# Section 2
# DWUA Facilities and Operations

The purpose of this section is to describe irrigation facilities and operations that are relevant to implementation of this CIDMP and to identify the activities that were proposed for coverage under the ESA Section 10 ITPs.

## 2.1 Covered Activities for Purposes of HCP

For purposes of the Habitat Conservation Plan (HCP), Covered Activities are irrigation management activities undertaken by DWUA, its member organizations, (irrigation districts and companies), and individuals comprising such member organizations, on Covered Lands. Such Covered Activities include following:

- water diversion and conveyance[1]; (for further information, see Sections 2.2.3, 2.2.4, and 2.2.7;
- operation and maintenance of diversion facilities such as diversion intakes, intake channels, headgates, fish screens, and bypass channels (for further information, see Sections 2.2.4, 2.3 and 2.4);
- operation and maintenance of canals and laterals (for further information, see Sections 2.2.4, 2.3, and 2.4);
- discharge of tailwater and operation of discharge facilities (including both irrigation water and intercepted stormwater) (for further information, see Section 2.2.5);
- releases of intercepted stormwater into selected creeks at points other than tailwater discharge points when stormwater flows exceed ditch capacity (for further information, see Section 2.2.6); and,
- construction activities related to capital projects listed in the 1999 Comprehensive Water Conservation Plan (for further information, see Section 6.1.1).
- all Habitat Conservation Measures included in Table 6-1, which includes:
    - HCM-1 Reduce diversions from Dungeness River per Tables 6-3 to 6-10. This will be done mainly through pipelining and other actions in the DWUA Water Conservation Plan. Additional actions such as water leasing, voluntary reductions in usage and/or construction of storage capacity can also be used to reduce diversions for purposes of CM-1.
    - HCM-2 Modify headgate on Agnew District's diversion facilities on the Dungeness River.
    - HCM-3 Modify culvert on Sequim-Prairie Tri-Irrigation Company's Independent canal bypass channel associated with diversion facilities on Dungeness River.

[1] Water is conveyed primarily in irrigation canals. Portions of several natural creeks are also used to convey irrigation water.

- ♦ HCM-4 Modify headgate on Highland District's diversion facilities on the Dungeness River.
- ♦ HCM-5 Improve McDonnell Creek downstream fish passage by realigning fish bypass pipeline. 2
- ♦ HCM-6 Inspect McDonnell Creek fish ladder daily and remove debris.
- ♦ HCM-7 Carry out Yakima Screen Shop Recommendations for diversion facilities from the 2001 report.
- ♦ HCM-8 Establish new agency notification and redd protection procedures related to working in-water.
- ♦ HCM-9 Steam clean or pressure wash all heavy equipment before entering the Dungeness River. Also perform visual inspection to verify no major fluid leaks are present. (Same as WQ-2)
- ♦ HCM-10 Establish a 100-foot buffer away from waters for fueling heavy equipment, mowers, etc. (Same as WQ-3)
- ♦ HCM-11 Create a formal spill response plan, including requiring spill containment equipment under certain conditions. (Same as WQ-4).
- ♦ HCM-12 Continue to contract with WDFW for fish screen maintenance to ensure proper maintenance.
- ♦ HCM-13 The DWUA will not intentionally dewater intake and bypass channels.

The DWUA also utilizes herbicides for ditch maintenance as described in Section 2.4. The DWUA did not seek herbicide coverage by NOAA Fisheries or USFWS since they have communicated they are unable to provide coverage for herbicide use at this time. Coverage from the federal Services for herbicide use may be sought in the future.

Covered Activities under this CIDMP do not include the (1) water diversions by individuals where such diversions do not emanate from DWUA member organizations, and (2) other non-irrigation actions of member organizations or individual landowners that are not specifically listed above. For example, application of fertilizers and pesticides to farm fields and agricultural practices (e.g., tilling, planting, grazing) conducted on farm fields do not constitute Covered Actions.

The remainder of this section consists of more detailed descriptions of the covered activities, as currently conducted by the DWUA. These descriptions are for informational purposes only, and are not intended to limit interpretation of the types of activities, particularly in regard to new practices that may be developed over the term of agreements developed to implement this CIDMP.

## 2.2 Water Supply and Water Use

### 2.2.1 Water Rights

The Water Right Permits and Certificates held by the Water Users Association (DWUA) members were researched by Montgomery Water Group in preparing the Comprehensive Water Conservation Plan (MWG 1997). Table 2-1 lists the known permits and certificates held by the DWUA members. The total water rights listed for diversion from the Dungeness River are 518.16 cfs to serve 25,908 acres. Water rights for three other points of withdrawal are also held which add up to 22 cfs to serve 1,100 acres. The conditions on water rights for the Dungeness River have been modified by a Trust Water Rights agreement signed by Ecology and DWUA members in 1998 (see Section 2.2.2).

Table 2-1
Water Rights Permits and Certificates[d]

| WRIS Number[a] | Location | Priority Date | Source | Ditch Outtakes | Purpose of Use[b] | Qi (cfs) | Acres | Period of Use |
|---|---|---|---|---|---|---|---|---|
| ***Sequim Prairie Ditch Company (now merged into Sequim-Prairie Tri-Irrigation Company)*** | | | | | | | | |
| S2-17220-J | T30N,R4W,S26 | Nov. 1895 | Dungeness R. | Sequim | IR,DG,ST | 20.0 | 1,000 | 4/15-9/15 |
| G2-00121-C | T30N,R4W,S24 | Feb. 1946 | Well | -- | IR | 7.0 | 350 | Unknown[c] |
| ***Eureka Irrigation Company (now merged into Sequim-Prairie Tri-Irrigation Company)*** | | | | | | | | |
| S2-17211-J | T29N,R4W,S12 | Jan. 1897 | Dungeness R. | Highland | IR,DG,ST | 23.08 | 1,154 | 4/15-9/15 |
| ***Clallam Ditch Company*** | | | | | | | | |
| S2-17224-J | T30N,R4W,S26 | 1902 | Dungeness R. | CCD[d] | IR,DG,ST | 60.0 | 3,000 | 4/15-9/15 |
| ***Independent Irrigation Company (now merged into Sequim-Prairie Tri-Irrigation Company)*** | | | | | | | | |
| S2-17232-J | T30N,R4W,S35 | 1906 | Dungeness R. | Independent | IR,DG,ST | 40.0 | 2,000 | 4/15-9/15 |
| ***Dungeness Irrigation Company*** | | | | | | | | |
| S2-17234-J | T30N,R4W,S26 | 1911 | Dungeness R. | CCD | IR,DG,ST | 70.94 | 3,547 | 4/15-9/15 |
| ***Highland Irrigation District*** | | | | | | | | |
| S2-17235-J | T29N,R4W,S12 | 1915 | Dungeness R. | Highland | IR,DG,ST | 70.14 | 3,507 | 4/15-9/15 |
| ***Agnew Irrigation District (formerly MaCleary-Lindsay Irrigation Company)[e]*** | | | | | | | | |
| S2-01341-J | T30N,R4W,S19 | Jun. 1925 | McDonald Cr. | Agnew | IR | 5.0 | 250 | Unknown[c] |
| S2-17237-J | T29N,R4W,S12 | Oct. 1918 | Dungeness R. | Agnew | IR,DG,ST | 146.0 | 7,300 | 4/15-9/15 |
| ***Cline Irrigation District*** | | | | | | | | |
| S2-17238-J | T30N,R4W,S26 | Jul. 1919 | Dungeness R. | CCD | IR,DG,ST | 46.0 | 2,300 | 4/15-9/15 |
| ***Dungeness Irrigation District*** | | | | | | | | |
| S2-17239-J | T30N,R4W,S26 | Mar. 1921 | Dungeness R. | Sequim Prairie | IR,DG,ST | 42.0 | 2,100 | 4/15-9/15 |
| S2-03592-C | T30N,R4W,S12 | Jan. 1932 | Hurd Cr. | -- | IR | 10.0 | 500 | Unknown[c] |
| ***Total*** | | | | | | | | |
| Dungeness | -- | -- | -- | | -- | 518.16 | 25,908 | -- |
| Other | -- | -- | -- | | -- | 22.0 | 1,100 | -- |
| | | | | | **TOTAL** | **540.16** | **27,008** | **--** |

(a) Last character indicates status: J – adjudicated right; C – certificate
(b) Purpose of Use: IR – irrigation; DG – domestic general; DS – domestic single; ST – stock watering.
(c) The period of use is not stated in the water rights documents. However, it is assumed to be 4/15 – 9/15, similar to the other water rights
(d) As discussed in Section 2.1.1, the water rights have been modified by the Trust Water Rights Agreement.

### 2.2.2 Memorandum of Understanding on Trust Water Rights

The DWUA and Ecology entered into a Memorandum of Understanding (MOU) in April 1998, addressing transfer of water to the Trust Water Rights Program under the provisions of Chapter 90.42 RCW. The MOU addresses only the mainstem adjudicated rights, not water rights on the smaller streams. A copy of the MOU is included in Appendix A. The MOU creates a temporary trust water right, and provides a process to create permanent trust water rights for future irrigation and instream flows. The MOU also formalizes the DWUA's commitment to use or divert no more than 50% of the flow of the Dungeness River as measured at the USGS gage at RM 11.8. The parties to the agreement include the DWUA and its individual members (districts and companies) and Ecology. There is no time limit on the agreement. However, there are provisions allowing for issuance of permanent certificates, as well as for parties to the agreement to convene a review of the agreement if needed. If a change to the agreement occurs, no changes to habitat conservation measures described in this Plan would likely result.

The following list includes selected provisions of the MOU:

- A quantity of 4,700 acre-feet per year will be reserved as a temporary trust water right, based on water conservation savings from 1990 to 1993. This temporary trust water right will be distributed 1/3 to uses by DWUA members, and 2/3 to instream flows. [Note: thus, the 1/3 quantity could potentially be diverted again in the future for irrigation purposes.]
- Additional water can be placed in the trust water rights program. Ecology will issue annual orders transferring water to the temporary trust. This water will be designated 1/3 to future uses, and 2/3 to instream flows. This will result in less water being available for diversion.
- Saved water will be recorded and credited to individual DWUA members (i.e., districts and companies) as attributable to their respective efforts.
- Members of the DWUA will limit their collective diversions from the Dungeness River to no more than ½ the flow in the river, as measured at the USGS gage.
- The upper limit of collective DWUA diversions is 156 cfs from the Dungeness River. This amount is overridden by the limitation of ½ the flow in the river, stated above. In addition, if records indicate 156 cfs is greater than demand, this amount may be reduced through additional negotiation.
- Any DWUA member may request withdrawal of water that has been put in the temporary trust and credited to that member for irrigation. A process is provided for certification of that quantity of water.
- Water users will measure diversions at each diversion point, according to a schedule specified in the MOU.
- At some point in the future when several years of record, not to exceed ten years in length, indicate there are no more significant water savings being gained through habitat conservation measures, permanent trust water certificates will be issued under Chapter 90.42 RCW.

The MOU is a stand-alone agreement between DWUA members and Ecology, and is not necessarily part of the implementing agreements that would be developed to carry out this CIDMP. However, it is relevant to the CIDMP in that it further demonstrates the DWUA's commitment to the water conservation actions discussed in Section 6 of this document. It is also worth noting that one of the stated purposes of the MOU is to document a commitment on behalf of Ecology to actively pursue funding, with the DWUA and others, for implementation of the water conservation plan.

### 2.2.3 Quantity of Water Diverted

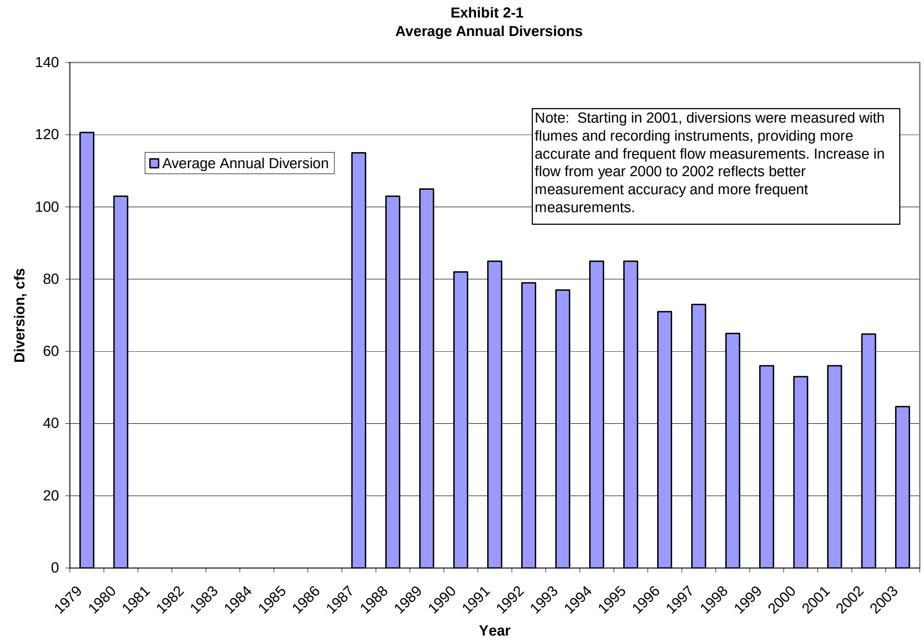
The DWUA members divert water from five diversions on the Dungeness River and one on McDonnell Creek. The Dungeness River diversions are on both the mainstem and side channels at River Miles 11.2, 10.9, 8.8, 8.0, and 7.2. The McDonnell Creek diversion is located at river mile 3.2 near Highway 101. Maps provided in Section 2.3 show the location of the diversion facilities.

