managers' harvest management plan for Puget Sound Chinook (PSIT and WDFW 2004) and are summarized in the April 30, 2005 Notebook (sections II.A.4. and II.C.4.). Following is a brief outline of management strategies:

- Prohibiting fisheries specifically directed at Dungeness Chinook until recovery is sufficient to support such fisheries.
- Managing fisheries by limiting exploitation rates, using harvest time and area closures, to remove or minimize negative effects on Chinook salmon productivity, abundance, diversity and spatial distribution.
- Pre-season forecasting for planning and implementing fisheries.
- Adequate fisheries regulation and enforcement to limit harvest within planning objectives.
- Adequate provisions for catch monitoring and escapement estimation.
- Coordination of management actions among the management entities.
- Learning and adapting harvest management over time.

Harvest Adaptive Management

The Co-managers' Chinook harvest management plan (PSIT and WDFW 2004) includes a section on monitoring, assessment and adaptive management. In that section it is noted that performance of Chinook fishery management will be evaluated annually to assess whether management objectives were met and identify factors affecting success or failure. This assessment will be documented in an annual document completed by mid February each year so that it may be utilized during the late winter / early spring annual pre-season fisheries planning process. This section of the Co-managers' plan goes on to generally discuss monitoring and assessment activities related to Chinook harvest adaptive management.

Most of the assessment and monitoring activities are not new. The Co-managers rely heavily on assessment and monitoring to build information upon which Chinook run forecasts are made and that serve as the basis for annual fisheries planning. In a sense, adaptive management has been a part of fisheries planning and implementation for a long time. The Point No Point Treaty Tribes and WDFW have for many years prepared a report annually that updates catch and escapement information and provides run forecasts for all salmon management units of the Strait of Juan de Fuca, including Dungeness Chinook (e.g., PNPTC and WDFW 2004). Generally, the assessments and monitoring needed to check and improve harvest management effectiveness are known and it is expected that under the Co-managers' harvest management plan and associated ESA 4(d) rule permit, adaptive management will occur.

The nature of harvest management requires that for adaptive management to be effective and efficient, it must be coordinated across all Puget Sound Chinook management units. Recognizing this need, Table 2 includes some widespread adaptive management needs but also focuses on summarizing assessments, tasks, tools and monitoring to be used in adaptive management of harvest for Dungeness Chinook. The general status of funding is also described in the table.

Integration of Habitat, Hatchery and Harvest

A brief discussion of this integration in the April 30, 2005 Notebook makes the point that habitat is the key to recovery of a productive, sustainable natural population of Chinook in the Dungeness watershed and therefore, the hatchery and harvest components of recovery necessarily serve roles complementary to the habitat component (section II.B.4.). The relationship between the recovery components is conveniently described by presenting runs of the "All H Analyzer" (AHA) model, shown below in Figure 2. Following that, six questions are addressed to help demonstrate the integration of the habitat, hatchery and harvest components.

Use of the AHA Model to Demonstrate Integration

Before presenting model runs in the context of integration, there is the following brief description of the AHA model and how the model results are displayed in Figure 2.

The AHA model is a spreadsheet tool that while based on simple calculations, provides for sophisticated assessment. It was developed by the HSRG, based on theoretical work by the HSRG, WDFW, NOAA Fisheries and other scientists. Input data are the actual or assumed habitat productivity and capacity, harvest rates and hatchery operations in a watershed; the model allows managers to consider the effects of habitat, harvest and hatchery factors together as the factors are changed in a series of model runs.

Table 2. Descriptions of harvest adaptive management assessments/tasks and associated monitoring/tools required, time frames and funding status.

Assessment/ Task	Rationale/ Direction	Monitoring/ Tools Required	Time Frame: Implementation/ Use	Funding	Funding Availability
Ensure harvest adaptive management continues to be coordinated across all management units	Harvest management is a complex process that integrates planning across management units.	Continued use of current tools/models and monitoring, and incorporation of new tools as they become available.	Continuing. Short & long term.	Continuing	Currently available.
Provide for integration & address interactions of harvest with habitat and hatchery (all parties involved in recovery).	Adaptive management must be integrated to succeed.	Some monitoring applies to all Hs; e.g., escapements, runsizes, productivity.	Continuing. Short & long term.	To be determined in course of completing adaptive management plans.	To be determined in course of completing adaptive management plans.
Estimate Chinook escapement returns to the Dungeness River.	Tracks escapement trends. Provides input to run forecasts. Accounts for differences in spatial distribution.	Spawner surveys to estimate HORs and NORs.	Continuing. Short & long term.	WDFW	Currently available.

Table 2 (cont.) Assessment/ Task	Rationale/ Direction	Monitoring/ Tools Required	Time Frame: Implementation/ Use	Funding	Funding Availability
Estimate harvests – but noting there are no current fisheries targeting Dungeness Chinook.	Measures success in meeting harvest objectives. Contributes to current run reconstruction and forecasting.	Use of fish tickets, catch monitoring and coded wire tag sampling.	Continuing. Short & long term.	WDFW	Current funding available but more needed.
Track regulatory and enforcement effectiveness.	Measures success in meeting harvest management objectives.	Based on enforcement patrol reports.	Continuing. Short & long term.	WDFW and Tribe.	Currently available.
Prepare annual harvest management reports.	Consistent with P.S. Chinook harvest plan.	Tribes and WDFW have history of annual reports for Strait of Juan de Fuca.	Continuing. Short & long term.	WDFW and Tribe.	Currently available.
Develop new Chinook fisheries simulation model to replace or supplement FRAM. Applies to P.S. Chinook in general.	Provide more effective support of pre-season harvest planning.	Requires major modeling effort.	Short and long term.	WDFW and Tribes	Currently not available.
Use of modeling tools, widespread and locally.	To help synthesize and evaluate information.	Models include FRAM, EDT-population, RER estimator and, when available, new Chinook fisheries simulation model.	Continuing. Short and long term.	WDFW and Tribes.	Currently available.

Table 2 (cont.) Assessment/ Task	Rationale/ Direction	Monitoring/ Tools Required	Time Frame: Implementation/ Use	Funding	Funding Availability
Dungeness Chinook cohort analysis and new run reconstruction.	To improve run forecasting. Provide basis for estimating exploitation rates and RER. Look at major Chinook population changes & trends.	Coded wire tagging and sampling currently. Cohort analysis and run reconstruction in future.	Continuing. Long term.	WDFW and Tribe	Coded wire tagging and sampling covered. Addit. funding for future analysis.
Improve estimates of Dungeness Chinook exploitation rates.	Provides check on meeting harvest management objectives.	Requires cohort analysis and new run reconstruction.	Long term.	WDFW and Tribe.	To be determined
Estimate a Dungeness Chinook rebuilding exploitation rate (RER).	To improve management of harvest risk.	Requires estimation of exploitation rates over long term. In short term, explore use of EDT population parameters to estimate RER.	Long and possibly short term.	WDFW and Tribe.	Currently available.
Assess genetic, demographic and ecological characteristics of the Dungeness Chinook population.	To check for possible major changes or trends (including NOR/HOR ratios, spawner & juvenile spatial distribution, and diversity reflected in genetic profiles, life hist. and bio. charact.) and assess harvest management responses.	Spawner surveys (for escapement estimates, escapement distribution, NOR/HOR ratios, genetic profiles, biol. character.), juvenile trapping (for hatch & wild emigrant estimates, genetic profiles, life hist. info. & biol. character.), snorkeling surveys for juvenile distribution and habitat use.	Continuing current programs, but need to initiate new programs. Short and long term.	Currently WDFW.	WDFW covers spawner surveys, genetic sampling and some juvenile trapping. Funding needed for genetic analysis, additional trapping, and snorkel surveys.

Table 2 (cont.) Assessment/ Task	Rationale/ Direction	Monitoring/ Tools Required	Time Frame: Implementation/ Use	Funding	Funding Availability
Assess distribution of Dungeness Chinook through the watershed & estuary.	To determine extent of distribution and signal the need for any new management actions.	Spawner surveys, juvenile trapping in tributaries, snorkel surveys.	Same as immediately above	Currently WDFW.	Same as immediately above.
Assess progress toward sustainable population and Co-managers' recovery goals.	Based on tracking major changes and trends, measured by productivity, abundance, diversity and spatial distribution.	From escapement estimates, cohort analysis and run reconstruction. Also may include use of EDT-population model.	Continuing. Long term.	WDFW	Currently available.
Prepare for 2009 PST annex negotiations with Canadians.	Highest Dungeness exploitation rates are Canadian.	Estimation of Dungeness RER may offer compelling argument. The negotiations would address a southern U.S. problem with Canadian Chinook exploitation and would need to be managed as a coordinated effort.	Long term.	WDFW and Tribes	Preparing analyses and argument may require additional funding.

The AHA model was originally developed to assess integrated hatchery program options as noted previously in the discussion of assumption #4 - one of the assumptions underlying the hatchery management hypotheses and presented within the above section, “Current Approach to Hatchery Adaptive Management”. However, the model also serves the present purpose of illustrating hatchery, habitat and harvest interactions. The HSRG is preparing a scientific paper that includes a description of the model. An overview of AHA is available at the hatchery reform web site (www.hatcheryreform.com , click on Publications).

Figure 2 describes the results of applying the computer model to the Dungeness Chinook stock. Across the top of the figure, five columns are labeled to describe alternative scenarios or model runs, the first labeled “Current–No Hatchery” and the last labeled “High Habitat–No Hatchery”, with several other in-between scenarios described below.

Inputs to the model are shown to the left of the figure and are labeled Habitat, Harvest and Hatchery Program. The Habitat inputs begin, for the “Current-No Hatchery” scenario, with the values for current Dungeness Chinook productivity and capacity estimated by EDT. The Harvest inputs of exploitation rates are in this case the same for natural origin and hatchery origin fish; they are estimates from the FRAM model (see section II.A.4. of April 30, 2005 Notebook). Finally, the hatchery program inputs include goals for percentages of pNOB and pHOS, and specific production/operation related information including broodstock number, annual smolt release, estimated recruits per spawner and estimated straying rate. There is also a switch to turn on a fitness loss adjustment, which is turned on for all model runs. Note that unless a value for broodstock number is input, there is no hatchery function for the model run.

Results of the model runs are shown at the bottom of Figure 2 in the form of small figures depicting Natural Origin Recruits (NORs), Hatchery Origin Recruits (HORs) and Surplus HORs to the hatchery, to the spawning grounds (habitat) and to harvest. Also, at the bottom left of Figure 2 is a diagram that shows the PNI (i.e., = pNOB / (pHOS + pNOB)) calculated for each scenario (or model run) and applies to evaluation of an integrated hatchery program. (The PNI is an index of the level of influence of the natural environment on the composite population – see discussion of assumption #4 in above section, “Current Approach to Hatchery Adaptive Management”.) Note that the range of PNI values at 0.5 and 0.7 (proposed thresholds described previously) are shown as heavy lines in the diagram. The following discussion of modeling for each scenario is based on the information shown in Figure 2.

The “Current-No Hatchery” scenario is meant to represent the Dungeness Chinook stock without a hatchery. The exploitation rate is conservatively set slightly high at 25%. Also, productivity is set at 3.7 recruits per spawner and capacity at 959 spawners, representing the EDT results for current habitat conditions without harvest. The results for this scenario show only NORs on the spawning grounds (habitat) and in the harvest (see figure at the bottom of the scenario column). These results approximate what might be expected to occur currently, on average, without hatchery influence. Note that escapement is between 400 and 500, and harvest, which is entirely incidental to fisheries for other stocks, is approximately 150.

Stock: DUNGENESS-CHINOOK		Curr-No Hatch	Curr-Hatch	Incr. Hab.	Decr. Hatch.	Hi. Hab-No Hatch
Habitat:	***Productivity***	3.7	3.7	5.8	5.8	7.7
	Capacity	959	959	2,129	2,129	2,923
	Minimum NOR Escapement	1	1	1	1	1
Harvest:	**Exploitation Rate --- NORs**	0.25	0.25	0.25	0.45	0.45
	--- HORs	0.25	0.25	0.25	0.45	0.45
Hatchery Program	**Broodstock Composition:**	pNOB pHOS	pNOB pHOS	pNOB pHOS	pNOB pHOS	pNOB pHOS
	Goal	0% 0%	20% 80%	20% 80%	50% 80%	0% 0%
	Realized	0% 0%	20% 67%	20% 43%	50% 26%	0% 0%
	Broodstock Number	0	112	112	60	0
	Smolt Release	-	204,120	204,120	109,350	-
	Recruits per Spawner	0.0	15.0	15.0	15.0	0.0
	Straying Rate	0%	50%	50%	50%	0%
	Fitness Loss? (Y/N)	n	y	y	y	n

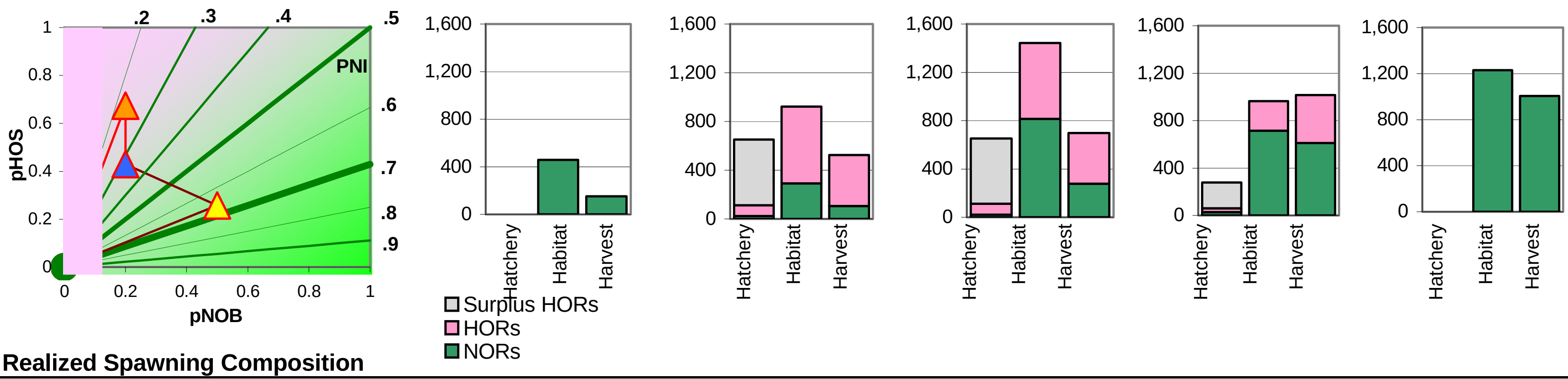

Figure 2. Input values and results of model runs / scenarios of the All H Analyzer (AHA) model – Dungeness Chinook.

The next scenario is labeled “Current-with Hatchery”; it assumes no change in habitat conditions or exploitation rate, but includes the new hatchery program that began with brood 2004 (and for which there have not yet been any adult returns to the Dungeness River). Based on recent NOR to HOR ratios, it is assumed that the pNOB (proportion of natural fish in broodstock) goal would be about 20% (assuming no differential selection of NORs in the collection of broodstock) and the pHOS (proportion of hatchery fish spawning naturally) goal would be 80%. Hatchery recruits per spawner would be about 15 (based roughly on WDFW experience in western Washington) and straying rate is set at 50%. The results show that the majority of all adult returns would be HORs and the PNI would be just over 0.2, indicating the hatchery program would not be integrated (by not meeting PNI threshold of 0.5) under these conditions and assumptions. Escapement to the spawning ground has increased to just over 900, though the majority are HORs, and harvest has risen to just over 500.

The “Increase Habitat” scenario assumes an improvement in productivity to 5.8 recruits per spawner. This is the EDT productivity estimate applicable to habitat restoration projects with high likelihood of implementation within 25 years (see table in section II.C.1. of April 30, 2005 Notebook). The exploitation rate, pNOB goal and pHOS goal remain unchanged. The results show a ratio of NORs to HORs close to 4:3; however, the PNI value of approximately 0.3 indicates that an integrated program would not be realized under this scenario. Spawning ground escapement has risen to approximately 1,450 and harvest has increased to approximately 700. Given the current escapement goal of 925, the results suggest the exploitation rate could be increased without significantly changing the PNI or escapement NOR to HOR ratios.

The “Decrease Hatchery” scenario maintains the previous scenario’s higher habitat values, includes a 50% decrease in hatchery production and an increase of the exploitation rate from 25% to 45%. Also, the pNOB goal has been increased to 50%, assuming the capability exists to select this higher proportion of natural fish for the broodstock. The pHOS goal remains at 80%. The results show the NORs are predominant in the escapement and harvest. The PNI is now 0.66, clearly indicating that an integrated hatchery program now exists. Spawning ground escapement is approximately 950, above the current escapement goal of 925, while harvest has increased to about 1,000. This scenario suggests that as habitat is restored and with a reduction in hatchery production, exploitation rates can be increased while maintaining an integrated hatchery program that allows the natural environment to drive adaptation and fitness of the Chinook population.

The ”High Habitat-No Hatchery” scenario assumes the restoration projects with as low as medium likelihood of implementation within 25 years are actually implemented, providing improvements in productivity and capacity as projected by EDT (see table in section II.C.1.). Also, it assumes the hatchery program is terminated. The exploitation rate continues at 45%. Escapement, now entirely NORs, is approximately 1,200 spawners and harvest is 1,000 fish. Another alternative would be to continue the hatchery operation under these conditions at production levels consistent with an integrated hatchery program; this would provide for higher levels of exploitation while allowing the natural environment to drive the population’s adaptation and fitness.

The series of model runs shown in Figure 2 demonstrate how habitat, hatchery and harvest actions may interact, in this case, based on selected model scenarios. A key consideration is the goal in managing the different components for Chinook recovery. With the goal of a sustainable, naturally adapted Chinook population, it is understood that constraints upon hatchery and harvest actions must exist to control risks while habitat is protected and restored.

Only with habitat recovery may these constraints be relaxed, while, in the process of recovery, accounting for specific interactions between habitat, hatchery and harvest actions. For example, the increased harvest rate of the "Decreased Hatchery" scenario would not be possible without the improvement in habitat conditions, owing to habitat restoration (and protection) actions; and at the same time, the objective of an integrated hatchery program would not be met without the reduced hatchery production. In managing for recovery, hatchery and harvest actions must be complementary and responsive to habitat conditions because recovery will only occur with the restoration and protection of habitat. Overall, adaptive management must be integrated to accommodate this approach.

Integration Questions

Following are several questions and answers addressing the integration of habitat, harvest and hatchery.

Re: harvest and habitat:

Q: Are harvest rates consistent with productivity of the population?

A: The Co-managers are managing for a relatively low exploitation rate (e.g., for 2004: the projected total exploitation rate is 23% total, all of which is pre-terminal; 18% of this total is owing to Canada and Alaska pre-terminal harvest [primarily Canada], the remaining 5% to southern U.S. pre-terminal harvest – see section II.A.4. of April 30, 2005 Notebook). The total is not expected to impede recovery of the respective management units. This conclusion is supported by considering the 2004 total Dungeness Chinook exploitation rate relative to EDT productivity estimates for the Dungeness watershed (see above discussion near the end of the "Diversity and Spatial Distribution" section).

Q: Are harvest rates consistent with providing necessary spatial structure?

A: They appear to be. See the above discussion under "Diversity and Spatial Distribution" that is based on EDT results specific to reaches within the Dungeness watershed.

Re: hatcheries and habitat:

Q: Are hatcheries used effectively to reintroduce and maintain populations where habitat is degraded?

A: The current primary goal of the hatchery program is to protect against extinction of Dungeness Chinook, now at risk owing to the degraded state of the habitat. Recent escapement estimates suggest that hatchery actions have been successful in maintaining the Chinook population levels. The new hatchery program (commencing with brood year 2004) has been conservatively designed to ensure adequate adult returns to the river to avoid extinction, while providing the opportunity to coded wire tag sufficient numbers of fish to provide results useful for management. The new program’s production may be adjusted down if adult returns are relatively high to reduce the risk of hatchery domestication effects on the Chinook population. Production may also be increased if returns are low enough to pose an extinction risk. Decisions will be made based on monitoring results as part of the adaptive management program.

Q: Are hatchery structures blocking access to important habitat?

A: No.

Re: harvest and hatcheries:

Q: Are harvest augmentation programs operated consistent with recovery of the ESU?

A: The Dungeness Chinook hatchery program currently is not designed as a fisheries augmentation program. Incorporation of an augmentation objective could only occur with substantive improvement in habitat conditions (see above section, “Use of the AHA Model to Demonstrate Integration”). Consideration of a change in hatchery objectives would likely not occur for a long time and would surface through the adaptive management program.

Q: Can production from hatchery harvest augmentation programs be caught without excessive harvest of natural fish?

A: Yes, but only with substantial improvement in habitat conditions (see discussion of scenario, “Decrease Hatchery”, in above section, “Use of the AHA Model to Demonstrate Integration”).

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ADDENDUM B

DUNGENESS WATERSHED SALMON RECOVERY
ADAPTIVE MANAGEMENT for HABITAT STRATEGY

Existing management resides with the Co-managers for hatchery and harvest. Management of habitat actions resides with governmental entities that have pertinent regulatory jurisdiction. Most of these governmental entities (Clallam County, Jamestown S'Klallam Tribe, City of Sequim, Washington Department of Ecology, Washington Department of Fish and Wildlife, US Fish and Wildlife Service, and US Forest Service), as well as several additional groups, are members of the Dungeness River Management Team (DRMT). The DRMT facilitates communication between entities and ranks habitat restoration and protection actions. The DRMT serves as the planning unit for the 2514 watershed planning process and has an advisory capacity to each of the regulatory entities, but has no regulatory jurisdiction itself.

A. Purpose of Adaptive Management

Adaptive management is a framework for learning during the implementation of salmon recovery and other watershed management activities. The purposes of the adaptive management program are to:

1. Track the implementation of watershed and salmon recovery plans. *(Did we do what we said we would?)*
2. Track and evaluate the effects of actions. *(Did the actions have the results we expected?)*
3. Use the information to set priorities. *(How should we change what we are doing?)*
4. Communicate progress. *(Tell others in and out of the watershed what is working.)*
5. Manage data. *(Use common methods and share resources.)*
6. Provide accountability to funding entities and to secure future funding.

B. Existing Management Entities in the Dungeness

1. Dungeness River Management Team

Since 1988, the Dungeness Watershed has had a long-standing watershed council known as the Dungeness River Management Team (DRMT). The DRMT was originally formed by Clallam County, and re-authorized in 1995 in a joint resolution from Clallam County and the Jamestown S’Klallam Tribe. Operating under the philosophy that a combination of local citizens and governmental agencies would be the most effective structure to resolve watershed issues, the DRMT is comprised of:

Clallam County

Jamestown S'Klallam Tribe
City of Sequim
WA Department of Fish and Wildlife
WA Department of Ecology (Puget Sound Action Team serves as alternate)
Riverfront Property Owners
North Olympic Land Trust
Dungeness National Wildlife Refuge (USFWS)
Dungeness-Quilcene Regional Planning Group
North Olympic Salmon Coalition
Sequim-Dungeness Agricultural Water Users Association
Protect the Peninsula's Future
US Forest Service (non-voting)
Clallam Conservation District (non-voting)

Over the years, the DRMT has served as the planning and oversight body for most of the major watershed plans and salmon recovery activities from the area between Siebert Creek and Jimmycomelately Creek in east Clallam County. The DRMT has been the planning unit for the development of the watershed plan under the Watershed Planning Act (2514) and is the citizens' group for rating local projects for the Salmon Recovery Funding Board. The DRMT meets monthly and the continuity and longevity of the organization has been cited as a major reason for the success of the watershed in completing a number of restoration and protection projects. The formation of a single watershed council to coordinate salmon recovery, water quality and quantity, and flood management activities has been an efficient structure to avoid repetition and to make efficient use of limited funding and staff resources.

Staff support for the Dungeness River Management Team has been provided largely on a voluntary basis from the Jamestown S'Klallam Tribe and Clallam County, and is dependent on the availability of funding resources and the priorities of these two governmental entities. Additionally, private citizens and other representatives on the DRMT contribute a significant amount of research, administrative, and technical support. A number of DRMT members and contributing volunteers are highly-qualified retired professionals from fields including architecture, corporate management, bio-statistics and rocket research.

2. DRMT Executive Committee

This standing committee is comprised of the representatives from Clallam County and the Jamestown S'Klallam Tribe along with three additional DRMT members, elected annually. The DRMT Executive Committee has as its primary function to plan and organize annual workplans and agendas for the DRMT. The annual workplan includes review and ranking of proposed restoration projects, reports on previous restoration project effectiveness, an annual report from the Dungeness agricultural water users on water withdrawals and instream flows, summaries of new technical information, and discussion of watershed issues as they arise. The Executive Committee assists Tribal staff in the preparation of an annual "Milestones" report, and reviews and drafts correspondence for the full DRMT.

3. **Dungeness River Restoration Work Group**

The DRRWG was originally formed in 1994 as an ad hoc group of state, federal, tribal, and county biologists and planners along with a riverfront property owner representative. The DRRWG presently serves as a standing technical work group to review technical information and proposed restoration projects and make recommendations to the full DRMT. A number of important reports have been initiated and completed by the DRRWG related to instream flows, restoration projects, flood plain management, and riparian land protection. The DRRWG provides annual input to the ranking of proposed SRFB projects, and oversaw the Ecosystem Diagnostic Treatment project in preparation of salmon recovery plan information.

4. **Dungeness Clean Water Work Group**

In response to the decline of water quality parameters in Dungeness Bay and the resultant shellfish harvest closures, a Clean Water Work Group was formed in 1999 to focus on water quality issues. The Clean Water Work Group oversees and coordinates studies and activities related to water quality and shellfish in Dungeness Bay, Sequim Bay and tributaries. A Clean Water Strategy was completed and adopted in 2000, and the Clean Water Work Group has been overseeing implementation, technical studies, and public education efforts. The group reports at least annually to the Dungeness River Management Team.

5. **Other Committees:**

A standing committee for public outreach and education was formed by the DRMT in the late 1990's. However the lack of staff resources and funding for education caused the committee to lapse. Public education activities are generally associated with specific planning and project efforts.

C. Roles and Responsibilities Related to Salmon Recovery Plan Implementation and Adaptive Management

Governmental Entities with Regulatory Jurisdiction

(Coordination and communication responsibilities are common to all.)

Clallam County:

- Insure that regulation and enforcement of land use activities are consistent with salmon recovery commitments and requirements for lands and shorelines under County jurisdiction.
- Implementation and administration of Comprehensive Plan, SMP, WRIA 18 plan (subject to approval), North Olympic Lead Entity Group
- Incorporate information received from DRMT and adaptive management into decision making process.

Jamestown S'Klallam Tribe:

- Exercise of treaty fishing rights and management/enforcement responsibilities consistent with US v. Washington
- Insure that regulation and enforcement of land use activities are consistent with salmon recovery commitments and requirements for lands and shorelines under Tribal jurisdiction.
- Incorporate information received from DRMT and adaptive management into decision making process.

City of Sequim:

- Insure that regulation and enforcement of land use activities are consistent with salmon recovery commitments and requirements for lands and shorelines under City jurisdiction.
- Implementation and administration of Comprehensive Plan and SMP
- Incorporate information received from DRMT and adaptive management into decision making process.

Washington Department of Ecology:

- Insure that issuance, regulation and enforcement of water rights are consistent with salmon recovery commitments and requirements
- Implementation responsibilities for WRIA 18 plan
- Technical assistance and enforcement for implementation of Dungeness Bay cleanup
- Review and regulatory responsibilities under the SMA, GMA and other state statutes
- Incorporate information received from DRMT and adaptive management into decision making process.

Washington Department of Fish and Wildlife:

- Co-management responsibilities for the operation, management and enforcement of fisheries harvest, hatcheries and habitat programs.
- Insure that issuance, regulation and enforcement of hydraulic project approvals are consistent with salmon recovery commitments and requirements
- Land management and purchase of critical habitat.
- Review and regulatory responsibilities under the SMA, GMA and other state statutes
- Incorporate information received from DRMT and adaptive management into decision making process.

US Fish and Wildlife Service (voting) and **US Forest Service** (non-voting)**:**

- Management and advisory coordination with DRMT subject to FACA.
- Administration of the Dungeness National Wildlife Refuge and Olympic National Forest
- Federal trust responsibility to Indian tribes
- Statutory responsibilities under the Endangered Species Act and Clean Water Act
- Technical advice, especially related to water quality, anadromous fish and habitat conditions.
- Incorporate information received from DRMT and adaptive management into decision making process.

Additional Dungeness River Management Team Members

(Coordination and communication responsibilities are common to all.)

Clallam Conservation District (non-voting)**:**

- Technical advice to landowners for soil and water conservation.
- Implements projects and reports on progress.

Dungeness Agricultural Water Users Association:

- Implementation of Comprehensive Water Conservation Plan; completion and implementation of CIDMP
- Monitor water withdrawals and relationship to instream flows
- Annual water use report
- Implement projects and report on progress

Riverfront Property Owners:

- Property stewardship
- Communication

North Olympic Land Trust:

- Insure that stewardship of existing properties is consistent with salmon recovery objectives and requirements, and other covenants.
- Coordination with other agencies and organizations for future purchase of land and conservation easements.

Dungeness-Quilcene RPG, North Olympic Salmon Coalition, Protect the Peninsula's Future:

- Insure consistency with previous watershed plans as appropriate.
- Share information and resources.
- Communication and coordination with constituents.

DUNGENESS WATERSHED SALMON RECOVERY PROGRAMS

Habitat Adaptive Management Communication and Coordination Structure

Watershed Oversight for Coordination and Communication:

Dungeness River Management Team

Description:
- Ongoing Watershed Council for 18 years
- 2514 watershed planning unit
- 2496 Citizen's advisory group for salmon recovery

Adaptive Management Functions:
- Track implementation.
- Track effectiveness
- Set priorities, forward recommendations
- Communicate progress
- Coordinate data and staff resources across organizations
- Report to funding and regulatory entities

Decision Making and Implementation:

Governmental Entities with Regulatory Jurisdiction (DRMT members)

Other DRMT member organizations and community groups

Description: See attached Roles and Responsibilities

Adaptive Management Functions:
- Project implementation and monitoring
- Set priorities for staff and organizational actions
- Report on effectiveness
- Communicate progress
- Accountable to funding and regulatory agencies in specific cases.

DRMT Standing Committees

Administration

DRMT Executive Committee:
- *Establishes draft workplans and agendas*
- *AM functions: incorporate ongoing and project specific review of implementation and effectiveness into DRMT workplan. Annual milestones report.*

Technical

Dungeness River Restoration Work Group:
- *Technical advisory group for DRMT*
- *AM functions: preparation of technical AM targets, monitoring protocols, coordinate monitoring with agencies*

Clean Water Work Group:
- *Tech and coordinating body for water quality cleanup in Dungeness Bay area.*
- *AM functions: Report on compliance with CWA parameters.*

DRMT Ad Hoc Committees

***Education and Outreach**: Subject to funding and staff resources*

***Project Specific:** e.g. flood plan update*

I. INTRODUCTION

A. Overview of the Dungeness Salmonid Recovery Planning Notebook

"Every River Has Its People" has long been a saying that describes the importance of the Dungeness River to the people, fish and wildlife that reside here. Members of the Dungeness group of S'Klallam Indians resisted efforts by early settlers to have them moved away from the watershed to a distant reservation. Under the leadership of James Balch, the Dungeness band of S'Klallams purchased land along Dungeness Bay in 1874 and named their community "Jamestown" in his honor. The modern descendants of the tribe now work closely with other Clallam County citizens to protect and restore the once-abundant resources that have supported and or attracted so many watershed residents.

The Dungeness Watershed Area: The Dungeness River and its main tributary, the Gray Wolf, drain a 270 square mile watershed of steep mountains, forested canyons and a broad open valley. (See location map) The river runs from its headwaters at about 6,,400 feet elevation in the Olympic National park, flowing about 32 miles downstream. The lower 10 miles flow through the Sequim-Dungeness Valley and empty into Dungeness Bay and the Strait of Juan de Fuca almost due north of the river's origin. The upper watershed receives approximately 63 inches of precipitation annually, but due to the "rainshadow" effect of the Olympic Mountains, Sequim receives only 16 inches. More than 16,000 people make their homes in the Dungeness River watershed, a figure that is rapidly expanding.

Watershed and Salmon Recovery Planning: The Dungeness River Management Team was originally formed in 1988 by Clallam County to bring watershed stakeholders to the table and address growing problems with flooding, water rights disputes, and declining salmon runs. The activities of the DRMT led to valuable partnerships between the County, Jamestown S'Klallam Tribe, riparian property owners, and agricultural water users. Based on questions from the watershed council's members, numerous studies were conducted over the past 17 years focusing on instream flows, salmonid utilization, stream channel geomorphology, water quality and other issues.

Several major planning processes were completed including the Dungeness-Quilcene Water Resources Management Plan (1994), legislative bill 2514 watershed planning (2003), comprehensive flood management plan (1989, updated 2003), water quality plans, irrigation management plans, and the development and prioritization of recommended salmon recovery projects.

Planning Recovery Notebook Format: Due to these extensive community efforts and the wealth of technical documents and plans for the Dungeness, the key governments tasked with preparing a response to the Shared Strategy have chosen to submit a response as a compilation of current and previous technical and community outreach work, rather than complete another plan. Although Clallam County and the Jamestown S'Klallam tribal staff have reviewed the "Outline for Salmon Recovery Plans" (WDFW; December, 2003), it appeared that much of the information in the outline has been generated by other Dungeness planning and technical documents.

The focus of the enclosed material is on Dungeness Chinook, as summer chum is largely discussed in the summer chum response being prepared by the Hood Canal Coordinating Council. Recently, the Shared Strategy Development Committee has requested that the bull trout be addressed in this document. Although very little information has been obtained specific to Dungeness summer chum and bull trout status, technical work group members believe that the proposed restoration activities for Dungeness Chinook will also benefit summer chum and bull trout, particularly in the lower river and estuary where restorations actions have been emphasized. More information on summer chum and bull trout historical estimates, current abundance and spawning distribution is needed.

As previously stated, it is anticipated that these restoration activities will also benefit bull trout. Bull trout may require greater habitat protection and restoration in some locations due to their having more specific habitat requirements than Chinook, summer chum, and most other salmonids, Bull trout are more sensitive to habitat degradation, require colder waters for their life cycles, and utilize a variety of habitats outside of areas inhabited by Chinook salmon.

As mentioned earlier, historical estimates, current abundance, and spawning distribution for bull trout is key information necessary for understanding the status and requirements of bull trout in the Dungeness River. In 2003, the Olympic National Forest started an initial survey of the bull trout distribution on the Dungeness River. The research is on-going.(L. Ogg, Per. Com., 2005). Preliminary results indicate that the bull trout utilize the extent of the Dungeness River upstream to an impassable barrier at milestone 19 and utilize the Dungeness' Gray Wolf tributary (US Fish & Wildlife, 2004; L. Ogg, Per. Com., 2005). This Recovery Planning Notebook relies upon and references information on the bull trout from the U.S. Fish & Wildlife Service's Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout (*Salvelinus confluentus*) , volume II: Olympic Peninsula Management Unit (2004)

The enclosed response is organized around the six questions posed by the Shared Strategy Development Committee, with subsections devoted to habitat, harvest and hatchery issues under each question. A few of the key documents cited in the response are included as an appendix (in paper or in some cases disks). Additional plans and technical studies are available for technical and policy reviewers upon request.

A key component of the response is the report from a working technical group that completed an Ecosystem Diagnostic Treatment (EDT) Analysis of the action plan for the Dungeness Chinook. It appears that the EDT report largely affirms the previous qualitative analysis that was done by the Dungeness River Restoration Work Group (technical habitat work group for the DRMT), which has been used in developing and prioritizing restoration projects. The U.S. Fish & Wildlife Service in their Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout (*Salvelinus confluentus*) (2004) “anticipate that many of the limiting factors for Chinook salmon identified through this model” [i.e. EDT modeling] “will be equally or partially applicable to bull trout.”

Policy Review: Over the past year Clallam County conducted its Comprehensive Plan and associated development regulations review as required by the Growth Management Act. The Critical Areas Ordinance was included in this review. An analysis of the effectiveness of the Clallam County Critical Areas Code in protecting salmonid habitat was completed by the Jamestown S’Klallam Tribe (report included in Question A).

The results of the Ecoystem Diagnostic Treatment (EDT) analysis have been studied by the Dungeness River Restoration Work Group and the DRMT. The results generally affirm the existing strategy so the DRMT has maintained the strategic element’s ranking. It should be noted that the strategic elements are inter-related and to be successful must be pursued in full and in concert.

Finally, it should be noted that the Dungeness watershed partners are well into implementation of many restoration projects for water conservation, riparian property purchase and protection, water quality restoration and other activities described here. The response to the Shared Strategy is a "snapshot" of recovery activities as they presently stand, and are continually subject to change as new information and funding is received.

B. Background and Status of Dungeness Chinook Population

NOAA Fisheries has provided guidance that recovery planning should be grounded in the concept of a *Viable Salmonid Population* (VSP). They go on to define a VSP as “an independent population that has a negligible risk of extinction due to threats from demographic variation, local environmental variation, and genetic diversity changes over a 100-year time period” (McElhany et al., 2000). The key elements of a VSP include abundance, productivity, spatial structure, and diversity.

The following definitions are generally accepted for the four VSP parameters:

Abundance – Abundance is simply defined as the population size. This may reflect the number of spawning adults, the number of adults surviving to recruit to fisheries, the number of smolts emigrating from the system, or in other terms. Generally, the abundance of a VSP must be sufficient to: 1) provide the population a high probability of surviving observed environmental variation; 2) provide resilience to withstand changing conditions; 3) maintain genetic diversity; 4) to provide ecological functions throughout its life-cycle, and 5) to take into account uncertainty in population assessment.

Productivity – Productivity is generally defined to be the growth rate of the population. Productivity is usually expressed as a ratio, for example, recruits/spawner. Recruits may be adults recruiting to a fishery, spawners, smolts, or other measure. For a VSP, the productivity should be sufficient to: 1) maintain abundance above the viable level (in the absence of hatchery subsidy); 2) maintain abundance above the viable level, even during poor ocean conditions; and, 3) provide compensatory response at low population size.

Spatial Structure – A population's spatial structure is made up of both the geographic distribution of a population as well as the processes that generate that distribution. Although the spatial structure could refer to any number of life history stages, for the purposes of recovery planning efforts tend to focus on spawning locations.

Diversity – Diversity is generally described as the breadth of morphological, behavioral, and life-history traits exhibited by a population. These traits may be gross in nature, like variability in body size or run timing. However, they may also be less obvious. For example the Ecosystem Diagnostic and Treatment (EDT) Model incorporates "life-history pathways" into its assessment of diversity. These pathways include not only differences in timing, but also differences in migrational behavior as a smolt emigrates from a system.

The following section describes the current status of the Dungeness River Chinook stock, in relation to the four VSP parameters:

a. **Abundance -** Estimates of the historic number of naturally spawning Chinook in the Dungeness River are difficult to provide, due to inconsistency in surveys over the years. It has been estimated that the river supported thousands of Chinook prior to appearance of Europeans in North America (Lichatowich, 1992). Unfortunately, little or no information exists from the time before major changes in the Dungeness Watershed began. Hatchery rack counts at the Dungeness Hatchery (RM 10.8) provide some information, but the recorded numbers are influenced both by the location of the rack, the hatchery program itself, as well as anthropogenic changes in the watershed. Substantial water withdrawals to support agriculture date to the early 1900's, while diking in the estuary began in the mid-late 1800's. Returns peaked in 1959 at 1,305 fish, but dropped in following years and remained low through 1981, when the hatchery program ended (Smith and Wampler, 1995).

Escapement estimates after the rack was removed in 1982 were based upon spawning ground surveys, using redd counts. The mean escapement between 1987 and 2001 was 123 fish, with a low of 45 fish in 1993 and a high of 335 fish in 1988 (Marlowe et al, 2001). The EDT modeling exercise completed in June 2004 for Dungeness River Chinook estimated that the river is theoretically currently capable of supporting 699 spawners, or 239 spawners at Maximum Sustained Harvest (MSH) levels (See EDT model results attached).

b. **Productivity –** Virtually no information is available to describe current or historical productivity in the Dungeness River. Smolt counts have not been conducted, and coded wire tag (CWT) data, which could be used to estimate adult recruitment to the fisheries, has been less than optimal. Therefore, the best estimate of current productivity available at this time comes from the EDT model. Results from that exercise estimate the current productivity of the Chinook stock, at the origin of the spawner recruit curve, to be 3.68 recruits/spawner. In this case, recruits are measured in terms of adults.

c. **Spatial Structure –** Generally speaking, Dungeness River Chinook continue to have access to their historic geographic range of habitat in the basin. The co-managers report that Dungeness Chinook historically utilized 18.9 miles of the mainstem, 5.1 miles of the Gray Wolf River, and the lower areas of Gold Creek (WDF&W & WWTIT, 1994). Fish continue to spawn throughout the majority of the basin. (See map of GPS data on Chinook redds attached to this section.) However, recent surveys seem to indicate that the Gray Wolf River, historically an important spawning area, is underutilized. In addition, side channel habitat in the lower river, once available for spawning and rearing has been lost due to diking and other channel changes. Migration of Chinook to the upper portions of the watershed was blocked for several decades by a rack at the hatchery at river mile 10.8, and was removed in the early 1990's. An acclimation pond in the Gray Wolf River was constructed in 1996 as part of the Chinook captive broodstock program in an attempt to re-establish Chinook runs in the upper historical range.

d. **Diversity -** The Dungeness wild Chinook population is described as a single population of native origin and spring/summer run timing. The hatchery rack observations from 1938-1981 found that the average first arrival at the rack was August 15 (Marlowe et al, 2001). Arrival at the river mouth likely occurred several weeks earlier, given that the rack was located over ten-miles upstream. Currently, Marlowe et al (2001) report that the average start of spawning activity is August 18, indicating virtually no change in run timing over the years.

Although run-timing appears to be unchanged over time, it should not be assumed that diversity, as more broadly described, remains unchanged. Given the loss of side-channel and estuarine habitat, a number of life-history pathways have been lost. The

EDT model estimates that only 70% of the historic pathways remain available to the stock.

Life history studies of Chinook and late pink salmon were conducted in 1997-1998 and again in 1999 - 2000 which indicated that most juvenile salmon migrate to the lower river or out of the system during their first year, but a small number of Chinook overwinter in the river and migrate out as yearlings. Copies of these studies are included in the appendices.

Based upon the above information, it is clear that the Dungeness River Chinook stock is in jeopardy of being lost, unless significant changes are made in the watershed. Abundance and productivity have fallen to such low levels that the co-managers have undertaken a hatchery supplementation program to maintain the population while habitat recovery projects can be implemented. In addition, the diversity of the population has been impacted, not by loss of sub-populations, but through the loss of life history pathways associated with specific habitat types. In order for recovery to occur, positive changes must be achieved in all four of the VSP parameters.

C. Background and Status of Dungeness Bull Trout Population

U.S. Fish & Wildlife Service (2004) has provided guidance for the bull trout recovery planning process in the Olympic Peninsula Draft Recovery Chapter. The overall goal for bull trout recovery is "to ensure the ongoing long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed across the species' native range so that the species can be delisted."

The key elements describing a recovered bull trout population are similar to the key elements of a VSP, as described in this Introduction section for Chinook salmon: adult abundance, productivity (trends or population growth rate), spatial structure (distribution of local populations within the "core area"), and diversity (connectivity allowing for the expression of the migratory life history of bull trout). [For further details see *Recovery Strategy, Goals, and Objectives*: p.133-147 of the Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout (*Salvelinus confluentus*) (2004)]. The U.S. Fish & Wildlife Service bases bull trout recovery within each management unit on the concept of "core areas A core area accordingly represents the combination of both a core population (*i.e.*, one or more local populations of bull trout inhabiting a core habitat) and core habitat (*i.e.*, habitat that could supply all the necessary elements for the long-term security of bull trout, including both spawning and rearing, as well as for foraging, migrating, and overwintering) and constitutes the basic unit upon which to gauge recovery (U.S. Fish & Wildlife Service, 2004).

Abundance – Generally the recovered abundance for bull trout is based on two factors. The first factor is the minimum number of adult spawners in the core area needed to avoid the deleterious effects from genetic drift. Bull trout need a minimum population size of between 500 and 1,000 adults in a core area to minimize these deleterious effects (Rieman and Allendorf, 2001). The second factor is the size of a local populations needed to address inbreeding concerns. Rieman and Allendorf (2001) estimated the need for a minimum number of 50 to 100 spawners per year to minimize potential inbreeding effects within local populations. In addition, the amount of suitable habitat is also considered (U.S. Fish & Wildlife Service, 2004).

Productivity – A stable or increasing population is key for recovery of bull trout. Measures of the trend of a population (the tendency to increase, decrease, or remain stable) include population growth rate or productivity. For a population to be considered viable, its natural productivity should be sufficient for the population to replace itself from generation to generation. Since estimates of the total population size are rarely available, the productivity or population growth rate is usually estimated from temporal trends in indices of abundance (i.e., redd counts) at a particular life stage (U.S. Fish & Wildlife Service, 2004).

Local Populations – The distribution and interconnection of multiple local populations throughout a watershed provide a mechanism for spreading risk from random, naturally occurring events and allows for potential recolonization in the event of local extirpations. Based in part on guidance from Rieman and McIntyre (1993), bull trout core areas (or watersheds) with fewer than 5 local populations are at increased risk of local extirpation, core areas with between 5 and 10 local populations are at intermediate risk, and core areas with more than 10 interconnected local populations are at diminished risk (U.S. Fish & Wildlife Service, 2004).

Connectivity -- The presence of the migratory life history form within the Olympic Peninsula Management Unit was used as an indicator of the functional connectivity of the unit. If the migratory life form were absent, or if the migratory form were present but local populations lacked connectivity, the core area was considered to be at increased risk. If the migratory life form persists in at least some local populations, with partial ability to connect with other local populations, the core area was judged to be at intermediate risk. Finally, if the migratory life form were present in all or nearly all local populations, and had the ability to connect with other local populations, the core area was considered to be at diminished risk (U.S. Fish & Wildlife Service, 2004).]

The following section describes the current status of the Dungeness River bull trout core area, in relation to the four key elements describing a recovered bull trout population.

a. **Abundance -** Detailed abundance estimates for the Dungeness bull trout core area are currently not available due to limited and nonrepresentative data. Bull trout distribution tends to be patchy, and sufficient information is not available for a more precise estimate of abundance in this watershed. Expanded studies on bull trout abundance and spawning-site locations is a high priority research and implementation action necessary for recovery. Following the above guidance for determining risk to a core area, based on Rieman and Allendorf (2001), and based on the estimate in the recovery chapter of between 500 and 1,000 adult bull trout, bull trout in the Dungeness watershed face risk from genetic drift (U.S. Fish & Wildlife Service, 2004). A more accurate evaluation of risk from genetic drift in the Dungeness core area will be possible with additional abundance information. Although only one year of data is available, comprehensive surveys combining radio telemetry and walking surveys in the Dungeness and Gray Wolf Rivers during 2004 documented only 52 redds (M. McHenry, Per. Com., 2005).

b. **Productivity –** Virtually no information is available to describe current or historical productivity of bull trout in the Dungeness River.

c. **Local Populations –** Based on limited information and local expertise, the U.S. Fish & Wildlife Olympic Peninsula Management Unit Recovery Team identified two local populations in the Dungeness watershed: Dungeness River and Gray Wolf River local populations. However, remote access and overlap of spawning time and location with other fall spawners make bull trout spawning rivers and streams extremely difficult to survey. Bull trout in the Dungeness likely have access to most of their historic geographic range of habitat in the basin, although availability of habitat at certain times of year may be limited due to low flows or warm water temperatures (U.S. Fish & Wildlife Service, 2004).

d. **Connectivity –** Migratory bull trout persist in the Dungeness and both the fish in the Dungeness and Gray Wolf Rivers have the ability to connect and to migrate to marine waters. The presence of the migratory life history form is used as an indicator of the functional connectivity of the watershed (U.S. Fish & Wildlife Service, 2004).

Because there is so little information on bull trout in the Dungeness River system, the status of bull trout is unknown at this time. However, since other salmonid populations with less stringent habitat requirements are depressed in the Dungeness and these salmonids are likely an important component of the bull trout prey base it is likely that the bull trout population in the Dungeness is depressed as well. The Olympic Peninsula Management Unit Recovery Team has identified expanded studies on bull trout abundance and spawning-site locations as a high priority research and implementation action necessary for recovery. Unless information becomes available to the contrary, the Dungeness River Technical Work Group and the Olympic Peninsula Management Unit Recovery Team will continue to work from the premise that the proposed restoration activities for Dungeness Chinook will also benefit the bull trout.

Part I: Introduction
References Cited:

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United States Fish and Wildlife Service. 2004. *Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout (Salvelinus confluentus) vol. II (of II).* May 2004. Olympic Peninsula Management Unit, Region 1. Portland, Oregon. 277 pp

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A. What will it take to achieve the planning targets or properly functioning conditions for independent spawning salmonid populations, including the protection of existing habitat functions and restoration? In areas without independent spawning populations, what will it take to protect existing functions and where are there good opportunities for enhancement and restoration?

In the Dungeness River and associated nearshore areas, the three H's: Habitat protection and restoration, a hatchery program focused on Chinook restoration, and a harvest management strategy that minimizes incidental Chinook take, must be fully funded, implemented, and integrated for salmon populations to reach properly functioning conditions. Functional habitat can only be protected through a combination of acquisition/conservation easements (Section A), regulatory protection (Section A.2 and F), and outreach/education/stewardship/public involvement programs (Section A.2 and F). Habitat restoration planning and activities are discussed below.

1. <u>HABITAT / WORKING HYPOTHESES AND SUMMARY OF RESTORATION STRATEGIES</u>

Efforts to recover Chinook and other salmonid species in the Dungeness River watershed have been underway for many years – predating the listing of Chinook, summer chum, and bull trout under the Endangered Species Act in 2000. The River Restoration Workgroup (RRWG), a technical advisory body for the Dungeness River Management Team (DRMT), conducted an extensive review (1997) of factors limiting Chinook and other salmonid production in the Dungeness River. This review was conducted at a reach level, and was based upon what has been termed "*The Seven Pillars of Restoration*" for the Dungeness River:

1) Reestablish functional channel and floodplain in the lower 2.6 miles through dike management and constriction abatement.
2) Abate man-made constrictions upstream of the Corps dike (everything above RM 2.6).
3) Create numerous stable, long-term log jams.
4) Manage sediment to stabilize the channel and reduce the risk of flooding.
5) Construct and/or protect side channels.
6) Restore suitable riparian vegetation and riparian-adjacent upland vegetation.
7) Conserve instream flows.

Subsequent to this report, and in part in response to the ESA listing of Chinook, summer chum and bull trout, the DRMT revised and expanded upon these recommendations to develop what has been termed the "Ten Strategic Restoration Elements for the Dungeness River Watershed" (JKST, 2003). In addition, the DRMT identified a strategy for sequencing these restoration elements in order to maximize the benefits of each action.

Finally, in June 2004, members of the RRWG and Mobrand Biometrics, Inc. completed an "EDT" (Ecosystem Diagnostic and Treatment) analysis of the effectiveness of a number of potential projects in restoring Chinook in the watershed. This EDT analysis provided "recovery goals" utilizing Properly Functioning Conditions Plus (PFC-Plus), as well as an evaluation of the ability of individual actions and suites of actions to move the population towards the recovery goals over time. In this case, PFC-Plus assumes PFC in the freshwater habitat (NMFS, 1996), and pristine conditions in the estuary. Therefore, the "recovery goals" established through the EDT model likely exceed the productivity and abundance actually possible (see response to Question C). However, the PFC-Plus standard was chosen by the planning participants to ensure that the estuary was incorporated into the goals. At the time that the goals were set, there were no guidelines established for PFC in the estuary.

Following (Table 1) is the ordered list from the 2003 DRMT report, along with the equivalent ranking from the EDT analysis. It should be noted that this EDT rank is approximated from the scores for 31 individual projects included in the EDT modeling exercise. The approximate rank was derived from the highest score for any given project within the same strategic element category. However, for a given strategic element, the individual projects under that element could have a broad range of scores. For example, an element might have three projects which scored #2, #3, and #17 on the EDT list. It should also be cautioned that because of the grouping of project types, a low EDT score for the strategic element does not necessarily indicate that there is not a particular project within the strategic element of high value (see the attached EDT model summary).In addition, EDT did not consider side channels in their reach analyses.

Table 1.
Ten Strategic Restoration Elements

Strategic Element	River Restoration Work Group 1996	Action Type	DRMT 2003	EDT 2004[1]
1. Restoration of the Lower River Floodplain and delta to RM 2.6	1st Pillar of Habitat Restoration	Restoration	#1	#2
2. Protection of existing functional habitat (RM 2.6 – 11.3)[2]	Importance of Side-channel protection noted	Protection	#2	#5
3. Floodplain restoration/ constriction abatement (RM 2.6 – 11.3)	2nd Pillar of Habitat Restoration	Restoration	#3	#3
4. Water Conservation/Instream Flow Protection and Water Quality Improvement/ Protect.	7th Pillar of Habitat Restoration	Protection/ Restoration	#4	#1
5. Restoration of Functional Riparian and Riverine Habitat	5th and 6th Pillars of Habitat Restoration	Restoration	#5	#8
6. Large Woody Debris Placement	3rd Pillar of Habitat Restoration	Restoration	#6	#7
7. Nearshore Habitat Protection and Restoration	8th Pillar (after publication)	Protection/ Restoration	#7	#6
8. Barrier Removal	Not Considered	Restoration	#8	#9
9. Stock Recovery/Rehabilitation	Not Considered	Protection/ Restoration	#9	Not ranked
10. Sediment Management/ Source Control	4th Pillar of Habitat Restoration	Protection/ Restoration	#10	#4[3]

[1] This EDT rank is approximated from the scores for 31 individual projects included in the modeling exercise.
[2] This action is modified from *Restoring the Dungeness* to include any means of protecting existing functional habitat. Originally, this action specifically identified protection through acquisition.
[3] The EDT action was to remove landslide prone Forest Service roads.

Table 2. Action list - updated following 6-14-04 workshop

Action number	Action name	Description	Type
0	Dungeness watershed build out - 25/100 yr	Effects of full build out in approximately 2030 under existing status quo regulations and land use policies.	Degradation
1A	Estuarine delta restoration - 25/100 yr	Remove Rivers End Dike and encourage reopening of a historic river mouth and associated distributary channel.	Restoration
1B	Schoolhouse Bridge modification - 25/100 yr	Lengthen Schoolhouse Bridge to widen channel between the floodplain upstream and riverine estuary downstream.	Restoration
2	Lower river floodplain restoration - 25/100 yr	Action focuses on restoring floodplain function lost due to Corps Dike and Beebe Dike; includes land purchase, removal of Corps and Beebe dikes, and placement of engineered log jams between Schoolhouse Bridge and Woodcock Road (between approximately RM 1 - 3.5).	Restoration
2A	Lower river floodplain restoration (Corps Dike setback) – 25/100 yr	Action addresses the same issues as Action 2 but it includes only the setback of the Army Corps Dike and not the Beebe Dike.	Restoration
3	Setback Ward Road - 25/100 yr	Setback Ward Road and construct engineered log jams	Restoration
4	Restore riparian corridor in Matriotti Cr - 25/100 yr	Restore riparian vegetation throughout riparian corridor of Matriotti Creek.	Restoration
5	Riparian corridor restoration to Hwy 101 - 25/100 yr	Purchase land and restore riparian vegetation between Hurd Creek and Highway 101 (between approximately RM 3.5 - 6.4)	Restoration
5	Riparian corridor protection to Hwy 101 - 25/100 yr	Purchase land and protect riparian vegetation between Hurd Creek and Highway 101 (between approximately RM 3.5 - 6.4)	Protection
6	Large wood placement to Hwy 101 - 25/100 yr	Strategically place LWD (engineered log jams) between Hurd Creek and Highway 101 (between approximately RM 3.5 - 6.4)	Restoration
7	Railroad bridge constriction abatement - 25/100 yr	Alter present bridge and dike configuration at site of railroad bridge.	Restoration
8	Riparian zone protection to Powerlines - 25/100 yr	Add new protection capability by purchasing land within the floodplain corridor between Highway 101 and Powerlines (approximately RM 6.4 - 8.8).	Protection
9	Hwy 101 bridge modification - 25/100 yr	Lengthen Highway 101 bridge to reduce constriction of floodplain at this site.	Restoration
10	Dungeness Meadows floodplain restoration - 25/100 yr	Remove lower end of Dungeness Meadows dike.	Restoration
11A	Large wood placement to Dungeness Meadows Dike - 25/100 yr	Strategically place LWD (engineered log jams) between Highway 101 and the lower end of the Dungeness Meadows Dike. Note: Action 11 has been deleted; this included placing ELJs upstream to the Powerlines.	Restoration
12	Eliminate Independent Outtake - 25/100 yr	Eliminate the Independent Outtake and make changes at other nearby irrigation facilities.	Restoration

Action number	Action name	Description	Type
13	Riparian zone restore/protect to Canyon Cr - 25/100 yr	Purchase land and restore and protect riparian vegetation between Powerlines and Canyon Creek (approximately RM 8.8 - 10.8).	Restoration/protection
14	Kinkade Is floodplain restoration - 25/100 yr	Remove bridge at Kinkade Island, a dike in the same vicinity, and revegetate riparian zone.	Restoration
15a	Removal of upper Haller dike - 25/100 yr	Remove the lower Haller Dike and revegetate the riparian corridor.	Restoration
15b	Removal of lower Haller Dike - 25/100 yr	Remove the upper Haller Dike and revegetate the riparian corridor.	Restoration
16	Removal of Robinson Dike - 25/100 yr	Remove Robinson Dike and bank hardening material on scattered parcels in vicinity.	Restoration
17	Relocation of hatchery infrastructure - 25/100 yr	Relocate Dungeness hatchery infrastructure away from floodplain.	Restoration
18	Large wood placement to Canyon Cr - 25/100 yr	Strategically place LWD (engineered log jams) between Powerlines and Canyon Creek (approximately RM 8.8 - 10.8).	Restoration
19	Modify Outtakes and screens to Canyon Cr - 25/100 yr	Changes would be made to outtake facilities and associated screens within the stream section between Powerlines and Canyon Creek (approximately RM 8.8 - 10.8).	Restoration
21A	Riparian forest restoration to Hurd Cr - 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between Schoolhouse Bridge and Hurd Cr (downstream RM 3.5).	Restoration
21B	Riparian forest restoration to Hwy 101- 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between Hurd Cr and Hwy 101 (RM 3.5 – 6.4).	Restoration
21C	Riparian forest restoration to Powerlines - 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between Hwy 101 and the Powerlines (RM 6.4 – 8.8).	Restoration
21D	Riparian forest restoration to Canyon Cr - 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between the Powerlines and Canyon Cr (RM 8.8 – 10.8).	Restoration
22	Water Conservation Projects - 25/100 yr	Implementation of conservation projects in the CIDMP is expected to reduce withdrawals by 25.5 cfs. Target flows of 100 cfs during irrigation season are expected to be achieved approximately 75% of the time in the late summer, but varies by season. (See tables in CIDMP, Chapter 6)	Restoration
23	Upper Dungeness roads decommissioning - 25/100 yr	Decommission and stabilize selected roads within the National Forest.	Restoration
25	Dungeness Bay water quality restoration - 25/100 yr	Implement the Dungeness Bay Cleanup Plan.	Restoration
26	Graysmarsh/Gierin Creek restoration - 25/100 yr	Restore 100 acres of saltmarsh habitat and associated lower portion of Gierin Creek.	Restoration
27	Small estuary restoration - 25/100 yr	Re-establish tidal flow and upstream connectivity in small estuaries near the Dungeness River mouth, including Cooper, Meadowlark, and Casselary Creeks.	Restoration

Table 3. Actions ranked based on effects on population performance and grouped into benefit categories A, B, C, D, and E

				Percent change from buildout			
Action no.	Action name	Cmb rank	Category	Prod	Abund.	Diver.	Ave.
22	Water Conservation Projects - 100 yr	1	A	0.20	0.25	0.29	0.25
2	Lower river floodplain restoration - 100 yr	2	A	0.19	0.42	0.15	0.25
2a	Lower river floodplain restoration (Corps Dike setback) – 100 yr	3	A	0.17	0.40	0.15	0.24
14	Kinkade Is floodplain restoration - 100 yr	4	B	0.15	0.18	0.23	0.19
23	Upper Dungeness roads decommissioning - 100 yr	5	B	0.13	0.18	0.28	0.19
15a	Removal of upper Haller dike - 100 yr	6	B	0.14	0.16	0.24	0.18
16	Removal of Robinson Dike - 100 yr	7	B	0.12	0.16	0.23	0.17
13	Riparian zone restore/protect to Canyon Cr - 100 yr	8	B	0.12	0.18	0.22	0.17
5	Riparian corridor restoration to Hwy 101 - 100 yr	9	B	0.13	0.20	0.03	0.12
1a	Estuarine delta restoration - 100 yr	10	B	0.09	0.33	0.03	0.15
10	Dungeness Meadows floodplain restoration - 100 yr	11	B	0.11	0.14	0.24	0.16
15b	Removal of lower Haller Dike - 100 yr	11	B	0.11	0.13	0.24	0.16
27	Small estuary restoration - 100 yr	13	B	0.09	0.30	0.03	0.14
11a	Large wood placement to Dungeness Meadows Dike - 100 yr	14	B	0.07	0.11	0.19	0.12
6	Large wood placement to Hwy 101 - 100 yr	15	C	0.07	0.16	0.03	0.09
17	Relocation of hatchery infrastructure - 100 yr	16	C	0.05	0.10	0.13	0.09
1b	Schoolhouse bridge modification - 100 yr	17	C	0.07	0.16	0.02	0.08
25	Dungeness Bay water quality restoration - 100 yr	18	C	0.07	0.14	0.02	0.08
9	Hwy 101 bridge modification - 100 yr	19	D	0.03	0.08	0.03	0.05
18	Large wood placement to Canyon Cr - 100 yr	20	D	0.00	0.09	0.06	0.05
21c	Riparian forest restoration to Powerlines - 100 yr	20	D	0.01	0.08	0.03	0.04
21d	Riparian forest restoration to Canyon Cr - 100 yr	20	D	0.01	0.08	0.03	0.04
3	Setback Ward Road - 100 yr	23	D	0.02	0.05	0.03	0.03
26	Graysmarsh/Gierin Creek restoration - 100 yr	23	D	0.04	0.11	0.01	0.05
7	Railroad bridge constriction abatement - 100 yr	25	D	0.02	0.04	0.03	0.03
21a	Riparian forest restoration to Hurd Cr - 100 yr	26	D	-0.01	0.08	0.03	0.03
4	Restore riparian corridor in Matriotti Cr - 100 yr	27	E	0.02	0.04	0.03	0.03
8	Riparian zone protection to Powerlines - 100 yr	28	E	0.01	0.00	0.01	0.01
12	Eliminate Independent Outtake - 100 yr	29	E	0.00	0.00	0.00	0.00
19	Modify Outtakes and screens to Canyon Cr - 100 yr	29	E	0.00	0.00	0.00	0.00
21b	Riparian forest restoration to Hwy 101- 100 yr	31	E	0.00	0.00	0.00	0.00

For each of these "*10 strategic elements*" a list of specific projects has been identified for each reach of the river. Additional projects were recommended in the "Salmon and Steelhead Habitat Limiting Factors for WRIA 18" (WSCC, 2000), the "Draft Dungeness River Comprehensive Flood Hazard Management Plan" (Clallam County, 2003) the Draft "2514" Watershed Plan, and the Draft Comprehensive Irrigation District Management Plan (CIDMP). These projects have further been initially prioritized in the North Olympic Peninsula Lead Entity (NOPLE) recovery strategy (NOPLE, 2001). Table 2 contains a list of those projects included in the EDT analysis, and a brief description of the actions. Table 3 ranks the projects based upon the EDT analysis. Note that the EDT ranking is based upon a combined score of change in productivity, abundance, and diversity for Dungeness River Chinook. A particular project may have a relatively low combined score, but have a high rank for one of the individual categories.

In combination, the EDT analysis found that the suite of actions deemed by the EDT Workgroup to have a “High” or “Medium” likelihood of implementation had a good chance of restoring the Chinook stock in the river to levels consistent with a Viable Salmonid Population (VSP), as defined by NMFS (Table 4). Although these suites of actions do not fully achieve the goals established using the PFC-Plus definition, they certainly restore productivity and diversity to desired levels, while they restore abundance to levels which are likely to preserve the genetic integrity of the stock (>500 spawners, Allendorf et al, 1997) while also supporting fisheries. It must be remembered, too, that the goals were established assuming pristine estuary conditions, and so are likely higher than can realistically be achieved. For a complete review of the EDT model outputs, please see the EDT Model attachment.

Table 4.
EDT Model Results
Likelihood of Implementation Scenarios (100-Year Analysis)

		100 - Years					
		High	Medium	Low	Current	Buildout	Targets
Adult	Productivity	6.48	8.21	8.29	3.68	3.28	9.3
Adult	Abundance	1,919	2,649	2,668	699	649	4,735
Adult	Diversity	0.99	0.99	1	0.70	0.68	1
Adult	Capacity	2,269	3,016	3,034	959	934	5,309
	Spawners @MSH	541	685	688	239	231	1,170
	MSH Harvest Rate	0.61	0.65	0.65	0.48	0.45	0.67
Juv.	Productivity	462	490	491	251	212	462
Juv.	Abundance	188,684	213,491	214,109	79,823	70,761	277,287

As should be apparent, the restoration elements and specific project list were developed through careful analysis and consideration by both the technical participants of the RRWG and other similar groups, as well as policy representatives of the DRMT and local governments. Inherent in each restoration element is an underlying hypothesis for how the actions will affect the aquatic habitat and the demographic, genetic, and ecological processes that determine the current and future Viable Salmonid Population (VSP) characteristics of the population. These hypotheses are specifically incorporated into the EDT analysis, but are explicitly stated below. It should be remembered that the VSP characteristics include: 1) Abundance (population size); 2) Productivity (recruits/spawner); 3) Spatial distribution (geographic distribution through out the historic range), and; 4) Diversity. In the case of Dungeness

Chinook, we have chosen to use the EDT model definition for diversity, which incorporates not only gross diversity (e.g. spring vs. summer fall type), but also diversity based upon life history pathways (trajectories through the watershed).

The following summary of hypotheses includes a brief explanation of the specific information known about the Dungeness Watershed which supports each hypothesis, as well as a list of actions (from Table 2) targeting each limiting factor. Each action is also identified as having a high, medium, or low likelihood of implementation. For these purposes, “High Likelihood” was generally defined as likely to happen in the next 5 – 10 years; “Medium Likelihood” was generally defined as either likely to happen in more than 10 years or may occur sooner if funding was available, and; “Low Likelihood” indicated that substantial barriers (funding, policy, logistics, etc.) minimized the possibility of implementing the project. This status is also reflected in the EDT analysis as “Likelihood of Implementation Scenarios”.

Hypotheses Summaries:

1. Restoration of the Lower River Floodplain and Delta to RM 2.6

Hypothesis: The loss of habitat function and area in the lower river floodplain and river delta have decreased population abundance, productivity, and diversity through the loss of essential rearing and salt/freshwater transition habitat. Spatial distribution is largely unaffected by these problems.

Explanation: The river delta and lower reaches of the Dungeness River historically provided critical rearing and transition habitat, as well as some spawning habitat, for Dungeness Chinook, summer chum, pink salmon, bull trout, and other salmonid species. As current slowed the gradient declined, depositing smaller sediment across a broad floodplain. Side-channel habitat and deep pools provided productive juvenile rearing habitat which could be used throughout the year. Finally, the lower velocities and shallow gradient provided for a smooth transition between salt and freshwater for both out-migrating smolts and returning adults.

Diking and active removal of large woody debris (LWD) has dramatically affected the productivity of this rearing and transition habitat. The gradient in the lower river has effectively been steepened through the loss of meanders (straightening) associated with diking. This alteration of gradient has consequently increased the river’s ability to transport sediment. However, the loss of multiple channels in the estuary, along with loss of floodplain area, has concurrently reduced the system’s ability to store sediment, subsequently leading to a rapid progradation of the delta cone. This new habitat is very unstable and unproductive as fish habitat. Finally, side channels, appropriate substrate, large woody debris, pools, and other critical habitat features are essentially non-existent.

Actions: The following specific projects have been identified to increase the quantity of essential rearing and salt/freshwater transition habitat:

1) Encourage reopening of a historic river mouth and associated distributary channels. (Medium Likelihood)
2) Lengthen Schoolhouse Bridge to widen channel between the floodplain upstream and riverine estuary downstream. (Medium Likelihood)
3) Army Corps (High Likelihood) and Beebe Dike set-back. (High Likelihood)

2. Protection of Existing Functional Habitat (RM 2.6 – 11.3)

Hypothesis: Protection of existing functional habitat in the lower river (RM 2.6 – 11.3) is critical to maintaining current river productivity, while other restoration efforts are implemented and maturing. Loss of existing habitat would affect abundance, productivity, diversity, and to a lesser degree, spatial distribution.

Explanation: It is widely recognized that the protection of existing functional habitat is a viable, and often cost effective, means of maintaining and restoring salmon populations (Roni et al, 2002). In the case of the Dungeness, such a significant portion of the lower river is so hostile to spawning and juvenile rearing, that the protection of functioning habitat is critical to the survival of the population. In particular, functional side-channel habitat of the type directly connected to the mainstem at both the upper and lower end of the channel is essential, as this habitat type has been shown to be utilized extensively by rearing Chinook, coho, and juvenile bull trout. (Hirschi and Reed, 1998). Chinook (and perhaps summer chum and bull trout) also spawn in these side-channel types (B. Rot, Pers. Com.; L. Ogg, Pers. Com., 2005).

Actions: The following specific projects have been identified to protect existing high quality habitat within the watershed[4]:

1) Riparian corridor protection/restoration to HWY 101 through land acquisition/easement. (High Likelihood)
2) Riparian corridor protection/restoration from HWY 101 to the Powerlines through land acquisition/easement. (Medium Likelihood)
3) Riparian corridor protection/restoration from Powerlines to Canyon Creek through land acquisition/easement. (Medium Likelihood)
4) Regulatory protection measures (Clallam County Critical Areas Code and other County Regulations[5], City of Sequim Critical Areas Codes and other City regulations, Fish and Forest Plan, DNR HCP, Federal Forest Plan,

[4] For a complete listing of land acquisition/easement actions, please see "*Recommended Land Protection Strategies for the Dungeness River Riparian Area"* (JKST and DRRWG, 2003).
[5] See "*Toward Recovery"* (Clallam County, 2001)

Shorelines Management Act, Dungeness Watershed Analysis, State Hydraulics Code, etc.) (High Likelihood – note that these actions serve as the baseline for the EDT analysis) While EDT modeled the regulatory protection measures as fully protective of habitat, in reality they range from a low to high level of protection. As currently written and enforced, the regulations will not enable habitat to recover to historical pristine conditions. The Federal Forest Plan (*Forest Ecosystem Management: An Ecological, Economic, and Social Assessment*, Forest Ecosystem Management Team, 1993) offers the best chance for recovery to Properly Functioning Conditions (PFC), while the rest could protect habitat close to PFC with regulatory changes or enforcement of current laws. Enforcement and recommended regulatory changes are discussed in Section F.

5) Education and Stewardship: To achieve PFC, a well funded and long-term comprehensive and collaborative program is needed. This includes an outreach, education, stewardship promotion, and public involvement program targeted toward watershed and marine shoreline residents. Outreach, education, stewardship promotion, and public involvement are discussed in Section F

3. Floodplain Restoration/Constriction Abatement (RM 2.6 – 11.3)

Hypothesis: "Floodplain development has destroyed off channel habitat through dikes or placement of fill, increased flood depths and velocities leading to scour of eggs, reduced or eliminated riparian vegetation leading to fewer and smaller pieces of large woody debris and restricted normal channel processes that create the complex suite of habitat that salmon dearly depend upon." (Rot, B., Pers. Com.) These changes have reduced abundance, through loss of spawning and rearing habitat; have reduced productivity through loss of rearing habitat, and; have reduced diversity by limiting the number of life history pathways available for fish. Aside from loss of side-channel habitat, spatial distribution is largely unaffected by these problems.

Explanation: Several important constrictions exist between RM 2.6 and RM 11.3. Four bridges constrict the channel throughout this stretch of river and cut off the river's access to its floodplain. In addition, a major dike system constricts the channel on the east side above HWY 101 (Dungeness Meadows Dike) and smaller dikes and/or bank hardening structures are in place on both sides of the river (RM 2.6-11.3). As a result of these constrictions, the river channel repeatedly experiences severe scouring and filling with sediment throughout these reaches, creating poor conditions for both adult spawning and juvenile fish rearing. Flooding of houses and facilities also occurs in this area. A few pockets of good quality side-channel habitat occur in these reaches, and are being used by both adult and juvenile salmonids. Upper river pink, Chinook, coho, chum, bull trout and steelhead salmon use these reaches of the river.[6]

Actions: The following specific projects have been identified to alleviate channel constrictions and thus increasing corresponding channel meanders and reducing gradient, velocities, scour, and bank erosion:

1) Railroad Bridge Constriction abatement (Medium Likelihood)
2) HWY 101 bridge modification. (Low Likelihood)
3) Remove lower end of the Dungeness Meadows Dike. (Medium Likelihood)
4) Remove bridge at Kinkade Island and the associated dike. (Medium Likelihood)
5) Remove upper Haller Dike at the Weikal property (High Likelihood if funding is obtained)
6) Remove lower Haller Dike (Low Likelihood)
7) Remove Robinson Dike (Medium Likelihood)
8) Relocate WDF&W Hatchery Infrastructure (Medium Likelihood)

4. Water Conservation, Instream Flow Protection and Water Quality Improvement/ Protection

Hypothesis: Diversion of water from the river system accentuates low flow conditions hindering fish passage, decreasing juvenile rearing area (particularly side-channel habitat), and increasing aggradation of the streambed in some locations (PSCRBT, 1991). Additionally, spawning of Chinook, summer chum, and pink salmon tends to be concentrated in mid-channel areas which are subjected to scour during winter high flow events. These changes have reduced abundance, through loss of side-channel spawning and rearing habitat; have reduced productivity through loss of side-channel rearing habitat, and increased redd scour, and; have reduced diversity by limiting the number of life history pathways available for fish. Productivity of the population has also been reduced by diminished water quality. Aside from loss of side-channel habitat, spatial distribution is largely unaffected by these problems.

Explanation: Water rights for irrigation and municipal purposes in the Dungeness River watershed greatly exceed summer low flows (540 cfs water rights vs. 173 cfs summer low flow) (Draft CIDMP, SDVAWUA, 8/29/03). Although these rights have never been fully utilized, in 1987 water users are estimated to have withdrawn 82% of the total river flow (~120 cfs) leaving ~25 cfs in the river (JSKT, 2003). Such a radical withdrawal of water virtually extinguished the ability of salmon to migrate upstream. In addition, spawning locations were limited to the mid-channel, where redds would be subjected to scour during winter storm events. In more recent years, water conservation measures undertaken by the irrigation districts, along with changing water

[6] This explanation section was quoted directly from *Restoring the Dungeness* (JSKT, 2003)

needs, have dramatically reduced diversion rates. In 2001, 33% of the total river flow was diverted (~40 cfs), while ~95 cfs remained in the river (JSKT, 2003).

Even with these reduced diversions, water withdrawals continue to affect salmon spawning and rearing habitat. Two Incremental Flow Instream Methodology (IFIM) analyses on the Dungeness River show that during summer low flow conditions, each cfs of stream flow represents about 1% of the weighted usable area (WUA) of the river (USFWS, 1991). In addition, recent work shows that side-channel habitat is very sensitive to flow (BOR and JSKT, 2003). In particular, this study found that in order to maintain conditions in most surface-fed side-channels suitable for spawning Chinook, the mainstem flow must exceed 180 cfs. When flows drop below 105 cfs, only one side-channel appears to meet spawning requirements for Chinook. Juvenile Chinook rearing habitat could be maintained in these side-channels at slightly reduced mainstem flows.

The Dungeness River is on the CWA 303(d) List of impaired water bodies for instream flows. In addition, water temperature data support a trend of increasing mean temperatures since the 1950's. Water temperatures in shallow mainstem areas are elevated to > 60^{o} F (Lichatowich, J., 1992 as referenced by Orsborn, J., and Ralph, S., 1994). Bull trout generally prefer water temperatures < 59^{o} F with optimum incubation conditions occurring between approximately 35 to 39^{o} F and optimum juvenile rearing conditions between approximately 39 and 46^{o} F (U.S Fish & Wildlife Service, 2004). According to preliminary results from the Olympic National Forest research on bull trout in the Dungeness River, bull trout tend to spawn upriver and in the Gray Wolf River where water temperatures are cooler (L. Ogg , Per. Com. 2005). Rearing habitat is seasonally limited by water withdrawals and elevated temperatures in the lower river (RM 3.5 – 8.8) (DRRWG, 1997). The extent of algae growth and bacterial mats in the bay [Dungeness Bay] suggests a high nutrient loading with the associated likelihood of low dissolved oxygen levels in the lower five miles of river, as it enters Dungeness Bay (WSCC, 2000). Irrigations ditches also convey pollutants to receiving waters through irrigation return flows (PSCRBT, 1991). Tailwater returns from irrigation ditches flow into the Dungeness mainstem, and into Matriotti, Hurd, Gierin, and Cassalery Creeks, and directly into Dungeness Bay. Tributaries to the lower river (Matriotti and Meadowbrook Creeks) are on the State 303(d) list (prepared by WA State and approved by the EPA) for bacteria, and the bacteria levels in the bay exceed the federal standard for safe shellfish harvest.[7]

Actions: The following specific projects have been identified to improve summer low flows and alleviate water quality concerns:

[7] This paragraph is copied directly from *Restoring the Dungeness* (JKST, 2003)

1) Implement water conservation projects contained the Dungeness Water Users Comprehensive Irrigation District Management Plan (Medium Likelihood)
   a. Piping, lining, and other conservation plan strategies
   b. Re-regulating Reservoir
   c. Water Rights, Leases, and trusts
   d. Reduce conveyance through river/creeks
2) Implement other domestic/municipal water conservation projects found in the draft WRIA 18 Watershed Plan. (Medium Likelihood)

5. Restoration of Functional Riparian and Riverine Habitat

Hypothesis: The generally poor condition of the lower river riparian habitat has led to decreased instream habitat complexity due to lack of woody debris of sufficient size to form stable log jams, has increased susceptibility of salmonids to predation due to lack of cover, and has influenced temperature profiles and food abundance through loss of canopy cover. These changes have reduced abundance, through loss of functional rearing habitat and direct mortality due to predation, and; have reduced productivity through loss of functional rearing habitat, diminished channel complexity, diminished prey abundance, and sub-optimal rearing temperatures. Diversity and spatial distribution are relatively unaffected by these problems.

