Watershed Profile: Dungeness

The Place and the People

Located on the northwest corner of the Olympic Peninsula, the Dungeness River is nestled in the dry rain shadow of the Olympic Mountains. The Dungeness River and its main tributary, the Gray Wolf, drain 172,000 acre area. The river flows from steep mountains and deep-forested canyons and, in the lower ten miles, into through the broad, open Sequim-Dungeness valley eventually emptying into the Dungeness Bay and the Strait of Juan de Fuca. Forming the southern boundary of the watershed, Mount Constance towers over the river and its 546 miles of streams and tributaries. The northern edges of the watershed are bound by 33 miles of shoreline along the Strait of Juan de Fuca.

Sedimentation is responsible for both the structure of the basin as well as the agricultural opportunities afforded to the people who live there. Ten thousand years ago, at the fullest extent of the ice age, glaciers extended across the Strait of Juan de Fuca and up the Dungeness valley. Lakes formed behind the ice dams, accumulating thick beds of coarse and fine sediments which are now largely responsible for the inherent instability of the upper watershed. As these sediments were transported out of the upper watershed they were deposited in a large alluvial fan. Channel migration occurred across the alluvial fan as the river continued to deposit sediments in the lower valley. As a result,all of the creeks have a floodplain which is larger than would be expected for streams in the lower valley.

The watershed contains a diverse array of land uses and cover types. Land uses include agricultural pasture, hay land and cropland on commercial and small farms, residential development scattered throughout the lower watershed, private and public forestland in the upper watershed, as well as a large portion of the Olympic National Park. Rural/agricultural land occupies 21% of the watershed. Seventy to eighty percent of the agricultural land is irrigated from water diverted from the river, which flows through an extensive network of irrigation ditches.

The basin is part of a region that receives less rainfall and more sunshine than any place in Puget Sound. In the Dungeness Watershed, this drier climate is both a boon for sun-lovers and a bane for farmers in the Dungeness River Valley, who need to irrigate their fields, and for salmon which need sufficient flows in which to swim. In the lower basin, summers are warm but not usually hot, and are generally dry. The lower part of the watershed has cool and rainy winters, but snow and freezing conditions are uncommon. The upper basin is cooler and wetter in all seasons allowing for winters cold enough that snow is common.

The Dungeness River valley has a long history of human habitation. Evidence from an excavation near Sequim shows that people inhabited the region as early as 11,000 years ago--not long after the Vashon ice sheet had departed. In the

late 1700s when the earliest European explorers came into the Strait of Juan de Fuca, they found native villages and camps along the shores and bays, indicating that bands of people moved between pre-established sites according to the seasons and availability of food resources. Based on archaeological reports, it is estimated that 400 to 2100 native people were subsisting on salmon and other bountiful natural resources in the Dungeness River area prior to contact with European explorers and settlers.

European settlement began in the 1850s and proceeded rapidly in locations with good harbors. Logging and early sawmills produced lumber for export down the pacific coast. The local town of Dungeness developed around these activities. In 1855 the Treaty of Point No Point was intended to settle land ownership questions with the S'Klallams. However, many S'Klallams remained near their traditional bays and rivers. Threatened with relocation to a distant reservation in 1874, a band of S'Klallams pooled $500 in gold coins to purchase 200 acres of land along Dungeness Bay. In respect for their leader they named their community Jamestown, and their descendants comprise the membership of the modern Jamestown S'Klallam Tribe.

Today more than 16,000 people make their homes in the Dungeness River watershed. Clallam County has been rapidly developing as the mild climate and beautiful scenery attract retirees and others to the region. According to Peninsula Development Association figures, the County population increased by over 75% between 1970 and 1992 and continues to grow today.

Property owners, farmers, and representatives of federal, tribal and state agencies are working together with local jurisdictions on the Dungeness River Management Team (DRMT) to address habitat protection and restoration opportunities on the Dungeness River for the people and salmon that live in and around the Dungeness River.

Key Facts (sidebar)

- Most of this watershed is located in Clallam County.
- The only major city is Sequim.
- Projected population growth for Clallam County is 16% from 2000 to 2020, much of which is expected to occur in the Sequim area.
- The planning area for the Dungeness Watershed under the state Watershed Management act is Watershed Resource Inventory Area (WRIA) 18 (Elwha-Dungeness).
- A portion of the Quilcene Basin (WRIA 17), the Dungeness and Elwha River Basins (WRIA 18) and the Lyre-Hoko Basin (WRIA 19) represent one planning area under Shared Strategy, which includes the western Strait of Juan de Fuca to Neah Bay, the western most point of the continental United States.