Most water is diverted from April 15 to September 15, which is the irrigation season. Smaller quantities of water are diverted year round for stock watering.

The DWUA measures flow of water diverted into their systems. The Washington Department of Ecology (Ecology) provided funding to install measurement flumes. Parshall flumes and near real-time flow monitoring equipment have been installed at the Clallam-Cline-Dungeness diversion (above the split of the three main canals – Station No. 18G250), the Sequim-Prairie Tri-Irrigation Company's Independent canal diversion (at the fish screen – Station No. 18K250), the Agnew diversion (at the fish screen – Station No. 18F250), the Highland diversion (at the fish screen - Station No. 18J250) and the Sequim-Prairie Tri-Irrigation/Dungeness diversion (at the fish screen – Station No. 18H250). The installation of the flumes was completed in 2001. Flow data can be obtained from those flumes in near real-time from Ecology at https://fortress.wa.gov/ecy/wrx/wrx/flows/regions/state.asp. An additional stream gaging station was installed for the McDonnell Creek diversion (Station No. 18P070) in 2003 to provide information on streamflow and the operation of the Agnew diversion.

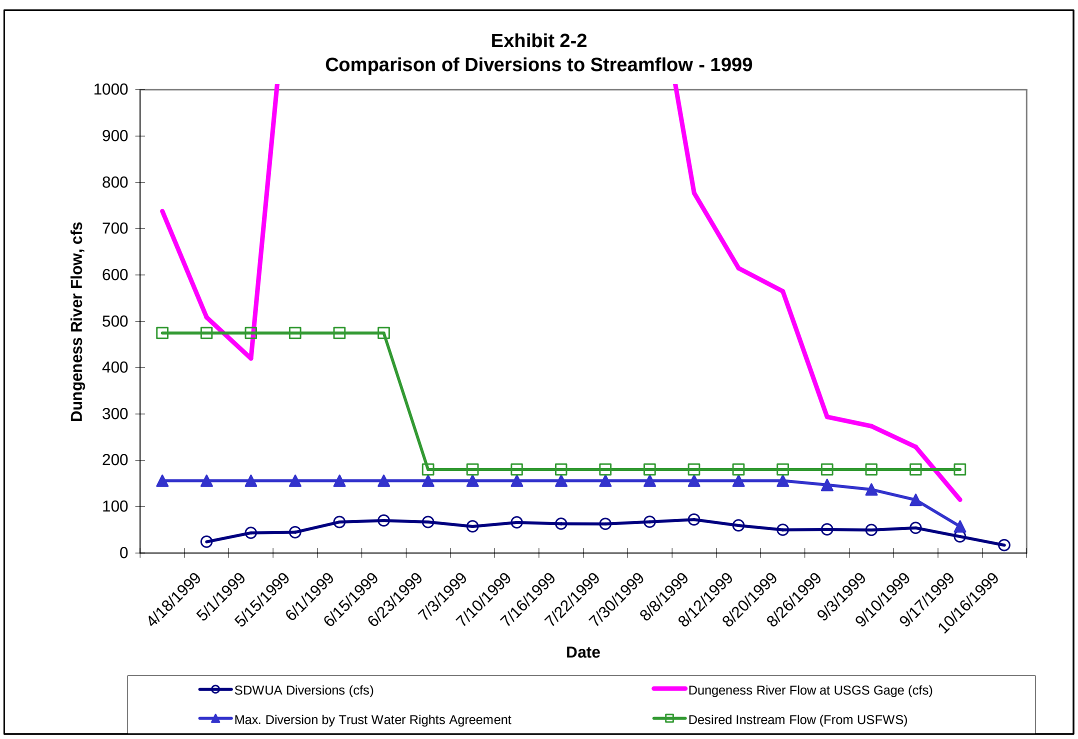
Real time flow data from the USGS gage on the Dungeness River (RM 11.8) can be obtained from the USGS Web Site at http://waterdata.usgs.gov/wa/nwis/uv?12048000 and near real time data from an Ecology gage on the Dungeness River (RM 0.8 – Station No. 18A050) is found at the Ecology website referenced above.

Data on Dungeness River diversions were summarized in the DWUA's Comprehensive Water Conservation Plan (CWCP). Those data were updated for this report by obtaining data from the DWUA and from new measuring flumes installed in 2001. The average annual diversion for all DWUA members for the period of 1979 through 2003 is presented in Exhibit 2-1. Data from 1981-1986 was not complete and therefore not compiled to calculate average annual diversions. The chart shows a large decrease in diversions occurring since the late 1970's. Diversions have been halved in that time-period. A reduction in average annual diversion of approximately 25 cfs has occurred since the early 1990's, which corresponds to the period-of-time the DWUA members starting focusing efforts on water conservation and reducing diversions.




The DWUA anticipates continued implementation of the water conservation plan, as described in Section 6 of this CIDMP. Construction activities associated with implementation are included in the Covered Activities.

The following four figures, Exhibits 2-2 to 2-5, compare the quantity of water diverted and the total streamflow present in the Dungeness River, as measured at the USGS gage upstream of all the irrigation diversions, from 1999 to 2002.



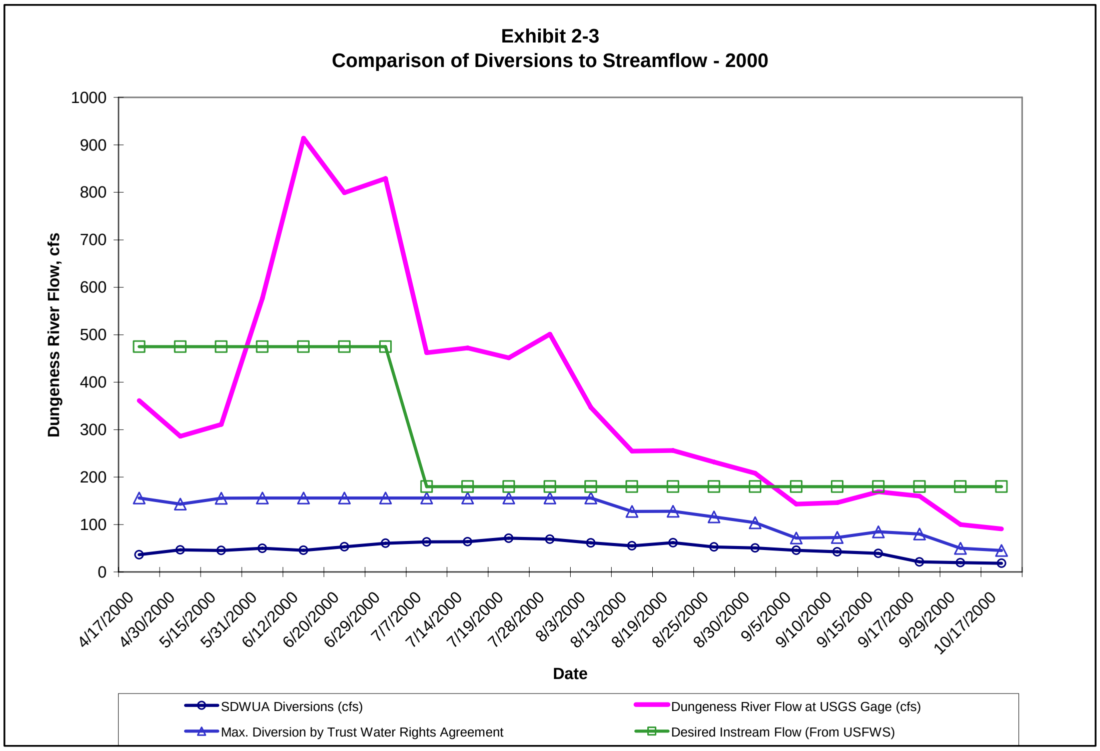


Exhibit 2-3
Comparison of Diversions to Streamflow - 2000
Dungeness River Flow, cfs
1000
900
800
700
600
500
400
300
200
100
0
4/17/2000
4/30/2000
5/15/2000
5/31/2000
6/12/2000
6/20/2000
6/29/2000
7/7/2000
7/14/2000
7/19/2000
7/28/2000
8/3/2000
8/13/2000
8/19/2000
8/25/2000
8/30/2000
9/5/2000
9/10/2000
9/15/2000
9/17/2000
9/29/2000
10/17/2000
Date
SDWUA Diversions (cfs)
Dungeness River Flow at USGS Gage (cfs)
Max. Diversion by Trust Water Rights Agreement
Desired Instream Flow (From USFWS)

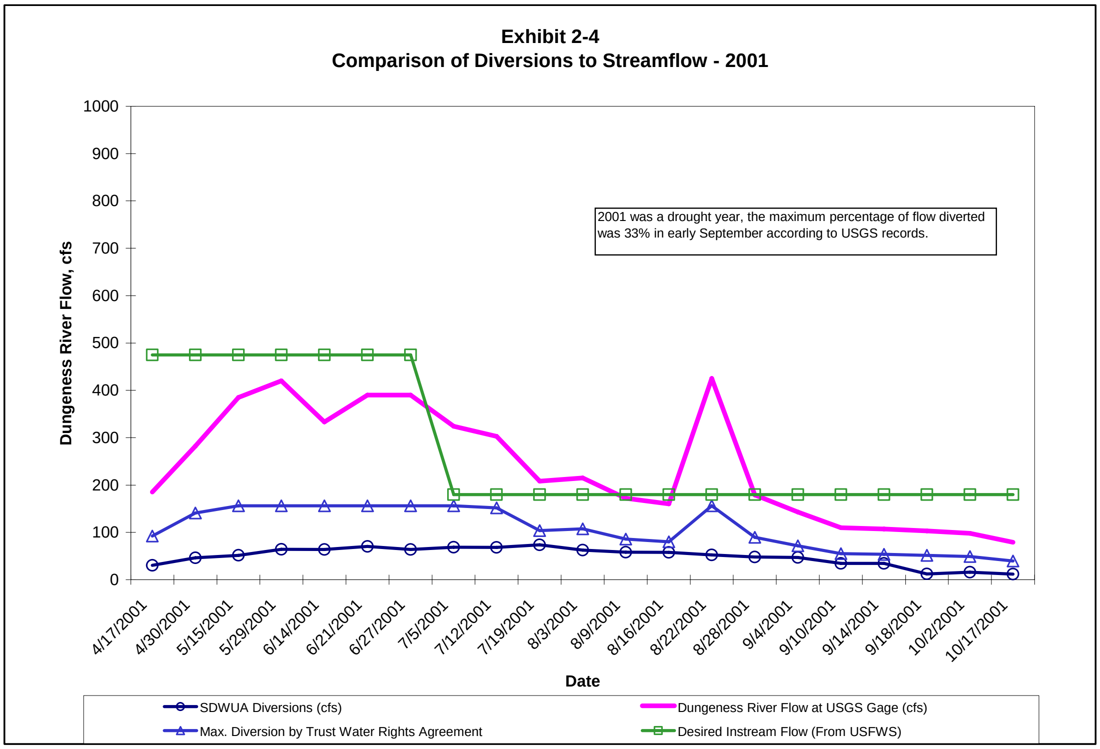
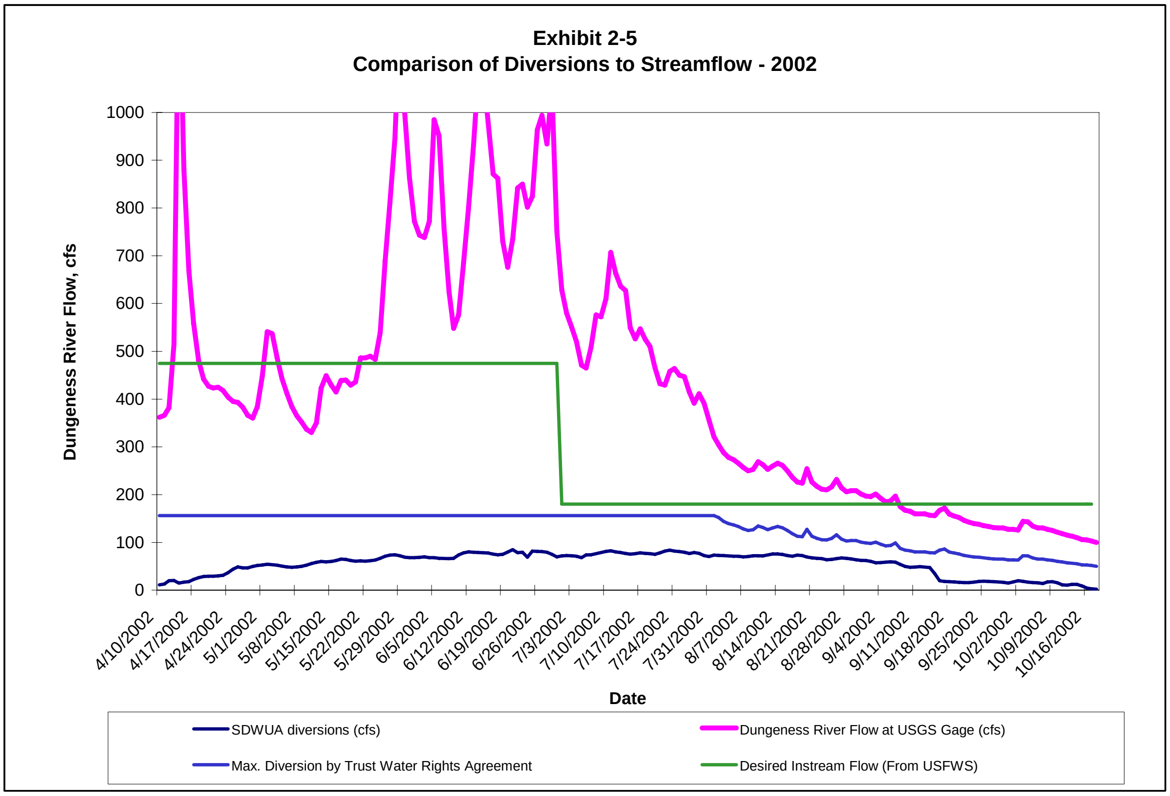