Explanation: The riparian zone is generally characterized as that area surrounding the stream channel where the soils are periodically "inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for a life in saturated soil conditions" (EPA, 1991). In the Pacific Northwest, a healthy riparian zone is typically dominated by coniferous trees, which function to provide the following important benefits to the ecosystem[8]:

1) provides organic material that can be used as food sources for aquatic organisms
2) supplies large woody debris that alters sediment storage, influences channel morphology, and enhances fish production
3) shading the stream and reducing temperature fluctuations
4) reducing bank erosion,
5) providing habitat and cover for both aquatic and terrestrial organisms.

Reach specific evaluations of the Dungeness River have identified a number of areas along the river where the condition of the riparian zone is inadequate to provide all (or in some cases, any) of the characteristics associated with healthy conditions (DRMT, 1997).

[8] (EPA, 1991)

Actions: The following specific projects have been identified to improve the quality of riparian habitat and function, including, temperature moderation, long-term recruitment of LWD, cover, food production, etc.:

1) Restore riparian corridor in Matriotti Creek (High Likelihood)
2) Restore riparian corridor through out the lower mainstem (numerous individual projects. See *Recommended Land Protection Strategies for the Dungeness River Riparian Area* (JKST and RRWG, 2003). (High Likelihood)

6. Large Woody Debris Placement

Hypothesis: Lack of large woody debris (LWD) and debris jams has reduced pool frequency and depth, reduced sediment storage and stability, and has reduced side-channel habitat. The lack of large woody debris has also resulted in increased velocities and associated channel instability, and bank erosion. These problems have decreased abundance through the loss of suitable spawning and rearing habitat; have decreased productivity through the loss of side channel habitat, rearing habitat, and diminished quality of spawning substrate resulting from scour and bank erosion. Diversity and spatial distribution are relatively unaffected by these problems.

Explanation: It is broadly recognized that large woody debris provides a critical function in river forming processes necessary for healthy fish habitat. "*Large woody debris plays a vital role in maintaining the distribution and frequency of many diverse flow and cover conditions in small forested streams and in serving to ameliorate the erosive forces of channel forming and flood flows. It is the condition created by the LWD e.g. variable velocity regimes, darkness, and overhead shelter, that fish seek out, and not the structure itself (Shirvell, 1990). Juvenile coho salmon and older age classes of bull trout, steelhead and cutthroat trout strongly prefer the low velocity habitats that various kinds of pools provide (Bisson et al., 1982;UF Fish & Wildlife Service, 2004). For these salmonids a loss of pools means almost a proportional decrease in their abundance. Seasonal velocity shadows cast by woody debris may be even more significant in maintaining salmonid abundance (McMahon and Hartman, 1989)*"[9]. Without a healthy riparian forest in the lower river (see point 5, above), recruitment of LWD or creation of LWD-capture locations is not possible. Further, there was a historic practice until the early 1980's on the Dungeness River of annually removing any LWD which accumulated over the winter as a flood abatement practice (R. Johnson, pers comm.). Any LWD present today is dominated by smaller pieces, which tends to be deposited outside the main channel. Few key pieces exist that are likely to form jams. Specific locations on the river have been identified where the placement of LWD is likely to provide a long-term

[9] Quote from "Assessment of Cumulative Effects on Salmonid Habitat: Some Suggested Parameters and Target Conditions" (Peterson, Hendry, and Quinn, 1992).

meaningful change in habitat conditions in the river, while minimizing any risk associated with placement of the jams.

Actions: The following specific projects have been identified for LWD placement:

1) Lower river floodplain restoration, LWD between Schoolhouse Bridge and Woodcock Road. (High Likelihood)
2) Strategically place LWD between Hurd Creek and HWY 101. (High/Medium Likelihood)
3) Strategically place LWD between HWY 101 and Dungeness Meadows Dike. (Medium Likelihood)
4) Strategically place LWD between Powerlines and Canyon Creek. (Medium Likelihood)

7. Nearshore Habitat Protection and Restoration

Hypothesis: The loss of nearshore and estuarine habitat from diking, draining, tide-gates, and fill has decreased the Chinook, chum salmon, and bull trout stocks' abundance and productivity through the loss of rearing area and the disruption of the food base of the entire nearshore aquatic community. The loss of quantity and function of these habitats has also reduced the diversity by limiting the number of life history pathways available for these stocks.

Explanation: Healthy estuarine and nearshore habitat is a critical component of the Chinook, summer chum salmon, and bull trout life history. For Chinook, it is not unusual for newly emergent fry to migrate quickly downstream, to rear in the estuary (Healy, in Groot and Margolis, 1991). When these fry vacate this area in early June, at a size of about 70 mm, the habitat may then be taken over by fingerling Chinook smolts which will rear through mid-July or August. These fry and smolts seem to prefer tidal channels with low banks and many subtidal refugia (Healy, in Groot and Margolis, 1991).

Although a portion of the Dungeness estuary is protected by the National Wildlife Refuge, much of the estuary has been altered through diking, fill, installation of tidal gates, and other impacts. The historic low-gradient habitat of the estuary and salt marsh (those tidal channels so important for Chinook and bull trout rearing) has been virtually eliminated at the river mouth. Numerous other "nursery-type" estuaries to the west and east of the river-mouth have had access to them cut off through diking and tidal gates, or have been wiped out through fill. Literally hundreds of acres of this type of habitat have been lost. In addition, the inner bay is continuing to fill in, with around 85% of holes deeper than 6.7 ft lost since 1967 (Rensel, 2003).

Actions: The following specific projects have been identified to improve the quantity and quality of estuarine and nearshore habitat:

1) Encourage reopening of a historic river mouth and associated distributary channels. (Medium Likelihood)
2) Implement Dungeness Bay Cleanup Plan (Clean Water Workgroup, 2002) (High likelihood)
3) Restore 100 acres of salt marsh habitat and associated portion of Gierin Creek (Medium Likelihood).
4) Re-establish tidal flow and upstream connectivity in small estuaries near the Dungeness River mouth, including Cooper, Meadowbrook, and Casselary Creeks. (Medium Likelihood)
5) Restore Bell Creek/Washington Harbor Estuary. (Not Modeled, but Low Likelihood)
6) Restore Jimmycomelately Creek/Dean Creek Estuaries[10]. (Not Modeled, but currently underway)
7) Implement other nearshore restoration/protection projects from the NOPLE Strategy.[11] (Not modeled, with a range of likely scenarios).

8. Barrier Removal

Hypothesis: Seasonal or complete barriers reduce abundance, productivity, diversity, and spatial distribution of Chinook, summer chum, and bull trout stocks by limiting the area of the river accessible to spawning and/or rearing fish.

Explanation: Physical barriers, blocking access to high quality habitat by either adult or juvenile salmon, are often a limiting factor for salmonid production. However, in the Dungeness River, barriers are a relatively minor problem. A small dam blocks access to Canyon Creek (a small tributary located at approximately RM 10.8), but it is not believed that Canyon Creek would provide significant spawning or rearing habitat for either Chinook salmon or summer chum, due to its small size. Canyon Creek is better suited for coho and steelhead spawning and rearing. It is likely that bull trout would use Canyon Creek for rearing, overwintering, and foraging if the dam were removed. It is doubtful that bull trout would spawn in Canyon Creek due to amount of roads and timber harvesting that have taken place in the Canyon Creek subwatershed (M.McHenry, Per. Com., 2005). In 2004, L. Ogg (2005) tracked one bull trout in the vicinity of the Canyon Creek Dam. In general, if removal of the Canyon Creek Dam benefits the prey base then bull trout will benefit.

[10] Not specifically included in EDT analysis or "*Restoring the Dungeness".*
[11] Not specifically included in EDT analysis or "*Restoring the Dungeness".*

It is also thought that some of the fish screen configurations and/or alignment to the river of the irrigation outtakes might present passage problems to or from side-channel habitat in some areas.

Actions: The following specific projects have been identified to alleviate conditions associated with this strategic element:

1) Remove Canyon Creek Dam (Not included in the EDT Model)
2) Improve fish screen/irrigation outtake alignments. (High Likelihood)

9. Stock Recovery/Rehabilitation

This element is covered in the hatchery section below

10. Sediment Management/Source Control

Hypothesis: While there is a natural instability of soils within the Dungeness Basin, the rates of slides, erosion, and channel instability have been significantly accelerated by human activities in the watershed. Increased sediment loading in the river affects the quality and stability of spawning habitat. This decrease in habitat quality leads to reduced abundance through direct mortality, as well as reduced productivity. To the extent that certain areas of the river may be more affected than others, these problems may also diminish the number of life history pathways available to the populations.

Explanation: The Dungeness River basin sediment yield is dominated by high values associated with glaciers, even though a very small portion of the watershed was actually covered by glaciers (DAWACT, 1995). In the upper watershed, three major landslides (deep-seated failures) in glaciolacustrine soils have contributed significant fine sediment loads to the river. Two of the slides are associated with USFS roads (Gold Creek and Silver Creek slides), while the third slide (upper Gray Wolf River slide) appears to be a natural event. Much of the coarse sediment is contributed to the system through bank erosion and channel degradation specifically associated with morphological changes in the channel due to diking and other floodplain alterations (such as the loss of functional riparian habitat and LWD). The river channel is being down-cut in the relatively steeper reaches upstream of approximately the RR Bridge, while actively aggrading in lower gradient depositional reaches within the Corp dikes. (Rot, pers comm) Both of the changes affect passage and access to side-channels (WSCC, 2000).

Chinook and summer chum salmon and bull trout have specific spawning requirements for substrate size, water velocity, and water depth (Groot and Margolis, 1991; USFWS, 2004). In addition, incubating salmon eggs are extremely susceptible to high concentrations of fine sediment in the substrate, as well as to redd scour during flood events (Peterson, Hendry, and Quinn, 1992). As a result of the increase of sediment loading and channel instability seen in the Dungeness River, high quality spawning habitat for Chinook, summer chum, and bull trout is distributed in small patches and seems to be susceptible to scour and/or aggradation, even during minor storm events (Orsborn and Ralph, 1994, and DRRWG, 1997).

Actions: The following specific projects have been identified to alleviate conditions associated with this strategic element[12]:

1) Decommission and stabilize selected roads within the National Forest[13]. (Medium Likelihood)

2. HABITAT / LAND USE ANALYSIS

The riparian corridor of the lower 10 miles is comprised of numerous individual parcels, predominately in private ownership, and subject to the land use jurisdiction of Clallam County. Due to the importance of lower river habitat and the complicated ownership structure, the lower Dungeness River has been the focus of several technical reports and plans since 1990, including:

- The appendix contains a report titled, "Recommended Land Protection Strategies for the Dungeness River Riparian Area" (Hals and Dungeness River Restoration Work Group, 2003) which was completed by the Jamestown S'Klallam Tribe and other contributors to detail the biological value of lands along the river for maintaining and improving salmonid habitat. The strategy is a parcel-by-parcel analysis of riparian property in the lower 10 miles of the Dungeness River, with prioritized recommendations for purchase, application of conservation easements, and landowner stewardship. The report identified approximately 600 acres for high priority purchase, of which committed funding exists for approximately 450 acres and negotiations are presently underway.

- In anticipation of the update of the Clallam County Comprehensive Plan in 2004, the Jamestown S'Klallam Tribe also retained Hals to prepare, "A Review of Clallam County Critical Areas Ordinance, 2001 in Protecting Riparian Areas - Using the Dungeness River as a Case Study." The study outlines the inadequacies of the current Critical Areas Code in terms of development along the river corridor. The report has been finalized since the June 2004 submittal, and is enclosed as an attachment to replace the draft version.

[12] It should be noted that a number of the LWD and riparian restoration projects previously listed are an integral component of controlling sediment, but are not restated in the following list.
[13] See the USFS Watershed Analysis for details.

- Clallam County recently completed a buildout analysis of the Sequim-Dungeness area as part of the growth management review. This analysis was included as a scenario during EDT modeling to evaluate the impact of full buildout under existing zoning and the present critical areas ordinance in additional degradation to habitat parameters. Buildout maps are in progress at the County, and are being overlaid with the critical areas.

The Dungeness watershed above river mile 11 is generally under public ownership under the jurisdiction of the Washington DNR, USDA Forest Service - Olympic National Forest, and Olympic National Park. A few large parcels downstream of the national forest boundary are private timberlands. Federal and State regulatory and management plans which are applicable to the Dungeness include:

- The Federal Forest Plan (1993) identifies the Dungeness Watershed as a Tier 1 Key watershed in the aquatic conservation strategy. These key watersheds are considered to be part of a system of large refugia that are crucial to at risk species and stocks, and for high water quality values. A Watershed Analysis of the Dungeness was conducted by the US Forest Service in 1995, and updated in 2003. Key recommendations to protect aquatic species include road reconstruction and decommissioning, culvert removal and repair, and other management measures identified in the Forest Plan

- Non-federal forest lands are subject to the Forest Practices Act of 1974 as well as the Forest and Fish rules promulgated in 1999.

- Clallam County currently implements the protection provisions of the Department of Ecology 1992 Stormwater Management Manual for Western Washington for properties subject to Critical Areas Code jurisdiction. A Draft Stormwater Management Ordinance complying with the DOE 2000 manual has been prepared and approved by the Clallam County Planning Commission, and forwarded to the Board of Clallam County Commissioners for further action.

- Clallam County ordinances prepared under the auspices of the 1971 Shoreline Management Act and the 1995 Growth Management Act also apply.

Question F more thoroughly treats policy recommendations related to land use. Recommended actions are summarized in Table F-1. Land use, watershed plans, and ordinance-making are developed and implemented through an extensive public process. The recommendations described in the response to Question F and in Table F-1 will be considered according to the local public review and adoption process.

3. HATCHERY MANAGEMENT

WDFW has operated a hatchery on the Dungeness River at RM 10.5 since 1902 and a smaller satellite facility at Hurd Creek near Dungeness RM 2.9 since 1960. For several decades, hatchery operations were primarily oriented to the production of coho for commercial and recreational harvest in the ocean, Strait of Juan de Fuca and Dungeness Bay. Since 1990, hatchery programs, while still supplying harvestable coho, have focused on the restoration of critical stocks of Chinook and chum salmon in the eastern Strait of Juan de Fuca.

Dungeness and Hurd Creek facilities and operations were analyzed in 2001-2 by the Hatchery Scientific Review Group, and recommended improvements to operations and facilities have been reviewed by the Dungeness River Management Team and relevant agencies. Several projects for facilities upgrades, operational changes, and additional study are included in recovery planning efforts.

Hatchery Management Hypotheses

The hatchery management hypotheses are that properly implemented hatchery management will 1) reduce the risk of extinction and 2) help rebuild the population to numbers that will be naturally sustainable without significantly negative effects upon the demographic, genetic and ecological processes that determine productivity, spatial distribution, diversity, and abundance levels of the natural population. These hypotheses also describe the hatchery management goals.

The following key assumptions underlie the hypotheses:

- Habitat recovery will be sufficient to support a productive and sustainable natural Chinook population.
- The hatchery program will produce Chinook smolts that return as adults at levels sufficient to rebuild the Chinook population.
- The hatchery program is successful in meeting its objectives and standards with respect to brood stock collection, spawning, incubation, rearing, disease control, and release of Chinook.
- The hatchery population will not become domesticated to the point where genetically and demographically it is significantly divergent from the natural population, nor will it significantly affect the genetics, demographics and ecological processes of the natural population.
- The non-Chinook hatchery programs for coho and steelhead are successful in implementing measures intended to avoid negative impacts of predation on Chinook and those measures do avoid such impacts.
- The rebuilt natural population will distribute throughout the known range of Chinook within the Dungeness watershed (this assumption is also dependent on habitat protection and recovery).

- The natural population will ultimately meet the abundance and productivity recovery goals (this assumption is also dependent on habitat protection and recovery).

The following hatchery management strategies are being implemented, consistent with the hypotheses, to help achieve the Chinook recovery goals.

- Initially work to reduce risk of extinction by using a captive brood stock program that minimizes impacts on natural production.
- Subsequently, implement a conventional brood stock collection program to maintain population levels until habitat restoration accommodates a robust, naturally sustainable Chinook population.
- Monitor, assess and adaptively manage program to meet hatchery objectives and standards and to evaluate the hatchery management hypotheses.
- Coordinate management actions among the management entities.

The specific hatchery programs, their objectives and standards, as well as monitoring, assessment and adaptive management are described below in response to the other questions.

4. HARVEST MANAGEMENT

Dungeness Chinook salmon are in a depressed state and have been listed as a threatened component population of the Puget Sound Chinook ESU (NMFS 1999). Because of this, they are not specifically targeted for fisheries harvest. However, some Dungeness Chinook salmon are harvested in mixed stock Chinook fisheries where they are a relatively small portion of the catch (e.g., U.S. saltwater recreational, U.S. troll, and Canadian and Alaskan fisheries), or are incidentally caught in fisheries for other species (e.g., coho, sockeye, and pink salmon). Currently, the harvest management objective is to limit the incidental impacts of these fisheries on Dungeness Chinook to low levels. In the future, as Dungeness Chinook recover, existing restrictions on these fisheries may be relaxed. Furthermore, when recovery occurs, fisheries specifically directed at Dungeness Chinook may be implemented. Such fisheries would be closely managed to maintain a healthy, sustainable population (note than no plan for any fisheries specifically targeting Dungeness Chinook currently exists).

Current fish harvest management potentially affecting Dungeness Chinook may be viewed in three categories: 1) within the Dungeness River and Bay, 2) within the State of Washington, and 3) in Canadian and Alaskan waters. Each category is addressed below followed by a description of available information on harvest and escapement of Dungeness Chinook.

Fish Harvest Management within Dungeness River and Bay

Currently, there are treaty Indian subsistence and non-treaty recreational fisheries for coho salmon, steelhead and trout (but not bull trout) in the river and bay. There are also treaty and non-treaty commercial fisheries, for coho salmon, in the bay. There is no fishery for Chinook salmon in these terminal areas. The timing of the coho fisheries is managed to minimize incidental capture of Chinook adults during the fall. However, during 2003, the WDFW creel census documented 29 bull trout encounters by recreational anglers during the coho season (K. Schultz, WDFW, Pers. Comm. 2004). Coho recreational, subsistence and commercial fisheries (using selective gear, capable of releasing non-target species) may not be opened in the river until after October 16. In Dungeness Bay, coho recreational fisheries are not opened until October 1, and subsistence and commercial fisheries are not opened until after September 20 with the requirement to release Chinook salmon through October 10. Similarly, to reduce the chance of intercepting juvenile Chinook salmon emigrants, the recreational trout fishery is not opened below Gold Creek and is opened above Gold Creek after June 1 (minimum size of 14 inches and any Chinook captured must be released). Management of the river and bay fisheries is reviewed each year as part of a larger planning effort for all of Washington State.

Fish Harvest Management within the State of Washington

Chinook harvest management planning in Washington State, and adjacent areas of the Pacific Ocean, is complex, involving a multiplicity of Federal and State management agencies, Treaty tribes and other entities interacting through formalized processes in the early part of each year. The outcome of the annual planning effort is a fisheries plan that contains specific regulations that will be implemented to manage salmon harvests. Following is a brief description of the major processes involved in Chinook planning, followed by brief discussion of how Dungeness Chinook are affected.

Each year, planning for fisheries of Chinook (and coho) in Washington is implemented through a process known as PFMC / North of Falcon preseason planning. PFMC is the acronym for the Pacific Fisheries Marine Council, a federally mandated council that, among other things, proposes to the Secretary of Commerce management provisions for the ocean salmon fisheries within the United States' Exclusive Economic Zone that extends 200 miles off the coast of Washington. North of Falcon identifies the region from Cape Falcon (just south of the Columbia River, on the Oregon coast) to the U.S. / Canada border, within the PFMC's jurisdiction in which the relevant preseason planning occurs. Because ocean fisheries planning cannot effectively take place without the consideration of inside fisheries (i.e., for the Columbia River, Washington coast, Strait of Juan de Fuca and Puget Sound), preseason planning for the inside fisheries is incorporated in the process. Preseason planning takes place in March, but includes preparation beginning the previous December or earlier and involves follow-up in April, often extending into the summer and fall fishing season. The process occurs in a series of scheduled meetings and depends on results of the simulation modeling of alternative fisheries' scenarios, using the Fisheries Resource Assessment Model (FRAM).

Another process that affects annual Chinook fisheries planning in Washington is that of the Pacific Salmon Commission (PSC), and its Southern Panel, which oversee the implementation of the Pacific Salmon Treaty between the U.S. and Canada. A treaty annex specifies how the salmon resources are to be managed, protected, and any harvests shared between the countries (see also the following section). Each year, details of abundance forecasts, fisheries assessments, monitoring and fishing proposals are reviewed and decisions on fisheries implementation and management are made. Of primary importance to Washington State Chinook fisheries planning is the annual forecast of Canadian interceptions of U.S. Chinook that is authorized by the Pacific Salmon Treaty and predicted to occur. This forecast is an essential input for the FRAM modeling. The PSC process begins in January and intersects with the PFMC / North of Falcon process in March.

The fact that Chinook salmon of the Puget Sound Chinook ESU, of which Dungeness is a component, are listed as a threatened species under the Endangered Species Act, has brought another process into Chinook fisheries planning. To meet requirements for permitting of fisheries under section 4(d) of the Endangered Species Act, the Puget Sound Treaty Tribes and Washington Department of Fish and Wildlife (WDFW) have prepared a Puget Sound Chinook harvest management plan that will serve as the basis for review and implementation of the 4(d) permitting by NOAA Fisheries Service. The latest version of the harvest management plan (Puget Sound Indian Tribes and WDFW 2004), applicable to years 2004 through 2009, has just been completed. The plan includes specific provisions for protecting individual Chinook stocks (including Dungeness) when they fall within defined critical and recovering levels. The provisions of this Chinook harvest management plan are used as a management guideline during the PMFC / North of Falcon fisheries planning process.

An understanding of how harvest management is applied to Dungeness Chinook each year may be best described by stepping through the annual fisheries planning process:

1) A preliminary forecast of the expected return to Dungeness bay, under average prior fisheries interceptions, is made in January. This forecast, along with similar forecasts for other Chinook stocks, is plugged into the FRAM simulation model, to generate initial projections of fishery harvests and escapements. By this means a preliminary assessment is made to identify those stocks that may be at critical or recovering status and thus would require protection to limit fisheries impacts upon them. This information on

stocks' status helps inform the continuing FRAM simulation modeling process, the results of which provide the basis for management decisions.

The criteria for determining a stock's status vary depending on the specific stock. With respect to Dungeness Chinook, if the forecasted escapement is less than 500 fish, the stock is deemed to be at critical status; if it is between 500 and 925 fish, it is deemed to be at recovering status. If the Dungeness Chinook escapement is projected to be at above 925 fish, no special protective provisions are expected, though efforts would be made to manage for the escapement goal, currently set at 925 fish.

2) If a stock is at critical or recovering status, defined limits to harvest exploitation rates (again varying depending upon the stock) are implemented in evaluating fisheries alternatives. In recent years, Dungeness Chinook have been at critical status. The protective limits for Dungeness Chinook are as follows: a) if the forecast escapement places the stock at recovering status (between 500 and 925), subsequent planning for southern U.S. fisheries (using the FRAM model) is limited to a Dungeness Chinook harvest exploitation rate not to exceed 10%; b) if the forecast escapement places the stock at critical status (less than 500), subsequent southern U.S. fisheries planning is limited by a Dungeness Chinook exploitation rate ceiling of 6%, and may be further limited based on additional fisheries modeling criteria (Puget Sound Treaty Tribes and WDFW 2003).

3) As the PFMC / North of Falcon fisheries planning proceeds, information is updated, and FRAM simulations are generated, looking for the appropriate fishing levels and balances to protect Chinook stocks based on their status. This process involves considering management controls such as the timing and locations of the various fisheries from the ocean to the terminal areas. The FRAM model accumulates the exploitation rates for each stock to check against the rate limits defined by the stock status.

4) Once the FRAM model runs have been completed and alternative fisheries regimes have been reviewed, a decision is made by the PFMC on ocean fisheries and the Washington State co-managers (WDFW and the tribes) agree on an annual plan for the inside fisheries (e.g., Strait of Juan de Fuca and Puget Sound). This fisheries plan includes the specific times, locations and other provisions (e.g., Chinook release requirement, size limit) of all the inside fisheries to occur that year.

5) Fishing regulations prohibit the harvesting of bull trout on the Olympic Peninsula (U.S. Fish & Wildlife, 2004). Since 1994 most recreational fisheries for bull trout in fresh and marine waters in the Coastal-Puget Sound Distinct Population Segment are closed.

As described previously, the Dungeness freshwater and bay fisheries are designed to avoid capture of Chinook and thus have little to no impact on Dungeness Chinook (but even the occasional non-landed mortalities are accounted as part of the southern U.S. fisheries). In addition, the Dungeness freshwater and bay fisheries avoid the capture of summer chum and bull trout. The level of limited impacts from southern U.S. fisheries on Dungeness Chinook depends on the stock status and the results of fisheries planning for the year. Currently, the southern U.S. (i.e., south of the Canadian border) incidental harvest of Dungeness Chinook that does occur is due primarily to marine recreational fisheries and to a lesser degree, U.S. troll, net and subsistence fisheries. Harvests and escapements of Dungeness Chinook are described below in a separate section.

<u>Harvest Management within Alaska and Canada (under the Pacific Salmon Treaty)</u>

As mentioned previously, the Pacific Salmon Treaty (PST) adds another layer to the management of Chinook harvest. The PST applies to chum but not bull trout. Harvest management under jurisdiction of the PST is considered here because Canadian fisheries, as well as Alaskan fisheries, currently have the greatest fishery-related impact on Dungeness Chinook salmon.

The salmon life history includes migration through waters outside the salmon's native country, where the salmon are susceptible to harvest by the other country. The PST addresses the concerns of both the U.S. and Canada about the other country's harvest effect upon its home-origin fish and about each country's right to harvest fish in its waters irrespective of the fish origin. These concerns, pertaining to all species of salmon, exist between the southern U.S. and Canada, and between Alaska and Canada. The treaty includes specific harvest management provisions to address these concerns. Coincidentally, the treaty provisions affecting Alaskan fisheries bear not only upon Alaskan interceptions of Canadian - origin fish but also upon Alaskan interceptions of fish originating from the southern U.S.

The PST was signed in 1985. Annexes to the treaty contain the specific salmon management provisions. The most recent update to the annexes was agreed to in 1999 and is applicable through 2008. Annex IV, Chapter 3 applies to southern Chinook salmon, originating from central / southern British Columbia and the southern U.S. (PSC 2000). Under the PST, Chinook-intercepting fisheries are divided into two types: Aggregate Abundance Based Management (AABM) fisheries and Individual Stock Based Management (ISBM) fisheries. Specific rules apply to each category separately. The AABM fisheries are managed by planning and accounting for the aggregated catch of stocks within each fishery's area and time frame. Management focus is on the specific fishery not the stocks. For each fishery, the annual target catch level is selected using a harvest rate index (also called abundance index and expressed as a portion of the catch for the 1979-1982 base period) that is determined by the annual Chinook pre-season abundance forecast or in-season abundance estimate, whichever is applicable. Annual fishery regulations (including fishing area/time openings and fish size limits) are prepared and implemented to achieve the target catch level of each AABM fishery. A computer model is used to calculate catch levels and help determine the annual fishery regulations. There are three AABM fisheries: Southeast Alaska (sport, net and troll), Northern British Columbia troll / Queen Charlotte Islands sport, and West Coast of Vancouver Island (troll and outside sport).

The ISBM fisheries address the harvest and conservation requirements of individual stocks or groups of stocks, the intent being to achieve maximum sustained yield or another agreed biologically based objective. The pool of ISBM fisheries includes the various British Columbia "inside fisheries" and southern U.S. fisheries (north of Cape Falcon). Indicator Chinook salmon stocks, representative of each ISBM fishery, are monitored through a coast-wide coded wire-tagging program. The Strait of Juan de Fuca marine net, troll and sport, and freshwater sport and net are in combination, a designated ISBM fishery with Hoko River Chinook as its indicator stock.

A defined index, computed preseason based on forecasted abundance and fishing plans (and evaluated post season), was to be used to manage the individual ISBM fisheries, the planning and evaluation being based in part on the indicator stocks; however, use of this approach requires first that the escapement dependent objectives be reviewed and agreed upon by the two countries. Since no agreement on ISBM stock escapement objectives currently exists, the default management approach is to reduce the total mortality rate, relative to a 1979-1982 base period, by 36.5 percent and 40 percent respectively for the Canada and the U.S. fisheries.

Again computer simulation modeling is used to help determine the annual fisheries controls necessary to meet the mortality rate criteria. The ISBM fishery management controls currently do not present limits upon the management of southern U.S. Chinook fisheries. Interceptions by Canada and Alaska of southern U.S. origin Chinook are estimated, as part of the AABM/ISBM fisheries planning effort, and are made available to the PFMC / North of Falcon planning process to assist with preparation of the annual fisheries plan for Washington State (as noted above).

Because Puget Sound Chinook were listed as threatened under the Endangered Species Act, the U.S. federal government was required under section 7 of the Act to conduct consultations that considered the impacts of Chinook harvest management under the PST. The consultations were completed and the U.S. Department of State (USDof S) and National Marine Fisheries Service (NMFS) issued a Biological Opinion in November 1999 (USDof S and NMFS 1999). The analysis, within the Biological Opinion, included estimates of Recovery

Exploitation Rates (RERs) for some northern Puget Sound Chinook stocks (that had sufficient coded wire tag information to allow such estimates). These RERs were target exploitation rates considered low enough to allow recovery of the stocks to viable population levels.

An assessment was made that suggested the limitations on exploitation rates under the PST were insufficient to meet the RERs for several Puget Sound Chinook stocks (and by implication other Chinook stocks for which inadequate information existed to develop RERs). However, it was decided that rejection of the treaty provisions (that is, the 1999 treaty updates) by the U.S. was unlikely to result in a better or more restrictive management regime in the near future. Also, the U.S. government noted that mechanisms existed within the treaty provisions to address deficiencies that become apparent with respect to individual stocks (though conditions must be met for these mechanisms to be implemented) and expressed concern about the loss of other benefits associated with the treaty. In conclusion, the U.S. government decided that management actions under the PST were not likely to jeopardize continued existence of Puget Sound Chinook.

The co-managers have expressed strong reservations about the USDof S / NMFS Chinook decision, noting that by accepting the potential impacts on Puget Sound Chinook of Canada and Alaska under provisions of the PST, the U.S. government has put the burden of fisheries restrictions to protect Chinook on Washington State and may have increased the risk of under escapement for some depressed Puget Sound Chinook stocks. This concern is exacerbated by the already existing disproportionately high interception of Puget Sound Chinook salmon by Canadian fisheries and relatively high interceptions by Alaska fisheries, when compared with southern U.S. fisheries (see, for example, the following section for description of fisheries effects on Dungeness Chinook). The co-managers continue to work for improved protection of at risk Chinook stocks under the PST. However, opportunity for change in the PST management process is not likely until the annex to the treaty is renewed effective in 2009.

<u>Harvest and Escapement of Dungeness Chinook</u>

There is not yet a sufficient record of coded wire tag results to provide an adequate direct estimate of fishery-related mortality distribution for Dungeness Chinook. However, tagging information on Elwha Chinook provides an estimate of the average distribution of fishery-related mortality for management years 1996 to 2000 (NMFS 2003) as follows.

Alaska	British Columbia	Washington troll	Puget Sound net	Washington recreational
10.0 %	69.2 %	4.7 %	3.8 %	12.3 %

Assuming the Dungeness Chinook's fishery-related mortalities are distributed similarly to those of the close by Elwha Chinook, it is apparent that the vast majority of fishery interceptions occur in Canada. Alaska also harvests a relatively large proportion compared to Washington fisheries. Most of the Washington fishery mortality is from the recreational fisheries, the majority of which occurs in marine waters.

The following table describes Dungeness River Chinook spawning escapement estimates for the years 1986 through 2002 (Puget Sound Tribes & WDFW 2004).

Return Year	Escapement
1986	238
1987	100
1988	335
1989	88
1990	310
1991	163
1992	153
1993	43
1994	65
1995	163
1996	183
1997	50
1998	110
1999	75
2000	218
2001	453
2002	633
1998-2002 Mean: 298	

As shown, escapement has been below the critical threshold of 500 spawners in all years but 2002. The mean escapement of the last five years is 298. Based on the final FRAM model run of Washington fisheries at the conclusion of the 2003 PFMC / North of Falcon fisheries planning effort, the anticipated exploitation rates and escapement for Dungeness Chinook for 2003 (NMFS 2003) were as follows.

River and Bay Exploitation Rate	Southern U.S. Preterminal Exploitation Rate	Southern U.S. Exploitation Rate	Total Exploitation Rate (Includes Canada and Alaska)	Projected Natural Spawning Escapement
0 %	5 %	5 %	23 %	352

The exploitation rates are calculated as the expected number of fishery-related mortalities divided by the expected total run size including the escapement. The table shows that the previously noted relatively high levels of Canadian and Alaskan fisheries impacts were expected to continue in 2003. The projected distribution of impacts for the year 2004 are likely to be similar to these 2003 preseason estimates.

The above fisheries mortality projections are based on estimates from Elwha Chinook tagging. A Dungeness Chinook program has begun and the co-managers will be seeking to incorporate this program's tagging results that would be directly applicable to, and therefore more representative of Dungeness Chinook, when the information becomes available.

Estimated exploitation rates for recent years are substantially lower than the rates of the 1980s. The following table shows the estimated average total exploitation rates of Strait of Juan de Fuca Chinook for the periods 1983-1987, 1998-2000 and 2001-2003 (Puget Sound Treaty Tribes and WDFW 2004). Percent differences (declines) in exploitation rates between period of 1983-1987 and the latter two periods are also shown. The table numbers have been generated using the FRAM model.

1983-1987 Average	1998-2000 Average	% Decline	2001-2003 Average	% Decline
76 %	38 %	51 %	18 %	76 %

Exploitation rate declines of similar magnitude have occurred in other regions of Puget Sound as well. These declines indicate the substantial curtailment of fisheries catches now being effected by harvest management conservation efforts.

In summary, the co-managers (WDFW and tribes) have worked through complicated management processes, addressing all Washington fisheries as well as those of Canada and Alaska, to substantially limit harvest effects upon depressed Chinook stocks including the Dungeness. There are currently no fisheries specifically directed at Dungeness Chinook and incidental impacts from southern U.S. fisheries are kept at a low level. The co-managers will attempt to incorporate management provisions that better protect at risk Washington Chinook stocks from the impacts of Canadian and Alaskan fisheries in the future.

Attachments to Question A:

- Restoring the Dungeness (Newberry/Jamestown S'Klallam Tribe, 2003)
- EDT report – Key Points in Understanding the EDT Action Analysis for Dungeness Chinook
- EDT River Reach Analysis
- Review of the Critical Areas Ordinance (Hals, 2004)

References

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Ecosystem Diagnostic Treatment (EDT)

In 2003, abundance and productivity targets for threatened Chinook salmon populations in Puget Sound were developed by Federal, State and tribal fisheries biologists and endorsed by DRMT. Planning targets are based on the four viable salmon population characteristics: abundance, productivity, diversity and spatial structure. This EDT analysis provided "recovery goals" utilizing Properly Functioning Conditions Plus (PFC-Plus), as well as an evaluation of the ability of individual actions and suites of actions to move the population towards the recovery goals over time.

As a tool used to diagnose the relative importance of environmental factors affecting fish population performance, the reach analysis helps to identify the most important factors that contribute to a loss of performance. When the factors are appropriately moderated or corrected, population performance improves.

Reach analysis helps to make the model more transparent. Each reach is analyzed to determine the relative effects on fish population performance when environmental attributes change due to watershed development. Reach analysis was performed for lower and upper reaches on the Dungeness. The Reach Analysis Overview is included as a part of this document.

In this case, PFC-Plus assumes PFC in the freshwater habitat (NMFS, 1996), and pristine conditions in the estuary. Therefore, the "recovery goals" established through the EDT model likely exceed the productivity and abundance actually possible. However, the PFC-Plus standard was chosen by the planning participants to ensure that the estuary was incorporated into the goals. At the time that the goals were set, there were no guidelines established for PFC in the estuary.

Results of the EDT model run have largely affirmed DRMT's current strategy and indicates that our action plan will bring us close to achieving the viable Salmon Population planning targets. Some assumptions in the model – most notably the pristine condition of the estuary – make it almost impossible to fully achieve the targets.

In the fall of 2004, the DRMT reviewed the EDT Analysis with technical staff who contributed to the model development. The list of priority habitat restoration projects resulting from the model were compared to the DRMT list of prioritized projects. The River Restoration Workgroup, taking EDT results into consideration, used its professional expertise to review the prioritized list of habitat protection and restoration projects.

As noted in the 2004 draft, EDT modelling shows that our action plan brings us close to the VSP planning targets. The assumptions used to formulate the goals (ie, pristine conditions in the estuary) make it almost impossible to achieve the targets in modelling runs. Given this uncertainty, and the mechanisms available in the adaptive management process, we expect to focus on implementation rather than additional modeling.

Key Points in Understanding EDT Action Analysis for Dungeness Chinook

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June 26, 2004

This summary highlights key points for understanding the results of modeling restoration/protection actions on Dungeness Chinook salmon. I focus on results for actions over a 100 year time horizon.

Action effectiveness values are provided in a separate Excel file.

Action ranks and groupings into biological benefit categories are provided in separate Excel files. Benefit categories range from A to E, with the A category giving the greatest benefits to Chinook population performance.

<u>No. 1A:</u> Estuarine delta restoration - 100 yr

- Rank – 10 of 31
- Biological significance category – B
- Action removes Rivers End Dike and facilitates reopening of a historic river mouth and associated distributary channel.
- Although ranked lower for productivity and life history diversity, this <u>action ranked third overall for restoring the abundance of spawners</u>. This suggests that the size of the Dungeness riverine estuary is acting as a sort of bottleneck to abundance in the watershed.
- Key assumptions used in analysis:
    - Action significantly increases the size of the riverine estuary available to be used by juvenile salmon and increases the amount of key habitat for juvenile rearing and acclimation;
    - Action results in a moderate increase in juvenile productivity within the riverine estuary.

<u>No. 1B:</u> Schoolhouse bridge modification - 100 yr

- Rank – 17 out of 31
- Biological significance category – C
- Action lengthens Schoolhouse Bridge to widen channel between the floodplain upstream and riverine estuary downstream.
- This action ranked in the middle or near the bottom for the three population performance measures compared to the other actions.
- Key assumptions used in analysis:
    - Action primarily has the effect of increasing the length of the estuary by adding channel length to the riverine forested section of the Dungeness river mouth estuary (this is the most upstream zone of the river mouth estuary that does not get influenced by salinity);

- The effect of adding riverine forested conditions to the river mouth estuary is to increase the amount of habitat available to juvenile rearing, although the overall size of the estuary is not changed significantly, this has the added effect of improving the quality of the estuary for rearing and acclimation.

No. 2: Lower river floodplain restoration - 100 yr

- Rank – 2 out of 31
- Biological significance category – A
- Action restores floodplain function lost due to Corps Dike and Beebe Dike.

- Although this action ranked second overall, it ranked first for increasing the average abundance of spawners returning to the river.
- Key assumptions used in analysis:
  - Action dramatically improves the quality and quantity of salmonid habitat in the lower river downstream of Hurd Creek;
  - Over a 100 year time horizon, it would fully restore pools, backwater pools, and off-channel habitat in the lower river;
  - Over a 100 year time horizon, it would dramatically reduce the effects of peak flow runoff in this section of river by increasing the amount of storage in the floodplain corridor;
  - Over a 100 year time horizon, it would dramatically reduce the effects of low flow discharge in this section of river (even with no change in irrigation withdrawal patterns) by providing more and deeper pools, connectivity between pools, and groundwater recharge from the floodplain corridor.

No. 2A: Lower river floodplain restoration (Corps Dike setback) – 100 yr

- Rank – 3 out of 31
- Biological significance category – A
- Action restores floodplain function lost due to Corps Dike.
- This action ranked second overall for increasing the average abundance of spawners returning to the river.
- Results for this action indicate that most of the benefit seen for Action 2 (which includes setbacks of both the Corps and Beebe dikes) comes from the setback of the Corps Dike. This occurs because a much greater amount of the benefit of setback is occurring downstream of Matriotti Creek, where there would be a very significant recovery of floodplain recovery from setback of the Corps Dike. This section of river is also longer than the reach between Matriotti and Hurd Creeks, where the primary benefit of setback of the Beebe Dike would occur.
- Key assumptions used in analysis:
  - Without setback of Beebe Dike, this action results in an overall effect to the lower reach (between Matriotti Creek and Schoolhouse Bridge) nearly has great has predicted for Action 2 (with Beebe included);
  - Without setback of Beebe Dike, this action results in an overall effect to the upper reach (between Hurd Creek and Matriotti Creek) in the affected river section approximately half that predicted for Action 2 (with Beebe included);

- Action dramatically improves the quality and quantity of salmonid habitat in the lower river downstream of Hurd Creek;
- Over a 100 year time horizon, it would fully restore pools, backwater pools, and off-channel habitat in the lower reach (below Matriotti Cr);
- Over a 100 year time horizon, it would dramatically reduce the effects of peak flow runoff in this section of river by increasing the amount of storage in the floodplain corridor – although the effect is reduced from that predicted for Action 2;
- Over a 100 year time horizon, it would dramatically reduce the effects of low flow discharge in this section of river (even with no change in irrigation withdrawal patterns) by providing more and deeper pools, connectivity between pools, and groundwater recharge from the floodplain corridor – although the effect is reduced from that predicted for Action 2.

No. 3: Setback Ward Road - 100 yr

- Rank – 23 out of 31
- Biological significance category – D
- Action setbacks Ward Road and constructs engineered log jams.
- This action ranked fairly consistently in the lower half of the actions for all three population performance measures.
- Key assumptions used in analysis:
  - Action is limited in scope and has a relatively small effect on the river downstream of the action; effects of the action could be expected to be significant, however, at or immediately adjacent to the activity site.

No. 4: Restore riparian corridor in Matriotti Cr - 100 yr

- Rank – 27 out of 31
- Biological significance category – D
- Action restore riparian vegetation throughout riparian corridor of Matriotti Creek.
- This action ranked consistently in the lower quartile of the actions for all three population performance measures.
- Key assumptions used in analysis:
  - Action is very limited in scope with respect to the spawning and rearing areas utilized by Chinook salmon in the Dungeness watershed; only one reach (Matriotti-1) is expected to be noticeably changed of all reaches used in the system by Chinook – relatively few Chinook use this reach compared to others.
  - Action would within Matriotti Creek primarily upstream of the reach Matriotti-1 and would have a relatively small effect on the conditions affecting Chinook within Matriotti-1.
- This action could be expected to have a greater benefit on other salmonids, i.e., those within Matriotti Creek, compared to its overall effect on Dungeness Chinook.

No. 5: Riparian corridor restoration/protection to Hwy 101 - 100 yr

- Rank – 9 out of 31
- Biological significance category – B
- Action restores and protects riparian vegetation between Hurd Creek and Highway 101.

- This action ranks in the middle of the group of actions that comprise Benefit Category B.
- This action has both a restoration and protection component, which helps its overall standing among all actions.
- Key assumptions used in analysis:
  - Action has small effects on flow characteristics in the affected reaches.
  - The restoration component of the action is greater than the protection component (in light of where and the extent of effect of expected buildout);
  - Actions has moderate to high recovery potential for affecting riparian function, wood loading, and pool quality and quantity in the reach between Highway 101 and Hurd Creek.

No. 6: Large wood placement to Hwy 101 - 100 yr

- Rank – 15 out of 31
- Biological significance category – C
- Action strategically places LWD (engineered log jams) between Hurd Creek and Highway 101.
- This action ranks consistently near the middle for all three population performance measures among all actions.
- Key assumptions used in analysis:
  - Action significantly increases wood load in the reach between Highway 101 and Hurd Creek, which has significant beneficial effects on pool quality and quantity, side channel development and depth of bed scour;
  - ELJs would remain intact long enough (or being maintained) while they aid in recovering natural wood capture capabilities of the river in this section.

No. 7: Railroad bridge constriction abatement - 100 yr

- Rank – 25 out of 31
- Biological significance category – D
- Action alters present bridge and dike configuration at site of railroad bridge.
- This action ranks consistently in the third or fourth quartile for all three population performance measures among all actions.
- Key assumptions used in analysis:
  - Action is limited in scope with respect to its overall effect on the reach where the activity would occur and would have relatively little carry-through effect to reaches downstream;
  - The greatest benefit to the attributes affecting salmon performance in the affected reach would be to bed scour, still the overall effect within the reach would be relatively small.

No. 8: Riparian zone protection to Powerlines - 100 yr

- Rank – 28 out of 31
- Biological significance category – E
- Action adds new protection capability by purchasing land within the floodplain corridor between Highway 101 and Powerlines.

- This action ranks consistently in the fourth quartile for all three population performance measures among all actions.
- This action works through protecting against increased effects on salmon habitat expected to occur with full buildout in the watershed.
- Key assumptions used in analysis:
  - In the reach where the actions operates directly (between Highway 101 and Canyon – though it only operates on the portion of the reach up to the Powerlines), it has a fairly significant effect on limiting the effect of buildout; this beneficial effect is relatively minor, however, to improving population performance when compared to not implementing this action.

No. 9: Hwy 101 bridge modification - 100 yr

- Rank – 19 out of 31
- Biological significance category – D
- Action lengthens Highway 101 bridge to reduce constriction of floodplain at this site.
- This action ranks consistently in the third or fourth quartile for all three population performance measures among all actions.
- Key assumptions used in analysis:
  - Action would have a significant effect on habitat at or relatively close to the activity site, though its effect overall on the entire reach remains relatively small when compared to how some other actions operate;
  - This action could be expected to improve habitat conditions affected by flow characteristics, pool spacing and quality, wood loading, bed scour, and riparian function.

No. 10: Dungeness Meadows floodplain restoration - 100 yr

- Rank – 11 out of 31
- Biological significance category – B
- Action remove lower end of Dungeness Meadows Dike.
- Although this action produced benefits near the bottom of the second quartile overall, it ranks fourth in affecting life history diversity.
- Key assumptions used in analysis:
  - Action has moderate effects on a variety of attributes within the directly affected reach (Highway 101 to Canyon Creek) and has lesser, indirect effects on conditions downstream of this reach.

No. 11A: Large wood placement to Dungeness Meadows Dike - 100 yr

- Rank – 14 out of 31
- Biological significance category – B
- Action Strategically places LWD (engineered log jams) between Highway 101 and the lower end of the Dungeness Meadows Dike.
- This action ranks in the second quartile for all three population performance measures among all actions; it is lowest ranked action in Benefit Category B.

- This action was defined at the June 14 Workshop, where it was decided that Action 11 should be revised to include wood placement downstream of Dungeness Meadows Dike and not alongside the dike.
- Key assumptions used in analysis:
  - Action significantly increases wood load in the affected portion of the reach, though overall, it has only a moderate effect on increasing loading to the reach; this has moderate effects on pool quality and quantity, side channel development and depth of bed scour;
  - ELJs would remain intact long enough (or being maintained) while they aid in recovering natural wood capture capabilities of the river in this section.

No. 12: Eliminate Independent Outtake - 100 yr

- Rank – 29 out of 31
- Biological significance category – E
- Action eliminates the Independent Outtake and makes changes at other nearby irrigation facilities.
- This action is ranked near the bottom among all actions for all three population performance measures.
- Key assumptions used in analysis:
  - Action eliminates an existing effect on downstream migrating juvenile Chinook that is currently relatively small and limited in scope.

No. 13: Riparian zone restore/protect to Canyon Cr - 100 yr

- Rank – 8 out of 31
- Biological significance category – B
- Action restores and protects riparian vegetation between Powerlines and Canyon Creek.
- This action ranks in the middle of the group of actions that comprise Benefit Category B.
- This action has both a restoration and protection component, which helps its overall standing among all actions.
- Key assumptions used in analysis:
  - Action has small effects on flow characteristics in the affected reaches.
  - The restoration component of the action is greater than the protection component (in light of where and the extent of effect of expected buildout);
  - Actions has moderate to high recovery potential for affecting riparian function, wood loading, and pool quality and quantity in the reach between Highway 101 and Hurd Creek.

No. 14: Kincade Is floodplain restoration - 100 yr

- Rank – 4 out of 31
- Biological significance category – B
- Action removes bridge at Kincade Island, a dike in the same vicinity, and revegetates riparian zone.
- This action is the top ranked one among all actions that fell within Benefit Category B; it is ranked in the first quartile for all three population performance measures.
- Key assumptions used in analysis:

- Action has moderate to high effects on physical habitat conditions within the directly affected reach (Highway 101 to Canyon Creek) but has only very small, indirect effects on conditions downstream of this reach;
- Action has relatively small effects on flow characteristics within the affected reach.

No. 15A: Removal of upper Haller Dike - 100 yr

- Rank – 6 out of 31
- Biological significance category – B
- Action removes the upper Haller Dike and revegetates the riparian corridor.

- This action is near the top of all actions that fell within Benefit Category B; it is ranked in the first or second quartile for all three population performance measures.
- Key assumptions used in analysis:
  - Action has moderate to high effects on physical habitat conditions within the directly affected reach (Highway 101 to Canyon Creek) and relatively small, indirect effects on conditions downstream of this reach;
  - Action has moderate effects on flow characteristics within the affected reach.

No. 15B: Removal of lower Haller Dike - 100 yr

- Rank – 11 out of 31
- Biological significance category – B
- Action removes the lower Haller Dike and revegetates the riparian corridor.
- This action is near the bottom of all actions that fell within Benefit Category B; it is ranked in the first or second quartile for all three population performance measures.
- Key assumptions used in analysis:
  - Action has moderate to high effects on physical habitat conditions within the directly affected reach (Highway 101 to Canyon Creek) and relatively small, indirect effects on conditions downstream of this reach;
- Action has moderate effects on flow characteristics within the affected reach.

No. 16: Removal of Robinson Dike - 100 yr

- Rank – 7 out of 31
- Biological significance category – B
- Action removes Robinson Dike and bank hardening material on scattered parcels in vicinity.
- This action is near the middle of all actions that fell within Benefit Category B; it is ranked in the first or second quartile for all three population performance measures.
- Key assumptions used in analysis:
  - Action has moderate to high effects on physical habitat conditions within the directly affected reach (Highway 101 to Canyon Creek) and very small, indirect effects on conditions downstream of this reach;
  - Action has small effects on flow characteristics within the affected reach.

No. 17: Relocation of hatchery infrastructure - 100 yr

- Rank – 16 out of 31
- Biological significance category – C
- Action relocates Dungeness hatchery infrastructure away from floodplain.
- Action ranks near the middle among all actions for each of the three population performance measures.
- Key assumptions used in analysis:
  - Action has moderate effects on physical habitat conditions within the directly affected reach (Highway 101 to Canyon Creek) and small, indirect effects on conditions downstream of this reach;
  - Action has small effects on flow characteristics within the affected reach.

No. 18: Large wood placement to Canyon Cr - 100 yr

- Rank – 20 out of 31
- Biological significance category – D
- Action strategically places LWD (engineered log jams) between Powerlines and Canyon Creek.
- Action ranks near the middle to bottom among all actions for each of the three population performance measures.
- Key assumptions used in analysis:
  - Action increases wood load in the affected portion of the reach, and overall, has a moderate to high rate of recovery on wood loading in the reach;
  - ELJs would remain intact long enough (or being maintained) while they aid in recovering natural wood capture capabilities of the river in this section.

No. 19: Modify Outtakes and screens to Canyon Cr - 100 yr

- Rank – 29 out of 31
- Biological significance category – E
- Action changes outtake facilities and associated screens within the stream section between Powerlines and Canyon Creek.
- This action is ranked near the bottom among all actions for all three population performance measures.
- Key assumptions used in analysis:
  - Action eliminates an existing effect on downstream migrating juvenile Chinook that is currently relatively small and limited in scope.

No. 21A: Riparian forest restoration to Hurd Cr - 100 yr

- Rank – 26 out of 31
- Biological significance category – D
- Action restores riparian forest on various parcels within the reach not covered by other actions, between Schoolhouse Bridge and Hurd Cr.
- This action was redefined from the action formerly Action 21, which would have restored riparian forest to all parcels where such action could occur between the Schoolhouse Bridge and Canyon Creek; this redefinition was meant to show the effects of such an action within each river section.

- Action produced benefits across a wide range of ranks among the three population performance measures, ranging from the second quartile for life history diversity to near the bottom of the last quartile for productivity.
- Key assumptions used in analysis:
  - Action has small to moderate effects on physical attributes within the most downstream reach above the river mouth estuary; <u>effectiveness values in this reach were reduced from those applied prior to the June 14 Workshop</u> based on discussions in the meeting and upon further review of parcels where such action could potentially occur.

<u>No. 21B:</u> Riparian forest restoration to Hwy 101- 100 yr

- Rank – 31 out of 31
- Biological significance category – E
- Action restores riparian vegetation within the reach not covered by other actions, between Hurd Cr and Hwy 101.
- This action was redefined from the action formerly Action 21, which would have restored riparian forest to all parcels where such action could occur between the Schoolhouse Bridge and Canyon Creek; this redefinition was meant to show the effects of such an action within each river section.
- Action ranked last because no parcels within the subject reach appeared to be available for such activity.
- Key assumptions used in analysis:
  - Action no effects on environmental conditions.

<u>No. 21C:</u> Riparian forest restoration to Powerlines - 100 yr

- Rank – 20 out of 31
- Biological significance category – D
- Action restores riparian vegetation within the reach not covered by other actions, between Hwy 101 and the Powerlines.
- This action was redefined from the action formerly Action 21, which would have restored riparian forest to all parcels where such action could occur between the Schoolhouse Bridge and Canyon Creek; this redefinition was meant to show the effects of such an action within each river section.
- Action produced benefits across two quartiles (third and fourth) of ranks among the three population performance measures.
- Key assumptions used in analysis:
  - Action has small to moderate effects on physical attributes within the most downstream reach above the river mouth estuary; <u>effectiveness values in this reach were reduced from those applied prior to the June 14 Workshop</u> based on discussions in the meeting and upon further review of parcels where such action could potentially occur.

<u>No. 21D:</u> Riparian forest restoration to Canyon Cr - 100 yr

- Rank – 20 out of 31
- Biological significance category – D

- Action restores riparian vegetation within the reach not covered by other actions, between the Powerlines and Canyon Cr.
- This action was redefined from the action formerly Action 21, which would have restored riparian forest to all parcels where such action could occur between the Schoolhouse Bridge and Canyon Creek; this redefinition was meant to show the effects of such an action within each river section.
- Action produced benefits across two quartiles (third and fourth) of ranks among the three population performance measures.
- Key assumptions used in analysis:
  - Action has small to moderate effects on physical attributes within the most downstream reach above the river mouth estuary; <u>effectiveness values in this reach were reduced from those applied prior to the June 14 Workshop</u> based on discussions in the meeting and upon further review of parcels where such action could potentially occur.

<u>No. 22:</u> Water Conservation Projects - 100 yr

- Rank – 1 out of 31
- Biological significance category – A
- Action conserves water flow, thereby increasing wetted usable area of channel.
- This action is <u>predicted to produce the highest increase in both productivity and life history diversity</u> among all actions.
- Key assumptions used in analysis:
  - Action affects entire river downstream of Agnew Diversion;
  - Action increases the quantity of habitat for life stages during summer and fall, which includes juvenile rearing, prespawner migration, and spawning;
  - Action increases likelihood that spawning will occur outside the main channel thalweg, decreasing chances of redds being scoured during fall and winter freshets; this assumption is the primary reason this action ranked so high;
  - Action increases likelihood of water flow along stream margins and in side channels; improving edge habitat in association with riparian corridor.
- Chinook population performance associated with this action dramatically increased over the preliminary results presented on June 14 because the earlier results did not include benefits to bed scour along stream margin and function of riparian corridor with increase in flow.
- Pattern of water saving across diversions formulated in discussion with Pat Crain and Shawn Hines.

<u>No. 23:</u> Upper Dungeness roads decommissioning - 100 yr

- Rank – 5 out of 31
- Biological significance category – B
- Action decommissions and stabilizes selected roads within the Dungeness watershed inside the Olympic National Forest.
- This action is <u>second ranked among all actions for life history diversity</u>; it is the second highest ranked action among all actions that fell into Benefit Category B.
- Key assumptions used in analysis:

- Action effects all reaches utilized by Chinook in the Dungeness watershed, except for reaches in the Gray Wolf drainage and the Matriotti Creek reach;
- Action is expected to have a high effect on sediment loading in the most upstream reaches used by Chinook in the watershed (excluding Gray Wolf), with effects diminishing in a downstream direction;
- Effects in the most downstream reach on attributes influenced by sediment loading are expected to be significant.

No. 25: Dungeness Bay water quality restoration - 100 yr

- ➢ Rank – 18 out of 31
- ➢ Biological significance category – C
- ➢ Action implements the Dungeness Bay Cleanup Plan.
- ➢ Although ranked lower for life history diversity, this action ranked near the middle among all actions for increasing productivity and abundance.
- ➢ Key assumptions used in analysis:
  - Action increases the quantity and quality of juvenile rearing habitat in Dungeness Bay, which function much like river mouth estuarine habitat for juvenile Chinook; improvements in quality and quantity of habitat are expected due to a predicted increase in eelgrass beds in the bay as nutrification is reduced;
  - No effects are expected on adult salmon habitat conditions.

No. 26: Graysmarsh/Gierin Creek restoration - 100 yr

- ➢ Rank – 23 out of 31
- ➢ Biological significance category – D
- ➢ Action restores 100 acres of salt marsh habitat and associated lower portion of Gierin Creek.
- ➢ Although ranked lower for life history diversity, this action ranked near the middle among all actions for increasing productivity and abundance.
- ➢ Key assumptions used in analysis:
  - Action increases the quantity and quality of juvenile rearing habitat in Graysmarsh, which functions much like river mouth estuarine habitat for juvenile Chinook because of its proximity to the Dungeness River mouth;
  - No effects are expected on adult salmon habitat conditions.

No. 27: Small estuary restoration - 100 yr

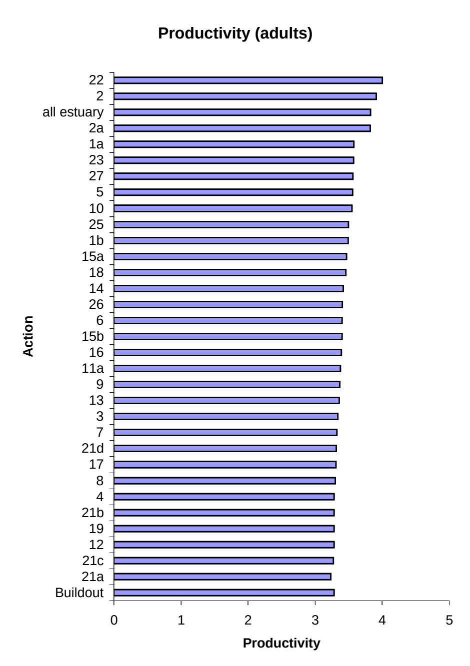
- ➢ Rank – 13 out of 31
- ➢ Biological significance category – B
- ➢ Action re-establishes tidal flow and upstream connectivity in small estuaries near the Dungeness River mouth, including Cooper, Meadowlark, and Casselary Creeks.
- ➢ Although ranked lower for productivity and life history diversity, this action ranked fourth overall for restoring the abundance of spawners. This suggests that the size of the Dungeness riverine estuary is acting as a sort of bottleneck to abundance in the watershed.
- ➢ Key assumptions used in analysis:

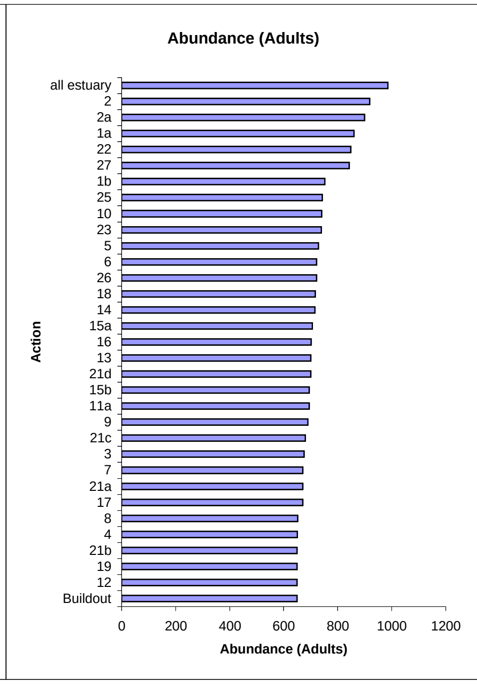
- Action significantly increases the size of the riverine estuary available to be used by juvenile salmon and increases the amount of key habitat for juvenile rearing and acclimation;

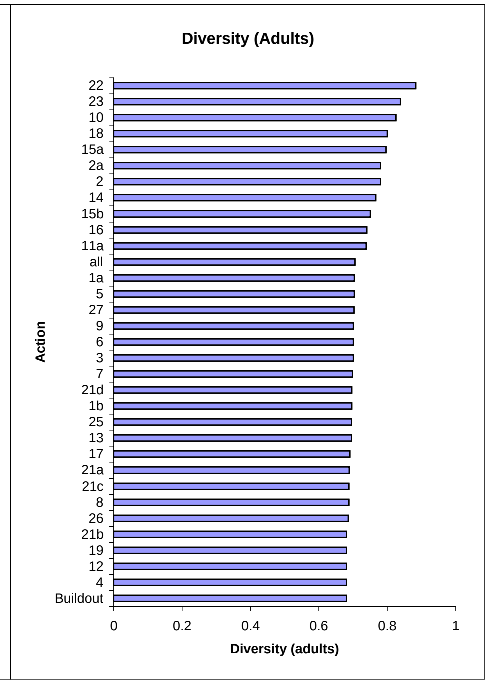
➢ Action results in a moderate increase in juvenile productivity within the riverine estuary.

6/24/04

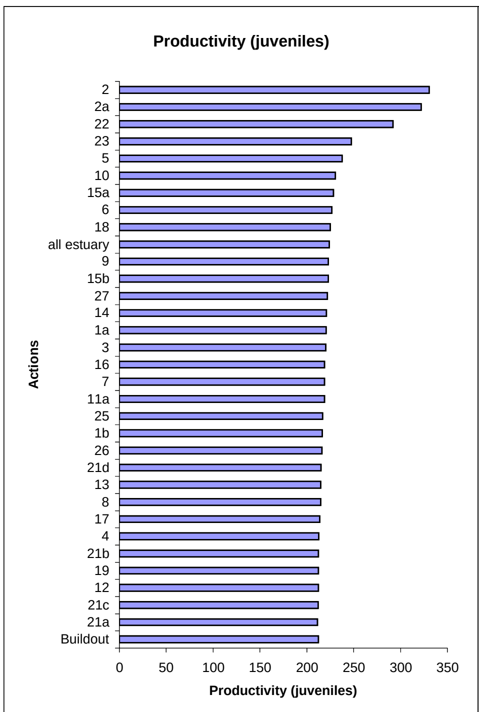
Dungeness adult Chinook - performance summary as productivity, average abundance, and life history diversity
Results for individual actions - 25 year time horizon

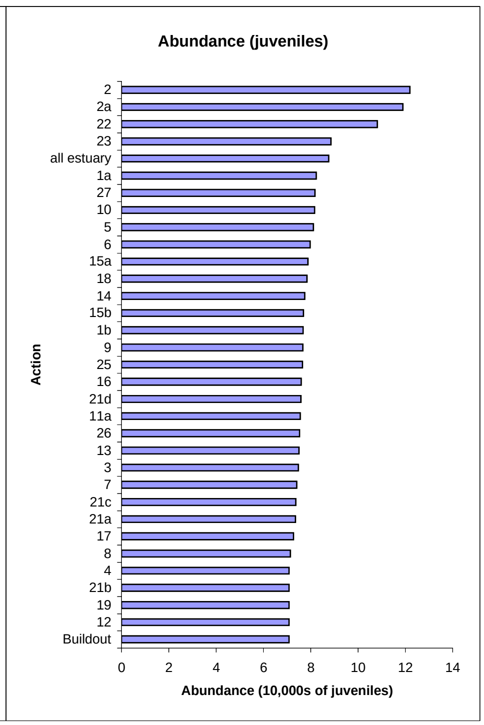






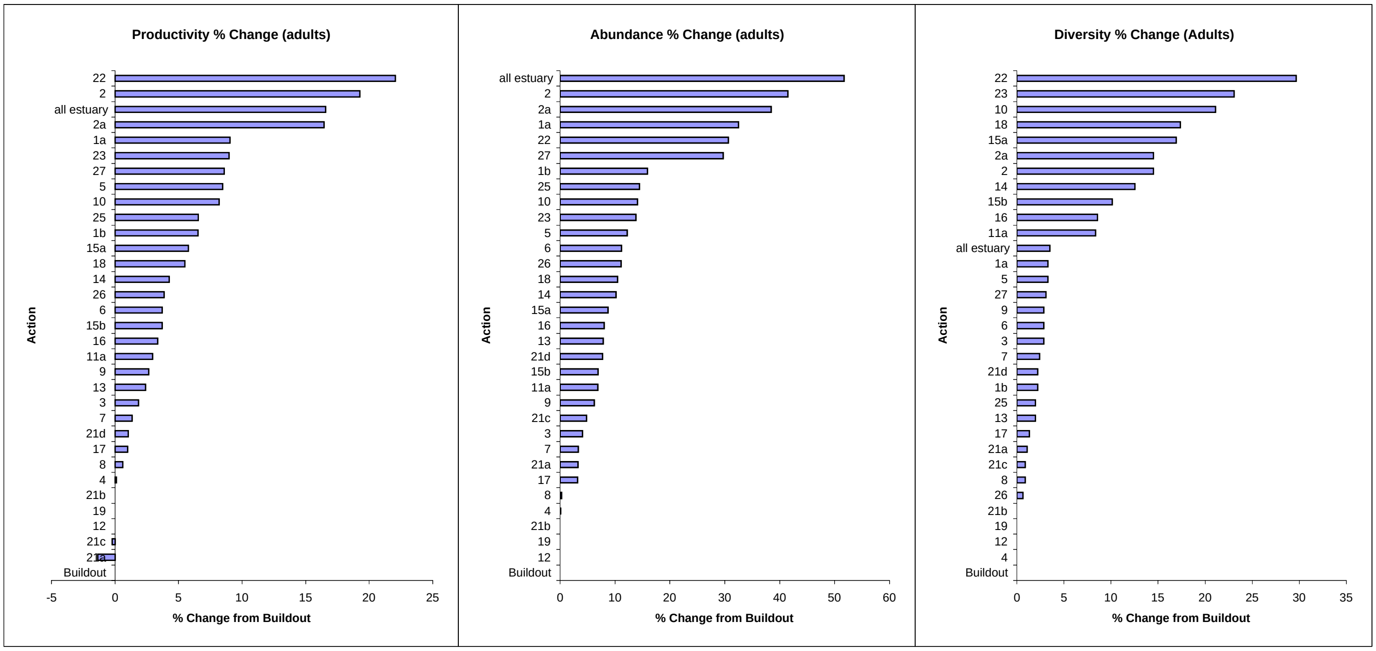
Dungeness juvenile Chinook - performance summary as juvenile productivity and average abundance
Results for individual actions - 25 year time horizon



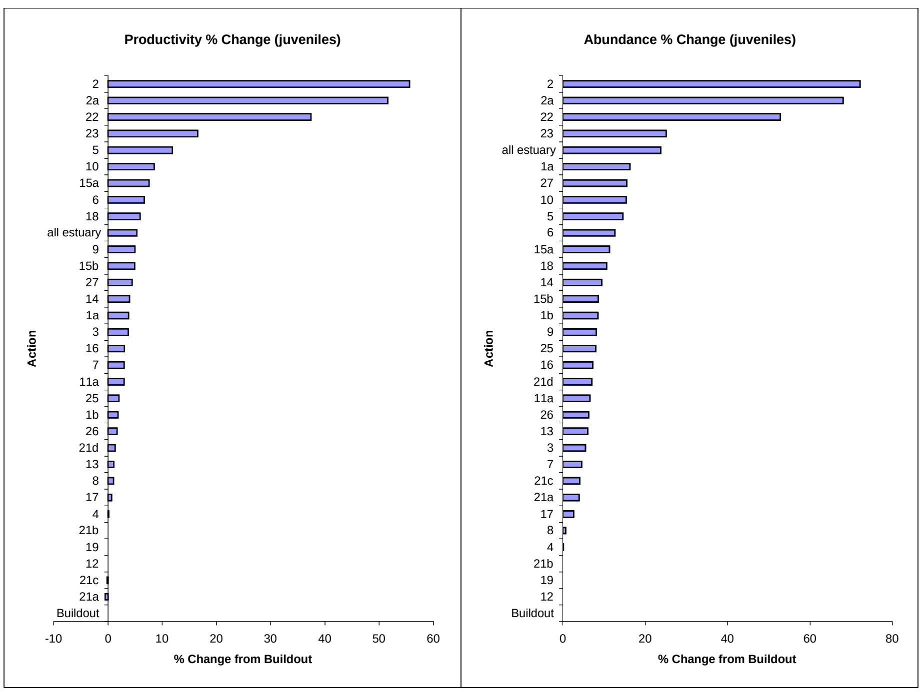


6/24/04

Dungeness adult Chinook - % performance change from buildout condition
Results for individual actions - 25 year time horizon

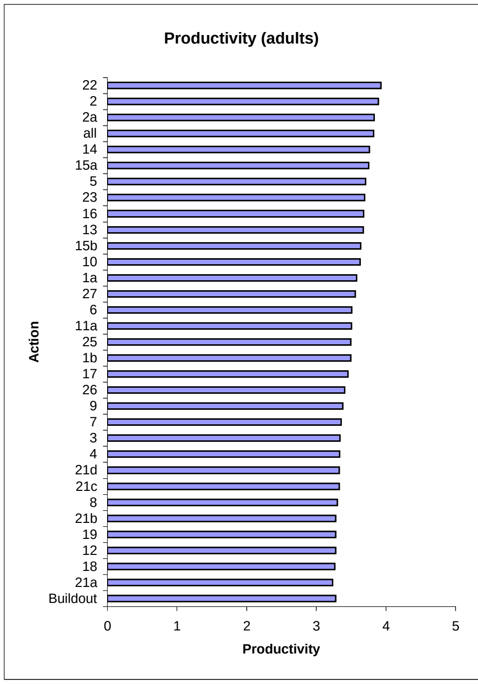


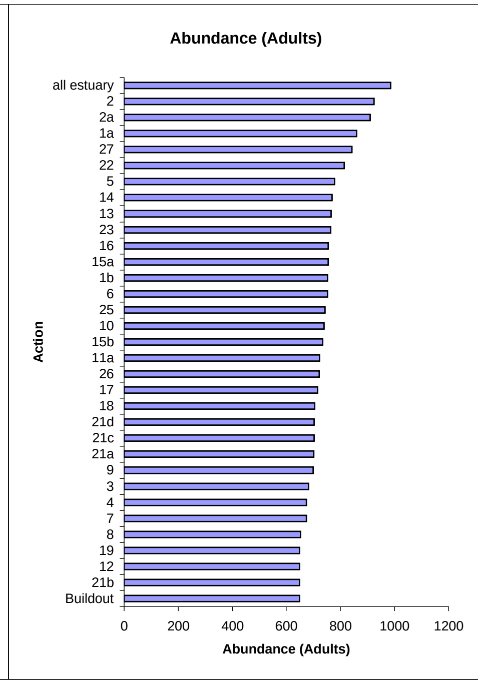
Dungeness juvenile Chinook - % performance change from buildout condition
Results for individual actions - 25 year time horizon

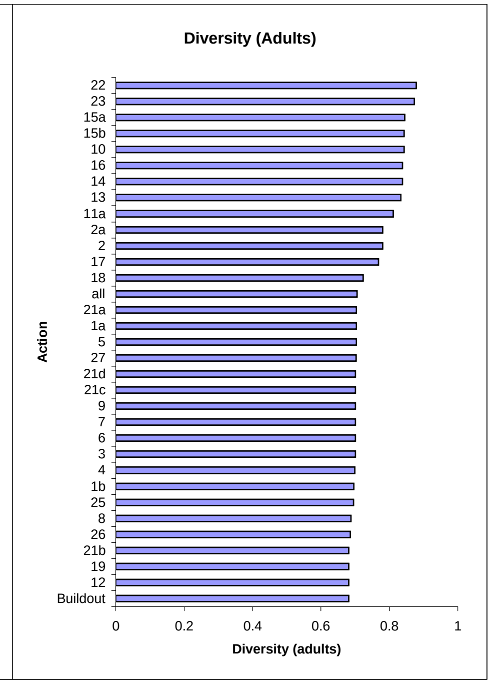


6/24/04

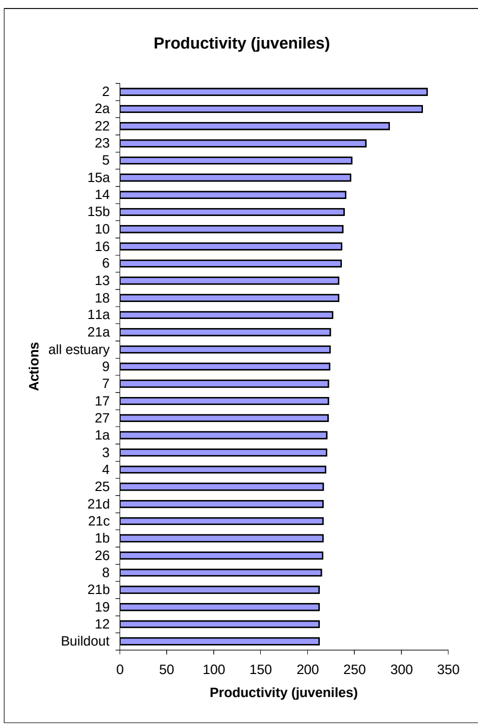
Dungeness adult Chinook - % performance change from buildout condition
Results for individual actions - 100 year time horizon

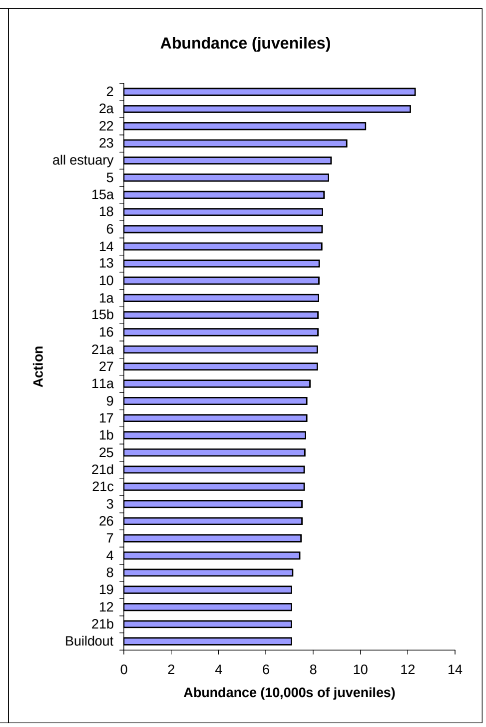






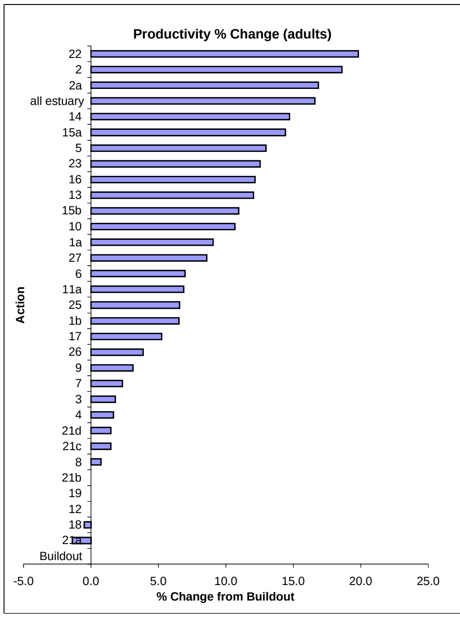
Dungeness juvenile Chinook - % performance change from buildout condition
Results for individual actions - 100 year time horizon