The Dungeness Salmon

Current fish populations in the Dungeness are a small fraction of what they are estimated to have been in the past. Historically, 11 populations or population components existed in the Dungeness. Currently, threatened early-run Chinook, threatened Hood Canal/Strait of Juan de Fuca summer chum, threatened bull trout, upper river “early” pink, lower river “late” pink, fall chum, coho, and winter and summer steelhead, along with sea-run cutthroat and resident rainbow trout live in the Dungeness along with native char.

Chinook return to the Dungeness in the late spring to mid summer with spawning occurring early August through early October. After emerging as fry in the early spring, most Chinook emigrate to rear in the estuary during their first year, while others will rear in the river for a year and emigrate as yearlings. Thus, estuarine habitat is very important for Dungeness Chinook, as the fish spend most of their first year in the estuary or nearshore area.

Summer chum enter the river in late August and spawn in the main channel through September. The young fish will then migrate to the estuary and nearshore area shortly after emerging from the gravel in late-spring.

Preliminary results of studies suggest that bull trout can be found throughout the Dungeness River upstream to an impassable barrier at milestone 19 and in the Gray Wolf tributary. They reproduce in colder water than other salmon (48° F or less). Some adults remain in fresh water all their lives, while others migrate to the estuary and may migrate to marine waters.

Recovery Goals

Members of the Dungeness River Management Team adopted an ecosystem approach to restore the physical and biological health of the watershed. Their general goals are to prevent loss of life and property from flooding; work towards the restoration of riparian and aquatic ecosystems within the Dungeness River watershed and estuary areas to mutually benefit wild and native salmonids and human residents; and to protect and enhance the water quality and quantity in the Dungeness 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.

Chinook

The long term Chinook recovery goal is to achieve a naturally sustaining population at harvestable levels for residents and visitors. Recovery is expected to occur over a 100-year time period. To get to this point, short term goals (to be achieved within 25 years) have also been identified. The long term goals are reflected in the table below.

Chinook Spawner Abundance Planning Targets for abundance (with productivity in parentheses)	
Low Productivity	High Productivity
4,700 (1.0)	1,200 (3.0)
The low productivity number represents one adult fish return per spawner, also called the equilibrium point of 1:1 (recruits per spawner). The high productivity number represents the number of spawners at the point where the population provides the highest sustainable yield for every spawner. The productivity ratio is in parentheses and represents the relationship of recruits per spawner.	

The Chinook planning targets are based upon the Ecosystem Diagnostic and treatment (EDT) Model and assume Properly Functioning Conditions (PFC) in the freshwater habitat and pristine conditions in the estuary. At the time the EDT modeling was completed, it was not possible to model PFC in the estuary. Therefore, it is understood by the participants that the planning targets may exceed the actual capacity of the watershed.

Goals for hatchery and harvest practices include providing for ceremonial, subsistence, commercial and recreational fisheries on a sustained basis. The Dungeness Chinook Hatchery Program established by co-managers is intended to maintain higher adult return rates until the habitat can support a productive and sustainable natural Chinook population. Currently, and for the short term, no recreational, subsistence or commercial fishing of Chinook in the bay and river is contemplated due to the decline in the Chinook population.

Bull Trout

The overall goal for recovery of the two bull trout populations in the Dungeness is to achieve and 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 de-listed. The recovered abundance target is a minimum population size of between 500 and 1,000 adults in a core area (Rieman and Allendorf, 2001). Additional goals include maintaining or expanding the current distribution of bull trout while increasing the abundance of the fish.

What is the current status of the Threatened Salmon populations?

Biologists estimate that about 8,000 Chinook entered the river annually before the 1850s. Dungeness Chinook, Hood Canal summer chum, and bull trout are considered to have fallen so dramatically, such that their low numbers "allow no room for further downward cycles" (McNulty, T. 2001). The Dungeness River Chinook especially is in jeopardy of being lost unless significant changes are made in the watershed.

Chinook

The Dungeness Chinook population is comprised of a single population of native origin fish with a spring/summer run timing. Run timing appears to be unchanged over time. However, a number of life-history pathways have been lost due to the

loss of side-channel and estuarine habitat. It's estimated that only 70% of the historic pathways remain available.

Generally speaking, Dungeness River Chinook continue to have access to their historic geographic range of habitat and now spawn throughout the entire river, though all too often in the last 30 years only 200 spawners have returned. Estimates suggest that the Dungeness River currently is theoretically capable of supporting 699 spawners and that the Gray Wolf River, historically an important spawning area, is underutilized. Additionally, side channel habitat in the lower river, once available for spawning and rearing, has been lost due to diking and other channel changes.