Exhibit 2-4
Comparison of Diversions to Streamflow - 2001
Dungeness River Flow, cfs
1000
900
800
700
600
500
400
300
200
100
0
2001 was a drought year, the maximum percentage of flow diverted was 33% in early September according to USGS records.
4/17/2001
4/30/2001
5/15/2001
5/29/2001
6/14/2001
6/21/2001
6/27/2001
7/5/2001
7/12/2001
7/19/2001
8/3/2001
8/9/2001
8/16/2001
8/22/2001
8/28/2001
9/4/2001
9/10/2001
9/14/2001
9/18/2001
10/2/2001
10/17/2001
Date
SDWUA Diversions (cfs)
Dungeness River Flow at USGS Gage (cfs)
Max. Diversion by Trust Water Rights Agreement
Desired Instream Flow (From USFWS)



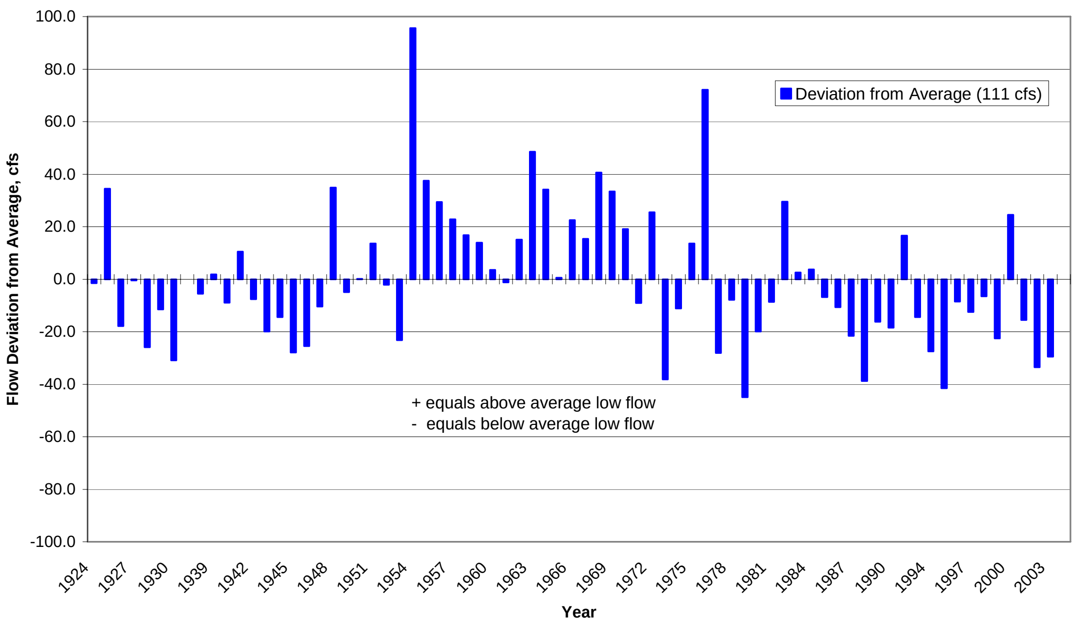

The peak DWUA diversions occur in July and August since the warmest, driest weather occurs during those months. After September 15, the DWUA diverts flow for stockwater purposes only causing diversions to decrease substantially at that time. Implementation of water conservation measures and improved management allowed the DWUA to meet the requirement of the Trust Water Rights Memorandum of Understanding with Ecology. That MOU, as described in Section 2.2.2, limits the quantity of water that can be diverted to 50% of the river flow as measured at the USGS gage. During the very dry year of 2001, the DWUA voluntarily reduced diversions below this level, such that the maximum percentage of Dungeness River flow diverted was only 33% even at the lowest flow conditions. The State of Washington supported this by funding leases of water rights for the purpose of augmenting streamflow. This voluntary action went beyond the terms of the MOU, and provides a demonstration of the DWUA's commitment to water conservation as well as the State's commitment to funding. These leases added 10 cfs to river flows beyond the 50 percent diversion limit.

There are sparse data on the Agnew Irrigation District's McDonnell Creek spill and diversion. According to the Agnew Irrigation District, spill quantities (into McDonnell Creek) typically range from 0.5 to 2.5 cfs. Diversion quantities typically range from 1.5 to 3.5 cfs, although more may be diverted during peak demand times and less during very low flow periods to maintain some baseflow in the creek. The Agnew Irrigation District has a water right for diversion of 5 cfs from McDonnell Creek.

The Dungeness River experiences low flow periods in late summer through early fall or until fall rains begin. The average 7-day low flow in the Dungeness River is 115 cfs.

This flow is close to the 90% exceedance level. The low flow is highly variable and is affected by periodic climate fluctuations. Exhibit 2-6 illustrates the historic record of 7-day low flows on the Dungeness River. Low flows can also occur in the winter months, when freezing conditions reduce flows. However, since irrigation activity is very limited at that time of year, this CIDMP focuses on the low flow conditions that occur in the late summer and early fall months.

Exhibit 2-6
7-day Low Flow History for Dungeness River




## 2.2.4 Diversion and Distribution System

The DWUA diversion and distribution system is comprised of the following six components, which are listed in the order water sequentially flows:

- The **diversion intake** is the point of diversion where water is diverted from the river or creek. The diversion is accomplished by either siting the diversion intake at a location so water naturally flows into it, or by modifying the riverbed to direct water into the diversion intake (i.e. via a push-up gravel berm).
- The **intake channel** conveys water from the diversion intake to the fish screen. Intake channels vary in length depending on the location of the fish screen. The DWUA keeps intake channels open and watered year round since fish may use them as rearing habitat.
- The **headgate,** located just upstream of the fish screen, controls the flow of water into the irrigation ditch system. Flow can be decreased, increased, or completely turned off by operating the headgate. The flow in the ditch system can be adjusted

without dewatering the bypass channel through the use of wooden slats, called flashboards, downstream of the fish screen.

- The **fish screen** prevents fish from entering the irrigation canal system, which begins downstream of the fish screen. Several different types of fish screens are used including flat-plate drum screens and rotating drum screens.
- The **bypass channel** provides a means for screened fish that have reached the screen to return to the river or creek. The DWUA keeps bypass channels open and watered year round since fish may use these channels as spawning and rearing habitat.
- **Canals and laterals**, collectively and commonly called “ditches”, begin downstream of the fish screen and deliver water-to-water users. Canals and laterals are similar, except that canals are larger than laterals and are the main distribution channels. Some of the 173 miles of ditches are in fact open ditches, while others are closed pipes. Ditches generally deliver water to the high point on each original 40-acre tract of land. Some individual water users add their own distribution system from the DWUA delivery point. However, these ditches are not considered part of the DWUA system and their operation is not a covered activity in the CIDMP. Policy No 22 of the DWUA’s Rules and Regulations (in Appendix B) requires water user-owned distribution systems to be comprised of closed pipe. Most members of the DWUA have a cost share program where they will pay for installation if the water user pays for the pipe.

### 2.2.5 Tailwater Discharge

The DWUA discharges tailwater from the DWUA irrigation system into natural waterways, wetlands, groundwater, and/or saltwater bays. Tailwater is any remaining water in an irrigation ditch after water has been delivered to the final water user on a given ditch system. Tailwater consists of water intentionally diverted to the irrigation system for irrigation purposes, as well as stormwater and rainfall that enters the system via open ditches. To physically deliver water to the last water user on any given system, more water must be diverted into the system than is used by water users. It should be noted both the volume of discharge and the number of discharge sites decrease as the conservation program converts open ditches to closed pipe. The volume of discharge decreases since stormwater has less access to the system. The number of discharge sites decreases since the hydraulics of piped systems do not require loading the system with more water than needed by water users.

There are currently 25 active tailwater sites, as listed in Table 2-2. Exhibit 2-7 shows the location of all tailwater sites. (Only sites identified by a number or address are active; the others have been eliminated through piping.) Tailwater locations are also shown on the maps of each district or company in Section 2.3.

At the end of the Cline District system, there are five tailwater sites identified. Several other stormwater outfalls exist nearby that may also contain some irrigation water but are primarily stormwater influenced. Those stormwater outfalls have not been classified as tailwater sites for this plan.

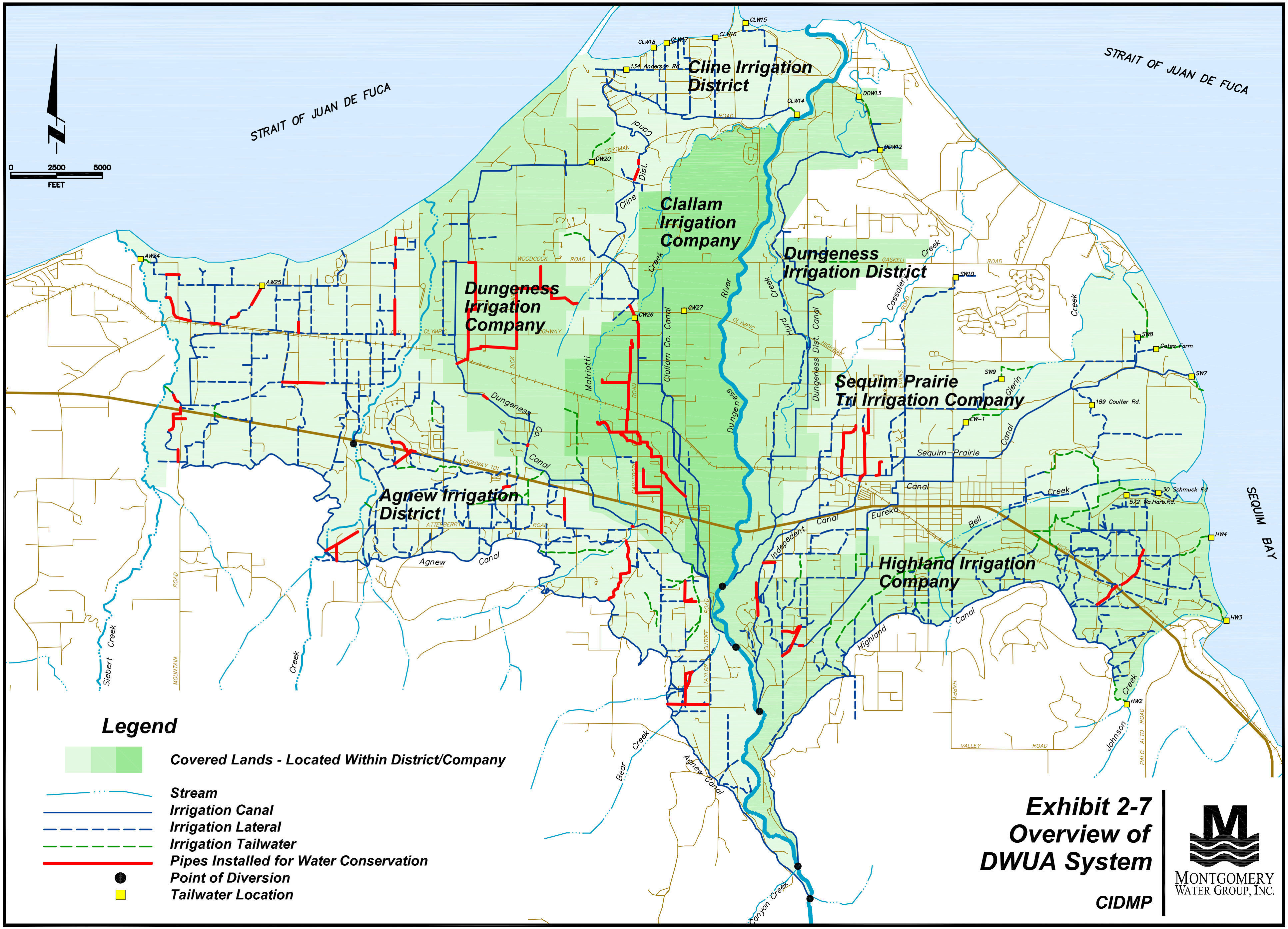


Exhibit 2-7
Overview of
DWUA System
CIDMP
MONTGOMERY WATER GROUP, INC.
sstoneman 03/01/05 08:52:15 Districts Overview.dwg