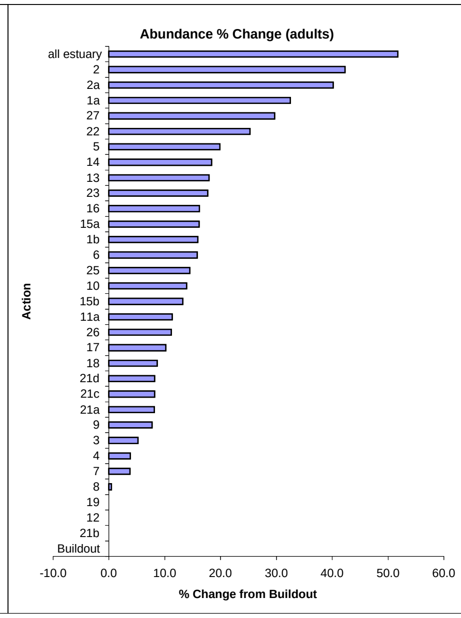


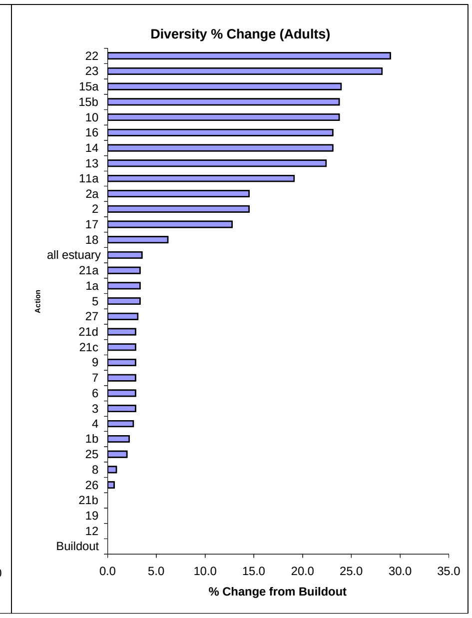


6/24/04

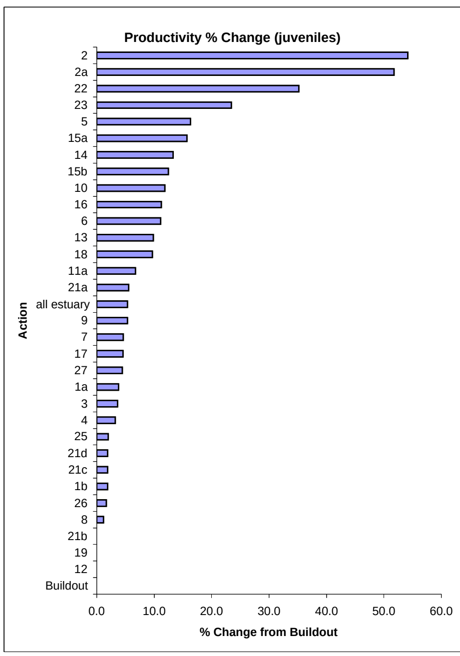
Dungeness adult Chinook - % performance change from buildout condition
Results for individual actions - 100 year time horizon

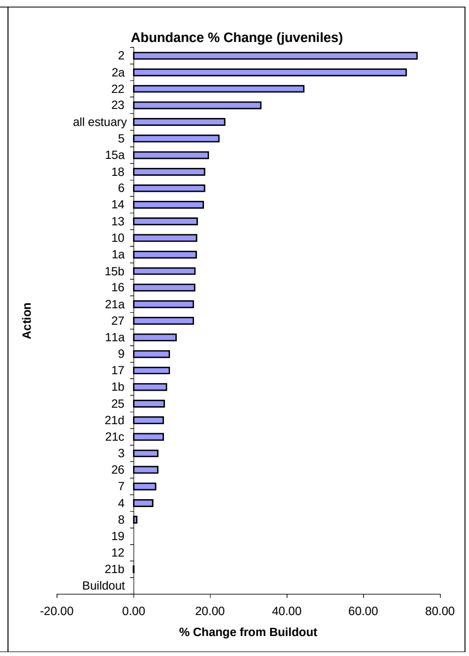






Dungeness juvenile Chinook - % performance change from buildout condition
Results for individual actions - 100 year time horizon





Action list - updated following 6-14-04 workshop

Action #	Action name	Description	Type
0	Dungeness watershed build out - 25/100 yr	Effects of full build out in approximately 2030 under existing status quo regulations and land use policies.	Degradation
1A	Estuarine delta restoration - 25/100 yr	Remove Rivers End Dike and encourage reopening of a historic river mouth and associated distributary channel.	Restoration
1B	Schoolhouse bridge modification - 25/100 yr	Lengthen Schoolhouse Bridge to widen channel between the floodplain upstream and riverine estuary downstream.	Restoration
2	Lower river floodplain restoration - 25/100 yr	Action focuses on restoring floodplain function lost due to Corps Dike and Beebe Dike; includes land purchase, removal of Corps and Beebe dikes, and placement of engineered log jams between Schoolhouse Bridge and Woodcock Road (between approximately RM 1 - 3.5).	Restoration
2A	Lower river floodplain restoration (Corps Dike setback) – 25/100 yr	Action addresses the same issues as Action 2 but it includes only the setback of the Army Corps Dike and not the Beebe Dike.	Restoration
3	Setback Ward Road - 25/100 yr	Setback Ward Road and construct engineered log jams	Restoration
4	Restore riparian corridor in Matriotti Cr - 25/100 yr	Restore riparian vegetation throughout riparian corridor of Matriotti Creek.	Restoration
5	Riparian corridor restoration to Hwy 101 - 25/100 yr	Purchase land and restore riparian vegetation between Hurd Creek and Highway 101 (between approximately RM 3.5 - 6.4)	Restoration
5	Riparian corridor protection to Hwy 101 - 25/100 yr	Purchase land and protect riparian vegetation between Hurd Creek and Highway 101 (between approximately RM 3.5 - 6.4)	Protection
6	Large wood placement to Hwy 101 - 25/100 yr	Strategically place LWD (engineered log jams) between Hurd Creek and Highway 101 (between approximately RM 3.5 - 6.4)	Restoration
7	Railroad bridge constriction abatement - 25/100 yr	Alter present bridge and dike configuration at site of railroad bridge.	Restoration
8	Riparian zone protection to Powerlines - 25/100 yr	Add new protection capability by purchasing land within the floodplain corridor between Highway 101 and Powerlines (approximately RM 6.4 - 8.8).	Protection
9	Hwy 101 bridge modification - 25/100 yr	Lengthen Highway 101 bridge to reduce constriction of floodplain at this site.	Restoration
10	Dungeness Meadows floodplain restoration - 25/100 yr	Remove lower end of Dungeness Meadows dike.	Restoration
11A	Large wood placement to Dungeness Meadows Dike - 25/100 yr	Strategically place LWD (engineered log jams) between Highway 101 and the lower end of the Dungeness Meadows Dike. Note: Action 11 has been deleted; this included placing ELJs upstream to the Powerlines.	Restoration
12	Eliminate Independent Outtake - 25/100 yr	Eliminate the Independent Outtake and make changes at other nearby irrigation facilities.	Restoration
13	Riparian zone restore/protect to Canyon Cr - 25/100 yr	Purchase land and restore and protect riparian vegetation between Powerlines and Canyon Creek (approximately RM 8.8 - 10.8).	Restoration/protection
14	Kincade Is floodplain restoration - 25/100 yr	Remove bridge at Kincade Island, a dike in the same vicinity, and revegetate riparian zone.	Restoration

15a	Removal of upper Haller dike - 25/100 yr	Remove the lower Haller Dike and revegetate the riparian corridor.	Restoration
15b	Removal of lower Haller Dike - 25/100 yr	Remove the upper Haller Dike and revegetate the riparian corridor.	Restoration
16	Removal of Robinson Dike - 25/100 yr	Remove Robinson Dike and bank hardening material on scattered parcels in vicinity.	Restoration
17	Relocation of hatchery infrastructure - 25/100 yr	Relocate Dungeness hatchery infrastructure away from floodplain.	Restoration
18	Large wood placement to Canyon Cr - 25/100 yr	Strategically place LWD (engineered log jams) between Powerlines and Canyon Creek (approximately RM 8.8 - 10.8).	Restoration
19	Modify Outtakes and screens to Canyon Cr - 25/100 yr	Changes would be made to outtake facilities and associated screens within the stream section between Powerlines and Canyon Creek (approximately RM 8.8 - 10.8).	Restoration
21A	Riparian forest restoration to Hurd Cr - 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between Schoolhouse Bridge and Hurd Cr (downstream of RM 3.5).	Restoration
21B	Riparian forest restoration to Hwy 101- 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between Hurd Cr and Hwy 101 (RM 3.5 – 6.4).	Restoration
21C	Riparian forest restoration to Powerlines - 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between Hwy 101 and the Powerlines (RM 6.4 – 8.8).	Restoration
21D	Riparian forest restoration to Canyon Cr - 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between the Powerlines and Canyon Cr (RM 8.8 – 10.8).	Restoration
22	Water Conservation Projects - 25/100 yr	Implementation of conservation projects in the CIDMP is expected to reduce withdrawls by 25.5 cfs. Target flows of 100 cfs during irrigation season are expected to be achieved approximately 75% of the time in the late summer, but varies by season. (See tables in CIDMP, Chapter 6)	Restoration
23	Upper Dungeness roads decommissioning - 25/100 yr	Decommission and stabilize selected roads within the National Forest.	Restoration
25	Dungeness Bay water quality restoration - 25/100 yr	Implement the Dungeness Bay Cleanup Plan.	Restoration
26	Graysmarsh/Gierin Creek restoration - 25/100 yr	Restore 100 acres of saltmarsh habitat and associated lower portion of Gierin Creek.	Restoration
27	Small estuary restoration - 25/100 yr	Re-establish tidal flow and upstream connectivity in small estuaries near the Dungeness River mouth, including Cooper, Meadowlark, and Casselary Creeks.	Restoration

Water Conservation Projects - 25 yr

Action no.	Action name	Affected reach	Reach length ft
22	Water Conservation Projects - 25 yr	Dungeness-5A	2,640
		Dungeness-4	22,704
		Dungeness-3	20,592
		Dungeness-2	3,168
		Dungeness-1	3,696

Attribute affected	Reach	25 yr % effect	100 yr % effect
Flow - change in low flows	Dungeness-5A	40%	40%
Channel width - month minimum width	Dungeness-5A	41%	41%
Habitat type - backwater pools	Dungeness-5A	10%	10%
Bed scour	Dungeness-5A	37%	37%
Riparian function	Dungeness-5A	8%	8%
Flow - change in low flows	Dungeness-4	40%	40%
Channel width - month minimum width	Dungeness-4	41%	41%
Habitat type - backwater pools	Dungeness-4	10%	10%
Bed scour	Dungeness-4	37%	37%
Riparian function	Dungeness-4	8%	8%
Flow - change in low flows	Dungeness-3	45%	45%
Channel width - month minimum width	Dungeness-3	48%	48%
Habitat type - backwater pools	Dungeness-3	12%	12%
Bed scour	Dungeness-3	43%	43%
Riparian function	Dungeness-3	10%	10%
Flow - change in low flows	Dungeness-2	45%	45%
Channel width - month minimum width	Dungeness-2	48%	48%
Habitat type - backwater pools	Dungeness-2	12%	12%
Bed scour	Dungeness-2	43%	43%
Riparian function	Dungeness-2	10%	10%
Flow - change in low flows	Dungeness-1	34%	34%
Channel width - month minimum width	Dungeness-1	36%	36%
Habitat type - backwater pools	Dungeness-1	9%	9%
Bed scour	Dungeness-1	32%	32%
Riparian function	Dungeness-1	7%	7%

Upper Dungeness roads decommissioning - 25 yr

Action no.	Action name	Affected reach	Reach length ft
23	Upper Dungeness roads decommissioning - 25 yr	Gold-1	7,920
		Dungeness-6	16,368
		Dungeness-5B	25,344
		Dungeness-5A	1,584
		Dungeness-4	22,704
		Dungeness-3	20,592
		Dungeness-2	3,168
		Dungeness-1	3,696

Attribute affected	Reach	25 yr % effect	100 yr % effect
Bed scour	Gold-1	60%	80%
Fine sediment	Gold-1	60%	80%
Habitat type - primary pools	Gold-1	30%	40%
Turbidity	Gold-1	60%	80%
Flow - change in high flows	Gold-1	60%	80%
Flow - intra-annual flow pattern	Gold-1	60%	80%
Bed scour	Dungeness-6	60%	80%
Fine sediment	Dungeness-6	60%	80%
Habitat type - primary pools	Dungeness-6	30%	40%
Turbidity	Dungeness-6	60%	80%
Flow - change in high flows	Dungeness-6	60%	80%
Flow - intra-annual flow pattern	Dungeness-6	60%	80%
Bed scour	Dungeness-5B	30%	40%
Fine sediment	Dungeness-5B	30%	40%
Habitat type - primary pools	Dungeness-5B	15%	20%
Turbidity	Dungeness-5B	30%	40%
Flow - change in high flows	Dungeness-5B	30%	40%
Flow - intra-annual flow pattern	Dungeness-5B	30%	40%
Bed scour	Dungeness-5A	30%	40%
Fine sediment	Dungeness-5A	30%	40%
Habitat type - primary pools	Dungeness-5A	15%	20%
Turbidity	Dungeness-5A	30%	40%
Flow - change in high flows	Dungeness-5A	30%	40%
Flow - intra-annual flow pattern	Dungeness-5A	30%	40%
Bed scour	Dungeness-4	23%	30%
Fine sediment	Dungeness-4	23%	30%
Habitat type - primary pools	Dungeness-4	11%	15%
Turbidity	Dungeness-4	23%	30%
Flow - change in high flows	Dungeness-4	23%	30%
Flow - intra-annual flow pattern	Dungeness-4	23%	30%
Bed scour	Dungeness-3	17%	22%
Fine sediment	Dungeness-3	17%	22%

Attribute affected	Reach	25 yr % effect	100 yr % effect
Habitat type - primary pools	Dungeness-3	8%	11%
Turbidity	Dungeness-3	17%	22%
Flow - change in high flows	Dungeness-3	17%	22%
Flow - intra-annual flow pattern	Dungeness-3	17%	22%
Bed scour	Dungeness-2	13%	17%
Fine sediment	Dungeness-2	13%	17%
Habitat type - primary pools	Dungeness-2	6%	8%
Turbidity	Dungeness-2	13%	17%
Flow - change in high flows	Dungeness-2	13%	17%
Flow - intra-annual flow pattern	Dungeness-2	13%	17%
Bed scour	Dungeness-1	13%	17%
Fine sediment	Dungeness-1	13%	17%
Habitat type - primary pools	Dungeness-1	6%	8%
Turbidity	Dungeness-1	13%	17%
Flow - change in high flows	Dungeness-1	13%	17%
Flow - intra-annual flow pattern	Dungeness-1	13%	17%

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Updated data with output received midday 6-23-04

Action	Prod	Neq	Div
Buildout	3.28	649	0.681
1a	3.58	860	0.704
1b	3.49	753	0.696
2	3.89	924	0.780
2a	3.83	910	0.780
3	3.34	683	0.701
4	3.34	674	0.699
5	3.71	778	0.704
6	3.51	752	0.701
7	3.36	674	0.701
8	3.30	652	0.687
9	3.38	699	0.701
10	3.63	739	0.843
11a	3.51	723	0.811
12	3.28	649	0.681
13	3.68	766	0.834
14	3.76	769	0.838
15a	3.75	754	0.844
15b	3.64	735	0.843
16	3.68	754	0.838
17	3.45	715	0.768
18	3.26	705	0.723
19	3.28	649	0.681
21a	3.24	702	0.704
21b	3.28	649	0.681
21c	3.33	702	0.701
21d	3.33	702	0.701
22	3.93	813	0.879
23	3.69	764	0.873
25	3.50	743	0.695
26	3.41	721	0.686
27	3.56	842	0.702

Percent Lookup

Percentage change from buildout

Action	Prod	Neq
Buildout		
1a	0.090	0.325
1b	0.065	0.159
2	0.186	0.423
2a	0.168	0.402
3	0.018	0.052
4	0.017	0.038
5	0.130	0.199
6	0.070	0.158
7	0.023	0.038
8	0.007	0.005
9	0.031	0.077
10	0.107	0.139
11a	0.069	0.113
12	0.000	0.000
13	0.120	0.179
14	0.147	0.184
15a	0.144	0.161
15b	0.110	0.132
16	0.122	0.162
17	0.052	0.102
18	-0.005	0.086
19	0.000	0.000
21a	-0.014	0.081
21b	0.000	0.000
21c	0.015	0.082
21d	0.015	0.082
22	0.198	0.253
23	0.125	0.177
25	0.066	0.145
26	0.039	0.111
27	0.086	0.297

Div
0.033
0.022
0.145
0.145
0.029
0.026
0.033
0.029
0.029
0.009
0.029
0.237
0.191
0.000
0.224
0.231
0.240
0.237
0.231
0.127
0.062
0.000
0.033
0.000
0.029
0.029
0.290
0.281
0.020
0.007
0.031

Action effectiveness assumptions for estuarine actions - FINAL

Action	% change in estuary size	% change in juv prod	% change in juv % key habitat	% change in adult prod
1A	34.5%	13.2%	88.0%	11.3%
1B	2.8%	7.9%	19.3%	11.3%
25	0.0%	7.9%	19.3%	0.0%
26	11.1%	7.9%	19.3%	0.0%
27	22.7%	13.2%	88.0%	0.0%
All estuarine	71.2%	22.4%	110.6%	21.1%

Updated data with output received midday 6-23-04

Action	Prod	Neq	Div
Buildout	3.28	649	0.681
1a	3.58	860	0.704
1b	3.49	753	0.696
2	3.89	924	0.780
2a	3.83	910	0.780
3	3.34	683	0.701
4	3.34	674	0.699
5	3.71	778	0.704
6	3.51	752	0.701
7	3.36	674	0.701
8	3.30	652	0.687
9	3.38	699	0.701
10	3.63	739	0.843
11a	3.51	723	0.811
12	3.28	649	0.681
13	3.68	766	0.834
14	3.76	769	0.838
15a	3.75	754	0.844
15b	3.64	735	0.843
16	3.68	754	0.838
17	3.45	715	0.768
18	3.26	705	0.723
19	3.28	649	0.681
21a	3.24	702	0.704
21b	3.28	649	0.681
21c	3.33	702	0.701
21d	3.33	702	0.701
22	3.93	813	0.879
23	3.69	764	0.873
25	3.50	743	0.695
26	3.41	721	0.686
27	3.56	842	0.702

Percent Lookup
Percentage change from buildout

Action	Prod	Neq
Buildout		
1a	0.090	0.325
1b	0.065	0.159
2	0.186	0.423
2a	0.168	0.402
3	0.018	0.052
4	0.017	0.038
5	0.130	0.199
6	0.070	0.158
7	0.023	0.038
8	0.007	0.005
9	0.031	0.077
10	0.107	0.139
11a	0.069	0.113
12	0.000	0.000
13	0.120	0.179
14	0.147	0.184
15a	0.144	0.161
15b	0.110	0.132
16	0.122	0.162
17	0.052	0.102
18	-0.005	0.086
19	0.000	0.000
21a	-0.014	0.081
21b	0.000	0.000
21c	0.015	0.082
21d	0.015	0.082
22	0.198	0.253
23	0.125	0.177
25	0.066	0.145
26	0.039	0.111
27	0.086	0.297

Div
0.033
0.022
0.145
0.145
0.029
0.026
0.033
0.029
0.029
0.009
0.029
0.237
0.191
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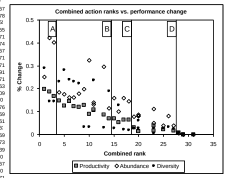
0.224
0.231
0.240
0.237
0.231
0.127
0.062
0.000
0.033
0.000
0.029
0.029
0.290
0.281
0.020
0.007
0.031

Percentages all updated on 6-23-04

Action	Prod	Rank	Action	Abundance	Rank	Action	Div	Rank	Action	Sum ranks	Cmb rank	Action	Cmb rank	Productivity	Abundance	Diversity
														% change		
1a	9.044332	12	1a	32.507768	3	1a	3.296705	14	1a	29	10	1a	10	0.090443318	0.325077682	0.032967
1b	6.519949	17	1b	15.922171	12	1b	2.197808	25	1b	54	17	1b	17	0.065199487	0.159221706	0.021978
2	18.5986	2	2	42.28795	1	2	14.505	10	2	13	2	2	2	0.18598606	0.4228795	0.14505
2a	16.83929	3	2a	40.182194	2	2a	14.5055	10	2a	15	3	2a	3	0.168392892	0.40182194	0.145055
3	1.800984	22	3	5.1664929	25	3	2.857146	18	3	65	23	3	23	0.01800984	0.051664929	0.028571
4	1.653427	23	4	3.8161184	26	4	2.637367	24	4	73	27	4	27	0.016534269	0.038161184	0.026374
5	12.95333	6	5	19.860697	6	5	3.296705	14	5	26	9	5	9	0.129533322	0.198606974	0.032967
6	6.964998	14	6	15.805785	13	6	2.857146	18	6	45	15	6	15	0.069649978	0.158057848	0.028571
7	2.318912	21	7	3.7795822	27	7	2.857146	18	7	66	25	7	25	0.023189125	0.037795822	0.028571
8	0.7241	26	8	0.4600906	28	8	0.879117	27	8	81	28	8	28	0.007241001	0.004600906	0.008791
9	3.106687	20	9	7.7009808	24	9	2.857146	18	9	62	19	9	19	0.031066868	0.077009808	0.028571
10	10.67066	11	10	13.891349	15	10	23.73627	4	10	30	11	10	11	0.106706613	0.138913487	0.237363
11a	6.882883	15	11a	11.318045	17	11a	19.12088	9	11a	41	14	11a	14	0.068828827	0.113180449	0.191209
12	0	28	12	0	29	12	0	29	12	86	29	12	29	0	0	0
13	12.04754	9	13	17.945784	8	13	22.41758	8	13	25	8	13	8	0.120475365	0.179457839	0.224176
14	14.72131	4	14	18.374514	7	14	23.07693	6	14	17	4	14	4	0.147213056	0.183745138	0.230769
15a	14.40446	5	15a	16.144253	11	15a	23.95605	3	15a	19	6	15a	6	0.144044585	0.161442525	0.239561
15b	10.9563	10	15b	13.20088	16	15b	23.7362	4	15b	30	11	15b	11	0.10956387	0.13200889	0.23736
16	12.16288	8	16	16.176353	10	16	23.07693	6	16	24	7	16	7	0.121628756	0.161763526	0.230769
17	5.246342	18	17	10.173579	19	17	12.74726	12	17	49	16	17	16	0.052463422	0.101735791	0.127473
18	-0.49693	30	18	8.6478711	20	18	6.153851	13	18	63	20	18	20	-0.004969272	0.086478711	0.061539
19	0	28	19	0	29	19	0	29	19	86	29	19	29	0	0	0
21a	-1.36843	31	21a	8.1058359	23	21a	3.296705	14	21a	68	26	21a	26	-0.013684321	0.081058359	0.032967
21b	0.006645	27	21b	-0.005484	31	21b	0	29	21b	87	31	21b	31	6.6448E-05	-5.4835E-05	0
21c	1.463471	24	21c	8.1878883	21	21c	2.857146	18	21c	63	20	21c	20	0.01463471	0.081878883	0.028571
21d	1.463471	24	21d	8.1878883	21	21d	2.857146	18	21d	63	20	21d	20	0.01463471	0.081878883	0.028571
22	19.8001	1	22	25.26684	5	22	29.0109	1	22	7	1	22	1	0.19800156	0.25266847	0.2901
23	12.54504	7	23	17.661812	9	23	28.13187	2	23	18	5	23	5	0.125450429	0.176618123	0.281319
25	6.560214	16	25	14.466901	14	25	1.978029	26	25	56	18	25	18	0.065602138	0.14466901	0.01978
26	3.856055	19	26	11.128541	18	26	0.659353	28	26	65	23	26	23	0.038560554	0.111285406	0.006594
27	8.58593	13	27	29.68028	4	27	3.07692	17	27	34	13	27	13	0.08585932	0.29680282	0.03076

Action benefit categories based on inspection of patterns of effect

Based on 100 year scenarios



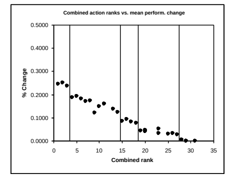
3.5	0.5
3.5	0
14.5	0.5
14.5	0
18.5	0.5
18.5	0
27.5	0.5
27.5	0

Action	Cmb rank	Category	Percent change			
			Prod	Abund.	Diver.	Ave.
22	1	A	0.1980	0.2527	0.2901	0.2469
2	2	A	0.1860	0.4229	0.1451	0.2513
2a	3	A	0.1684	0.4018	0.1451	0.2384
14	4	B	0.1472	0.1837	0.2308	0.1872
23	5	B	0.1255	0.1766	0.2813	0.1945
15a	6	B	0.1440	0.1614	0.2396	0.1817
16	7	B	0.1216	0.1618	0.2308	0.1714
13	8	B	0.1205	0.1795	0.2242	0.1747
5	9	B	0.1295	0.1986	0.0330	0.1204
1a	10	B	0.0904	0.3251	0.0330	0.1495
10	11	B	0.1067	0.1389	0.2374	0.1610
15b	11	B	0.1096	0.1320	0.2374	0.1596
27	13	B	0.0859	0.2968	0.0308	0.1378
11a	14	B	0.0688	0.1132	0.1912	0.1244
6	15	C	0.0696	0.1581	0.0286	0.0854
17	16	C	0.0525	0.1017	0.1275	0.0939
1b	17	C	0.0652	0.1592	0.0220	0.0821
25	18	C	0.0656	0.1447	0.0198	0.0767
9	19	D	0.0311	0.0770	0.0286	0.0455
18	20	D	-0.0050	0.0865	0.0615	0.0477
21c	20	D	0.0146	0.0819	0.0286	0.0417
21d	20	D	0.0146	0.0819	0.0286	0.0417
3	23	D	0.0180	0.0517	0.0286	0.0327
26	23	D	0.0386	0.1113	0.0066	0.0521
7	25	D	0.0232	0.0378	0.0286	0.0299
21a	26	D	-0.0137	0.0811	0.0330	0.0334
4	27	E	0.0165	0.0382	0.0264	0.0270
8	28	E	0.0072	0.0046	0.0088	0.0069
12	29	E	0.0000	0.0000	0.0000	0.0000
19	29	E	0.0000	0.0000	0.0000	0.0000
21b	31	E	0.0001	-0.0001	0.0000	0.0000

Estuarine marked in red

Average % change in performance measures

Based on 100 year scenarios



3.5	0.5
3.5	0
14.5	0.5
14.5	0
18.5	0.5
18.5	0
27.5	0.5
27.5	0

6-24-04 FINAL

Actions ranked based on effects on population performance and grouped into benefit categories A, B, C, D, and E

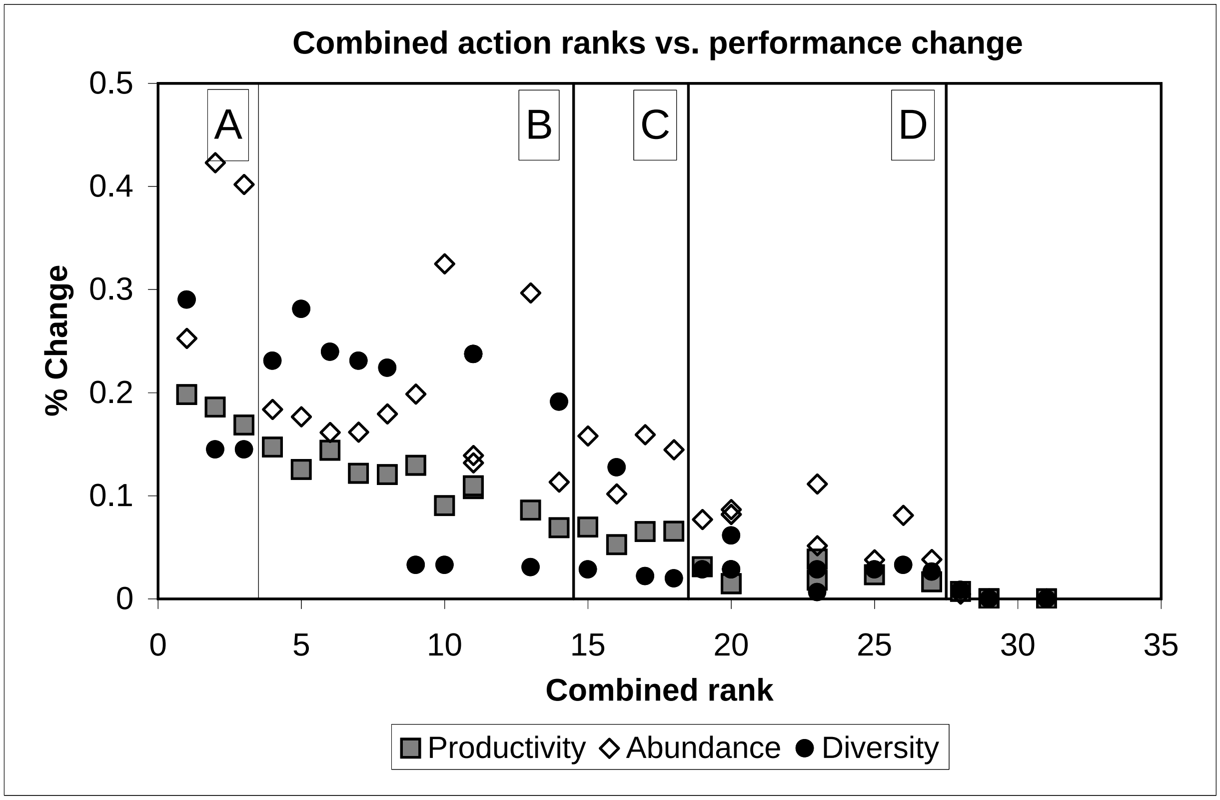
				Percent change from buildout			
Action no.	Action name	Cmb rank	Category	Prod	Abund.	Diver.	Ave.
22	Water Conservation Projects - 100 yr	1	A	0.20	0.25	0.29	0.25
2	Lower river floodplain restoration - 100 yr	2	A	0.19	0.42	0.15	0.25
2a	Lower river floodplain restoration (Corps Dike setback) – 100 yr	3	A	0.17	0.40	0.15	0.24
14	Kincade Is floodplain restoration - 100 yr	4	B	0.15	0.18	0.23	0.19
23	Upper Dungeness roads decommissioning - 100 yr	5	B	0.13	0.18	0.28	0.19
15a	Removal of upper Haller dike - 100 yr	6	B	0.14	0.16	0.24	0.18
16	Removal of Robinson Dike - 100 yr	7	B	0.12	0.16	0.23	0.17
13	Riparian zone restore/protect to Canyon Cr - 100 yr	8	B	0.12	0.18	0.22	0.17
5	Riparian corridor restoration to Hwy 101 - 100 yr	9	B	0.13	0.20	0.03	0.12
1a	Estuarine delta restoration - 100 yr	10	B	0.09	0.33	0.03	0.15
10	Dungeness Meadows floodplain restoration - 100 yr	11	B	0.11	0.14	0.24	0.16
15b	Removal of lower Haller Dike - 100 yr	11	B	0.11	0.13	0.24	0.16
27	Small estuary restoration - 100 yr	13	B	0.09	0.30	0.03	0.14
11a	Large wood placement to Dungeness Meadows Dike - 100 yr	14	B	0.07	0.11	0.19	0.12
6	Large wood placement to Hwy 101 - 100 yr	15	C	0.07	0.16	0.03	0.09
17	Relocation of hatchery infrastructure - 100 yr	16	C	0.05	0.10	0.13	0.09
1b	Schoolhouse bridge modification - 100 yr	17	C	0.07	0.16	0.02	0.08
25	Dungeness Bay water quality restoration - 100 yr	18	C	0.07	0.14	0.02	0.08
9	Hwy 101 bridge modification - 100 yr	19	D	0.03	0.08	0.03	0.05
18	Large wood placement to Canyon Cr - 100 yr	20	D	0.00	0.09	0.06	0.05
21c	Riparian forest restoration to Powerlines - 100 yr	20	D	0.01	0.08	0.03	0.04
21d	Riparian forest restoration to Canyon Cr - 100 yr	20	D	0.01	0.08	0.03	0.04
3	Setback Ward Road - 100 yr	23	D	0.02	0.05	0.03	0.03
26	Graysmarsh/Gierin Creek restoration - 100 yr	23	D	0.04	0.11	0.01	0.05
7	Railroad bridge constriction abatement - 100 yr	25	D	0.02	0.04	0.03	0.03
21a	Riparian forest restoration to Hurd Cr - 100 yr	26	D	-0.01	0.08	0.03	0.03
4	Restore riparian corridor in Matriotti Cr - 100 yr	27	E	0.02	0.04	0.03	0.03
8	Riparian zone protection to Powerlines - 100 yr	28	E	0.01	0.00	0.01	0.01
12	Eliminate Independent Outtake - 100 yr	29	E	0.00	0.00	0.00	0.00
19	Modify Outtakes and screens to Canyon Cr - 100 yr	29	E	0.00	0.00	0.00	0.00
21b	Riparian forest restoration to Hwy 101- 100 yr	31	E	0.00	0.00	0.00	0.00

Action list - updated following 6-14-04 workshop

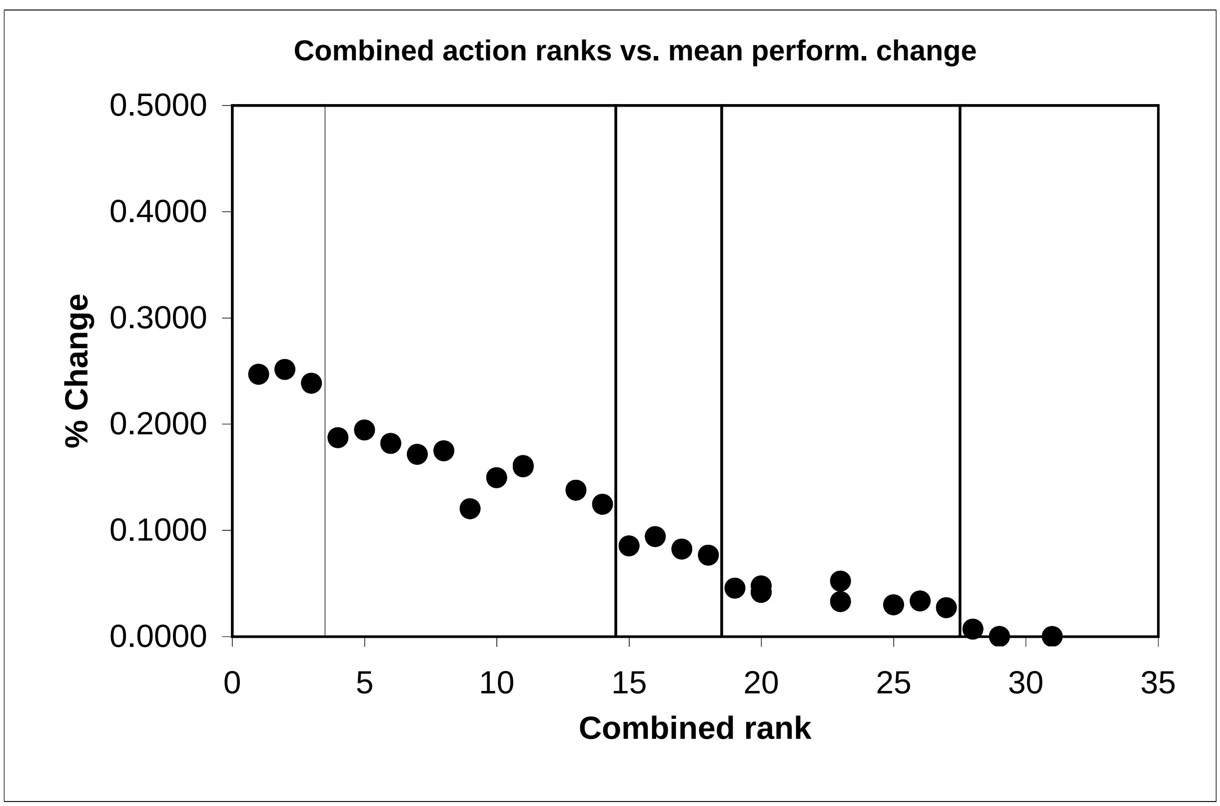
Action number	Action name	Description	Type
0	Dungeness watershed build out - 25/100 yr	Effects of full build out in approximately 2030 under existing status quo regulations and land use policies.	Degradation
1A	Estuarine delta restoration - 25/100 yr	Remove Rivers End Dike and encourage reopening of a historic river mouth and associated distributary channel.	Restoration
1B	Schoolhouse bridge modification - 25/100 yr	Lengthen Schoolhouse Bridge to widen channel between the floodplain upstream and riverine estuary downstream.	Restoration
2	Lower river floodplain restoration - 25/100 yr	Action focuses on restoring floodplain function lost due to Corps Dike and Beebe Dike; includes land purchase, removal of Corps and Beebe dikes, and placement of engineered log jams between Schoolhouse Bridge and Woodcock Road (between approximately RM 1 - 3.5).	Restoration
2A	Lower river floodplain restoration (Corps Dike setback) – 25/100 yr	Action addresses the same issues as Action 2 but it includes only the setback of the Army Corps Dike and not the Beebe Dike.	Restoration
3	Setback Ward Road - 25/100 yr	Setback Ward Road and construct engineered log jams	Restoration
4	Restore riparian corridor in Matriotti Cr - 25/100 yr	Restore riparian vegetation throughout riparian corridor of Matriotti Creek.	Restoration
5	Riparian corridor restoration to Hwy 101 - 25/100 yr	Purchase land and restore riparian vegetation between Hurd Creek and Highway 101 (between approximately RM 3.5 - 6.4)	Restoration
5	Riparian corridor protection to Hwy 101 - 25/100 yr	Purchase land and protect riparian vegetation between Hurd Creek and Highway 101 (between approximately RM 3.5 - 6.4)	Protection
6	Large wood placement to Hwy 101 - 25/100 yr	Strategically place LWD (engineered log jams) between Hurd Creek and Highway 101 (between approximately RM 3.5 - 6.4)	Restoration
7	Railroad bridge constriction abatement - 25/100 yr	Alter present bridge and dike configuration at site of railroad bridge.	Restoration
8	Riparian zone protection to Powerlines - 25/100 yr	Add new protection capability by purchasing land within the floodplain corridor between Highway 101 and Powerlines (approximately RM 6.4 - 8.8).	Protection
9	Hwy 101 bridge modification - 25/100 yr	Lengthen Highway 101 bridge to reduce constriction of floodplain at this site.	Restoration
10	Dungeness Meadows floodplain restoration - 25/100 yr	Remove lower end of Dungeness Meadows dike.	Restoration
11A	Large wood placement to Dungeness Meadows Dike - 25/100 yr	Strategically place LWD (engineered log jams) between Highway 101 and the lower end of the Dungeness Meadows Dike. Note: Action 11 has been deleted; this included placing ELJs upstream to the Powerlines.	Restoration
12	Eliminate Independent Outtake - 25/100 yr	Eliminate the Independent Outtake and make changes at other nearby irrigation facilities.	Restoration
13	Riparian zone restore/protect to Canyon Cr - 25/100 yr	Purchase land and restore and protect riparian vegetation between Powerlines and Canyon Creek (approximately RM 8.8 - 10.8).	Restoration/protection
14	Kincade Is floodplain restoration - 25/100 yr	Remove bridge at Kincade Island, a dike in the same vicinity, and revegetate riparian zone.	Restoration
15a	Removal of upper Haller dike - 25/100 yr	Remove the lower Haller Dike and revegetate the riparian corridor.	Restoration
15b	Removal of lower Haller Dike - 25/100 yr	Remove the upper Haller Dike and revegetate the riparian corridor.	Restoration
16	Removal of Robinson Dike - 25/100 yr	Remove Robinson Dike and bank hardening material on scattered parcels in vicinity.	Restoration

17	Relocation of hatchery infrastructure - 25/100 yr	Relocate Dungeness hatchery infrastructure away from floodplain.	Restoration
18	Large wood placement to Canyon Cr - 25/100 yr	Strategically place LWD (engineered log jams) between Powerlines and Canyon Creek (approximately RM 8.8 - 10.8).	Restoration
19	Modify Outtakes and screens to Canyon Cr - 25/100 yr	Changes would be made to outtake facilities and associated screens within the stream section between Powerlines and Canyon Creek (approximately RM 8.8 - 10.8).	Restoration
21A	Riparian forest restoration to Hurd Cr - 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between Schoolhouse Bridge and Hurd Cr (downstream of RM 3.5).	Restoration
21B	Riparian forest restoration to Hwy 101- 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between Hurd Cr and Hwy 101 (RM 3.5 – 6.4).	Restoration
21C	Riparian forest restoration to Powerlines - 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between Hwy 101 and the Powerlines (RM 6.4 – 8.8).	Restoration
21D	Riparian forest restoration to Canyon Cr - 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between the Powerlines and Canyon Cr (RM 8.8 – 10.8).	Restoration
22	Water Conservation Projects - 25/100 yr	Implementation of conservation projects in the CIDMP is expected to reduce withdrawls by 25.5 cfs. Target flows of 100 cfs during irrigation season are expected to be achieved approximately 75% of the time in the late summer, but varies by season. (See tables in CIDMP, Chapter 6)	Restoration
23	Upper Dungeness roads decommissioning - 25/100 yr	Decommission and stabilize selected roads within the National Forest.	Restoration
25	Dungeness Bay water quality restoration - 25/100 yr	Implement the Dungeness Bay Cleanup Plan.	Restoration
26	Graysmarsh/Gierin Creek restoration - 25/100 yr	Restore 100 acres of saltmarsh habitat and associated lower portion of Gierin Creek.	Restoration
27	Small estuary restoration - 25/100 yr	Re-establish tidal flow and upstream connectivity in small estuaries near the Dungeness River mouth, including Cooper, Meadowlark, and Casselary Creeks.	Restoration

Action Benefit Ratings Based on Inspections of Patterns of Effect
Based on 100-yr Scenarios



Average % change in performance measures
Based on 100 year scenarios



6-24-04 FINAL

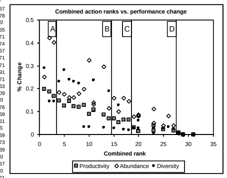
Actions ranked based on effects on population performance and grouped into benefit categories A, B, C, D, and E

Action no.	Action name	Cmb rank	Category	Percent change from buildout Prod	Abund.	Diver.	Ave.
22	Water Conservation Projects - 100 yr	1	A	0.20	0.25	0.29	0.25
2	Lower river floodplain restoration - 100 yr	2	A	0.19	0.42	0.15	0.25
2a	Lower river floodplain restoration (Corps Dike setback) – 100 yr	3	A	0.17	0.40	0.15	0.24
14	Kincade Is floodplain restoration - 100 yr	4	B	0.15	0.18	0.23	0.19
23	Upper Dungeness roads decommissioning - 100 yr	5	B	0.13	0.18	0.28	0.19
15a	Removal of upper Haller dike - 100 yr	6	B	0.14	0.16	0.24	0.18
16	Removal of Robinson Dike - 100 yr	7	B	0.12	0.16	0.23	0.17
13	Riparian zone restore/protect to Canyon Cr - 100 yr	8	B	0.12	0.18	0.22	0.17
5	Riparian corridor restoration to Hwy 101 - 100 yr	9	B	0.13	0.20	0.03	0.12
1a	Estuarine delta restoration - 100 yr	10	B	0.09	0.33	0.03	0.15
10	Dungeness Meadows floodplain restoration - 100 yr	11	B	0.11	0.14	0.24	0.16
15b	Removal of lower Haller Dike - 100 yr	11	B	0.11	0.13	0.24	0.16
27	Small estuary restoration - 100 yr	13	B	0.09	0.30	0.03	0.14
11a	Large wood placement to Dungeness Meadows Dike - 100 yr	14	B	0.07	0.11	0.19	0.12
6	Large wood placement to Hwy 101 - 100 yr	15	C	0.07	0.16	0.03	0.09
17	Relocation of hatchery infrastructure - 100 yr	16	C	0.05	0.10	0.13	0.09
1b	Schoolhouse bridge modification - 100 yr	17	C	0.07	0.16	0.02	0.08
25	Dungeness Bay water quality restoration - 100 yr	18	C	0.07	0.14	0.02	0.08
9	Hwy 101 bridge modification - 100 yr	19	D	0.03	0.08	0.03	0.05
18	Large wood placement to Canyon Cr - 100 yr	20	D	0.00	0.09	0.06	0.05
21c	Riparian forest restoration to Powerlines - 100 yr	20	D	0.01	0.08	0.03	0.04
21d	Riparian forest restoration to Canyon Cr - 100 yr	20	D	0.01	0.08	0.03	0.04
3	Setback Ward Road - 100 yr	23	D	0.02	0.05	0.03	0.03
26	Graysmarsh/Gierin Creek restoration - 100 yr	23	D	0.04	0.11	0.01	0.05
7	Railroad bridge constriction abatement - 100 yr	25	D	0.02	0.04	0.03	0.03
21a	Riparian forest restoration to Hurd Cr - 100 yr	26	D	-0.01	0.08	0.03	0.03
4	Restore riparian corridor in Matriotti Cr - 100 yr	27	E	0.02	0.04	0.03	0.03
8	Riparian zone protection to Powerlines - 100 yr	28	E	0.01	0.00	0.01	0.01
12	Eliminate Independent Outtake - 100 yr	29	E	0.00	0.00	0.00	0.00
19	Modify Outtakes and screens to Canyon Cr - 100 yr	29	E	0.00	0.00	0.00	0.00
21b	Riparian forest restoration to Hwy 101- 100 yr	31	E	0.00	0.00	0.00	0.00

Percentages all updated on 6-23-04

Action	Prod	Rank	Action	Abundance	Rank	Action	Div	Rank	Action	Sum ranks	Cmb rank	Action	Cmb rank	Productivity	Abundance	Diversity
														% change		
1a	9.044332	12	1a	32.507768	3	1a	3.296705	14	1a	29	10	1a	10	0.090443318	0.325077682	0.032967
1b	6.519949	17	1b	15.922171	12	1b	2.197808	25	1b	54	17	1b	17	0.065199487	0.159221706	0.021978
2	18.5986	2	2	42.28795	1	2	14.5055	10	2	13	2	2	2	0.18598606	0.4228795	0.14505
2a	16.83929	3	2a	40.182194	2	2a	14.5055	10	2a	15	3	2a	3	0.168392892	0.40182194	0.145055
3	1.800984	22	3	5.1664929	25	3	2.857146	18	3	65	23	3	23	0.01800984	0.051664929	0.028571
4	1.653427	23	4	3.8161184	26	4	2.637367	24	4	73	27	4	27	0.016534269	0.038161184	0.026374
5	12.95333	6	5	19.860697	6	5	3.296705	14	5	26	9	5	9	0.129533322	0.198606974	0.032967
6	6.964998	14	6	15.805785	13	6	2.857146	18	6	45	15	6	15	0.069649978	0.158057848	0.028571
7	2.318912	21	7	3.7795822	27	7	2.857146	18	7	66	25	7	25	0.023189125	0.037795822	0.028571
8	0.7241	26	8	0.4600906	28	8	0.879117	27	8	81	28	8	28	0.007241001	0.004600906	0.008791
9	3.106687	20	9	7.7009808	24	9	2.857146	18	9	62	19	9	19	0.031066868	0.077009808	0.028571
10	10.67066	11	10	13.891349	15	10	23.73627	4	10	30	11	10	11	0.106706613	0.138913487	0.237363
11a	6.882883	15	11a	11.318045	17	11a	19.12088	9	11a	41	14	11a	14	0.068828827	0.113180449	0.191209
12	0	28	12	0	29	12	0	29	12	86	29	12	29	0	0	0
13	12.04754	9	13	17.945784	8	13	22.41758	8	13	25	8	13	8	0.120475365	0.179457839	0.224176
14	14.72131	4	14	18.374514	7	14	23.07693	6	14	17	4	14	4	0.147213056	0.183745138	0.230769
15a	14.40446	5	15a	16.144253	11	15a	23.95605	3	15a	19	6	15a	6	0.144044585	0.161442525	0.239561
15b	10.9563	10	15b	13.20088	16	15b	23.7362	4	15b	30	11	15b	11	0.10956387	0.13200889	0.23736
16	12.16288	8	16	16.176353	10	16	23.07693	6	16	24	7	16	7	0.121628756	0.161763526	0.230769
17	5.246342	18	17	10.173579	19	17	12.74726	12	17	49	16	17	16	0.052463422	0.101735791	0.127473
18	-0.49693	30	18	8.6478711	20	18	6.153851	13	18	63	20	18	20	-0.004969272	0.086478711	0.061539
19	0	28	19	0	29	19	0	29	19	86	29	19	29	0	0	0
21a	-1.36843	31	21a	8.1058359	23	21a	3.296705	14	21a	68	26	21a	26	-0.013684321	0.081058359	0.032967
21b	0.006645	27	21b	-0.005484	31	21b	0	29	21b	87	31	21b	31	6.6448E-05	-5.4835E-05	0
21c	1.463471	24	21c	8.1878883	21	21c	2.857146	18	21c	63	20	21c	20	0.01463471	0.081878883	0.028571
21d	1.463471	24	21d	8.1878883	21	21d	2.857146	18	21d	63	20	21d	20	0.01463471	0.081878883	0.028571
22	19.8001	1	22	25.26684	5	22	29.0109	1	22	7	1	22	1	0.19800156	0.25266847	0.2901
23	12.54504	7	23	17.661812	9	23	28.13187	2	23	18	5	23	5	0.125450429	0.176618123	0.281319
25	6.560214	16	25	14.466901	14	25	1.978029	26	25	56	18	25	18	0.065602138	0.14466901	0.01978
26	3.856055	19	26	11.128541	18	26	0.659353	28	26	65	23	26	23	0.038560554	0.111285406	0.006594
27	8.58593	13	27	29.68028	4	27	3.07692	17	27	34	13	27	13	0.08585932	0.29680282	0.03076

Action benefit categories based on inspection of patterns of effect
Based on 100 year scenarios

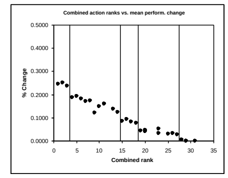


3.5	0.5
3.5	0
14.5	0.5
14.5	0
18.5	0.5
18.5	0
27.5	0.5
27.5	0

Action	Cmb rank	Category	Percent change			
			Prod	Abund.	Diver.	Ave.
22	1	A	0.1980	0.2527	0.2901	0.2469
2	2	A	0.1860	0.4229	0.1451	0.2513
2a	3	A	0.1684	0.4018	0.1451	0.2384
14	4	B	0.1472	0.1837	0.2308	0.1872
23	5	B	0.1255	0.1766	0.2813	0.1945
15a	6	B	0.1440	0.1614	0.2396	0.1817
16	7	B	0.1216	0.1618	0.2308	0.1714
13	8	B	0.1205	0.1795	0.2242	0.1747
5	9	B	0.1295	0.1986	0.0330	0.1204
1a	10	B	0.0904	0.3251	0.0330	0.1495
10	11	B	0.1067	0.1389	0.2374	0.1610
15b	11	B	0.1096	0.1320	0.2374	0.1596
27	13	B	0.0859	0.2968	0.0308	0.1378
11a	14	B	0.0688	0.1132	0.1912	0.1244
6	15	C	0.0696	0.1581	0.0286	0.0854
17	16	C	0.0525	0.1017	0.1275	0.0939
1b	17	C	0.0652	0.1592	0.0220	0.0821
25	18	C	0.0656	0.1447	0.0198	0.0767
9	19	D	0.0311	0.0770	0.0286	0.0455
18	20	D	-0.0050	0.0865	0.0615	0.0477
21c	20	D	0.0146	0.0819	0.0286	0.0417
21d	20	D	0.0146	0.0819	0.0286	0.0417
3	23	D	0.0180	0.0517	0.0286	0.0327
26	23	D	0.0386	0.1113	0.0066	0.0521
7	25	D	0.0232	0.0378	0.0286	0.0299
21a	26	D	-0.0137	0.0811	0.0330	0.0334
4	27	E	0.0165	0.0382	0.0264	0.0270
8	28	E	0.0072	0.0046	0.0088	0.0069
12	29	E	0.0000	0.0000	0.0000	0.0000
19	29	E	0.0000	0.0000	0.0000	0.0000
21b	31	E	0.0001	-0.0001	0.0000	0.0000

Estuarine marked in red

Average % change in performance measures
Based on 100 year scenarios



3.5	0.5
3.5	0
14.5	0.5
14.5	0
18.5	0.5
18.5	0
27.5	0.5
27.5	0

Updated data with output received midday 6-23-04

Action	Prod	Neq	Div
Buildout	3.28	649	0.681
1a	3.58	860	0.704
1b	3.49	753	0.696
2	3.89	924	0.780
2a	3.83	910	0.780
3	3.34	683	0.701
4	3.34	674	0.699
5	3.71	778	0.704
6	3.51	752	0.701
7	3.36	674	0.701
8	3.30	652	0.687
9	3.38	699	0.701
10	3.63	739	0.843
11a	3.51	723	0.811
12	3.28	649	0.681
13	3.68	766	0.834
14	3.76	769	0.838
15a	3.75	754	0.844
15b	3.64	735	0.843
16	3.68	754	0.838
17	3.45	715	0.768
18	3.26	705	0.723
19	3.28	649	0.681
21a	3.24	702	0.704
21b	3.28	649	0.681
21c	3.33	702	0.701
21d	3.33	702	0.701
22	3.93	813	0.879
23	3.69	764	0.873
25	3.50	743	0.695
26	3.41	721	0.686
27	3.56	842	0.702

Percent Lookup
Percentage change from buildout

Action	Prod	Neq
Buildout		
1a	0.090	0.325
1b	0.065	0.159
2	0.186	0.423
2a	0.168	0.402
3	0.018	0.052
4	0.017	0.038
5	0.130	0.199
6	0.070	0.158
7	0.023	0.038
8	0.007	0.005
9	0.031	0.077
10	0.107	0.139
11a	0.069	0.113
12	0.000	0.000
13	0.120	0.179
14	0.147	0.184
15a	0.144	0.161
15b	0.110	0.132
16	0.122	0.162
17	0.052	0.102
18	-0.005	0.086
19	0.000	0.000
21a	-0.014	0.081
21b	0.000	0.000
21c	0.015	0.082
21d	0.015	0.082
22	0.198	0.253
23	0.125	0.177
25	0.066	0.145
26	0.039	0.111
27	0.086	0.297

Div
0.033
0.022
0.145
0.145
0.029
0.026
0.033
0.029
0.029
0.009
0.029
0.237
0.191
0.000
0.224
0.231
0.240
0.237
0.231
0.127
0.062
0.000
0.033
0.000
0.029
0.029
0.290
0.281
0.020
0.007
0.031

Action list - updated following 6-14-04 workshop

Action number	Action name	Description	Type
0	Dungeness watershed build out - 25/100 yr	Effects of full build out in approximately 2030 under existing status quo regulations and land use policies.	Degradation
1A	Estuarine delta restoration - 25/100 yr	Remove Rivers End Dike and encourage reopening of a historic river mouth and associated distributary channel.	Restoration
1B	Schoolhouse bridge modification - 25/100 yr	Lengthen Schoolhouse Bridge to widen channel between the floodplain upstream and riverine estuary downstream.	Restoration
2	Lower river floodplain restoration - 25/100 yr	Action focuses on restoring floodplain function lost due to Corps Dike and Beebe Dike; includes land purchase, removal of Corps and Beebe dikes, and placement of engineered log jams between Schoolhouse Bridge and Woodcock Road (between approximately RM 1 - 3.5).	Restoration
2A	Lower river floodplain restoration (Corps Dike setback) – 25/100 yr	Action addresses the same issues as Action 2 but it includes only the setback of the Army Corps Dike and not the Beebe Dike.	Restoration
3	Setback Ward Road - 25/100 yr	Setback Ward Road and construct engineered log jams	Restoration
4	Restore riparian corridor in Matriotti Cr - 25/100 yr	Restore riparian vegetation throughout riparian corridor of Matriotti Creek.	Restoration
5	Riparian corridor restoration to Hwy 101 - 25/100 yr	Purchase land and restore riparian vegetation between Hurd Creek and Highway 101 (between approximately RM 3.5 - 6.4)	Restoration
5	Riparian corridor protection to Hwy 101 - 25/100 yr	Purchase land and protect riparian vegetation between Hurd Creek and Highway 101 (between approximately RM 3.5 - 6.4)	Protection
6	Large wood placement to Hwy 101 - 25/100 yr	Strategically place LWD (engineered log jams) between Hurd Creek and Highway 101 (between approximately RM 3.5 - 6.4)	Restoration
7	Railroad bridge constriction abatement - 25/100 yr	Alter present bridge and dike configuration at site of railroad bridge.	Restoration
8	Riparian zone protection to Powerlines - 25/100 yr	Add new protection capability by purchasing land within the floodplain corridor between Highway 101 and Powerlines (approximately RM 6.4 - 8.8).	Protection
9	Hwy 101 bridge modification - 25/100 yr	Lengthen Highway 101 bridge to reduce constriction of floodplain at this site.	Restoration
10	Dungeness Meadows floodplain restoration - 25/100 yr	Remove lower end of Dungeness Meadows dike.	Restoration
11A	Large wood placement to Dungeness Meadows Dike - 25/100 yr	Strategically place LWD (engineered log jams) between Highway 101 and the lower end of the Dungeness Meadows Dike. Note: Action 11 has been deleted; this included placing ELJs upstream to the Powerlines.	Restoration
12	Eliminate Independent Outtake - 25/100 yr	Eliminate the Independent Outtake and make changes at other nearby irrigation facilities.	Restoration
13	Riparian zone restore/protect to Canyon Cr - 25/100 yr	Purchase land and restore and protect riparian vegetation between Powerlines and Canyon Creek (approximately RM 8.8 - 10.8).	Restoration/protection
14	Kincade Is floodplain restoration - 25/100 yr	Remove bridge at Kincade Island, a dike in the same vicinity, and revegetate riparian zone.	Restoration
15a	Removal of upper Haller dike - 25/100 yr	Remove the lower Haller Dike and revegetate the riparian corridor.	Restoration
15b	Removal of lower Haller Dike - 25/100 yr	Remove the upper Haller Dike and revegetate the riparian corridor.	Restoration
16	Removal of Robinson Dike - 25/100 yr	Remove Robinson Dike and bank hardening material on scattered parcels in vicinity.	Restoration

17	Relocation of hatchery infrastructure - 25/100 yr	Relocate Dungeness hatchery infrastructure away from floodplain.	Restoration
18	Large wood placement to Canyon Cr - 25/100 yr	Strategically place LWD (engineered log jams) between Powerlines and Canyon Creek (approximately RM 8.8 - 10.8).	Restoration
19	Modify Outtakes and screens to Canyon Cr - 25/100 yr	Changes would be made to outtake facilities and associated screens within the stream section between Powerlines and Canyon Creek (approximately RM 8.8 - 10.8).	Restoration
21A	Riparian forest restoration to Hurd Cr - 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between Schoolhouse Bridge and Hurd Cr (downstream of RM 3.5).	Restoration
21B	Riparian forest restoration to Hwy 101- 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between Hurd Cr and Hwy 101 (RM 3.5 – 6.4).	Restoration
21C	Riparian forest restoration to Powerlines - 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between Hwy 101 and the Powerlines (RM 6.4 – 8.8).	Restoration
21D	Riparian forest restoration to Canyon Cr - 25/100 yr	Riparian vegetation would be restored on various parcels within the reach not covered by other actions between the Powerlines and Canyon Cr (RM 8.8 – 10.8).	Restoration
22	Water Conservation Projects - 25/100 yr	Implementation of conservation projects in the CIDMP is expected to reduce withdrawls by 25.5 cfs. Target flows of 100 cfs during irrigation season are expected to be achieved approximately 75% of the time in the late summer, but varies by season. (See tables in CIDMP, Chapter 6)	Restoration
23	Upper Dungeness roads decommissioning - 25/100 yr	Decommission and stabilize selected roads within the National Forest.	Restoration
25	Dungeness Bay water quality restoration - 25/100 yr	Implement the Dungeness Bay Cleanup Plan.	Restoration
26	Graysmarsh/Gierin Creek restoration - 25/100 yr	Restore 100 acres of saltmarsh habitat and associated lower portion of Gierin Creek.	Restoration
27	Small estuary restoration - 25/100 yr	Re-establish tidal flow and upstream connectivity in small estuaries near the Dungeness River mouth, including Cooper, Meadowlark, and Casselary Creeks.	Restoration

6-24-04 FINAL

Biological Significance Scenarios

Biological significance categories are A to E, with A producing the highest benefits per actions and E the lowest.

		25 year						
		A	**B**	**C**	**D**	**E**	**Current**	**Buildout**
Adult	**Productivity**	4.65	7.04	7.63	7.78	7.78	3.68	3.28
Adult	**Abundance**	1095	2227	2490	2555	2555	699	649
Adult	**Diversity**	0.93	0.99	0.99	0.99	0.99	0.70	0.68
Adult	**Capacity**	1395	2596	2866	2932	2932	959	934
	Spawners at MSH	347	610	662	674	674	239	231
	MSH harvest rate	0.54	0.62	0.64	0.64	0.64	0.48	0.45
Juvenile	**Productivity**	385	471	480	484	484	251	212
Juvenile	**Abundance**	148814	202671	212374	214377	214377	79823	70761

		100 year						
		A	**B**	**C**	**D**	**E**	**Current**	**Buildout**
Adult	**Productivity**	4.63	7.61	8.12	8.29	8.29	3.68	3.28
Adult	**Abundance**	1086	2391	2591	2667	2668	699	649
Adult	**Diversity**	0.93	0.99	1	1	1	0.70	0.68
Adult	**Capacity**	1385	2752	2955	3033	3034	959	934
	Spawners at MSH	345	636	673	688	688	239	231
	MSH harvest rate	0.54	0.64	0.65	0.65	0.65	0.48	0.45
Juvenile	**Productivity**	379	480	486	491	491	251	212
Juvenile	**Abundance**	144269	206660	211244	214065	214109	79823	70761

Scenario A includes actions 22 and 2 only (not 2A because of redundancy)
Scenario B includes actions 14, 23, 15a, 16, 13, 5, 1a, 10, 15b, 27, 11a plus Scenario A actions
Scenario C includes actions 6, 17, 1b, 25, plus Scenario A and B actions
Scenario D includes actions 9, 18, 21c, 21d, 3, 26, 7, 21a, 4 plus Scenario A, B, and C actions
Scenario E includes all estuary and freshwater actions (excluding action 2a)

NOTE 1: Biological Significance Scenario E is the same scenario as Low Likelihood Scenario
NOTE 2: All results adult and juvenile results are based on NO HARVEST

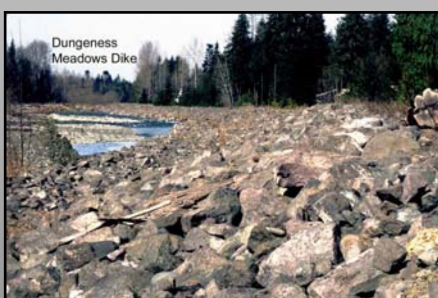
6-24-04 FINAL
Likelihood of Implementation Scenarios

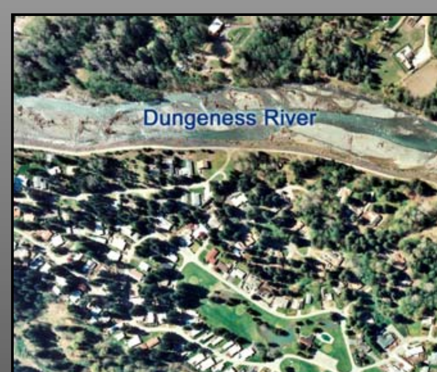
		25 year				
		High[a]	Medium[b]	Low[c]	Current	Buildout
Adult	**Productivity**	5.83	7.71	7.78	3.68	3.28
Adult	**Abundance**	1764	2544	2555	699	649
Adult	**Diversity**	0.98	0.99	0.99	0.70	0.68
Adult	**Capacity**	2129	2923	2932	959	934
	Spawners at MSH	517	674	674	239	231
	MSH harvest rate	0.59	0.64	0.64	0.48	0.45
Juvenile	**Productivity**	439	482	484	251	212
Juvenile	**Abundance**	179117	213955	214377	79823	70761

		100 year				
		High[a]	Medium[b]	Low[c]	Current	Buildout
Adult	**Productivity**	6.48	8.21	8.29	3.68	3.28
Adult	**Abundance**	1919	2649	2668	699	649
Adult	**Diversity**	0.99	0.99	1	0.70	0.68
Adult	**Capacity**	2269	3016	3034	959	934
	Spawners at MSH	541	685	688	239	231
	MSH harvest rate	0.61	0.65	0.65	0.48	0.45
Juvenile	**Productivity**	462	490	491	251	212
Juvenile	**Abundance**	188684	213491	214109	79823	70761

a = High Scenario Actions are 1a, 2a, 4, 5, 6, 15a, 19, 21a, 21b, 21c, 21d, 23, 25
b = Medium Scenario Actions are 1b, 2, 3, 7, 8, 10, 11a, 12, 13, 14, 16, 17, 18 plus High Actions (excluding action 2a)
c = Low Scenario Actions are all freshwater and estuary actions (excluding action 2a)

NOTE 1: Low Likelihood Scenario is the same scenario as Biological Significance Scenario E
NOTE 2: All results adult and juvenile results are based on NO HARVEST





A Review of Clallam County Critical Areas Ordinance, 2001 in protecting Riparian Areas - Using the Dungeness River as a Case Study. *Prepared for the Jamestown S'Klallam Tribe by Hansi Hals*

June 2004

A Review of Clallam County Critical Areas Ordinance, 2001 in protecting Riparian Areas - Using the Dungeness River as a Case Study.

I. What is a riparian area and why is it considered a critical area?

Riparian areas occur adjacent to rivers, streams, seeps, and springs. Riparian areas are transitions between aquatic and upland habitats and contain elements of both aquatic and terrestrial ecosystems. Riparian habitat is the habitat (forage, shelter, water) available in a riparian area. Because it is generally a narrow band, riparian habitat covers a relatively small portion of the state (0.5 – 2%), but it provides habitat for a large portion of the State's wildlife. Approximately 85% of Washington's terrestrial vertebrate species use riparian habitat for essential life activities.

Riparian areas are important for wildlife and fisheries for many reasons:
1. Riparian areas have a high diversity of plant species and vegetation structure, thereby providing niches for numerous fish and wildlife species.
2. Riparian areas provide unique habitat features necessary for many fish and wildlife species to survive. This includes forage, nesting/ breeding habitat, and cover for land animals. The linear shape of riparian areas creates high edge (change from one habitat to another).
3. Riparian areas modify the environment (microclimate): an example is vegetation in riparian areas shade streams maintaining cool temperatures needed by most fish. Further, the moisture content in riparian areas makes it highly productive for vegetation and insects.
4. Plant roots stabilize stream banks and control erosion and sedimentation, and vegetation creates overhanging cover for fish.
5. Riparian vegetation contributes leaves, twigs, and insects to streams, thereby providing basic food and nutrients that support fish and aquatic wildlife.
6. Large trees that fall into streams create pools, riffles, backwater, small dams, and off-channel habitat that are necessary to fish for cover, spawning, rearing, and protection from predators. Pools help maintain riffles where gravel essential for spawning accumulates.
7. Riparian vegetation, litter layers, and soils filter incoming sediments and pollutants thereby assisting in the maintenance of high water quality.
8. Riparian areas serve as natural corridors or migration routes.
9. Riparian areas (flood plains) store floodwater reducing downstream flood damage to fish habitat and private property.

Sources:
Johnson, David and Thomas O'Neil, Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, 2001.

Washington Department of Fish and Wildlife, Management Recommendations for WA Priority Habitat Areas, 1997.

II. How does Clallam County's Critical Areas Ordinance (Ordinance No. 709, 2001) protect riparian areas?

A. The following describes the protections provided for the riparian area of the Dungeness River within Clallam County's Critical Areas Ordinance.

Part Three of the Critical Areas Code: Aquatic and Wildlife Habitat Conservation Areas
The entire lower 11 mile reach of the Dungeness River is within the designated critical habitat by the National Marine Fisheries Service (NMFS) for three fish species listed as threatened by the Endangered Species Act - Puget Sound Chinook, Hood Canal/Strait of Juan de Fuca Summer Chum, and bull trout. The NMFS defined critical habitat is now regulated by Clallam County as Class 1 Wildlife Habitat Conservation Areas (adopted March 17, 2000). The Class 1 Wildlife designation provides stricter guidance than the former Dungeness River category of Aquatic Habitat Conservation Area. Regulated development activities which occur within or adjacent to (200 feet landward from Ordinary High Water Mark (OHWM)) Class I Wildlife Conservation Areas require the preparation of a Habitat Management Plan. A template Habitat Management Plan was prepared in April 2000 ("General Habitat Management Plans and Guidance for Threatened Species of Salmonids in Clallam County"). Landowners may utilize the guidance as set forth in the above management plan template or prepare their own. The Critical Areas Code lists specific criteria privately prepared plans must include. The general guidance offers:

For Rivers and Creeks –

1. Development should be located at least one site potential tree height from the OHWM and outside of the jurisdictional area (200' landward from the OHWM) if possible given lot dimensions.
2. All native vegetation should be retained within one site potential tree height of the OHWM. Where the native vegetation no longer exists within one site potential tree height, native cover shall be re-established.
3. Construction of new dikes or bulkheads will generally occur within Channel Meander Hazards associated with riverine systems. These types of developments will require a Variance (Public Hearing before the County's Hearing Examiner) from the CAO and will require the preparation of a geotechnical report in addition to a Habitat Management Plan. Clallam County will be allowed to monitor compliance with the Habitat Management Plan into the future. The CAO (27.12.315 section 12. (7)) states that stabilization projects shall not be located within the channel meander hazard.
4. Requires a notice to Title of the Class I jurisdictional area and a statement that a Habitat Management Plan has been formulated for this parcel and is on file with Clallam County Department of Community Development. All future development on this parcel shall occur in accordance with provisions of the Habitat Management Plan.
5. Prior to any zoning or comprehensive plan amendment, an environmental assessment shall be approved by Clallam County to determine if the proposal would be consistent with the Critical Areas chapter and if mitigation measures would be necessary if the proposal were approved. The review shall occur before any SEPA threshold determination.
6. All Forest Practices (timber harvesting and associated development activity) shall maintain the potential tree height buffer from Ordinary High Water Mark (OHWM). In addition, those lands harvested and not reforested under a Class I, II, or III permit and which do not meet the standards of this chapter and are later converted to non-forest use shall have all local permits withheld for six years.

Part Four: Geologically Hazardous Areas

Two of the purposes listed within this section are directly in line with the purposes of the protection strategy – 1. Provide standards to protect human life and property from potential risks and 2. Control erosion and siltation, and protect water quality in order to protect habitat for fish and marine shellfish, and allow for natural movements of streams and rivers within a floodplain. The **channel meander hazard**, defined as a landslide hazard area, **is described as areas subject to the natural movement of stream channel meanders associated with alluvial plains where long term processes of erosion and accretion of the channel can be expected to occur**. The meander hazard **does not include 1) areas protected from channel movement due to the existence of permanent levees and 2) areas outside meander hazard that may be subject to stream channel avulsion** (rapid movement of the entire stream). Clallam County has mapped the area considered a channel meander hazard. This section offers the following protection:

1. Buffer of 50' from the edge of the channel meander zone for all major and minor development.
2. Buffers that are in their natural state should not be altered.
3. Specific guidance provided for buffer reduction and hazard tree removal.
4. For land divisions – no lot or parcel shall be created within landslide hazard unless geotechnical report certifies it will be stable. Land divisions containing landslide hazard areas are prohibited unless each lot contains at least one building site. The hazard area and buffer shall be noted on final plat with a statement that subsequent development will comply with critical areas standards.
5. Notice to the Title when a development proposal is submitted. Statement containing notice of critical area and buffer, and applicability of part four of the Critical Areas Code.
6. Prior to any zoning or comprehensive plan amendment, an environmental assessment shall be approved by Clallam County to determine if the proposal would be consistent with the Critical Areas chapter and if mitigation measures would be necessary if the proposal were approved. The review shall occur before any SEPA threshold determination.
7. All Forest Practices (timber harvesting and associated development activity) shall maintain the 50' buffer from edge of geologic hazard area. In addition, those lands harvested and not reforested under a Class I, II, or III permit and which do not meet the standards of this chapter and are later converted to non-forest use shall have all local permits withheld for six years.

Part 5: Frequently Flooded Areas

The land defined as frequently flooded area is made up of "floodway" land (the channel of a stream, plus any adjacent areas, that must be kept free of encroachment in order to discharge the base flood without cumulatively increasing water surface elevation more than one foot) and "special flood hazard areas" (classified by the Federal Emergency Management Agency in the *Flood Insurance Study of Clallam County, December 5, 1989*). The frequently flooded areas designation offers the following protection:

1. In designated floodways construction or reconstruction of residential structures is prohibited. There are exceptions listed for existing homes (Part 5, section 6a).
2. In designated flood hazard areas residential, commercial and industrial buildings are prohibited unless constructed or placed on lots or parcels of land platted by a final plat approved by December 10, 1980 for the Dungeness River.
3. Critical facilities are prohibited. Critical facilities include but are not limited to: schools; hospitals; police, fire and emergency structures; nursing homes; pipelines; airports; municipal water and sewer facilities; highways.
4. Any land divisions must have one building site for each lot that is not within the frequently flooded area and is at least one acre in size.
5. Recreational vehicles are restricted in frequently flooded areas to fewer than 180 consecutive days. They must be fully licensed and ready for highway use, be on its wheels, and have no permanently attached additions.
6. For any property on which a development proposal is submitted there shall be a notice to Title filed. The notice shall include the presence of the critical area and a statement describing possible limitations in the critical area.
7. Prior to any zoning or comprehensive plan amendment, an environmental assessment shall be approved by Clallam County to determine if the proposal would be consistent with the Critical Areas chapter and if mitigation measures would be necessary if the proposal were approved. The review shall occur before any SEPA threshold determination.

Part Six: Critical Aquifer Recharge Areas

Intent #3 of this part of the Critical Areas Code, to recognize the relationship between surface and groundwater resources, is also within the broad purpose of the protection strategy. The Critical Aquifer Recharge Area is defined as an area which contains hydrogeologic conditions that provide the recharge to an aquifer which is a current or potential potable water source and is highly susceptible to the introduction of contaminants. The entire area considered by the Dungeness Protection Strategy is mapped as a Critical Aquifer Recharge Area and offers:

1. Specific criteria and regulation for aboveground/ underground storage tanks and vaults.
2. All new agriculture or hobby farms shall use best management practices concerning animal keeping, animal waste disposal, fertilizer use, pesticide use, waste water applications, and stream corridor management. All new farms shall seek the technical assistance of Clallam Conservation District and Cooperative Extension Agent.
3. Any land division proposals will be evaluated for impact to groundwater. In designated floodways construction or reconstruction of residential structures is prohibited. There are exceptions listed for existing homes (Part 5, section 6a).

Prior to any zoning or comprehensive plan amendment, an environmental assessment shall be approved by Clallam County to determine if the proposal would be consistent with the Critical Areas chapter and if mitigation measures would be necessary if the proposal were approved. The review shall occur before any SEPA threshold determination

III. How is the Critical Areas Code inadequate in protecting the riparian functions of the Dungeness River?

The following describes inadequacies of Clallam County's Critical Areas Ordinance in protecting the riparian areas of the Dungeness River.

1. Inadequate Restoration of Buffer Zones The buffer widths prescribed in the Critical Areas Ordinance are based on the assumption that the buffer has not been degraded. In many locations along the Dungeness River, buffers have been degraded by past land use practices (more than 20% of the west bank adjacent to the channel meander zone is unvegetated, and more than 15% of the east bank adjacent to the channel meander zone is unvegetated)[1]. In order for buffers to be effective in these areas, the buffers either need to be increased in width or restored. Restoration is encouraged in the Critical Areas Code, but it is not being adequately addressed.[2] The guidance for Threatened Species of Salmonids in Clallam County (April, 2000) states that where native vegetation no longer exists within one site potential tree height, native cover is re-established. A site potential tree height for most of the Dungeness River is up to 150' (Clallam County Soil Survey). It has been over three years since this guidance was adopted as regulation, and many cleared areas (approximately 130 acres/ from 2003 spring aerials) remain. On one parcel vegetation was removed within the buffer area, affecting over two acres of riparian land. In most cases, full recovery will take several decades to achieve. Restoration of buffer zones should be required instead of encouraged.

2003 Aerial photograph shows new structure close to Haller Dike, however no restoration activity is evident.

Recommendation: Native cover should be re-established within one site potential tree height for the entire lower river (RM 0.0 to RM 10.5) by 2010. Clallam County shall provide technical assistance and cost-share program information to landowners. Parcels that have adequate vegetation should receive a modest tax incentive each year through 2010 as an incentive.

[1] H. Hals: Analysis of spring 2003 aerial photographs
[2] List of Parcels with new development but do not appear to have fulfilled restoration requirement

2. Channel meander hazard buffer requirements should be as stringent as active channel buffers. The buffer requirement for the channel meander hazard is 50' from the edge of the channel meander zone for all major and minor development. The channel meander zone by definition includes areas subject to the natural movement of stream channel meanders. By definition, the active channel will move and migrate within the channel meander zone. It is therefore inadequate to have the channel meander hazard buffer less than the active channel buffer (which is 75'minimum for the Dungeness River for minor new development, 150' for major new development).