Bull Trout

The U.S. Fish and Wildlife Service has identified two local populations of bull trout in the Dungeness watershed: one in the Dungeness River and one in the Gray Wolf tributary.

Bull trout distribution tends to be patchy, and sufficient information is not available for a precise estimate of abundance. Comprehensive surveys conducted in 2004 combining radio telemetry and walking surveys in the Dungeness and Gray Wolf Rivers documented only 52 redds. No information is available to describe historic or current productivity. Bull trout in the Dungeness are likely to 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.

What are the key factors contributing to the current status of the populations?

Historically it is believed that Chinook swam far upstream and spawned in the upper Gray Wolf River and Gold Creek. Chinook were captured at a brood stock collection fence or "rack" that was put in the river at the hatchery at RM 10 in the early 1930s. The rack generally prevented Chinook from returning to the upper river for over 50 years. Efforts to produce sustainable runs with hatchery releases were largely unsuccessful. The effects from the hatchery programs and rack on Chinook spawning timing and location continue to be a hotly debated topic.

The main reasons for decline of Dungeness salmon can be attributed to the combined impact of a variety of land use activities that have occurred over several decades. During the 1890s settlers began irrigating their land with Dungeness River water, and a fish hatchery was built at Canyon Creek. Early settlers constructed dikes and drainage systems near the river mouth, converting tidal and estuarine areas into farmland. Both the upper and lower watersheds were logged, resulting in landslides in some areas. While areas of the headwaters were protected within Olympic National Park, other sections of the upper watershed in the Olympic National Forest were commercially logged.

National Forest policies for upper watershed management are now geared toward the protection of fish and wildlife species.

Historically, dikes, levees and other actions to control the lower reaches of the river have degraded vital refuge for juvenile salmon, truncated tributaries have degraded over-wintering habitat and contribute to scouring of redds. Diking along the river has constricted the natural process of stream channel formation and the transport of sediment. Major dikes are located on the east bank from RM 0 -2.6 (the “Corps” dike) as well as RM 7.6 – 8.4 (the Dungeness Meadows dike). Smaller dikes and embankments constructed by property owners are located throughout the lower ten miles of the river.

Five bridges currently cross the Dungeness River. Their design is such that they constrict the river to a narrower channel, which tends to increase water velocities and erosion potential.

With the increasing human population, the demand for water for irrigation, domestic and business use has markedly increased. The source for this water is both the Dungeness River and groundwater. Most of the water is diverted from mid-April through September, the same time that Chinook return to the river and begin to spawn. Since the early 1990’s, collaborative problem solving between the Dungeness River Agricultural Water Users Association, the Jamestown S’Klallam Tribe and others has resulted in water conservation measures which, along with changing water needs, have dramatically reduced diversion rates. Nonetheless, water withdrawals continue to affect salmon spawning and rearing habitat.

In addition to the increasing demand for fresh water, development is also adding contaminated run-off from lawns, driveways, parking lots, and other urban landscape features, and from farm animals, decaying irrigation ditches, leaky septic systems and other sources. The Jamestown S’Klallam Tribe was recently forced to abandon their commercial oyster farm in Dungeness Bay due to excessive bacteria levels from these sources.

Overall Approach to Recovery

Property owners, farmers, and representatives of federal, tribal and state agencies are working together with local jurisdictions on the Dungeness River Management Team (DRMT) to address habitat protection and restoration opportunities on the Dungeness River. Their work started over 16 years ago to bring disparate interests together in order to develop, support and promote protection, restoration and coordination among all levels of government and members of the public. By August 2003, representatives of local governments and Tribal leaders, irrigators, landowners, key cooperating agencies and community members adopted a strategy to achieve salmon recovery goals. They identified ten “strategic elements” habitat restoration and protection that help them work cooperatively toward--and measure--their progress.

Key Strategies and Actions Supporting the Overall Approach to Recovery

The ten strategic elements to achieve recovery are identified and described in *Restoring the Dungeness* (p. 36) to achieve recovery as follows:

- Restoration of Lower River floodplain and delta to River Mile 2.6
- Protection of existing functional habitat through land purchase (RM 2.6 – 11.3)
- Floodplain Restoration/Constriction Abatement (RM 2.6 – 11.3)
- Water Conservation, Instream Flow Protection and Water Quality Improvement/Protection
- Restoration of Functional Riparian and Riverine Habitat
- Large Woody Debris Placement
- Nearshore Habitat Protection and Restoration
- Barrier Removal
- Stock Recovery/Rehabilitation/Hatchery Reform
- Sediment Management/Source Control
  (Restoring the Dungeness, 36)

The following key strategies and actions for habitat, harvest and hatchery are ten-year goals developed by the DRMT. Implementation of habitat project restoration projects and management actions outside of the regulatory framework is dependent on adequate funding and land owner cooperation. For example, over the next ten years, 600 acres of land is targeted for purchase and conservation easements are being sought for an additional 250 acres. These goals cannot be achieved without adequate funding and landowner agreement.