**Table 2-2**
**Tailwater Sites**

| No | Site No. | District/ Company | Waterbody Discharged To | Latitude | Longitude | Location Description |
|---|---|---|---|---|---|---|
| 1 | AW24 | Agnew | Groundwater. Unlikely any reaches Siebert Creek since discharge qty is small (0-.03 cfs) and runs through a long (approx 1000 ft) unmaintained ditch. | 48°06'56.7" | 123°16'54.3" | 856 Gerhke Road |
| 2 | AW25 | Agnew | Strait of Juan de Fuca | 48°06'45.2" | 123°15'08.5" | 1079 Finn Hall Road |
| 3 | CW26 | Clallam | Groundwater. Unlikely any reaches Matriotti Creek since discharge qty is small (0-.03 cfs) and runs through a long (approx 1000 ft) unmaintained ditch. | 48°06'31.1" | 123°10'15.1" | Olympic Highway/Cays Road |
| 4 | CW27 | Clallam | Groundwater. Unlikely any reaches a creek since discharge qty is small (0-.03 cfs) and runs through a long (approx 1000 ft) unmaintained ditch. | 48°06'31.6" | 123°09'46.9" | Olympic Highway/Cays Road |
| 5 | CLW14 | Cline | Dungeness River | 48°08'21.3" | 123°08'20.9" | Lotzgesell/Dungeness River |
| 6 | CLW15 | Cline | Dungeness Bay. Very little reaches the bay since discharge qty is small and runs through a wetland first. | 48°09'03.7" | 123°08'56.9" | Marine Drive/Olympic Straights |
| 7 | CLW16 | Cline | Dungeness Bay | 48°08'58.9" | 123°09'22.5" | 520 Marine Drive (Tribe uses 495 address) |
| 8 | CLW17 | Cline | Dungeness Bay | 48°08'56.8" | 123°09'53.2" | 80 Marine Drive |
| 9 | CLW18 | Cline | Dungeness Bay. Discharge qty is small (0-.03 cfs). | 48°08'56.6" | 123°09'53.7" | Marine Drive/Cays Road |
| 10 | CLW19 134 Anderson Rd | Cline | Groundwater. Unlikely any reaches Dungeness Bay since discharge qty is small (0-.03 cfs) and runs through a long (approx 1000 ft) unmaintained ditch. | 48°08'42.6" | 123°10'10.5" | 134 West Anderson Road |
| 11 | DW20 | Dungeness Company | Wetland and Woods Creek. Very little reaches creek since it runs through wetland first. | 48°07'50.6" | 123°11'26.4" | 442 Lotzgesell |
| 12 | DDW12 | Dungeness District | Wetland. Unlikely any reaches Dungeness Bay since qty is small (0-.03 cfs) and runs through wetland first. | 48°08'02.7" | 123°07'10.3" | 4041 Dungeness Highway |
| 13 | DDW13 | Dungeness District | Meadowbrook Creek | 48°08'27.9" | 123°07'25.3" | 4382 Dungeness Highway |
| 14 | 30 Schmuck Rd | Highland | Groundwater. Unlikely any reaches Sequim Bay since it runs through a pond, a ditch, and a wetland first. | 48°04'54.5" | 123°03'25.3" | 30 Schmuck Road |
| 15 | 572 Wa. Harb. Rd | Highland | Groundwater. Unlikely any reaches Sequim Bay since it runs through a pond, a ditch, and a wetland first. | 48°04'53.4" | 123°03'44.5" | 572 Washington Harbor Road |
| 16 | HW2 | Highland | Johnson Creek | 48°03'14.6" | 123°03'59.3" | Happy Valley/Huffman Rd |
| 17 | HW3 | Highland | Johnson Creek. Small discharge qty (0-0.03 cfs). | 48°03'55.8" | 123°02'44.2" | John Wayne Marina |
| 18 | HW4 | Highland | Wetland. Unlikely any reaches Sequim Bay since it runs through a wetland first. | 48°04'16.1" | 123°03'04.5" | 1794 West Sequim Bay Rd |

**Table 2-2 (cont.)**
**Tailwater Sites**

| No. | Site No. | District/ Company | Waterbody Discharged To | Latitude | Longitude | Location Description |
|---|---|---|---|---|---|---|
| 19 | 189 Coulter Rd | Sequim-Prairie Tri-Irrigation | Wetland. Unlikely any reaches Sequim Bay since it runs through a wetland first. | 48°05'46.0" | 123°03'05.4" | 189 Coulter Road Reservoir |
| 20 | EW1 | Sequim-Prairie Tri-Irrigation | Gierin Creek | 48°05'35.9" | 123°05'56.2" | 981 Gierin Creek Lane |
| 21 | Gates Farm | Sequim-Prairie Tri-Irrigation | Groundwater. Unlikely any reaches Strait of Juan de Fuca since it runs through a wetland and a ditch first. | need | need | Gates Farm |
| 22 | SW10 | Sequim-Prairie Tri-Irrigation | Groundwater. Unlikely any reaches Cassalery Creek since it runs through a ditch first and the ground is very porous. | 48°06'51.6" | 123°06'07.9" | Dungeness Highway/ Evans Road |
| 23 | SW7 | Sequim-Prairie Tri-Irrigation | Strait of Juan de Fuca | 48°05'51.3" | 123°02'52.3" | Marlyn Nelson Park at Port Williams, SW7 |
| 24 | SW8 | Sequim-Prairie Tri-Irrigation | Gierin Creek | need | need | Graysmarsh |
| 25 | SW9 | Sequim-Prairie Tri-Irrigation | Gierin Creek | 48°05'44.4" | 123°05'43.6" | 301 Port Williams Road |

Water is also discharged from the DWUA irrigation system at other sites to streams during storm events or to deliver water to downstream users. While that discharge could be defined as tailwater, for the purposes of this Plan, it is described as stormwater and conveyance water. Sections 2.2.6 and 2.2.7 describe the locations of those other discharges.

Table 2-2 details the receiving body for each tailwater discharge. Table 2-3 shows how many tailwaters discharge into each type of receiving body as follows: seven to streams or rivers, four to wetlands, six to saltwater, and eight to groundwater. Groundwater is considered the receiving body when the volume of tailwater is so small and/or there is a long unmaintained stretch of ditch past the point where the tailwater is measured, so that tailwater essentially does not reach a surface waterbody.

Table 2-3
Type of Tailwater Receiving Body

| Type of Receiving Body | | Qty |
|---|---|---|
| Stream/River | | 7 |
| Wetland | | 4 |
| Saltwater | | 6 |
| Groundwater | | 8 |
| | **Total** | **25** |

Tailwater discharges measurements are taken just past the last water user. Discharges are monitored on a daily basis, recorded by the DWUA on at least a weekly basis and compiled in an annual flow report. The annual flow reports summarize diversions, Dungeness River flow, tailwater, and percentage of diversions to Dungeness River flow, percentage of tailwater to diversions, changes in irrigated land, improvements to systems and other relevant information. A comparison of tailwater quantities to DWUA diversions is shown on Exhibits 2-8 through 2-10 for 1996, 1999 and 2000. The quantity of tailwater has declined slightly over that time-period and it is currently about 8 cfs during peak operations.

### 2.2.6 Release of Stormwater into Creeks

Two irrigation districts occasionally release water from canals into creeks due to overloading of their canals by stormwater. Agnew and Highland Irrigation Districts both receive large quantities of stormwater in their systems since they are located in hilly terrain. Other districts and companies do not have this problem since they are located in flat terrain and can operate their headgates to minimize the effect of stormwater. The stormwater received by Agnew primarily runs off forestlands, while the stormwater received by Highland runs through primarily residential areas. When the amount of combined stormwater and irrigation water in the ditch exceeds the capacity of the ditch, the district releases water to a nearby creek. Agnew spills into Bear Creek near Taylor Rd, Cassidy Creek (a tributary to McDonnell Creek), Matriotti Creek, and McDonnell Creek. Highland spills into Bell Creek. The volume of collective spilled water is approximately 35 cfs during rainstorms.

**Exhibit 2-8**
**Comparison of Diversions and Tailwater - 1996**

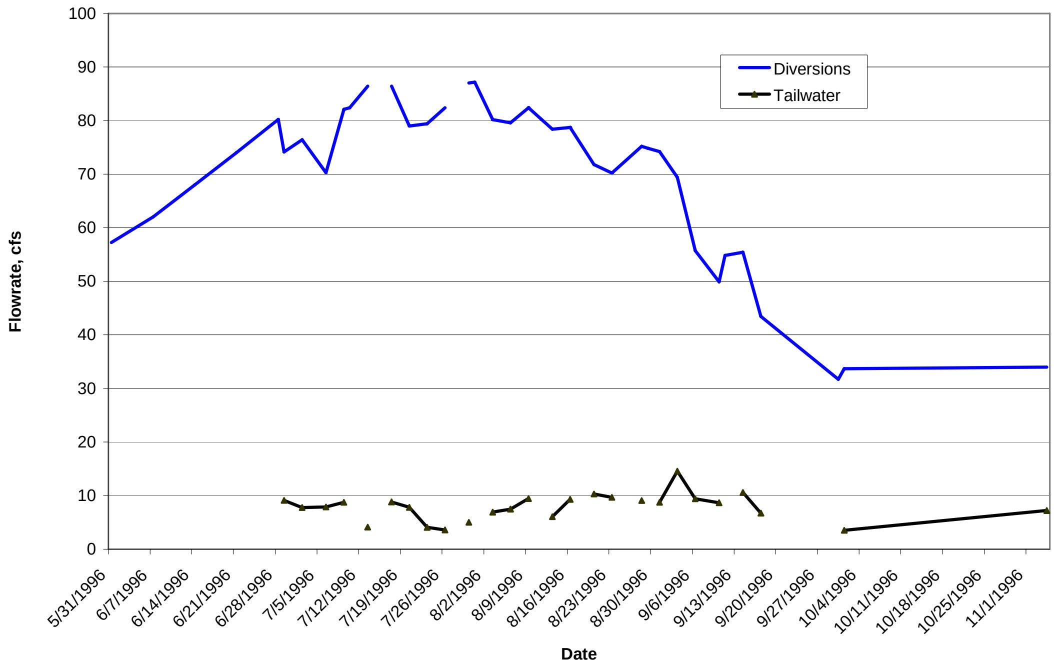



**Exhibit 2-9**
**Comparison of Diversions and Tailwater - 1999**

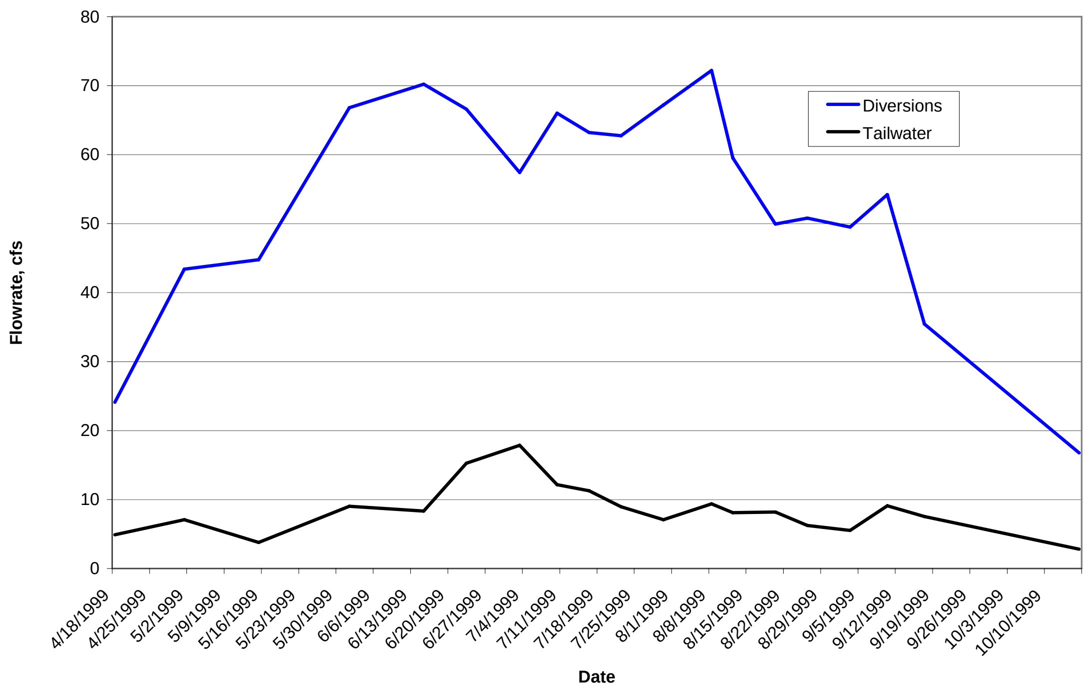
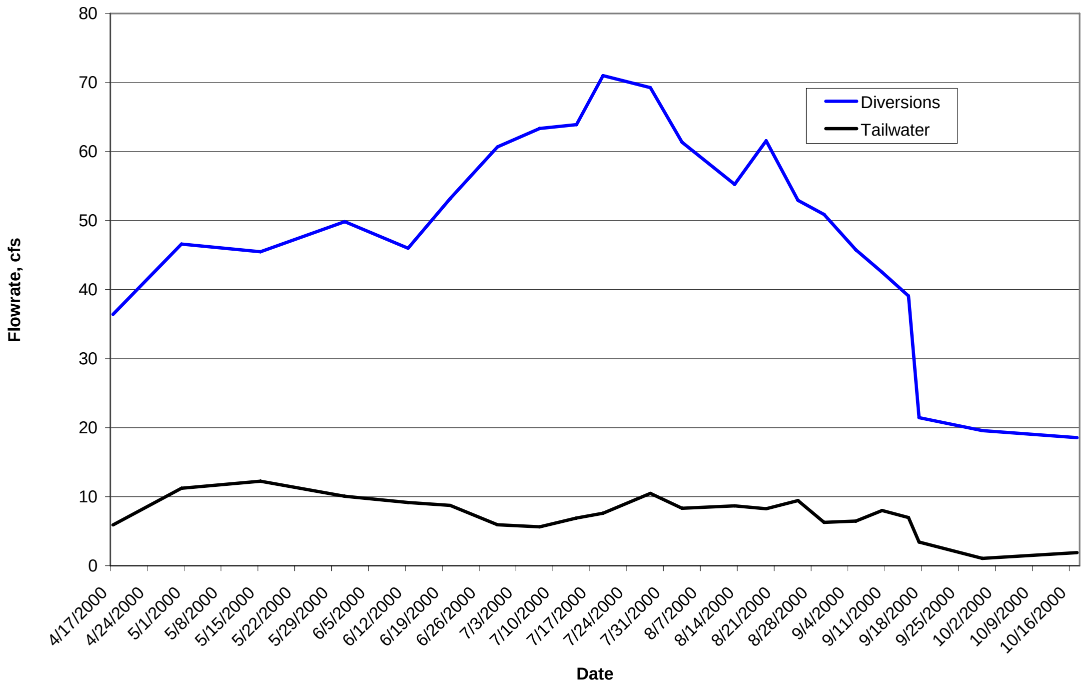


**Exhibit 2-10**
**Comparison of Diversions and Tailwater - 2000**




The need for this practice varies. During wet years it can occur up to twice a year, yet during dry years it may not occur at all. It typically occurs during the non-irrigation season, as a result of heavy rainfall or rain-on-snow events that generate runoff. At this time of year, there is little irrigation water flowing through the canals, while natural creeks are already flowing at relatively high levels because of increased runoff. Much of the water released would have entered natural waterways anyway, if the irrigation system were not in place.