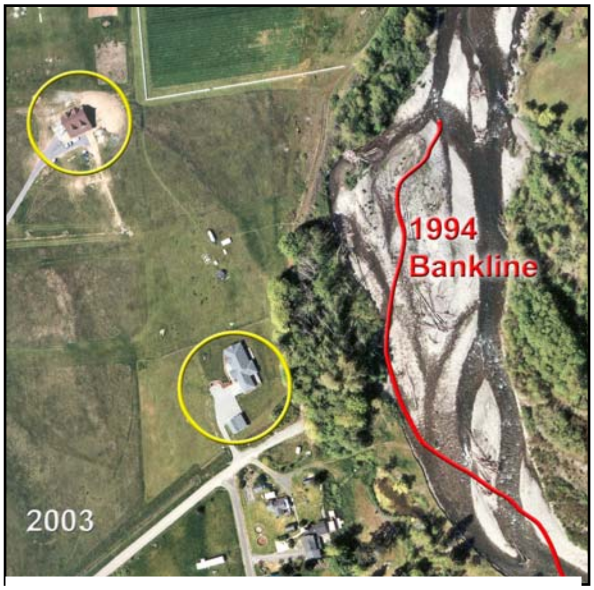


Figure 1

Figure 1: *An example of why CMZ buffer requirements should be more stringent.* The lower home shown in the 2003 photograph has been built approximately 50 feet from the channel meander hazard boundary. The photograph depicts the channel's westward migration --- and illustrates the point that the buffer to the active channel may be reduced to 50' over time, which is inadequate for the protection of the river resources and the home.

Recommendation: The Critical Areas Code should be revised to make minimum stream buffer widths begin at the edge of the channel meander zone.

3. Setback requirements are subject to vague guidance for Threatened Species of Salmonids The guidance for Threatened Species of Salmonids in Clallam County (April, 2000) states that development should be located outside of jurisdictional area (200 feet from the Ordinary High Water Mark) ***if possible***, given lot dimensions. The guidance is unenforceable by the *if possible* caveat.

   Recommendation: Revise the guidance for Threatened Species of Salmonids in Clallam County (April, 2000) so that it states that development should be located outside of jurisdictional area.

4. Enforcement of size restrictions on minor development is lacking
   The critical areas code differentiates between major and minor development, and assigns buffer requirements accordingly. For a single family dwelling to be minor development, all structures; home, deck, garage, etc. included must be less than 4,000 sq. ft. The 2003 aerial photos provide appearance that new minor development may exceed the 4,000 sq. ft. threshold on approximately 50% of the development that has occurred since 1999.[3] Enforcement and monitoring of new development are insufficient.

[3] Parcel list attached of minor new development that appears to exceed 4,000 sq. ft. threshold

Figure 2: *An example of minor new development that may exceed the maximum 4,000 sq. ft. threshold*. (Parcel 042026129060)

Figure 2

Recommendation: Building inspection should include structure's footprint and parcels that exceed size restriction should be penalized.

5. Inadequate riparian buffer requirements
   The 75' minimum buffer width for minor development along the Dungeness River is not adequate to retain various riparian habitat functions as reported in the literature – even if the buffer has not been degraded. (Appendix A. Riparian habitat buffer widths needed to retain various riparian habitat functions as reported in the literature, organized by riparian habitat function; WDFW, 1997 and Appendix B. A Low-Risk Strategy For Preserving Riparian Buffers Needed to Protect and Restore Salmonid Habitat In Forested Watersheds of Washington State, Pollock and Kennard, 1998). While some riparian functions are reported to require over 300', a minimum buffer of 250' is recommended by the Summer Chum Recovery Plan (WDFW and Point No Point Treaty Tribes, April 2000). The buffer widths prescribed in the Critical Areas Ordinance are based on the assumption that the buffer has not been degraded. In many instances the buffer has been degraded and the attempt to encourage restoration is not addressing the degradation adequately.[4]

   Recommendation:
   Clallam County needs to recognize that along the Dungeness River the buffer has been degraded and the established buffer widths based on a functioning buffer are therefore inadequate. Restoration requires more resources. In addition, Clallam County should review buffer widths in light of salmon recovery strategies and adopt a 200' minimum buffer width for Class 1 Wildlife Habitat Conservation Areas. [5]

6. Grandfathering
   Land plats recorded before December 10, 1980 are exempted from the prohibition of building in special flood hazard areas for the Dungeness River.
   Recommendation: Remove grandfather clause exempting building in hazard areas.

7. Map corrections are needed
   The Critical Areas maps for the Dungeness River were revised in October 2001. In May 2002 the U.S. Bureau of Reclamation completed a Physical Processes of the

[4] List of acreage that requires restoration in the Dungeness Riparian Area
[5] List of parcels that could not "fit" minor new development with 200' buffer from cmz

Dungeness River Study including comprehensive maps. A comparison of the BOR maps with the critical areas maps reveals numerous spots where the County maps a critical area smaller in size that the BOR study maps.[6] The County critical areas maps should be revised. For example, the channel meander hazard boundary is inadequate in comparison to the BOR maps on the west bank immediately south of Old Olympic Highway and there are at least five areas where the 100 year floodplain boundary is inadequate in comparison to the BOR maps.

Recommendation: Review County Critical Areas Maps and revise as needed. Initiate review by FEMA to update FEMA maps as well. Provide thorough field investigation and clear definition of channel meander hazard.

8. Exceed minimum standard when possible
A review of the aerial photographs taken in Spring 2003 reveals parcels where owners, while they met the minimum requirements of the critical areas code, could have built further away from the Dungeness River. The County should encourage development with an incentive program (such as the open space public benefit rating table for property taxes) for the widest buffer possible given lot dimensions.[7]

Figure 3: *An example of minor new development that could have provided a larger buffer*. This Knutsen Rd. development meets minimum requirements, but lot dimensions would allow another 100' buffer.

Recommendation: Provide technical assistance to landowners and encourage widest buffers possible given lot dimensions.

Figure 3

[6] Table attached with inconsistencies between County CAO maps and BOR maps described by river reach.
[7] Parcel list attached of new development that could have provided more than the minimum buffer.

Attachment A: List of Parcels with Minor New Development that do not appear to have met Restoration Requirements

Parcel	Street
043011430050	Grandview Dr.
043035440200	River Run Rd.

Attachment B: List of Acreage that needs Restoration in the Dungeness Riparian Area

RailRoad Bridge vicinity (approx. 20 acres)
155 Taylor Cut-Off Rd (4.5 acres)
203 Taylor Cut-Off Rd (10 acres)
81 Traxinger Ln (7 acres)
70 Traxinger Trl (3.5 acres)
133 Curtis Ln. (6 acres)
1225 Taylor Cut-Off Rd. (5 acres)
364 Clover Ln. (6 acres)
Fish Hatchery Rd. vicinity (21 acres)

Attachment B: List of Parcels with Minor New Development since 1999 that Appears to Exceed the 4,000 sq. ft. Threshold.

Parcel	Street
043011140020	Knutsen Farm Rd.
043014140085	Riverview Dr. (had existing structure, added new structure and total footprint appears to exceed 4,000 sq. ft.)
042026129060	Taylor Cut-Off Rd.
043026130150	Taylor Cut-Off Rd.
043035440200	River Run Rd.
042902120080	May Rd.

Attachment C: List of Parcels with Minor New Development since 1999 that could have Provided More than Minimum Buffer Required

Parcel	Street
043011140020	Knutsen Farm Rd.
043035440200	River Run Rd. (new structure)
042902120080	May Rd.

Attachment D: List of Parcels that appear to have Cleared Vegetation within Site Potential Tree Index of OHWM

Parcel	Street
043026120180	Taylor Cut-Off Rd.

Attachment E: River reaches without riparian vegetation in 2003 (within 50' of channel meander hazard (as mapped by Clallam County)).

Reference Landmarks	Approximate West Bank Unvegetated Reaches	Approximate East Bank Unvegetated Reaches
River Mouth (RM 0.0)	RM 0.7 – RM 0.9	
Schoolhouse Br. (RM 1.0)	RM 1.0 – RM 1.25	RM 0.9 – RM 1.9
	RM 2.75 – RM 3.25	RM 2.8 – RM 3.0
Woodcock Rd. (RM 3.25)	RM 3.45 – RM 3.54	
Old Oly. Hwy. (RM 3.8)	RM 3.8 – RM 3.85	
Railroad Bridge (RM 5.6)	RM 4.95 – RM 5.5	RM 6.22 – RM 6.75
Hwy. 101 (RM 6.4)	RM 6.5 – RM 6.8	
	RM 7.3 – RM 7.5	
	RM 7.85 – RM 7.9	RM 7.95 – RM 8.2
Powerline Crossing (RM 8.8)	RM 8.9 – RM 9.3	
	RM 9.5 – RM 9.65	
Canyon Creek (RM 10.8)	RM 10.6 – RM 10.8	

Source: Aerial photographs taken 4-14-03 and 5-6-03 for Jamestown S'Klallam Tribe

Attachment F: List of parcels that could not "fit" minor new development with a 200' buffer to channel meander zone.

Reference Landmark	Parcel Number
Riverview Rd. area	043014149030
Riverview Rd. area	043014149040
Railroad Bridge area	043023110000
Railroad Bridge area	043023110175
Highway 101 area	043023410000
Dawley side channel area	043023440020
Dawley side channel area	043026110200
Dawley side channel area	043026140130
Dawley side channel area	043026140160
May Rd. east bank area	043035440000
May Rd. east bank area	042902110050
May Rd. east bank area	043026110200

Attachment G: **Inconsistencies between U.S. Bureau of Reclamation 2002 study maps and Clallam County Critical Areas Map by river reach**.

Approximate River Mile	**Description of Inconsistency**
RM 3.8 – RM 4.3 (south of Old Oly. Hwy)	BOR map shows active side channels from 1942/43, a larger channel meander zone, and floodplain boundary up to 100' wider.
RM 4.7 – RM 5.6 (straddles Railroad Bridge)	BOR map shows wider floodplain boundary and different channel meander zone.
RM 7.5 – RM 8.2 (Dungeness Meadows)	BOR map shows active side channels from 1942/43 map behind Dungeness Meadows
RM 8.2 – RM 9.1 (straddles powerline crossing)	BOR map shows wider floodplain area
RM 9.5 – RM 10.3 (May Rd to hatchery area)	BOR map shows wider floodplain area

B. What is the watershed vision for salmonid recovery and other interests and needs in the watershed? How do you envision balancing and complementing the various needs and the interests of your watershed?

1. <u>Habitat</u>

In response to the problems facing the Dungeness watershed community, the Dungeness River Management Team was formed by Clallam County in 1988 to begin a collaborative effort by stakeholders to identify solutions to declining salmonid populations, increased property damage by flooding, and disputes over water resources. Early questions posed by the DRMT led to scientific studies addressing salmonid populations, instream flows, water quality, stream geomorphology, forest practices and a host of other issues. Following a number of planning processes, the DRMT was revised and reinstated in 1995 by a rare joint resolution of the Clallam County Board of Commissioners and the Jamestown S'Klallam Tribal Council. The DRMT is comprised of citizens and agency personnel representing the following interests:

Clallam County
Jamestown S'Klallam Tribe
City of Sequim
Clallam Conservation District (non-voting)
Dungeness - Quilcene Water Resources Regional Planning Group
North Olympic Salmon Coalition / Sports Fishers
North Olympic Land Trust
Property Owners (2)
Protect the Peninsula's Future
Sequim-Dungeness Agricultural Water Users Association
US Fish & Wildlife Service - Dungeness Nat'l Wildlife Refuge (non-voting)
US Forest Service (non-voting)
US Washington Department of Ecology / Puget Sound Action Team
Washington Department of Fish and Wildlife

The enclosed publication, "Restoring the Dungeness" (JST, 2003) provides an overview of the DRMT, along with a description of the criteria which the team developed to review and prioritize salmon recovery actions. Page 82 includes a list of the team's mission statement and goals, which are repeated here as follows.

> THE DRMT MISSION STATEMENT: *"To preserve and enhance the Dungeness River Watershed Planning Area through an ecosystem approach to restore its physical and biological health."*

The GOALS OF THE DUNGENESS RIVER MANAGEMENT TEAM:

Goal 1: Prevent loss of life and property from flooding.

Goal 2: Work toward restoration of riparian and aquatic ecosystems within the Dungeness River watershed and estuary to mutually benefit wild and native salmonids and human residents.

Goal 3: Protect and enhance water quality and quantity in the Dungeness River Watershed Planning Area to support all beneficial uses, including an adequate clean water supply for current and future human needs and a higher productive capacity of fish and wildlife habitats.

Goal 4: Encourage cooperation, coordination and management among all levels of government and citizenship in protecting ground and surface water quality and quantity.

Goal 5: Exchange information on technical studies, issues and projects occurring in the Dungeness River Watershed Planning Area.

Goal 6: Promote public participation and education about the watershed so as to develop and encourage a community stewardship ethic and help prevent / resolve conflict.

Goal 7: Support, promote and facilitate implementation of relevant management plans and strategies developed for this area and endorsed by the DRMT.

The DRMT vision for the watershed: "Forests, Farms, Fish and Friends, Sharing a Home Together."

"Restoring the Dungeness" summarizes several years of community and technical work in developing a river restoration strategy for the Dungeness Watershed. The document was endorsed by the DRMT in 2004 to confirm that it is an accurate representation of the DRMT's watershed vision. (Letter attached at the end of Question B.)

Key planning processes for the watershed that have occurred over the past 16 years include the Dungeness River Area Watershed Management Plan (1993) and Clean Water Strategy (2000) which addressed water quality, Dungeness-Quilcene Water Resources Management Plan (1994) focusing on water quantity, comprehensive flood management plans, detailed water conservation plans for the Dungeness irrigation system, Federal watershed analyses, and salmon recovery planning. Most recently the DRMT was involved in the development of the Water Resource Inventory Area 18 watershed management plan for the Elwha-Dungeness region under the auspices of the Watershed Planning Act (2514). The 2514 Plan included several water conservation strategies along with other habitat management recommendations. Relevant excerpts of this plan are contained at the end of the Question B response.

2. Hatchery Management

One of the outgrowths of the formation of the Dungeness River Management Team in the 1980's was the request by elected officials and citizens to address the decline in the abundance of Chinook salmon. Extensive in-river spawner escapement surveys were conducted, consisting of snorkel surveys by the USFWS and redd monitoring by WDFW. Concern for the long-term future of the stock was heightened by the unstable ecological conditions in the Dungeness River. The depressed and vulnerable status of the stock led to the establishment of the Dungeness River Chinook Salmon Rebuilding Project.

The overall goal of the project is, "To provide a self-sustaining, natural population that maintains the genetic characteristics of the existing Chinook salmon stock and meets the agreed-to escapement goal in three out of every four years by the year 2008. The goal of the rebuilding program is to provide a healthy, self-sustaining population that maintains the genetic characteristics of the existing Chinook salmon stock.

The intent is to achieve a population size compatible with the Dungeness River basin, that will maintain an adequate effective population size, and that can withstand moderately adverse ecological impacts. It is recognized that the long-term success of the rebuilding program is dependent upon significant restoration of Chinook salmon habitat in the Dungeness River and correcting other factors that limit production. The key procedure selected for rebuilding the Chinook salmon population in the Dungeness River is development of, and expansion from, a captive broodstock.

It should be recognized that the use of captive broodstock methodology for wild stock restoration is experimental and is undertaken with some level of risk to genetic integrity and the long-term health of the stock(s)" (Smith and Wampler, 1995). The Dungeness River Chinook Salmon Rebuilding Project Progress Reports, 1992-1993 and 1993-1998, list objectives for genetic parameters, natural production, production, and monitoring and evaluation.

Additional information on the Dungeness Chinook Captive Broodstock Program is contained in the response to Question C. Detailed information or a copy of the progress reports on the rebuilding effort can be made available upon request.

The U.S. Fish & Wildlife Service recognizes that certain recovery units may require the use of artificial propagation techniques in order to meet recovery criteria. However, the overall guidance is that every effort should be made to recover a species in the wild before implementing an artificial propagation program. Because recovery for bull trout entails the identification and correction of threats affecting bull trout, artificial propagation programs should only be considered once the reasons for decline have been addressed (U.S. Fish & Wildlife Service, 2004).

3. Harvest

As expressed in the 2001 Puget Sound Comprehensive Chinook Management Plan, the co-managers goal is:

> *"to protect, restore, and enhance the productivity, abundance, and diversity of Puget Sound Chinook salmon and their ecosystems to sustain ceremonial, subsistence, commercial, and recreational fisheries, non-consumptive fish benefits and other cultural and ecological values. Achievement of this goal requires that harvest be constrained within limits appropriate to the productivity of each stock. Harvest management must work in concert with habitat protection and restoration…Ultimately, success of the Comprehensive Chinook Management Plan includes restoring populations to levels that provide meaningful harvest on a sustained basis."*

Although there is currently no directed fishery for bull trout on the Olympic Peninsula, it is important to recognize that the incidental catch of bull trout can occur during general “trout” and salmon fisheries. Incidental hooking mortality varies by gear type and incidental mortality associated with gill-net fisheries that target salmon and steelhead varies by mesh size and timing, location, and duration of net sets.

4. Integration of Habitat, Hatcheries and Harvest

Habitat is the key to recovery of productive, sustainable natural populations of Chinook and bull trout in the Dungeness River. This is especially true in the lower river and estuary for Chinook because of the habitat loss and degradation in these areas historically supported much of the Chinook population. Without restoration and protection of habitat in sufficient quantity and quality, the population levels of Chinook and bull trout cannot be recovered to meet recovery goals or satisfy criteria for a viable salmonid population.

For Chinook the hatchery and harvest components of recovery are complementary to the habitat component. The Chinook hatchery program serves as a stopgap measure to reduce risk of extinction by increasing freshwater survival of Chinook. The higher survival increases the numbers or adults returning to the river. The hatchery program thus helps maintain the population at a level where it is at lower risk of extinction until there is sufficient habitat recovery to support productive, natural Chinook production. Once the naturally spawning population becomes viable, the hatchery program may be reduced or terminated as the situation recommends.

Harvest management controls fisheries impacts on the Chinook population, helping to maintain and build the numbers of returning adults. There are currently no fisheries targeting Dungeness Chinook and, by setting a low ceiling on the harvest rate in Washington State, incidental harvest of fisheries on other stocks and species is kept at an extremely low level (projected at less than 6% of the Dungeness Chinook run in 2004). Efforts continue to bring about reductions of potential impacts from the out of state fisheries of Alaska and Canada.

Higher Dungeness Chinook escapements in recent years suggest that the management of hatcheries and harvest, at least initially, has been successful in building the run to maintenance levels. Successful implementation of habitat restoration and protection measures will in time provide the environment for a productive, sustainable natural Chinook population in the Dungeness River. As presented here, there are no conflicts in objectives or implementation between the action plans for habitat, hatcheries and harvest. Taken together, they form an integrated recovery strategy.

References Cited in Question B Response are contained in the list of "Dungeness Restoration Plans and Activities (1989 - present) which is attached to Question C.

Attachments for Question B Response:

Letter from DRMT endorsing "Restoring the Dungeness"
Excerpts from 2514 Watershed Management Plan

3.1.1 FUTURE WATER SUPPLY STRATEGIES FOR PEOPLE AND FISH

Strategies for future water supply are described below. Each strategy is cross-referenced to the sections of Chapter 3 that contain the principal recommendations that would implement it.

- ***Emphasize Water Conservation:*** Emphasize implementation of all cost-effective water conservation measures, including public outreach and education as well as "building in" conservation for the long term through building and land use requirements. *(Sections 3.1.2(B), 3.1.7, and 3.6.)*
- ***Protect Instream Flows:*** Retain flows in all WRIA 18 streams and rivers to protect instream values. Establish instream flows to protect surface waters not already appropriated and close certain WRIA 18 streams and rivers (see Section 3.3.2) to new appropriations, at least during low-flow seasons. Minimize out-of-basin exports of water from WRIA 18 streams (however, the policy of "regionalizing" the use of existing Elwha River water rights in West WRIA 18 to meet new water demand would export water from the Elwha eastward as far as the Morse Creek watershed). *(Recommendation 3.1.3(A) and Section 3.3.2)*
- ***Continue Irrigation Water Management:*** Continue the implementation of Dungeness water management, water conservation, and water transfers under the Trust Water Agreement. Continue to implement water leases and land fallowing during low flow periods to reduce irrigation water demand and to protect Dungeness River flows. Complete and implement the CIDMP to guide irrigation water management. *(Section 3.1.8)*
- ***Emphasize Public Water Supply:*** Encourage new water demand to be served by the existing Group A public water systems wherever feasible. *(Sections 3.1.2(C) and 3.1.5)*
- ***Limit Exempt Wells where Public Water Service can be Feasibly Provided:***[1] Limit the proliferation of new exempt wells within the framework of potential groundwater reserves for new development. Require new development to be served by public water systems rather than exempt wells wherever public water service is available in a reasonable timeframe and is cost-effective. *(Section 3.1.4(C) and 3.1.5(C))*
- ***Regionalize West WRIA 18 Water Supply:*** Regionalize new public water service in West WRIA 18 to meet new demand largely from existing Elwha River and other Group A water rights. Encourage the use of existing interties between the larger Group A public water systems (e.g., City of Port Angeles and Clallam PUD No. 1), and new interties to smaller systems to distribute Elwha River water to meet new demand in West WRIA 18 to the extent feasible and cost-effective. *(Section 3.1.5(D))*

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[1] "Exempt wells" are exempt from the requirement to apply for a water right. However, they are not exempt from other requirements. An exempt well may be used for stockwatering, or to water a lawn or noncommercial garden up to one-half acre, or for single or group domestic use or industrial use not exceeding 5000 gallons per day (RCW 90.44.050).

- ***Investigate Groundwater Supply for New East WRIA 18 Water Supply:*** Focus upon ground water and water gained through savings or management (i.e. storage) as the resources with the most potential for residential and municipal development in East WRIA 18. In this area, direct all new wells, exempt or non-exempt, to the middle and deeper aquifers wherever these sources occur and provide a minimum 100' wellhead protection zone around all wells. Develop a legal mechanism to allocate an agreed-upon amount of saved water to development, while protecting instream flows and existing water rights. Emphasize water service to new development from the existing larger systems (City of Sequim, Clallam PUD) wherever feasible. Explore feasibility of utilizing deep aquifer sources to meet new water demand growth, if such development can demonstrate no impairment to limited surface waters. *(Section 3.1.4)*
- ***Availability of Water for Future Appropriation:*** As a mandatory element of watershed planning, Planning Units must indicate the availability of water for future appropriation.[2] The WRIA 18 future water supply strategy relies on the use of existing municipal water rights (Elwha River) in West WRIA 18, and on existing water systems, water management strategies, deep groundwater and a potential groundwater reserve for East WRIA 18 subbasins. A limited groundwater reserve, if established for the Dungeness planning area, would utilize water savings from efficiency and conservation, subject to existing law and the development of an intergovernmental agreement. *(Sections 3.1.4(D), 3.1.5(D), and 3.3.2)*
- ***Take Advantage of Water Reclamation and Reuse:*** Take advantage of all practical water reclamation and reuse opportunities (the most significant untapped opportunities are located in West WRIA 18). *(Section 3.1.10)*
- ***Study New Storage:*** Study new storage opportunities, including aquifer storage and recovery and new off-channel surface storage. Design or retrofit new land development to facilitate groundwater recharge and runoff to wetlands, small streams and groundwater. *(Section 3.1.9)*

[2] Water may be appropriated by application to the Department of Ecology for a new water right.

3.1.4 Groundwater Supply Sources

Issue: Groundwater from deeper aquifers may be the source on which East WRIA 18 will rely for future water supply in order to conserve surface water for instream values and protect public health. It also has some potential to provide storage that could mitigate peak water demand impacts for West WRIA 18 public water systems. It is the principal source of water for single and small group domestic systems that are remote from Group A public water systems (using exempt wells). Key issues include (1) hydraulic continuity between surface and ground waters; (2) the protection of surface water in WRIA 18 without closing off access to groundwater supply; (3) whether sufficient groundwater exists to provide a reliable supply to meet future demand growth in East WRIA 18; and (4) the proliferation of exempt wells.

Existing Condition and Current Actions

New groundwater rights in hydraulic continuity with surface water may generally not be issued by Ecology when streams are closed, when senior surface or groundwater rights would be impaired, or when an instream flow rule is in effect and minimum flows are not being met. The Clallam County Critical Areas Ordinance (Part Six) protects critical aquifer recharge areas.

Dungeness Planning Area/East WRIA 18: Groundwater is becoming well characterized in East WRIA 18, with past work by the USGS and a groundwater model recently developed with funding by the Department of Ecology (Ecology 2002). Recent studies have been completed by the USGS and BOR (Thomas et al. 1999, Simonds and Sinclair 2002, Bountry et al. 2002). USGS studies (Thomas et al. 1999) show that East WRIA 18 surface water, the shallow aquifer, and deeper aquifers are hydrologically connected. This could seriously constrain the ability to use groundwater supply to meet new water demand growth. Because hydraulic continuity diminishes in volume with depth, withdrawals from deeper aquifers may have substantially less impact on surface water (Thomas et al. 1999).

The City of Sequim responded to the 1994 DQ Plan recommendations by assessing the ability of deep wells at the Port Williams Wellfield to meet current and future needs. Based on the study, the City reduced the use of their Ranney System to a minimum and substantially reduced use of the Silberhorn Wellfield. A second study compiled all information from well logs, creek flows, precipitation, irrigation, and water quality sampling. The City completed its Water System Comprehensive Plan in November 2000, incorporating findings of this and other studies. The City has wellhead and watershed protection programs for City's aquifer recharge areas. The City worked with Ecology and DOH to assess requirements for filtration. It was determined that the Ranney system is a groundwater source not under the influence of surface water. The City is not required to provide filtration from this source.

Elwha-Morse Planning Area/West WRIA 18: Groundwater supply is not well characterized in West WRIA 18, however the Department of Health believes that wells in West WRIA 18 will not likely yield sufficient production for significant public water supply (pers. comm. John Ryding, DOH Regional Engineer). Studies underway to assess the potential for aquifer storage and recovery in West WRIA 18 suggest that aquifers are highly variable in their extent depth, are not large, and are generally not contiguous (Pacific Groundwater Group, unpublished data). No large pumping wells were identified, but many smaller wells exist. Preliminary conclusions suggest that groundwater discharge from unsaturated areas is relatively rapid. The Clallam syncline (an east-west trough cutting across West WRIA 18) and areas on plains between the incised stream drainages hold some potential for groundwater.

Exempt Wells[3]: RCW 19.27.097 provides that a County or City may impose conditions on building permits requiring connection to an existing public water system where the existing system is willing and able to provide safe and reliable potable water to the applicant with reasonable economy and efficiency. Currently, the County follows an agreement with the City of Sequim (the "SERP"). RCW 18.104.040 gives the departments of Health and Ecology joint authority to limit well construction in areas requiring intensive control of withdrawals. More than 5000 wells have been included in East WRIA 18 as part of groundwater modeling there.

Consolidation of Exempt Wells: RCW 90.44.105 allows consolidation of exempt wells with existing water systems.

Desired Conditions and Outcomes

- A safe, sufficient, and reliable long-term public water supply.
- Protection of surface stream flows in hydraulic continuity with groundwater withdrawals where streams are closed or minimum instream flows are in effect.
- Protection of groundwater quality in the development of new water supplies.
- Sustainable long-term use of groundwater.
- Resumption of water right processing which allows for orderly development meeting new water demand without impairment to surface water flows, groundwater and existing users.

Recommendations

A. Groundwater Withdrawals:

1. Allow groundwater withdrawals from deeper aquifers in continuity with surface water if impacts on stream flow are mitigated. Mitigation should address impacts to flows, water quality and temperature. For example, flow mitigation might be accomplished by returning an amount of water to the potentially affected stream reach equivalent to the calculated impact. This will be refined in intergovernmental agreements, as recommended below, in C-3 (a) and (b).
2. For all well construction activity in WRIA 18, follow and enforce the State Minimum Standards for Construction and Maintenance of Wells and the Water Well Construction Act or relevant Federal standards.[4]

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[3] "Exempt wells" are exempt from the requirement to apply for a water right. However, they are not exempt from regulation in the same manner as all other appropriations of water. An exempt well may be used for stockwatering, or to water a lawn or noncommercial garden up to one-half acre, or for single or group domestic use or industrial use not exceeding 5000 gallons per day.

[4] DQ recommendation C.11.4

3. Encourage all new water supply wells, including exempt wells, to be drilled to the second aquifer or lower in the Dungeness Planning Area/East WRIA 18. Also see 3.1.4(D) for further information on groundwater withdrawals in the Dungeness area.

B. Seawater Intrusion:

1. Seawater intrusion of water supply wells is known to have occurred in the past near the shoreline of WRIA 18. Given increasing development pressure throughout WRIA 18 and reduced irrigation recharge in East WRIA 18, the County and Cities should consider adopting a seawater intrusion policy, since areas of risk for seawater intrusion occur all along the WRIA 18 coastline. Review other seawater intrusion policies for potential ideas (Island, Jefferson, San Juan counties).
2. Develop subregional water management plans for areas where potential seawater intrusion has been documented.[5]
3. The County should consider requiring chloride tests as part of potable water requirements for building permits in some cases, such as within 1000 ft. of the shoreline or a documented exceedance of the drinking water standard for chloride (250 mg/L).

C. Exempt Well Regulation:

1. The County should undertake an outreach program to educate well drillers and landowners of the need to receive approval as recommended in this section before drilling new exempt wells. *(See Recommendations, Section 3.6.3)*
2. New exempt wells should be drilled only where public water service is unavailable. Unavailable means not within a reasonable timeframe, is not cost-effective, or is not feasible. If new development lies within a reasonable distance from the boundaries of the service area of a public water system, that public water system should have been contacted and requested to provide service prior to land use approval.
3. Clallam County should approve building permits served by exempt wells only if public water service is unavailable.

   a) The County should allow exempt wells to serve new development in East WRIA 18 according to the intergovernmental agreement to be developed (see Recommendation 3.1.4 (D) below). *(See Section 3.6.3 with regard to the interaction between wellhead and septic zones of control and with regard to County oversight on well siting.)*

   b) In West WRIA 18, where stream closures have been recommended or established by rule (or indicated by the SWSL[6]), exempt wells may still be

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[5] DQ recommendation C.11.9

[6] Surface Water Source Limitation (SWSL): In many small streams across the state, restrictions to protect fish already exist on some water right permits. Under RCW 77.50.050 the Department of Fish and Wildlife (WDFW) reviews water right applications and advises Ecology as to whether sufficient stream flow would remain to support fish populations if the water right were granted (WDFW's advisories are called SWSL files). For example, WDFW might advise issuing a water right with a **"low flow proviso,"**

developed according to exceptions developed in an intergovernmental agreement between the State and the County, at minimum. This agreement will be developed by summer 2004.

4. As part of the building permit review process, the County should advocate and require water conservation using best available designs, technologies, and current practices.

5. Where new development is proposed and Group A public water service is unavailable as described in Recommendation C-2 above, formation of a water system is encouraged, and Ecology should consider issuing a water right for those systems.

6. Without good cause, those users currently connected to public water service should not be allowed to disconnect in order to use a new exempt well or to shift water use to an existing exempt well. Such users also should not be allowed to drill a new exempt well to augment water supply. Use of existing exempt wells should be discouraged, especially during late summer.

7. Consolidation of exempt wells to public water rights and service from existing Group A systems is encouraged. The plumbing for unused wells should be removed and the well properly decommissioned or dedicated to scientific purposes.

8. WRIA 18 recommends to the legislature that the RCW 90.44.050 exemption for individual residences (and associated outdoor water use) should be reduced to a more realistic withdrawal volume, such as 500 gpd. This would not apply to wells serving Group B systems.

D. Intergovernmental Agreement for Dungeness Planning Area Groundwater Withdrawals: (the following version was accepted by the subcommittee on February 3, 2004)

Note: The Lower Elwha Klallam Tribe decided to abstain from voting on this recommendation, as mentioned in their cover letter to this plan.

Surface water flows in the Dungeness planning area of WRIA 18 and 17 are seasonally limited, with late season flows generally providing much less water than that needed to support both offstream uses and healthy fish stocks and ecosystems. Technical studies and the results of groundwater modeling for east WRIA 18 indicate a significant connection between the Dungeness River and area aquifers. This situation has contributed to a delay in decision making on water right applications. The current pattern of water development and unmanaged withdrawals, including use of wells exempt from water right permits, poses risks to water quality and stream flows.

Clallam County, the Department of Ecology, and the Jamestown S'Klallam Tribe will work over the next six months to create an intergovernmental agreement

requiring diversion to cease when stream flow drops to the level specified by WDFW on the water right. When WDFW judges that diverting any additional water would leave insufficient water to support fish, they might advise that all water right applications be denied for the entire stream. This has led Ecology to **close** some streams to further consideration of water right applications.

identifying a groundwater reserve or other water management vehicle consistent with existing law that will facilitate land use planning, managed growth and protection of instream flows in the Dungeness watershed. The following shared goals of the governments will be addressed in the intergovernmental agreement:

- Protect, restore, and increase flows in the Dungeness River necessary for fish and wildlife populations and habitat, particularly during critical periods of the year;
- Provide certainty in meeting the future water needs of people, while protecting existing rights and without reducing or otherwise adversely altering existing flows that are necessary for fish and wildlife;
- Identify and fully mitigate (bucket for bucket) future water use impacts to surface waters where recommended instream flows for fish are not met, during fish-critical times; and
- Implement conservation practices and innovative water management strategies across the watershed, such as surface water storage, aquifer storage and recovery, improved management or curtailment of late season use by existing and new water users, public outreach and education, and other measures listed in the Plan.

For the purposes of this section of the Plan, mitigation is defined as the following: Modifications of actions that (1) avoid impacts by not taking a certain action or parts of an action; (2) minimize impacts by limiting the degree or magnitude of the action and its implementation; (3) rectify impacts by repairing, rehabilitating, or restoring the affected environment; (4) reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or (5) compensate for impacts by replacing or providing substitute resources or environments.[7]

Potential Conservation, Regulatory and Management Tools

The means of achieving the above goals will be through implementation of various tools including conservation, innovation, regulation, and measurement. For example, water for new development will be obtained from existing water rights, conservation and efficiency, water resource management measures and other mechanisms, rather than new development relying mainly on traditional paths such as using exempt wells or obtaining new appropriations of water. The effects of growth on streams and rivers will be minimized and mitigated, and late season impacts on regulated surface waters or fish populations will especially be avoided. Several of the primary tools necessary to achieve the common goals are as follows:

<u>Conservation Measures</u>: The County will institute a series of water use conservation and efficiency measures that would affect existing wells, in addition to new public and exempt wells. The state, County and irrigators will investigate

[7] From the glossary of "Forest Ecosystem Management: An Ecological, Economic, and Social Assessment," July 1993, Report of the Forest Ecosystem Management Assessment Team (USFS, NOAA, NMFS, BLM, USFWS, NPS, EPA).

the feasibility of linking residential development to mitigation offered by conserved water from irrigation or other sources.

Historically, water savings and improvements to Dungeness stream flows have come from changes in irrigation infrastructure. These water savings are protected by the 1998 Trust Water Right MOU and allocated 2/3 to instream flows and 1/3 to future adjudicated agricultural uses. If water savings are put to beneficial agricultural use or come from other sources, details would need to be addressed in the intergovernmental agreement described in this section.

Innovative Water Management Projects: The County and other entities will explore and implement innovative ways of returning water to aquifers and streams through aquifer storage and recovery, off-channel surface storage, etc.

One avenue of investigating the potential for use of deep aquifers could be through a collaborative effort between resource managers and a developer or other entity. A developer (or other entity) might drill a deep test well for purposes of a) assessing water availability and potential impairment of existing rights for purposes of securing a water right, b) providing information on deep aquifer conditions, c) conducting pumping tests to try to assess effects on surface water, and d) providing information to help verify the 2003 regional ground water model.

Such an exploration of the potential for deep wells to provide water without impairing surface waters could be pursued through the use of preliminary permits. A preliminary permit is issued to a water right applicant when the application is lacking information upon which to make a decision. Although the combination of deep aquifer water and mitigation of late season effects might well be a feasible source of supply, there is no prior guarantee of a water right as the result of work under a preliminary permit.

Regulatory Controls: The County will pursue legally-enforceable regulatory controls aimed at: (1) limiting the number of new exempt wells in favor of larger systems, (2) regulating the location, minimum depth and density of wells, and (3) reducing the withdrawal rate allowed from exempt wells. Elements of public water system plans, growth management plans, GMA and zoning ordinances, and building ordinances related to water development, use and delivery will be consistent with and support implementation of watershed plan elements.

Measurement: The County, Ecology and others will create a system of monitoring withdrawals, water use, static water levels, and stream flows in an effort to: (1) measure trends in use and conservation, (2) track the quantity of new domestic groundwater use, including that covered by existing water rights, 3) verify regional groundwater model results, and (4) determine the need for new or adjusted policies.

Future Water Availability Framework

Several different approaches could be used to establish water availability for future re-allocation. One approach would be to define a mechanism that reserves a limited amount of ground water derived from conservation water savings, or aquifer or off-channel storage, for new residential developments, provided use of such reserved water would not degrade fish populations or beneficial uses and is mitigated. Such mitigation would likely include water conservation and water management strategies and commitments. Details of the legal framework for such a reserve and associated mitigation requirements would need to be worked out in the intergovernmental agreement and in the watershed plan's implementation plan and rule. For the purposes of this plan, the term "reserve" describes the concept of a defined amount of water gained through water savings, allocated to new development and administered jointly by the County and Ecology. Such a reserve would need to be recognized through a rulemaking process for a reservation under the Water Code if Ecology is to recognize that water as a reserve for purposes of its regulatory and permitting decisions.

These approaches share the following common elements:

1. Capacity for new groundwater development will be created from water efficiency savings or other means of providing water supply (e.g. off-channel storage or artificial aquifer recharge) that does not impinge on seasonally limited surface waters.
2. The potential will be explored for establishing geographic and quantitative groundwater extraction boundaries based on the 2003 regional groundwater model, the results of model runs of future build-out scenarios, and other available technical information. Any delineation of boundaries will consider effects on fish habitat and instream flows, etc., as well as preliminary indications that withdrawals from deeper zones may affect surface water. Potential depth of wells, density of wells and extraction volumes will be evaluated. The aquatic habitat value of all fish-bearing streams within the watershed will be assessed and the potential effects of groundwater pumping on these evaluated.
3. Regular monitoring of static water levels in each aquifer will be conducted.
4. If requested by the Planning Unit following plan approval and based on staff availability, Ecology will take appropriate actions to process pending water right applications. In order for Ecology to issue new water rights, applications would still need to meet all tests for water availability, beneficial use, and no impairment of existing rights or the public interest, as well as and include mitigation of effects on surface waters.
5. The intergovernmental agreement will consider developing direction for the defining of areas within the Dungeness watershed for early processing of water right applications.

Elements of a Reserve if Established

If a reserve appears to be the most practical approach for making water available for future development, then legal obstacles associated with establishment would need to be explored. Regardless of the mechanism eventually developed, a rule element establishing water for future allocation should outline the processes for evaluating water savings and availability, reallocating saved water, and addressing mitigation requirements.   The rule element should be based on the following:

a. Capacity for new ground water development would come from saved water or other means of providing water supply that does not impinge on limited surface waters.

b. The County and Ecology would agree on a split in allocation from the reserve between exempt wells and non-exempt groundwater rights.

c. Cumulative quantities allocated through water-related decisions by the state and County could not exceed the reserve amount agreed to in the intergovernmental agreement and established by rule.

d. All new permit-exempted and permitted withdrawals would be debited from the reserved quantity for the full quantity potentially withdrawn.

e. Withdrawals from the reserve would be monitored individually or as part of a study and these data tracked in a database. Amendments to this process could be made if monitoring data indicated the need.

f. Users of new withdrawals from the reserve may be required to enter restrictive covenants to decommission their wells if public water supply becomes available. The conditions under which public water supply is considered available would need to be defined. Funding through state and local mechanisms would be sought to assist decommissioning.

g. The groundwater reserve would be acknowledged with respect to instream flows established by rule.

h. High levels of water conservation and efficiency would be required as a condition for use of reserved water as part of a building permit or water right. This would apply to both inside and outside water use efficiency. Use of reserve water might also require curtailment of late season use or other measures to minimize impacts. (See Section 3.1.7 and Appendix 2-D for proposed water conservation measures.) In addition, an outreach program would be conducted encouraging all users in seasonally water-short areas to limit late summer water use.

E. WRIA 18 Groundwater Modeling and Research:

1. Hydrogeologic research should be pursued as a critical component to the future stewardship, allocation and management of water resources of the region. Current groundwater studies should be continued and extended across West WRIA 18 to assess the location (both geographically and at depth), quantity, quality, and feasibility of extraction of groundwater supplies.

2. A hydrogeologic assessment should include identification of areas of recharge and discharge. If current studies indicate it, further more detailed investigation of the potential for aquifer storage and recovery should be conducted, considering both physical and legal constraints.

3. The East WRIA 18 groundwater model should be maintained in sufficient detail to allow analysis of how the groundwater system will respond to alternative scenarios of future water development and use. The Dungeness groundwater

model advisory committee should continue to guide and advise on the use of the model.

4. The West WRIA 18 groundwater characterization in process should be used as to further the future stewardship, allocation and management of water resources of the region.

5. Conduct well monitoring with the objective of long-term aquifer assessment and in the context of long-term surface water gaging.

   a. Continue ambient well water level monitoring in East WRIA 18 (Ecology and County) Evaluate current network for efficiency, whether wells are representative of aquifers, geographical coverage, and data gathering plan. Conduct some continuous water level measurements in an established well network.

   b. Evaluate potential benefits of placing monitoring wells in the vicinity of dike setbacks. Place monitoring wells in the lower river and at Kincaide Island. Place continuous recorders in wells believed to be highly responsive to surface water.

6. Query the East WRIA 18 groundwater model to determine priorities to convert existing surface water users to groundwater (e.g., some irrigation areas) and effects of such conversion.

7. Focus future studies on the following areas: Blyn, West Sequim Bay, East Sequim Bay, West of Siebert Creek, and West WRIA 18 subbasins to be determined by the West WRIA 18 Watershed Council (see Recommendation 3.8.1).

8. Conduct periodic groundwater quality studies as described in Section 3.2. With regard to seawater intrusion affecting groundwater supplies, obtain chloride data as an indicator of seawater intrusion.

3.1.7 Water Conservation

Issue: The conservation and wise use of existing water supplies is a priority to extend surface and ground water supplies, protect instream values, and reduce uncertainties regarding future growth in demand for water.

Existing Condition and Current Actions

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, landscaping, reuse and water use, and construction codes, rate structures, and other measures. The DQ Plan (1994) set forth these goals, which remain important today:

- ***Goal 1:*** To manage water conservation based on hydrologic cycles and ecosystem principles.
- ***Goal 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.

Clallam County's Critical Areas Ordinance requires BMPs and performance standards. Outdoor residential use is not regulated by the County. The City of Sequim Comprehensive Plan and Titles 17 & 18 of the Sequim Municipal Codes also apply. Section 2.3.3 describes measures undertaken by public water systems and commercial irrigation in WRIA 18 to conserve water.

Emergency Water Shortage Response Plans: The City of Port Angeles has prepared an Emergency Water Shortage Response Plan, and the Water Users Associations include water shortage response in their Rules and Regulations.

Comprehensive Water System Plans: The cities of Sequim and Port Angeles have prepared Comprehensive Water System Plans containing conservation plan chapters.

City of Sequim Response to DQ Plan Recommendations: The DQ Plan proposes detailed conservation actions for the City of Sequim (DQ recommendation C.12.2). The City has responded in a variety of ways. A water conservation chapter is incorporated in the November 2001 Water System Comprehensive Plan. Over the past 20 years, City water use per capita has dropped from 280 gpcd to less than 170 gpcd. This compares favorably with other municipalities in similar climates. The Sequim City Council is empowered to implement mandatory restrictions during shortages or for health or environmental reasons. This was last done during a 1994 water shortage. The City has accomplished an approximately 40% reduction in per capita use since the 1980s. The City requires water conservation on all new construction, remodel and plumbing permits. Commercial uses are required to meet the conservation requirements listed in the recommendation. The City's Utility Rate Task Force Committee regularly reviews the City's water rate structure. The current rate structure is an inclined block rate (various higher rates apply after 800 cf of monthly residential or commercial use). The City has installed new meters for all uses and production points. A seasonal water rate has not been adopted, as the inclined block rate is believed to stimulate conservation. The City has an ongoing conservation education program.

Desired Conditions and Outcomes

- Cost-effective water conservation of scarce WRIA 18 water sources allows water to remain instream for environmental values, and creates a sustainable water supply.
- Full and ongoing implementation of Water Users Association *Comprehensive Water Conservation Plan* for the East WRIA 18 irrigation system and of the water conservation portions of Group A public water system *Water System Comprehensive Plans* that have been written for the cities of Port Angeles and Sequim and the Clallam PUD.
- Expanded residential water conservation the smaller Group A water systems, Group B systems, and individuals acting voluntarily to conserve water used for indoor and outdoor purposes in the home.
- Drought response planning in place incorporating a staged approach with appropriate triggers based on snowpack and stream flow conditions for the larger Group A public water systems.
- Late season low-flow demands on stream flows largely reduced or eliminated.

Recommendations

A. Water Conservation Education and Outreach:

1. Distribute a water use survey to local residents to assess current uses of water and perceptions about water use. The survey developed and used by the City of Tacoma should be examined (the Tacoma survey found that high water users were often very conservation oriented, but lacked the knowledge of effective water conservation practices).
2. Encourage the development of water conservation education programs in the school districts. The benefits of environmental education in children and young adults are well documented. Aside from establishing good stewardship practices at an early age, there is also a tendency of influencing adults with whom these children interact.
3. Encourage local water purveyors to attend regional and national water conservation conferences (i.e., AWWA) to be familiar with new information and technologies.
4. Target exempt well owners for education on water conservation.
5. Establish a water resource conservation education program.[8] This is typically considered to be the most difficult element of a water conservation program to maintain, but one of the most important. The program should address:
    a. Lifestyle changes.
    b. Strategies for education and increased public awareness to encourage voluntary conservation.
    c. Targets for water conservation for each user group including achievable technology.

[8] DQ Recommendation R.4.2.4 and R.4.2.10, including subheads

d. Conservation and reduction goals, considering “targeting” by user groups and including consideration of all water sources.

B. Regional Water Conservation Planning and Standards:

1. Conservation and efficiency strategies should be developed and implemented region-wide to provide the most efficient use of all water resources.[9]
2. Link water conservation plans of water purveyors, including small systems and irrigation systems, and develop area-specific County water conservation planning. Identify and target population growth areas outside of UGAs.
3. Clallam County and all WRIA 18 purveyors, including cities, the PUD, and small water systems, should develop conservation plans implementing best available designs and technology, using current practices and meeting the goals and standards set forth in this section. Building and domestic water conservation standards should be tied to well and building permits (County and cities).
4. 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 groundwater planning, and integration of implementation activities.[10]

C. Water Shortage Response Planning:

1. All Group A purveyors drawing from surface water sources should develop and implement water shortage response plans during critical water periods. These plans should prioritize water uses during such periods. The plans should establish emergency water conservation programs for all users under extreme drought conditions, and voluntary reductions in use under all less extreme conditions.
2. A regional water modeling and monitoring system should be developed to avoid a water crisis in a low water year. It should provide for an early warning system, invoking a staged 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.[11]
3. Water Shortage Response Plans should include staged “fish triggers”, conservation goals, and incentives or disincentives modeled on those developed by the City of Port Angeles and the Lower Elwha Klallam Tribe (see 3.9.1). Each stage should be distinct.
4. Water Shortage Response Plans should be adopted by ordinance when they are to be implemented by local jurisdictions and should include appropriate enforcement provisions.

[9] DQ Recommendation R.4.1

[10] DQ Recommendation R.4.2.5

[11] DQ Recommendation R.4.2.4(d)

5. Purveyors of Elwha River water should be encouraged to adopt the City's WSRP, including water conservation procedures that will be implemented for each of the water shortage stages.

6. Clallam County, Clallam PUD, the cities of Sequim and Port Angeles, and the Water Users Association should develop a coordinated Emergency Water Shortage Response Plan including "fish triggers" to implement a phased response plan with multiple triggers at stages as a low flow situation unfolds. These triggers should be adopted by ordinance and/or interlocal agreement.

D. Seasonal Water Conservation:

1. A seasonal water conservation program should be implemented annually during the low flow period by the County, the Water Users Association, and all Group A and B purveyors. This should be required as a condition on any future water permits.

2. Industries are encouraged to schedule any annual maintenance shutdowns to coincide with typical low flow periods in the basin of origin.

3. Storage and fire protection measures should not require the development of new sources or instantaneous withdrawals in low flow periods.

E. Comprehensive Water System Conservation Plans:

1. All Group A water systems should include within their Comprehensive Water System Plans a comprehensive water conservation chapter that sets forth specific provisions to reduce water consumption among residential, commercial and industrial users. Group A water systems are encouraged to fully implement the water conservation portions of their Water System Comprehensive Plans.

2. All Group A water systems should document actual progress in implementing conservation measures.

3. Municipal and county parks departments should adopt appropriate water conservation programs.

4. Group A water systems are encouraged to develop incentives for retrofits for all preexisting housing offered for sale which meet new water conservation standards for both residential and commercial water users.[12]

5. Public water supplies should be managed to encourage efficiency and meet health requirements.[13]

   a. Inform water users about State building regulations under the plumbing code concerning the use of efficient indoor fixtures.

   b. 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.

[12] DQ Recommendation R.4.2.7

[13] DQ Recommendation C.14.1, including subheads

c. Investigate a water master or other management regime for coordination and management of water systems in the area.

F. City of Sequim Water Audit:

1. The City of Sequim should move forward with its water audit program, included as a recommendation in its 1995 plan, before the next water system planning process (as scheduled in the 2000 plan).

2. The City of Sequim should strive to reduce its lost and unaccounted for water from the current 30% to the targeted 15% more quickly than over the 20 year planning horizon identified in the Water System Comprehensive Plan.

G. Leak Detection: Regularly implement leak detection using approaches defined in approved Comprehensive Water System Plans. Where such plans are not in place, identify target pipelines and ditches and establish an ongoing leak detection program.

H. Water Conservation Rates, Rebates, and Incentives:

1. Encourage the adoption of water conservation-based utility rates for domestic, commercial, and industrial users. This may include tiered rate structures, seasonal pricing, or other means of assuring adequate water supply for instream and out-of-stream users.

2. Examine incentives for water conservation practices by residential, commercial and industrial users. Examples include rate reductions, tax incentives, and reduced wastewater charges.

3. Encourage the expansion and continuation of rebate programs for the purchase of energy and water efficient appliances. Encourage, and make available, water conservation devices for indoor and outdoor use, particularly for high consumptive water users.

4. Petition the State to define “conservation” to promote incentives for efficiency (e.g., eliminate taxes on conservation materials and equipment; provide rebates to provide conservation incentives).[14]

5. Investigate opportunities for using recharge fees, incentives for saving, and buyback programs to promote water conservation.[15]

6. Assess the economics of water conservation strategies including rates, time, “pay back”, timelines, and the condition/place of used water.[16]

I. Low Water Demand Landscaping:

1. Encourage the use of low water demand landscaping using native plants and appropriate lawn care maintenance practices.

2. Require conservation BMPs for new and existing golf courses.[17]

[14] DQ Recommendation R.4.2.8

[15] DQ Recommendation R.4.2.11

[16] DQ Recommendation R.4.2.12

3. Cut lawns to an appropriate height to reduce transpiration.
4. Provide incentives for landscaping companies to advertise as environmentally friendly and knowledgeable (Landscaping firms often provide maintenance recommendations that are counter to established water conservation techniques).
5. Encourage the use of appropriate frequency and volume of water in residential irrigation.
6. Provide public education as to how much and when to water lawns. Promote understanding that lawns will green up again after summer browning.
7. Programs and regulations should be developed for outdoor water conservation. These should include:[18]
    a. Restrictions on lawn watering, car washing and other low-necessity uses when supplies are short.
    b. The use of efficient low-flow sprinkler heads, pumps and other equipment, and drought-tolerant landscaping when there is no recharge potential.
    c. Prudent-practices guidelines and education on vegetative composition and total size of lawns, gardens and plantings.

[17] DQ Recommendation R.4.2.9

[18] DQ Recommendation C.14.2, including subheads

3.1.8 Irrigation Water Management

Issue: The Sequim-Dungeness River Valley Agricultural Water Users Association (WUA) is the largest user of Dungeness River water, diverting water from five outtakes on the mainstem. Irrigation water recharges groundwater, augments wetlands, and affects flows in small streams. Irrigation diversions and low streamflows in summer and late fall have been identified as critically limiting to salmon production. The WUA have made significant improvements in reducing their diversions to benefit stream flows. Irrigation ditches provide conveyance for irrigation water as well as potentially providing pathways for stormwater and pollutants.

Existing Condition and Current Actions

The 1994 Dungeness-Quilcene Water Resources Management Plan (DQ Plan) contains informal, but important agreements negotiated between the WUA and the Jamestown S'Klallam Tribe (JSKT) on the subject of water conservation and flow restoration. Following a recommendation of the DQ Plan, the 1998 Trust Water Rights Memorandum of Understanding between the Water Users and Ecology (MOU) was developed to institutionalize the agreements and protect the WUA's conserved water from relinquishment. A tentative determination of water rights was made and the irrigators agreed to adjust their water rights to substantially lower amounts than those adjudicated in 1924. They further agreed to not divert more than 50% of the river's flow as measured at the USGS gage (although the "gap" identified in the DQ Plan remains -- notwithstanding this improvement). In practice, recent diversions have averaged 55 to 57 cfs over a season, with highest use sometimes up to 20 cfs more in early and mid-summer. WUA data indicate that irrigation water users have generally achieved diversions well below 50% of the river's flow, although the 50% threshold is more difficult to meet during the lowest flows in September and October. These steps and others outlined in the DQ Plan have been considered so innovative and constructive that the WUA and the JSKT have jointly received national and state level awards.

Another tool used by the WUA is "split season" water leasing. During the 2001 drought, Ecology and the WUA reached agreement on removing 1,000 acres from irrigation that otherwise would have been watered, from August 1 to September 15. The WUA and Ecology have also negotiated similar leases for 2003 through 2005, covering the same portion of the irrigation season. These leases help in addressing another agreement reached in the DQ Plan, to achieve more than 50% of the flow in the river, particularly after September 1st.

The Trust Water MOU includes a process for allocating conserved water to temporary trust status. One-third of water conservation savings placed in temporary trust is held for adjudicated uses (irrigation), and the remaining two-thirds is dedicated to instream flows. When conservation is considered largely implemented, Ecology will issue superceding certificates and create a permanent trust water right for instream flows.

The Dungeness Valley irrigation system has been the subject of several studies over the years. The impacts of reduced irrigation were modeled by the USGS in 1983. In 1999 the USGS completed a study characterizing the relationship between the irrigation system and groundwater in the Dungeness valley, to provide a detailed basis for modeling effects of changes in the irrigation system. This study gathered extensive new data on surface water, small streams, ditch leakage and effects of irrigation.

In 1999 the Comprehensive Agricultural Water Conservation Plan for the Sequim Dungeness Water Users Association was completed for WUA agricultural irrigation facilities. This effort also included modeling to assess effects of changes in irrigation efficiency, primarily by updating the earlier USGS model and incorporating the USGS data being gathered at that time. Irrigation use was evaluated in depth by the USGS (1999) and the Montgomery Water Group (MWG) (1999). Canal losses were also evaluated by MWG in 1993, and in 1999 MWG and USGS worked together to refine these numbers. Impacts of implementation of the Water Conservation Plan on small streams, wetlands, wells, and groundwater levels have been thoroughly evaluated in a 2003 Ecology EIS on the plan, using a newly developed groundwater model.

Several entities have undertaken implementation of the Conservation Plan. The WUA and the JSKT have collaborated on many projects. The Jamestown S'Klallam Tribe has obtained funding from federal and state sources to improve irrigation infrastructure and conveyance efficiency. The Clallam Conservation District (CCD) administers an Irrigation Efficiencies Program, a program designed to help irrigators conserve water by upgrading their irrigation systems. The CCD has also funded piping projects to improve water quality. Both the CCD and the Natural Resources Conservation Service (NRCS) often assist in evaluating current system efficiency and with designing projects.

Irrigation water use is monitored by real-time measurement and data is summarized weekly by the WUA. The diversion data is posted on Ecology's website; the WUA publishes annual reports summarizing diversions, tailwater measurements, irrigated acreage, and completed projects.

There has been a general shift in the agricultural base to less water-intensive crops and practices. In addition, there is a trend towards increasing domestic non-potable use of irrigation water, with a reduction in commercially irrigated acreage. Irrigated acreage has decreased to less than half the historic amount. Although several commercial irrigators still farm in the Dungeness Valley, a significant portion of already-subdivided agricultural land is currently rented by farmers in order to do so. A program to preserve agricultural farmland is aimed at maintaining the land base for commercial agriculture.

The WUA adopted detailed Rules and Regulations implementing many features recommended through the DQ process. Of an original total of 9 districts and companies, restructuring has reduced the number to 7 and the WUA is considering further consolidation. The WUA has funded the position of Water Use Coordinator since 1993, and each member company or district has a ditch rider responsible for managing the system. A Comprehensive Irrigation District Management Plan (CIDMP) is underway to ensure that operation of the irrigation system is in compliance with the Endangered Species Act and the Clean Water Act.

Desired Conditions and Outcomes

- Water Users Association Comprehensive Water Conservation Plan implemented in full.
- Irrigation water use continues to be monitored and managed in cooperation with DRMT.
- Residential customers of the WUA are educated regarding water use efficiency, lower water use landscaping, and the need for late season conservation.
- Irrigation water use and facilities operate in compliance with the Endangered Species Act and Clean Water Act.
- Commercial agriculture has a healthy economy and future in the Dungeness Valley.

Recommendations

(Also see Section 3.3 for recommendations regarding irrigation water management as it affects wetlands and small streams.)

A. Continue to improve the management of the Sequim-Dungeness River Valley Agricultural Water Users Association (WUA) and irrigation districts/companies:

1. WUA districts and companies are encouraged to pursue further consolidation of operations and maintenance, as warranted.
2. The WUA 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.[19]
3. The WUA should continue its participation in the Dungeness River Management Team.
4. WUA districts and companies should respect the authority of the water use coordinator to enforce agreements among and between WUA districts, companies, Tribes and other entities, in order to avoid the expense of having to hire a watermaster or stream patrolman.[20]
5. Encourage voluntary compliance with the guidelines for prioritization of water uses for times when flows are critically low.[21] (*These guidelines are described in the WUA's Drought Response Plan, within their Rules and Regulations*. *See Appendix 1-C*).
6. The Clallam Conservation District should continue to work with WUA districts and companies, with input from the Department of Ecology, to develop a brochure for prospective water users (e.g. new or prospective buyers of property served by the irrigation system) which provides general information on the system, water conservation needs, late season water shortages, and the possibility of late summer cutbacks. The County should provide the resulting information to property owners served by the irrigation system.

[19] DQ Recommendation C.4
[20] DQ Recommendation C.2.4.1, modified
[21] DQ Recommendation C.2.1.3.d, modified

B. Implement the 1998 Trust Water Memorandum of Understanding.

1. Continue improved water management and conservation so as to provide that no less than 50% of the instantaneous flow, as measured at the USGS gauge at River Mile 11.8, will remain instream.[22]
2. Once conservation measures have been fully implemented, complete the transfer of conserved water. Issue a State trust water certificate for instream flow purposes, and issue superceding certificates to the individual irrigation companies and districts for adjudicated uses that reflect water savings.
3. Continue to update water rights certifications where water rights have been relinquished and are not subject to the Trust Water MOU.
4. Assess water savings and the IFIM recommendations periodically with the participation of the DRMT, WUA, JSKT, and the Departments of Ecology and Fish and Wildlife.[23]

C. Complete and implement a Comprehensive Irrigation District Management Plan to ensure compliance with both the Endangered Species Act and the Clean Water Act.

1. Ensure that outtakes and tailwaters are upgraded where necessary to minimize impact on salmonids.
2. Ensure presence of effective fish screens/barricades.
    a. Prevent fish from entering areas where they may be stranded by interruptions in irrigation flow.
    b. Conduct field checks to assure that effective fish screens or barricades are in place at irrigation return flow locations and diversions, including locations where small streams are being used for conveyance. Upgrade as needed.
    c. Consistent with the WUA Comprehensive Water Conservation Plan or subsequent studies, consider piping irrigation water around lowland East WRIA 18 small streams. (See Recommendations 3.1.8 F and G, below.)
3. Continue to seek and implement efficiencies to the irrigation system, such as piping leaky irrigation ditches and establishing reregulating reservoirs where appropriate.
4. Implement the WUA's Comprehensive Water Conservation Plan.
5. Recognizing that the DQ Plan recommended target flows (*see definition on following page*) of 100 cfs, which are often in excess of 50% of the instream flow in the late summer, review data and negotiate achievable flow targets for seasonal time periods necessary to protect and restore salmon now listed as threatened under the Endangered Species Act.[24]

[22] DQ Recommendation C.2.1, modified
[23] DQ Recommendation C.2.1.3.c, modified
[24] DQ Recommendation C.2.1.3.b, modified

D. Management Water Withdrawals: Identify and implement measures for reduction and management of water withdrawals between August 15 and October 15. Explore the possibility of revisions to the irrigation schedule which is currently April 15 – September 15[25]:

   1. Investigate the feasibility of terminating *most* irrigation on September 1.
   2. Allow later watering, specifically for seed crops, within the context of overall ESA compliance for the WUA. Arrange a special permit system for individual crops that need to continue watering after September 15. Identify an efficient method to deliver water to these users without major withdrawal.
   3. Quantify the amount of, and define the use for, water withdrawals in the off-season. Incorporate this into the water right.
   4. Manage the need for seasonal shifts on a year-to-year basis.
   5. Consider a lease/buy-out of late season watering rights on a willing seller basis.
   6. To the extent cost-effective and feasible, switch to groundwater sources for late season stock watering.
   7. Ensure that the WUA Rules and Regulations are enforced (e.g. make certain that water users are not irrigating from stock flows outside of the irrigation season, prohibit the use of conveyed irrigation water to feed or maintain ornamental ponds, etc.). (*See Water Users Association Rules and Regulations*).

E. Continued Monitoring: Continue to monitor the impacts of reduced irrigation recharge on small streams, wells and groundwater.

F. In light of the critical status of Dungeness fish stocks, prohibit the intentional diversion of irrigation water from the Dungeness for augmenting wetlands or small streams.

G. In implementing changes to the irrigation system, consider the resulting impacts from changes in flow patterns and conveyance.[26]

   1. Conveyance:

      a. Streams should not be used for irrigation ditch conveyance, except where no alternatives exist.[27] No new uses of streams for conveyance should be established. Where feasible, minimize or eliminate use of streams as conveyance (even though this is legally allowed under WUA water rights).

      b. Conduct an assessment to evaluate impacts to salmon that result from use of small streams for conveyance of irrigation water. Include an exploration of alternatives/solutions to conveyance of Dungeness River water through small streams.

[25] DQ Recommendation C.2.3 with additions
[26] DQ Recommendation C.10.2A, modified
[27] DQ Recommendation C.10.2A.5, modified

2. Mimic Nature: In cases where streams do receive flow partially from agricultural diversion from the Dungeness River, flows should mimic nature as much as possible.[28]

Minimum vs. Target Flows

The DRMT considered two types of flows in developing this watershed plan: minimum instream flows and target flows. A *minimum instream flow* is a flow set by State rule (by Ecology), and applies to State water rights. It is junior to water rights in existence when it is adopted, and it, in essence, establishes a flow level below which new water rights will not be appropriated. A minimum instream flow generally has a priority date of the date of the rule establishing it, however, by law, instream flows established through 2514 planning have a priority date as of two years after the Initiating Governments first receive funding from Ecology. Although a minimum instream flow rule establishes the level of flow needed to fully protect and preserve fish and other instream environmental values, it does not guarantee that the flow level will be achieved because the rule may be junior to other water rights in the stream. Recommendations for minimum instream flows to be established by rule for the Dungeness River are listed in Section 3.13 and were established based on an updated review of the Dungeness River IFIM study, focusing primarily on instream flow requirements of chinook during spawning.

A *target flow*, as used in the DQ Plan, is a realistic instream flow goal that may be achievable either in the long run or in most years, following an evaluation of historical water use and fisheries needs as well as the implementation of water conservation measures. It was recognized during the preparation of the DQ Plan that target flows could not be achieved in all years due to potential drought conditions. In such cases, the agreement to divert no more than 50% of the flow as specified in the Trust Water Rights Agreement became the operative regulatory constraint on water withdrawals. However, during a severe drought in 2001 the WUA voluntarily passed a resolution that they would manage withdrawals to attempt to achieve instream flows of no less than 60 cfs below their diversions regardless of the relative percentages. Continuation of this policy is under discussion within the CIDMP process.

Similar to the DQ Plan's intent, target flows are used as an operational concept by the federal agencies (NOAA Fisheries/NMFS, and USFWS, collectively called “the Services”) with jurisdiction under the Endangered Species Act. The term “target flow” is not defined in law or regulation. Target flows have no relation to State water rights, including minimum instream flows, but may preempt them if formally established through an ESA compliance action such as a Habitat Conservation Plan or legal action brought under the ESA. Target flows for the Dungeness are expected to be formally established through the implementing agreements associated with the CIDMP, currently in progress. In addition to implementation through the CIDMP agreements, target flows may also be established through amendments to the Trust Water Rights MOU.

[28] DQ Recommendation C.6.2.6, modified

3.13.1 Dungeness River (WRIA# 18-0018)

Issue: The Lower Dungeness River (the lower 11 river miles) has been heavily impacted by construction of levees and bank hardening (other riverbank protection structures); clearing of riparian vegetation; construction of bridges that constrict the river; gravel extractions; and water diversions. In the Upper Dungeness River, sediment input from unstable soils on steep slopes and forest management practices (particularly forest road management) have produced excessive sediments loads in the river. These have led to such effects as channel braiding and aggradation; disconnection of the river from its floodplain; blocking of access to productive side channel habitat; scouring of redds; and seasonal low flows that can severely impair salmonid stocks. The DQ Plan (1994) identified a “gap” between stream flows needed to meet biological requirements and out-of-stream uses. The gap has been narrowed by actions taken under the DQ Plan, but remains an issue for the Dungeness River.

Puget Sound Chinook, Hood Canal/Eastern Strait of Juan de Fuca summer chum, and Puget Sound bull trout are *federally listed* as *threatened* under the Endangered Species Act. Fall coho, Upper Dungeness pink, and summer and winter steelhead are *state-listed* as *depressed*. Spring/summer Chinook, lower Dungeness River pink, and Hood Canal/Eastern Strait of Juan de Fuca summer chum are *state-listed* as *critical*.

Existing Condition and Current Actions

The Dungeness River is one of the principal drainages occurring in WRIA 18. The Dungeness is a short, steep river draining 270 square miles. The mainstem extends 31.9 miles and its primary tributary, the Gray Wolf River, adds another 17.4 miles. In addition, there are an additional 256 miles of tributaries in the basin. Seven anadromous salmonid species are indigenous to the Dungeness River (Chinook, coho, pink, chum, steelhead, cutthroat, and bull trout).

The Dungeness River has an extensive history of watershed management and planning (described in Section 1.2) which has included a broad range of studies of river processes, habitat, and salmonid stocks (summarized in Section 2.8). The Dungeness River Management Team (DRMT) has worked to implement recommendations from the original Dungeness-Quilcene (DQ) Plan since its publication in 1994. Recent major studies and actions include a Trust Water Agreement (TWA) (1998) (see Section 2.3) to reduce irrigation diversions from the river, allocate saved water to a trust water right and allocate trust water to instream flows and agricultural uses; a comprehensive irrigation water conservation plan (Montgomery Water Group 1999); a hydrogeologic assessment (Thomas et al. 1999); a study of river physical processes, impacts and restoration issues in the lower Dungeness (Bountry et al. 2002); a study of surface-water groundwater interactions (Simonds and Sinclair 2002); a study of Dungeness side channel instream flows and their relation to mainstem flows (Bureau of Reclamation 2003); an assessment of geomorphic conditions in the Kinkade Island reach (Bureau of Reclamation, in preparation); an Environmental Impact Statement on the Water Conservation Plan; and a groundwater model (Department of Ecology, 2003).

The USFWS performed an instream flow study for the lower Dungeness River using the Instream Flow Incremental Methodology (IFIM) during 1988-1989 (Wampler and Hiss 1991). Two study sites were selected to represent instream habitat found in river reaches from RM 1.8 to 2.5 and RM 3.3 to 6.4, respectively. Both reaches lie below the five irrigation diversions on the river. Predictions for the amount of usable habitat area under different flow conditions were calculated for steelhead (spawning, juvenile and adult), bull trout (dolly varden) juvenile, coho (spawning and juvenile), Chinook (juvenile, spring Chinook spawning and adult), and pink salmon (spawning). In December 1992, the Dungeness Instream Flow Group (including the USFWS, Jamestown S'Klallam Tribe, NMFS, WDFW, and Ecology) was reconvened to complete the evaluation and interpretation of the instream flow study. Based on this review, the Dungeness Instream Flow Group set Dungeness River flow targets for optimum fish habitat for each month. The Dungeness River Restoration Work Group (DRRWG) met again in January 2002 and affirmed that the IFIM results and recommendations remain valid and useful for the Dungeness River. IFIM results were used to set a minimum low flow recommendation which would provide optimal levels of habitat area for priority species and life stages, as defined in Hiss, 1993a. It should be noted that August through October is considered a critical period due to the fact that both irrigation withdrawals and salmon migration and spawning continue at a time of naturally diminishing flows. (*See page 2.8-46 to 2.8-54 for more information on the IFIM study and instream flows*). Biologists have also noted through observations in recent years that low flows force salmon to spawn nearer to the middle of the channel, making the redds more susceptible to scouring during high winter flows.

The Limiting Factors Analysis (LFA), (Haring 1999), found that the primary fish access concern in the mainstem Dungeness River is that low stream flows during late summer/early fall impede adult salmon migration and decrease usable juvenile habitat in over 9 miles of river (PSCRBT 1991, Lichatowich 1990, Orsborn and Ralph 1992). As the rate of flow is artificially lowered in August and September, the potential for development of barriers to upstream passage caused by shallow riffles is increased, preventing adult pink and Chinook from reaching preferred spawning grounds (Wampler and Hiss 1991).

Spawning habitat is substantially reduced in reaches that have been subject to water withdrawals, as compared to pre-withdrawal habitat conditions. Surveys, such as the 1997-1998 study conducted by the Jamestown S'Klallam Tribe (Hirschi and Reed, 1998), and spot checks in the lower river have substantiated this by indicating a number of locations where juvenile salmonids become trapped in pools or other low spots along the margin of the wetted channel. Consequently, some trapped juveniles perished as water depths dropped and temperatures exceeded 68º F.

There are a number of side channels in the lower river (from downstream of the Railroad Bridge to the Ward Bridge) with good water quality, but the value of these side channels is decreased as access is cut off due to low flow (Orsborn and Ralph 1994). The LFA reviewed the IFIM study, and stated: "It is apparent that it is necessary to maintain the entire river flow in the channel during the lowest flow periods for full benefit to salmon."

Other limiting factors identified in the LFA include bedload aggradation in some portions of the lower river between the mouth and the railroad bridge; and loss of side channel access due to diking and other constructions.

Desired Conditions and Outcomes: *(Derived from the Goals of the Dungeness River Management Team, revised and adopted in 2002.)*

- Land use and river processes are integrated to prevent loss of life and property from flooding.
- Riparian and aquatic ecosystems within the Dungeness River watershed and estuary areas are restored to mutually benefit wild and native salmonids and human residents.
- Water quality and quantity in the Dungeness River Watershed Area are protected and enhanced to support all beneficial uses, including an adequate clean water supply for

current and future human needs and a higher productive capacity of fish and wildlife habitats.

- Cooperation and coordination occurs among all levels of government and citizens in protecting ground and surface water quality and quantity.
- Information on technical studies, issues and projects occurring in the Dungeness River watershed planning area is exchanged among agencies and citizens.
- Public participation and education about the watershed occurs so as to develop and encourage a community stewardship ethic and help prevent or resolve conflict.
- Recommendations of relevant plans and strategies for the Dungeness River endorsed by the DRMT are implemented.

Recommendations

Although all DQ Plan Chapter 6 recommendations address the Dungeness River system in some way, many are related to other topics addressed by recommendations in this watershed plan and are repeated in the sections to which they are most closely related (e.g., irrigation water management, groundwater quantity, etc.). The DQ recommendations that most closely focus on Dungeness River habitat and flows are included in this section.

A. Water Quality: The Dungeness River is included in a comprehensive program of water quality recommendations presented in Section 3.2.

B. Habitat: Many of the habitat recommendations presented in Section 3.3 for WRIA 18 as a whole also apply to the Dungeness River.

1. Dungeness River Management: The DRMT and DRRWG should seek funding and continue their work on comprehensive river restoration through the strategic restoration elements identified following review of the Dungeness-Quilcene plan, Dungeness River Watershed Area Plan, the “Blue Book,” Limiting Factors Analysis, and the Clean Water Strategy.

   These 10 strategic elements are also described in the 2003 publication, “Restoring the Dungeness: An Overview of the Dungeness Restoration Strategy, 2003,” and include the following:

   a. Restoration of the lower river floodplain and delta to river mile 2.6
   b. Protection of existing functional habitat through conservation easements and land purchase from willing land owners (river mile 2.6 to 11.3)
   c. Floodplain restoration/constriction abatement
   d. Water conservation, instream flow protection and water quality improvement/protection
   e. Restoration of functional riparian and riverine habitat
   f. Large woody debris placement
   g. Nearshore habitat protection and restoration
   h. Barrier removal
   i. Stock recovery/rehabilitation/hatchery reform
   j. Sediment management/source control:

A description of the Limiting Factors Analysis is included in the Appendix. While the 10 strategic elements describe most of the habitat recommendations for the Dungeness River, the DRMT added the following habitat recommendations to the 2003 WRIA 18 plan:

2. Restoration Projects:
   a. Complete a chapter for restoration of Dungeness chinook as part of the Puget Sound salmon recovery plan to be submitted and approved by the Federal services with ESA jurisdiction, subject to the availability of funding and personnel.
   b. Incorporate an adaptive management approach in implementing recommended restoration projects.
   c. Monitor and evaluate results of restoration projects.
   d. Update habitat restoration recommendations as new scientific information develops.
   e. Continue to develop and implement restoration projects that restore river and estuarine function.

3. Land Protection:
   a. Review the "Recommended Land Protection Strategies for the Dungeness River" from the DRRWG containing biological recommendations for the purchase and protection of land or conservation easements from willing sellers and protection of riparian parcels along the Dungeness River.
   b. Seek funding to help land protection entities to cover costs related to helping landowners establish conservation easement agreements or donations, and the endowment fund needed to protect and monitor agreements in perpetuity.
   c. Review and implement opportunities to purchase critical riparian parcels of the Dungeness River for flood hazard reduction and habitat restoration and protection.

4. Flood hazard management:
   a. Complete and implement the comprehensive Dungeness River flood hazard reduction plan that is integrated with habitat restoration planning and protection strategies. (Currently in progress; draft has been completed, 2003.)

5. Road maintenance and restoration:
   a. Provide necessary maintenance/restoration on forest roads in the upper watershed to minimize potential of sediment delivery downstream. Numerous roads have remaining areas that are at high risk of failure, and should receive immediate attention, and consideration for abandonment.
   b. Reduce forest road densities to less than 2.4 miles per square mile, which is the identified road density threshold of concern identified in the Federal Watershed Analysis.

6. Recreational/off-road-vehicle (ORV) trail development:
   a. Assure that any recreational/ORV trails in the vicinity of the River (or crossing it) fully account for protection of salmon spawning, habitat and water quality.

   b. ORV activity should be located as far from the River, tributary surface waters, wetlands and critical wildlife habitat as possible.

7. Riparian vegetation:
   a. Identify and correct areas affected by unrestricted animal access.
   b. Restore suitable riparian vegetation and riparian-adjacent upland vegetation.

8. Side channels:
   a. Protect and restore critical side channel habitat per studies conducted by the Bureau of Reclamation (2003) and Hirschi and Reed (1998).

C. <u>Fish Propagation and Hatchery Reform</u>: Pursue implementation of recommendations of the Hatchery Science Review Group for the Dungeness system as follows:

1. Continue the chinook restorative captive brood program with broodstock on hand; size the hatchery program to riverine carrying capacity.
2. Conduct additional studies to evaluate chinook life history phases, distribution and migration patterns, as well as riverine carrying capacity; consider these in relation to habitat quality and type.
3. Develop an alternative recovery plan; consider a phase-in of a new program that does not involve captive broodstock, but continues the goal of maintaining genetic resources and reduces the risk of extinction.
4. Seek new water sources to provide warmer rearing water than presently exists at the Dungeness Hatchery.
5. Remove the intake barrier at Canyon Creek to allow passage of adult and juvenile chinook to historic spawning/rearing habitat; open nearby side channel to provide important off-channel rearing habitat.
6. Assure that hatchery coho production is not increased above present levels.
7. Evaluate the effects of naturally spawning hatchery-origin coho on the stability of chinook and pink salmon redds.
8. Secure funding sources should be sought for the continued operation of the Dungeness and Hurd Creek hatcheries, subject to the HSRG recommendations for operation and modification of the facilities.