1. **Restoration of the lower river floodplain and delta** to increase the quantity of essential rearing and salt/freshwater transition habitat
    - Army Corps of Engineers and Beebe Dike set-back.

2. **Protection of existing functional habitat within the watershed**
    - Riparian corridor protection/restoration to Highway 101 through land acquisition/easement
    - Regulatory protection measures to be utilized include the Critical Areas Codes, Forests and Fish rules, Department of Natural Resources Habitat Conservation Plan, the Federal Forest Plan, Shorelines Protection Act, the State Hydraulics Code, the WRIA 18 Watershed Plan, and Tribal land use regulations

3. **Floodplain Restoration/Constriction Abatement (RM 2.6 – 11.3) to alleviate channel constrictions,** thereby increasing corresponding channel meanders and reducing gradient, velocities, scour and bank erosion
    - Removal of upper Haller Dike at the Weikal property

- Property will be purchased for the Corps Dike setback. The area will be re-vegetated and engineered log jams will be constructed.

4. **Water Conservation, Instream Flows, and Water Quality Improvement/ Protection** to improve summer low flows and alleviate water quality concerns
    - Implement such projects as piping and lining and other conservation strategies, re-regulating reservoir, water rights and leases and trusts, and reduce conveyance through river/creeks
    - Implement other domestic/municipal water conservation projects identified in the WRIA 18 Watershed Plan

5. **Restoration of Functional Riparian and Riverine Habitat** to improve the quality of riparian habitat and function, including temperature moderation, long-term recruitment of LWD, cover, food production, etc.
    - Restore riparian corridor in Matriotti Creek
    - Restore riparian corridor throughout the lower mainstem (numerous individual projects (see Recommended Land Protection Strategies for the Dungeness, 2003)
    - River Riparian Area

6. **Large Woody Debris Placement**
    - Lower river floodplain restoration, LWD between Schoolhouse Bridge and Woodcock Road
    - Strategically placed LWD between Hurd Creek and Highway 101

7. **Nearshore Habitat Protection and Restoration** to improve the quantity and quality of estuarine and nearshore habitat
    - Implement Dungeness Bay Cleanup Plan (Clean Water Workgroup, 2002)
    - High priority restoration, protection and assessment projects along the strait of Juan de Fuca

8. **Barrier Removal to** address passage conditions
    - Improve fish screen/irrigation out-take alignments

9. **Stock Recovery/Rehabilitation hatchery Reform** (See Hatchery Strategy, below)

10. **Sediment Management/Source Control**
    - Decommission and stabilize selected roads within the National Forest

Hatchery Management

The DRMT hypothesizes that habitat recovery will be sufficient to support a productive and sustainable natural Chinook population. Hatchery management strategies are designed to be consistent with recovery goals. A hatchery broodstock supplementation program is being utilized to bolster Chinook production in the watershed. The program will be conducted until the restored habitat can accommodate a robust, naturally sustainable Chinook population. Non-Chinook hatchery programs for coho and steelhead are managed to avoid negative impacts of predation on Chinook.

Harvest Management

Currently, there is no fishery for Chinook in the river or bay. The timing of coho fisheries is managed to minimize incidental capture of Chinook adults during the fall. The recreational trout fishery is timed to reduce the chance of intercepting juvenile Chinook salmon out-migrants.

Adaptive Management

The Adaptive Management Plan provides short term and long term monitoring parameters for the ten strategic elements identified above in the discussion of the overall approach to recovery. Monitoring activities in the Dungeness watershed are divided into four categories. The following table identifies the four categories and provides an example of a statement of purpose, example of subtasks, and lead partners for each category. The Dungeness recovery plan also identifies a schedule and costs for each subtask. Some of the subtasks are performed on an ongoing basis. For others, costs have been calculated and funding sources are being sought. (The Tables can be found in Section D of the Recovery Plan, p. 4-7.) Parameters have also been identified for