### 2.2.7 Conveyance in Natural Stream Channels

The DWUA uses McDonnell, Agnew, Bear (direct Dungeness tributary), Bear (indirect Dungeness tributary), Hurd, Bell, and Gierin Creeks for conveyance of irrigation water. Matriotti Creek was used in the past for conveyance, but this activity is no longer practiced. Use of streams for conveyance is allowed by State law at Chapter 90.03.030 RCW which states, in part, “any person may convey any water which he or she may have a right to use along any of the natural streams.”

McDonnell Creek is used for conveyance by Agnew Irrigation District during the irrigation season. Water is originally diverted from the Dungeness River and enters Agnew’s Main Canal. Water is spilled into McDonnell Creek at river mile 4.7. The volume of water involved is approximately 0.5-2.5 cfs. It is conveyed 1.5 miles down to river mile 3.2, which is just south (upstream) of Hwy 101. There water is diverted into an intake channel. Agnew Irrigation District also has a water right for diversion of McDonnell Creek flows, as distinct from the Dungeness River water conveyed off the Main Canal.

Agnew Creek is used for conveyance by Agnew Irrigation District. Water is originally diverted from the Dungeness River and continues down the Agnew's Main Canal into Agnew's ditch system. Water is spilled (up to approximately 4.0 cfs during the peak irrigation season) into Agnew Creek about one quarter mile west of McDonnell Creek. Individual irrigators then divert the spilled water via screened pumps. There are currently approximately 10 of these pumps, all north of Highway 101. The DWUA does not perform any maintenance operations on Agnew Creek.

Bear Creek (the direct Dungeness tributary) is used for conveyance by Agnew Irrigation District. Water is originally diverted from the Dungeness River into the Agnew's Main Canal. Water is spilled (approximately 0.25 to 1.0 cfs) into Bear Creek near Taylor Cutoff Road. Individual irrigators then divert the spilled water by screened pumps. The DWUA does not perform any maintenance operations on Bear Creek.

Bear Creek (the indirect Dungeness tributary via Matriotti Creek) is used for conveyance by Agnew Irrigation District. Water is originally diverted from the Dungeness River and continues down the Agnew's Main Canal into Agnew's ditch system. Water is spilled (approximately 0.5 to 1.5 cfs) into Bear Creek near Parrish Road and Kitchen Road. Individual irrigators then divert the spilled water by screened pumps. The DWUA does not perform any maintenance operations on Bear Creek.

A reach of Hurd Creek is used for conveyance by the Dungeness District. Water is originally diverted from the Dungeness River at the Sequim-Prairie diversion. A lateral off the main Dungeness District canal occupies what may have been an upstream reach of Hurd Creek that was diverted to irrigation use. The lateral forks back to the main canal. Just downstream of the fork, the present Hurd Creek starts. It is not known if the lateral occupies a channel that was a reach of the creek or just an ephemeral channel that led to the creek.

Bell Creek is used for conveyance by Highland Irrigation District. Water is originally diverted from the Dungeness River and continues down the Highland Main Canal into Highland's ditch system. Water is spilled (up to approximately 1.5 cfs) into Bell Creek at River Mile 1.8 near where the ditch crosses 5$^{th}$ Avenue. Currently, two individual irrigators divert the spilled water by screened sump pumps on the creek bank. The DWUA does not perform any maintenance operations on Bell Creek.

Gierin Creek is used for conveyance by Sequim-Prairie Tri-Irrigation Company. Water is originally diverted from the Dungeness River and continues down through the company's ditch system. Approximately 0.3 cfs is spilled into Gierin Creek. Individual irrigators then divert the spilled water by screened pumps. The DWUA does not perform any maintenance operations on Gierin Creek.

### 2.2.8 Water Use Efficiency

The 1999 CWCP contained analyses of water use efficiencies based upon acreage irrigated in 1996 and the flow records in 1996. Table 2-4 summarizes those calculations. Current efficiencies are higher than reported in 1999, since the DWUA continued to implement water conservation measures.

**Table 2-4**
**DWUA Combined Losses and Conveyance Efficiencies for 1996**

| Estimated Flow Parameter | Month | | | | |
|---|---|---|---|---|---|
| | May | Jun | Jul | Aug | Sep |
| Diverted (cfs) | 70.5 | 79.9 | 82.6 | 78.6 | 53.2 |
| Tailwater and Spill Losses (cfs) | 17.6 | 17.2 | N/A | 12.1 | 12.7 |
| Water Supplied (cfs) | 52.9 | 62.7 | N/A | 66.4 | 40.5 |
| Crop Irrigation Requirement (cfs) | 12.2 | 28.8 | 37.1 | 27.7 | 18.2 |
| On-Farm Losses (cfs) | 6.6 | 15.5 | 20.0 | 14.9 | 9.8 |
| Conveyance Losses (cfs) | 34.1 | 18.4 | N/A | 23.9 | 12.4 |
| Conveyance Efficiency (percent) | 52 | 77 | N/A | 70 | 77 |
| Project Efficiency (percent) | 27 | 55 | N/A | 43 | 53 |

N/A - Sufficient data not available to allow computation of parameter.
Source: CWCP (MWG, 1999)

## 2.3 Facilities of Individual Irrigation Districts and Companies

To serve the irrigated acreage within the Action Area, an extensive network of irrigation canals and laterals is required. Canals are larger than laterals and collectively they are called ditches. Table 2-5 summarizes the length of canals and laterals within the irrigation systems. By the end of 2003, a total of 118 miles of open canal and lateral existed in the systems, as well as about 54 miles of closed piped canal and lateral. The lengths were obtained from a field assessment and mapping of the irrigation system performed in 1996 for the CWCP and then updated through 2003 based on completed pipelining projects since then. Section 6.1 describes the piping projects completed. Approximately 20 miles of open ditch has been replaced between 1996 and 2003. Exhibit 2-6 provides a general map of the irrigation facilities showing the location of the diversions, canals, laterals and tailwater.

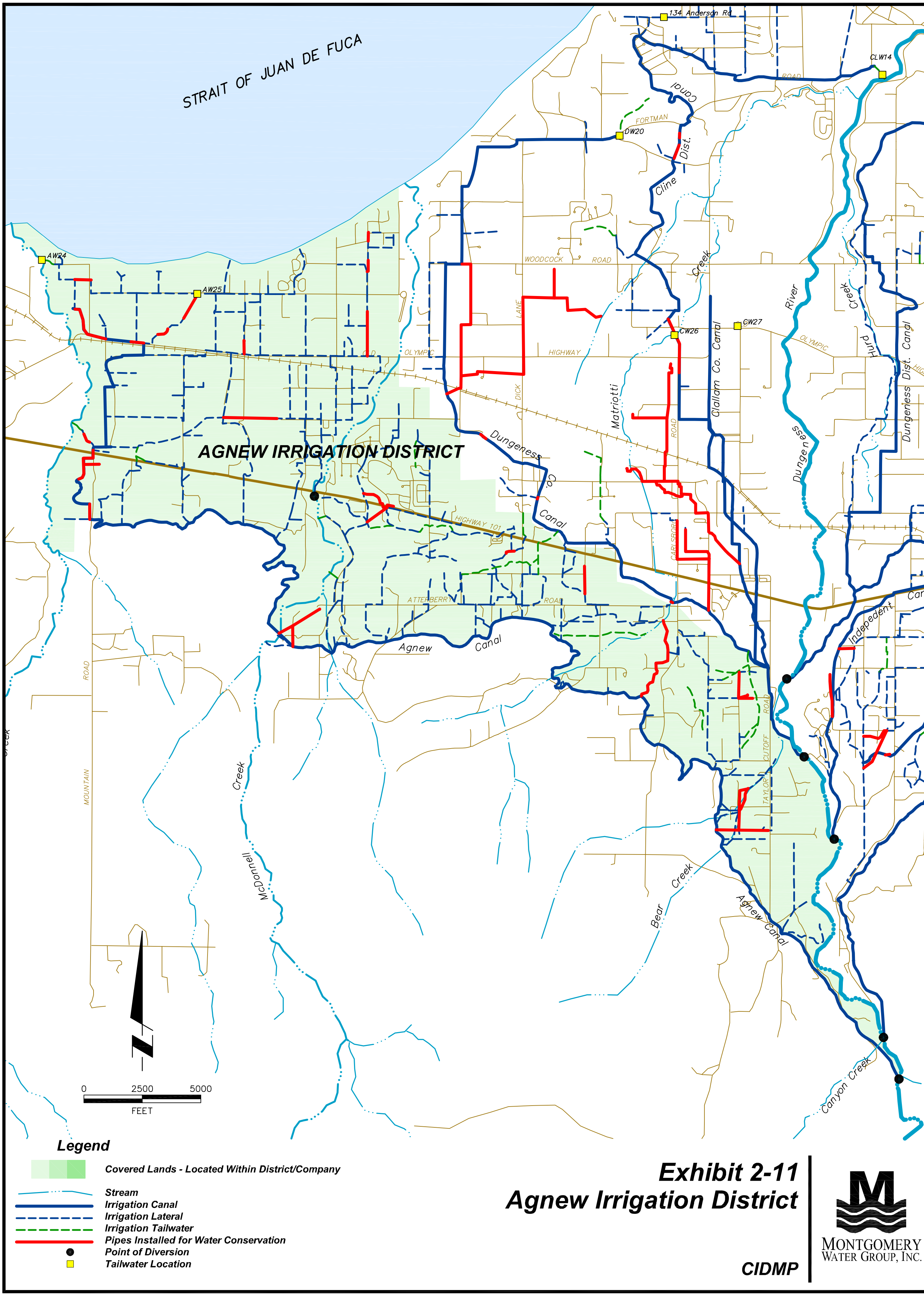
**Table 2-5**
**Summary of District Irrigation Facilities**

| Company / District | Length of Canals (ft) | | Length of Laterals (ft) | | Number of Turnouts | | |
|---|---|---|---|---|---|---|---|
| | Open | Piped | Open | Piped | Domestic | Agricultural | Stock |
| Agnew District | 74,410 | 6,440 | 200,100 | 53,330 | 248 | 54 | 20 |
| Clallam Company | 18,550 | 2,080 | 24,350 | 1,870 | 23 | 21 | 1 |
| Cline District | 39,620 | 7,580 | 21,390 | 15,750 | 25 | 22 | 1 |
| Dungeness Company | 38,260 | 960 | 29,410 | 4,500 | 4 | 28 | 1 |
| Dungeness District | 27,530 | 3,410 | 18,890 | 1,730 | 15 | 19 | 2 |
| Highland District | 33,690 | 940 | 86,200 | 59,880 | 160 | 39 | 6 |
| Sequim - Prairie Tri-Irrigation Company | 65,340 | 7,170 | 50,800 | 17,380 | 52 | 27 | 1 |
| **Totals in Feet (1996)** | **297,390** | **28,590** | **431,150** | **154,450** | **527** | **210** | **32** |
| **Totals in Miles (1996)** | **56.3** | **5.4** | **81.7** | **29.3** | | | |
| **Totals in Miles (2003)** | **53.8** | **7.9** | **64.5** | **46.5** | | | |

Source: CWCP (MWG, 1999). Summary of 1996 canal and lateral lengths.

### 2.3.1 Agnew Irrigation District

The Agnew Irrigation District supplies water to 1,561 acres (1,274 acres agricultural, 287 acres domestic/residential). It has 52 miles of open canal and lateral, and 11.3 miles of pipeline. The maximum average daily diversion in year 2000-2002 was approximately 21 cfs measured downstream of their fish screen. There are two tailwater discharge sites with a combined discharge of approximately 2 cfs. Exhibit 2-11 presents the entire Agnew system showing locations of open ditches, closed pipes, the point of diversion and tailwater locations.