D. <u>Instream Flows</u>:

1. The DQ Plan recommended that the Department of Ecology set instream flows for the Dungeness River derived from IFIM studies (Wampler and Hiss 1991). Based on DRRWG review of the Dungeness River IFIM, including selection of species, life stages, reaches and channels, the Dungeness River Management Team recommends that minimum instream flows be established at the Schoolhouse Bridge gage (RM 0.5, below all irrigation diversions) at the flow levels recommended by the Dungeness Instream Flow Group (Wampler and Hiss 1991; Hiss and Lichatowich 1990; Hiss 1993a):

   a. November through March: 575 cfs
   b. April through July: 475 cfs

c. August through October: 180 cfs

These recommended minimum flows are not based on seasonal, historic Dungeness River flows. Rather, they represent the flows required to maintain optimal potential fish habitat area. They were derived from overlapping habitat preference flow values for the highest-ranking species and life stages, as detailed in *Recommended Instream Flows for the Lower Dungeness River* (Hiss, 1993a). Table 3.13-1 summarizes the ranking process for how the recommended flows were determined. (*For an in-depth account of how the recommended flows were developed, please refer to the referenced Hiss document*.) The recommended flows serve as a biological benchmark against which the flow effects of any future water management and water right decisions should be evaluated (Hiss 1993a).

Note that the August through October (critical months) flow recommendation provides 100 percent of the habitat area expressed as "weighted usable area" (WUA) for chinook and pink spawning and migration, two of the most threatened or critical stocks in the Dungeness, and the two highest ranked species-life stage combination identified in the IFIM study (1991). (*Please see Section 2 and Appendix 3-C for discussion of the relationship between instream flows set by rule and existing senior water rights.*)

2. Manage future development to protect instream flows and trust water rights.

3. Negotiate flows for late season that consider water conservation measures, variations in snow pack and weather, and the ability of the water users association to manage diversions and water use. *See section 3.1.8 on irrigation water management for additional recommendations*.

4. Assess water savings and the IFIM recommendations periodically with the participation of the DRMT, Water Users, Tribe, and the Departments of Ecology and Fish and Wildlife.[1]

E. Gravel Movement and Channel Structure:

1. Continue to evaluate potential effects of gravel movement on aquatic habitat and on flood hazard as identified in studies conducted by the U.S. Geological Survey and Bureau of Reclamation.

2. Manage gravel movement where appropriate to promote channel stability, enhance fish habitat, and reduce flood hazard.

F. Fisheries Harvest Management:

1. Fish management actions should reflect the need to protect and rebuild stocks while instream flow protections and habitat improvement projects are implemented. Results of captive program should be evaluated before reinitiating program.

2. State and Tribal fish managers should work with DRMT to present information on harvest management practices and their relationship to salmon recovery efforts.

3. Goals should be established for threatened and critical species reflecting the need to

[1] DQ recommendation C.2.1.3.c, modified

maintain genetic diversity and spatial distribution in the watershed through natural fluctuations over time.

4. 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.

Table 3.13-1 Monthly ranking of species and life stages, maximum habitat area flow (cfs), and recommended flows based on rank of species and life stages.

Month(s)	Species	Stage	Status Rank[A]	Stage Rank[B]	Reliability[C]	Total Score	Maximum Hab. Flow[D]	Species combined[E]
Jan	Coho	Spawn	1	1	1	3	575	575
	Steelhead	Rear	1	1	1	3	475	
	Chinook	Rear	1	0	1	2	475	
	Dolly V.	Rear	0	0	1	1	650	
Feb-Mar	Steelhead	Spawn	1	1	1	3	600	575[F]
	Steelhead	Rear	1	1	1	3	475	
	Chinook	Rear	1	0	1	2	475	
	Dolly V.	Rear	0	0	1	1	650	
Apr-Jun	Chinook	Rear	1	1	1	3	475	475
	Steelhead	Rear	1	1	1	3	475	
	Steelhead	Spawn	1	0	1	2	600	
	Coho	Rear	0	1	0	1	375	
Jul	Chinook	Rear	1	1	1	3	475	475
	Steelhead	Rear	1	1	1	3	475	
	Chinook	Migr.	1	0	1	2	575	
	Steelhead	Migr.	1	0	1	2	80	
	Coho	Rear	0	1	0	1	375	
Aug	Chinook	Spawn	1	1	1	3	220	180
	Pink	Spawn	1	1	1	3	150	
	Steelhead	Rear	1	1	1	3	130	
	Chinook	Rear	1	0	1	2	50	
	Chinook	Migr.	1	0	1	2	240	
	Chum	Spawn	1	0	1	2	220	
	Coho	Rear	0	0	0	0	30	
Sep	Pink	Spawn	1	1	1	3	150	180
	Chinook	Spawn	1	1	1	3	220	
	Chum	Spawn	1	1	1	3	220	
	Steelhead	Rear	1	1	1	3	130	
	Chinook	Migr.	1	0	1	2	240	
Oct	Pink	Spawn	1	1	1	3	150	180
	Chum	Spawn	1	1	1	3	220	
	Steelhead	Rear	1	1	1	3	130	
Nov-Dec	Coho	Spawn	1	1	1	3	575	575
	Chum	Spawn	1	1	1	3	575	
	Steelhead	Rear	1	1	1	3	475	
	Dolly V.	Rear	0	0	1	1	650	

From: Hiss, 1993a

[A] Scored “1” for “considered depleted,” “0” for “not considered depleted” (or for insufficient information)
[B] Spawning ranked higher than rearing or migration from August through March; rearing ranked higher than spawning or migration from April-July.
[C] Coho rearing ranked lower than other species and life stages.
[D] Upper-reach flows corresponding to peak habitat area using all channels from November through July; or upper-reach flows using only the main channel from August through October.
[E] Desired optimum flow was chosen intuitively from overlapping peak regions of the habitat preference curves presented in Wampler and Hiss (1991) for highest-ranking species and life stages.
[F] For simplicity, the previous month’s recommended flow was substituted for 600 cfs.

3.3.1 Area-Wide Habitat Restoration, Salmon Recovery and Fish Management

Issue: Watershed management plans should incorporate, facilitate and support habitat restoration and salmon recovery underway through other State processes (see Chapter 1). This watershed plan explicitly aims to fulfill elements of a salmon recovery plan as envisioned under the Shared Strategy for Puget Sound ("shared strategy").

Existing Condition and Current Actions

In WRIA 18, habitat losses, Endangered Species Act (ESA) listings, and the decline of other stocks (e.g., Dungeness River pinks) underscore the need for watershed planning to address habitat restoration and salmon recovery on a regional basis.

Endangered Species Act Listings and Other Stock Declines: ESA listings (Puget Sound Chinook salmon, Hood Canal/Eastern Strait of Juan de Fuca summer chum, and Puget Sound bull trout) are motivating a wide range of responses, including a multitude of fisheries management actions, the evaluation and potential setting of target stream flows, attention to improving freshwater quality, and numerous restoration projects being undertaken throughout WRIA 18.

The Salmon and Steelhead Stock Inventory (SASSI, 1992) provides important basic stock status information on all anadromous stocks, not just those listed under ESA. SASSI, and more recent stock analyses, describe these other stocks (of chum, coho, pink, and steel-head) as generally depressed or critical, with few exceptions (see Table 2.1-8). In response to the decline of virtually all anadromous stocks in the WRIA 18 study area, extensive planning, management, and restoration efforts have been conducted for many years.

Salmon Restoration Plans and Strategies: Currently, North Olympic Peninsula habitat restoration, salmon recovery, and fish management goals, objectives, and actions are guided by several comprehensive documents and planning processes. These are described in detail in Chapter 1. Prominent plans and processes (some of which have been updated since the publication date shown here) include:

(1) the WRIA 18 *Limiting Factors Analysis* (Haring, 1999);

(2) the *North Olympic Peninsula Lead Entity (NOPLE) Salmon Habitat Recovery Strategy* (2001), as a regional strategy and prioritization of habitat projects;

(3) the *Recommended Restoration Projects for the Dungeness River* (Dungeness River Restoration Work Group, 1997), sometimes called the "Blue Book," as a detailed and comprehensive restoration plan for the Dungeness River and a statement of the fundamental "pillars" of river restoration (updated proposed project list in Appendix 3-A);

(4) the *Elwha River Ecosystem Restoration EIS* (1995, et seq.);

(5) *Dungeness River Chinook Salmon Rebuilding Project Progress Report 1992-93* Northwest Fishery Resource Bulletin;

(6) *Dungeness River Chinook Salmon Rebuilding Project Progress Report 1993-98*, (WDFW Report #FPA00-24, 2001);

(7) the *Summer Chum Salmon Conservation Initiative* (WDFW and PNP Treaty Council, 2000), as a recovery plan for Hood Canal and Strait of Juan de Fuca summer chum;

(8) *Restoring the Dungeness: An Overview of the Dungeness River Restoration Strategy* (Jamestown S'Klallam Tribe, 2003), as documentation of the status of the Dungeness River watershed area and a description of the restoration strategy and recovery planning being actively pursued by the local community;

(9) the updated Dungeness Watershed Analysis (USFS) as a project list for federal forest lands; and

(10) additional habitat restoration plans, as summarized in the Appendices.

Together, these address the habitat needs of all WRIA 18 streams, develop an extensive range of restoration actions, and establish an overall strategy and priority structure to coordinate effort and optimize results. They also form a basis for the necessary monitoring activities to properly design, implement, and evaluate these restoration actions.

Subbasin Plans: The primary documents described above are supplemented by more extensive and detailed stream-specific restoration plans for certain streams in WRIA 18. Notable examples for the Elwha-Morse area include those developed as part of the Elwha dam removal and ongoing restoration of Valley Creek. For the Dungeness planning area, examples include the 1997 DRRWG "Blue Book," the 1994 DQ Plan, and the current Comprehensive Irrigation District Management Plan process, as well as documents pertaining to the ongoing restoration of Jimmycomelately Creek.

All of these habitat efforts have translated into significant improvements to WRIA 18 habitat in numerous individual watersheds. Prime examples of these successful improvements can be found on Valley, Morse, Siebert, and Jimmycomelately creeks, and throughout the Lower Dungeness River. Sponsored by local governments, tribes, the Regional Fisheries Enhancement Group (RFEG) (North Olympic Salmon Coalition, NOSC), state and federal agencies, citizen groups, and other non-profit organizations, these restoration projects have included a wide range of habitat restoration actions. These actions have included purchase of land from willing sellers, conservation easements, channel realignment, LWD placement, spawning gravel replenishment, riparian vegetation control and enhancement, flow restoration, fencing and other access control, blockage removal, and passage enhancements.

Harvest: As elsewhere in Washington, harvest in open salt waters in WRIA 18 is co-managed by the tribes, the WDFW, and the National Marine Fisheries Service (NMFS). This co-management addresses matters such as allocations, management of "terminal" vs. "mixed-stock" harvest strategies, regulation of seasons and gear, and similar aspects of harvest. In freshwater (within WRIA 18 watersheds), harvest is co-managed between the tribes and the Washington Dept. of Fish & Wildlife (WDFW). Management oversight is applied to allocations, seasons, gear, and other components of harvest. At the local level, DRMT has occasionally submitted recommendations for harvest regulations for Dungeness stocks.

Hatcheries: Like harvest management, the complexities and challenges of hatchery management are closely linked to the outcomes of habitat restoration. Hatcheries entail construction of large facilities along stream channels and have substantial associated water rights. Consequently, hatcheries can have substantial physical impacts on the river channel and hydrologic impacts based on their water consumption. Also, fisheries science recognizes that hatchery programs have important, far-reaching effects on both the genetics and the survival rates of wild stocks. A statewide Hatchery Scientific Review Group (HSRG) reviewed all hatchery practices in light of the latest understanding of fisheries biology and hatchery impacts (Hatchery Scientific Review Group, 2002).

Hatcheries are present on the Dungeness and Elwha rivers. There are two hatcheries on the Dungeness, one at Hurd Creek, a small, east-bank tributary originating at RM 2.7 of the lower Dungeness, and the other at RM 10.5 on the mainstem of the river. These hatcheries currently support harvest supplementation programs for Dungeness Chinook, Coho, and steelhead stocks. The operation of these two hatcheries locally, which was reviewed in 2002 by the HSRG, is primarily a WDFW responsibility, with close involvement of the Jamestown S'Klallam Tribe.

On the Elwha River, WDFW operates a hatchery at RM 3.0 and the Lower Elwha Klallam Tribe operates its own hatchery at RM 1.0 on their reservation. These two hatcheries are fully incorporated into the larger Elwha River dam removal and river restoration project, and are managed consistent with the multi-agency fisheries restoration plan that is a principal part of the overall restoration. It is also possible that Morse Creek will be given a role in supporting that overall restoration effort.

Hydro: Hydropower facilities will soon represent a minor consideration in WRIA 18. With the impending removal of the two major dams on the Elwha River, the only remaining hydropower facility in WRIA 18 will be the City of Port Angeles facility on upper Morse Creek (RM 7.2), owned by the City of Port Angeles (see Morse Creek Section 2.4 for further detail).

Desired Conditions and Outcomes

- WRIA 18 stocks recovered to levels that can support healthy, sustainable fisheries.
- WRIA 18 salmonids listed under the ESA recovered to population levels sufficient to warrant delisting and subsequent recreational and commercial harvest.
- Well-integrated salmon recovery, habitat restoration and watershed planning processes, including chapters in salmon recovery plans for chinook, summer chum, and bull trout.
- A comprehensive funding program and strategy for regional habitat restoration and salmon recovery.
- Ongoing subbasin programs to inventory habitat, update the Limiting Factors Analysis, and identify and prioritize habitat protection and restoration projects.
- Long-term fish and habitat management, for healthy fish stocks and watershed processes, based on continuing monitoring and adaptive adjustments.

- Maintenance, protection, restoration, and enhancement of native and wild fish stocks including listed (ESA), critical, high potential of becoming critical, depressed and healthy stocks of salmonids in the river.[1]

Recommendations

A. Fisheries Habitat Management:

1. The DRMT, the West WRIA 18 Watershed Council and local technical advisory groups should be involved in implementation of an approach to the management of native and wild stocks, fish habitat, and hatcheries that reflects the need to protect and rebuild stocks while instream flow and habitat improvement projects are implemented.[2]
2. In all management actions, strive to retain (maintain) or restore structural and functional characteristics of river, riparian and wetland habitats which are important to fish and wildlife.[3]
3. 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.[4] See Table 3.4-3 for priority categories for West WRIA 18 streams and rivers.
4. Protect and maintain or enhance, and in some cases, restore those areas with high values and functions.[5]
5. Identify, study, and seek to restore degraded river, riparian and wetland habitat conditions caused by both natural and human impacts.[6]
6. Develop a management plan to increase the values and functions of the habitat and to make better use of the existing water resources.[7]
7. Education for riverside landowners and river users should be considered as a vital component of the habitat management planning effort.[8]

B. Harvest:

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.[9]

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[1] DQ Rec. R.11
[2] DQ Rec. R.11.2 & R.11.2.2(a), modified
[3] DQ Rec. R.8, modified
[4] DQ Rec. R.8.1
[5] DQ Rec. R.8.3, modified
[6] DQ Rec. R.8.6
[7] DQ Rec. R.8.7
[8] DQ Rec. C.7.1.14
[9] DQ Rec. R.11.2.1

C. Hatcheries:

1. Implement HSRG recommendations related to protection of wild salmon runs, continuation of hatchery-based fish restoration and incubation programs, and minimization of competition between hatchery and wild fish.
2. Protect wild fish and provide good conditions for hatchery fish while avoiding competition between the two.
3. Open the anadromous fish passage presently blocked by the diversion to the hatchery at Canyon Creek. Consider moving some hatchery facilities out of the floodplain and restore the floodplain on the Dungeness Hatchery grounds.
4. Continue the restoration and recovery programs in Jimmycomelately Creek and the Dungeness River. Secure ongoing funding necessary for facilities such as Hurd Creek hatchery and for personnel to implement these programs until they sunset.

D. Monitoring:

1. Prepare an annual report on WRIA 18 habitat restoration and salmon recovery. Maintain integrated and updated documentation of actions taken under all regional and subbasin habitat restoration and salmon recovery plans and programs. Integrate information on stock status, fisheries management, and hatchery management at the watershed level.
2. Use GIS to track monitoring locations.
3. Adopt, at minimum, the required elements of the State-level Watershed Health monitoring program.
4. Explore funding sources for ongoing monitoring, including local government, and state or federal sources. Include funding for monitoring in river and habitat studies.
5. Conduct regular reconnaissance of all appropriate WRIA 18 rivers and streams by a qualified stream geomorphologist to identify emerging problems and changes affecting restoration and rehabilitation actions.

E. Enforcement:

1. Seek additional funding to increase enforcement of fish and wildlife regulations with emphasis on critical and threatened species.
2. Support increased enforcement and monitoring of salt-water fisheries, interception, and take.

3.3.5 Riparian Corridors

Issue: Riparian corridors are an inseparable element of river ecosystems and their health is vital to properly functioning conditions in these environments. Riparian zones provide a wide array of important habitat features and other benefits to the natural and human environment.

Existing Condition and Current Actions

As broad attention increasingly has been given to water resource and habitat issues, the importance of riparian corridors has become better understood and they have been, to some extent, incorporated into the various planning efforts and land use management actions of local governments. Riparian habitat is considered in the inventories and strategies for small streams and is included within the local regulatory frameworks, monitoring and evaluation activities, and habitat protection and restoration projects. Key efforts include a riparian land protection program focused on the Lower Dungeness River, restoration planned and underway on Jimmycomelately Creek, and efforts by local watershed groups on the Elwha River, and Tumwater, Valley, Ennis, Matriotti, Siebert, and Bell creeks.

Desired Conditions and Outcomes

- Riparian zones are considered and included in habitat restoration activities associated with WRIA 18 streams wherever required for properly functioning conditions.
- High priority, high-value riparian lands are identified and prioritized for protection.
- A local action program retains and enhances existing riparian habitat.
- WRIA 18 riparian lands are regularly monitored and assessed.
- Riparian management considerations are incorporated into broader habitat programs, including salmon recovery, flood hazard, and stormwater planning.

Recommendations: *(in addition to all applicable recommendations listed for rural streams)*

A. Land Protection:

1. Fund and undertake a program of purchasing priority riparian parcels from willing sellers on WRIA 18 rivers and streams. Such a program can be coordinated with the CREP and FREP programs. Build on the DRRWG riparian parcel prioritization (in *Recommended Land Protection Strategies for the Dungeness Riparian Area* (2003)) for the Dungeness River and on other processes that identify key property needs.
2. Seek grant funding to help landowners establish conservation easement agreements and to build the endowment funding needed to uphold agreements for perpetuity.

B. Riparian Management and Buffers:

1. Riparian management goals and activities should be explicitly considered and, wherever possible, integrated with all related planning processes and habitat restoration projects such as flood hazard management, stormwater planning, and salmon recovery projects.

2. Maintain and periodically update detailed mapping of existing, potential, and, to the extent feasible, historic riparian zones.

3. Regularly monitor the extent and ecological condition of existing and potential riparian areas.

4. Protect riparian buffers, including marine riparian buffers.

5. Consider existing water quality and the potential to affect water quality whenever determining stream riparian buffers for land development.

C. Riparian Restoration:

1. Continue riparian restoration and fencing to stabilize stream banks and marine riparian areas and to reduce the movement of pollutants.

2. Use native plants in restoring WRIA 18 riparian zones.

D. Livestock Access: Where livestock access is not addressed under the Critical Areas Ordinance (i.e., for areas not designated "critical"), identify and locate problem areas, define BMPs, and consider designation under CAO.

3.3.7 Floodplains and Flood Hazard Management

Issue: Floods, flood hazard management, and the floodplains over which flood waters extend profoundly influence river processes, habitat conditions for fish and wildlife, and human health and safety. Full consideration of flood hazard management planning and the hydrologic and fluvial geomorphologic functions and values of flooding should be incorporated in watershed and land use planning.

Existing Condition and Current Actions

This section addresses subbasins (or portions of subbasins) in which streams retain at least remnant portions of intact floodplains and in which floodwaters are developed from predominantly natural watershed lands. In WRIA 18 subbasins (or portions of subbasins) where historic floodplains have been significantly altered by urban development and where floodwaters are managed within largely urbanized watersheds, issues and recommendations are considered in this watershed plan under the topic of stormwater management.

The Dungeness River is subject to occasional major Pacific storms and vulnerable to rapid onset of flooding. The river channel has experienced downcutting and aggradation, lateral instabilities and side-channel changes, in the river channel; and slope failures and mass wasting in the upper river on National Forest land. The largest of 10 major flood events of record considered in the 1990 plan is now considered a 25-year flood event, but a new flood of record (7,610 cfs) occurred in January 2002. A USGS gage record peak discharge (circa 1900-01) has more recently been identified to be as high as 7540 cfs.

Although the county flood plan is currently being updated for the Dungeness, Clallam County is operating under the 1990 Dungeness River Comprehensive Flood Control Management Plan. That plan concentrated primarily on protecting life and property from flood hazard in the 100-year flood plain as defined in a 1989 FEMA (Federal Emergency Management Agency) Flood Insurance Study. Since 1927, eleven major constrictions have been constructed from the hatchery downstream. Substantial changes in the river corridor since 1990 include: replacement bridges at Highway 101 and Old Olympic Highway; extension of the Dungeness Meadows dike; reconstruction of a portion of the Haller dike; bank stabilization and channel protection downstream of Railroad Bridge and upstream of Schoolhouse Bridge; and large woody debris modifications.

Over the past decade intensive efforts have been made in river restoration, salmonid recovery, and watershed planning, and extensive research has added to the knowledge of Dungeness River processes and conditions. Considering the significance of changes and new information accumulated over the past 12 years, DRMT, Clallam County and Ecology have recognized the need to modify and broaden the Flood Plan addressing longstanding concerns for protecting life and property while incorporating river restoration and salmon recovery. A Flood Plan Committee has been convened. An amended flood plan is currently in preparation. Countywide, including the remainder of WRIA 18, the 1995 Clallam County Flood Hazard Management Plan provides guidance, but does not incorporate habitat-related considerations.

In East WRIA 18, flood management projects have been continually pursued as resources have allowed. In 1999, Chadd reviewed and documented projects that were either being planned at that time or that were completed in the prior 5-year period (1994 through 1999):

- A County Critical Areas Ordinance, passed in December 1999, was created to provide buffers for these areas. Flood plain restoration projects were ongoing as possible.
- A 1997 project downstream of the old Duncan Bridge (May Road crossing on the Robinson property) pulled back the bank by 450 feet and reduced a major constriction on the river.
- A 1997 project at Fish Hatchery Road stabilized the bank with bioengineering.
- A 1997 project pulled back and reconstructed the Haller Dike (with NRCS).
- A study of dikes on the Dungeness River was initiated by the Corps of Engineers in 1997.
- A 2000 technical report by the Bureau of Reclamation compared 1930's and 2000 conditions and analyzed alternatives for levee modifications along the Dungeness River in the Lower 2.7 River Miles.
- The Burlingame Bridge was replaced in the mid-1990's, expanding the bridge span by 290 feet and removing a constriction including over 12,000 cubic yards of fill that had been placed along with the old bridge in 1935.
- A 2000 engineering study was prepared for the County by the Bureau of Reclamation to evaluate river hydraulic and sediment transport aspects of extending or lengthening the Schoolhouse Bridge.
- A dike pullback was scheduled for Kinkade Island in 2000. This is the narrowest constriction in the upper Dungeness. (Project completed in 2000, results being monitored by Streamkeepers; a geomorphic assessment of Kinkade Island was prepared for Clallam County by Bureau of Reclamation in 2003.)
- The County hired a Salmon Resources Planner (Nov. 1999) to coordinate updating the County's Flood Control Management Plan. (Draft Dungeness River Comprehensive Flood Hazard Management Plan completed in 2003; *Recommended Land Protection Strategies for the Dungeness Riparian Area* was developed by the RRWG in 2003, and will be integrated into the final Comprehensive Flood Hazard Management Plan.)

In 2001 a joint effort by NOLT and the Interagency Committee on Outdoor Recreation (IAC) was completed, resulting in the protection of 103 acres (in eight separate parcels) of riparian and floodplain habitat. One 40-acre parcel is now protected floodplain/riparian habitat that will enable the relocation of a dike to increase the associated floodplain just upstream of the Schoolhouse Bridge. The county has initiated a comprehensive land acquisition program for the "River's End" properties at the mouth of the Dungeness in order to achieve flood hazard reduction, floodplain protection and restoration, and riparian habitat improvement. The program is now completing its first purchases.

Flood-related concerns on the Elwha River have been extensively evaluated in the context of dam removal and river restoration. Because of the substantial changes to river morphology and hydrology following dam removal, thorough attention is being given to the habitat aspects of floods and floodplains within the overall restoration process.

Regulatory protection and management of non-federal floodplains and their habitat value is provided under the County's Critical Areas Ordinance. As called for in the Growth Management Act, Sequim addresses these concerns within critical areas management through its zoning ordinance (Title 18.80, Environmentally Sensitive Areas Protection, which includes development standards) Port Angeles also has critical areas ordinances and has prepared a Stormwater Management Plan (1996).

Accurate flood maps for each watershed are among the most important tools in flood hazard and floodplain management. However, FEMA flood maps for much of WRIA 18 are out of date. For example, the FEMA maps for the Dungeness are based on actuarial information in addition to historical physical features. Consequently, they do not accurately reflect current or changing river conditions, nor do they present a correspondingly accurate portrait of flood risks. FEMA has received funding to update these maps under a "map modernization project", to which localities can provide new data in order to improve the new maps.

Desired Conditions and Outcomes

- Comprehensive flood hazard management plans for major WRIA 18 subbasins (Elwha, Morse, and Dungeness) that fully incorporate river processes and habitat considerations.
- Accurate and updated flood maps for major WRIA 18 subbasins.
- WRIA 18 streams and rivers are reconnected to their floodplains and estuaries to the extent feasible, consistent with the protection of human health, safety, property and salmon recovery.
- Voluntary landowner participation in efforts to protect riparian floodplain.

Recommendations

A. Flood Hazard Management Planning and Floodplain Restoration:

1. Protect, and in some cases restore, floodplain and estuarine habitat to provide functions and values necessary to provide for the protection of life, safety, and property and to protect fish and other wildlife resources, to reestablish naturally functioning stream geomorphology, reconnect river and streams to their floodplains and tidal estuaries, restore natural river and floodplain processes, and maintain river channels and banks in dynamic equilibrium. A gradual evolution away from flood plain development and occupation and impacts on the ecosystem should be the goal.[10] Reconnect estuarine wetlands to their adjacent streams wherever possible.
2. Clallam County should develop and implement a new integrated flood planning and habitat restoration/protection plan, linking previous plans, Comprehensive Plan, 2514 Watershed, Blue Book, Land Protection Strategy, and Clean Water District planning.
3. Reevaluate flood planning in light of changes to streams and habitat conditions after major floods occur.

[10] DQ Rec. R.9

4. Outside of existing urban areas and designated urban growth areas, limit impervious cover to no more than 7 percent. Inside urban areas and designated urban growth areas, incorporate low impact development standards. (See also Section 3.5)
5. Prohibit future development in the Dungeness River floodplain. (Refer to the County's Floodplain Ordinance regarding these regulations.) Review, update and strengthen Clallam County Floodplain Ordinances to make sure they are adequate to protect natural floodplain functions.[11]
6. Implement the Dungeness River Comprehensive Flood Hazard Management Plan, as updated; continue implementation of the Dungeness River Area Watershed Management Plan; and integrate them with revisions to the County Comprehensive Plan, applicable County ordinances, and salmon recovery planning.

B. Floodplain Delineation:

1. Delineate the floodplains of small WRIA 18 streams.
2. Redraw FEMA delineations based on LIDAR mapping and BOR studies, to reflect actual fluvial geomorphology.
3. Update Critical Areas maps based on LIDAR and other aerial mapping sources.

[11] DQ Rec. R.9.1

C. What are your measurable Dungeness Chinook and bull trout recovery goals and the timeframe to achieve them? What has already been accomplished toward achieving them?

1. Dungeness Chinook Recovery Goals

Abundance and productivity targets for threatened Chinook salmon populations in Puget Sound have been developed by Federal, State and tribal fisheries biologists and endorsed by the Dungeness River Management Team. Planning targets are based on the four viable salmon population characteristics: abundance, productivity, diversity and spatial structure. The Ecosystem Diagnosis and Treatment (EDT) method (Mobrand Biometics, Inc., 1999) was used to model the parameters for recovery of Puget Sound Chinook populations. This EDT analysis provided "recovery goals" utilizing Properly Functioning Conditions Plus (PFC-Plus), as well as an evaluation of the ability of individual actions and suites of actions to move the population towards the recovery goals over time. In this case, PFC-Plus assumes PFC in the freshwater habitat (NMFS, 1996), and pristine conditions in the estuary. Therefore, the "recovery goals" established through the EDT model likely exceed the productivity and abundance actually possible. However, the PFC-Plus standard was chosen by the planning participants to ensure that the estuary was incorporated into the goals. At the time that the goals were set, there were no guidelines established for PFC in the estuary.

The following Chinook abundance planning targets and productivities were developed for the Dungeness watershed based on results generated by EDT.

Dungeness Chinook Escapement Planning Targets in Comparison With Mean Escapement Over the Last Fifteen Years

Escapement Planning Targets with Productivity in Parentheses		Mean Escapement (1987 - 2001)
4,700 (1.0*)	1,200 (3.0*)	123

**Note: Productivity is expressed as adults produced per spawner.*

The planning targets indicate a range of escapement and the associated productivities (or adult returns per spawner) that would constitute recovery. The range is needed to show that abundance and productivity are related, and even under recovery conditions, will tend to vary inversely (the productivity declines when the abundance increases and vice versa). Thus, the range of related target escapements and productivities shown represents the recovery goals.

The EDT analysis not only provides an estimate for the abundance and productivity targets, but also diversity and time to achieve recovery. The EDT model incorporates "life-history pathways" into its assessment of diversity. These pathways include not only differences in timing, but also differences in migrational behavior as a smolt emigrates from a system. Time to achieve recovery is obtained through simulated environments, with an outlook for 25 and 100 years. The following two tables summarize the output of the EDT exercise. The “High”, “Medium”, and “Low” scenarios are the suites of projects found in the response to Question A.

EDT Model Results
Likelihood of Implementation Scenarios
25-Year Analysis

		25 - Years					
		High	Medium	Low	Current	Buildout	Targets
Adult	Productivity	5.83	7.71	7.78	3.68	3.28	9.3
Adult	Abundance	1,764	2,544	2,555	699	649	4,735
Adult	Diversity	0.98	0.99	0.99	0.70	0.68	1
Adult	Capacity	2,129	2,923	2,932	959	934	5,309
	Spawners @MSH	517	674	674	239	231	1,170
	MSH Harvest Rate	0.59	0.64	0.64	0.48	0.45	0.67
Juv.	Productivity	439	482	484	251	212	462
Juv.	Abundance	179,117	213,955	214,377	79,823	70,761	277,287

EDT Model Results
Likelihood of Implementation Scenarios
100-Year Analysis

		100 - Years					
		High	Medium	Low	Current	Buildout	Targets
Adult	Productivity	6.48	8.21	8.29	3.68	3.28	9.3
Adult	Abundance	1,919	2,649	2,668	699	649	4,735
Adult	Diversity	0.99	0.99	1	0.70	0.68	1
Adult	Capacity	2,269	3,016	3,034	959	934	5,309
	Spawners @MSH	541	685	688	239	231	1,170
	MSH Harvest Rate	0.61	0.65	0.65	0.48	0.45	0.67
Juv.	Productivity	462	490	491	251	212	462
Juv.	Abundance	188,684	213,491	214,109	79,823	70,761	277,287

As can be seen, significant progress is made towards achieving the goals, even in the first 25-years for only those projects deemed to have a “High” likelihood of implementation. Productivity dramatically increases (3.68 vs 5.83), while abundance more than doubles (699 vs 1,764) and diversity nears full restoration (98%). The response is even greater when the “Moderate” likelihood projects are included. Most of the recovery is modeled to occur in the first 25-years, due to the immediate impact of certain project types (those that increase the quantity of available habitat). However, recovery is shown to continue over the 100-year time period modeled, as riparian vegetation matures and wood recruitment projects mature.

In light of additional EDT analysis and results obtained in June, 2004, the Dungeness River Management Team, fisheries co-managers, local governments and other key watershed partners will be undertaking more analysis of the recovery goals in the next year to determine whether the present restoration strategy should be revised. However, the project partners are confident that the actions already under consideration will lead to the establishment of a VSP Chinook population in the Dungeness River.

2. Dungeness Bull Trout Recovery Goals

This section is based on the U.S. Fish & Wildlife Service's Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout (*Salvelinus confluentus*) , volume II: Olympic Peninsula Management Unit (2004), See pages 133-147 in the draft plan for more details. Entire paragraphs and sentences from the draft plan have been copied in this section with the U.S. Fish & Wildlife Service's permission (S. Spalding, Per. Com., 2005).

The Olympic Peninsula Recovery Team, consisting of Federal, State, county, and tribal fisheries biologists, have developed recovery targets for threatened bull trout populations in the Olympic Peninsula Management Unit. Planning targets are based on the four key elements describing a recovered bull trout population: abundance, productivity, local populations, and connectivity (U.S. Fish & Wildlife Service, 2004).

The Olympic Peninsula Recovery Team also evaluated each of the above described elements under a potential recovered condition to produce recovery criteria. The evaluation of these elements under a recovered condition assumed the implementation of actions identified within their draft plan. The recovery targets for the Olympic Peninsula Management Unit reflect: (1) the stated objectives for the management unit; (2) the evaluation of each population element under both current and recovered conditions; and (3) consideration of current and recovered habitat characteristics within the management unit. These recovery targets are subject to refinement in the future as more detailed information on bull trout population dynamics becomes available. Given the limited information currently available for bull trout in the Olympic Peninsula Management Unit, both the level of adult abundance and the number of local populations needed to lessen the risk of extinction should be viewed as best estimates at this time. This approach to developing recovery criteria acknowledges that the status of populations in some core areas may remain short of ideals described by conservation biology theory. Certain natural attributes or small patch size may limit some core areas, and these may always remain at a relatively high risk of extinction. Because of the limited data available within the Olympic Peninsula Management Unit, the recovery team relied heavily on the professional judgment of its members (U.S. Fish & Wildlife Service, 2004).

Within each management unit, recovery will be based on the concept of functional "core areas." A core area represents the combination of both a core population (*i.e.*, one or more local populations of bull trout inhabiting a core habitat) and core habitat (*i.e.*, habitat that could supply all the necessary elements for the long-term security of bull trout, including both spawning and rearing, as well as for foraging, migrating, and overwintering) and constitutes the basic unit upon which to gauge recovery (U.S. Fish & Wildlife Service, 2004).

Ensuring the long-term persistence of all extant local populations, especially those exhibiting the migratory life history, is key to supporting self-sustaining core areas of bull trout within the Coastal-Puget Sound Distinct Population Segment. Migratory forms are important because they provide an opportunity for core populations to exchange genetic material and, hence, increase the diversity and stability of the overall distinct population segment. Presumably this diversity reduces the risk of extinction of the distinct population segment. Large migratory bull trout also have higher fecundity than the resident forms and use a greater diversity of spawning and foraging habitats, which further contributes to population diversity and lowers the risk of extinction. All migratory life history forms require intact spawning and rearing habitat connected to adequate foraging, migration, and overwintering habitat. For migratory bull trout, these required habitats span the whole watershed, from headwater tributaries to the estuary and, for anadromous bull trout, adjacent marine nearshore habitat, as well as freshwater systems outside their natal watershed (U.S. Fish & Wildlife Service, 2004).

To develop a recovered abundance target for each core area, two factors were considered. The first factor was the minimum number of adult spawners in a core area needed to avoid the deleterious effects from genetic drift. The team selected the high value of 1,000 spawning adults from the suggested range of 500 to 1,000 spawning adults. In addition, the amount of available suitable habitat was also considered. The recovered abundance level for Dungeness core area was determined to be at least 1,000 adult spawners. The recovery team emphasized that a more precise estimate of recovered abundance will be possible following availability of additional current abundance information. The second factor considered in developing recovered abundance targets was the size of local populations needed to address inbreeding concerns. Based on the guidance presented above, the Olympic Peninsula Recovery Team chose to base local population abundance on the higher value of the 50 to 100 spawners needed to avoid inbreeding depression. The team acknowledges that this minimum abundance for local populations may need to be revised in order to buffer against random naturally occurring catastrophic events. Available information indicates that many, if not most, local populations can achieve this abundance, provided adequate habitat conditions are maintained or restored. The team acknowledged that some local populations may not be able to achieve this ideal minimum abundance, while others will likely reach much higher abundances due to natural differences in habitat capacity among the local populations. However, based on the population guidance and information from Rieman and Allendorf (2001), the team believed 100 spawners should be the current basis for setting recovered abundance targets for each local population in the Olympic Peninsula Management Unit (U.S. Fish & Wildlife Service, 2004).

For recovery to occur, the distribution of the 2 local populations currently identified in the Dungeness should be maintained or expanded while abundance is increased. Reconnecting fragmented habitat and restoring degraded habitat, as well as identifying new or previously undescribed local populations, should allow the distribution of bull trout to increase as recovery progresses (U.S. Fish & Wildlife Service, 2004).

Productivity will be measured by evaluating trends in abundance. Bull trout abundance in the Dungeness is likely below the recovered abundance level and will need to exhibit an increasing trend. Because there is so little baseline information about bull trout productivity in the Dungeness, the recovery team believes that it will require at least 15 years of monitoring to accurately determine a stable or increasing trend (U.S. Fish & Wildlife Service, 2004).

Bull trout in the Dungeness have access to almost all habitat historically available. A barrier does exist at the mouth of Canyon Creek at the WDFW Dungeness Fish Hatchery. Habitat in Canyon Creek is considered good for rearing, overwintering, and foraging and the feasibility of passage needs to be addressed (M. McHenry, Per. Com., 2005). Criteria and specific actions necessary for passage can be developed and implemented as the necessary information becomes available (U.S. Fish & Wildlife Service, 2004).

Time required to achieve recovery depends on bull trout status, factors affecting bull trout, implementation and effectiveness of recovery actions, and responses to recovery actions. A tremendous amount of work will be required to restore impaired habitat, reconnect habitat, and eliminate threats from nonnative species. Three to 5 bull trout generations (15 to 25 years), or possibly longer, may be necessary before recovery is achieved (U.S. Fish & Wildlife Service, 2004).

3. Habitat Restoration Activities and Accomplishments

Since the inception of the Dungeness River Management Team in 1988, substantive progress has been made on each of the ten restoration strategies described in "Restoring the Dungeness." The attached list of *Dungeness Watershed Restoration Plans & Activities 1989 to Present* has been updated from the one presented in Appendix 5 of "Restoring the Dungeness" and provides a fairly complete list of accomplishments divided into the categories of, I. Plans and Studies which covers planning documents, habitat assessments, stock analysis, and studies of instream flows, water conservation and water quality; and II. Restoration and Education Projects and Programs. These projects are also shown on the maps following this section. Highlights of the watershed community's accomplishments include the following habitat-related activities:

a. ***Restoration of the Lower River Floodplain and Delta:*** Identified as the highest priority restoration activity for several years, watershed partners have purchased seven parcels of land on the west side of the river mouth at River's End Road, and have funding in hand for buyout of additional properties, as well as demolition and removal of buildings, septic systems and other structures. Funding is also in hand for re-vegetation of the floodplain area in the first river mile at the estuarine river interface. Analysis of dike setback of the US Army Corps dike on the east side has been conducted by the Bureau of Reclamation (Bountry et.al., 2002), and discussions are in progress between the Corps, County and Dungeness River Restoration Work Group.

b. ***Protection of Existing Functional Habitat through Land Purchase (RM 2.6 - 11.3):*** The Dungeness River Restoration Work Group completed the report, "Recommended Land Protection Strategies for the Dungeness Riparian Area" (Hals and DRRWG, 2003) in June, 2003 which consists of a parcel by parcel analysis of the Dungeness riparian corridor with recommendations for purchase priorities, conservation easements and stewardship. Approximately 600 acres of land are identified in the report for high priority purchase. Of these 600 acres, committed funding exists for approximately 450 acres and negotiations are underway for purchase. Currently the North Olympic Land Trust holds title to conservation easements for more than 100 acres of riparian land along the Dungeness River and the report recommended this type of protection as a high priority for over 250 additional acres. A map of the lands along the Dungeness riparian corridor which have been placed into protected status since 1989 is enclosed following this section.

c. ***Floodplain Restoration / Constriction Abatement (RM 2.6 - 11.3:*** Several important constrictions exist between river mile 2.6 and 11.3 including four bridges, a major dike system and smaller dikes and bank hardening. Since 1989, several studies have been conducted to analyze channel geomorphology, which suggest alternative ways to restore floodplain habitat and reduce flood hazard. These include a detailed analysis by the Bureau of Reclamation (Physical Processes, Human Impacts and Restoration Issues of the Lower Dungeness River, Bountry et al., 2002) and an update of the Dungeness River Comprehensive Flood Management Plan (Clallam County, 2003). Projects which have been completed to reduce constrictions along the river include the widening of the Old Olympic Highway Bridge (from a 130 foot span to a 430 foot span) and setback or removal of bank hardening projects on individual parcels. These projects are also dependent upon the purchase of land or easements described above.

d. Water Conservation, Instream Flow Protection and Water Quality Improvement / Protection:

Water Quantity: The Dungeness River has been utilized extensively for irrigation for over 100 years, and water rights were severely overappropriated in a 1924 adjudication. Biologists measured irrigation withdrawals in September of 1987 and found that 82% of the total flow was being withdrawn. Water conservation has been one of the most successful habitat restoration programs in the Dungeness River. Following numerous instream flow studies, irrigation ditch efficiency analyses, construction projects to line ditches and "plug leaks" in the system, instream flows have improved dramatically. Flow conditions comparable to those in 1987 were experienced in the 2001 drought, and total water withdrawals did not exceed 33% of the flow due to infrastructure improvements and efficient management . The irrigators have completed a Comprehensive Water Conservation Plan and associated EIS, and are in the late stages of completing a Comprehensive Irrigation District Management Plan, which will serve as an HCP for irrigation activities when implementing agreements are signed. All Dungeness Irrigation districts and companies signed a trust water rights agreement with the Washington Department of Ecology in 1998 to insure that withdrawals would not exceed 50% of the total instream flow and that 2/3 of conserved water would go to instream flow.

Water Quality: The Clallam Conservation District has implemented major improvements in irrigation ditch systems to reduce or eliminate the addition of pollutants into the Dungeness River, tributaries and Dungeness Bay. Additionally, water temperatures in the Dungeness mainstem and side channels have been improved by the reduction of diversions by the agricultural community. Although fecal coliform counts in Dungeness Bay have been elevated in recent years, the Jamestown S'Klallam Tribe, Clallam County, Clallam Conservation District and the Washington Department of Ecology have conducted numerous studies and monitoring to identify the sources of pollution and take remedial action. Two TMDLs have been conducted, one for the River and its tributaries, and one for the Bay, in response to the requirements of the Clean Water Act. A "Clean Water Strategy" is being developed to serve as the Clean Up Plans for the two TMDLs   Actions include animal exclusion through fencing of riparian corridors, animal waste management, inspection and repair of septic systems, stormwater management and extensive public outreach.

e. ***Restoration of Functional Riparian and Riverine Habitat:*** Two categories of activities are included in this strategy, focused on restoration of small tributaries of the Dungeness River and revegetation along the mainstem. Sporadic restoration of small tributaries such as Matriotti, Hurd and Bear Creeks has been completed, largely by the Clallam Conservation District. Revegetation along the mainstem has been identified as a high priority for landowner stewardship, and funding has been sought for project coordination.

f. ***Large Woody Debris Placement:*** The 1997 publication, "Recommended Restoration Projects for the Dungeness River" by the Dungeness River Restoration Work Group contained recommendations for LWD projects throughout the lower river to improve or create refugia and stable habitat conditions. The Jamestown S'Klallam Tribe and Clallam Conservation District have constructed 31 log jams on the lower 10 miles of the Dungeness River between 1997 and 2000. An analysis of the effectiveness of these structures was completed by the Tribe in 2002 (Hagen). Most of these structures were placed opportunistically, where the Tribe could identify willing landowners and appropriate sites, and where the potential liability from adjacent downstream property owners was low (i.e. no houses immediately downstream). The Tribe completed an engineering analysis of the railroad bridge reach from RM 4.6 to 6.4 (Philip Williams and Associates., 2002) for a reach-scale LWD project consisting of 11 engineered log jams and has submitted a funding proposal for the current round of the Salmon Recovery Funding Board.

g. ***Nearshore Habitat Protection and Restoration:*** For Dungeness Bay, this strategy is linked closely to restoration of the lower river floodplain and delta, as diking along the river mouth and tidal diking have changed the circulation patterns of the estuary. The Jamestown S'Klallam Tribe conducted extensive circulation studies of the Bay (Rensel et al., 2002) to identify the relationship between bacteria sources, circulation and flushing of the Bay. Clallam County and the Tribe have formed a Clean Water Work Group to focus on the implementation of the TMDL through improved animal keeping practices, septic disposal and stormwater management. Other important estuary areas at the mouths of Gierin Creek (Graysmarsh), Bell Creek (Washington Harbor) and other small steams along Dungeness Bay are considered to be important salmonid habitat and funding has been sought by the Clallam Conservation District to develop remedial plans.

h. Barrier Removal: Barriers along the lower 11 miles of the Dungeness include a dam on the Canyon Creek tributary, seasonal blockages caused by irrigation outtake facilities, and blockages caused by riverbed downcutting or aggradation and low flow conditions. Blockages associated with irrigation facilities have been analyzed during the preparation of the Comprehensive Irrigation District Management Plan (CIDMP) and proposed remedial activities are identified in the plan. The Canyon Creek dam is associated with the water supply system for the upper Dungeness hatchery, and alternatives for water supply are being evaluated by WDFW. Although barrier removal at Canyon Creek would open important fish habitat, it is not considered a restoration activity for Chinook. The Olympic Peninsula Recovery Team considers the habitat in Canyon Creek to be adequate for rearing, overwintering, and foraging by bull trout and recommends that the feasibility of passage be addressed. Criteria and specific actions required for passage can be developed and implemented as the necessary information becomes available.

i. Stock Recovery / Hatchery Reform: Life history studies of Chinook and late pink salmon were conducted in 1997-1998 and again in 1999 - 2000 which indicated that most juvenile salmon migrate to the lower river or out of the system during their first year, but a small number of Chinook overwinter in the river and migrate out as yearlings. The studies looked at juvenile use of side channel habitat in the lower river, and helped to focus land purchase and easement efforts on to the most highly productive habitat areas.

For a description of the Chinook captive broodstock program and other hatchery related accomplishments, please see the hatchery portion of the response to this question.

j. Sediment Management / Source Control: Several road decommissioning and stabilization projects have occurred on Olympic National Forest land in the upper Dungeness watershed in the last few years and additional work is proposed. The US Forest Service completed an update of the Dungeness Watershed Analysis in 2003 largely focusing on slope / soil stability and sediment management.

For additional information on the activities of the Dungeness River Management Team and partner organizations, see the enclosed annual "Milestone" reports for 2001 - 2003.

4. Hatchery Management Activities and Accomplishments

Dungeness Chinook Captive Brood Program: Critically low Chinook adult returns to the Dungeness River watershed led to the initiation of a Chinook captive brood program in 1992 (Smith and Wampler 1995). The program involved mining eggs from Chinook redds for six brood years; that is through brood year 1997. The eggs were incubated and hatched, and the Chinook juveniles were reared in the hatchery until mature. The captive adults were then spawned, the eggs fertilized and incubated, and the fry reared and released. This captive brood program provided the means for increasing juvenile emigrants quickly while minimizing impact on the natural population. Releases of progeny from captive brood have averaged 1.5 million from 1996 through 2003. Provisions were taken to mark juveniles of the mined eggs from each redd so that when mature, the captive adults would be mated to minimize potential genetic introgression (inbreeding) that might result from working with the limited initial numbers of salmon. The juveniles were released at various life stages and locations within the watershed in an effort to increase diversity and spatial distribution of returning adults. The last release of juveniles from the captive brood program occurred in the spring of 2004. Details of the planning, history and operation of the captive brood program are described in Smith and Wampler (1995) and Freymond et al. (2001). Annual releases by numbers and locations are described in the Dungeness River Chinook Hatchery Genetic Management Plan (HGMP).

Adult Chinook returns in recent years indicate the captive brood program has been successful in increasing adult returns. Adult escapement to the river has averaged 575 spawners over the last three years (2001-2003), ranging from 453 to 640 spawners. These higher returns will now accommodate implementation of a conventional Chinook brood stocking program that is scheduled to begin in the fall of 2004. The new program is intended to maintain the higher adult return rates until the habitat can support a productive and sustainable natural Chinook population. This new program is described below in the response to the Question D.

Dungeness Non-Chinook Hatchery Programs: The Dungeness hatchery operations also support programs for other species both within and outside the Dungeness River watershed. These include coho and winter steelhead programs within and coho (Snow Creek) and Chinook (Elwha River) programs outside the watershed. The facilities had supported an in-river fall pink program and a summer chum program at Salmon Creek, both recently terminated. Support for the programs outside the watershed involves incubation and/or rearing juveniles before transfer back to streams of origin for final rearing and release.

The within watershed programs of coho and steelhead include the provision of delaying release until after June 1 to reduce potential predation on the listed species of Chinook and summer chum salmon, and also on Dungeness pink salmon. The expectation is that the delay in release of the larger coho and steelhead yearlings (age 1+) will provide the opportunity for the smaller Chinook, summer chum and pink juvenile emigrants (age 0+) to move out of the river and estuary in time to avoid becoming prey to the larger fish. The programs are also closely managed to control potential fish pathogens that might affect the natural salmonid populations in the watershed. Currently, 10,000 steelhead and 550,000 coho are released from Dungeness Hatchery annually. Details of the Dungeness non-Chinook hatchery programs are described in the respective HGMPs and in the non-Chinook RMP (PSTT and WDFW 2004).

<u>Defining Chinook Hatchery Management Programs under ESA</u>: The Co-managers, under the Endangered Species Act, are in the process of obtaining permits from NOAA Fisheries for hatchery operations affecting Puget Sound Chinook. They have submitted Resource Management Plans (RMPs) for hatchery Chinook and for hatchery non-Chinook species as part of the permitting requirements under section 4(d) of the Endangered Species Act (WDFW and PSTT 2004, PSTT and WDFW 2004). These plans describe how the Co-managers are managing hatchery programs to help conserve some Puget Sound Chinook natural populations (e.g., Dungeness) and also to control potential hatchery impacts on natural Chinook populations (i.e., for programs that augment Chinook harvest and for non-Chinook species programs). In support of this effort, the Co-managers have also prepared an EIS and Hatchery Genetic Management Plans (HGMPs). The HGMPs describe planning and operation of the individual hatchery programs at every hatchery facility. Virtually all of the Co-managers' hatchery management planning relevant to Puget Sound Chinook, including Dungeness Chinook, is described in these documents.

<u>Hatchery Reform</u>: Hatchery management is a dynamic process, changing over time through monitoring, review and adaptive management. Another process currently affecting the direction of hatchery management in Washington State is the Puget Sound and Coastal Washington Hatchery Reform Project. This project, begun at the behest of Washington State's congressional representatives in 1999, is meant to be a comprehensive hatchery reform effort to conserve indigenous genetic resources, assist with natural population recovery, provide for sustainable fisheries, conduct scientific research, and improve the quality and cost effectiveness of hatchery programs (HSRG 2004). The project is led by an independent panel of scientists called the Hatchery Scientific Review Group (HSRG). Over the last three years, the HSRG has reviewed hatchery programs within all the regions of Puget Sound and the Coast and made specific recommendations. Eastern Strait of Juan de Fuca programs were reviewed in 2001 and recommendations by the HSRG were made available shortly thereafter (HSRG 2002). The following recommendations were made with respect to Dungeness:

- Initiate a field study to describe life history patterns of Dungeness Chinook, including a description of juvenile and adult life history phases, and their distribution, abundance and migratory movements into, within and out of the river and estuary. A careful study in relation to habitat quality and type will be invaluable in determining the carrying capacity for Chinook juveniles in the Dungeness River and for designing future hatchery-based recovery programs.

- Continue the restorative captive brood program with broodstock on hand. Size the hatchery program (adults used, smolts released) to match riverine carrying capacity. Discontinue zero-age releases in July and August. Provide the capability to produce a mix of zero-age and yearling Chinook. (*See above description of captive brood program.*)
- Develop an alternative recovery plan. Consider phase-in of a new hatchery program that does not involve captive broodstock, but continues the goals of maintaining genetic resources and reduces risk of extinction.
- Seek new water source(s) to provide warmer rearing water than presently exists at the Dungeness Hatchery.
- Remove the intake barrier at Canyon Creek to allow passage of adult and juvenile Chinook and bull trout to historic spawning/rearing habitat above the dam. (*It has since been determined that Chinook would be unlikely to use the habitat above the intake barrier and, therefore, this project is not included here as a part of Chinook recovery*). There are approximately 2.0 miles of potential habitat upstream of the dam and the Olympic Peninsula Management Unit chapter recommends addressing the feasibility of passage in order to provide additional habitat for bull trout and other salmonids (U.S. Fish & Wildlife Service, 2004). Criteria and specific actions needed for passage could be developed and implemented as the necessary information becomes available.
- Open the side channel above and across the river from Canyon Creek and near the current Dungeness River intake at the Dungeness Hatchery, to provide important off-channel rearing habitat for Chinook juveniles. (*This project is not currently included among the habitat recovery projects*.
- Address long-term habitat improvement issues. The hatchery program will be successful only if the post-release environment is able to support the population. (*See habitat recovery sections.*)

Additionally, the following two recommendations relevant to Chinook were made for the Dungeness coho hatchery program.

- Do not increase the size of the program above its current level because of the concern for negative ecological interactions with other important stocks within the basin. (*Note that the Co-managers had already reduced the size of the program prior to this recommendation.*)
- Evaluate the effects of naturally spawning, hatchery-origin coho on the stability of Chinook and pink salmon redds in the Dungeness River and modify the program to address this concern.

The Co-managers have been working to respond to most of these recommendations as described in the response to Question D. The HSRG and Co-managers are planning to follow-up in the near future with a formal review of progress in addressing the HSRG recommendations in all regions of Puget Sound and the Coast.

5. Harvest Management

As noted in the harvest portion of the response to Question A, the harvest management of salmon in the Pacific Northwest is a complex, inter-jurisdictional process covering salmon as they transit various regions throughout their migratory range. Harvest management objectives have been negotiated by the co-managers to ensure that the harvest rate for Dungeness Chinook in Southern US waters remains low, and is estimated at less than six percent of the total run in 2004. Harvest in Canadian and Northern US waters is controlled by the provisions of the US/Canada Salmon Treaty.

Within the Dungeness River and Bay and adjacent marine areas, several additional measures have been taken to insure that directed and incidental catches of salmon do not impede progress toward recovery. Over the past thirty years, the low abundance of Dungeness River Chinook has precluded any directed harvest with commercial gear in the River or Bay. Recreational or subsistence harvest of Chinook has also been prohibited in the Dungeness River for decades and such opportunities have been eliminated in the Bay for recent years. A number of measures have been taken to reduce incidental take during fisheries in the pre-terminal and terminal areas, including:

- No commercial Chinook fisheries occur in the eastern Strait of Juan de Fuca during the summer months.
- No retention of Chinook, chum, or bull trout is allowed in recreational and subsistence salmon fisheries in the eastern Strait of Juan de Fuca, including Dungeness Bay, during the summer months.
- Dungeness Bay is closed to recreational salmon fishing in all months of the year except October.
- Commercial salmon fishing in the Bay remains closed during the spring and summer until Chinook have passed into the river system. Fisheries managers maintain close communication with technicians conducting Chinook spawner surveys so that Chinook are clearly up into the river system and not migrating back and forth to the bay where they would be subject to take.
- To insure that fishermen can quickly release any live Chinook , chum, or bull trout encountered and minimize the opportunity for mortality from marine mammals, commercial fishermen are required to tend their gillnets at all times.
- The hatchery coho gillnet fishery operates during daylight hours only which provides Chinook, summer chum, and bull trout greater visibility of the gear, through October 10.
- Recreational and subsistence fishing in the River remains closed through October 15 to avoid any late season Chinook and summer chum encounters.

- Tribal fisheries managers have instituted a logbook requirement for commercial salmon fisheries in Dungeness Bay in order to better document encounters of Chinook and chum during coho gillnet fisheries.
- Fisheries enforcement officers have implemented emphasis patrols of the commercial hatchery coho fishery in Dungeness Bay.

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United States Fish and Wildlife Service. 2004. *Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout (Salvelinus confluentus) vol. II (of II).* May 2004. Olympic Peninsula Management Unit, Region 1. Portland, Oregon. 277 pp

Other references cited in the Question C are listed on the attachment to Question C, "Dungeness Watershed Restoration Plans and Activities (1989 - present)

ATTACHMENTS TO QUESTION C:

Dungeness Watershed Restoration Plans and Activities (1989 - present)

Annual "Milestone" reports of the Dungeness River Management Team (2001-2003)

DUNGENESS WATERSHED RESTORATION PLANS AND ACTIVITIES
(1989 – PRESENT)

I. Plans and Studies

A. Major Plans and Documents

- *Clean Water Strategy For Addressing Bacterial Pollution in Dungeness Bay and Watershed.* May 2002. Clean Water Workgroup, Clallam County.
- *Comprehensive Water Conservation Management Plan.* 1999. Montgomery Water Group. Prepared for Dungeness River Agricultural Water Users Association, WA Department of Ecology.
- *Dungeness Area Watershed Analysis.* Dungeness Area Watershed Cooperative Team. 1995. Prepared for US Forest Service, Olympic National Forest.
- *Dungeness River Area Watershed Management Plan.* 1993. Dungeness Watershed Committee coordinated by Clallam County.
- *Dungeness River Area Watershed.* 1991. Puget Sound Cooperative River Basin Team for Clallam County.
- *Dungeness River Comprehensive Flood Control Management Plan.* 1990. Kramer, Chin & Mayo for Clallam County (update due 2004).
- *Dungeness River Greenway Plan.* 1994. CZM, by Clallam County.
- *Dungeness-Quilcene Water Resources Management Plan.* 1994. Regional Planning Group, Jamestown S'Klallam Tribe Coordinating Entity.
- *Dungeness Watershed Analysis 2nd Iteration.* 2001-2002. US Forest Service, Olympic National Forest.
- *Hydrogeologic Assessment of the Sequim-Dungeness Area, Clallam County, Washington.* 1999. Thomas. US Geological Survey Water-Resources Investigations Report 99-4048.
- *Physical Processes, Human Impacts and Restoration Issues of the Lower Dungeness River.* 2002. Bountry, et al., US Bureau of Reclamation. Prepared for Jamestown S'Klallam Tribe.
- *Recommended Land Protection Strategies for the Dungeness River Riparian Area.* 2003. Hals, H. and Dungeness River Restoration Workgroup. Prepared for the Jamestown S'Klallam Tribe.
- *Recommended Restoration Projects for the Dungeness River, (Habitat Plan/Blue Book).* Dungeness River Restoration Work Group. 1997. Prepared for the Dungeness River ManagementTeam.
- *Relationship Between the Upper Dungeness River and the Bedrock Aquifer, Clallam County.* December 2001. Garrigues, R. and J. Shedd. WA Department of Ecology.
- *Restoring the Dungeness: An Overview of the Dungeness River Restoration Strategy.* 2003. Newberry, L. Prepared for the Jamestown S'Klallam Tribe.
- *Salmon and Steelhead Habitat Limiting Factors, WRIA 18, Final Report.* Haring. 1999. State Conservation Commission with Dungeness River Restoration Workgroup.
- *Sequim-Dungeness Groundwater Protection Project (and "Strategy*"). 1992-1994. Clallam County and Groundwater Committee.
- *Shoreline Master Program/Inventories.* Ongoing. Preparation for future amendments to integrate GMA/CAO/Watershed Planning.
- *Water Cleanup Plan for Bacteria in the Lower Dungeness Watershed.* Total Maximum Daily Load (TMDL) Submittal Report. June 2002. Hempleton, C. and D. Sargeant. WA Department of Ecology Southwest Regional Office.

B. Habitat Assessment

- *An Aquatic Resource Assessment of the Dungeness River Basin System: Phase I.* 1992. Orsborn and Ralph. Prepared for the Jamestown S'Klallam Tribe.
- *An Aquatic Resource Assessment of the Dungeness River Basin System: Phase II - Physical Channel Analysis, Hydrology, and Hydraulics, & Phase III - Fisheries Habitat Survey.* 1994. Orsborn and Ralph. Prepared for the Jamestown S'Klallam Tribe and USFS.
- *Dungeness Bay Bathymetry, Circulation and Fecal Coliform Studies, Phase I.* 2001. Rensel and Smayda. Prepared for Jamestown S'Klallam Tribe.
- *Dungeness Bay Bathymetry, Circulation and Fecal Coliform Studies, Phase II.* 2002. Rensel. Prepared for Jamestown S'Klallam Tribe.
- *A Fire-Year Report on Constructed Log Jams Built by the Jamestown S'Klallam Tribe on the Dungeness River.* September 2002. Hagen, M. Prepared for the Jamestown S'Klallam Tribe.
- *Kinkade Island Geomorphic Assessment, Dungeness River, Washington.* 2003. US Bureau of Reclamation. Prepared for Clallam County.
- *Review of the Influence Exerted by Environmental Factors on Spring Chinook Salmon in the Dungeness River.* 1993. Lichatowich. Prepared for the Jamestown S'Klallam Tribe.
- *Seepage and Mainstem Aquifer Characterization.* 2001. USGS, WA Department of Ecology.
- *Siebert Creek Watershed Assessment.* 2003. US Fish and Wildlife Service, Pacific Woodrush, Clallam Conservation District, Jamestown S'Klallam Tribe, Clallam County.
- *Upper Dungeness Aquifer Study – Final Report: Relationship Between the Upper Dungeness River and the Bedrock Aquifer, Clallam County.* 2001. Gibbons. WA Department of Ecology.

C. Stock Analysis / Rebuilding / Recovery

- *Dungeness Chinook Acclimation Ponds / Chinook Broodstock Program.* 1996-present. Jobs in the Woods (BIA), Jamestown S'Klallam Tribe.
- *Dungeness Chinook Captive Broodstock Program.* 1992-present. WA Department of Fish and Wildlife, Jamestown S'Klallam Tribe, USFWS, volunteers.
- *Dungeness Chinook Redd Mapping Study.* On-going. 1992-present. Jamestown S'Klallam Tribe.
- *Dungeness Chinook Salmon Rebuilding Project Progress Report, 1992-1993.* 1995. Smith, WDFW and Wampler, USFWS.
- *Dungeness Fall Pink Captive Broodstock Program and Tagging.* 1995-present. WDFW, Jamestown S'Klallam Tribe, USFWS.
- *Dungeness Pink Outmigration.* 1994. USFWS.
- *Dungeness River Pink and Chinook Salmon Historical Abundance, Current Status and Restoration.* 1993. Lichatowich. Prepared for the Jamestown S'Klallam Tribe.
- *Dungeness Salmonid Life History Study.* 1998. Hirschi and Reed. Prepared for Jamestown S'Klallam Tribe. Life History Assessment continues by the Jamestown S'Klallam Tribe (2002).
- *The Evolving Dungeness River: juvenile salmon and their use of side channel habitat - A comparison of data collected 1997/1998 vs. 1999/2000.* May 2003. Rot, B. Jamestown S'Klallam Tribe.
- *Smolt Trapping on Siebert, Matriotti (and Jimmycomelately) Creeks.* On-going. Northwest Indian Fisheries Commission, Jamestown S'Klallam Tribe, WDFW, volunteers.
- *1992 Washington State Salmon and Steelhead Stock Inventory (SASSI).* 1993. WDFW and Washington Tribes.

D. Instream Flow / Water Conservation / Water Quality / Water Resources Studies

- *Aquifer Storage and Recovery Evaluation Report.* 2003. Tetra Tech FW, Inc. Prepared for Clallam County.
- *Dungeness Bay Bathymetry, Circulation and Fecal Coliform Studies, Phase I.* 2001. Rensel, J. and Smayda, T. Prepared for the Jamestown S'Klallam Tribe.
- *Dungeness Bay Bathymetry, Circulation and Fecal Coliform Studies, Phase II.* 2003. Rensel, J. Prepared for Jamestown S'Klallam Tribe.
- *Dungeness Bay Fecal Coliform Bacteria Total Maximum Daily Load Study.* March 2004. Sargeant, D. WA Department of Ecology.
- *Dungeness River and Matriotti Creek Fecal Coliform Bacteria Total Maximum Daily Load Study.* May 2002. Sargeant, D. WA Department of Ecology Environmental Assessment Program.
- *Dungeness River /Matriotti Creek Total Maximum Daily Load Study Preliminary Data Results for November 1999-October 2000.* January 2001. Sargeant.
- *Dungeness River Instream Flow Side Channel Study*. 2003. Investigates relationship flows in the mainstem with flows in the side channels, and the impacts from irrigation withdrawals. US Bureau of Reclamation. Prepared for Jamestown S'Klallam Tribe.
- *Dungeness River Irrigation Ditch Leakage Assessment.* 1993. Montgomery Water Group. Prepared for WA Department of Ecology and Dungeness River Agricultural Water Users Association.
- *Dungeness Sediment Reduction for Fish/Shellfish Project.* 1999-2002. Sediment / temperature monitoring instream and extensive bay / small tributaries monitoring. In cooperation with WA Department of Ecology, Clallam County, WA Department of Health, CCWF funds.
- EIS for *Comprehensive Water Conservation Management Plan.* 2003. Foster Wheeler, Inc. Prepared for WA Department of Ecology.
- *Fish Habitat Analysis for the Dungeness River Using the Instream Flow Incremental Methodology.* 1991. Wampler and Hiss, USFWS.
- *Groundwater Flow Model of the Sequim-Dungeness Area.* 2003. Tetra Tech FW. Prepared for Clallam County.
- *Groundwater Quality in the Agnew and Carlsborg Area, Clallam County (December 2000-*December 2002). 2003. Department of Ecology. Clallam County.
- *Instream Flow Recommendations for Dungeness-Quilcene Area Salmon and Steelhead Streams, 1993.* 2000. Hiss, USFWS, Dungeness River Restoration Work Group, with WA Department of Ecology review of Dungeness watershed streams.
- *Irrigation Tailwater Quality Assessment.* 2003. Clallam Conservation District.
- *Irrigation and Stormwater Feasibility Study.* 2003. Cline Irrigation District, Clallam County Road Department, Washington Conservation Commission, Clallam Conservation District, Department of Ecology.
- *Potential Application of Microbial Source Tracking Methods to The Dungeness Watershed and Bay.* 2003. Battelle Pacific Northwest Division. Prepared for Clallam County and WA Department of Ecology.
- *Recommended Instream Flows for the Lower Dungeness River, 1993.* 2000. Hiss, USFWS, Dungeness River Restoration Work Group, with WA Department of Ecology review of Dungeness watershed streams.
- *SNOTEL Gauges* (2). 1998-1999. Installation in upper Dungeness to predict instream flows, drought, flooding. NRCS, for Jamestown S'Klallam Tribe.
- *Stream flow measurements* (on river, tributaries, irrigation ditches), Dungeness River. 1924-present / ongoing. USGS. Also flow measurements are collected by WA Department of

Ecology (real-time monitoring on five irrigation outtakes), Jamestown S'Klallam Tribe, Sequim-Dungeness Agricultural Water Users Association, Streamkeepers.

- *Surface Water-Ground Water Interactions Along the Dungeness River and Vertical Hydraulic Conductivity of Streambed Sediments, Clallam County, Washington, September 1999-July 2001.* August 2002. Simonds, F.W. and K. Sinclair. WA Department of Ecology and US Geological Survey.
- *Potential Stormwater Impacts on Sediment Quality in Urbanizing Clallam County Streams.* 2003. Battelle Pacific Northwest Division. Prepared for Clallam County.
- *Water Storage and Site Feasibility Study.* 2003. Montgomery Water Group, Inc. Prepared fro Clallam County and WA Department of Ecology.

II. Restoration and Education Projects and Programs

A. Restoration Projects and Programs

- *Burlingame Bridge Widening and Habitat Restoration.* 2001. Clallam County.
- *Conservation Reserve Enhancement Program (CREP).* Ongoing. Washington Conservation Commission, NRCS.
- *Derelict Fishing Gear Removal Pilot Project.* 2003. Northwest Straits Commission, NOAA, Clallam County Marine Resource Committee, Puget Sound Action Team, WDFW.
- *Dungeness Irrigation System Improvements* – Implementation of projects recommended in the Comprehensive Water Conservation Plan to improve water conveyance efficiency/fisheries survival (fish screens, ditch pipe lining, siphon replacement). Jamestown S'Klallam Tribe/WDFW, JFE-DNR, 1994-1998, IAC 1999-2001, WA SRFB 1999-2001. Clallam Conservation District/CCWF, 1999-2001. Sequim-Dungeness Agricultural Water Users Association, NRCS.
- *Dungeness Large Woody Debris Placement.* 1996-2001. JFE-DNR, JIW-BIA & IAC, Jamestown S'Klallam Tribe.
- *Dungeness Riparian Habitat Restoration Program.* 1997-2001. Purchase of conservation easements from willing sellers. North Olympic Land Trust, Clallam County.
- *Dungeness River Bank Stabilization* - Bioengineering projects to stabilize eroding banks in lower river. Clallam County/EPA, WDFW, JFW-DNR, and County roads/bridges projects. 1994.
- *Dungeness USFS Roads Sediment Reduction Project.* 2000-2003. Road stabilization and decommissioning, road drainage improvements. USFS, in partnership with Clallam Conservation District, Pacific Coast Watershed Project, WA Conservation Corps, Olympic National Forest.
- *Sequim Prairie Irrigation Channel/Fish Screens/By-Pass/Habitat Restoration Project.* 1999-2001. Joint Funding WACERT, Sustainable Solutions, Jamestown S'Klallam Tribe. Completed by Jamestown S'Klallam Tribe.
- *Stream Restoration Projects* (fencing/re-vegetation along rivers/creeks - Gray Wolf, Bell, Cassalery, Hurd, Matriotti, Meadowbrook, Siebert). 1994–present. JFE-DNR, Clallam County, Clallam Conservation District, Jamestown S'Klallam Tribe, Youth Conservation Corps, Pacific Woodrush.

B. Public Education Projects

- *"A Manual of Tools for Understanding the Natural History of the Dungeness River Watershed."* 1996. Clark, Clark and Newberry. Prepared for the Jamestown S'Klallam Tribe.

- *“Every River Has Its People” (The 1993 State of the Dungeness River Report).* 1993. Jamestown S'Klallam Tribe, Public Involvement and Education (PIE) Grant, Puget Sound Water Quality Authority.
- *“Keys to an Understanding of the Natural History of the Dungeness River System.”* 1996. Clark and Clark. Prepared for the Jamestown S'Klallam Tribe.
- Dungeness Bay Stewardship Initiative. 1999. Clallam County, CCWF.
- Dungeness Bay Tour. 1998. Clallam County.
- Dungeness Bay Watchers. 1999. Public Involvement and Education (PIE) Grant, Puget Sound Water Quality Authority, Clallam County.
- *Dungeness River Audubon Center at Railroad Bridge Park* – Public access, education, research, annual river festival. Ongoing. Rainshadow Foundation, Olympic Peninsula Audubon Society, Jamestown S'Klallam Tribe.
- *Dungeness River Riparian Landowners Education Project* – “Living on the River” booklet. 1998. Clallam County, CCWF.
- *Groundwater Guardian Program.* 2001-present. Clean Water District, Clallam County, Groundwater Foundation.
- *Living by the Coast, Coastal Processes Workshops.* 1998-1999. CZM, Clallam County.
- Matriotti Creek Environmental Learning Area. 1992 – Ongoing. Clallam County.
- *Pollution Prevention Outreach Program* (Landowner Education). 1994-1995. Clallam and Jefferson Conservation Districts, WSU Cooperative Extension, funded by Jamestown S'Klallam Tribe/EPA grant.
- *Salmon in the Dungeness River: From Abundance to Emptiness, Parts 1 and 2.* McNulty, T. 2001. Prepared with the Jamestown S'Klallam Tribe.
- *Sequim Irrigation Festival – Increasing Awareness of the Dungeness River -* -Parade entry and “River Gone Run” play. 1996-1998. Jamestown S'Klallam Tribe, Olympic Theatre Arts.
- Stream Keepers of Clallam County. 1999-present. Clallam County.

III. Studies / Projects in Progress 1998-2004

A. Projects / Plans / Studies / Programs in Progress

- *Comprehensive Irrigation District Management Plan.* Due 2004. Economic and Engineering Services, Inc. Prepared for Sequim-Dungeness Agricultural Water Users Association. Funded by WA Department of Agriculture.
- *Conservation Reserve Enhancement Program.* On-going. Washington Conservation Commission, Clallam Conservation District.
- *Draft Dungeness River Comprehensive Flood Hazard Management Plan.* Draft completed June 2003. Final expected 2004. Update to Comprehensive Flood Control Management Plan. Clallam County, Dungeness Flood Planning Committee.
- *Dungeness Bull Trout Telemetry Project.* 2003-2007. US Forest Service, Us Fish and Wildlife Service, WDFW, Olympic National Park, Ecology’s Washington Conservation Corps, Dungeness Farms.
- *Dungeness Estuary Restoration* – Purchase of estuarine land from willing sellers (including appraisals, reviews and environmental assessments of estuarine parcels), relocation of dwellings, demolition and revegetation. 1999-present. Clallam County, Jamestown S'Klallam Tribe, WDFW, US Fish and Wildlife Service, landowners.
- *Dungeness Irrigation System Improvements*. On-going. To improve water conveyance efficiency, water conservation, and fisheries survival. Sequim-Dungeness Agricultural

2002 Milestone Restoration and Conservation Activities in the DRMT Geographic Focus Area

Prepared by: Dungeness River Management Team

FISHERIES / WATER RESOURCES

Dungeness River In-Stream Flow Side Channel Study

During the months of June through October 2002, field data was collected from ten Dungeness River side channels to assess the relationship between flows in the main stem and flows in the side-channels. Side channel cross-sectional data, including width, depth, temperature, and flow velocity were analyzed with Dungeness main stem measurements to help determine the main stem discharge ranges necessary to provide viable salmonid habitat in the side channels. Conclusions from the study were presented to the DRMT January 2003.

Contributors: US Bureau of Reclamation (USBR), Jamestown S'Klallam Tribe (JSKT), Clallam County, Washington Department of Ecology (DOE)
Contact: Andy Brastad, Clallam County, 360-417-2415
Status: Final report due March 2003.

Using GPS to record gauge location

Smolt Trapping on Jimmycomelately and Siebert Creeks

In the spring of 2002, natural resources technicians at the Jamestown S'Klallam Tribe were trained to survey smolt production on Jimmycomelately and Siebert Creeks. Smolt traps were built and installed, and out migration data (species ID, size, number) were recorded.

Contributors: Northwest Indian Fisheries Commission, JSKT, WDFW, volunteers
Contact: Scott Chitwood, JSKT, 360-681-3616
Status: Traps will be reinstalled on both Siebert and Jimmy-comelately Creeks, and possibly Matriotti Creek, in April 2003. The Jamestown S'Klallam Tribe maintains the smolt production data.

Real-Time Stream Flow Monitoring

Through DOE's Environmental Assessment Program (EAP), the DRMT selected and prioritized stream site locations for up to eight real-time telemetry gauges. The gauges transmit flow discharge and temperature data to DOE. Site locations were prioritized according to where data would be most valuable for long-term salmon recovery. Gauges were installed on Morse (lower), Jimmycomelately, Siebert, Ennis, and Little River Creeks. This program also operates the gauge at Schoolhouse.

Contributors: Clallam County, DOE, JSKT, Dungeness River Management Team (DRMT)
Contact: Andy Brastad, Clallam County, 360-417-2415
Status: The temporary gauge near the Railroad Bridge was removed at the end of the USBR's study period. Real-time data for the other telemetry gauges can be accessed at DOE's website: http://www.ecy.wa.gov/apps/watersheds/flows/regions/state.asp
Two additional gauges will be installed in early 2003, one in McDonald Creek and one in Morse Creek (upper).

Water Conservation (Irrigation Ditch Piping) Projects

As part of an on-going effort to conserve Dungeness River water, the irrigation community and others have been involved in the implementation of projects to improve irrigation system efficiency. Efforts have resulted in reduced river water withdrawal, pond elimination, and conserved instream flows. Projects that were completed in 2002 include the following:

- Agnew Irrigation District: installed approximately 1,500 feet of pipe near Taylor Cut-off Road;
- Sequim Prairie Tri Company: completed 4 separate projects near Old Olympic Highway using a total of 12,740 feet of pipe;
- Highland Irrigation District: installed approximately 1,400 feet of pipe near Miller Road.