Summary of Dungeness Watershed Area Monitoring Program			
Category	**Purpose**	**Example of activity/ subtask**	**Lead Partners**
Biological Processes	Attempt to determine success of physical or ecological restoration, e.g. adequate instream flows	Hydrology – baseline – measure instream flows	* USGS * Ecology
Habitat Conditions and Functions	Attempt to determine the current status of habitat conditions and functions, including LWD, solids and water quality	Large Woody Debris performance – 5 year analysis of LWD placement	*Jamestown S'Klallam Tribe
Biological Response	Measure current status of biological responses to restoration actions, e.g. abundance of salmon	Riparian Vegetation performance – annual air photos, project-specific monitoring of revegetation projects, report on land use	* Jamestown S'Klallam Tribe * Conservation District * Clallam County Noxious Weed

		strategies	Board
Changes to Surrounding Land Use	Look at changes in land use that have the potential to affect watershed processes and conditions either positively or negatively	Land use performance – Critical Areas code compliance, build-out scenario based on zoning, county draft flood plan, annual monitoring of conservation easements	*Clallam County * Jamestown S'Klallam Tribe * WDFW * North Olympic Land Trust

Results

The watershed plan for the Dungeness was reviewed by the Puget Sound Technical Recovery Team (a group of seven scientists) and an interagency committee facilitated by the Strategy Shared staff. The TRT reviewed the plan to determine the degree of certainty that the plan can achieve recovery goals. The conclusions of this analysis are below. For the most part, the issues identified below by the analysis are discussed in the watershed plan, but the reviewers felt they merited particular attention to increase the certainty of achieving plan outcomes. Where the analysis identified key uncertainties, proposals are included for consideration. If implemented along with the watershed plan's other actions, these proposals would increase the certainty of results and achieve the requirements for a recovery plan under the Endangered Species Act.

Both the Dungeness River Management Team process and the example of the Jamestown S'Klallam Tribe and irrigators' water conservation agreement are a model of collaboration. Nowhere else in the region have irrigators and the agricultural community committed to a water conservation effort at the level that is being implemented in the Dungeness. Past successes and the clear level of commitment to implement plan actions increase the certainty that this watershed can meet its stated goals.

According to the TRT recovery criteria, along with the Elwha Chinook, the Dungeness Chinook are one of the two Chinook populations in this region needed to achieve low risk for ESU recovery.

The plan is founded on a sound technical analysis. It offers a new application of the EDT model in the harvest management plan that attempts to improve the plan's approach to address the spatial structure characteristics of a recovered population. This type of application may prove useful for overall H-Integration, not just in this watershed, but throughout the ESU. The reviewers encourage the DRMT to consider expanding this analysis to hatcheries and habitat and use it to help enhance H-integration. Particular efforts on hatchery-habitat integration and reconciling harvest management objectives with recovery objectives are important next steps for increasing certainty in the plan's outcome for Chinook.

Even with the existing water conservation program, the low flow issues continue to be a major factor impacting fish in this watershed. As the plan is implemented, reviewers encourage continued efforts to identify opportunities to conserve water and increase flow in the Dungeness River system.

The nearshore and estuarine areas are a vital element for salmon recovery. The plan recognizes that protection of existing habitat and restoration actions are needed. The reviewers encourage close coordination with the lead entity group and regional efforts.

The TRT has expressed strong concerns about how the historic and potential future harvest levels under the existing Chinook annex of the Pacific Salmon Treaty (most of which could occur through interception in Canadian and Alaska fisheries) are inconsistent with assumptions about the ability of the habitat to support sufficient productivity of the Dungeness population to allow recovery to proceed. Specifically, it appears from the information presented that potential harvest levels under the existing annex may exceed the productivity likely to be exhibited by the Dungeness population, given current and near-term habitat conditions. The TRT understands that the opportunity for change in the Pacific Salmon Treaty management process is not likely until the annex to the treaty is renewed and effective in 2009. While the negotiators should take advantage to renegotiate lower harvest in 2009, it is also important to develop a method to get population specific estimates of harvest impacts for the Dungeness so that effects of changes in habitat and harvest management can be monitored and assessed.

The review process also identified a number of issues and uncertainties that cross many Puget Sound watersheds. Where a regional approach is needed in addition to a local approach to address these items, they are discussed in the regional strategy section of this document or in the regional adaptive management and monitoring program. The “cross-watershed” issues identified are:

- The importance of habitat protection strategies and the need to asses the results for fish from the combination of protection tools available,
- The need to develop H-integration strategies or where they are included to move them further down the integration continuum over time,
- The need to develop or complete a robust adaptive management and monitoring program,
- The need to reconcile local nearshore strategies and actions with the regional nearshore chapter,
- The need to address water resources, both water quality and water quantity,
- The need to link the effects of land use to habitat-forming processes and to habitat conditions.

If the proposals above are implemented, especially if flow issues and lower river functions and constrictions are addressed, this watershed and its Chinook population have the ability to achieve low risk status and will provide a critical contribution to the recovery of Puget Sound Chinook.