# Exhibit 2-11
# Agnew Irrigation District

MONTGOMERY WATER GROUP, INC.

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***Dungeness River Diversion Facilities***

The Agnew Irrigation District diverts from the west side of the Dungeness River through a shared diversion with WDFW. The diversion is located at River Mile 11.2, the most upstream irrigation diversion on the Dungeness River. Exhibit 2-12 shows the location of the diversion, the intake canal, return flow canal and fish screen on an aerial photo. Exhibit 2-13, is a photograph taken at the point of diversion looking up the Dungeness River.

**Exhibit 2-13**
**Agnew/WDFW Shared Diversion on the Dungeness River**

The Agnew intake at the Dungeness River is shared with the WDFW fish hatchery's intake. The WDFW holds two water rights for diversion from the Dungeness River at that point with a total quantity of 40 cfs. The Agnew/WDFW diversion withdraws water and conveys it a short distance to a gate structure, which controls the flow to two locations. Those locations are a hatchery water supply and a 2,100 ft long, 54-inch pipe that conveys water to the fish screen. The hatchery water supply is screened and the flow into the pipeline is not. The fish screens are also shared as water is diverted downstream of the fish screens to the hatchery. Exhibit 2-14 provides more detailed information on the configuration of the shared diversion facilities.

The WDFW operates the shared facilities through an agreement with the Agnew Irrigation District. This document does not describe in detail the operation and maintenance practices of the shared facilities by WDFW. WDFW is currently studying the feasibility of improving the diversion and fish screen facilities by moving the fish screens closer to the Dungeness River. That study was underway at the time this report was prepared.

Exhibit 2-15 shows the shared fish screen facilities. Exhibit 2-16 shows the monitoring flume on the Agnew main canal located just downstream of the fish screens. The monitoring flume records and reports the quantity of water diverted by Agnew Irrigation District.

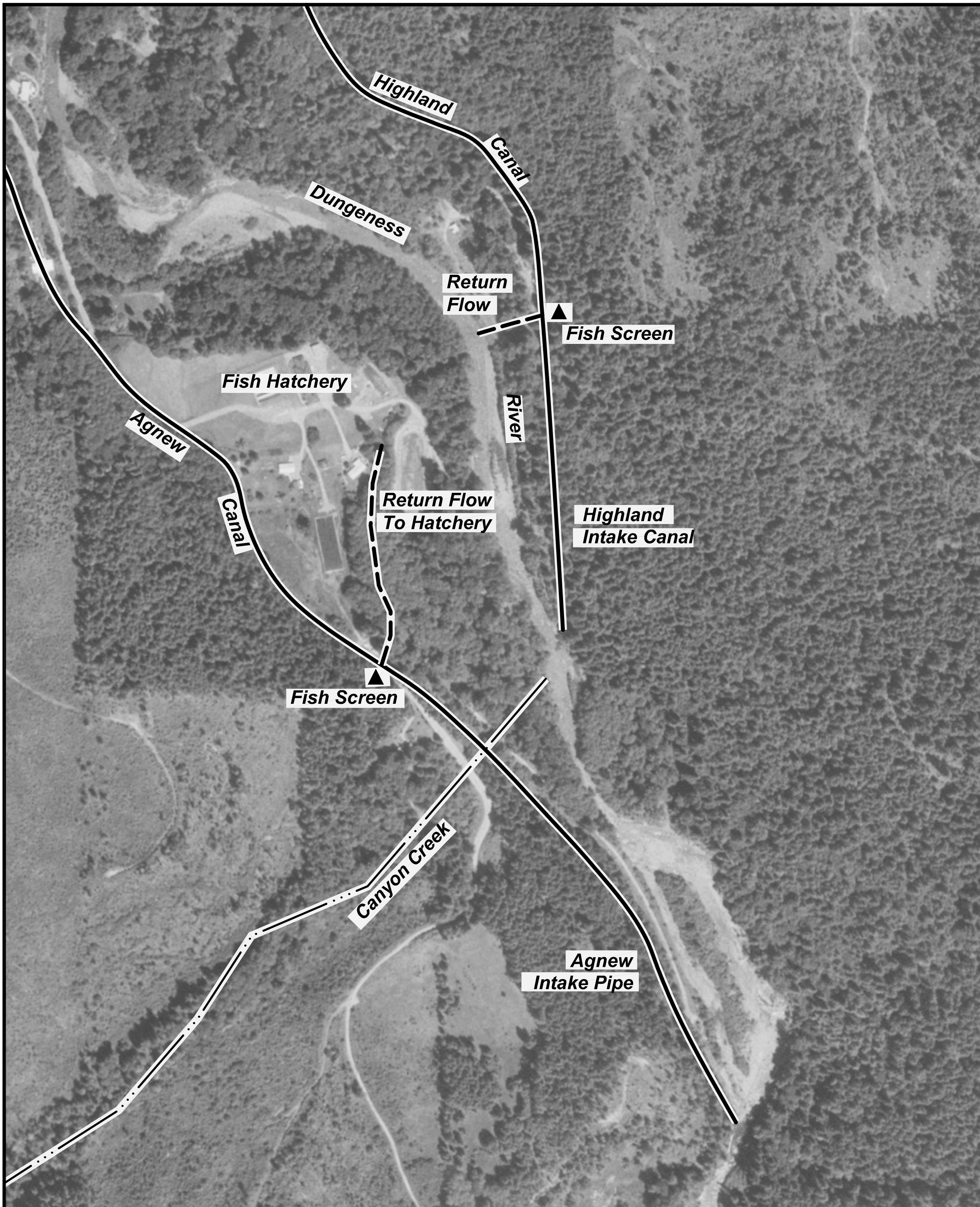


*Photo date: 1996*

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*See Exhibit 2-13 for more detailed map of Agnew and WDFW Hatchery system.*

## Exhibit 2-12
## Agnew and Highland Diversions
## Dungeness River

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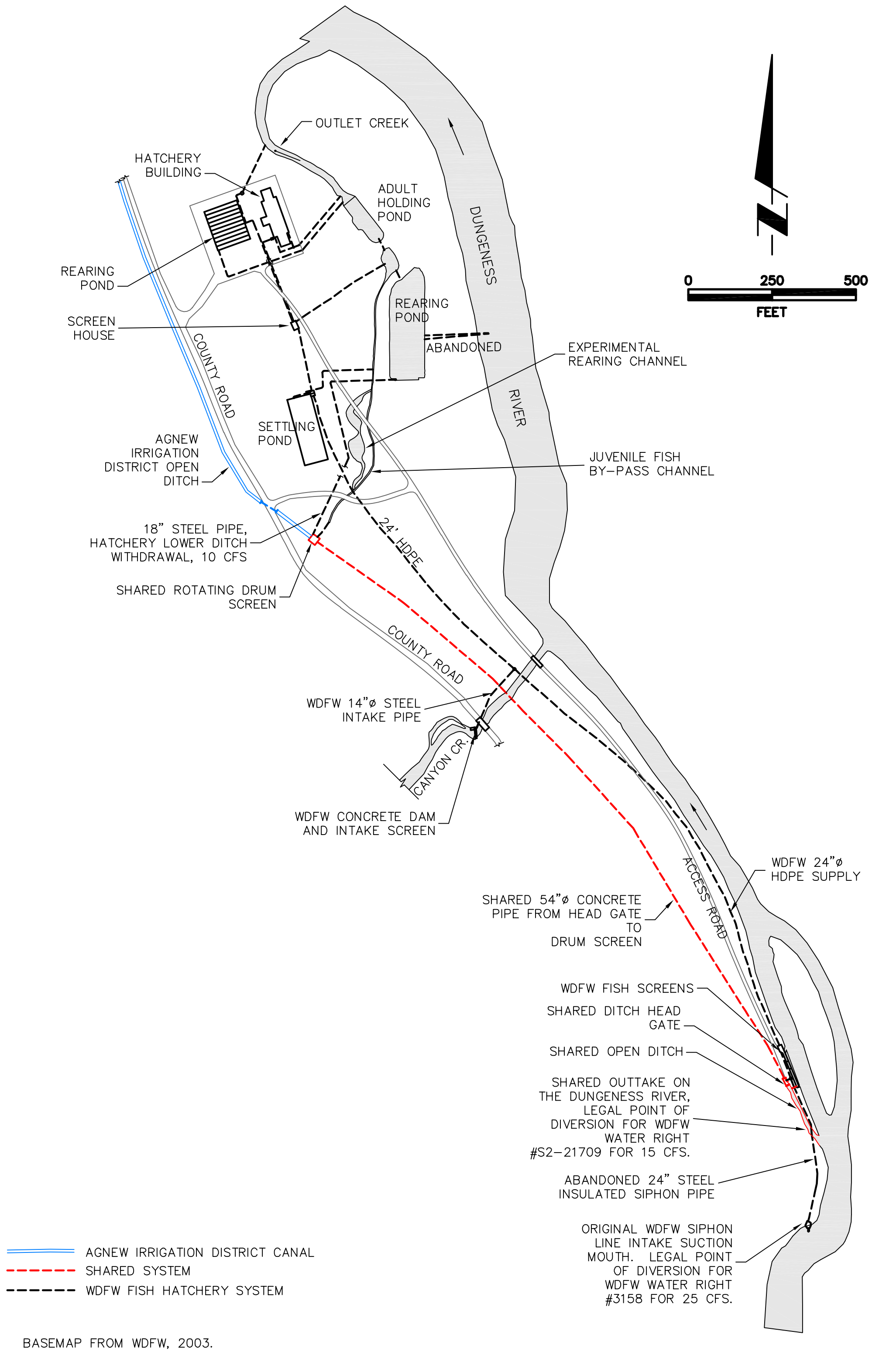


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**Exhibit 2-14**
**Agnew and WDFW Fish Hatchery Diversion Structures**

**CIDMP**

MONTGOMERY WATER GROUP, INC.

**Exhibit 2-15**
**Agnew/WDFW Shared Fish Screens**

**Exhibit 2 -16**
**Agnew Flow Monitoring Flume**

### *McDonnell Creek Diversion Facilities*

As discussed in Section 2.2.3, Agnew Irrigation District also has a diversion on McDonnell Creek at River Mile 3.2. The District holds a 5 cfs water right for diversion from McDonnell Creek, and also uses the creek channel to convey Dungeness River water from the Agnew Main Canal to the diversion point. Approximately 20-25% of the Agnew Irrigation District is served with water from the McDonnell Creek diversion.

The District operates a small diversion dam on the creek located just south (upstream) of Hwy 101 to divert the conveyed water and McDonnell Creek flow. A concrete dam with a steep-pass fish ladder is located on McDonnell Creek at the point of diversion. The fish ladder is closed during the summer when all flows are directed to the fish screen and bypass channel or irrigation ditch. This seasonal closure is necessary to maintain pool height behind the dam in order to divert water into the irrigation system and to efficiently operate the fish bypass system. Flow is diverted from the dam into a short canal and to a fish screen facility. A rotating drum screen and fish bypass pipe prevents fish from entering the canal. Exhibit 2-17 shows the location of these features. Exhibits 2-18 though 2-20 show McDonnell Creek at the diversion dam, the fish screen facilities, and the fish bypass pipe. Additional discussion of these facilities, and possible alterations that could be considered in the future, are presented in Section 6 of this CIDMP.

**Exhibit 2-18**
**Agnew Diversion Dam and Fish Ladder on McDonnell Creek**

Maintenance for the McDonnell Creek diversion facilities is the same as for other diversion facilities as described in Section 2.4 except for the following. Maintenance of the diversion intake (the dam) does not require heavy equipment in the creek and generally does not require the rearrangement or removal of gravel or sediment. Sediment removal has only been required twice since the construction of the dam in 1983. Both of those instances were due to abnormally high peak flows.


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## Exhibit 2-17
## Agnew Diversion
## McDonnell Creek

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WATER GROUP, INC.