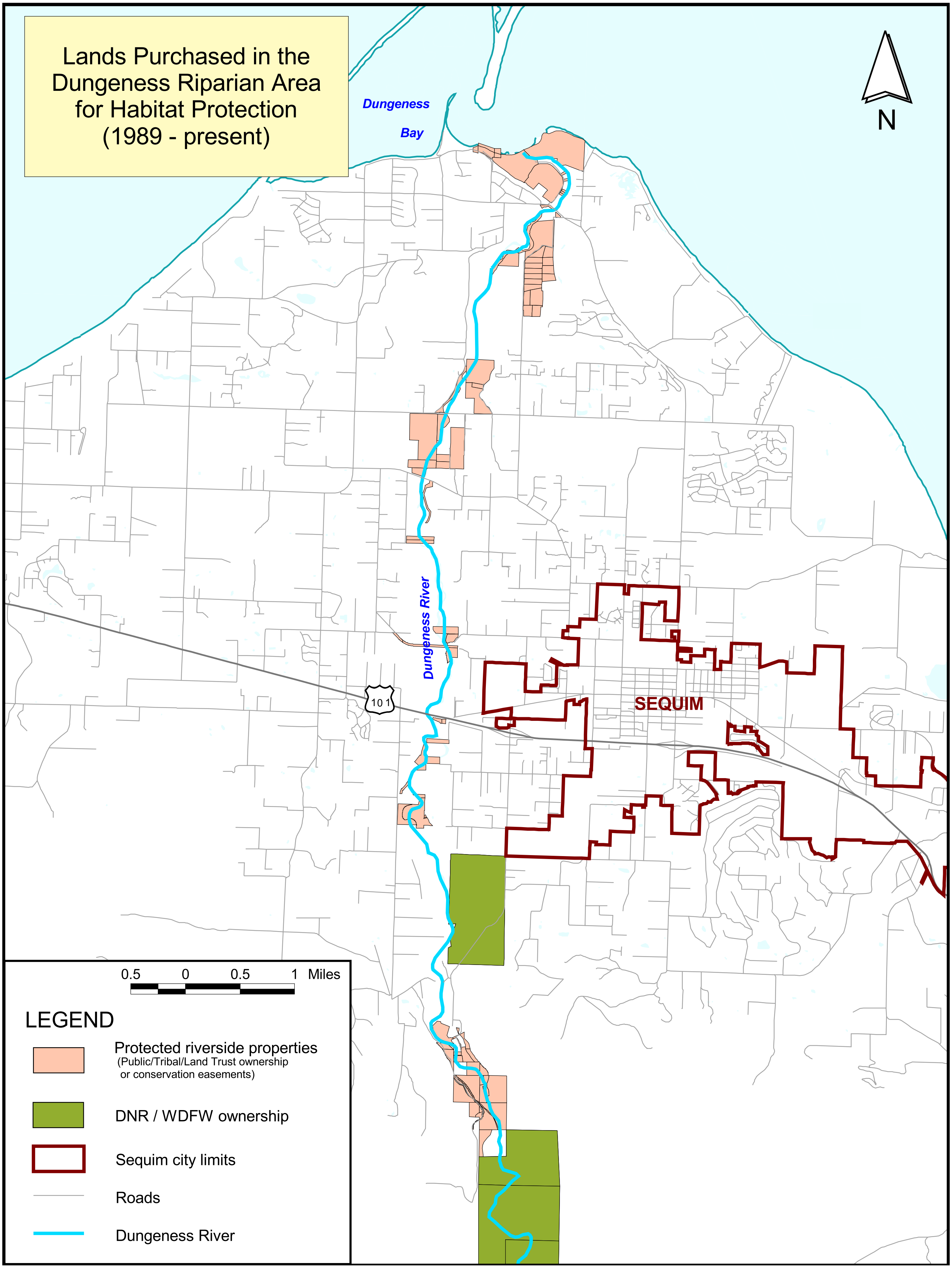
Contributors: Agnew Irrigation District and property owners (on the Steller Ridge lateral off Taylor Cut-off Road) served by Agnew Irrigation District; Sequim Prairie Tri Irrigation Company; Highland Irrigation District; Clallam Conservation District (CCD); JSKT; Salmon Recovery Funding Board (SRFB)
Contact: Mike Jeldness, Dungeness River Agricultural Water Users Association (WUA), 360-683-4331
Status: Projects complete and functional.

Water Users Association, Clallam Conservation District, Jamestown S'Klallam Tribe, NRCS.

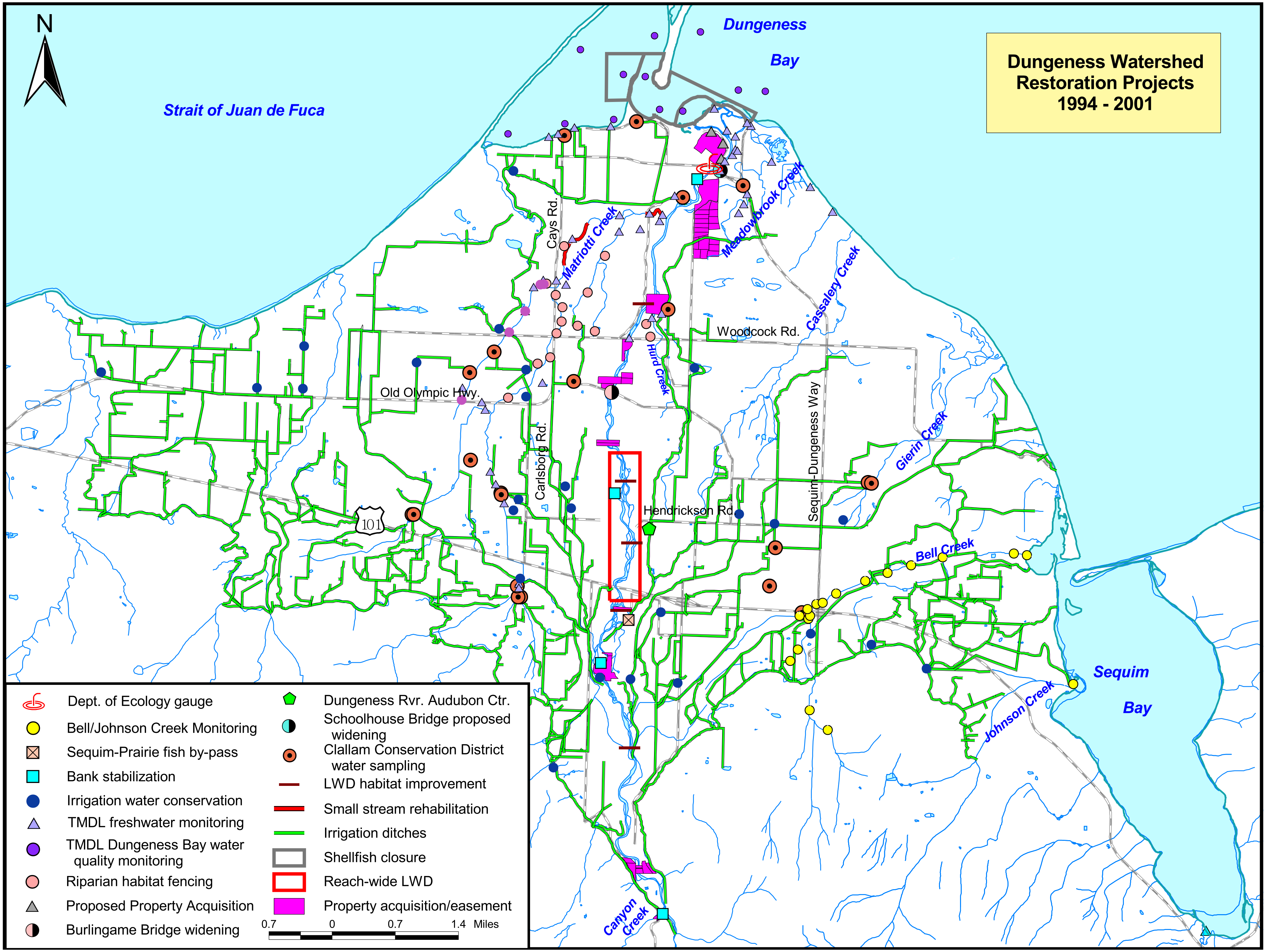
- *Dungeness Irrigation Water Leasing*. 2003-2005. Sequim-Dungeness Agricultural Water Users Association, WA Department of Ecology.
- *Dungeness Refuge Noxious Weed Removal*. 2001-ongoing. Dungeness National Wildlife Refuge, volunteers.
- *Dungeness Scour Chain Study of Bedload Scour and Deposition.* 1999-2002. (Data collection completed 2002.) BIA, Jamestown S'Klallam Tribe.
- *Dungeness USFS Roads Sediment Reduction Project.* 2002-ongoing. Stabilization / decommission and repair. USFS, in partnership with Clallam Conservation District, Pacific Coast Watershed Project, WA Conservation Corps and Olympic National Forest.
- *Phase II Lower Dungeness River Restoration Project* – historical characterization of Lower Dungeness River and floodplain, and native replanting of 90 acres of riparian/floodplain habitat. 2003-2007. US Fish and Wildlife Service, Jamestown S'Klallam Tribe, willing landowners.

B. Planning

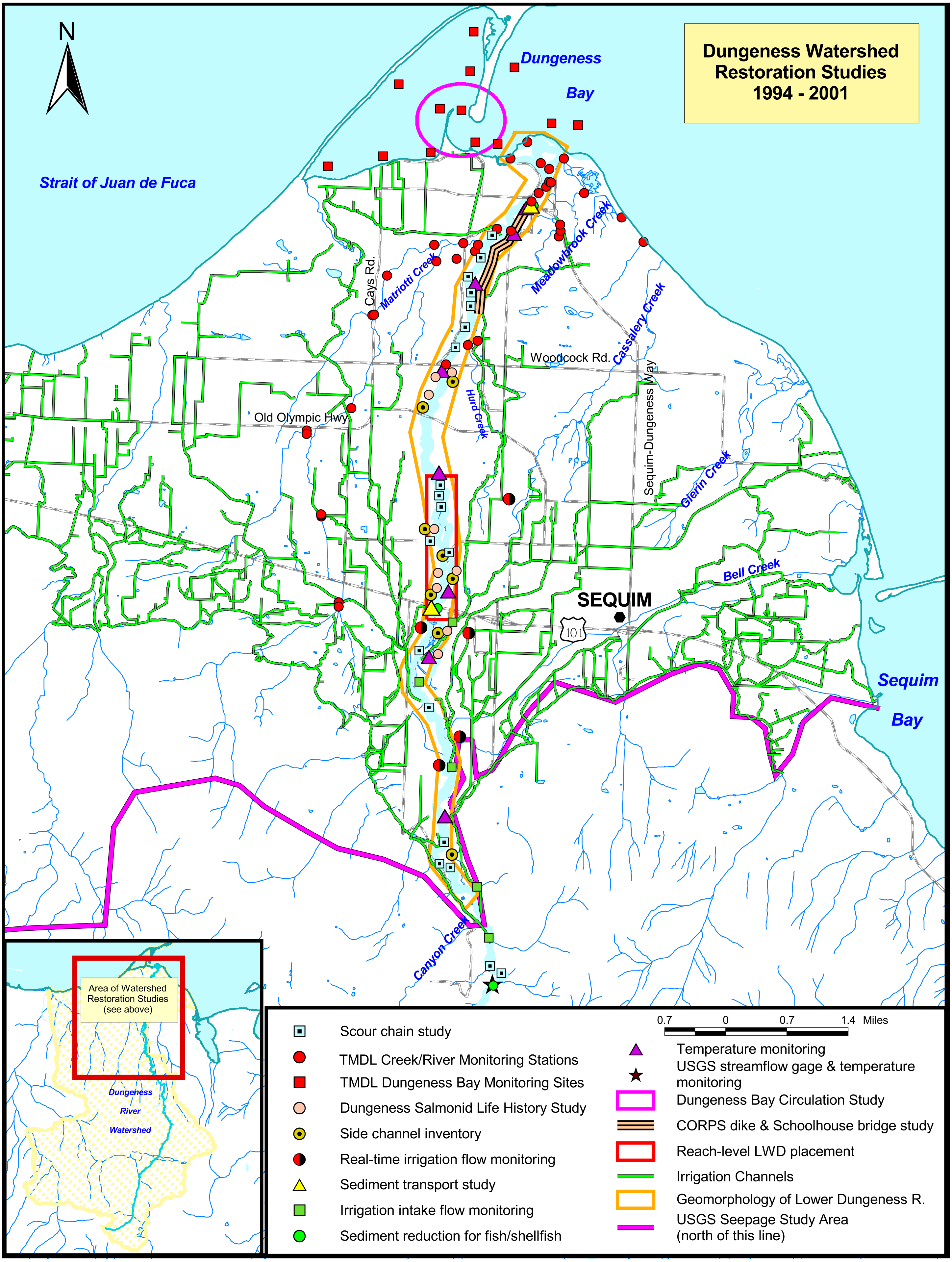
- *State HB2496 North Olympic Peninsula Salmon Recovery Planning (WRIA's 17-20).* 1998-present. Clallam County lead.
- *State HB2514 Watershed Planning (WRIA 18).* 1998-present. WRIA 18 Initiating Governments (Clallam County, City of Port Angeles, Jamestown S'Klallam Tribe, Lower Elwha S'Klallam Tribe, Agnew Irrigation District, Washington State Department of Ecology), DRMT planning group. Project lead: Clallam County. Phase III completed 2004.
- *Clallam County Marine Resource Committee.* 2001-present/ongoing.
- *Agricultural Conservation Planning and Implementation.* On-going technical assistance for: agricultural conservation and Best Management Practices, farm conservation plans, dairy nutrient management plans, restoration planning. Clallam Conservation District.



Lands Purchased in the
Dungeness Riparian Area
for Habitat Protection
(1989 - present)
Dungeness
Bay
N
Dungeness River
SEQUIM
101
0.5 0 0.5 1 Miles
LEGEND
Protected riverside properties
(Public/Tribal/Land Trust ownership
or conservation easements)
DNR / WDFW ownership
Sequim city limits
Roads
Dungeness River



Dungeness Watershed Restoration Projects 1994 - 2001
N
Strait of Juan de Fuca
Dungeness
Bay
Sequim
Bay
Matriotti Creek
Meadowbrook Creek
Cassalery Creek
Hurd Creek
Gierin Creek
Bell Creek
Johnson Creek
Canyon Creek
Cays Rd.
Woodcock Rd.
Old Olympic Hwy.
Carlsborg Rd.
Sequim-Dungeness Way
Hendrickson Rd.
101
Dept. of Ecology gauge
Bell/Johnson Creek Monitoring
Sequim-Prairie fish by-pass
Bank stabilization
Irrigation water conservation
TMDL freshwater monitoring
TMDL Dungeness Bay water quality monitoring
Riparian habitat fencing
Proposed Property Acquisition
Burlingame Bridge widening
Dungeness Rvr. Audubon Ctr.
Schoolhouse Bridge proposed widening
Clallam Conservation District water sampling
LWD habitat improvement
Small stream rehabilitation
Irrigation ditches
Shellfish closure
Reach-wide LWD
Property acquisition/easement
0.7 0 0.7 1.4 Miles


Dungeness Watershed Restoration Studies 1994 - 2001
N
Dungeness
Bay
Strait of Juan de Fuca
Cays Rd.
Matriotti Creek
Meadowbrook Creek
Cassalery Creek
Woodcock Rd.
Sequim-Dungeness Way
Hurd Creek
Old Olympic Hwy
Gierin Creek
Bell Creek
SEQUIM
101
Sequim
Bay
Canyon Creek
Area of Watershed Restoration Studies (see above)
Dungeness River Watershed
0.7 0 0.7 1.4 Miles
Scour chain study
TMDL Creek/River Monitoring Stations
TMDL Dungeness Bay Monitoring Sites
Dungeness Salmonid Life History Study
Side channel inventory
Real-time irrigation flow monitoring
Sediment transport study
Irrigation intake flow monitoring
Sediment reduction for fish/shellfish
Temperature monitoring
USGS streamflow gage & temperature monitoring
Dungeness Bay Circulation Study
CORPS dike & Schoolhouse bridge study
Reach-level LWD placement
Irrigation Channels
Geomorphology of Lower Dungeness R.
USGS Seepage Study Area (north of this line)

WATER QUALITY

Irrigation Water Quality Improvement

Contaminated tailwater to Matriotti Creek was eliminated with the completion of 2 irrigation ditch piping projects, one in the Carlsborg area and one off Hooker Road. Contractors hired by the Clallam Ditch Company installed approximately 16,000 feet of pipeline in the Carlsborg area. The Agnew Irrigation District Hooker Road Lateral project entailed replacing approximately 4,500 feet of open ditch with pipeline. The County Roads Department assisted with road crossings on the Agnew project.

Contributors: CCD, Clallam Ditch Company, Washington Conservation Commission, National Fish and Wildlife Foundation, DOE, JSKT, Agnew Irrigation District
Contact: Joe Holtrop, CCD, 360-452-1912 x 5
Status: Completed.

Installing pipe

Dungeness River and Matriotti Creek Fecal Coliform Bacteria Total Maximum Daily Load (TMDL) Study

In water year 2000 (Nov 1999 - Oct 2000), DOE conducted a TMDL study in order to establish new fecal coliform criteria and to facilitate restoration of water quality in the Dungeness River and Matriotti Creek. Study results confirmed violations of water quality standards for fecal coliform in Matriotti Creek and Dungeness Bay, Meadowbrook and Cooper Creeks, Golden Sans Slough, and several irrigation ditches. The final report, Dungeness River and Matriotti Creek Fecal Coliform Bacteria TMDL Study, was completed May 2002 and includes study results and recommendations. It is available from DOE.

Contributors: DOE, JSKT, Clallam County, CCD, Clean Water Workgroup
Contact: Debby Sargeant, DOE, 360-407-6684; Christine Hempleman, DOE, 360-407-6329
Status: In June 2002, a cleanup implementation strategy (Water Cleanup Plan for Bacteria in the Lower Dungeness Watershed: TMDL Submittal Report) was published as a follow up to the TMDL. The Cleanup Plan describes implementation actions to address the problems listed in the TMDL study. Examples include public education, septic inspections and maintenance, and agricultural BMPs. A separate TMDL study is being conducted for Dungeness Bay and will be completed in 2003.

Agricultural Conservation Planning and Implementation

Agricultural conservation and Best Management Practices (BMPs) were applied on several farms in 2002, with guidance from the CCD and Washington Conservation Commission. Activities included:

- Installation of one manure lagoon and four manure aerators in the Bell Creek area;
- Placement of three animal waste storage structures/compost facilities;
- Installation of ~100 feet of riparian fencing and 1,200 feet of stream-bank stabilization (all of the stream-bank stabilization occurred on Siebert Creek);
- Distribution of ~300 rain barrels for water conservation (this occurred countywide).

The Clallam Conservation District provided guidance to landowners wishing to participate in land use planning. Their efforts resulted in eight farm conservation plans, two dairy nutrient management plans, and seven riparian restoration plans. The CCD conducted resource inventories and evaluations on nine properties within the DRMT focus area.

The Conservation Reserve Enhancement Program (CREP) provides technical assistance and financial incentives for buffers along salmon streams that run through agricultural land. Currently six landowners are enrolled in the program.

Contributors: Landowners, CCD, Washington Conservation Commission, DOE, Clallam County, JSKT, Natural Resource Conservation Service (NRCS), Farm Services Agency
Contact: Joe Holtrop, CCD, 360-452-1912 x 5
Status: On-going.

Groundwater Guardian Program

In February, the Clean Water District submitted an application to the Groundwater Guardian Program, a program which supports, recognizes, and connects communities working to protect groundwater. The application process included submittal of a list of proposed groundwater education and/or protection activities. In the fall, the Groundwater Foundation officially designated the Clean Water District Outreach Team as the “Sequim-Dungeness Groundwater Guardian Community.”

Contributors: Clean Water District, Clallam County, Groundwater Foundation
Contact: Ann Soule, Clallam County, 360-417-2424
Status: On-going.

RIPARIAN LAND PROTECTION AND RESTORATION

Jimmycomelately (JCL) Creek and Estuary Restoration

Components of this project include removal of a log dump in the estuary (2002), relocation of JCL to its former channel (2002/03), removal of buildings along the shoreline (2002/03), removal of dikes and fill (2003), construction of a new bridge on Highway 101 (2003). The following accomplishments occurred in 2002:

Early stages of construction

- Channel realignment construction initiated;
- Placement of large woody debris and streambed gravel;
- Log dump and building removal;
- Bridge design drafted.

Contributors: JSKT, Clallam County, CCD, DOE, Washington Department of Fish and Wildlife (WDFW), Washington Department of Transportation (WDOT), Bureau of Indian Affairs (BIA), US Forest Service (USFS)
Contact: Sam Gibboney, JSKT, 360-681-3613
Status: Excavation and construction of the new channel was approximately 85% complete before it was shut down for winter. Construction will resume in summer 2003.

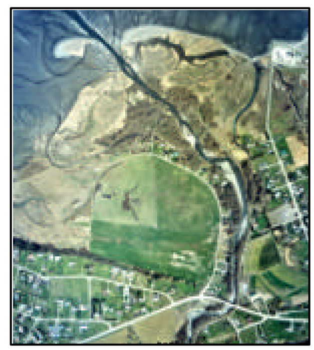
Ground breaking ceremony (July 11, 2002)

Dungeness Estuary Restoration

After receiving grant funding from the SRFB in 2001, Clallam County began planning for a large-scale restoration effort of the Dungeness River estuary. In 2002, landowners in the Rivers End area were contacted, and a meeting was held between landowners and project partners. Twelve landowners (representing 18 land parcels) signed letters of intent to sell, and the County initiated appraisal and relocation processes.

Contributors: Clallam County, JSKT, WDFW, USFS, SRFB
Contact: Cathy Lear, Clallam County, 360-417-2361
Status: Funding is currently being sought for re-vegetation.

Dungeness River mouth and estuary (2002)



Riparian Land Conservation

Appraisals were conducted and conservation easements were purchased on two riparian land parcels, one at the headwaters of Matriotti Creek and one at lower Bell Creek. The conservation easements protect the land from development. The North Olympic Land Trust (NOLT) accepts perpetual responsibility for keeping the land protected, as well as for on-going monitoring.

Contributors: Landowners, NOLT, Clallam County
Contact: Cathy Lear, Clallam County, 360-417-2361
Status:

UPPER WATERSHED

Dungeness Watershed Analysis

This is an update of previous watershed analyses to improve the quality of the data and fill in gaps identified in earlier efforts. The science-based analysis focused on sedimentation, stream channel processes, and the identification of restoration opportunities. The project area comprises federal lands in the upper watershed. In 2002, sources of sediment and areas of channel instability were mapped, and priority restoration projects were identified and recommended for treatments.

Contributors: Olympic National Forest
Contact: Robbin Stoddard, USFS, 360-956-2433
Status: The project was initiated in 2001 and completed in Dec 2002. Information on the project is available at the Hood Canal Ranger District office in Quilcene.

Dungeness USFS Road Sediment Reduction Project

This project involves upgrading several US Forest Service roads, and decommissioning other roads (located in the highest risk landforms and the riparian zone), in order to reduce road-delivered sediment inputs to anadromous spawning and rearing habitat in the Dungeness River. The East Crossing Campground, located in the riparian area and served by the road to be decommissioned, is also under contract to be decommissioned in 2003. Major repair work occurred at seven sites along 12 miles of road in 2002. Implementation and effectiveness monitoring sites were also established.

Contributors: Olympic National Forest, SRFB, CCD, Washington Conservation Corps
Contact: Scott Hagerty, District Soil Scientist, USFS, 360-765-2249
Status: The project was initiated in Jan 2002, and the expected completion date is Sept 2003. Remaining work for 2003 includes decommissioning of 3.4 miles of road, converting 0.5 miles of road to trail, and decommissioning the East Crossing Campground.

Jimmycomelately Road Drainage Improvement

Approximately 10 miles of road (2840 and 2850) in the upper JCL watershed (~ River Mile 12) received road drainage structure improvements. This involved the addition and replacement of ditch relief culverts, ditches and culvert cleaning, and road surface grading.

Contributors: Olympic National Forest (Title II funds)
Contact: Scott Hagerty, District Soil Scientist, USFS, 360-765-2249
Status: This project was initiated in May 2002 and completed in Oct 2002.

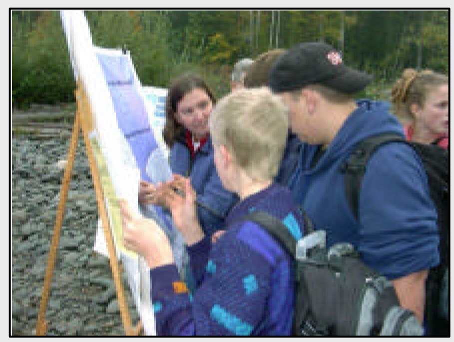
COMMUNITY OUTREACH

National Water Monitoring Day

In October, the Clean Water District organized local participation in National Water Monitoring Day, an event launched by the US Geological Survey to mark the 30th anniversary of the Clean Water Act. For our area, experts presented methods and monitoring objectives for surface and ground water to ~200 students from Sequim High School. Students also participated in hands-on field activities.

Contributors: US Geological Survey (USGS), Clean Water District, Clallam County, JSKT
Contact: Ann Soule, Clallam County, 360-417-2424
Status: N/A

Student measuring water level in a well (photo credit: Sue Chickman)



Students locating their watershed (photo credit: Sue Chickman)

Dungeness River Audubon Center at Railroad Bridge Park

The Dungeness River Audubon Center provided wide-ranging educational opportunities to the Dungeness community and its visitors. In all, the Center was venue to 330 educational events attended by ~9,500 individuals. At least 3,150 additional visitors dropped in at the Center to look at exhibits and request information on the area. Some of the 2002 highlights include:

- 7th Grade Watershed Week (April) and follow-up community presentation (June): curriculum and field trip for all 7th graders attending Sequim Middle School
- Field Trips (May): 6th grade field trips to the Dungeness River
- Summer Camp (July): science camp for 3rd-5th graders
- Dungeness River Audubon Festival (Sept): festival dedicated to issues related to the Dungeness River Watershed and watershed education; 3,000+ attendees.

Contributors: National Audubon Society, Olympic Peninsula Audubon Society, Rainshadow Natural Science Foundation, JSKT, local volunteers
Contact: Bob Boekelheide, Director, 360-683-4076
Status: A schedule of upcoming events can be found at the Center's website: http://www.dungenessrivercenter.org

School field trip on the Dungeness River

This document was prepared by the Dungeness River Management Team (DRMT)
For more information about the DRMT, see our website: http://www.olympus.net/community/dungenesswc/

WATER RESOURCES:

PROJECT NAME/LOGISTICS	PROJECT DESCRIPTION
Water Conservation (Irrigation Ditch Piping) Projects **Contributors:** *Sequim-Dungeness Agricultural Water Users Association (WUA), Jamestown S'Klallam Tribe (JSKT) (IAC-SRFB), Clallam Conservation District (CCD) (Centennial Clean Water Fund, National Fish and Wildlife Foundation), NRCS, Dungeness Irrig. Company, Sequim-Prairie Tri Irrig. Company, Highland Irrig. District, Agnew Irrig. District, Cline Irrig. District, Clallam Ditch Company* **Contact:** *Shawn Hines, JSKT, 360-681-4664, Joe Holtrop, CCD, 360-452-191, Mike Jeldness, WUA, 360-683-4331* **Project Status:** *Dungeness, Agnew, Clallam, Cline projects near completion. Highland projects to be complete by April 2002. Sequim-Prairie-Tri projects to be complete prior to June 2002.*	As part of an on-going effort to implement recommendations from the WUA Comprehensive Water Conservation Plan (1999), the Tribe and CCD have been active in administering grant funded projects which involve piping several miles of leaking irrigation ditches within the Dungeness Watershed. Primary objectives include increasing useable salmonid habitat in the Dungeness River by improving irrigation system efficiency to conserve instream flows, and improving habitat for salmonids by protecting water quality via lower instream temperatures. In some cases, irrigation districts/ companies provided much of the construction work themselves, enabling implementation of several more projects than were originally projected in grant applications. Project site location descriptions for 2001 are available from the Tribe.
Drought Leases **Contributors:** *WUA, Department of Ecology (DOE), CCD* **Contact:** *Cynthia Nelson, DOE, 360-407-0276; Mike Jeldness, WUA, 360-683-4331* **Project Status:** *Details are included in the 2001 Drought Response Report to the Legislature (DOE Publication # 01-11-017), a publication produced by DOE, December 2001 (see URL: http://www.ecy.wa.gov/pubs/0111017.pdf).*	The DOE allocated funds for water rights leases to farmers in order to keep trust water in the Dungeness River. DOE worked with the WUA to commit more than 1,000 acres of normally irrigated land to the temporary water trust program. Between August 1 and September 15 (the end of the irrigation season), irrigators removed approximately 20 percent of their acreage from production. This action augmented stream flows to protect spawning salmon. Collectively, the leased water from the Dungeness River corresponded to about 460 acre-feet.
Real-Time Monitoring on Dungeness Irrigation Diversions **Contributors:** *WUA, DOE* **Contact:** *Lyn Coleman, DOE, 360-407-0276; Mike Jeldness, WUA, 360-683-4331* **Project Status:** *Installation was completed Spring 2001, and measuring devices are fully functional. Data generated from these stations is currently being managed by Ecology.*	This project entailed equipping the five irrigation outtakes with realtime monitoring devices that measure flow and temperature. The data will assist the WUA in implementing the Trust Water Right agreement with DOE. Previous day's data can be obtained from the following DOE web page: http://www.ecy.wa.gov/programs/eap/flow/shu_dung_irrig.html
Seepage and Main-stem Aquifer Characterization **Contributors:** *US Geological Survey (USGS), DOE* **Contact:** *Cynthia Nelson, DOE, 360-407-0276; Bill Simonds, USGS, 253-428-3600 x2669* **Project Status:** *Preliminary results were presented to DRMT in October 2001. Final report due in early 2002.*	In 1999, the USGS began conducting a study of the Dungeness River flow and the shallow aquifer in the area. Fieldwork was completed in Fall 2001. Objectives of the study include: to determine the relationship between the Dungeness River and groundwater i.e. to determine where the water is being exchanged; to examine the effects of rain and snow on the exchange; and to provide estimates of streambed conductance.

Upper Dungeness Acquifer Study - Final Report: Relationship Between the Upper Dungeness River and the Bedrock Aquifer, Clallam County **Contributors:** *DOE's Environmental Assistance Program (EAP);* **Contact:** *Tom Gibbons, EAP, 360-407-6638* **Project Status:** *The project report was published December 2001 and is available at:* *http://www.ecy.wa.gov/biblio/0103027.html*	A synoptic-flow (seepage run) study was conducted on the upper Dungeness River in September and October 2000, and a final report was published December 2001. The study reach is located between the Gray Wolf confluence (RM 15.9) and the upper USGS stream gage site (RM 11.8). The purpose of the study was to assess the relationship between the upper Dungeness River and the underlying bedrock aquifer and to attain synoptic-flow data to examine river gains and losses in the study reach. A description of the study area, methods, results, and recommendations are all included in the study publication.

UPPER WATERSHED:

PROJECT NAME/LOGISTICS	PROJECT DESCRIPTION
Dungeness USFS Roads Sediment Reduction Project ~10.4 miles (Fall 2000 SRFB Project) **Contributors:** *Partnership with Clallam Conservation District (CCD) (SRFB project sponsor), Pacific Coast Watershed Project, and Olympic National Forest (ONF), Washington Cosnervation Corps (WCC).* **Contact:** *Scott Hagerty, USFS, 360-765-2200; Joe Holtrop, CCD, 360-452-1912* **Project Status:** *Stabilization completed 2001. Decommission and repair contract awarded 2001. Implementation to begin July 2002. Completion expected 2002-2003.*	Road drainage improvement and stabilization work was carried out to minimize road-related delivery of coarse/fine sediment inputs to anadromous spawning and rearing habitat in the Dungeness River. These efforts will aid to protect salmon habitat and improve water quality. Treatments included additional ditch relief culverts; armoring of inlets/outlets; fillslope pullback; ditch cleaning; spot road resurfacing near stream courses. Road decommissioning in 2001 consisted of removing culverts, unstable fill-slopes, ripping road surface, and outsloping segments. Soil bioengineering techniques for soil stabilization will also be performed as a component of the project in 2002-2003. The project will result in a total of approximately 3.4 miles of decommissioned roads, and 7.0 miles of road stabilization.
Dungeness Watershed Analysis 2nd Iteration Contract **Contributors:** *ONF* **Contact:** *Robin Stoddard, USFS, 360-956-2433* **Project Status:** *Contract for data collection - prepared August 2001. Development of restoration opportunities is set for February-March 2002. Analysis to be completed by March 2002. Updated watershed analysis document to be completed summer 2002.*	This science-based analysis contract, initiated in 2001, will focus on the relationship of roads and slope stability with stream channel processes. It will cover approximately 170 square miles and will consist primarily of federal lands in the upper portion of the Dungeness River watershed. The core team will address aquatic and terrestrial issues, with emphasis on Threatened and Endangered species, anadromous fish stocks, aquatic habitat and water quality. The team hopes to further science-based understanding of the watershed for the purpose of identifying restoration opportunities on lands within the analysis area.

RIPARIAN LAND PROTECTION AND/OR RESTORATION:

PROJECT NAME/LOGISTICS	PROJECT DESCRIPTION
DePalma Floodplain Acquisition and Conservation Easement **Contributors:** *Department of Fish and Wildlife (WDFW), Puget Consumer Cooperative Farmland Fund (PCCFF)* **Contact:** *Randy Johnson, WDFW, 360-417-3301* **Project Status:** *Pending.*	The project is located within the northeastern section of the Dungeness floodplain, (adjacent to the east side of Towne Road, above the Schoolhouse Bridge and the Still property). PCCFF acquired the entire 96 acres of this parcel. WDFW obtained a purchase option for the northern 22 acres of the property. Additionally, WDFW purchased a highly restrictive conservation easement on the remaining 74-acre portion, which will prohibit development practices and/or other activities that could potentially interfere with natural river processes.

Dungeness Riparian Habitat Restoration Program

Contributors: *North Olympic Land Trust (NOLT), Clallam County*
Contact: *Eve Dixon, NOLT, 360-417-1815*
Project Status: *Project began in 1997/1998 and has continued through 2001. Easements are in perpetuity and NOLT bears the responsibility of monitoring and enforcement if necessary.*

The North Olympic Land Trust completed acquisition of eight conservation easements on 103.5 acres, totaling over two miles of Dungeness riparian corridor. The easements are designed to preserve critical habitat of the Dungeness River and its associated side channels and flood plain. The easements are located within the entire lower river, encompassing the entire Gagnon side channel, reaching close to the mouth and to the upstream side of Kinkade Island.

Conservation Reserve Enhancement Program (CREP)

Contributors: *CCD (Conservation Commission)*
Contact: *Jennifer Coyle, CCD, 360-452-1912*
Project Status: *Ongoing*

This incentive program pays for the restoration of riparian forest buffers along salmon streams in agricultural land and compensates landowners for taking land out of production. Currently, four properties totaling 22 acres are enrolled or are in the process of enrolling in the program.

Large Woody Debris (LWD) Restoration Project Monitoring

Contributors: *JSKT, Bureau of Indian Affairs (BIA)*
Contact: *Byron Rot, JSKT, 360-681-4615*
Project Status: *In progress; report due 2002.*

A grant from the BIA Jobs in the Woods Program was used by the Tribe to monitor LWD structures, which were constructed from 1997 through 2000. 2001 monitoring included field and photo observation of jam function during high and low flows. The 2000 Dawley side channel project, located at RM 6.6, received more intensive monitoring including: summer low flow cross-section surveys and photographs to monitor structural channel change through time; summer low flow and winter base flow juvenile surveys to determine community composition and density; and monitoring of planted riparian vegetation for mortality.

Bureau of Reclamation (BOR) Study on the Geomorphology of the Lower Dungeness River (Presentation of Results)

Contributors: *BOR (Lower Colorado River Office), JSKT*
Contact: *Byron Rot, JSKT, 360-681-4615*
Project Status: *Preliminary results presented to DRMT, DRRWG, and public in October 2001. Final report due to Tribe early 2002.*

In 1997, the BOR was asked by JSKT to complete a geomorphological investigation of the Dungeness River. The overall study objective was to gain a better understanding of altered river process due to historical and current human activities occurring within the floodplain. Specifically, the study team aimed to: describe the physical processes of the Dungeness river through geomorphic investigations; identify human impacts on the River's natural processes; and develop predictions of future channel change and potential management options. In October 2001, the BOR presented results of the study and proposed several important recommendations to the DRMT, the DRRWG, and the public.

WATER QUALITY:

PROJECT NAME/LOGISTICS	PROJECT DESCRIPTION
Formation of Clallam County Clean Water District **Contributors:** *Clallam County* **Contact:** *Valerie Wilson, Clallam County, 360-417-2543; Andy Brastad, Clallam County, 360-417-2415* **Project Status:** *District boundaries were set and corrective actions were identified in the Clean Water Strategy (described below).*	A Clean Water District was formed by Clallam County in May 2001 The initial impetus for initiating the District was in response to the Department of Health's (DOH) closure of portions of Dungeness Bay to shellfish harvest due to fecal coliform contamination. The scope of the District has since broadened to include not only shellfish contamination problems, but *all* water quality problems. Similarly, the boundaries of the District have expanded to encompass the entire DRMT focus area, allowing for a watershed approach to addressing water quality issues.

Formation of Clean Water Workgroup

Contributors: *Clallam County, JSKT, CCD, Dungeness River Management Team (DRMT), DOH, DOE, PUD, City of Sequim, and Dungeness National Wildlife Refuge*
Contact: *Valerie Wilson, Clallam County 360-417-2543; Lyn Muench, JSKT, 360-681-4631*
Project Status: *Implementation actions are ongoing; outreach tours and workshops were conducted in 2001 and are planned for 2002.*

Although participants began meeting in 1997, the Clean Water Workgoup officially formed in 2001. The group's role is to implement activities recommended in the Clean Water Strategy (2000) which was formally adopted by the Board of Clallam County Commissioners (BOCCC) in May 2001. The group reports directly to the BOCCC and also serves as a subcommittee to the DRMT.

Total Maximum Daily Load (TMDL) Study

Contributors: *DOE,Clallam County, DOH, JSKT, others*
Contact: *Debbie Sargent, DOE, 360-407-6684*
Project Status: *Two publications were produced in 2001: "Dungeness River / Matriotti Creek TMDL Stud"y Preliminary "Data Results for Nov 1999 - Oct 2000," by Debbie Sargent, January 2001; and "Dungeness River / Matriotti Creek Fecal Coliform Bacteria TMDL Study Streamflow Summary" by James Shedd, November 2001. Public comment on final technical report set for April 2002. Target date in early 2002 for setting load allocations. JSKT continues to monitor water quality at Ecology-established TMDL stations.*

In response to consistently degrading water quality in the Dungeness Bay over the last decade, and to the federal closure of the Bay to shellfish harvest, the Jamestown S'Klallam Tribe and DRMT requested the assistance of the Washington Department of Ecology in monitoring water quality within the Dungeness River and Bay. In water year 2000 (November 1999 through October 2000), the DOE proceeded by conducting a TMDL study for the purpose of establishing new fecal coliform criteria and to facilitate restoration of water quality. TMDL sample sites occur at various locations along the Dungeness River and Matriotti Creek. The report's findings will be used to set future TMDL load allocations.

Circulation Study - Phase 1: Dungeness Bay Bathymetry, Circulation and Fecal Coloform Studies

Contributors: *JSKT; J.E. Jack Rensel, Ph.D. (Rensel Associates Aquatic Science Consultants), Thomas J. Smayda, P.E. (Smayda Environmental Associates, Inc.)*
Contact: *Lyn Muench, JSKT, 360-681-4631; Shawn Hines, JSKT, 360-681-4664*
Project Status: *Phase 2 fieldwork is currently under way. Expected completion date: December 2002.*

In response to the April 2000 closure of Dungeness Bay to Shellfish harvest, and the subsequent formation of the Clean Water District and Clean Water Workgroup, the JSKT hired consultants to investigate water circulation and fecal coliform sources and losses within the Dungeness Bay. Fieldwork included bathymetric mapping, circulation studies and water quality monitoring in May and October 2000. The new data (water quality, marine fecal coliform concentrations, bird abundance, river flow rates, tidal data) was analyzed along side previously-gathered data, which the consultants compiled from other sources. The combined data will eventually be used by DOE to establish new fecal coliform criteria for the Dungeness River. The analysis and its recommendations were completed August 2001.

Irrigation Water Quality Improvement

Contributors: *Dungeness IC, Clallam Ditch Company, Agnew ID, CCD (Conservation Commission and DOE Centennial Clean Water Fund, Conservation Commission Dairy Cost Share and National Fish and Wildlife Foundation), JSKT (IAC-SRFB), Clallam County Road Department, NRCS, Streamkeepers, WUA*
Contact: *Joe Holtrop, CCD, 360-452-1912*
Project Status: *Dungeness and Clallam projects complete. Project construction for Agnew will be complete prior to June 2002.*

The Dungeness Irrigation Company replaced approximately 7,100 feet of open irrigation ditch with pipeline, completely eliminating contaminated irrigation tailwater to Mud Creek. CCD and the WUA ranked tailwater ditches based on water quality data collected by DOE and Streamkeepers. The Dungeness Company tailwater ditch to Mud Creek had the second highest fecal coliform loading out of 27 ditches monitored. A construction contract was awarded in December 2001by the Clallam Ditch Company for the installation of approximately 17,000 feet of pipe in the Carlsborg area. This project will eliminate contaminated tailwater to Matriotti Creek and pumping from the creek. This project ranked number 4 for fecal coliform loading. Design is complete for the piping of approximately 4,500 feet of open irrigation ditch delivering contaminated tailwater to Matriotti Creek within Agnew Irrigation District.

Farm Conservation Planning

Contributors: *CCD (Conservation Commission, DOE Centennial Clean Water Fund, County); technical assistance provided by CCD.*
Contact: *Joe Holtrop, CCD, 360-452-1912*
Project Status: *Ongoing.*

Seven landowners, including two dairies, developed comprehensive farm conservation plans. These plans provide an assessment of current management practices, resource concerns and land user objectives. CCD conducted resource inventories and evaluations on 17 properties.

Conservation Practice Implementation

Contributors: *CCD (Conservation Commission, DOE Centennial Clean Water Fund, County); technical assistance provided by CCD and NRCS.*
Contact: *Joe Holtrop, CCD, 360-452-1912*
Project Status: *Ongoing.*

The following conservation practices were implemented in 2001:

- 3,207 feet of riparian fencing
- 5 alternative stock water sources
- 3 alternative stream crossings
- 5 fish migration barriers removed in Hurd Creek
- 1 compost structure
- 1 liquid manure aeration system

OTHER HIGHLIGHTS:

PROJECT NAME/LOGISTICS	PROJECT DESCRIPTION
Dungeness River Audubon Center at Railroad Bridge Park **Contributors:** *Partnership among JSKT, Rainshadow Natural Science Foundation, Olympic Peninsula Audubon Society, National Audubon Society* **Contact:** *Bob Boekelheide, Director, 360-683-4076* **Project Status:** *The Center is fully functional. A capital campaign is under way for future funding for operation and expansion.*	Construction of the Dungeness River Audubon Center at Railroad Bridge Park was completed, and a full time Director/ Volunteer Coordinator was hired in September 2001. The Grand Opening occurred on October 21, 2001. The Center provides exhibit, classroom, and meeting space, and it includes computer facilities. Formal and informal environmental education programs are also offered. Additional information can be found on the Center's website: http://www.dungenessrivercenter.org
Comprehensive List of Restoration Projects Completed and Ranked **Contributors:** *DRMT Members* **Contact:** *Shawn Hines, JSKT, 360-681-4664* **Project Status:** *The DRMT intends to review and/or revise the project list on an annual basis.*	The DRMT prioritized Dungeness Watershed Proposed Projects in March/April 2001. The list, created by the DRMT, consists of 10 strategic elements, including 41 potential activities. Restoration of the Lower Floodplain and Delta ranked as the highest priority strategic element. Potential activities within this element ranked as follows: land acquisition (#1), schoolhouse bridge expansion (#2), and Army Corps of Engineer dike removal/setback (#3).
Chinook Captive Broodstock Tagging **Contributors:** *WDFW, JSKT (Pacific Salmon Treaty/Bureau of Indian Affairs funding), local volunteers* **Contact:** *Scott Chitwood, JSKT, 360-681-4616* **Project Status:** *Annual tagging expected to continue through 2004. A progress report on the Dungeness River Chinook Salmon Rebuilding Project (1993 - 1998) was complete January 2001 by WDFW and is available in the Jamestown Tribal Natural Resources Library.*	The Chinook Captive Broodstock Program was initiated in 1992. State, hatchery and tribal staff, along with local volunteers, removed a portion of wild chinook eggs from their river nests, raised them in captivity until they were adults, spawned them and released the offspring back into the river. The tagging program complements the broodstock program by enabling fisheries managers to track the success of chinook stock restoration and recovery efforts. A total of 2,080,000 juveniles were released in stages at different locations in the watershed. Of those released, 330,000 were unmarked, while the remaining were either coded-wire-tagged (and/or adipose clipped), blank-wire-tagged, or otolith marked.

Fall Pink Salmon Supplementation Program

Contributors: *WDFW, NOSC*
Contact: Don Rapelje, WDFW, 360-683-4255
Project Status: Small pink fry will be marked in March 2002. Fry will be released in April 2002.

WDFW continued a fall pink salmon broodstock collection effort during 2001. The program was initiated in 1995 due to the fact that egg incubation conditions in the lower Dungeness River are not optimal for the long-term health of the pink stock. A fish weir was installed in the lower Dungeness River, which captured adult salmon from August 7 through September 17, 2001. 876 captured fish were transferred to a protected fish culture facility and genetically identified. Approximately half were identified as fall pink. These broodstock produced 300,000 eggs. Fry releases, a portion of which will be marked, will occur in the spring from Hurd Creek Hatchery.

Salmon Recovery Funding Board (SRFB) Visit

Contributors: *DRMT members*
Contact: *Shawn Hines, JSKT, 360-681-4664*

The Salmon Recovery Funding Board toured the Dungeness watershed and met with DRMT members in September 2001 to review and discuss SRFB-funded projects and how these integrate with other local restoration efforts. The DRMT received positive feedback from SRFB representatives for its salmon recovery efforts.

2514 Watershed Planning

Contributors: *DRMT*
Contact: *Jeremy Pratt, Entrix, 360-452-7057*
Project Status: *Additional background information on the Watershed Planning Act and 2514 process can be found on the Washington DOE web page:* *http://www.ecy.wa.gov/watershed/background.html*

The 1998 legislature passed the Watershed Planning Act (HB 2514), which directed local watershed councils to develop watershed plans for managing water resources and protecting existing water rights. A consultant guides the planning process in Water Resources Area 18 and is working with the DRMT on the Dungeness Watershed Plan. The following accomplishments occurred in 2001:

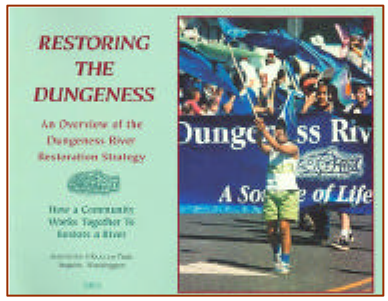
- held "visioning" workshop in March 2001
- identified issues and held focus workshops on habitat, salmon recovery, integration with ESA compliance, instream flows, small streams, riparian corridor, wildlife, water quality, groundwater (including scoping groundwater model)
- developed draft watershed characterization and draft "planning framework" for Dungeness Watershed Plan

2003 Milestone Restoration and Conservation Activities in the DRMT Geographic Focus Area

WATER RESOURCES PLANNING

Restoring the Dungeness: An Overview of the Dungeness Restoration Strategy:

This report summarizes the work of the past decade by the Jamestown S'Klallam Tribe (JSKT), Dungeness River Management Team (DRMT) and other community and regional partners toward salmon recovery in the Dungeness watershed. The document serves as an overview of the recovery strategy developed by the Dungeness watershed community. Although it is not a technical recovery plan, it does contain major elements needed for a local salmon recovery plan. The report is divided into four chapters, presenting thorough descriptions of the Dungeness Watershed's history, the status of Dungeness River salmon, the restoration strategy (including 10 strategic actions to restore healthy aquatic habitat), and citizen and technical involvement in Dungeness salmon restoration.



Contributors: JSKT, Northwest Indian Fisheries Commission (NWIFC) (via NOAA's Salmon Recovery Program), Point-No-Point Treaty Council
Contact: Shawn Hines, JSKT, 360-681-4664
Status: Report published summer 2003. The DRMT plans to formally endorse this Strategy.

Phase III 2514 Watershed Planning:

The 1998 legislature passed the Watershed Planning Act (ESHB 2514), which directed local watershed councils to develop watershed plans for managing water resources and developing strategies to meet the needs of both people and fish. Assisted by a consultant, the DRMT has been working on the East Watershed Resources Inventory Area (WRIA) 18 portion of the plan, covering the watersheds in the DRMT area of geographic focus. (The Elwha-Morse Management Team (EMMT) developed plan recommendations for West WRIA 18). Clallam County was the lead agency for this project. Phase III of the planning process (developing a draft plan) was nearly complete in 2003.

Contributors: DRMT, WRIA 18 Initiating Governments (Clallam County, City of Port Angeles, JSKT, Lower Elwha S'Klallam Tribe, and Agnew Irrigation District (as the area's largest water purveyor)), Washington State Department of Ecology (DOE), Entrix, Inc.
Contact: Ann Soule, Clallam County, 360-417-2424; Cynthia Nelson, DOE, 360-407-0276
Status: The Draft WRIA 18 Elwha-Dungeness Watershed Plan was completed 2003. Formal approval by DRMT, EMMT, Initiating Governments, and DOE took place January 2004. The Plan will be submitted to the Board of Clallam County Commissioners April 2004, for Public Hearing prior to Board approval and submittal to the Washington Department of Ecology.

Aquifer Storage and Recovery Evaluation Report:

As part of on-going planning requirements and current 2514 watershed planning efforts, Clallam County hired consultants to evaluate the potential for aquifer storage and recharge (ASR) in the Sequim-Dungeness area via the irrigation system. ASR involves the storage of water within an aquifer (during wet seasons) via injection or infiltration of water, with the subsequent retrieval of the water from the aquifer when needed during dry seasons. The report discusses the groundwater model used in the study, identifies potential recharge areas, recommends diversion period and rate, describes steady state and transient ASR simulations used in the study, and provided a list of conclusions.

Contributors: Clallam County, Tetra Tech FW, Inc.,
Contact: Ann Soule, Clallam County, 360-417-2424
Status: Report published July 2003. The hydrogeologic review and the selection criteria led to two possible ASR locations, each over a mile to the east and west of the Dungeness River.

Groundwater Model of the Sequim-Dungeness Area:

The Department of Ecology hired consultants to develop a regional groundwater flow model for the Sequim-Dungeness area for use as a tool in analyzing the impacts of the Dungeness River Water Users Association Comprehensive Water Conservation Plan (Water Conservation Plan) alternatives. Steady state and transient models were developed for the period from December 1995 to September 1997. Creation of the model consisted of the following key activities: (a) review of existing data, (b) model input development, (c) model development and construction, (d) model calibration, and (e) completion of a sensitivity analysis.

Contributors: DOE, Clallam County, Tetra Tech FW, Inc.
Contact: Cynthia Nelson, DOE, 360-407-0276; Ann Soule, Clallam County, 360-417-2424
Status: Model completed summer 2003. In addition to its use in analyzing impacts of irrigation in the Environmental Impact Statement for the Water Conservation Plan, it is being used in the 2514 watershed planning effort, the Comprehensive Irrigation District Management Plan (CIDMP) process, development of DOE's in-stream flow and water management rule, and in Clallam County's on-going planning work.

Kinkade Island Geomorphic Assessment, Dungeness River, Washington:

This report integrates recently collected data and information with a previous geomorphic analysis in the vicinity of Kinkade Island. It provides information on the historical development of Kinkade side channel and the existing river processes. A prediction of future channel changes and the risk of erosion along the boundaries of the present flood plain are also included, along with potential affects from Kinkade Island channel changes to the river reach downstream of Kinkade Island.

Contributors: Clallam County, US Bureau of Reclamation
Contact: Cathy Lear, Clallam County, 360-417-2361
Status: Assessment published July 2003.

Draft Dungeness River Comprehensive Flood Hazard Management Plan 2003:

This Draft Plan updates and amends the Clallam County Public Works Department's *Dungeness River Comprehensive Flood Control Management Plan* (1990) and focuses on preserving and restoring river processes while recognizing the need to protect human life and property. After describing state processes designed to reduce flood hazards; the history of Dungeness flood planning; watershed, land use and socioeconomic characteristics; and Dungeness flood history, the Draft Plan identifies recommended approaches for flood hazard management and provides alternative solutions for the management of specific flood or erosion hazards in the Dungeness floodplain.

Contributors: Clallam County, Dungeness Flood Planning Committee (JSKT, Clallam County, Dungeness River Audubon Center, Washington Department of Fish and Wildlife (WDFW), DOE, riverside property owners)
Contact: Cathy Lear, Clallam County, 360-417-2361
Status: Draft Plan completed June 2003. Final draft, SEPA and public review processes, and adoption by Board of County Commissioners expected by the end of 2004.

FISHERIES RESTORATION AND RECOVERY

Summer Chum Recovery Project:

Each fall, as summer chum return to Jimmycomelately Creek, a certain number are trapped and spawned. The eggs are transported to hatchery or instream incubation sites to be raised as part of the Summer Chum Recovery program. Fish are also allowed to move upstream to spawn naturally, depending upon the numbers returning. In 2003, over 86,753 summer chum eggs were collected for the recovery project. Eleven volunteers participated on a regular basis, and another 30 have contributed time and effort since the program was initiated.

Contributors: WDFW, North Olympic Salmon Coalition (NOSC), JSKT, volunteers
Contact: Cheri Scalf, WDFW, 360- 379-9516
Status: Fry will be released spring 2004.

North Olympic Salmon Coalition volunteers at incubation site

Smolt Trapping on Jimmycomelately, Siebert, Matriotti Creeks:

Natural resources technicians from the Jamestown Tribe continued to survey smolt production on Jimmycomelately and Siebert Creeks. New to the program this year was a survey of smolt production on Matriotti Creek. Smolt traps were constructed and installed, and out migration data (species ID, size, number) were recorded. In addition to the smolt data, juvenile (pre-migratory) steelhead and cutthroat data were also collected.

Contributors: NWIFC, JSKT, WDFW, volunteers
Contact: Scott Chitwood, Natural Resources Director, JSKT, 360-681-3616
Status: Surveys were conducted April – June 2003. Traps will be reinstalled spring 2004. Results are as follows:

Stream	Smolts			Juveniles	
	Coho	Steelhead	Cutthroat	Steelhead	Cutthroat
Siebert	1915	758	125	727	70
Jimmy	1274	105	99	224	135
Matriotti	8963	508	424	345	125

Derelict Fishing Gear Removal Pilot Project:

Abandoned or lost fishing gear can present safety, liability, nuisance and environmental impact issues in marine waters. As part of the Northwest Straits Commission's Clallam County Nearshore Mapping and Restoration Project, identification, location and safe removal of derelict fishing gear was started in several Puget Sound waters, including Dungeness and Sequim Bays. A derelict fishing gear removal plan was approved by WDFW. Surveys and derelict gear removal operations occurred June 2003. From the data collected, there were an estimated 361 derelict crab pots in Dungeness Bay, and 347 in Sequim Bay.

Contributors: Northwest Straits Commission (NWSC), NOAA, Clallam County Marine Resource Committee (MRC), Puget Sound Action Team (PSAT), WDFW
Contact: Joe Schmitt, Clallam County MRC (Chair), 360-928-3489
Status: Based on the observations and the results of the Clallam County derelict fishing gear project, conclusions and recommendations to further reduce the impact of derelict fishing gear on the marine environment of Clallam County were made.
Notes: Further information can be found on the following webpages:
Clallam County MRC: http://www.clallammrc.org/CCMRC/
WDFW: http://www.wdfw.wa.gov/fish/derelict/
NWSC: http://www.nwstraits.org/projects.html#derelict

Dungeness Bull Trout Telemetry Project:

The Olympic National Forest (ONF) and partners are conducting a bull trout study in the Dungeness River. The purpose of this study is to identify key spawning, rearing, and over-wintering habitats, migratory patterns and seasonal staging area. This study will focus on whether or not an anadromous life history form exists within the Dungeness River population. DNA samples will be collected to help discern bull trout population structure within the watershed and similarity of Dungeness bull trout to populations in adjacent watersheds. In 2003, 25 bull trout were implanted with transmitters. Two stationary receivers were installed (one near the mouth of the Dungeness and one at the confluence of the Grey Wolf and Dungeness) to aid with fish tracking efforts.

Contributors: US Forest Service (USFS), US Fish and Wildlife Service (USFW), WDFW, Olympic National Park (ONP), Ecology's Washington Conservation Corps (WCC), Dungeness Farms
Contact: Larry Ogg, ONP, 360-877-5254
Status: 2003 was the first year of this five-year study.

RIPARIAN AND ESTUARINE PROTECTION AND RESTORATION

Phase II Lower Dungeness River Restoration Project:

The two goals of this project are: (1) to complete a historical characterization of the Lower Dungeness River and floodplain, and (2) to replant 90 acres of riparian/floodplain habitat with native species. The historical landscape characterization will occur from the river mouth to River Mile (RM) 2.7, covering ~ 800 acres. JSKT contracted with the University of Washington to complete this task, which will provide information about the condition of the river and floodplain at the time of early Euro-American settlement, and at subsequent times over the following 150 years. Using the information from the characterization and subsequent planning, suitable native species will be planted on ~ 90 acres of state and private estuarine and riparian areas.

Contributors: USFW, JSKT, willing landowners
Contact: Ginger Phalen, USFW, 360-753-5819
Hansi Hals, JSKT, 360-681-4601; Byron Rot, JSKT, 360-681-4615
Status: Phase II of the project officially began August 2003. The expected completion date for the historical characterization work is late summer 2004. Projected completion date for the planting and post project maintenance and monitoring is October 2007.
Notes: USFW Jobs in the Woods Watershed Restoration Program is contributing $216,500 towards project completion. JSKT is contributing $75,000, for a total project cost of $291,500.

Recommended Land Protection Strategies for the Dungeness River Riparian Area:

The Dungeness River Restoration Workgroup (DRRWG) undertook this land protection study for the DRMT to address both flood protection and salmon recovery in the Dungeness. The study details the biological value of riparian lands in maintaining and improving salmonid habitat along the Dungeness River. It also describes the methodology used to produce the strategy, provides a reach-by-reach riparian lands analysis, discusses recommendations for protecting high quality and restoring poor quality habitat, and summarizes various Dungeness River regulatory programs.

Contributors: DRRWG, JSKT, Clallam County, WDFW, Natural Resources Conservation Service (NRCS), Clallam Conservation District (CCD), private landowners
Contact: Hansi Hals, JSKT, 360-681-4601
Status: Report published August 2003. The DRMT formally endorsed this report December 2003.

Dungeness Refuge Noxious Weed Removal:

Dungeness National Wildlife Refuge staff and volunteers mechanically removed Dalmatian Toadflax (*Linaria dalmatica*) from Graveyard Spit, a designated Research Natural Area due to its unique vegetation characteristics. Dalmatian Toadflax is state listed as a Class B noxious weed and, as do other noxious weeds, greatly reduces habitat quality by out-competing native plants for nutrients and water. Its only occurrence in Clallam County is on Graveyard Spit, so removing the plant is a high priority in order to prevent spreading to other parts of the Olympic Peninsula, and to preserve the native vegetation in the area. Due to the significant amount removed in 2001 (765 lbs), only 11 lbs had to be removed this year.

Left: Dalmation Toadflax (Class B noxious Weed)
Right: Volunteers removing Toadflax from Graveyard Spit

Contributors: Dungeness National Wildlife Refuge, volunteers
Contact: Annette de Knijf or Pam Sanguinetti, Dungeness National Wildlife Refuge, 360-457-8541
Status: Refuge staff will continue to monitor and remove any regrowth.

Dungeness Estuary Restoration:

Appraisals, reviews, and environmental assessments were completed in 2003 for landowners participating in the River's End restoration project. Six parcels were purchased, the occupants of dwellings were relocated, and the structures on the parcels were winterized. To help existing dollars go farther, funding was applied for and received to help decommission the structures, purchase of the remaining properties, and restore vegetation.

Contributors: Clallam County, JSKT, WDFW, USFW, USFS, SRFB, River's End landowners
Contact: Cathy Lear, Clallam County, 360-417-2361
Status: Funding has been obtained for revegetation, decommissioning, and purchase of properties. Two more landowners have asked to have their properties appraised, bringing to 20 the total number of parcels that may be purchased during this phase of the project.

Stream Buffering:

Through the Conservation Reserve Enhancement Program, the Clallam Conservation District helped landowners implement five riparian restoration plans, benefiting 18.5 acres and nearly one mile of salmon streams and wildlife habitat. Implementation included riparian planting of native trees and shrubs.

Contributors: Landowners, CCD, Washington Conservation Commission, Farm Service Agency, NRCS
Contact: Joe Holtrop, CCD, 360-452-1912 x 5
Status: On-going.
Notes: CCD provided technical and financial assistance. See the Clallam Conservation District's 2003 Report of Accomplishments for further details.

Phase II Jimmycomelately (JCL) Creek and Estuary Restoration:

Realignment of JCL creek began in 2002, and excavation and shaping of the main channel and floodplain were completed August 2003. This included digging the channel, placement of spawning gravel along the stream corridor, installing large woody debris throughout the channel and floodplain, and riparian planting and seeding. Restoration work in the estuary included removal of the log yard pier and 30,000 yd^3 of fill. As an update of project phases, the Jamestown Tribe created a brochure entitled *The 'Undevelopment' of Jimmycomelately Creek and Estuary*. It describes history and background information for the project, the significance of the project to threatened and other important species, project planning steps, and a 2003 status report.

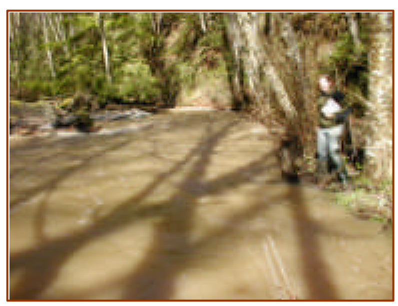
Aerial of newly completed channel upstream of Hwy 101 (March 2003)

Contributors: Clallam County, WDFW, CCD, US-EPA, USFW, JSKT, Department of Transportation, landowners
Contact: Byron Rot, JSKT, 360-681-4615 or Sam Gibboney, JCL Project Coordinator, 360-681-4613
Status: Construction for the redesigned Hwy 101 bridge over the creek is expected 2004. An Estuary Monitoring Plan will be finalized early 2004.
Notes: Planning documents prepared for the overall project in 2003 include: *A Conceptual Plan for Restoring the Lower Sequim Bay* Estuary, and *Channel Design for Realignment of the Jimmycomelately Creek Channel*.

Siebert Creek Watershed Assessment:

This assessment will identify and prioritize restoration actions in the Siebert Creek Watershed. The project includes identification, mapping and prioritization of the following: (a) sediment sources throughout the entire watershed (conducted by Clallam Conservation District); (b) locations where LWD placement is needed; (c) restoration activities to address channel constriction, bank erosion and channel instability; and (d) off-channel rearing areas for restoration in the watershed's lower two miles. Habitat data will also be collected to support Pacific Woodrush's efforts to protect intact habitats and ecological processes through land purchase and conservation easements from willing landowners. This project will benefit coho salmon, winter steelhead and cutthroat trout.

Stormwater monitoring during bank-full flood event (March 2003)



Contributors: USFW, Pacific Woodrush, CCD, JSKT, Clallam County
Contact: Ginger Phalen, USFW, 360-753-5819
Status: This work is ongoing and expected to be completed by May 2004. 2003 work included sediment monitoring, observation and documentation of water clarity, color, suspended sediment, LWD, and other habitat characteristic measurements. A DNR Level I Riparian Habitat Assessment was also completed.
Notes: The USFW Puget Sound/Coastal Program is contributing \$15,000 towards project completion. Project partners are contributing \$17,330. Total project cost is \$32,330.

WATER QUALITY

Draft Comprehensive Irrigation District Management Plan (CIDMP):

This project has both water quality and water conservation elements. See WATER CONSERVATION section below.

Potential Application of Microbial Source Tracking Methods to the Dungeness Watershed and Bay:

One of the components of the Clean Water Strategy for Addressing Bacterial Pollution in Dungeness Bay and Watershed (Clallam County, 2002) is to conduct additional pollutant source assessments. This study accomplishes that by looking at microbial source tracking (MST) methods. The study provides an overview of various MST methods and recommends appropriate applications to the Dungeness Bay and Watershed.

Contributors: Clallam County, DOE, Battelle Pacific Northwest Division
Contact: Valerie Streeter, Clallam County, 360-417-2543
Status: The report was published June 2003. Funding is being sought to use MST for pollutant source tracking in Dungeness River and Bay.

Groundwater Quality in the Agnew and Carlsborg Area, Clallam County (December 2000 – September 2002):

This work was undertaken to assess current groundwater quality conditions and trends for the high-growth communities of Agnew and Carlsborg, which lie north and west of the city of Sequim. Eight wells were monitored quarterly from December 2000 to September 2002 for six field parameters (total persulfate nitrogen, nitrate+nitrite-N, fecal coliform bacteria, chloride, total iron, and total manganese) to determine if groundwater quality has changed appreciably since area wells were first sampled in 1980.

Contributors: DOE, Clallam County
Contact: Kirk Sinclair, DOE, 360-407-6557
Status: Report published April 2003.

Agricultural Conservation Planning and Implementation:

Agricultural conservation and Best Management Practices (BMPs) were applied on several farms in 2003, with technical and financial assistance from CCD. Activities included: installation of two solid manure storage structures and cost-share for one liquid manure agitator; installation of 920 feet of riparian fencing; and installation of two barn roof runoff management systems. These actions helped reduce potential surface and groundwater pollution. The CCD assisted landowners with development of seven farm conservation plans. The CCD helped all five dairies in the area develop dairy nutrient management plans in compliance with the Dairy Nutrient Management Act. Three of the five dairies fully implemented their plans in 2003.

Contributors: Landowners, CCD, Washington Conservation Commission, DOE, Clallam County, JSKT, NRCS
Contact: Joe Holtrop, CCD, 360-452-1912 x 5
Status: On-going.
Notes: See the Clallam Conservation District's 2003 Report of Accomplishments for further details.

Potential Stormwater Impacts on Sediment Quality in Urbanizing Clallam County Streams:

The objective of this study was to provide initial sediment quality assessments with regard to heavy metals and total petroleum hydrocarbons for five selected streams in Clallam County: Bell Creek and McDonald Creek (in the DRMT focus area); and Morse Creek, Ennis Creek and Valley Creek (in the EMMT focus area). This was accomplished by chemical analyses, which screened for the presence of stormwater contaminants in sediment samples taken from the streambeds of these creeks. Evaluation of the data included a comparison of sediment, metal and hydrocarbon concentrations to unaffected sites ("reference sites") within each stream.

Contributors: Clallam County, Battelle Pacific Northwest Division
Contact: Valerie Streeter, Clallam County, 360-417-2543
Status: Study published June 2003.

Irrigation Tailwater Quality Assessment:

Over a two-year period, the Clallam Conservation District conducted an assessment of water quality in irrigation tailwater ditches. Streamkeeper volunteers collected water samples and measured flow in 21 ditches. The samples were analyzed for fecal coliform bacteria. These data as well as water quality data collected by the DOE were evaluated to determine priorities for ditch treatments.

Contributors: Sequim-Dungeness Valley Agricultural Water Users Association (WUA), Washington Conservation Commission, CCD, DOE, Streamkeepers
Contact: Joe Holtrop, CCD, 360-452-1912 x 5
Status: Assessment is complete. Three irrigation ditches have been replaced with pipelines and two more are planned for piping in 2004.

Irrigation and Stormwater Feasability Study:

Irrigation ditches in the lower Clallam Irrigation District convey contaminated stormwater runoff and irrigation water to inner Dungeness Bay. This feasibility study was conducted to identify the sources of contaminated runoff in ditches and determine appropriate alternatives for treatment.

Contributors: Cline Irrigation District, Clallam County Road Department, Washington Conservation Commission, CCD, DOE
Contact: Joe Holtrop, CCD, 360-452-1912 x 5
Status: The feasibility study is complete. One irrigation lateral has been selected for replacement with buried pipe. Six other laterals cannot be replaced with pipelines without taking measures to manage drainage and stormwater runoff. Further study is necessary.

Stormwater Management Demonstration Projects:

The Clallam Conservation District developed plans for and received a grant for two stormwater management demonstration projects. The first, aimed at demonstrating to homeowners a variety of residential stormwater best management practices, will highlight stormwater treatment practices and low impact development techniques that can be incorporated into an existing residential development. The second project, directed at owners and mangers of private roads, will entail a roadside demonstration site showcasing a variety of road-related stormwater management best management practices. The site will be used to evaluate the effectiveness, as well as maintenance requirements of various stormwater management practices that are appropriate for treating runoff from roads.

Contributors: CCD, County Road Department, JSKT, landowners, PSAT
Contact: Joe Holtrop, CCD, 360-452-1912 x 5
Status: Demonstrations to occur in 2004.

Agnew Irrigation District Water Quality Improvement:

Open ditches at three locations within the Agnew Irrigation District were pipelined in order to eliminate livestock access to open ditches (thus, eliminating potential water quality problems) and to allow landowners' use of the land they own that was formerly taken up by open ditch. The projects entailed replacing the following open ditch reaches with buried irrigation pipe: 1,320 feet on the Stellar Ridge lateral; 1,320 feet on the Agnew Store lateral from Old Olympic Highway north to Linderman Road; and 340 feet at on Heuhslein Road. All are closed end pressure systems and all use 6-inch 3034-sewer pipe.

Contributors: Agnew Irrigation District, landowners within Agnew Irrigation District
Contact: Mike Jeldness, Agnew Irrigation District, 360-683-4331
Notes: Construction performed by Agnew Irrigation District's Maintenance Crew; Material expenses paid for by landowners.

Natural Landscaping Training Program:

The Clallam Conservation District developed plans and received a grant for a Natural Landscaping Training Program. This program will expand on the District's popular Landscaping with Native Plants Clinics by including classroom sessions that guide participants through the processes of site analysis and design. Training participants will develop environmentally friendly landscape designs for their properties that incorporate low impact development concepts. The first training will be conducted in the fall of 2004.

Contributors: CCD, PSAT
Contact: Joe Holtrop, CCD, 360-452-1912 x 5
Status: Curriculum under development, first training to occur in fall 2004.

WATER CONSERVATION

Final EIS for Dungeness River Agricultural Water Users Association Comprehensive Water Conservation Plan:

This EIS was completed in order to fulfill SEPA requirements for the Water Conservation Plan, a 1999 plan which provides recommended measures that, when implemented, reduce diversion of water from the Dungeness River for irrigation and domestic uses by the Water Users Association member companies and districts. The EIS describes the Water Conservation Plan proposal, alternative actions for reducing diversions from the Dungeness, the affected environment, environmental impacts and potential mitigation measures. The EIS describes the Water Conservation Plan proposal, alternative actions for reducing diversions from the Dungeness, the affected environment, environmental impacts and mitigation.

Contributors: DOE, Dungeness Technical Advisory Group, Foster Wheeler Environmental Corporation
Contact: Cynthia Nelson, Department of Ecology, 360-407-0276
Status: Report published November 2003. In December 2003, Ecology formally adopted the Water Conservation Plan.

Draft Comprehensive Irrigation District Management Plan (CIDMP):

One of three pilot projects in the State, the CIDMP process for the Sequim-Dungeness Area is a voluntary, incentive-based approach that provides a means for irrigation entities to address requirements under the Endangered Species and Clean Water Acts, while continuing to supply water to meet irrigation needs. The aim is to produce a final approved Plan, the implementation of which will help to obtain higher stream flows during dry periods, improved water quality conditions, and improved prospects for recovery of listed species, while continuing necessary irrigation activities with assurances from state and federal agencies.

Contributors: WUA, Technical Advisory Team, CCD, Clallam County, Graysmarsh, JSKT, USFW, NOAA, DOE, WDFW, Washington Department of Agriculture, Economic and Engineering Services, Inc., Montgomery Water Group, inc., R2 Resource Consultants, Inc.
Contact: Mike Jeldness, WUA, 360-683-4331
Status: Initial drafts complete 2003. Another draft is expected early 2004, with a Final Plan and public review process expected summer 2004.

Water Storage and Site Feasibility Study:

The goal of this study was to identify and evaluate potential off-channel surface water storage sites that could be used to store flow diverted from the Dungeness River during high flow periods for later use during periods of low streamflow. It focuses on storage projects that could reduce irrigation diversions from the Dungeness River during water-short periods. The report includes the following topics: hydrology, identification and selection of alternatives, cost estimates, permitting, conclusions and recommendations.

Contributors: Clallam County, DOE, Montgomery Water Group, Inc.
Contact: Ann Soule, Clallam County, 360-417-2424
Status: Study published June 2003.

Dungeness Irrigation Water Leasing:

Under the Washington Water Acquisition Program developed by the State, DOE leased water rights from irrigators in the Sequim-Dungeness area. Seventeen farmers currently participate in the program, which will pay the irrigators to remove ~1,400 acres of farmland from production, thus eliminating late season irrigation for this acreage. This translates to approximately 10 cfs of the irrigator's legal quota of water. Instead of diverting the water for irrigation, the water will remain instream from August 1st through September 15th, improving the habitat for threatened and other species of Dungeness salmon.

Contributors: WUA, DOE
Contact: Cynthia Nelson, DOE, 360-407-0276
Status: These leases have been negotiated for 2003-2005.

Sequim-Prairie Tri Re-regulation Reservoir:

This project received grant funding in 2003 to improve stream flows in the Dungeness for salmon. The project entails construction of a re-regulation reservoir, piping of several thousand feet of on-farm irrigation laterals, and installation of a low-pressure watering system. Once complete, estimated water savings (from reduction of transport loss, and elimination of tailwater and seepage) is 3.0cfs, which will remain instream. Much of the pre-project planning (permitting, cultural resources review, construction designing, etc.) was conducted in 2003.

Contributors: Sequim-Prairie Tri Irrigation Company, Salmon Recovery Funding Board (SRFB), Washington Conservation Commission and DOE (Irrigation Efficiency Program-IEP, administered by CCD), JSKT
Contact: Gary Smith, Sequim-Prairie Tri Irrigation Company
Status: Construction scheduled for 2004.
Notes: SRFB is funding 53.4% of project costs, Irrigation Efficiencies Program is funding 35%, and landowners within the project area are funding the remainder costs.

UPPER WATERSHED

Upper Dungeness Road Sediment Reduction Project:

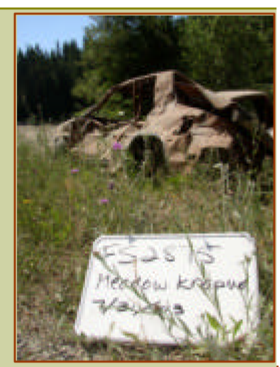
The Olympic National Forest (ONF), in cooperation with Clallam Conservation District (CCD) and other contributors, decommissioned 3.2 miles of highly unstable road located adjacent to the Dungeness River. The road possessed numerous erosion sites that contributed to significant water quality problems and impacted aquatic habitat conditions downstream. Major excavation work included removal of extensive fill (approximately 27,000 cubic yards) at two large stream crossings, and removal of a rip rapped section of road directly adjacent to the River. The road is now being converted to a trail suitable for hiking, biking and stock use. Plans for watershed restoration interpretive signage are also being considered.

Contributors: USFS, CCD, SRFB, ONF, Pacific Coast Watershed Partnership, Federal Highways Administration, DOE's Washington Conservation Corps (WCC) Program
Contact: Scott Hagerty, District Soil Scientist, USFS, 360-765-2249
Status: The project was initiated January 2002, and was completed October 2003. Remaining work includes erosion planting, follow-up soil bioengineering treatments, trail construction and interpretive signing.
Notes: This project was sponsored by CCD and partially funded by SRFB.

Clallam County Noxious Weed Removal:

The US Forest Service, in cooperation with Clallam and Jefferson Counties, surveyed 130 miles (157 acres) and mechanically treated 37 miles (46 acres) in the upper watershed. Weed species removed include Tansy Ragwort, Scotch Broom, Canada Thistle, Bull Thistle, Spotted Knapweed and Meadow Knapweed. Under the leadership of Clallam County's Noxious Weed Control Coordinator, and with help from Clallam County's Road Department and Clallam County Sheriff chain-gang work crew, four individuals removed an estimated 77,000 weeds.

Contributors: USFS, Clallam County, DOE's WCC Program
Contact: Dick Carlson, District Silviculturist, USFS, 360-877-5254; Pat Grover, Forestry Technician, USFS, 360-877-5254; Cathy Lucero, Noxious Weed Control Coordinator, Clallam County, 360-417-2442
Status: Survey conducted May - Oct 2003.



Meadow Knapweed at FS Road 2875

Gold Creek FS2800 Road Decommissioning and FS2810 Road Upgrading Project:

This road decommissioning and upgrading project occurred in a tributary to the Dungeness River on Olympic National Forest. The project decommissioned approximately 2.0 miles of FS Road 2800. Goals of this project were to: (a) remove erosion and sedimentation hazards which contributed to downstream impacts on resident and anadromous fish habitat, and (b) restore approximately 1.0 mile of resident fish habitat. The upgrading of FS Road 2810 improved access and safety for passenger cars in the upper Dungeness watershed. By upgrading stream crossings and road drainages, stream water quality was also improved.

Contributors: Pacific Coast Watershed Partnership, ONF, Federal Highways Administration, DOE's WCC Program
Contact: Scott Hagerty, District Soil Scientist, USFS, 360-765-2249
Status: Construction began August 2003 and was completed December 2003.

Gold Creek Stream Crossing Removal

COMMUNITY OUTREACH

Dungeness River Audubon Center at Railroad Bridge Park:

The Dungeness River Audubon Center continued to be the primary public venue for classes, presentations, field trips, and exhibits related to the Dungeness Watershed and its wildlife. It is also an important meeting space for interest groups (e.g. DRMT) involved with watershed and fisheries management, forest management, septics education, environmental health, flood planning, irrigation planning, and groundwater modeling. In 2003, the Center sponsored or participated in 394 events involving 7,788 attendees. Over 6 ,856 walk-in visitors signed the Center's guest book. Of these, 48% were from outside the Sequim/Port Angeles area. The Center provided many field trips for schools and home –school students, including "Watershed Weeks," a special two-week curriculum written by Center staff for 7th graders, plus four days of stewardship and environmental learning activities for Sequim 6th graders.

Summer Nature Camp, July 2003

Status: Upcoming events are listed at the Center's website: http://www.dungenessrivercenter.org
Notes: Community outreach was also an element to many of the other projects listed in this document.

Contributors: National Audubon Society, Olympic Peninsula Audubon Society, Rainshadow Natural Science Foundation, JSKT, local volunteers
Contact: Bob Boekelheide, Director, 360-683-4076

"River Talk" on flooding, July 2003

LIST OF ACRONYMS

ASR	Aquifer Storage and Recharge
CCD	Clallam Conservation District
CIDMP	Comprehensive Irrigation District Management Plan
DOE	Washington Department of Ecology
DRMT	Dungeness River Management Team
DRRWG	Dungeness River Restoration Work Group
EIS	Environmental Impact Statement
ESHB	Engrossed Substitute House Bill
JSKT	Jamestown S'Klallam Tribe
LWD	Large Woody Debris
MRC	Marine Resource Committee
NOAA	National Oceanic and Atmospheric Administration
NOSC	North Olympic Salmon Coalition
NRCS	Natural Resource Conservation Service
NWIFC	Northwest Indian Fisheries Commission
NWSC	Northwest Straits Commission
ONP	Olympic National Park
PSAT	Puget Sound Action Team
RM	River Mile
SRFB	Salmon Recovery Funding Board
US-EPA	US Environmental Protection Agency
USFS	US Forest Service
USFW	US Fish and Wildlife Service
WCC	Washington Conservation Corps
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resources Inventory Area
WUA	Sequim-Dungeness Valley Agricultural Water Users Association

This document was prepared by Shawn Hines, Jamestown S'Klallam Tribe, for the Dungeness River Management Team (DRMT). For more information about the DRMT, see the DRMT's website: http://www.olympus.net/community/dungenesswc/

D. What on-the-ground actions can be accomplished in the next 5 to 10 years and what will be the result for populations and habitat functions (i.e. actions to turn the negative trend around)? What are the next steps to advance other changes that cannot be addressed in the shorter timeframe?

1. Habitat Restoration Actions

a. Project List and Supplement: The Dungeness River Management Team formally adopted a prioritized project list of proposed actions for the Dungeness Watershed area which is contained in Appendix 6 of "Restoring the Dungeness." The list has been used as the basis for project applications to the Salmon Recovery Funding Board and other funding sources for the past few years, and is organized around the ten major restoration strategies for the watershed. In April through June, 2004, the project list was re-structured to facilitate completion of an Ecosystem Diagnostic Treatment method analysis. In this "Supplemental Project List" (located at the end of the response to Question D), the DRMT project list was rearranged by river reach, and each project was evaluated for biological importance (based on EDT diagnosis), *biological importance to bull trout (based on the Recovery Actions listed in US Fish & Wildlife Draft Document ,2004),* likelihood of implementation, steps or barriers needed to achieve implementation, and projected cost estimates. The enclosed EDT analysis grouped actions together and ran model scenarios based on biological importance and the likelihood of implementation. EDT outputs show the results for populations and habitat functions. In general, the original priorities of the DRMT project list correspond well with the modeled effects on the viable salmon population parameters. The technical work group involved in the EDT analysis has considered discrepancies between the EDT outputs and previous recommendations. Some of the discrepancies are due to modeling limitations (such as estuarine conditions), and some may represent a new perspective on project priorities. EDT results have been reviewed by the DRMT for consideration of possible changes to the project list items.

The biological importance to bull trout was based on recovery actions identified in the US Fish & Wildlife Service Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout (*Salvelinus confluentus*), Vol. II, 2004, pp. 155-207. The recovery actions are comprised of a hierarchical listing of tasks necessary for recovery of bull trout in the Olympic Peninsula Management Unit. The first tier action entries consist of general recovery actions under which more specific second and third tier actions reside. For example, a recovery action listed in Table D-1 as 1.3.10 indicates a first tier of 1. (1. Protect, restore, and maintain suitable habitat conditions for bull trout), a second tier of 3 (1.3 Identify impaired stream channel and riparian areas and implement actions to restore their appropriate functions), and third tier of 10 (1.3.10 Restore instream habitat such as projects focusing on enhancement of habitat through large woody debris, logjams, and complex channels).

In general, projects identified as high likelihood of implementation by the Dungeness River Restoration Work Group are those likely to be implemented in the next 10 years, for which specific plans have already been developed and/or some funding has already been obtained. Medium likelihood actions are fairly well defined, but in order for them to be implemented, substantial barriers to implementation will need to be addressed and/or major preliminary steps in the project sequence must be completed. Finally, the DRMT list and supplement identifies additional projects which can be achieved subject to funding and community/agency support, but will require considerable study and planning prior to implementation and are not expected to be achieved in the short term.

b. Barriers to Implementation/ Next Steps for Long Term Habitat Restoration: Barriers which are generic to the watershed (and other watersheds) include limitations on funding availability, liability concerns, and project sponsor workload.

- *Limited funding* exists for salmonid habitat protection and restoration in general, and competition is keen. Funding is particularly difficult for some of the large scale projects that have multiple phases, such as lower Dungeness River restoration which involves property buyout, removal of existing buildings or structures, engineering and design of dike setback, construction of an alternative dike configuration, and re-construction of functional habitat through excavation, gravel placement, log jam placement and re-vegetation. The ability of a sponsor organization to obtain funding for several years to complete the sequence is extremely difficult.
- *Liability* is a potential barrier where restoration work is located in the stream thalweg upstream of houses or other infrastructure. Project sponsors for log jams, dike setback or removal, bridge widening and other mainstem projects in a large system such as the Dungeness can minimize liability by careful design with competent and accredited engineers, but nothing prevents a downstream landowner from attempting to sue. Clallam County and WDFW have been sued for flood control projects in the past, and smaller non-governmental sponsors are reluctant to risk legal action.
- *Project sponsors* in a large system such as the Dungeness are few for the reasons outlined above, and because the workload for operating restoration projects often falls on top of staff members who were already committed to other tasks. Project funding generally has very strict limitations on the percent that can be used for project oversight and administration, and few sponsors can employ staff for the project planning, initial engineering and scoping, outreach and supervision that are generally necessary for implementation. In addition, some sponsors may have the staff and

engineering support but lack the understanding and capability of restoring dynamic riverine systems.

Additional information on barriers to implementation that are specific to Dungeness watershed projects are noted in the project list supplement. The opportunity to implement many projects is directly dependent on the willingness of the private landowner to sell their property or to allow restoration projects to proceed. Where landowners are not willing, implementation may need to wait until property ownership changes hands, but in all cases the landowners have been approached to encourage their participation and to explain the risk to property and resources to continue to reside near the river. In a few cases, the need for preliminary planning and engineering are limiting implementation.

A few projects in the Dungeness list have been rejected or reworked since technical and policy representatives agree that implementation simply is not likely. These "reworked" projects include the removal or relocation of the majority of the Dungeness Meadows dike, where the number of houses at that location and potential expense is unrealistic; and removal of the Corps dike downstream of Schoolhouse Bridge for the same reason. Additionally, the Gold Creek slide in the upper watershed is known to contribute substantial amounts of fine sediment, but technical experts have not been able to identify a solution that does not contain the possibility of making things worse.

c. Nearshore Restoration Actions: An integrated nearshore recovery strategy for the north Olympic Peninsula has been developed by the Technical Review Group of the North Olympic Peninsula Lead Entity Group and this portion of the NOPLEG salmon recovery strategy is enclosed. The strategy considers regional nearshore functions and conditions, and contains a list of nearshore recovery and protection projects.

The ESU-level *Regional Nearshore and Marine Chapter for the Puget Sound Salmon Recovery Plan* was developed by Puget Sound Action Team staff in consultation with many others and on behalf of the Nearshore Policy Group. At the watershed level the North Olympic Peninsula Lead Entity has created a conceptual model for its nearshore recovery strategy, *Draft* N*earshore Strategy for the North Olympic Peninsula* (NOPLE, 2005) which addresses the diverse habitats of North Olympic Nearshore areas. Nearshore areas of particular interest to the Dungeness watershed are bounded by Sequim Bay on the east and Morse Creek on the west. NOPLE has identified ten prioritized protection and restoration projects for this nearshore segment. The prioritized projects are expected to restore and protect the nearshore.

Projects specific to the Dungeness watershed and nearshore vicinity are described in "Restoring the Dungeness", and focus on Dungeness Bay, and small estuaries associated with independent tributaries to the Strait of Juan de Fuca in east Clallam County.

Due to declining water quality conditions in Dungeness Bay, Clallam County declared a Clean Water District in the eastern portion of the County and a "Clean Water Strategy" has been developed to focus on fecal coliform pollution of the lower river and bay. Additionally, an extensive study of circulation patterns and substrate elevations in Dungeness Bay was conducted by the Jamestown S'Klallam Tribe in 2000-2002 (Rensel, 2002) which documented dissolved oxygen problems, and a declining range of habitat factors such as loss of deep pools and eelgrass beds.

d. ***Habitat Monitoring / Adaptive Management:*** Monitoring activities in the Dungeness watershed are divided into four categories: ***Ecological processes*** attempt to determine the success of physical or ecological restoration (e.g. adequate instream flows); ***Habitat conditions and functions*** tasks attempt to determine the current status of habitat conditions and functions, including large woody debris, soils and water quality; ***Biological response tasks*** measure the current status of biological responses to restoration actions (e.g. abundance of salmon); and ***Changes to Surrounding Land Use*** to look at changes in land use that have the potential to affect watershed processes and conditions either positively or negatively (based on Shreffler, 2001). Monitoring activities are summarized in the following chart:

monitoring chart first of 3 pages

monitoring chart 2nd of 3

monitoring chart 3rd of 3

2. Hatchery Management Activities/Next Steps

a. New Chinook Hatchery Program: Following up on the discontinued Chinook Captive Brood program and consistent with the third HSRG recommendation described above under question #C, a new hatchery program is scheduled to begin with the collection of brood stock in the fall of 2004. The program's goals are to maintain population levels until habitat restoration accommodates a robust, naturally sustainable Chinook population and to meet the current escapement goal of 925 spawners in three out of four years.

- ***Hatchery Facilities and Production***: The new Chinook hatchery program will include use of facilities at Dungeness Hatchery, located at river mile 10.5 of the Dungeness River, and at Hurd Creek Hatchery placed at the lower end of Hurd Creek, a tributary entering the Dungeness River at river mile 2.8. A rearing pond located at river mile 1.0 on the Gray Wolf River will also be used. The facilities are described in the Dungeness Chinook HGMP.

  The program will begin with the collection of brood stock in the fall. Potential brood stock sources include the Dungeness Hatchery adult return trap, the remaining captive brood stock (up to 13 spawners), a hoop trap in the upper river, collection of Chinook at the pink salmon weir trap in the lower river in odd years (if pink salmon hatchery program is resumed), and gaffing or netting Chinook spawners at various locations in the watershed. The brood stocking goal is 112 spawners (assuming a 1:1 ratio of females to males) expected to produce 220,000 fertilized eggs.

  The eggs will be incubated and hatched, and the juvenile salmon will be reared for release as zero-age smolts (30-40 fish per pound) the following spring and as yearling smolts (5-10 fish per pound) one year later. Release targets are 100,000 for each age group. Brood year production priority will be yearling smolts because they have shown higher survival after release from the hatchery.

  Incubation and early rearing will occur at Hurd Creek Hatchery. One hundred thousand juveniles will be transferred from Hurd Creek Hatchery to Dungeness Hatchery in April/May. Another 50,000 juveniles will be transferred from Hurd Creek Hatchery to the Gray Wolf acclimation pond in April for short-term rearing and release in May/June as zero-age smolts. Dungeness Hatchery will also release 50,000 zero–age smolts in May/June. The following year, two lots of 50,000 yearlings smolts from the same brood will be released, one at Dungeness Hatchery and one at Hurd Creek Hatchery. This pattern of production will continue for each brood year for the duration of the program. After the first year, planned total annual releases would be as shown in the following table.

Annual Releases of Hatchery Chinook in Dungeness River

	Dungeness Hatchery	Hurd Creek Hatchery	Gray Wolf Pond
Zero-age smolts	50,000		50,000
Yearling smolts	50,000	50,000	

Additional information on the new hatchery program is contained in the Dungeness Chinook HGMP.

- ***Hatchery Operational Objectives and Standards*:** Operational objectives and standards include brood stocking and production targets, fish spawning, rearing and transfer protocols, minimizing negative interactions with listed species (i.e., natural Chinook and summer chum), maintaining stock integrity and genetic diversity, maximizing survival and controlling fish pathogens, and ensuring compliance with state and federal water quality standards. WDFW utilizes manuals and guidelines that specifically describe hatchery practices for spawning, transfers, disease control, maintenance of genetic diversity, and controlling effluent effects on water quality. More detailed descriptions of the objectives and standards are provided in the Dungeness Chinook HGMP.

b. **<u>Hatchery Program Monitoring</u>:** Monitoring is being done or is planned at several levels. WDFW routinely monitors its hatchery programs using established record keeping procedures that include temperature monitoring, water quality monitoring, accounting for numbers of adults returning the hatchery, numbers and sex of fish spawned, numbers of eggs fertilized and their survival to eyed stage and to hatching, timing of adult returns, numbers of eggs hatching, and numbers of fry ponded. Records also include feeding rates and schedules, fish growth rates and survival, and the numbers and size of fish at release. Detailed information is collected on fish health, including testing for pathogens and recording of disease incidents and treatments. Such record keeping has for many years been, and continues to be, the standardized approach by which WDFW tracks and evaluates its hatchery programs.

WDFW also estimates escapement of Chinook and pink salmon in the Dungeness watershed. The Chinook escapement estimates are based on surveys of redds throughout the spawning season (Smith and Wampler 1995); spawner live and dead counts are the basis of escapement estimates for pink salmon. The Chinook escapement estimates, coupled with the counts of hatchery returns, provide estimates of total Chinook spawners returning to the Dungeness River.

The WDFW marks otoliths or coded-wire-tags all hatchery Chinook releases. The tags are recovered by sampling intercepting fisheries and by sampling carcasses for tags and otoliths at the hatchery and in the river. Sex, scales (for aging) and length of the fish are also sampled. The otolith mark and coded-wire-tag information, and age classes determined from scales, allow the origins of fish to be determined and adult run sizes to be reconstructed by brood year. The success of the hatchery program in producing adult returns can then be tracked and the dispersal of returning hatchery adults in the watershed may be monitored.

WDFW has proposed a project to monitor and assess salmon resources in the watershed and estuary. The project is proposed in response to the HSRG recommendation to: "Initiate a field study to describe life history patterns of Dungeness Chinook." As the HSRG points out, such a study will be invaluable in helping to determine carrying capacity of Chinook juveniles and helping make future decisions on the hatchery program.

The study will also provide information on the distribution of Chinook and other species in the watershed and estuary, and provide information bearing on interactions between hatchery and wild fish and between species. Baseline information will be collected initially to facilitate tracking changes in fish distribution and behavior over the long term in response to various recovery actions including habitat recovery. The study will focus on surveying and trapping fish at various locations within the watershed and estuary. It will also expand spawner surveys to include coho and steelhead. Sampled fish will be identified by species. Salmonids will be sexed, measured for length and sampled for marks, tags and scales. Genetic samples of Chinook will also be collected and processed. The data will be analyzed and reported in annual reports. Project operations will include:

- Operating a mainstem screw trap to determine Chinook, coho and steelhead abundance and migratory movements within the watershed (Apr. – Sep.).
- Surveying the estuary (including the Dungeness intertidal zone and adjacent tideland) with beach seines and traps at a variety of tidal regimes to address all species distribution and life history (Apr. – Sep.).
- Fence trapping Mattriotti and Bear Creeks to determine tributary distribution, abundance and migration patterns of all species (Apr. – Sep.).
- Helping with Chinook and pink (in odd numbered years) spawner surveys in the late summer/early fall (Aug. – Oct.).
- Conducting coho spawner surveys in late fall/early winter (Oct. – Dec.). Determining percent hatchery and wild origin coho on the spawning grounds.
- Conducting steelhead spawner surveys in April and May, as time permits, to determine stock status.
- If time permits, snorkel surveying index areas throughout the system periodically to determine relative species abundance and rearing habitats.

The project has not yet been funded. Project personnel, equipment and supplies along with costs are described in the answer to question # 6.

c. <u>New Hatchery Water Sources:</u>

Several alternatives have been investigated by WDFW to address problems with the hatchery water supply, which is subject to freezing and sedimentation problems. The most recent proposal, included here, has not been reviewed by habitat technical staff. The new intake design will cost approximately $900,000, but it does not include a small building to keep pipes from freezing and no extended boom back hoe for cleaning, adding building and other structures may increase cost to $960,000.

The new intake will provide about 35 cfs of water directly to the hatchery. At the current intake site, sheet pile and concrete will be used to direct water into two pipes each with drum screens. This would allow the hatchery to get water directly instead of sharing an intake with irrigators. The hatchery would be able to take the required amount of water at the new intake and with the drum screens return excess water and fish directly back to the river.

Pacific Rim Geological Technical Inc. resurveyed the hatchery grounds last year after the first couple of wells were dug and very little water was found. They concluded that even if other wells were dug, there would not be enough water. However, there might be enough well water (150 gpm) to do incubation. Thus meeting the HSRG recommendation to find a warmer water source and an alternative to Canyon Creek does not look possible. With that in mind, there are three proposals on the table for Canyon Creek. They are:

1) Vertical Slot Fishway	Approximate cost = $550,000.
2) Alaska Steeppass	Approximate cost = $608,000.
3) River Weir Fishway	Approximate cost = $1.6 million.

Hatchery staff prefers the first option which will allow a withdrawal of up to 8.5 cfs from Canyon Creek.

d. <u>Screening Hatchery Intakes</u>: The WDFW will screen all water intakes to prevent adverse impacts to listed fish (WDFW and PSTT 2004).

e. <u>Adaptive Management of Hatchery Programs</u>: The hatchery management hypotheses and assumptions behind them can be assessed from the results of monitoring and assessment. For example, the recent increases in escapement estimates appear to suggest that the hatchery program has been successful in building up the numbers of returning adults, reducing the risk of extinction. Additional monitoring and assessment is needed now and in the future to better understand the relationship between hatchery and naturally spawned Chinook, between Chinook and other species, and between Chinook and the habitat. The existing and proposed monitoring and assessment programs are designed to address the assumptions underlying the hatchery management hypotheses, including no significant genetic divergence within the naturally spawning population, avoidance of negative impacts by non-Chinook hatchery species, and the eventual redistribution of Chinook throughout its known range within the Dungeness watershed.

The Dungeness Chinook hatchery program can be modified in response to the results of monitoring and assessment (e.g., altered rearing and release strategy, reduced production or termination). The Co-managers are currently working with the HSRG to better understand the meaning and proper design of an "integrated" hatchery program such as that for Dungeness Chinook. An integrated program is defined by its intent to have the natural environment drive the adaptation and fitness of a composite population that spawns both in the hatchery and in the watershed.

New guidelines associated with the concept of an integrated program are being developed to limit the potential effects of hatchery domestication upon the population and in the future may be incorporated in the Dungeness Chinook program. The Co-managers and HSRG will also be developing a review process to follow-up on the HSRG recommendations and, over the long term, incorporate new information (e.g., from monitoring and assessment) into hatchery management decisions. It is the intent of the Co-managers to use the best scientific information available to adaptively manage the Dungeness Chinook hatchery program.

3. <u>Harvest Management</u>

As noted in previous questions, Fisheries Managers at the tribal, state and Federal level have taken specific actions to eliminate directed fisheries and minimize incidental take of Dungeness Chinook and summer chum. Additional resources for enforcement would assist the effort to insure that illegal fishing or incidental take is eliminated that would affect threatened populations.

The Hoko Chinook are presently the indicator stock for the Strait of Juan de Fuca, and monitoring of the Hoko will need to continue as long as that is the case. Fisheries managers will need to evaluate whether the Hoko stock is representative of the Elwha and Dungeness systems. Dungeness Chinook are presently tagged, but not clipped. A coded wire tagging program for the captive broodstock program has been operational for several years, and a CWT component is included in the WDFW comprehensive monitoring proposal under the hatchery management section.

The co-managers in Washington State have expressed strong concerns about existing disproportionately high interception of Puget Sound Chinook salmon by Canadian fisheries and relatively high interceptions by Alaska fisheries, when compared with southern U.S. fisheries. However, opportunity for change in the PST management process is not likely until the annex to the treaty is renewed effective in 2009.

References Cited in the Response to Question D are contained in the list of "Dungeness Watershed Restoration Plans and Activities (1989 to Present) located at the end of Question C.

ATTACHMENTS to Question D:

- Table D-1 Dungeness Restoration Project List – Supplement for EDT Analysis (April 30, 2005)
- Nearshore Restoration Strategy excerpt from the regional salmon recovery strategy of the North Olympic Peninsula Lead Entity Group

DUNGENESS RESTORATION PROJECT LIST – Supplement for EDT Analysis
June 30, 2004

Introductory Notes:

This list serves as a supplement to the Dungeness Watershed Proposed Project List 2002-2005 which was approved by the Dungeness River Management Team in September, 2002 and is described in "Restoring the Dungeness", (Jamestown S'Klallam Tribe, 2003). The supplement was prepared for use in an Ecosystem Diagnostic Treatment (EDT) analysis of watershed restoration options and the effectiveness of the proposed restoration actions in achieving Chinook recovery goals.

In this supplement, the DRMT project list has been rearranged by river reach, and each project is evaluated for biological importance (based on EDT outputs), likelihood of implementation in the short, medium or long term, steps or barriers needed to achieve implementation, and projected cost estimates.

***EDT categories** are groups of projects rated from A-E with A providing the greatest benefits. **EDT ranks** are generally based on combined scores for productivity, abundance and diversity. Individual projects may rank higher for one particular VSP parameter but have a lower combined rank, thus the combined rank may not be the most important issue in establishing project priorities.*

EDT analysis was run on benefit to Chinook, but the DRMT project list covers all species of salmon. The EDT rankings thus may not appear to be biologically significant for particular projects, but those projects may have significant benefits for other species.

*Proposed studies and hatchery-related projects, which are noted on the DRMT project list, are not included in this supplement as proposed actions, but may be considered steps or barriers to implementation for other actions. **Additionally, the EDT technical work group broke projects into additional components for modeling purposes, thus some of the projects on the supplemental list are NOT contained on the DRMT project list.***

*The **Likelihood of Implementation** factor was rated for the purposes of running EDT restoration scenarios. These ratings were <u>generally</u> based on the following temporal parameters:*

> ***HIGH =** 0-10 years: Actions for which specific plans have already been developed and/or some funding has already been obtained.*
>
> ***MEDIUM** = 10-20 years: These actions are fairly well defined, but In order for them to be implemented, substantial barriers to implementation will need to be addressed and/or major preliminary steps in the project sequence must be completed.*
>
> ***LOW =** 20-50 years: Projects which are needed for restoration and can be achieve in the long term subject to funding and community/agency support, but are not likely to be implemented in the short term.*

THE LIKELIHOOD OF IMPLEMENTATION RATINGS AND THE EDT OUTPUTS HAVE NOT BEEN REVIEWED BY THE DUNGENESS RIVER MANAGEMENT TEAM.** (The final set of EDT outputs was provided to the EDT Work Group on June 28, 2004.) **DISCUSSION BETWEEN THE EDT TECHNICAL WORK GROUP AND THE DRMT IS NEEDED TO EVALUATE THE EDT RESULTS AND CONSIDER POSSIBLE AMENDMENTS TO THE DRMT PROJECT LIST.

RIVER MOUTH TO SCHOOLHOUSE BRIDGE (RM 0 to 1.0): Character and function of the lower Dungeness River and estuary interface are severely altered by dikes and constrictions, resulting in a loss of multiple channels, tidal interchange and the ability of the river to discharge sediment load effectively. This portion of the river is the most constricted portion of the river and is diked on both sides -- a Corps dike on the east side constructed in the 1960's, and a small dike of unconsolidated materials on the west side (Rivers End Road). The Rivers End dike has been repeatedly breached in the past 20 years, with repeated flooding of properties on the west side. Tidal diking during the late 19th century also contributed to the loss of estuarine sloughs at the river mouth. Restoration of this portion of the river has been identified as the highest priority by the DRMT and proposed actions include the purchase of property from willing sellers, and estuarine delta / floodplain reconstruction.

Proposed Action (EDT Model Input #)[a]	**Restoration Strategy (from DRMT list)**	**Sub-actions/Tasks involved**	**Status/ Steps / barriers to implementation**	**Biological Importance (based on EDT output)**[b]	**Likelihood of implementation**[c]			**Cost Estimates**[d]
					High	**Med**	**Low**	
(1A) Estuarine Delta Restoration: *This was treated as one project for EDT modeling*	Purchase of land from willing sellers.	Rivers End Road buyout	Major funding in hand and many purchases have been completed or are in process. There are a few unwilling sellers.	Category B Rank 10 *(Note that this project ranked 3rd for abundance.)*	X			$2,850,000 funding in hand for #1A and #2 combined
	Floodplain reconstruction	Removal of Rivers End dike and building/ septic demolition	Building and septic demolition funding has been obtained. Land purchase must be completed prior to dike removal					$225,000 of funding in hand
	Restoration of Functional Riparian and Riverine Habitat	Revegetation with indigenous species	Funding acquired					$270,000 funding in hand
(1B) Schoolhouse Bridge Modification	Restoration of Functional Riparian and Riverine Habitat	Lengthen Schoolhouse Bridge 300 feet to the west. *This project was added by the EDT work group for modeling.*	Project is closely linked to lower river floodplain restoration upstream. Engineering of possible bridge lengthening and/or dike setback has not been completed.	Category C Rank 17		X		No estimate available

[a] This number corresponds to the EDT action number input in the EDT model runs, and does not reflect the output rank or category. See EDT results for more information.
[b] This category represents the EDT category from A to E with A being the highest benefit. The rank is the combined rank for abundance, productivity and diversity. Projects may score higher on one of these factors, but have a lower combined rank.
[c] This factor is shown as it was rated by the Dungeness River Restoration Work Group for EDT analysis. Discussion and review of these ratings with the Dungeness River Management Team has not yet occurred.
[d] See basis for cost estimates in the Response to Question E. These estimates are highly preliminary and have not been reviewed by DRMT/DRRWG.

SCHOOLHOUSE BRIDGE TO WOODCOCK ROAD/HURD CREEK (RM 1 to 3.5): Constrictions in this reach include the Corps dike on the east side and an access road on the Beebe property to the west. The inability of the River to discharge sediment load has resulting in bedload aggradation, and increased flood hazard. Side channels, meanders, appropriate substrate and large woody debris are mostly non-existent. Restoration strategies focus largely on the setback of the Corps dike along the east side of this reach.

Proposed Action (EDT Model Input #)	**Restoration Strategy (from DRMT list)**	**Sub-actions/Tasks involved**	**Status/ Steps / barriers to implementation**	**Biological Importance (based on EDT output)**	**Likelihood of implementation**			**Cost Estimates**
					High	**Med**	**Low**	
(2) Lower River Floodplain Restoration *This was combined and modeled as one project in EDT analysis by the work group.*	Purchase of land or easements: Priorities are specified in "Recommended Land Protection Strategies for the Dungeness Riparian Area" – (Hals, et. al., 2003)	Purchase property for Corps Dike setback – east side upstream of Schoolhouse Bridge	Some land already purchased. Some sellers may not be willing until alternatives are identified by Corps.	Category A Rank 2	X			See Project #(1A) above; funded by WDFW
		Beebe area (west side)	Property owner will need to agree to purchase of property or easement.					$525,000
		South end of Corps dike to Woodcock Road (Hurd Creek area)	Some property already in stewardship agreements. Will need to acquire property from a few small owners					$180,000
	Restoration of lower river floodplain	Corps dike setback – east side upstream of Schoolhouse Bridge	Corps Analysis of dike setback options and community outreach will be required. Funding needed					$7,250,000 (excluding purchase of property)
		Setback of Beebe dike and revegetation	Purchase of property or easement required.					$2,000,000
	Large Woody Debris Placement	Engineered log jams (ELJ's) placed opportunistically	Setback may be needed prior to implementation at several locations.					$1,275,000 (for 15 ELJ's)

(2A) Lower River Floodplain Restoration	Same Strategy as Proposed Action (2), but without considering Beebe dike setback (nor the tasks associated with it)	Same as Proposed Action (2) items that deal with ACOE dike setback (not Beebe dike)	Same as Proposed Action (2) items that deal with ACOE dike setback (not Beebe dike)	Category A Rank 3 *Ranked separately, but actually an alternative project to the previous one.*		X		See Project #(2) above
(3) Setback Ward Road	Restoration of lower river floodplain	Setback Ward Road and construct engineered log jams	Purchase of property required. Engineering.	Category D Rank 23		X		ELJ cost is included in Project #(2) above; No estimate for setback
(4) Restoration of Functional Riparian and Riverine Habitat	Restoration of Functional Riparian and Riverine Habitat	Restoration of tributary systems in this reach (Matriotti) through vegetative riparian buffers. *Hurd Creek was not included in model input because none of the model trajectories run through Hurd Creek.*	Some projects already have been implemented.	Category E Rank 27 *This project received a low combined rank in EDT because it was modeled for Chinook.*	X			Estimated $7,500/acre x 20 acre/yr x 3 yr = $450,000

WOODCOCK ROAD/HURD CREEK TO HWY 101 (RM 3.5 – 6.4): This reach is characterized by a mixture of large and small riparian parcels, primarily in private ownership. Floodplain conditions are generally good through this reach, particularly on a few large parcels that have fairly mature riparian vegetation and side channel habitat, thus protection of existing habitat features is a high priority for this portion of the river. Constrictions occur at the 3 bridges in this reach and a few small-scale dikes. The 1997 report, "Recommended Restoration Projects for the Dungeness River" indicated the need for LWD throughout the reach to improve channel diversity and avoid further erosion from streambank development.								
Proposed Action (EDT Model Input #)	**Restoration Strategy (from DRMT list)**	**Sub-actions/Tasks involved**	**Status/ Steps / barriers to implementation**	**Biological Importance (based on EDT output)**	**Likelihood of implementation**			**Cost Estimates**
					High	**Med**	**Low**	
(5) Riparian Corridor Restoration to Hwy 101 (including habitat protection and passive restoration)	Purchase of land or easements: Priorities are specified in "Recommended Land Protection Strategies for the Dungeness Riparian Area" – (Hals, et. al., 2003)	Severson Property	Major funding in hand. Property owner recently deceased and purchase discussions will continue with heirs.	Category B Rank 9	X			$3.975 million funding in hand
		Purchase of property or easements on other small parcels	Some parcels and easements already purchased.					$600,000
(6) Large Woody Debris Placement to Hwy 101	Large woody debris placement	Large scale LWD project between 101 and Old Olympic Hwy	Preliminary engineering plans prepared, funding application submitted	Category C Rank 15	X			$920,000
		Engineered log jams placed opportunistically throughout reach	Liability constraints prohibit placement at many locations. Lack of funding and willing sponsors inhibit short term implementation.					$680,000 (for 8 ELJ's)
(7) Floodplain Restoration/ Constriction Abatement	Floodplain restoration/ constriction abatement	Alter present bridge and dike configuration at site of Railroad Bridge	Analysis of options for altering present bridge and dike configuration will need to occur	Category D Rank 25		X		No estimate available

HWY 101 TO POWER LINES (RM 6.4 – 8.8): Habitat conditions are poor throughout the reach with the exception of the highly productive Dawley Side Channel located just upstream of Highway 101 on the east side. Ownership is largely comprised of numerous small private parcels, and extensive bank alteration and gravel removal operations have occurred throughout. A large dike protecting the Dungeness Meadows development on the east side has substantially removed habitat diversity. The river bed is highly unstable both horizontally and vertically; vegetative cover and LWD are poor. Three irrigation outtakes are located in this area and the structure and maintenance of these facilities has contributed to channel instability and habitat loss.

Proposed Action (EDT Model Input #)	**Restoration Strategy (from DRMT list)**	**Sub-actions/Tasks involved**	**Status/ Steps / barriers to implementation**	**Biological Importance (based on EDT output)**	**Likelihood of implementation**			**Cost Estimates**
					High	**Med**	**Low**	
(8) Riparian Corridor Protection to powerlines	Purchase of land or easements: Priorities are specified in "Recommended Land Protection Strategies for the Dungeness Riparian Area" – (Hals, et. al., 2003)	Dawley Side Channel (identified in field studies as major juv. Chinook habitat area)	Major funding in hand.	Category E Rank 28		X		$200,000 needed (in addition to funding in hand)
		Spring Creek area	Parcels not presently developed are recommended for purchase or easement					$675,000
		West bank throughout reach	Scattered parcels recommended for easements					$500,000
(9) Bridge Modification 101	Floodplain restoration/ constriction abatement	101 Bridge lengthening *(This project was added by the work group for EDT modeling)*	No plan to alter at present time since highway infrastructure is relatively new there.	Category D Rank 19			X	NA
(10) Dungeness Meadows Restoration and Protection		Removal of lower portion of Dungeness Meadows dike and purchase of affected properties from willing sellers *(This project was added by the work group for EDT modeling)*	Removal of entire dike is not considered due to extensive development. Removal of lower portion will require property purchase, outreach, engineering and construction.	Category B Rank 11		X		$1,730,000

(11A) Large Woody Debris Placement to Dungeness Meadows dike	Large woody debris placement	Engineered log jams have been placed throughout reach. More are recommended up to Dungeness Meadows Dike.	Lack of funding and willing sponsors. Liability issues are a major obstacle in this reach.	Category B Rank 14		X		$340,000 (for 4 ELJ's)
(12) Elimination of Independent Outtake and Other Outtake Modifications	Irrigation infrastructure changes[e]	CIDMP recommends elimination of the Independent outtake and changes at other outtake sites	Funding needed. Final approval of CIDMP and environmental review will be required.	Category E Rank 29		X		Estimates through CIDMP

[e] Modifications to irrigation outtakes received zero scores because they have little relationship to increasing Chinook VSP parameters. However, these scores do not reflect the potential harm to Chinook redds from continuing operation and maintenance of the outtakes in their present configuration. This issue is discussed at some length in the draft Comprehensive Irrigation District Management Plan. Also note that all modifications to the irrigation system have been rated medium (implementation within 20 years) because of the timeline in the CIDMP, but may be implemented much sooner if funding permits.

POWER LINES TO CANYON CREEK (RM 8.8 - 10.8): Some channel meander occurs through this reach, but several homes on individual parcels are located within the historic and geological floodplain, and bank alteration and armoring has resulted. Flooding has damaged, removed, or threatened homes in the Haller Dike/ May Road area as well as Kincade Island. The US BOR indicates that a channel avulsion of the mainstem Dungeness into Kincade Creek is likely. Ownership is comprised of numerous small private parcels, a large landholding by the Washington DNR on the east bank, and the WDFW hatchery facilities. The river bed is unstable and substantial downcutting has occurred. Two irrigation outtakes are located in this area and the structure and maintenance of these facilities has contributed to channel instability and habitat loss.

Proposed Action (EDT Model Input #)	Restoration Strategy (from DRMT list)	Sub-actions/Tasks involved	Status/ Steps / barriers to implementation	Biological Importance (based on EDT output)	Likelihood of implementation			Cost Estimates
					High	Med	Low	
(13) Riparian Corridor Protection to Canyon Creek (including protection and restoration)	Purchase of land or easements: Priorities are specified in "Recommended Land Protection Strategies for the Dungeness Riparian Area" – (Hals, et. al., 2003)	Purchase of scattered individual parcels or easements identified for prevention of further development in flood plain.	Funding needed, and willing landowners.	Category B Rank 8		X		$300,000
(14) Kinkade Island Floodplain Restoration		Buyout of Kincade Island to eliminate flood hazard and allow formation of side channel habitat, and dike removal	Funding needed and willing landowners.	Category B Rank 4		X		$1,300,000
(15a) Buyout and Removal of Upper Haller Dike	Floodplain restoration/ constriction abatement	Buyout and removal of Upper Haller Dike and revegetate	Funding needed and willing landowners. Major liability issues to consider.	Category B Rank 6	X			Property purchase: $200,000; Dike removal: $500,000
(15b) Buyout and Removal of Lower Haller Dike		Buyout and removal of Lower Haller Dike and revegetate	Funding needed and willing landowners. Major liability issues to consider.	Category B Rank 11			X	$1.5 million

(16) Removal or Setback of Bank Armoring on Scattered Parcels (Robinson Dike Removal)		Removal or setback of bank armoring on scattered parcels (Robinson Dike Removal)	Funding needed and willing landowners	Category B Rank 7		X		$2.5 million
(17) Relocation of Hatchery Infrastructure (*project was added by the work group for modeling)*	Floodplain restoration/ constriction abatement	Relocation of hatchery infrastructure away from floodplain (overall effect = more stable channel)	No specific plans or funding developed.	Category C Rank 16		X		No estimates available
(18) Large Woody Debris Placement	Large woody debris placement to Canyon Creek	Engineered log jams have been suggested throughout reach (up to Canyon Creek).	Liability constraints prohibit placement at many locations. Lack of funding and willing sponsors,	Category D Rank 20		X		$100,000 engineering analysis needed for DM Dike to Canyon Ck reach
(19) Modification of Outtake Facilities and Screens	Irrigation infrastructure changes	CIDMP recommends changes of outtake facilities and screens.	Funding needed. Final approval of CIDMP and environmental review.	Category E Rank 29	X			Estimates through CIDMP
(20) Removal or modification of Canyon Creek Dam *(This project was removed from EDT modeling as it is not considered to be a benefit to Chinook.)*	Barrier Removal	Removal or modification of Canyon Creek dam.	Hatchery studies have not identified alternative water source. Additional discussions needed to develop plan for a fishway or alternative configuration.	NA		NA		See discussion in hatchery section of response.

ACTIONS AFFECTING ENTIRE RIVER BELOW CANYON CREEK: (below RM 10.8): The Dungeness River below Canyon Creek is primarily in private ownership of small parcels with varying levels of development. The "Recommended Land Protection Strategies for the Dungeness Riparian Area" and the DRMT project list include recommendations for revegetation throughout this portion of the River. Additionally, the River is subject to water withdrawals below this point for irrigation, impacting instream flows and habitat availability.

Proposed Action (EDT Model Input #)	Restoration Strategy (from DRMT list)	Sub-actions/Tasks involved	Status/ Steps / barriers to implementation	Biological Importance (based on EDT output)	Likelihood of implementation			Cost Estimates
					High	Med	Low	
(21A) Riparian Reforestation	Restoration of Functional Riparian and Riverine Habitat to Hurd Creek	Reforestation of riparian parcels with indigenous conifer & deciduous vegetation	Sporadic reforestation has occurred associated with individual projects. More comprehensive program coupled with riparian stewardship needed.	Category D Rank 26	X			Estimated $7,500/acre x 20 acres = $150,000
21B) Riparian Reforestation	Restoration of Functional Riparian and Riverine Habitat to Highway 101	Reforestation of riparian parcels with indigenous conifer & deciduous vegetation		Category E Rank 31	X			
21C) Riparian Reforestation	Restoration of Functional Riparian and Riverine Habitat to Powerlines	Reforestation of riparian parcels with indigenous conifer & deciduous vegetation		Category D Rank 20	X			
21D) Riparian Reforestation	Restoration of Functional Riparian and Riverine Habitat to Canyon Creek	Reforestation of riparian parcels with indigenous conifer & deciduous veg.		Category D Rank 20	X			
(22) Water Conservation Projects	Dungeness Water Conservation/ Instream Flow Protection	Details in CIDMP.[f]	Funding needed. Final approval of CIDMP by the Services and environmental review will be required.	Category A Rank 1		X[g]		Estimated $20 million for all conservation and infrastructure improvements

[f] Implementation of conservation projects in the CIDMP is expected to reduce withdrawals by 25.5 cfs. Expect to achieve target flows of 100 cfs during the irrigation season approximately 75% of the time in the late summer, but varies by season. (See Ch. 6 Tables in CIDMP)

[g] Al modifications to the irrigation system have been rated medium (implementation within 20 years) because of the timeline in the CIDMP, but may be implemented much sooner if funding permits.

UPPER DUNGENESS WATERSHED (above RM 10.8) FROM CANYON CREEK TO UPPER DUNGENESS AND TRIBUTARIES (excluding Grey Wolf River): Ownership of upper Dungeness watershed is primarily U.S. Forest Service and riparian area is subject to Federal watershed analysis and management. Upper watershed is characterized by steep slopes and large areas of unstable soils. Extensive road-building for previous logging purposes has accelerated sediment input.

Proposed Action (EDT Model Input #)	**Restoration Strategy (from DRMT list)**	**Sub-actions/Tasks involved**	**Status/ Steps / barriers to implementation**	**Biological Importance (based on EDT output)**	**Likelihood of implementation**			**Cost Estimates**
					High	**Med**	**Low**	
(23) Upper Dungeness road decommissioning and stabilization	Sediment Management/ Source Control	Upper Dungeness road decommissioning and stabilization	US Forest Service has complete analysis of several areas and implemented decommissioning projects	Category B Rank 5	X			$615,000 (including monitoring)
(24) Gold Creek Slide Remediation *(This project was removed from EDT modeling consideration per correspondence with the US Forest Service Ranger District)*	Sediment Management/ Source Control	Gold Creek slide remediation	Slide is considered to be a major source of sediment input, but intervention may have additional negative impacts. There are no plans to address the issue at this time.	NA			NA	NA

NEARSHORE AREAS: Loss of nearshore and estuarine habitat from diking, draining, tide-gates and fill has disrupted the foodbase of nearshore aquatic communities and resulted in a loss of rearing area. Four nearshore areas in proximity to the Dungeness River mouth are part of the strategy to restore watershed salmon populations. The DRMT project list does not include other nearshore areas as part of a strategy to protect or improve migration corridors, and a regional effort to address the issue is needed.

Proposed Action (EDT Model Input #)	**Restoration Strategy (from DRMT list)**	**Sub-actions/Tasks involved**	**Status/ Steps / barriers to implementation**	**Biological Importance (based on EDT output)**	**Likelihood of implementation**			**Cost Estimates**
					High	**Med**	**Low**	
(25) Dungeness Bay Water Quality Restoration and Protection	Nearshore Habitat Protection and Restoration	Dungeness Estuary and Bay: Implementation of Dungeness Bay Cleanup Plan. • Removal of structures and septic systems (see Rivers End project) • Farm plans/BMPs • Irrigation tailwater treatment Restoration of eelgrass beds	Dungeness Cleanup Plan has been developed. Funding for full implementation is lacking. Some projects for farm plans and septic remediation have been implemented.	Category C Rank 18	X			Proposal for $900,000 pending
(26) Graysmarsh/ Gierin Creek Restoration		Graysmarsh/Gierin Creek Estuary: Restoration of 100 acres of saltmarsh estuarine habitat and lower Gierin Creek.	Landowner permission needed to explore further restoration potential.	Category D Rank 23		X		No estimate available
(27) Small Estuary Restoration		Small estuaries along several creek mouths including Cooper, Meadowlark and Casselary: Restablish tidal flow and upstream riparian restoration	Landowner permission needed to explore further restoration potential,	Category B Rank 13		X		Feasibility study proposal for $75,000 pending

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Nearshore strategy for the North Olympic Peninsula

Subcommittee contributors: J.Anne Shaffer, Randy Johnson, Ed Bowen, John Cambalik, Josey Paul, Gwen Bridge, Jeff Shellberg, Walt Blendermann, Pat Crain, Cathy Lear, Katie Krueger, Larry Ward, Jennifer Hagen, Martha Hurd, Dee McClanahan, Richard Brocksmith, Steve Todd, Ian Miller, Kevin Long, and NOPLE coordinator Selinda Barkhuis.

Revised April 20, 2005

This strategy addresses nearshore processes of the NOPLE in accordance with the PSNERP Guidance for Protection and Restoration of the Nearshore Ecosystems of Puget Sound. The goal of this strategy is synonymous with the NOPLE goal of 'protect the best, restore the rest'. Key features, processes, and biological elements of the NOPLE nearshore are detailed below. A conceptual model articulates the relationship between each of these elements and their priority considerations to lead to effective ecosystem restoration. This strategy provides criteria to define priority actions for effective nearshore. Individual projects submitted for NOPLE funding consideration will be ranked relative to the criteria provided in the PSNERP document.

<u>Definition of nearshore habitat</u>: The physical features of tidal influence and light penetration delineate nearshore habitat. The nearshore is generally defined as the area that extends from tree line to minus 30 meters (90 feet) Mean Low Low Water (MLLW) and to the upstream limit of tidal influence. Marine riparian vegetation and sediment-supplying eroding bluffs (feeder bluffs) support healthy nearshore habitat and are therefore considered a part of the nearshore environment.

<u>Key features of nearshore of the North Olympic Peninsula</u>. The NOP is extremely variable in its physical and biological nearshore. Physical forming processes of the nearshore vary temporally and seasonally. Habitat composition varies dramatically temporally and spatially. As a result, the North Olympic Peninsula nearshore is composed of extremely diverse habitats. Sediment processes are a dominant feature in the nearshore for both the Strait and the Pacific based on different energy regimes

<u>Defining processes of nearshore of NOPLEG</u>:, Defining processes of the nearshore include: hydrologic processes (both marine and riverine); wind and current driven sediment processes; light, and; water quality. These define the biological and physical components of the NOPLEG nearshore. In general, nearshore morphology is a product of wave and tidal action, marine and fluvial sediment and wood supply, geology, and the influence of creeks and rivers. Eroding bluffs and river systems are important sources of sediment and wood, which are vital materials for creating and maintaining spits and low gradient sandy beaches. However, either a reduction or increase of sediment supply over natural (background) levels can alter nearshore morphology and ecosystem processes.

<u>Key habitats of NOPLEG nearshore</u>: Key habitats of the NOPLEG nearshore include: feeder bluffs, which define large portions of our nearshore area; riparian, intertidal and subtidal zones of river associated estuaries; embayments; sandy shorelines, and; rocky shorelines. Within these, along the Strait, nearshore vegetated habitats are dominant (occur along on average of 60 % of Strait shoreline). Overstory and understory kelp beds are the dominant vegetated habitats along the Strait (40% of shoreline and almost 80 % of all coastal kelp resource), followed by eelgrass beds and tidal estuaries. Along the Outer Coast, kelp habitats are the dominant vegetated habitats. Eelgrass and surfgrass are also present and locally abundant.

Steep beaches, rocky shorelines, eroding bluffs and depositional areas, and frequent kelp beds characterize higher wave energy environments of more exposed nearshore areas of the North Olympic Peninsula. Lower wave energy habitats – tidal marshes, eelgrass beds, expansive tide flats, large estuaries, and sandy beaches – are present in more protected reaches, including in the lee of spits. These lower energy habitats are fairly limited in extent, extremely vulnerable to human impacts, and in many cases have been severely degraded. They are therefore high priorities for protection and restoration. Where low energy nearshore habitat is dependent upon a spit for protection, maintenance of the spit's drift cell sediment supply is of critical importance.

Key nearshore habitat function. There are significant data gaps to understanding habitat function in the nearshore of the Olympic Peninsula. Select nearshore habitats are defined as critical by WAC and federal regulation based on their documented use by juvenile salmonid for migration, smoltification, refuge, and feeding, and juvenile and adult forage fish for migration, refuge, feeding, and spawning. These include marine and estuarine riparian zones, estuarine marsh habitat, documented forage fish spawning areas, and kelp and eelgrass beds. Though not currently in state or federal regulation, feeder bluffs are also deemed by NOPLE to be significant habitat and are therefore considered additionally as priority habitats for potential restoration.

The working assumption for this model is that restoration/protection emphasis should be on the juvenile stages of salmonid development, followed by spawning habitat for prey species (forage fish), and access for returning adults. The working convention within the NOPLE TRG, Elwha-Morse Management Team and Dungeness River Management Team has been that tidally influenced estuaries, including marsh and eelgrass habitats, and their role for nursery grounds for feeding and refuge, are the top priority for fish recovery. Habitats that provide an intact migratory corridor and forage fish spawning are an important- though slightly lower-priority than estuarine/tidal marsh habitats.

Dominant anthropogenic limiting factors for processes and function of significant nearshore habitats
Restoring and protecting processes that both define nearshore habitats and influence their function are NOPLE priorities. Factors limiting nearshore process must be addressed before habitat function may be restored. Priority limiting factors for the nearshore of NOPLE are:
1. Alteration of shorelines (including armoring, filling);
2. Alterations of lower rivers (including diking, channelizing, and tidegates);
3. Alterations of water quality-Non-point, Industrial, and Catastrophic (such as oil-spills);
4. Alterations of natural sediment supply (either increase or decrease) such as increased suspended sediment loads from rivers and reduced supply from feeder bluffs;
5. Overwater and Inwater structures (including docks and piers); and
6. Alterations to freshwater quantity

Geographic element of nearshore. For discussion purposes, NOPLEG nearshore is presented in three general areas (based on general distributions and physical processes): Outer coast (Jefferson County line to Cape Flattery); Western Strait (Cape Flattery to Agate Bay), and Central Strait (Agate Bay to Clallam County line). Proposed assumption: Each of these geographic areas are of the same priority.

Within each of these, dominant anthropogenic limiting factors vary by geographic area, and are listed below (not in priority order).

Geographic area	Priority nearshore process	Priority Limiting factor	Habitats	Priority Actions to Restore Process
Outer Coast: Jefferson County line to Cape Flattery	Lower river hydrodynamics, nearshore sediment processes, tides, currents and wave erosion	Alterations to lower rivers; upland management practices; and in some areas, increased fluvial sediment supply	Lower rivers, tidal estuaries, sandy/gravel beaches, kelp beds, eelgrass and seagrass beds	Restore nearshore sediment processes, including lower river hydrodynamics and the effects on tidal marshes and kelp beds, with prior assessments where necessary.
Western Strait: Cape Flattery to Agate Bay	Nearshore and riverine sediment processes, lower river hydrodynamics, water quality & quantity	Shoreline armoring and alteration; lower river alterations; upland management practices including increased fluvial sediment supply; in and overwater	Lower rivers, tidal estuaries, kelp beds, sand beaches, sand gravel beaches kelp beds, eelgrass beds	Restore nearshore and riverine sediment processes, and water quality, including lower river hydrodynamics, shoreline alterations, and the effects on tidal marshes and kelp beds, with prior assessments where necessary.

		structures		
Central Strait: Agate Bay to Clallam County Line*	Lower river hydrodynamics; nearshore sediment processes, water quality; light	Lower river alterations, shoreline armoring and alterations, in and over water structures; water quality degradation (non-point and point)	Lower rivers, tidal estuaries, kelp beds, sand beaches, sand gravel beaches, cobble beaches, kelp beds, eelgrass beds	Restore nearshore sediment processes, including lower river hydrodynamics, shoreline alterations, and the effects on tidal marshes and kelp beds, with prior assessments where necessary. Restore water quality

Within embayments of the Central Strait, including Port Angeles, Sequim, Dungeness and Discovery Bays, the defining nearshore processes most impacted are sediment processes, water quality, and light. Dominant limiting factors are shoreline armoring and alterations, overwater structures, and non-point and point source water quality degradation.

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Geographic area	Significant Habitat	Habitat Function (species and use)*							Hab limi
		Forage fish	Pink	Sockeye	Chinook	Chum	Coho	Bull trout	
Outer Coast:Jefferson County line to Cape Flattery	Lower rivers and estuaries	unknown	unknown	Unknown. See Makah and USFW	unknown	Unknown	unknown	Unknown Actually, quite a bit of info from Sam Brenkman.	Alte incl arm loss
	Vegetated habitats	unknown	unknown	Unknown	unknown	Unknown	unknown	unknown	Alte incl arm ove stru
	Sand gravel beaches	Some spawning sites documen ted	unknown	Unknown	unknown	Unknown	unknown	unknown	Alte incl arm loss
Western Strait: Cape Flattery to Agate Bay	Lower rivers and estuaries	unknown	unknown	NA	Current, historic but large data gaps	Current but large data gaps	Current, but large data gaps	unknown	Alte incl arm loss
	Vegetated habitats	Some migration documen ted, large data gaps	unknown	NA	unknown	Unknown	unknown	unknown	Alte incl arm fill
	Sand gravel beaches	Some spawning sites documen ted	unknown	NA	unknown	Unknown	unknown	unknown	Alte incl arm loss
Central Strait: Agate Bay to Clallam County Line*	Lower rivers and estuaries	unknown	Unknown [Note: Actually pinks use the Dungeness, Morse and Elwha. Nearshore work by Joe Hiss (USF&WS) for Dungeness Bay	NA	Current & historic	Current & historic	Current & historic	Current & historic	Low alte arm ove stru wat
	Vegetated habitats	Some migration documen ted, large data gaps	unknown	NA	unknown	Unknown	unknown	unknown	Alte incl arm ove stru wat
	Sand gravel beaches	Some spawning sites documen ted	unknown	NA	unknown	Unknown	unknown	unknown	Alte incl arm wat loss

Table 2. Habitat function within the North Olympic Peninsula. *Status of knowledge of use of habitat by species. Functions include migration, feeding, spawning, refuge.

Geographic area	Priority action
Outer coast	Assessments to define habitat function and limiting process is top priority
Central and Western Strait	Assessments to define habitat function and protection and restoration actions are of equal priority
Eastern Strait	Protection and restoration actions of highest priority-assessments of lower priority

Table 3. Summary of key actions by geographic area

Conceptual model for nearshore salmonid recovery strategy of the North Olympic Peninsula

This conceptual model addresses nearshore processes of the North Olympic Peninsula, which encompasses WRIA 20-18). It includes the nearshore of outer coast from the southern Jefferson County line and all of Clallam County shorelines of the outer coast and Strait of Juan de Fuca. It is a technical tool to direct actions for nearshore restoration.

Assumptions of model:

1. The goal of NOPLE's nearshore strategy is to a) protect the most important physical forming processes and functioning nearshore habitats, and; b) restore impaired habitat forming processes and function important for salmonid recovery.
2. The model is constructed using a precautionary approach recognizing that large data gaps exist. The model will be revised as these data gaps are addressed.
3. The three geographic areas listed above are of equal priority for nearshore restoration;
4. Within each of these areas:
    a. Salmonid stocks, including the resources that support them, are of highest priority;
    b. For salmonid stocks, rearing habitat is of higher priority than migration corridors
    c. Critical habitats defined by WAC, federal regulation, as well as riparian zones and feeder bluffs contribute to higher survival of salmonid, and so are highest priority;
    d. Restoring and preserving processes that define these critical nearshore habitats are a highest priority.
5. Restoring historic habitat function is a priority, provided processes that form the habitat are intact, and/or restored by removing limiting factor.
6. Physical Process, Ecological Scale, Temporal Scale, Spatial Scale, Habitat Function and Habitat Type are the six focus elements for restoration that will address linkages necessary for successful species recovery.
7. Restoration success of these six elements is cumulative. Therefore actions that address more of each of these elements have a higher likelihood of success.

Prioritization of nearshore actions: There is an interest to prioritize restoration actions within each of these geographic areas specific to the key limiting elements and restoration goals stated above. Action evaluation is based on restoring and/or protecting processes that define significant nearshore habitat, by addressing a limiting factor impacting, or threatening to impact, a significant nearshore process. Criteria are in four main categories: Physical process, (15) ; Ecological Scale (11 points) ; Temporal Scale (12 points) ; Spatial Scale (10 points). Habitat function and Habitat types are also prioritized, and once ecological, temporal, spatial criteria are met, may be prioritized for a maximum of 10 and 20 points respectively. Criteria for each category follow.

RESTORATION/PROTECTION ACTIONS

There are three gatekeeper criteria, all of which must be incorporated for a proposal to be considered:

1. Addresses nearshore physical habitat forming processes
2. Addresses habitat functions
3. Addresses habitat forming processes and functions using historic conditions as a guide where this information exists

If a restoration or protection actions meets the above criteria the following scoring is applied:

1. Ecological Scale: Maximum of points:
   a. Restores/protects forage fish spawning habitat.
   b. Addresses one or more significant habitats as identified in Table 2 (Habitat Function Table) of the Conceptual Framework.
   c. Eliminates impacts to habitat forming processes and/or habitat function as identified in Table I (Nearshore Habitat Processes) and the Table 2 (Habitat Function Table) of the Conceptual Framework.
   d. Provides meaningful protection/restoration for fish use on a regional scale.
2. Project connectivity: Maximum of points.:
   a. Relates to other process-based restoration/preservation events in the same salmon corridor.
3. Spatial Scale – relative size
   a. Large
   b. Medium
   c. Small
4. Temporal Scale: Maximum of points:
   a. Restore and/or protect a nearshore process, which is long term by nature.
   b. Project does not require a lot of maintenance.
   c. If the project is time sensitive.
5. Habitat prioritization: Maximum of points
   a. P1 = points
   b. P2 = points
   c. P3 = points
   d. P4 = points

Nearshore Habitat Prioritization	
Priority	Habitats*
P-1	• Estuaries associated with the Tier 1 watersheds • Tidal marsh complexes and eel grass meadows contiguous or within 10 miles of P-1 estuaries • Tidal marshes exceeding 10 acres in size • Beaches documented as being significantly used for rearing by recently outmigrating juveniles
P-2	• Estuaries associated with Tier 2 watersheds • All other tidal marsh complexes and eel grass meadows • Kelp forests and low-gradient shorelines within 10 miles of P-1 and P-2 estuaries • Forage fish spawning beaches

P-3	• All other estuaries • Kelp forests and low-gradient shorelines farther than 10 miles from P-1 and P-2 estuaries
P-4	• Naturally unvegetated sub-tidal habitat • High gradient shorelines
*Contributing Processes: physical features (e.g. feeder bluffs, riparian zones) that contribute significantly to the maintenance of nearshore habitat will receive the same priority rating as the habitat it supports.	

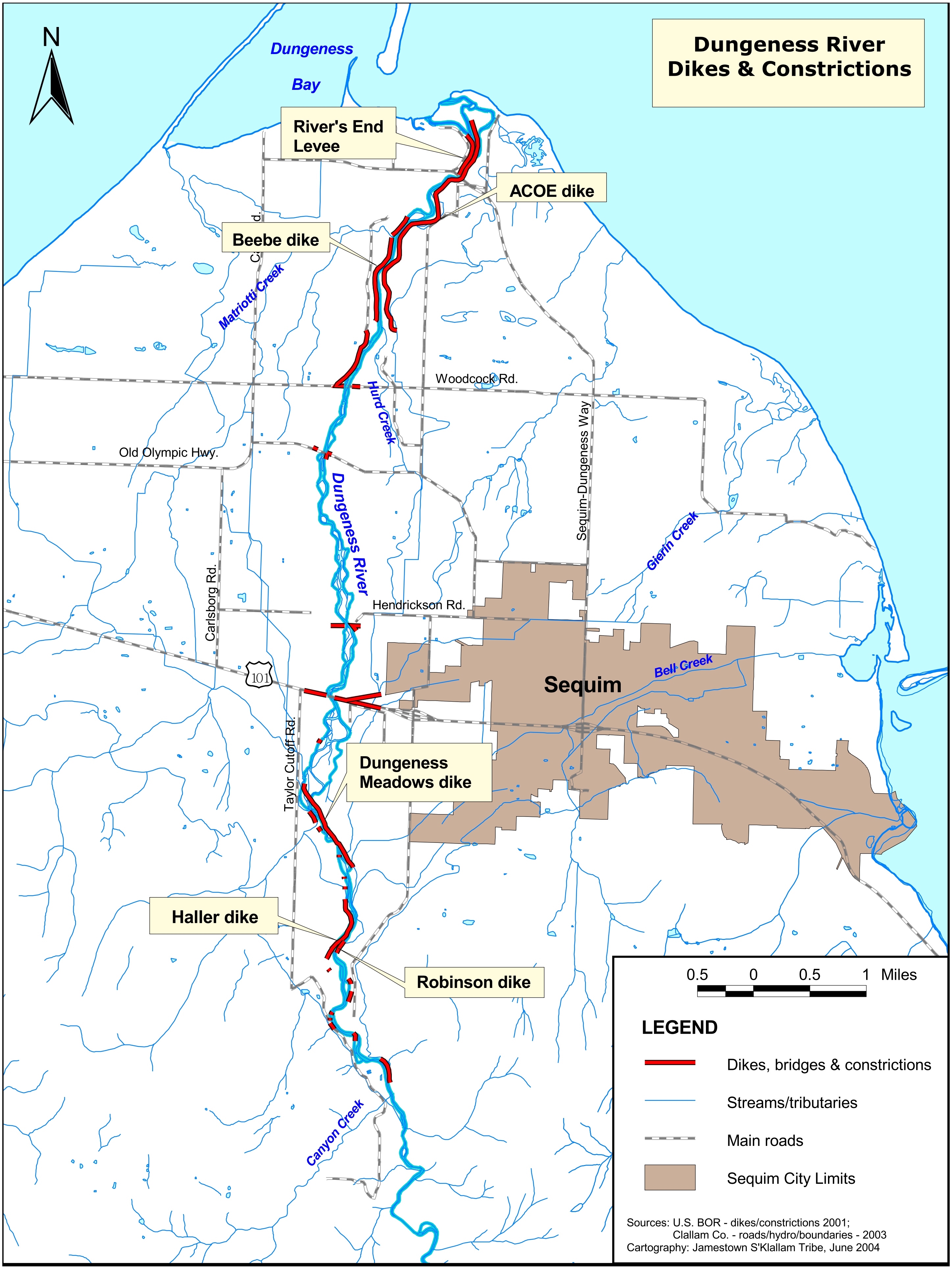
Based on the project scoring a project may be deemed a priority. Successful projects must be designed so that information gained may be incorporated into this strategy on an annual basis.

ASSESSMENT PROJECTS

There are two gatekeeper criteria, either of which must be incorporated for a proposal to be considered: The results

1. must **directly and clearly** lead to identification, siting, or design of habitat protection or restoration projects or
2. fill a data gap that is identified as a priority in a lead entity strategy and is limiting project or strategy development.

If an assessment project meets the above criteria the following scoring is applied:
<To be developed>


Dungeness River
Dikes & Constrictions
N
Dungeness
Bay
River's End
Levee
ACOE dike
Beebe dike
Matriotti Creek
Woodcock Rd.
Hurd Creek
Old Olympic Hwy.
Dungeness River
Sequim-Dungeness Way
Gierin Creek
Carlsborg Rd.
Hendrickson Rd.
101
Sequim
Bell Creek
Taylor Cutoff Rd.
Dungeness
Meadows dike
Haller dike
Robinson dike
Canyon Creek
0.5 0 0.5 1 Miles
LEGEND
Dikes, bridges & constrictions
Streams/tributaries
Main roads
Sequim City Limits
Sources: U.S. BOR - dikes/constrictions 2001;
Clallam Co. - roads/hydro/boundaries - 2003
Cartography: Jamestown S'Klallam Tribe, June 2004

E. What are the preliminary estimates for cost of actions (i.e. projects, acquisition, regulations, incentives, etc.) and ongoing operations in the next 5 to 10 years?

The response to Question D contains a project list supplement (Table D-1) with estimated costs (where available) for restoration projects. The list supplement also indicates "likelihood of implementation" which is generally based on a time frame of 0-10 years for high, 10-20 years for medium, and 20-50 years for low. The cost estimates were obtained by contacting individuals with experience in each project type and applying them to the Dungeness. The River Restoration Work Group has revised cost estimates for habitat restoration project actions since the June 2004 submittal.

In addition to recovery project restoration costs, implementation of Dungeness salmonid recovery will need funds for hatchery modifications, monitoring and scientific studies, planning, project oversight, public education and enforcement. A number of activities, particularly related to monitoring, planning, education and enforcement, are presently operated through the budgets of State and Federal agencies, the Jamestown S'Klallam Tribe, Clallam County, Clallam Conservation District, and volunteer organizations. The present contributions by partner organizations are difficult to estimate, as these costs are embedded in a variety of agency budgets. The ability of the watershed partners to continue or supplement these activities will be affected by Federal and State budget appropriations and initiatives.

Estimated costs for projects and activities that could potentially be implemented in the next 10 years are summarized below. Since the restoration project costs are a short-term subset of the specific project costs contained in the Project List Supplement in Question D (Table D-1), and are organized differently, they will not match in all cases. The 10 year estimate also includes costs for other habitat-related activities, hatchery and harvest items, and public education. As stated above, project action cost estimates have been revised, but should still be considered preliminary.

Summary of Cost Estimates for Dungeness Salmon Recovery in the Next 5-10 Years[*,**]

A. Restoration Projects:	**Needed**	**In-hand**
Land Acquisition	5,530,000	6,825,000
Lower River Restoration (RM 0.0 – O.9) (structure removal and revegetation)		495,000
LWD Placement Construction and Engineering	2,395,000	920,000
Revegetation	670,000	
Constriction Abatement		
Lower River:	18,050,000	
Schoolhouse Bridge - $4,000,000		
Army Corps of Engineers (RM 1.0-2.6) - $7,250,000		
Beebe dike - $2,000,000		
Ward Rd. setback - $4,800,000		
Above Hwy. 101:	4,050,000	
Dungeness Meadows dike (lowest reach) $1,400,000		
Robinson dike - $2,500,000		
Upper Haller dike - $150,000		
Bull Trout Specific Actions	480,000	
Water Quality		900,000
Water Conservation (½ of total 20 year program)	10,000,000	
Sediment Management	615,000	
Nearshore Feasibility Study	75,000	
Subtotal Estimate for 10 years for Restoration Projects:	**$41,865,000**	
B. Other - Habitat Related:		
2 FTE's Land Use Enforcement @ $60,000 x 5 years	600,000	
Habitat Assessment/Monitoring @ $250,000 x 2	500,000	
Public Outreach & Education 1 FTE @ $60,000 x 5 years	300,000	
Subtotal for Other:	**$1,400,000**	
C. Hatchery:		
New Water Supply (also addresses Canyon Creek Barrier)	900,000	
Monitoring (5 years total)	1,230,159	
Subtotal for Hatchery:	**$2,130,159**	
D. Harvest:		
2 Enforcement FTE's @ $60,000 x 5 years	600,000	
Subtotal for Harvest:	**$600,000**	
GRAND TOTAL	**$45,995,159**	

[*] All are unfunded unless noted.
[**] Includes projects rates as high by the DRRWG, **but these ratings and estimates have not been reviewed by the DRMT.**

Notes/ Basis for Cost Estimates:

1. Restoration Projects (by strategy)

a. Purchase of Land and Conservation Easements from Willing Sellers:

Land purchase and easement costs identified in the Project List Supplement are based on assessed value increased to fair market value (generally 150% of assessed, based on experience) with transaction costs (appraisals and closing) added in (Hals, Pers. Comm.).

The cost of purchasing all of the high priority purchase recommendations in the Recommended Land Protection Strategy for the Dungeness River Riparian Area (Hals, et. al., 2003) is estimated at $6.75 million, of which approximately $5.25 million is currently funded. The cost of purchasing conservation easements is difficult to forecast, as these are expected to be highly variable due to the unique nature of each conservation easement and the potential for donations. As a note, the North Olympic Land Trust acquired over 100 acres of Dungeness riparian land in the late 1990's through an $800,000 grant program. For the purposes of salmonid recovery planning we have estimated that the easement value will be approximately $5.5 million.

A total of $6,825,000 of funding from the SRFB, WDFW Coastal Wetlands program, USFWS-HCP program, WDFW-WWRP program and a private foundation is presently in hand and being spent for property and easement purchase in the Dungeness watershed. Most of these funds are focused on the Lower River / Estuarine area, the large intact landholding near Railroad Bridge Park, and some highly productive side channel areas upstream of Highway 101. A map of the lands already protected through outright purchases and easements is included in the response to Question C.

b. Water Conservation and Irrigation Efficiency / Operations

The 1999 Comprehensive Irrigation Water Conservation Plan identified a total of $9 million of high priority improvements to the irrigation system for water efficiency and conservation, with complete construction of all recommended improvements at $20 million. Several high-priority projects have already been implemented, or have funding in hand.

The Comprehensive Irrigation District Management Plan (in progress, 2004 draft) also identifies a number of improvements to the five irrigation outtakes in the Dungeness River which will minimize operational mortality to juvenile salmonids (e.g. modification of fish screens, combining outtakes, changing fish bypass configuration). Proposals for off-channel storage facilities to provide irrigation water during the critical late-season low flow period are also being developed. It is expected that the final CIDMP will provide more detailed and updated cost estimates. For purposes of the supplemental list, the upper figure of the 1999 plan ($20 million) was utilized, recognizing that full implementation will take 20 years. Half of that amount is forecast for the next 10 years.

c. Large Woody Debris Placement

Large woody debris projects were placed in selected locations on the Dungeness mainstem from 1997 to 2000, and an estimated cost of $75,000 for each engineered log jam (ELJ) was incurred by the Jamestown S'Klallam Tribe (Hagen, Pers. Comm.). Since 2000, flooding has greatly increased natural recruitment of log jams.

Technical experts in large woody debris placement were consulted and recommended that efforts be largely concentrated on reach-scale large woody debris projects. A conceptual engineering analysis of the Railroad Bridge area (RM 4.6 to 6.4) was completed in 2002 by Phil Williams and Associates. The analysis led to a funding proposal (funded in 2004 by SRFB and BIA) for $920,000 for the construction of 11 ELJ's including $140,000 for engineering and construction oversight and $60,000 for monitoring. This estimate roughly translates to a cost of $85,000 per ELJ.

Cost estimates in the Supplemental Project List were made by estimating a desired similar density of ELJ placement in other selected reaches where LWD natural recruitment is lacking (Rot, Pers. Comm.), and using a figure of $85,000 per ELJ. However, Rot also indicated that LWD projects in the area between the downstream end of the Dungeness Meadows dike and Canyon Creek would need a separate engineering analysis estimated at $100,000 since this section of the river is extremely unstable and difficult to work in.

d. Sediment Management / Source Control

The USDA Forest Service has implemented a number of road decommissioning and stabilization projects in the last five years in the Upper Dungeness watershed. USFS personnel provided the attached estimate of specific projects ($420,000) (Hagerty, Pers. Comm.) and indicated that another 12 miles of decommissioning is needed in the Gold Creek Crossing (12 miles at $15,000 per mile = $180,000). They also identified the need for $15,000 of monitoring for a combined total of $615,000.

e. Water Quality

Costs of monitoring are presently being carried by the WA Department of Ecology, WA Department of Health, the Jamestown S'Klallam Tribe and Clallam County, as well as volunteers from the Streamkeepers. An extensive water quality monitoring and remediation proposal for $900,000, was funded by the EPA through the Targeted Watershed program. It is estimated that annual monitoring and septic program costs are approximately $75,000.

Additional projects for animal exclusion from tributaries and irrigation ditches, revegetation, and constructed wetlands for tailwater treatment have been implemented for over a decade by the Clallam Conservation District. An estimate of $150,000 per year for 3 years is included in the supplemental list.

f. Restoration of Functional Riparian and Riverine Habitat

The major activity for restoration of functional riparian and riverine habitat is revegetation. Clallam County and the Jamestown S'Klallam Tribe have received grants totaling $270,000 from the USFWS and the SRFB for re-vegetation of the River's End Road area.

Revegetation of tributary systems, such as Matriotti Creek has generally been under the leadership of the Clallam Conservation District. The Conservation District has estimated riparian restoration at an average cost per acre of $7,500 including site preparation, replanting due to mortality, maintenance until vegetation is established, program administration and annual rental (Holtrop, Pers. Comm.)

Hals (Pers. Comm.) estimates that approximately 20 acres of mainstem riparian habitat will need revegetation in the next five years. Although Hals estimated a total cost of $60,000 for this project, it did not include replanting and maintenance, thus the cost per acre provided by the Conservation District has been utilized in the Supplemental project list.

Hals and the River Restoration Work Group (2003) recommended a landowner stewardship program for Dungeness riparian landowners, consisting of qualified technical staff to provide technical assistance one-on-one to landowners to advise on habitat management on their property. Hals (pers.comm.) estimates that this program will cost $70,000 for an initial two-year program.

g. Constriction Abatement

Cost estimates for constriction abatement projects such as dike removal and/or setback, bridge extension, and removal of bank armoring are extremely difficult to make since detailed engineering analysis will be required. Personal communication with the Washington Department of Ecology Flood Management Division (Sokol) indicated that dike removal and setback projects in south Puget Sound have ranged from $200 to $1,000 per linear foot, excluding land acquisition costs. Sokol also indicated that more recent estimates from agency engineers, including the US Army Corps of Engineers, were using a figure of $1,400 per linear foot.

The following estimates were used in the Supplemental Project List and should be considered highly preliminary. Unless otherwise noted, a figure of $500 per linear foot was used for large-scale projects, and $1,000 per linear foot for small-scale projects of 500 feet or less.

Schoolhouse Bridge Lengthening:	$4,000,000
Estimated by Clallam County Roads Department	
Lower River Corps Dike:	
As this will be a Corps project, the high range estimate was used for the setback portion.	
Removal and setback of 2,500 linear feet @ $1,400 =	$3,500,000
Removal of 7,500 linear feet @ $500 =	$3,750,000
	$7,250,000
Beebe Dike:	
Removal and/or setback of 4,000 linear feet @ $500 =	$2,000,000
Ward Rd. setback	$4,800,000
Estimated by Clallam County Roads Department	
Dungeness Meadows Lower dike:	
Removal and/or setback of 2,000 lin. feet @ $500 =	$1,000,000
Purchase of 12 undeveloped parcels @ $15,000 =	$ 180,000
Purchase of 3 houses @ $150,000 =	$ 450,000
Additional project costs	$ 100,000
	$1,730,000
Robinson:	
Removal and/acquisition	$2,500,000
Haller:	
Removal and/setback of 4,000 lin feet @ $500 = (represents east and west portion)	$2,000,000
Easement at 2002 estimate =	$ 200,000
	$2,200,000

Other scattered dike removal projects:	
2,000 linear feet @ $1,000 =	$2,000,000
TOTAL CONSTRICTION ABATEMENT =	$22,480,000

h. Bull Trout Specific Actions

There is a general lack of information on bull trout in the Dungeness River**.** Limited information exits on their abundance and population or their life histories and habitat needs on the Dungeness. The Olympic Peninsula Management Unit Recovery Team has identified expanded studies on bull trout abundance and spawning-site locations as a high priority research and implementation action necessary for recovery (U.S. Fish & Wildlife Service, 2004).

A baseline study to identify key spawning, rearing, and overwintering habitats; migratory patterns; and distribution throughout the basin is essential in order to generate a set of restoration projects that should assist in bull trout recovery. Some tasks for the baseline study would include radio telemetry tracking, snorkel and spawning surveys, and DNA testing to ascertain genetic diversity and similarity within the watershed and adjacent watersheds. In addition, two restoration projects have been proposed for bull trout restoration. One includes the placement of LWD at the East Crossing Campground and a second deals with the removal or modification of the Canyon Creek Dam**.** With the barrier removed, it is likely that bull trout would use Canyon Creek for rearing, overwintering, and foraging (M.McHenry, Per. Com., 2005).

It is estimated that the cost of the baseline study including annual surveys for 10 years would be approximately $350,000 and the cost of the LWD emplacement at East Crossing Campground would be approximately $130,000. Additional information on the Canyon Creek Dam costs is described in the response to Question D and is included in the earlier table (Summary of Cost Estimates for Dungeness Salmon Recovery in the Next 5-10 Years) in part C under the New Water Supply for Hatchery.

2. <u>Other Habitat Related Projects</u>

Clallam County is concerned about their ability to maintain funding levels for existing staff dedicated to enforcement of the Critical Areas Code and other ordinances, and indicated that more staff is needed to meet the workload. The need for 2 FTE positions at $60,000 for the next 5 years was estimated.

A component of the Adaptive Management Plan relies on conducting habitat assessments similar to the 1994 habitat assessment by Orsborne and Ralph to determine changes in quality and quantity of habitat. The cost estimate is $250,000. We have included two assessments to be conducted at approximately 5 year interval

3. Hatchery Management

WDFW has indicated the need for hatchery upgrades and extensive monitoring to meet recommendations of the Hatchery Science Reform Group. These programs are described in the hatchery sections of the response to other questions. Additionally, a spreadsheet of the first year of the WDFW monitoring proposal is attached. Monitoring over the entire five year period is estimated as follows:

Year 1:	282,432
Year 2:	226,532
Year 3:	233,328
Year 4:	240,328
Year 5:	247,538

Total five year cost = $1,230,159

4. Harvest Management

Fisheries managers have indicated the need for two additional fisheries enforcement officers to insure release of threatened species and to conduct emphasis patrols on the river. Two FTE officers at $60,000 for a five year period is $600,000.

Attachments to Question E:

- WDFW monitoring proposal
- USFS road decommissioning spreadsheet

MEMORANDUM
May 24, 2004

TO: Manuel Farinas, Scott Chitwood and Chris Weller

FROM: Bill Freymond

SUBJECT: **Dungeness River Project Proposal – To Meet HSRG Recommendations**

I developed the following project proposal after our discussions last week. This proposal combines juvenile trapping, adult steelhead, coho, pink and chinook spawner surveys, tributary trapping, estuary sampling and snorkel surveys. It addresses the HSRG recommendations to 1) "Initiate a field study to describe the life history patterns of Dungeness chinook, including a description of juvenile and adult life history phases, and their distribution, abundance and migratory movements into, within and out of the river and estuary" and 2) "to evaluate effects of naturally spawning, hatchery-origin coho on stability of chinook and pink salmon redds." The project includes one Fish and Wildlife Biologist 2 for 12 months and 4 Scientific Technician 2's for 10 months (March – December) each.