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**Exhibit 2-19**
**Agnew Fish Screen at McDonnell Creek**

**Exhibit 2-20**
**Agnew Fish Bypass Pipe on McDonnell Creek**

## 2.3.2 Clallam-Cline-Dungeness (CCD)

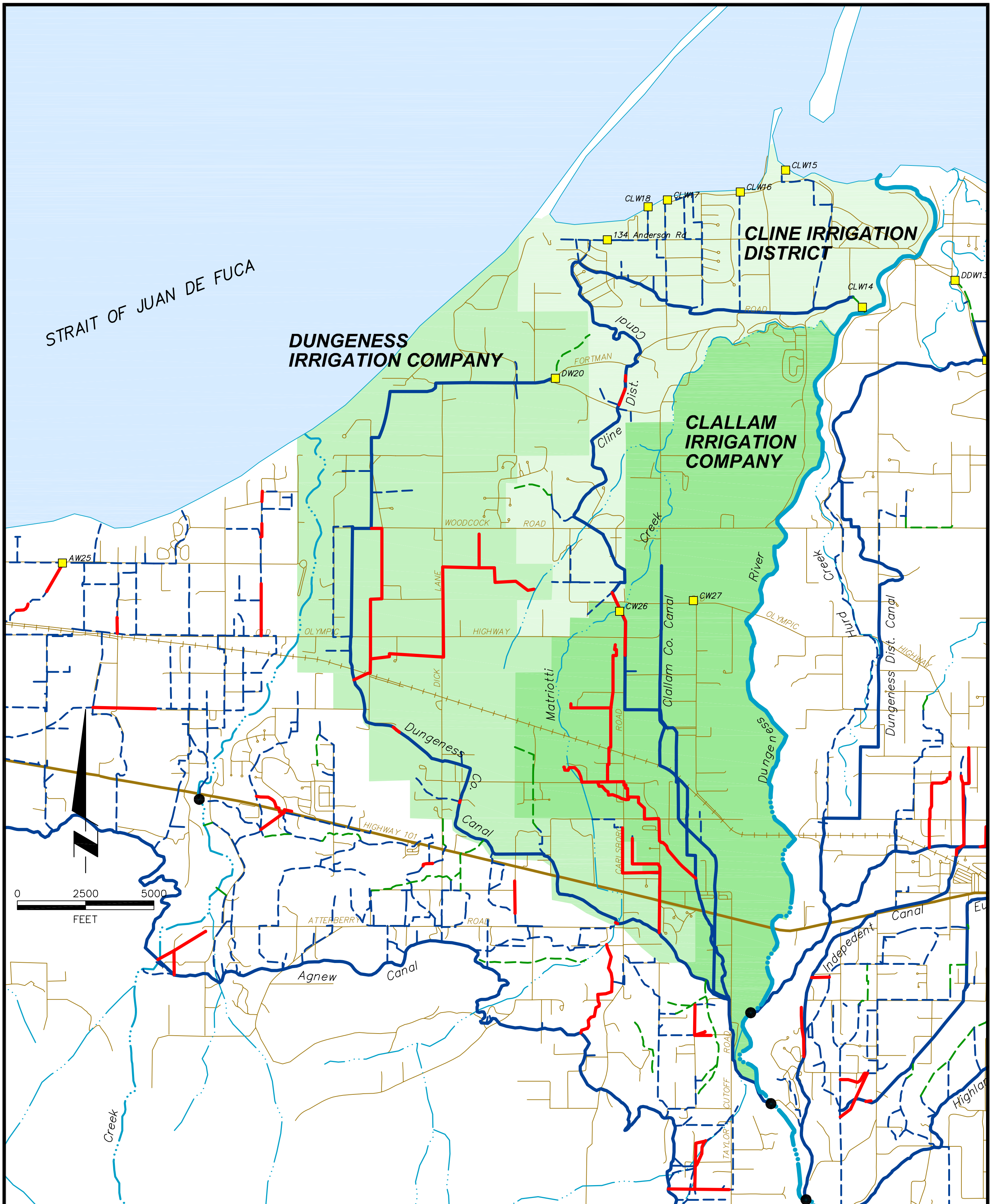
The Clallam, Cline and Dungeness irrigation districts and companies share diversion facilities. The Clallam Irrigation Company serves 392 acres (343 acres agricultural, 49 domestic), the Cline Irrigation District serves 438 acres (413 acres agricultural, 25 domestic) and the Dungeness Irrigation Company serves 662 acres (653 acres agricultural, 9 domestic). Combined, the three entities have 32.5 miles of open canal and lateral and 6.2 miles of piped canal and lateral. The maximum diversion in 2001 was approximately 19 cfs. The tailwater flow is approximately 3.5 to 4 cfs. The Clallam Company has two tailwater locations, the Cline Irrigation District has six tailwater locations, and the Dungeness Company has one tailwater locations. Exhibit 2-21 presents the entire CCD system showing locations of open ditches, closed pipes, the point of diversion and tailwater locations.

**Exhibit 2-23**
**CCD Intake Structure**

The CCD diversion is located at River Mile 8.0, located on west bank of Dungeness River.

The intake structure is a concrete box with a bar rack situated in the bank armored with riprap. Exhibit 2-22 shows the location of the diversion, the intake canal, return flow canal and fish screen on an aerial photo. Exhibit 2-23 shows the intake structure, which is on the left bank of the Dungeness River.

The intake and fish screen structures were replaced in the mid-1990s. The fish screens are flat-plate screens designed by WDFW. Exhibits 2-24 and 2-25 show the fish screen and the CCD measuring flume.




## Exhibit 2-21
## Clallam, Cline, Dungeness Irrigation Facilities

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**Exhibit 2-24**
**CCD Fish Screens**

**Exhibit 2-25**
**CCD Measurement Flume**

## 2.3.3 Highland Irrigation District

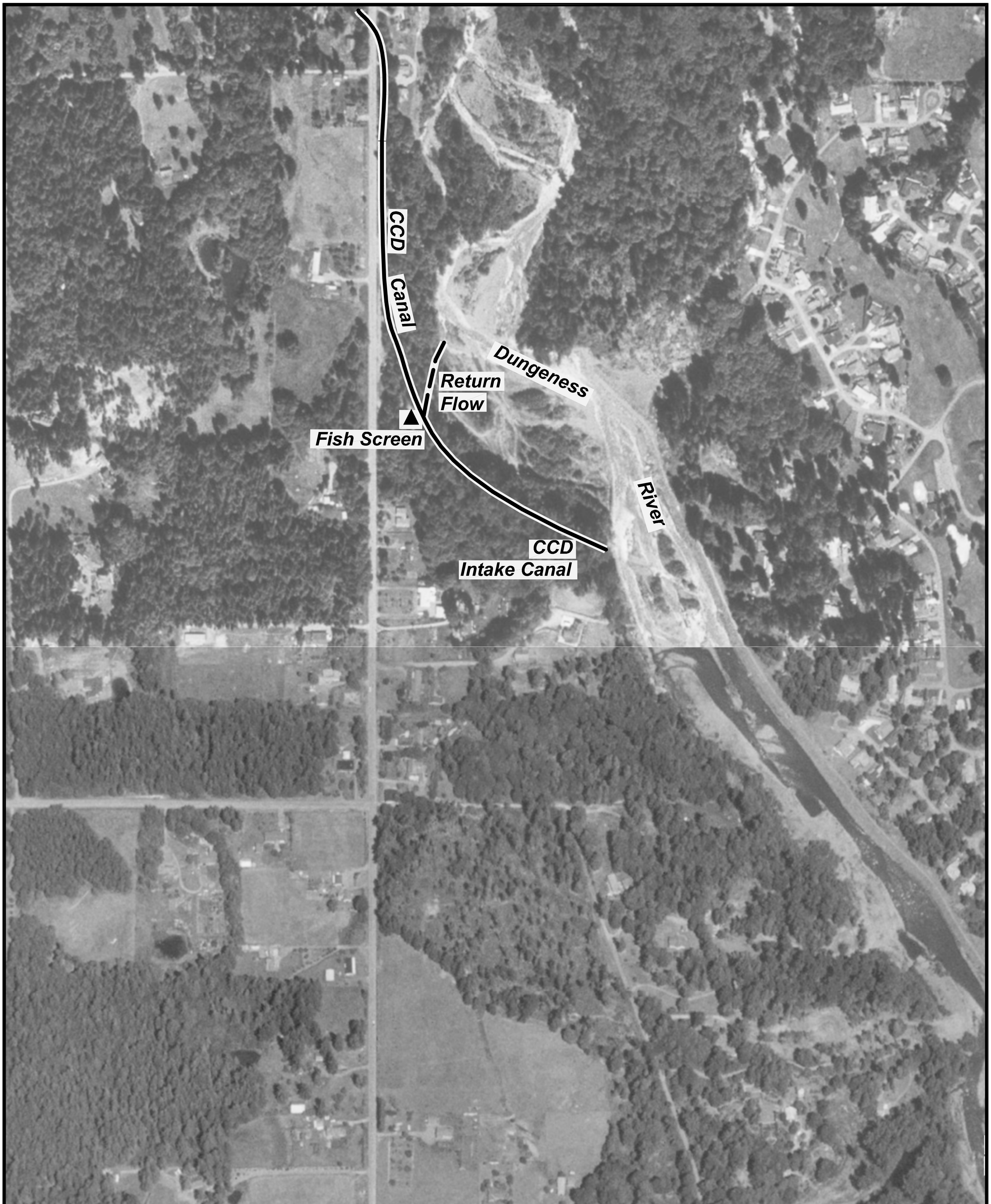
The Highland Irrigation District supplies water to a total area of 995 acres, 830 in agricultural use and 165 in domestic/residential use. It has 22.7 miles of open canal and lateral and 11.5 miles pipeline. The maximum diversion in year 2001 was approximately 17 cfs. There are five tailwater discharge sites with a combined discharge of approximately 2 cfs. Exhibit 2-26 presents the entire Highland system showing locations of open ditches, closed pipes canals, the point of diversion and tailwater locations.

The Highland Irrigation District diversion is located at River Mile 10.9. The intake is located on a side channel of Dungeness River. Exhibit 2-12 shows the location of the diversion, the intake canal, return flow canal and fish screen on an aerial photo. Exhibit 2-27 shows the intake structure. The structure is a reinforced concrete structure with underflow (sluice) gates. The intake structure and inlet channel are armored with rock riprap to prevent erosion of the river bank and prevent migration of the side channel into the intake channel.

**Exhibit 2-27**
**Highland Intake Structure with Underflow Gates**

**Exhibit 2-28**
**Highland Intake Looking Downstream of Gates**

Exhibit 2-28 shows a close-up of the downstream part of the intake structure where water enters the intake channel from the underflow gates.

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## Exhibit 2-22
## Clallam, Cline, Dungeness Diversion
## Dungeness River

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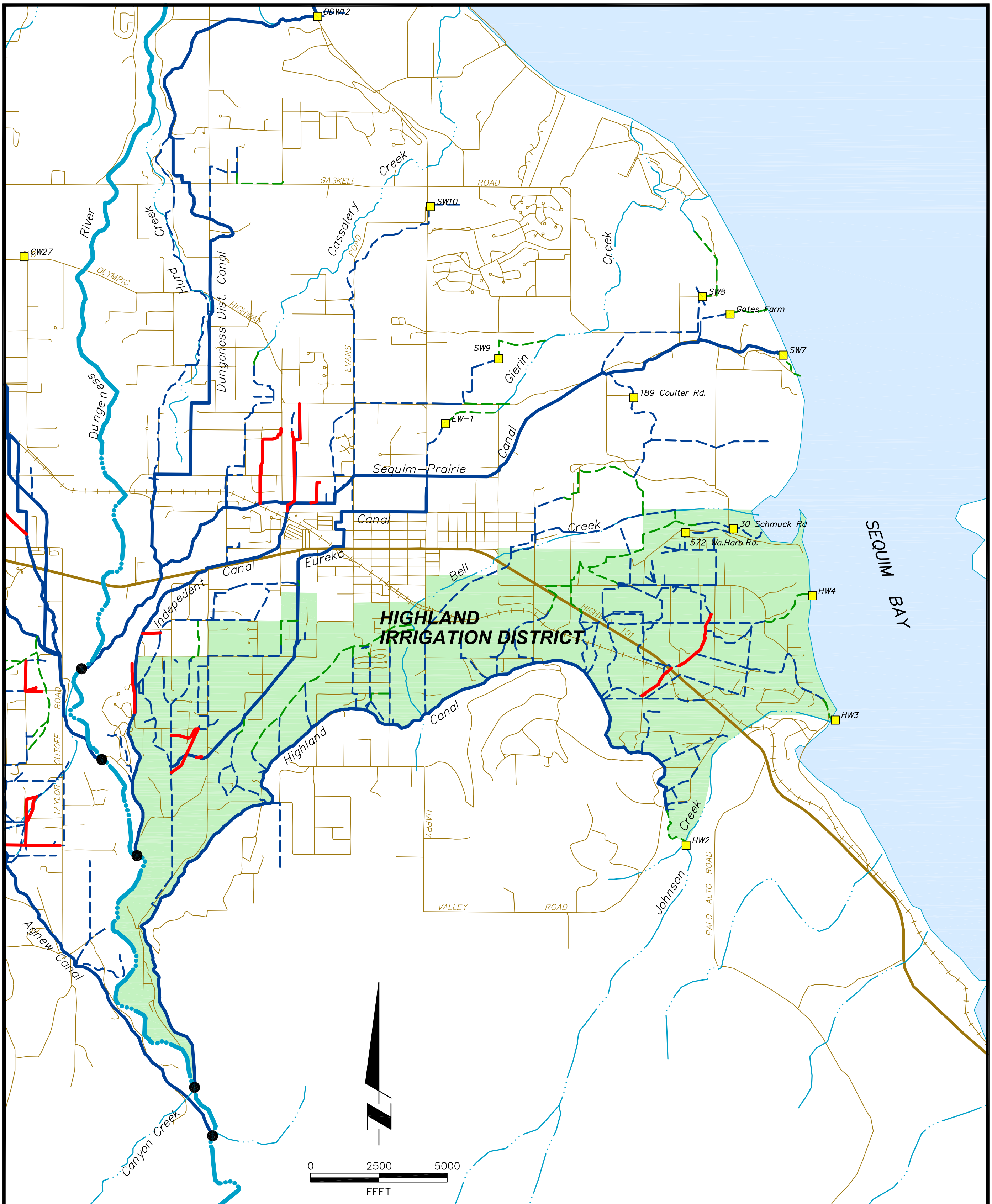



**Legend**

- Covered Lands - Located Within District/Company
- Stream
- Irrigation Canal
- Irrigation Lateral
- Irrigation Tailwater
- Pipes Installed for Water Conservation
- Point of Diversion
- Tailwater Location

# Exhibit 2-26 Highland Irrigation District

**CIDMP**

MONTGOMERY WATER GROUP, INC.