The Fish and Wildlife Biologist will be the project lead and responsible for supervision, data collection and analysis, sampling schedules and quarterly and annual reports. The project team will:

1. Operate a mainstem screw trap to determine chinook, coho and steelhead abundance and migratory movements within the watershed. (Apr. – Sep.)
2. Survey the estuary (including the Dungeness intertidal zone and adjacent tideland) with beach seines and traps at a variety of tidal regimes to address all species distribution and life history. (Apr. – Sep.)
3. Fence trap Mattriotti and Bear Creeks to determine tributary distribution, abundance and migration patterns of all species. (Apr. – Sep.)
4. Help with chinook and pink (in odd numbered years) spawner surveys in the late summer/early fall (Aug. – Oct.). Conduct coho spawner surveys in late fall/early winter (Oct. – Dec.) Determine percent hatchery and wild origin coho on the spawning grounds.
5. Conduct steelhead spawner surveys in April and May, as time permits, to determine stock status.
6. If time permits, snorkel survey index areas throughout the system periodically to determine relative species abundance and rearing habitats.

First Year Cost

1. Personnel – Salary and Benefits: (see attached spreadsheets)
    a. Biologist 2, Range 48 = $61,870
    b. 4 Scientific Technician 2's = $142,862
2. Goods and Services:
    a. $100 per month per employee = $5,200.
3. Travel:
    a. $300 per month per employee = $15,600.
4. First Year Equipment Costs = $56,900.

Total First Year Cost = $282,432.

Second Year Cost = $226,532
Third Year Cost = $233,328
Fourth Year Cost =$240,328
Fifth Year Cost =$247,538

Total Five Year Cost = $1,230,159

Dungeness River Project Proposal, 6/27/02. - PAGE 2

One-Time Costs/First Year

One mainstem screw trap	$27,500	($25-30,000)
2 Tag Detector Wands	$3,400	
Beach Seine	$1,000	
Boat	$20,000	
2 Snorkel Gear/Dry suits, etc.	$4,000	
Miscellaneous sampling needs	$1,000	
Total	**$56,900**	

Dungeness River Project Proposal, 5/24/04 - To Meet HSRG Recommendations - PAGE 1

ANNUAL COSTS

Fish Biologist 2

	Step K	Goods & Services	Travel	Total
Range 48				
Salary (per month)	$4,216	100 per month	300 per month	
Benefits a/	$940			
Total	**$5,156**	**$100**	**$300**	$5,556

a/	OASI =	0.062	of salary
	Retirement =	0.0177	of salary
	L & I =	$63.16	per month
	Health =	457.39	per month
	Medical Aide =	0.0145	of salary
	Pers. Service =	0.005258	of salary

Fish Biologist 2 for 12 months	**$61,870**	**$1,200**	**$3,600**	$66,670

Scientific Technician 2

	Step K	Goods & Services	Travel	
Range 36				
Salary (per month)	$2,775	100 per month	300 per month	
Benefits a/	$797			
Total	**$3,572**	**$100**	**$300**	$3,972

a/	OASI =	0.062	of salary
	Retirement =	0.0177	of salary
	L & I =	$63.16	per month
	Health =	457.39	per month
	Medical Aide =	0.0145	of salary
	Pers. Service =	0.005258	of salary

4 - Scientific Technician 2's for 10 months	**$142,862**	**$4,000**	**$12,000**	$158,862

TOTAL SALARIES, BENEFITS, G&S and TRAVEL

Fish Bio 2 for 12 mos. and S.T. 2 for 10 mos.	**$204,732**	**$5,200**	**$15,600**	$225,532

GRAND TOTAL **$225,532**

Dungeness River Project Proposal, 5/24/04 - To Meet HSRG Recommendations - PAGE 3

First Year Costs

	Step K	Equipment & Miscellaneous	Total
Fish Bio 2 for 12 mos.and two S.T. 2's for 10 mos.	$225,532	$56,900	**$282,432**

Second Year Costs

	Step K	Equipment & Miscellaneous	Total
Fish Bio 2 for 12 mos.and two S.T. 2's for 10 mos. Note: one-time equipment expense the first year.	$225,532	$1,000	**$226,532**

Third Year Costs

	Step K	Equipment & Miscellaneous	Total
Fish Bio 2 for 12 mos.and two S.T. 2's for 10 mos. Note: Inflation rate of 1.03 used x total	$225,532	$1,000	**$233,328**

Fourth Year Costs

	Total
Note: Inflation rate of 1.03 used x total from third year	**$240,328**

Fifth Year Costs

	Total
Note: Inflation rate of 1.03 used x total from fourth year	**$247,538**

GRAND TOTAL 5 YEARS	**$1,230,159**

ROAD NO	MILES	COST/Mi	CONTRACT COST	TOTAL PROJECT
Stabilization/Upgrade				
2870-000	6	40,000	$240,000	$288,000
2870-120	1.6	1,500	$2,400	$5,400
2800-000	1	1,500	$1,500	$1,800
Decommissioning				
2870-250	1.6	15,000	$24,000	$28,800
2800-120	2.7	15,000	$40,500	$48,600
2875-000	2	10,000	$20,000	$24,000
2875-070	2	10,000	$20,000	$24,000
		TOTAL	**$348,400**	**$420,600**

US FOREST SERVICE ESTIMATES FOR UPPER DUNGENESS

F. What commitments (policy level decisions, funding, etc.) will be necessary for implementation, and what conditions need to be in place for the commitments to be made? Statements of commitment are expected from local decision-makers by June 2005.

1. Habitat Management

County and Tribal staff have identified the need for policy level discussion, decisions and/or actions related to salmon recovery on the following issues during the next 12 months:

a. Land Use:

- Clallam County completed "Toward Recovery" in 2000 as a response to the Endangered Species Act listing and proposed listing of salmonid species in Puget Sound, the Strait of Juan de Fuca and the Pacific Coast (attached to the Question F response). The document was submitted to NMFS and USFWS, and received an oral review. No negative comments were received, other than the need for city and county inter-jurisdictional cooperation. The document outlined current and intended activities related to watershed planning; habitat restoration; municipal, rural, commercial and industrial development; stormwater discharge and other issues in the 4(d) rule. Several recommended actions in the document have been or are being implemented, but need to be updated

- Clallam County is presently involved in an update of the Comprehensive Plan. County officials have indicated that the County is not planning on updating the Critical Areas Code (CAC) during this review. A review of the effectiveness of the CAC in protecting habitat in the Dungeness River corridor has been completed by the Jamestown S'Klallam Tribe and the Dungeness River Restoration Work Group (Hals, et.al. 2004 draft; enclosed in response to Question A), and is presently being reviewed by County planning staff. Hals et al (2004) suggest that changes to the CAC and enforcement of existing code need to occur to protect at risk riparian habitat.

- The EDT model scenarios from June, 2004 assumed a buildout based on current zoning and urban growth boundaries. Any changes to either need to be weighed against salmon recovery and endangered species.

- Clallam County currently implements the protection provisions of the Department of Ecology 1992 Stormwater Management Manual for Western Washington for properties subject to Critical Areas Code jurisdiction. A Draft Stormwater Management Ordinance complying with the 2001 manual has been prepared and approved by the Clallam County

Planning Commission, and in August 2003 was forwarded to the Board of Clallam County Commissioners for further action.

- The County has indicated that they are addressing clearing and grading provisions through the Clallam County Critical Areas Code, rather than adopting a separate clearing and grading ordinance. A clearing and grading ordinance would help prevent clearing, grading, or filling sensitive land prior to obtaining building permits.

- The Jamestown S'Klallam Tribe has completed a number of developments in the Blyn area (Jimmy-come-lately Creek watershed) and acquired several parcels and/or conservation easements for habitat protection and restoration. The Blyn area is a mix of Tribal trust/reservation lands and fee-simple lands under County jurisdiction. The County's build-out estimates for the Blyn area do not presently reflect Tribal plans for development or protection of the Blyn area. The Tribe will need to complete a land use plan for Blyn to improve inter-jurisdictional coordination and protection of the Jimmy-come-lately/Sequim Bay area following the completion of the restoration work now in progress.

- The City of Sequim has not adopted a sensitive species plan, which was identified as a task in the City's 1996 Comprehensive Plan. The urban growth boundary for the City of Sequim presently does not include the Dungeness River, however the proximity of the City boundary and recent large-scale commercial developments near the River highlight the need for the City Council to develop a land use policy reflecting ESA considerations.

- Private lands: Much of the recovery plan for the Dungeness River depends upon the voluntary actions of land owners, either through a willingness to sell property, participate in some form of conservation easement, or to voluntarily limit the use of their land. Securing these agreements can be difficult. Finally, in some cases potential funding sources may be in conflict. For example, certain federal funding has been used to protect agricultural land in the Dungeness Watershed from development. However, these properties are in the historic floodplain, and would be affected by levee setbacks. Although not insurmountable, these types of conflicts in land use objectives and funding sources need to be addressed.

b. Watershed Planning and Management:

- 2514 Planning: A watershed management plan was completed and approved by the Planning Units, consisting of the Dungeness River Management Team and the Elwha-Morse Management Team, for Water

Resource Inventory Area 18 (Elwha - Dungeness) in 2003 (Entrix, Inc., 2003). The initiating governments (Clallam County, City of Port Angeles, Jamestown S'Klallam Tribe, Lower Elwha Klallam Tribe, and Agnew Irrigation District as the largest water purveyor) are proceeding to Phase IV implementation of the plan. Relevant excerpts of the plan are attached. Also see water resource management section below.

- Continuation of the Dungeness River Management Team has consistently been a recommendation of watershed planning processes for the past 15 years. Clallam County and the Jamestown S'Klallam Tribe have provided staff and technical assistance for DRMT operations and are committed to continuation of assistance provided that budget and staff workload allow.

- The DRMT will review the new results of the EDT analysis conducted in the spring of 2004 for a possible update of their prioritized project list and assessment of the recovery goals.

c. Water Quality and Nearshore Habitat:

- Clallam County will continue to oversee the operations of the Marine Resources Committee, subject to re-appropriation of the Northwest Straits Initiative, for regional coordination of nearshore protection and restoration projects.

- Clallam County will continue operation of the Clean Water District and lead the Clean Water Work Group to pursue implementation of the Clean Water Strategy for cleanup of the Dungeness watershed including Dungeness Bay and nearby sensitive estuarine areas, Dungeness River and tributaries, the irrigation system, and the Sequim Bay watershed which is part of WRIA 17.

d. Water Resource Management:

- Water conservation of the Dungeness irrigation system is subject to the existing Trust Water Rights Memorandum of Agreement between the Sequim-Dungeness Agricultural Water Users Association and the Washington Department of Ecology. A Comprehensive Water Conservation Plan has been completed along with an EIS. The Water Users Association is working with the Washington Departments of Agriculture and Ecology, US Fish and Wildlife Service, National Marine Fisheries Service, Jamestown S'Klallam Tribe and others to complete a Comprehensive Irrigation District Management Plan to bring irrigation management in compliance with the Endangered Species Act and Clean Water Act. The CIDMP and implementing agreements are anticipated to be completed within the next 12 months. A key technical and policy decision by the Services and the Water Users will be to determine whether feasible conservation measures will allow adequate instream flows to meet fish recovery goals for the river.

- The WRIA 18 Watershed Management Plan (Entrix, 2003) identifies the potential use of a concept known as "Ground Water Reserves" as a method of preserving in-stream flows. In essence, a limited reserve of groundwater would be established through water conservation measures (both surface water and ground water), which could be utilized for future residential development. Water from the Ground Water Reserve would be drawn from an aquifer not in hydraulic continuity with the Dungeness River. The County faces policy and technical questions associated with the groundwater reserve on the additional work necessary to implement the required conservation measures, the potential size of a reserve, and its effect on development. There may also be details that need to be worked out to avoid any legal obstacles associated with the Ground Water Reserve and to identify the specific aquifer to be used for the reserve. Technical and policy negotiations are scheduled for the summer of 2004.

e. ***Funding Considerations:*** As mentioned in the response to Question D, funding uncertainties act as a barrier to implementation. Governmental agencies are struggling to meet existing levels of planning, monitoring and enforcement. Funding for restoration projects and a more intensive effort toward public education on salmon recovery are directly dependent on the availability of Federal and State funding.

2. Hatchery Management

WDFW is committed to the funding and implementation of the new Chinook hatchery program. Funding for an improved water system, comprehensive monitoring, and other recommendations of the Hatchery Science Review Group is being sought.The co-managers will continue cooperative working relationships for operation of Dungeness hatchery facilities and technical studies. Co-managers will need to incorporate the implementation of HSRG recommendations and results of monitoring into the WDFW and Tribal budget processes to assure that facilities operations continue to contribute to salmon recovery efforts.

3. Harvest Management

As noted in previous questions, co-managers in Washington State are negotiating annual harvest plans to comply with ESA requirements, but have expressed strong concerns about existing disproportionately high interception of Puget Sound Chinook salmon by Canadian fisheries and relatively high interceptions by Alaska fisheries, when compared with southern U.S. fisheries.

Opportunity for change in the PST management process is not likely until the annex to the treaty is renewed effective in 2009.

Toward Recovery

Clallam County Response to the Endangered Species Act Listing of and Proposed Listing of

Salmonids Species in Puget Sound, the Strait of Juan de Fuca and the Pacific Coast

Clallam County
Department of Community Development
P.O. Box 863
Port Angeles, WA
98362

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TOWARD RECOVERY

INTRODUCTION

This report is a compendium of salmon recovery and ecosystem restoration activities and programs that have occurred, are occurring or will occur in Clallam County. The County's activities are based on cooperative efforts with other individuals and agencies involved in salmon habitat recovery. The report is formatted to fit with NMFS' and USFWS' requirements under the Endangered Species Act (ESA). Clallam County had already identified the protection and conservation of salmon and salmon habitat as being a crucial priority. Many measures had been implemented prior to the direct federal involvement with local salmon recovery progress. Therefore, information contained within this report reviews the autonomous efforts of Clallam County and its cooperators to conserve salmon and salmon habitat, but is framed as a response to the ESA. Without a coordinated responseto the Endangered Species Act, the need for ESA-related project by project review salmon recovery actions or programs would slow recovery efforts and progress. Just as importantly, under the citizen suit provisions of the ESA, if the County can not prove compliance with ESA standards, local jurisdictions face substantial liability and compliance costs. Additionally, there is the potential for a substantial loss of local control or input to the salmon recovery process and other activities (such as natural resource use or development) to the federal government as a result of the recent listings.

Particularly, the report addresses both the recent listings of several salmonid species as *threatened* under ESA and the recognized need to maintain currently healthy stocks that are showing significant population declines on the north Olympic Peninsula. The geographic area encompassed should include the known or critical habitats for all of the listed populations, and could include the entirety of Clallam and Jefferson Counties. More specifically, the critical habitats for the listed species include: 1) Hood Canal/Strait of Juan de Fuca summer chum found in portions of Hood Canal and the Strait of Juan de Fuca, including all major tributaries to the west of Dungeness Spit, 2) Puget Sound chinook found in the Elwha and Dungeness Rivers, as well as the Strait of Juan de Fuca to the west end of Freshwater Bay, 3) Lake Ozette sockeye found in the Lake Ozette Basin, and 4) bull trout currently known to exist in the Hoh, Elwha, and Dungeness Rivers, as well as in Morse Creek.

In addition to being a response to the ESA, this document serves as a starting point for local, regional, and state-level discussions on identifying actions and activities that are appropriate and necessary to: 1) meet the requirements and goals of the ESA, and 2) conserve existing healthy salmon populations in the future. Consequently, the scope of this report focuses on explaining current ongoing and future activities as they relate to the National Marine Fisheries Service's (NMFS), the federal agency responsible for management of salmon listed under the ESA (See *Background* section of this report for further information on the 4(d) Rule). This document also seeks to make current information available to both field specialists and the general public.

Portions of this text highlighted in gray are excerpts from recent proposed rules published in the *Federal Register*. The *Federal Register* is a publication of the Government Printing Office, which, as a component of the federal rule-making process, publishes the federal government's interpretation of the laws passed by Congress.

BACKGROUND

ESA Purpose and Scope

In May of 1999, NMFS, under the ESA, listed six species of salmonids as *threatened*, three of which are found in various locations across the North Olympic Peninsula. These three species are Hood Canal/Strait of Juan de Fuca summer-run chum salmon, Puget Sound chinook, and Lake Ozette sockeye salmon. Then, in June of 1999, the US Fish and Wildlife Service listed the Puget Sound/Coastal populations of bull trout as threatened.

The purposes of the ESA are:

> "… [T]o provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve these purposes."

In other words, the ESA's purposes are not limited to listing of endangered or threatened species, but also are required to include the conservation of species and their habitats.

Section 4(d) of the ESA and "Take Prohibitions"

Section 4(d) of the ESA specifically provides that regulations shall be issued to provide for the conservation of a species listed as *threatened.* These regulations may include any or all of the orders to stop taking an endangered species. The application of these regulations is automatic under Section 9(a) of the ESA, known as "take prohibitions":

> "Whether take prohibitions or new regulations are necessary is in large part dependent on the biological status of the species and potential impacts of various activities on the species…NMFS concludes that threatened chinook, chum, and sockeye salmon are at risk of extinction primarily because their populations have been reduced by human "take." West Coast populations of these salmonids have been depleted by take resulting from harvest, past and ongoing destruction of freshwater and estuarine habitats, poor hatchery practices, hydropower development, and other causes" (65 *Federal Register* 170 January 3, 2000).

NMFS has procedures for enforcement of these rules, specific to each species. These draft 4(d) rules were published on January 3, 2000. Final rules were published on July 21, 2000 and will take effect on January 8, 2001. The US Fish and Wildlife Service (USFWS) automatically applies the "take prohibitions" from section 9(a) at the time a species is listed as threatened. Therefore, areas of Clallam County are already subject to the permitting regulations under ESA.

The listing of local salmonids as threatened has prompted states, counties, tribes and others to request NMFS to: 1) clarify and provide guidance on what activities may adversely affect salmon, including how to avoid or limit those effects, and 2) apply take prohibitions only where programs or efforts are not able to conserve threatened salmonids. As a result, NMFS has issued a proposal for "limits on take prohibitions" under a 4(d) rule.

Proposal for "Limits on Take Prohibitions"

Under this proposal, cities, counties, state and tribal governments, and other organizations would be assured that the programs and activities they either conduct or permit are consistent with ESA requirements to avoid or minimize impacts to threatened salmonids. If those programs and activities sufficiently protected and conserved listed salmonids, additional rules to stop the taking of salmonids would be unnecessary. NMFS would then be able to focus its enforcement efforts on activities and programs that had not yet provided adequate species protection and conservation.

USFWS has published a similar, but not identical, proposal for bull trout, which would allow the preparation of Conservation Enhancement Plans by government or other organizations. If these plans were approved by USFWS, that agency would grant similar protections from liability under the ESA for bull trout. The more detailed proposal by NMFS allowed for 13 different "limits on take" within the 4(d) rule. These limits were for the following types of activities:

(1) activities conducted in accord with ESA incidental take authorization;
(2) ongoing scientific research activities, for a period of 6 months;

(3) emergency actions related to injured, stranded, or dead salmonids;
(4) fishery management activities;
(5) hatchery and genetic management programs;
(6) activities in compliance with joint tribal/state plans developed within *United States v. Washington or United States v. Oregon;*
(7) scientific research activities permitted or conducted by the states;
(8) state, local, and private habitat restoration activities;
(9) properly screened water diversion devices;
(10) road maintenance activities in Oregon;
(11) certain park maintenance activities in the City of Portland, Oregon;
(12) certain development activities within urban areas; and
(13) forest management activities within the state of Washington.

Detailed standards for meeting the requirements of the "limits" were provided for *some* of the 13 activities in the proposed rule. For example, in (1) above, some of the limits allowed for continued actual fulfillment of Habitat Conservation Plans, such as the DNR HCP. Other activities, such as (6), were clearly outside the scope of local governments or individual tribes. The final rule deleted (8) and re-titled it "(12)" to MRCI development.

Approval Process:

Both NMFS' and USFWS' proposed regulations would be approved by the Regional Administrator of the Agency, which would provide liability protection of local jurisdictions under ESA. The NMFS draft 4(d) rule goes into greater detail of the approval process, which is essentially a federal rulemaking process involving five steps:

(1) Submission of the proposal to NMFS.
(2) Initial approval by the Regional Administrator.
(3) Publication in the *Federal Register* of the proposal and supporting documents.
(4) Allowance of 30 days for public comment.
(5) Approval or disapproval of the proposal by the Regional Administrator, based on comments received from the public.

Local Efforts to Respond to NMFS "Limits on Take"

Both Clallam County and the State of Washington commented on the NMFS draft rule. Specifically, both governments addressed the approval process for such proposals and requested that the formal adoption process be modified to allow for state approval, with oversight by NMFS. Given the currently small number of examples of Habitat Conservation Plans, NMFS will, most likely, directly review proposals, even if the approval process changes.

Accordingly, this document will be submitted to NMFS, USFWS, and the Governor's Salmon Recovery Office after completion of an initial review by local governments and organizations. Even upon completion, this report will be a starting point for discussion of the relative merits of the salmon recovery efforts, as well as for discussion of the process used for "Watershed Conservation Planning." Undoubtedly, it will continue to change as the process unfolds.

This document describes County efforts at responding locally to 3 of the "limits": (8), (10), and (12). Those sections are entitled "Watershed Conservation Planning, "Road Maintenance," and "Municipal, Rural, Commercial and Industrial Development," respectively. The "Watershed Conservation Planning" section is structured to consider the broader goals of a Conservation Enhancement Plan, which USFWS is considering for its "special rule," and to meet the goal of ESA: "…[T]o provide a means whereby the ecosystem upon which endangered species and threatened species depend may be conserved."

In the remainder of this report, each of the three above named sections includes the excerpt from the 4(d) rule to which the County has responded or plans to respond. Following these excerpts, tables identify the currently ongoing and future conservation measures that represent the County's efforts to maintain and restore the habitats of threatened salmonids.

ONGOING AND FUTURE CONSERVATION MEASURES

Watershed Conservation Planning

Since the initial drafting of this document, NMFS has removed the following excerpt from their draft 4(d) rule, leaving it up to state governments to set watershed conservation guidelines. However, it is likely that this framework will be used by USFWS for their listing of bull trout as threatened. Clallam County will be working with the State of Washington to determine appropriate watershed conservation planning. This section of the draft (4) rule was incorporated into the County's response to the ESA and remains a key component in our ESA response and broader critical salmon recovery and ecosystem restoration goals.

"(8) The prohibitions of paragraph (a) of this section (take prohibitions) relating to threatened species of salmonids…do not apply to habitat restoration activities…provided that:

(i) The states of Washington or Oregon certify to NMFS in writing the activity is part of a watershed conservation plan, where:

(A) NMFS has certified to the State in writing that the State's watershed conservation plan guidelines meet the following standards. Guidelines must result in plans that:

(1) Consider the status of the affected species and populations;
(2) Design and sequence restoration activities based upon information obtained from an overall watershed assessment;
(3) Prioritize restoration activities based on information from watershed assessment;
(4) Evaluate the potential severity of direct, indirect and cumulative impacts on the species and habitat as a result of the activities the plan would allow,
(5) Provide for effective monitoring;

(6) Use best available science and technology of habitat restoration, use adaptive management to incorporate new science and technology into plans as they develop, and where appropriate, provide for project specific review by disciplines such as hydrology or geomorphology;
(7) Assure that any taking resulting from implementation will be incidental;
(8) Require the state, local government, or other responsible entity to monitor, minimize and mitigate the impacts of any such taking to the maximum extent practicable;
(9) Will not result in long-term adverse impacts;
(10) Assure that the safeguards required in watershed conservation plans will be funded and implemented.

(B) The state has made a written finding that the watershed conservation plan, including its provisions for clearing projects with other agencies, is consistent with those state watershed conservation plan guidelines.
(C) NMFS concurs in writing with the state finding."

However, when a species is listed as endangered or threatened, USFWS automatically implements Section 9. The County, then, must respond to both these agencies, which means the County is crafting a response to two separate and differing sections of the ESA. USFWS may create a (4)d rule for bull trout, in a "Notice of Proposed Supplemental Rules," USFWS states:

"…[W]e request specific information and comment from Federal and State agencies, local municipalities and private individuals or organizations on the following:

Habitat Restoration Activities

(1) The types of habitat restoration activities we should address under an amendment to the special rule;
(2) The standards or criteria for habitat restoration activities that must be met in order to be exempted from take prohibitions; and
(3) Comments on the nature and scope of minimal monitoring and reporting programs for habitat restoration activities.

Regulated Activities

(1) The types of regulated activities we should address in an amendment to the special rule;
(2) The standards or criteria for regulated activities that must be met in order to be exempted from the take prohibitions;
(3) The appropriate components of a CEP or similar plan;
(4) Appropriate monitoring and reporting programs for regulated activities; and
(5) Information on how habitat for the bull trout should be identified and how it should be protected or enhanced."

In the County's attempts to satisfy the requirements of both these agencies, it has set forth both its ongoing conservation measures and future conservation measures (see Table 1 below). Components of a Watershed Conservation Plan that would meet both of the above guidelines can be broken down into 3 elements:

(1) Interlocal agreements for coordination of activities across jurisdictions,
(2) Prior, ongoing and future habitat enhancement and recovery activities, and
(3) Cooperative Watershed and Habitat Restoration Planning Efforts.

The second element should be coordinated with ongoing and prior watershed planning efforts, information sources and recovery plans. Ongoing watershed planning should include specific tasks directed toward salmon restoration and should also further the goals of the ESA. Some of the needs listed in Table 1 below can not be accomplished by Clallam County and its cooperators; other governmental units and agencies would have to become involved before Clallam County could satisfy these measures.

Table 1. Interlocal Agreements

Ongoing Conservation Measures	**Future Conservation Measures**
Creation of the North Olympic Peninsula Lead Entity Group (1999).	Need: Improved coordination between Clallam County (or a local regional entity), other jurisdictions in Western Washington, Governor's Salmon Recovery Office, NMFS, and USFWS, which is currently inadequate (2000).
Creation of the WRIA 18 Initiating Governments for Watershed Planning, which consists of the member governments and entities of the Dungeness River Management Team and the Elwha_Morse Management Team (1999).	Need: Lake Ozette Sockeye Steering Committee currently has no dedicated staff or funds. Further, Lake Ozette recovery planning efforts are hampered by lack of political power, bureaucratic recognition and geographic isolation (2000).
Finalizing interlocal agreements for WRIAs 19 and 20 in early 2000.	
Creation of the Lake Ozette Sockeye Steering Committee (1999).	
Marine Resources Committee (1999).	

The information in Table 2 below represents the County's response to the second element in the watershed conservation planning guidelines. These guidelines were intended to meet with both NMFS and USFWS requirements:

Table 2. Habitat Restoration Activities

Ongoing Conservation Measures	Future Conservation Measures
Jobs for the Environmental projects—Meadowbrook Creek (1992), 2700 feet bioengineered bank stabilization, McDonald Creek Restoration (1992), Meadow Brook Restoration (1992), Bell Creek Reconstruction (2200 feet) (1996), Morse Creek Estuary Restoration (1996), Tassel Creek Culvert replacement (1996)	Jimmy Come Lately Creek and Estuary Restoration in cooperation with the Jamestown Tribe, WDFW, WDOT, Wa. Dept. of Ecology, USFWS, EPA, Ducks Unlimited, IAC, Clallam Conservation District, (ongoing)
Other projects—Matriotti Creek Reconstruction (1993), Bell Creek Estuary Restoration (1999), Bogachiel River streambank stabilization/LWD placement (1995&1996).	Dungeness River Dike reconfiguration: Lower River Estuary Restoration, Schoolhouse Bridge Replacement, Corps Dike setback/removal (2002-2005) Canyon Creek Dam Removal and Fish Hatchery Dike Setback (2002). Standardization of protocols and implementation of a region-wide habitat and restoration project monitoring program (2000).
Kincaid Island Dike Removal (1999).	
Burlingame Bridge on the Dungeness (1999).	
Siebert Creek Bridge on Old Olympic (1998).	
LWD jams in the Dungeness and Elwha (1996-2000).	
Trust water rights agreement between agricultural water users and Department of Ecology (1998).	
Water conservation projects in the Irrigation System of the Sequim Dungenesss Valley (1996-present).	
Formation of the Marine Resources Committee implementing the Murray-Metcalf Bill (1999).	
Multiple water quality and habitat restoration projects by the Clallam Conservation District in WRIAs 18 and 19, LWD placement by the Makah Tribe in the Sekiu and Clallam Rivers and the Lake Ozette System, Enhancement projects on Bear Creek by the Quileute Tribe, and numerous projects by the Hoh Tribe in the Hoh drainage.	
Elwha River Ecosystem Restoration (1995-2030).	

Table 3 below shows Clallam County's efforts to satisfy half of the third element in their Watershed Conservation Plan. This third element is "Cooperative Watershed and Habitat Restoration Planning Efforts." Because the County has developed plans and committees, both citizen groups and professional groups, to address each of these efforts individually, our response to each will appear in Table 3 and Table 4.

Table 3. Watershed Planning

Ongoing Conservation Measures	Future Conservation Measures
Sequim Bay Early Action Watershed Plan (1990)	WRIA planning under ESHB 2514 for WRIAs 18 (Dungeness and Elwha), 19 (Lyre-Hoko), and 20 (Sol Duc—Hoh) (1999—2003)
Dungeness River Comprehensive Flood Hazard Management Plan (1990)	Marine Resources Committee (2000-beyond).
Dungeness River Area Watershed Management Plan (1994)	It is expected that entities such as Dungeness River Management Team, Elwha-Morse Management Team, and WRIAs 19 & 20 will be ongoing into the foreseeable future.
Dungeness-Quilcene Plan (1994)	**Need: Funding and commitment to continue watershed management efforts in the North Olympic Peninsula's WRIAs.**
Port Angeles Area Watershed/Comprehensive Plan (1995)	
Marine Resources Committee Planning (1999-future).	
Clallam County Comprehensive Flood Hazard Management Plan (1996).	
Sol Duc Watershed Analysis (1995)	
Dungeness River (USFS Watershed Analysis (1995)	
Sequim-Dungeness Groundwater Protection Strategy 1994	
Several Department of Natural Resource Watershed Analyses (1995-present).	

The second half of the third element of a Watershed Conservation Plan (Habitat Restoration Planning) is outlined in Table 4 below.

Table 4: Habitat Restoration Planning

Ongoing Conservation Measures	Future Conservation Measures
Creation of North Olympic Peninsula Lead Entity Group. Consists of Clallam and Jefferson counties; the Cities of Sequim, Port	Need: Fully integrated (with habitat protection, development, timber harvest, salmon harvest, flood hazard reduction, water

Angeles and Forks; the Jamestown S'Klallam, Makah, Quileute, and Hoh Tribes; and other organizations, such as the North Olympic Salmon Coalition and the Pacific Coast Salmon Coalition.	use, etc) habitat restoration project lists that are prioritized with and across watersheds.
The Lead Entity Group creatd a Technical Review Group and a Technical Advisory Group. These groups review project proposals and have completed the Limiting Factors Analyses for WRIAs 18, 19 and 20.	Salmon and trout life history study.
Dungeness River Restoration Workgroup, formed in 1996, completed Recommended Restoration Projects for the Dungeness River in 1997. This document has been adopted as policy guidance for river management by the Dungeness River Management Team.	1999 Hydrologic Assessment of Sequim Dungeness Area.
JimmyComeLately Workgroup, formed in 1997, is working toward a model restoration project on JimmyComeLately Creek, which will have application across the Hood Canal summer chum ESU.	Status of marine protected areas.
Lake Ozette Steering Committee, comprised of NMFS, Clallam County, Olympic National Park, WDFW, the Makah and Quileute Tribes, and landowners is conducting an analysis of limiting factors within the basin.	

CONCLUSION

The central focus of the above actions and activities is reliance on watershed planning into the future. In order for watershed planning to be successful, both in terms of recovery of salmon populations and responding to the requirements of the ESA, the watershed planning groups must exist well beyond the planning stage into the implementation and evaluation stages. Only in this way will local jurisdictions and organizations take responsibility for actions that occur in their watersheds. Willingness and ability to take responsibility for local actions that effect local citizens leads to fundamentally better, as well as more integrated, decision making with regard to competing natural resource-based land uses. Such actions would include habitat restoration, habitat protection, development, timber harvest, salmon harvest, flood hazard reduction, water use, etc. Over time, this is the only means to retaining a measure of local control of regional natural resources.

Municipal, Rural, Commercial and Industrial Development

The NMFS proposal lists 12 issues that, if satisfied by local governments, will exempt new municipal, rural, commercial and industrial development activities from the ESA Section 4(d) take prohibitions. By satisfying these 12 points, local jurisdictions can demonstrate that they have programs and activities in place, either existing or planned, that protect habitat and populations of threatened salmon. Landowners, potential developers, and the jurisdictions controlling new development will benefit from assurance that their actions, approvals, and maintenance practices are consistent with ESA requirements. They will also be protected from third-party lawsuits that might initiate due to alleged impacts of their activities on threatened species.

This document lists a set of ongoing conservation measures (see Table 5 below) that Clallam County will achieve in order to comply with the ESA, i.e. NMFS' "limit on take prohibitions" and USFWS' 4(d) exceptions. It also establishes long-term conservation measures that Clallam County must implement in order to maintain the exemption and conserve the species and the ecosystems on which they depend. To a large extent, this document relies on existing ordinances and practices; it serves as a summary of conservation standards and measures detailed in any "exemption agreement" to be entered into prior to the effective date of the 4(d) rule, or after reaching agreement with USFWS.

In order to maintain the limit on take, Clallam County will need to conduct the planning and public participation processes necessary to create and implement locally-tailored watershed plans. These plans will establish long-range protections for salmonids in a way that is approved by the community, local jurisdiction, and NMFS. Through watershed conservation planning, participants will discuss the desired future conditions of the watershed and the preservation and restoration efforts needed to achieve those goals.

NMFS's Standard for ESA Compliance

The proposed 4(d) rule states that 12 issues must be adequately addressed before NMFS will certify local ordinances governing new urban development, i.e. local Critical Areas Ordinances, Stormwater Ordinances, etc., as ESA-compliant. NMFS has indicated that such policies are also appropriate for rural development. The following excerpts from the NMFS draft 4(d) rule present these issues for local ordinances:

> "A. NMFS concludes that development governed by ordinances that meet the listed principles will address the potential negative impacts on salmonids associated with new development. In such circumstances, adequate safeguards will be in place that NMFS does not find imposition of additional Federal protections through take prohibitions necessary and advisable for conservation of listed salmonids. The [take] prohibitions…do not apply to urban development activities provided that: Such development occurs pursuant to city or county ordinances that NMFS has agreed in writing are adequately

protective…For NMFS to find ordinances…adequate, they must address the following issues in sufficient detail and in a manner that assures that urban developments will contribute to conserving listed salmonids and will result in development patterns and actions that conserve listed salmonids. Many of these issues are derived from Spence, An Ecosystem Approach to Salmonid Conservation (NMFS, 1996) and citations therein. NMFS recognizes that some of these principles require integrated planning for placement of buildings, transportation or stormwater management and that those 12 principles will have to be applied in the context within which the development is to occur, which will differ among major new developments and for small, single lot developments or redevelopments.

1. Avoid inappropriate areas such as unstable slopes, wetlands, areas of high habitat value, and similarly constrained sites.
2. Avoid stormwater discharge impacts to water quality and quantity or to the hydrograph of the watershed.
3. Require adequate riparian buffers around all perennial and intermittent streams, lakes or wetlands.
4. Avoid stream crossings by roads wherever possible, and where one must be provided, minimize impacts through choice of mode, sizing and placement.
5. Protect historic stream meander patterns and channel migration zones; avoid hardening of stream banks.
6. Protect wetlands and wetlands functions.
7. Preserve the hydrologic capacity of any intermittent or permanent stream to pass peak flows.
8. Landscape to reduce need for watering and application of herbicides, pesticides and fertilizer.
9. Prevent erosion and sediment runoff during construction.
10. Assure that water supply demands for the new development can be met without impacting flow needed for threatened salmonids either directly or through groundwater withdrawals, and that any new water diversions are positioned and screened in a way that prevents injury or death of salmonids.
11. Provide all necessary enforcement, funding, reporting, and implementation mechanisms.
12. The development complies with all other state and Federal environmental or natural resource laws and permits.

B. The city or county…will provide NMFS with annual reports regarding implementation and effectiveness of the ordinances, including any water quality monitoring information the jurisdiction has available, an aerial photo (or some other graphic display) of each urban development or urban expansion area at sufficient detail to demonstrate the width and vegetative condition of riparian setbacks, success of stormwater retention and other techniques; and a summary of any flood damage, maintenance problems, or other issues.

C. Prior to determining that city or county ordinances…are adequate, NMFS will publish notification in the *Federal Register* announcing the availability of the ordinances…for public review and comment. The comment period will be not less than 30 days. If new information indicates the need to modify ordinances…that NMFS has previously found adequate, the city [or] county…will work with NMFS to draft appropriate amendments and NMFS will…determine whether the modified ordinances…are adequate. If at any time NMFS determines that compliance problems or new information shows that the ordinances or guidelines are not achieving desired habitat functions, or where even with the habitat characteristics and functions originally targeted, habitat is not supporting population productivity levels needed to conserve the ESU, NMFS will notify the jurisdiction. If the jurisdiction does not make changes to respond adequately to the new information, NMFS will publish notification in the *Federal Register* announcing its intention to impose take prohibitions on activities associated with that program. Such an announcement will provide for a comment period of not less than 30 days, after which NMFS will make a final determination whether to subject the activities to all ESA section 9 take prohibitions.

D. NMFS approval of ordinances shall be a written approval by NMFS…Regional Administrator.

In addition, USFWS provides the following direction in the announcement of a 'special rule for bull trout' (November 10, 1999):

"We are also considering amending the special rule to exempt other land and water management activities from the take prohibitions of the Act when they are conducted in accordance with enforceable regulations that provide substantial protection for bull trout. Activities considered for coverage under the amended special rule would be non-Federal activities, and would be implemented under locally prepared, Service-approved, Conservation Enhancement Plans (CEPs). Activities that would be exempted under a special rule could involve some level of impact, but would have to fall within an overall framework that would contribute to the conservation of the species… We see an opportunity for State agencies and county and local governments (collectively referred to as the Jurisdictions) to provide substantial protection for bull trout. Jurisdictions could utilize their authorities to implement existing regulations, or promulgate new regulations that comply with the provisions of the Act. The Jurisdictions would enforce those regulations covering a variety of land and water management activities. A few of these existing authorities include growth management acts, shoreline management acts, State environmental policy acts, timber harvest regulations, and instream construction and water discharge permits. The benefit of an amended 4(d) rule to these Jurisdictions is that it provides an expedient process for obtaining generic approval in advance of ongoing and proposed actions requiring compliance with the take prohibitions of the Act. The amended 4(d) rule would provide take coverage and cost savings to thousands of small land owners, and others, who are conducting activities that may take bull trout. Once established, it is anticipated that Jurisdictions could obtain generic Service approval for State and local regulated activities faster than through the section 10(a)(1)(B) process for habitat conservation plans (HCPs)."

Ongoing & Future Conservation Measures

Local governments' current regulations, policies and practices further the efforts to conserve and protect salmon. The "Ongoing Conservation Measures" (see tables) detail Clallam County's effective measures, which can be implemented now under current regulations, policies and/or budget. "Future Conservation Measures" (see tables) may also include activities to which local jurisdictions have committed; these activities, such as watershed planning and habitat recovery efforts, are currently underway

The following tables also include "Future Conservation Measures." Clallam County is committed to pursuing and implementing these activities, based, in part, on ongoing assessment needs. The citizens of this county are strongly committed to the conservation and protection of salmon; thus, we have full faith that future conservation measures will be implemented as predicted by our local government.

The following portion of this document, much of which appears in tables, represents Clallam County's proposed actions. These actions will be effective during the watershed planning process of site-specific watersheds. This section also outlines major future conservation measures that jurisdictions will undertake, and specifically addresses each of the 12 principles of the proposed 4(d) rule as appears earlier in this document.

Issue 1. Avoid inappropriate areas, such as unstable slopes, wetlands, areas of high habitat value and similarly constrained sites.

Table 6 below sets forth efforts the County currently has in effect as regards the use of "inappropriate areas" as defined above, as well as its plan for future efforts.

Table 6. Avoidance of Inappropriate Areas

Ongoing Conservation Measures	Future Conservation Measures
Clallam County Shoreline Master Program (1989)	Update clallam County Shoreline master Program and Shoreline code for conformance with the Critical Areas Code and ESA (2001)
Clallam County Interim Critical Areas Ordinance (1992)	
County-wide Planning Policies (1993)	
Clallam County Comprehensive Plan and sub-area Plans (1995)	
State Wetland Integration Strategy Report (1997)	
Clallam County Shoreline Code Amendment (1997)	
Clallam County Critical Areas Code (1999)	
Critical Areas GIS Mapping and Updates	

(1992, 1995, 1999, 2000	
Dungeness River Greenway Planning (1994) JimmyComeLately Restoration related acquisition	
Jamestown S'Klallam, WDFW, and IAC acquisition projects throughout Jamestown U&A	
Completion of Clallam County acquisition policy (2000)	

Issue 2. Avoid stormwater discharge impacts to water quality and quantity or to the hydrograph of the watershed.

Table 7 below sets forth the County's interim conservation standard with regard to the second principle of the proposed 4(d) rule. Particularly, NMFS has further defined this standard as follows:

"Preserve, or move stream flow patterns (hydrograph) closer to the historic peak flow and other hydrograph characteristics of the watershed. Through a combination of reduction of impervious surfaces, runoff detention, and other techniques development can achieve that purpose within its portion of the watershed. Other development design characteristics, stormwater management practices and buffer requirements will prevent sediment and other pollutants from reaching any watercourse." (NMFS)

Table 7. Stormwater

Interim Conservation Standard	Future Conservation Standard
Adoption of 1992 Washington Department of Ecology Stormwater manual for areas within the jurisdiction affected by Critical Areas Code	Promulgation of clearing and grading code, (2000)
Clallam County Critical areas Code (1999) (Aquatic Habitat Conservation Area and Wetland Buffers, variance requirements to maintain watershed hydrology and stormwater recommendations).	Adoption of County-wide stormwater standards (Assumes State Standards meet NMFS/USFWS requirements) (2001)
WRIA 18, 19, 20 Limiting Factors Analysis describing stormwater effects by stream basin. (1999,2000)	Changes SEPA checklist to minimize stormwater impacts from residential development (2000)
Rural Road Design Standards to minimize impervious surface (1999-2000)	
Prepare Clallam County Erosion Control and	Further integrate Comprehensive Planning

Stormwater Brochure and Standards for small parcels (2000)	with Watershed Planning to minimize stormwater impacts.

Issue 3. Require adequate riparian buffers around all perennial and intermittent streams, lakes, or wetlands.

Table 8 below addresses the third principle of the proposed 4(d) rule as regards "riparian buffers" and Clallam County's efforts to incorporate NMFS standards locally. NMFS has outlined the importance of these buffers and has set probable restrictive needs as follows:

"Because of the intensity of disturbance in surrounding uplands, riparian buffers are at least as critical in urban areas as in rural areas. Without adequately vegetated riparian set-backs, properly functioning conditions including temperature control, bank stability, stream complexity and pollutant filtering cannot be achieved. All existing native vegetation must be retained because of its importance in maintaining bank stability, stream temperature, and other characteristics important to water quality and fish habitat. Prevent destruction of existing native vegetation prior to land use conversions. Where the area contains non-native vegetation, maintained lawn, or is cropped, add or substitute native vegetation within the riparian set-back to achieve a mix of conifer, deciduous trees, understory and ground covers must be planted. To the extent allowed by ownership patterns, the development set-back should be equivalent to greater than one site potential tree height (approximately 200 ft or at least to the break in slope for steep slopes) from the outer edge of the channel migration zone on either side of all perennial and intermittent streams, in order to protect off-channel high flow rearing habitat and allow full stream function. Within that set-back the first 50 ft should be protected from any mechanical entry or disturbance, structures,or utility installations, and should be dominated by mature conifers groundcovers. Disturbances should be minimized." (NMFS), together with some hardwoods and a vigorous, dense understory of native plants. This inner buffer should also be protected from high-impact recreational use and any trails should be of natural, permeable materials. The inner buffer provides multiple values, including root systems for bank stability. The outer 100-plus ft of set-back should be entirely in native vegetation (not in maintained lawn) with a mix of conifer, deciduous trees, understory and groundcovers. Disturbances should be minimized." (NMFS)

Table 8. Riparian Buffers

Ongoing Conservation Measures	Future Conservation Measures
State Wetland Integration Strategy Report (1995)	Integration of Limiting Factors Analysis with Watershed Planning under 2514 (2000-2004)
Clallam County Critical Areas Code (1999) • Class 1 Fish and Wildlife Habitat Conservation Areas (Habitat Management Plan Required within 200' of Critical	Update Clallam County Shoreline master Program and Shoreline Code for conformance with the Critical Areas code and ESA (2001)

habitat for Threatened/Endangered Species) • Restoration of degraded buffers required • Aquatic Habitat Conservation Area Buffers • Wetland Buffers and Wetland Variance Criteria • Geologic Hazard (Channel Migration Hazard, Ravine, Marine Bluff) protection standards, buffers and Variance Criteria.	

Issue 4. Avoid stream crossings by roads wherever possible, and where one must be provided, minimize impacts through choice of mode, sizing and/or placement.

Table 9 below describes County ongoing and future measures as regard "stream crossings," which applies to the fourth principle of the proposed 4(d) rule. NMFS has further defined standards of this principle as follows:

"One method of minimizing stream crossings and disturbances is to optimize transit opportunities to and within newly developing urban areas. Consider whether potential stream crossings can be avoided by access redesign. Where crossings are necessary, minimizing their impacts by preferring bridges over culverts; sizing bridges to a minimum width; designing bridges and culverts to pass at least the 100-year flood and associated debris, and meet with WDFW criteria; assuring regular monitoring and maintenance over the long term; and prohibiting closing over of any intermittent or perennial stream. WDFW's Fish Passage Design at Road Culverts, March 3, 1999 provides an excellent framework for action." (NMFS)

Table 9. Stream Crossings

Ongoing Conservation Measures	Future Conservation Measures
Clallam County Comprehensive Plan and sub-area Plans (1995)	Update Clallam County Shoreline Master Program and Shoreline code for conformance with the Critical Areas Code and ESA (2001)
Clallam County Critical Areas Code (1999) • New road crossings of a typed stream requires a variance from code. • Rural Road Standards (2000-2001)	Hoko-Ozette Road (Johnson Creek).
WRIA 18, 19, 20 Limiting Factors Analysis describing road/culvert effects by stream basin (1999,2000)	
Ongoing infrastructure projects such as the Jimmycomelately Bridge, Burlingame and	

Schoolhouse Bridges on the Dungeness and culvert replacement such as Jamestown Road (Cassalary Creek), Spath road (Mattriotti Creek), Whitcomb-Diimmel Road (Tassel Creek), Nordstrom and Wasankari Roads (Salt Creek), and	

Issue 5. Protect historic stream meander patterns and channel migration zones; avoid hardening of stream banks.

Table 10 below shows the future and ongoing actions of Clallam County to "protect historic stream meander patterns" pertinent to the fifth principle of the proposed 4(d) rule. NMFS has set a minimum standard of development design along streams as follows:

"All development should be designed to allow streams to meander in historic patterns of channel migration. Adequate riparian buffers linked the channel migration zone should avoid need for bank erosion control in all but the most unusual situations. Rip-rap blankets or similar hardening techniques are not allowed, unless bioengineering solutions are impossible because of particular site constraints. Habitat elements such as wood, rock, or other naturally occurring materials must not be removed from streams. WDFW's "Integrated Streambank Protection Guidelines, June, 1998" provides sound guidance, particularly regarding mitigation for gravel recruitment and channel complexity lost through streambank hardening." (NMFS)

Because NMFS failed to mention the importance of nearshore habitat and shorelines protection in the draft 4(d) rule, and because Clallam County has an unusually high proportion of nearshore and shoreline habitats along and within its geographical boundaries, the County chose to address this principle in its own plans, ordinances, and codes. Particularly, the Bank Stabilization standards in the Critical Area Code and the Update of the Shoreline Master Program and Code address marine shorelines. NMFS received numerous comments on this omission from their rule, though, in fairness, the current level of knowledge regarding the management of the nearshore marine environment is limited. More studies are needed regarding management of these areas to conserve salmonid habitat and prey species for salmon.

Table 10. Stream Meander Patterns

Ongoing Conservation Measures	Future Conservation Measures
Clallam County Critical Areas Ordinance (1999) • Channel Meander Hazards • Bank Stabilization Standards	Update Clallam County Shoreline Master Program and Shoreline code for conformance with the Critical Areas Code and ESA (2001)
Update Dungeness River Comprehensive Flood Control Management Plan (2000)	Reconfiguration of Dungeness River Corps Levee (2000-2006)

FCAAP Funded Channel Meander Zone Mapping &Information Project (2000-2001)	
Kincaid Island Dike Removal Project (2000)	
Mapping of hardened marine and Freshwater shorelines in WRIA 18, 19, and 20 Limiting Factors Analysis	

Issue 6. Protect wetlands and wetlands functions.

Table 11 below explains Clallam County's ongoing and future efforts to "protect wetlands" at the standard of the draft 4(d) rule, particularly the rule's sixth principle. NMFS expands on its intent "to protect" as follows:

"Protect wetlands and the vegetation surrounding them to maintain wetland functions. Design around wetlands for their positive habitat, water quality, flood control, and groundwater connection values, providing adequate buffers. Retain all existing natural wetlands." (NMFS)

Table 11. Wetlands

Ongoing Conservation Measures	Future Conservation Measures
State Wetland Integration Strategy Report (1995)	Watershed Planning under ESHB 2514 to maintain hydrology of watersheds (1999-2005)
Clallam County Critical Areas Code (1999) • Landscape and Watershed-based Functional Assessment Unique to Clallam County Wetlands • Restoration of degraded buffers required • Wetland Buffers and Wetland Variance Criteria • Critical Areas GIS Mapping and Updates (1992, 1995, 1999, 2000) • EPA-funded Wetland function Educational Project (2000)	Update clallam County Shoreline Master Program and Shoreline Code for conformance with the Critical Areas Code and ESA (2001)

Issue 7. Preserve the hydrologic capacity of any intermittent or permanent Stream to pass peak flows.

The efforts by Clallam County to "preserve hydrologic capacity" as pertains to the seventh principle of the draft 4(d) rule, are guided by standards and policies contained in Table 12 below. NMFS sets minimum standard requirements for local governments as follows:

"Local ordinances should assure that, at a minimum, the Flood Management Performance Standards of Title 3 of Metro's Urban Growth management Functional Plan are applied to all development in urban expansion areas, together with any other steps needed to protect hydrologic capacity. In combination with the buffer or set-back provisions above, this means that for new, large developments, fill or dredging should never occur unless in conjunction with a necessary stream crossing." (NMFS)

Table 12. Hydrologic Capacity

Ongoing Conservation Measures	Future Conservation Measures
Clallam County Critical Areas Code (1999) • Adoption of 1992 Washington Department of Ecology Stormwater manual for areas affected by Critical Areas Code. • Aquatic Habitat Conservation Area Protection Standards • Geologic Hazard Protection Standards	Creation of clearing and grading code, (2000)
	Adoption of county-wide stormwater standards (2001)
	Cooperation with City of Sequim in Stormwater Planning for Bell Creek Basin (2001-2003)

Issue 8. Landscape to reduce need for watering and application of herbicides, ` pesticides and fertilizer.

Table 13 below shows the County's efforts to comply with the eighth principle of the draft 4(d) rule. NMFS gives limited, but specific, direction on landscape plans, as follows:

"Plans must include techniques local governments will use to encourage planting with native vegetation, reduction of lawn area, and reduced water use. These steps will contribute to water conservation and ultimate reduction of fertilizers, pesticides, herbicides that may contribute to water pollution." (NMFS)

Table 13. Landscape

Ongoing Conservation Measures	Future Conservation Measures
Clallam County Critical Areas Code (1999) • Adoption of 1992 Washington Department of Ecology Stormwater manual for areas affected by Critical Areas code • Buffer Standards for all Critical Areas	Creation of clearing and grading code, (2000)
Prepare Clallam County Erosion control and Stormwater Brochure and Standards for small parcels (2000)	Adoption of county-wide stormwater standards (2001)
	Change SEPA checklist to encourage reduced impervious surfaces, retention/planting of native vegetation (2000)
	Watershed Planning under ESHB 2514 to maintain hydrology of watersheds (1999-2005)

Issue 9. Prevent erosion and sediment runoff during construction.

Clallam County's efforts to "prevent erosion" as specific to the draft 4(d) rule's ninth principle is contained in Table 14 below. NMFS' directives include:

"Prevent discharge of sediments by assuring that at a minimum the requirements of Title 3 of Metro's urban Growth Management Functional Plan are applied in large scale urban developments." (NMFS)

Table 14. Erosion and Sediment

Ongoing Conservation Measures	Future Conservation Measures
Adoption of 1992 Washington Department of Ecology Stormwater manual for areas affected by Critical Areas Code	Promulgation of clearing and grading code, (2000)
Clallam County Critical Areas Code (1999) (Aquatic Habitat conservation Area and Wetland Buffers, variance requirements to maintain watershed hydrology and stormwater recommendation.	Adoption of county-wide stormwater standards (Assumes State Standards meets NMFS/USFWS requirements) (2001)
WRIA 18, 19, 20 Limiting Factors Analysis describing stormwater/sedimentation effects by stream basin. (1999-2000)	Change SEPA checklist to minimize stormwater impacts from residential development (2000)
Rural Road Design Standards to minimize impervious surface (1999-2000)	Complete Forest Practices (conversion) MOU with DNR (2001)
Prepare Clallam County Erosion Control and Stormwater Brochure and Standards for small parcels (2000)	Further integrate Comprehensive Planning with Watershed Planning to minimize stormwater impacts (Ongoing)

Issue 10. Assure that water supply demands for the new development can be met without impacting flow needed for threatened salmonids either directly or through groundwater withdrawals, and that any new water diversions are positioned and screened in a way that prevents injury or death of salmonids.

Clallam County's ongoing and future actions as apply to the tenth principle of the draft 4(d) rule are specified in Table 15. Particularly, the County responds to "water supply demands" through its watershed plans, assessments and projects, as well as through entities that manage specific watersheds within county jurisdiction.

It should be noted that regulation of water withdrawal from ground or surface waters is within the regulatory control of the Washington State Department of Ecology. However, regulation of water *diversions* (for the presence and adequacy of fish screens) is the responsibility of the Washington State Department of Fish and Wildlife. Locally, current watershed planning councils focus on the issue of water conservation and supply in WRIAs 17, 18, 19 and 20. Combined, these WRIAs represent all watersheds contained within Clallam County.

Table 15. Water Supply Demands

Ongoing Conservation Measures	Future Conservation Measures
Sequim Bay Early Action Watershed Plan (1990)	It is expected that entities such as Dungeness River Management team, Elwha-Morse Management Team, and WRIAs 19 & 20 will be ongoing into the foreseeable future.
Dungeness River Area Watershed management Plan (1993)	
Dungeness-Quilcene Plan (1995)	
Sequim,-Dungeness Groundwater Protection Strategy (1994)	
Dungeness River Water Conservation Projects (1996-present)	
Sequim-Dungeness Hydrogeologic Assessment (1995-1999	
WRIA planning under ESHB 2514 for WRIAs 18 (Dungeness and Elwha), 19 (Lyre-Hoko), and 20 (Sol Duc) (1999-2003)	

Issue 11. Provide all necessary enforcement, funding, reporting, and implementation mechanisms.

Table 16 refers to Clallam County's addition of both water quality monitoring measures and personnel to perform those monitoring functions suggested by the eleventh principle of the draft 4(d) rule. NMFS sets general standards in the following excerpts from the rule:

"Identify a commitment to and the responsibility to regularly monitor and maintain detention basins and other management tools over the long term, and to adapt practices as needed based on monitoring results."

"Provide all enforcement, funding, monitoring, reporting, and implementation mechanisms needed to assure that ultimate development will comply with the ordinances."

"The city or county…will provide NMFS with annual reports regarding implementation and effectiveness of the ordinances, including any water quality monitoring information the jurisdiction has available, an aerial photo (or some other graphic display) of each urban development or urban expansion area at sufficient detail to demonstrate the width and vegetative condition of riparian set-backs, success of stormwater retention and other techniques; and a summary of any flood damage, maintenance problems, or other data issues." (NMFS)

Table 16. Enforcement

Ongoing Conservation Measures	Future Conservation Measures
Addition of 2 Code Compliance Officers to Clallam County Department of Community Development (2000)	Formulation of monitoring strategy during watershed planning and habitat restoration processes andin approval of this plan by NMFS, USFWS and the Governor's Salmon Recovery Office (2000-2006)
Clallam County Streamkeepers Program for water quality, habitat and benthic invertebrate monitoring (1997-present	
Watershed plan related water quality monitoring (1991-present)	
Well monitoring database (1997-present)	

Issue 12. The development complies with all other state and Federal [sic] environmental or natural resource laws and permits.

Table 17 shows Clallam County's addition of personnel and management act requirements in fulfillment of the twelfth principle of the draft 4(d) rule. NMFS does not further define the role of local government on this principle.

In fact, the proposed 4(d) rule is contradictory on this point. In the text explaining the rule, this requirement is linked to principle eleven above, and requires a jurisdiction to have the enforcement and tracking ability to ensure development complies with the plan, i.e. this document in its final format. In the text of the proposed rule itself, this requirement is put forth without any explanation of intent, and the scope of the requirement is huge. Because of this lack of specificity, what NMFS expects from this requirement is difficult to interpret. Practically, it is impossible for any jurisdiction to certify to NMFS that any particular development, regardless of scale, meets with "all other state and Federal [sic] environmental or natural resource laws and permits."

Table 17. Development Complicity

Ongoing Conservation Measures	Future Conservation Measures
Addition of 2 Code Compliance Officers to Clallam County Department of Community Development (2000)	Formulation of monitoring strategy during watershed planning and habitat restoration processes and in approval of this plan by NMFS, USFWS and the Governor's Salmon Recovery Office (2000-2006)
GMA requirements for consistency (approved water source) prior to issuanceof building permits (1993)	Better coordination across jurisdictions, especially cities and counties Washington Department of Fish and Wildlife, Washington Department of Ecology, US Army Corps of Engineers, and NMFS and USFWS themselves.

Road Maintenance

The proposed standards in the 4(d) rule fall into three general areas:

1. The setting of regional standards for road maintenance. Washington State Department of Transportation has been in negotiations with NMFS and USFWS in regards to these standards.
2. The scheduling and means of tracking training for road crews to implement these standards.
3. The developing of a "guidebook" for road maintenance that is specific to given road segments, i.e. scheduling the maintenance of ditches at times that would cause the least damage to aquatic resources, culvert maintenance schedules, management restrictions around wetlands adjacent to the road, etc.

The proposed 4(d) rule identifies the road maintenance issues that must be addressed before NMFS will certify such local activities as ESA compliant. The following excerpts from the 4(d) rule present these road maintenance issues:

"A. The take prohibitions…do not apply to road maintenance activities provided that:

1. The activity results from routine road maintenance activity by…county or city employees that complies [sic] with the Oregon Department of Transportation's Maintenance Management System Water Quality and Habitat Guide (June, 1999).
2. Neither pesticide and herbicide spraying not ODOT dust abatement are included within this exception, even if in accord with the state's guidance.
3. Prior to implementing any changes to the 1999 Guide, the ODOT will provide NMFS a copy of the proposed change for review and approval as within this exception.

B. Prior to approving any change in the 1999 Guide, NMFS will publish notification in the Federal Register [sic] announcing the availability of the draft changes for publicreview and comment. Such an announcement will provide for a comment period on the draft changes of not less than 30 days.

C. Any city or a county in Oregon desiring its routine road maintenance activities to be within this exception first enters a memorandum of agreement with NMFS committing to apply the management practices in the guide, detailing how it will assure adequate training, tracking, and reporting, including how it will control and narrow the circumstances in which a practice will not be followed because it is not 'feasible,' 'practical,' or 'possible' and describing in detail any dust abatement practices it requests to be covered.

D. On a regular basis, NMFS will evaluate the effectiveness of the program in protecting and achieving habitat function commensurate with conservation of the listed salmonids. With a full-time staff person at NMFS dedicated to coordination and communication with ODOT staff on a regular basis and participation in monthly and quarterly review meetings, NMFS is assured of regular feedback on how the program is operating. That feedback will provide information on the frequency and nature of any deviations from the practices specified in the Guide….Finally, through annual reporting of external complaints and their outcomes, ODOT will identify needed 'modifications of, or improvements to' any of the minimization/avoidance measures and has committed to making changes to the measures as necessary. Likewise, ODOT will incorporate changes reflecting new scientific information and new techniques and materials. If the program does not achieve its goals, NMFS will identify ways in which the program needs to be altered or strengthened. Changes may be required if the program is not protecting desired habitat functions, or where even with the habitat characteristics and functions originally targeted, habitat not supporting population productivity levels needed to conserve the ESU. If…the ODOT program to no longer provide sufficient protection for threatened salmonids, NMFS shall notify ODOT. If ODOT does not make changes within a mutually determined time period to respond adequately to the new information, NMFS will publish notification in the Federal Register [sic] announcing its intention to impose take prohibitions on activities associated with the program. Such an announcement will provide for a comment period of not less than 30 days, after which NMFS will make a final determination whether to subject the activities to all ESA section 9 take prohibitions.

E. NMFS' approval of city or county programs following the ODOT program, or of any amendments, shall be a written approval by NMFS' Northwest Regional Administrator.

Existing and On-going Conservation Efforts

Clallam County's response to this portion of the draft 4(d) rule is to convene a regional work group (DOT Olympic Region and Clallam, Jefferson, Mason, and Grays Harbor Counties) in June 2000. This group will review and amend the DOT standards for maintenance and will develop a region-wide training and tracking process, which DOT will likely lead.

With its GIS system and geographic framework process, Clallam County will be developing road segment specific maintenance guides, beginning in those areas where listed stocks are most effected. Probably, this process will take several years to complete and will require the commitment of substantial funds. Clallam County is currently seeking funding for a new, more detailed topographic data layer to simplify this task.

Towards Recovery

Salmon, probably more so than most other species , are intimately adapted to both the local freshwater and nearshore environments they inhabit and the larger-scale oceanic environments , that represent a portion of their life-history. Recovery of salmon populations and the ecosystems they inhabit will require large scale and local actions that are as intimately linked to watersheds as the salmon themselves.

On a regional scale, the requirements for salmon recovery and ecosystem restoration are simple : understanding the habitat conditions within our local watersheds; understanding how salmon populations are related to each other and to those habitat conditions; and how actions by individuals and organizations effect those relationships. The northern Olympic Peninsula contains an incredible geographic, biologic, and ecological diversity. The task of salmon recovery on the northern Olympic Peninsula is,therefore, complex, and requires more sustained and coordinated efforts, and presents more unique challenges than similar efforts in other areas of the State. The recent listing of four species that occur on the northern Olympic Peninsula, more listings than in any other area of the State, is a direct reflection of this diversity and complexity. This document cites numerous actions, programs, reports, studies, and recommendations undertaken by the County and its cooperators. A full and complete understanding of the scope of salmon recovery efforts that have taken place and will take place would require that all of these documents be included or attached to this document. The collective size of these documents (besides being a monumental task to a reader) prevents their inclusion in this document. As further understanding is gained, the information and complexity of the "problem" will grow.

A keystone to salmon recovery in Clallam County is the dependence on local watershed management committees to implement salmon recovery programs and actions. It is at this scale that the information gathered is most useful, and feedback is most direct. It is also at this scale that salmon recovery will have the best chance of success. Linking local actions to larger scale actions, including the requirements of the Endangered Species Act, is not the sole responsibility of Clallam County or its cooperators. The federal and state agencies must show willingness to allow flexibility in their own actions, and in actions that are undertaken by local groups. Clallam County hopes that this document is a first step toward recovery, trust and cooperation between all citizens and levels of government.

General Habitat Management Plans and Guidance for Threatened Species of Salmonids in Clallam County

4/11/00

The guidance/recommendations incorporated in this document are subject to change in the future, when additional scientific information becomes available or specific direction is received from the listing agencies (National Marine Fisheries Service (NMFS) or US Fish and Wildlife Service (USFWS)). The need for additional information in the marine shoreline environment is especially acute, as the relationship between certain development activities and habitat quality is poorly understood. Given these uncertainties, this document is intended to provide minimum requirements for a Habitat Management Plan, and as a starting point for professionals who will be preparing such plans.

Class I Wildlife Habitat Conservation Areas are defined within the Clallam County Critical Areas Code as "Within 200-feet or equivalent to critical habitat designations for threatened or endangered species under the federal Endangered Species Act, or Washington State law". On Feb. 16, 2000 NMFS published final rule designating "critical habitat" for the following "threatened" species – Puget Sound Chinook, Hood Canal-Strait of Juan de Fuca Summer Chum, and Lake Ozette Sockeye. The Critical Habitat designations included areas which are currently inhabited by the species such in Jimmycomelately Creek, the Dungeness River, the Elwha River, the Ozette River, Lake Ozette and tributaries, and the Strait of Juan de Fuca from the eastern County line to the western head of Freshwater Bay. On March 17, 2000, these critical habitat designations became effective, and Clallam County began regulation of these areas as Class 1 Wildlife Habitat Conservation Areas. Regulated development activities which occur within or adjacent to (200 feet landward from the Ordinary High Water Mark (OHWM)) Class I Wildlife Conservation Areas require the preparation of a Habitat Management Plan pursuant to the requirements of the Clallam County Critical Areas Ordinance.

The guidance outlined below serves as recommended Habitat Management Plans for minor new development (i.e. predominantly single family residences) proposed adjacent to Class 1 Wildlife Conservation Areas. Adherence to specific elements outlined below will satisfy the requirements for a Habitat Management Plan. Departure from the guidance outlined below, or major new development (land divisions, commercial or industrial development or clearing in excess of an acre) will require preparation of a site-specific Habitat Management Plan by a private consultant.

General Habitat Management Plans

The locations within the County which currently are classified as Class I Wildlife Conservation Areas for the threatened salmonids listed above occur in both the marine and freshwater environments. The preparation of a Habitat Management Plan will be different in depending upon the environmental conditions in the local area. The following guidance is specific to the general types of environments which can be found within the present Class I Wildlife Habitat Conservation Areas in the County. It should be noted that the standards outlined below will in many cases be less stringent than required in other parts of the Critical Areas Code, or in other portions of County Code. For instance, building setbacks from the top of a Marine Bluff will also need to meet the standards of the Shoreline Code and the Building Code; Channel meander hazards (a Geologic Hazard Area under the Critical Areas Code) are in many locations farther than 200 feet from the OWHM, development in these areas would not be allowed without a Variance from the standards of the Critical Areas Code.

Marine Shorelines –

Top of Marine Bluff –

1) Permanent structures are located at least one site potential tree height (125-180 feet) from the top of the bluff or 200 feet from the OHWM . Native vegetation within this zone should be retained.
2) Where native vegetation is not present, it should be replanted and restored when it is possible and safe to do so.

Toe of Marine Bluff – (total distance from base of bluff to OHWM less than 200 feet)

1) The amount of clearing and grading is the minimum necessary, and is located such that the need for future bulkheading is eliminated. Mitigation measures could include reworking of existing bulkheads to form a more “natural” beach environment, or beach nourishment.
2) Proposed developments in these areas will require the preparation of a geotechnical report and a Variance (Public Hearing before the County’s Hearing Examiner) from the Geologic Hazard Protection standards of the Critical Areas Code in addition to the Habitat Management Plan.

Low Angle Bluff – This type of shoreline is mostly restricted to areas of Sequim Bay and other protected waters along low energy marine shorelines. These areas generally can fully support coniferous species of trees and a normal forest understory.

1) Development is located more than one site potential tree height (125-180 feet) from the shoreline. These areas will also likely require preparation of a geotechnical report if located on the slope itself.

Low Bank or No Bank Littoral Beaches – These areas are located at Diamond Point, parts of interior Sequim Bay, the Jamestown/Jamestown Beach/Seashore Lane/3 Crabs road shoreline, the mouth of Morse Creek, and areas east and west of the Elwha River. The primary cause of habitat disruption on these types of shorelines, which are characterized by annual beach erosion and deposition cycles, is the construction/maintenance of marine bulkheads. Development should be located well landward of the OHWM to prevent the need for bulkheading in the future.

Typically this means location of new development well back from the primary beach berm, and retention of the native vegetation (usually beach rye) on the beach berm or primary dune.

1) Development is located landward of the start of tree cover where tree cover is present. In areas where tree cover is not present, development should be located 50 feet landward from the landward edge of the primary beach dune.
2) Proposals for reconstruction of existing bulkheads should include consideration of beach nourishment, alternative design of the bulkhead, or removal of the bulkhead. A coastal geologist or engineer must be consulted in proposals for construction or maintenance of marine bulkheads. The implementation of the Habitat Management Plan should be monitored no less than every 5 years. Monitoring can include site visits and remote sensing data/use of the County Geographic Information System.

Deltas and Estuaries – Maintenance of tidal flux and flow patterns is essential to the proper functioning of these areas as fish and wildlife habitat and to reduce flood damage to adjacent properties or structures.

1) Development is located outside of the floodplain wherever possible (as required in the Frequently Flooded Areas chapter of the Critical Areas Code) and deposition of fill eliminated.
2) Development should be located at least one site potential tree height from the OHWM or edge of the wetland, and native vegetation retained between the development and the OHWM or wetland edge.

Rivers and Creeks –Most rivers and creeks are currently bounded by either Channel Meander Hazard or other Geologic Hazards (i.e. ravines). Development in these areas will require the preparation of geotechnical reports according to the standards listed at CCC 27.12.820 in the Critical Areas Code. In general, those areas which are not bounded by a geologic hazard area have had the riparian zones reduced or eliminated by past land-use practices. In these areas the buffers should be restored, and development located at least one site potential tree height from the OHWM. Construction of new dikes, levees or bulkheads will generally occur within Channel Meander Hazards associated with riverine systems. These types of developments will require a Variance (Public Hearing before the County's Hearing Examiner) from the Critical Areas Code and will require the preparation of a geotechnical report in addition to a Habitat Management Plan.

1) Development is located outside of the jurisdictional area if possible given lot dimensions. All native vegetation should be retained within site potential tree height of the OHWM.
2) Where the native vegetation no longer exists within one site potential tree height, native tree cover is re-established.
3) Reconstruction of existing dikes, levees, and bulkheads incorporates large woody debris and vegetation (and meet the standards for Stabilization and Relocations defined in the Critical Areas Code). Use of WDFW's Integrated Streambank Protection Guidelines is recommended.

General Requirements:

The implementation of the Habitat Management Plan should be monitored no less than every 5 years. Monitoring can include site visits and remote sensing data/use of the County Geographic Information System.

1) Clallam County will be allowed to monitor compliance with the Habitat Management Plan into the future. Before entering onto the property for monitoring of compliance with the plan or the success of any vegetative plantings, Clallam County shall give the landowner 2 weeks written notice.

Adherence to the Habitat Management Plan – As required in the Critical Areas Code:

"Any property on which a development proposal is submitted shall have filed with the Clallam County Auditor: 1) a notice to title of the presence of the critical area or buffer, 2) a statement as to the applicability of this chapter to the property, and 3) a statement describing possible limitations on actions in or affecting such areas or buffers as approved by the Administrator. Clallam County shall record such documents and will provide a copy of the recorded notice to the property owner of record. Development proposals which are also defined as normal repair and maintenance of existing structures or developments, including but not limited to: roof repair, interior remodeling, wood stove permits, etc., and on-site sewage disposal systems repairs or replacement, are exempt from this requirement. Applies to: Wetlands, Aquatic Habitat Conservation Areas, Class I Wildlife Conservation Areas, Landslide Hazards, and Frequently-flooded areas."(CCC 27.12.320.4)

For Class I Wildlife Conservation Areas, the notice to title includes a statement that "A Habitat Management Plan has been formulated for this parcel and is on file with the Clallam County Department of Community Development. All development on this parcel shall occur in accordance with the provisions of the Habitat Management Plan."
This will ensure that departure from the requirements of the Habitat Management Plan will be a violation of County Code. In addition, final approval of any development undertaken pursuant to a Habitat Management Plan shall not be given if any provisions of the plan are not adhered to. Final approval will not be given until such time as a mitigation plan for the effected habitat is prepared, approved by the County, and implemented.

Privately Prepared Habitat Management Plans

For major new development, or for development proposals which require departure from the general plans listed above, a Habitat Management Plan must be formulated by a qualified biologist and submitted for the County to review and approval. The standard for approval by the County is that "no net loss of wetland or critical habitat results". Development proposals which will result in a net loss of critical habitat will require a Variance from the standards of the Critical Areas Code.

The standards for preparation of a Habitat Management Plan are defined in the Critical Areas Code as follows:

C.C.C. 27.12.830 <u>HABITAT MANAGEMENT PLAN</u>

1. This report shall identify how the development impacts Class I or II Wildlife Habitat Conservation Areas. The Washington Department of Wildlife Priority Habitat and Species Management Recommendations (1991) may serve as guidance for this report or bald eagle protection rules outlined in WAC 232-12-292, as now or hereafter amended.

2. The Habitat Management Plan shall contain a map prepared at an easily readable scale, showing: the location of the proposed development site; the relationship of the site to surrounding topographic, water features, and existing and/or proposed building locations and arrangements; a legend which includes a complete legal description, acreage of the parcel, scale, north arrows, and date of map revision.

3. The Habitat Management Plan shall also contain a report which describes the nature and intensity of the proposed development; an analysis of the effect of the proposed development, activity or land use change upon the wildlife species and habitat identified for protection; and a plan which identifies how the applicant proposed to mitigate any adverse impacts to wildlife habitats created by the proposed development.

4. This plan shall be prepared by a person who has been educated in this field and has professional experience as a wildlife biologist. For minor new development proposals, the Department of Community Development may complete the plan unless the applicant wishes to employ a qualified professional at the applicant's expense. Where this plan is required for the protection of eagle habitat, the eagle habitat management plan shall normally be prepared by the Department of Fish and Wildlife as required under the Bald Eagle Management Rules.

Specifically, if the proposed development activity will have an effect on the habitat identified for protection, the “mitigation” sequence for the plan is defined in the next two sections:

c.c.c. 27.12.840 <u>Mitigation plan - GENERAL REQUIREMENTS</u>

1. The applicant shall identify and describe why those regulated uses and activities are not and cannot be consistent with the provisions of this chapter and shall describe how impacts shall be mitigated.

2. The applicant shall mitigate impacts to critical areas by doing one or more of the actions listed below in order of preference:

   a. Avoiding the impact altogether by not taking a certain action or parts of actions. This may be accomplished by selecting a reasonable alternative that does not involve impacts to critical areas or buffer impacts; applying reasonable mitigation measures, such as drainage and erosion control, alternative site planning, and/or using best available technology.

   b. Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts. This may be accomplished in one of the following methods, or through other methods as deemed appropriate: selecting a reasonable alternative that avoids most critical area impacts; applying reasonable mitigation measures, such as drainage and erosion control, preservation of critically important plants and trees, limitation of access to critical areas, seasonal restrictions on construction activities, phased development, and/or establishment of buffers.

c. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment for unavoidable impacts. This may be done by reestablishing critical area functions and buffers on-site which have been lost by alterations or activities.

d. Compensating for the impact by replacing, enhancing, or providing substitute resources or environments for unavoidable impacts. This may be done by intentionally creating critical area functions and buffer at another location where none currently exist, improving existing wetlands and wetland buffers at another location, or otherwise providing a substitute wetland resource at another location as compensation for any unavoidable adverse wetland impacts.

3. The Review Authority shall determine whether identified impacts can be first avoided and secondly minimized. For any impacts to critical areas that are determined to be unavoidable and necessary, the Review Authority shall determine whether such impact should be rectified or compensated. The Review Authority shall affirm that no net loss of wetland or critical habitat results.

4. Critical area impacts can be mitigated if mitigation measures would not result in an extraordinary hardship and denial of reasonable use of the property.

C.C.C. 27.12.850 AQUATIC AND WILDLIFE HABITAT CONSERVATION AREAS - SPECIAL REQUIREMENTS

1. Mitigation plans for impacts to wildlife habitat conservation areas shall be prepared by a biologist with professional experience in mitigation plan design, implementation, and monitoring. Where this plan is required for the protection of eagle habitat, the eagle habitat management plan shall normally be prepared by the Washington State Department of Fish and Wildlife, as required under the Bald Eagle Management Rules. The Washington Department of Wildlife Priority Habitat and Species Management Recommendations, dated May 1991, may serve as guidance for preparing mitigation plans to protect Wildlife Habitat Conservation Areas.

2. Possible mitigation measures to be included in the report, or required by the Review Authority, could include, but are not limited to:

a. Establishment of buffer zones;

b. Preservation or restoration of critically important plants and trees, or other affected areas;

c. Limitation of access to habitat areas;

d. Seasonal restriction of construction activities; and

e. Establishing phased development requirements and/or a timetable for periodic review of the plan.