**Exhibit 2-29**
**Highland Fish Screens**

**Exhibit 2-30**
**Highland Fish Screen**
**Return Flow Channel**

The Highland District has two rotating drum screens as shown in the Exhibit 2-29. A return flow channel directs fish back to the Dungeness River. The return flow channel, Exhibit 2-30, has been used by salmon to spawn in and water is released from the Highland canal to maintain a minimum flow in the return channel.

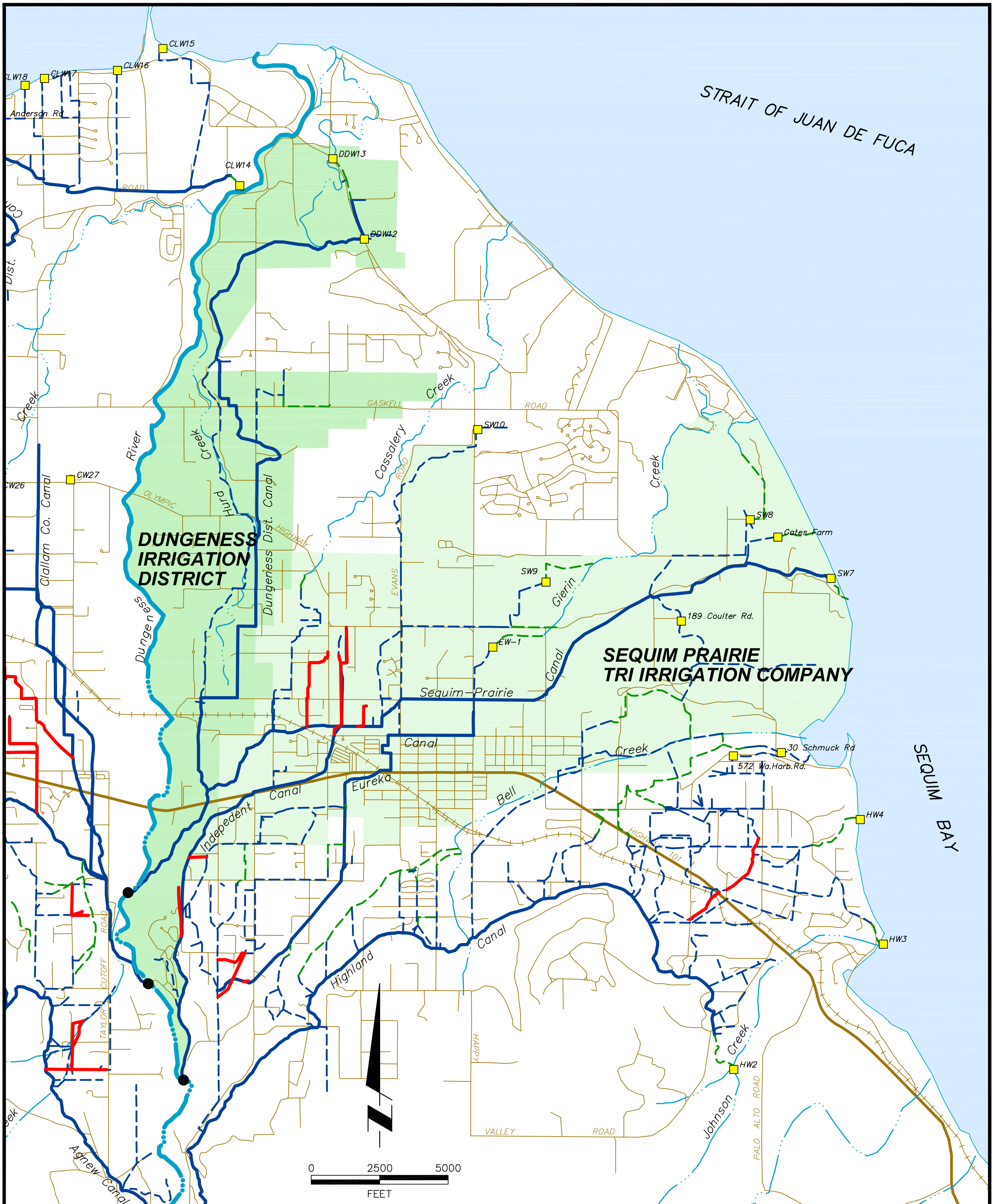
The Highland Irrigation District also supplies water to the Eureka Canal, which is part of the Sequim-Prairie Tri-Irrigation Company.

### 2.3.4 Sequim-Prairie Tri-Irrigation Company/Dungeness Irrigation District

The Sequim-Prairie Tri-Irrigation Company was formed by merging the Sequim-Prairie Ditch Company, the Eureka Irrigation Company, and the Independent Irrigation Company. The Sequim-Prairie Tri-Irrigation Company supplies water to approximately 1,268 acres, (1,028 acres in agricultural use and 240 in domestic/residential use) using the water rights associated with the three former irrigation companies. It has 22 miles of open canal and lateral, and 4.6 miles of pipeline. The maximum diversion in year 2001 was approximately 18 cfs. There are seven tailwater discharge sites with a combined discharge of approximately 2.5 cfs. Exhibit 2-31 presents the Sequim-Prairie Tri-Irrigation Company system, as well as the Dungeness Irrigation District system, showing locations of open ditches, closed pipes, points of diversions and tailwater locations. The Sequim-Prairie Tri-Irrigation Company system has three main canals named for the three prior irrigation companies which merged: The Sequim-Prairie canal, the Eureka canal, and the Independent canal.

The Sequim-Prairie Tri-Irrigation Company receives its water through two diversions, one for the Independent canal and another for the Sequim-Prairie canal. The Eureka canal receives some water via Highland Irrigation District.

The diversion for the Independent canal is located at RM 8.8 on the east bank and serves the former Independent Irrigation Company. The intake on the Dungeness River uses a push-up gravel berm to divert flow into a ditch when flow levels are low or when the main channel is not flowing against the east bank. Exhibit 2-32 shows the location of the diversion, the intake canal, return flow canal, and fish screen on an aerial photo. Exhibit 2-33 shows the intake channel off of the Dungeness River.




## Legend

- Covered Lands - Located Within District/Company
- Stream
- Irrigation Canal
- Irrigation Lateral
- Irrigation Tailwater
- Pipes Installed for Water Conservation
- Point of Diversion
- Tailwater Location

# Exhibit 2-31
# Sequim Prairie Tri Irrigation Co. and Dungeness Irrigation Dist.

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# Exhibit 2-32
# Independent Canal Diversion
# Dungeness River

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Flow is directed into a 2,000-foot long canal to a fish screen structure located at the south end of the Dungeness Meadows development. Exhibit 2-34 shows the fish screen structure. Exhibit 2-35 shows the return flow channel to the Dungeness River. The return flow water drops off the end of a road culvert near the fish screen structure.

The diversion for the Sequim-Prairie canal is located at RM 7.2 and serves the former Sequim-Prairie Irrigation Company.

**Exhibit 2-33**
**Independent Canal Intake Channel at Dungeness River**

The intake is located on side channel of Dungeness River (the Dawley side-channel). Exhibit 2-36 shows the location of the diversion, the intake canal, return flow canal and fish screen on an aerial photo. The intake channel is maintained at a slope flatter than the Dungeness River and is elevated above river level. Water returns to a side channel and the Dungeness River over a rock weir section and also through the fish screen bypass.

**Exhibit 2-34**
**Fish Screens on Independent Canal Diversion**

**Exhibit 2-35**
**Return Channel from Independent Canal Fish Screens**

Exhibit 2-37 shows the Dawley side channel (on the left) looking upstream as it splits from the mainstem Dungeness River (on the right). Exhibit 2-38 shows the Dawley side channel looking downstream into the channel. Exhibit 2-39 shows the intake channel upstream of the fish screen.

**Exhibit 2-37**
**Dawley Side Channel and Dungeness River**

**Exhibit 2-38**
**Dawley Side Channel**

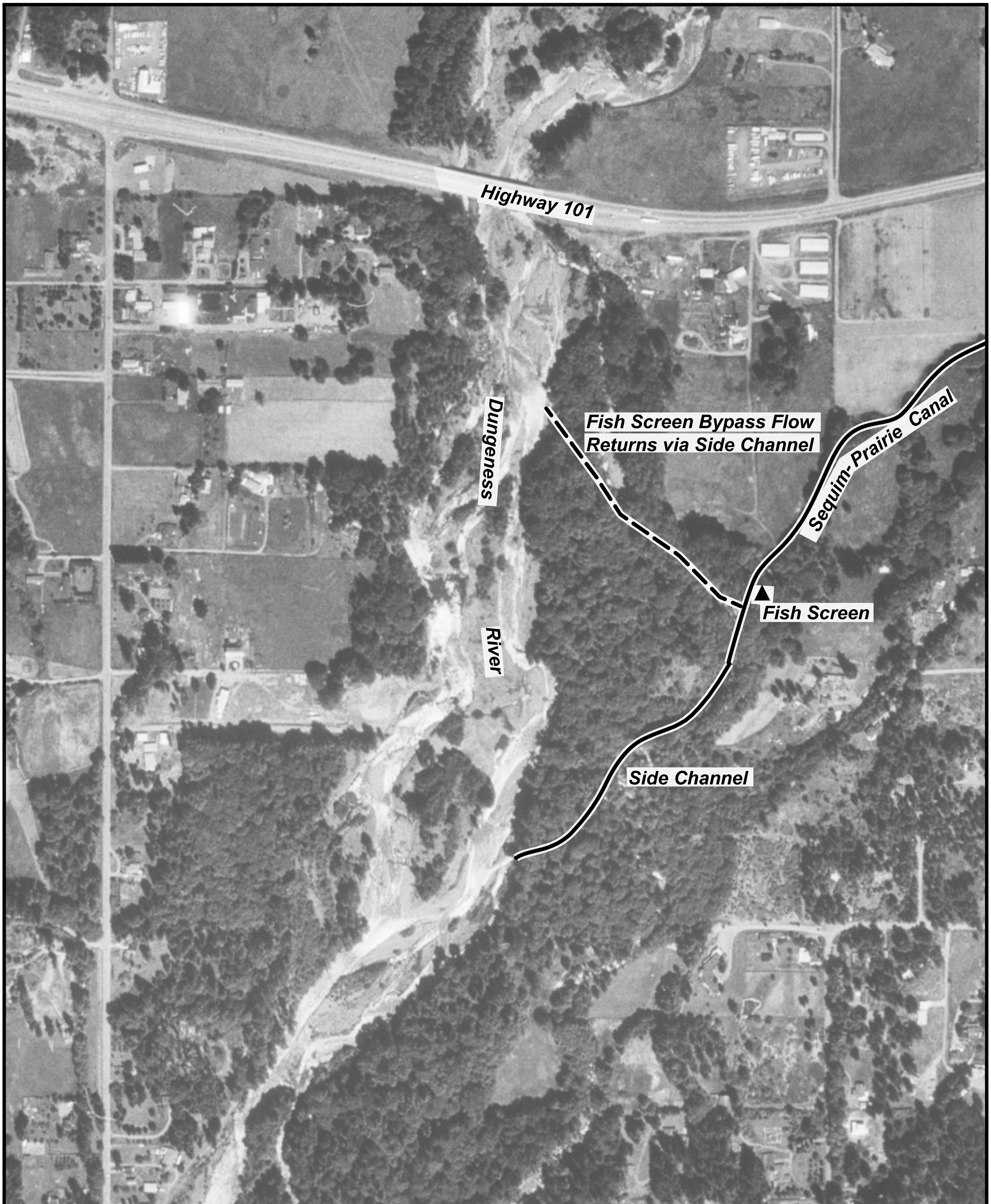


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**Exhibit 2-36**
**Sequim-Prairie Canal Diversion**
**Dungeness River**

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MONTGOMERY WATER GROUP, INC.

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The Dungeness Irrigation District shares the Sequim-Prairie canal intake with Sequim-Prairie Tri-Irrigation Company. The Dungeness Irrigation District supplies water to approximately 478 acres (463 acres agricultural, 15 acres domestic/residential). It has 8.8 miles of open canal and lateral, and 1 mile of pipeline. Tailwater is discharged in two locations. The tailwater discharge is approximately 0.3 cfs.

**Exhibit 2-39**
**Sequim Prairie Intake Canal Channel Upstream of Fish Screens**

**Exhibit 2-40**
**Sequim-Prairie Canal Fish Screen Structure**

## 2.4 Maintenance of DWUA Facilities

Maintenance of DWUA facilities is required to keep them operating effectively. Table 2-6 provides an overview of the type of maintenance performed for each facility. Maintenance generally falls into two categories: 1.) rearrangement or removal of gravel and/or sediment and 2.) control of nuisance vegetation that grows along ditch banks.

Table 2-6
Maintenance of DWUA Facilities

| DWUA Facility | Fish Present? | Heavy Equipment in Water? | Disturb Gravel and/or Sediment? | Vegetation Control? |
|---|---|---|---|---|
| Diversion intake | Yes | Yes | Yes | No |
| Intake channel | Yes | No | Yes | Yes |
| Headgate | Yes | No | No | No |
| Fish screen | Yes | No | No | No |
| Bypass channel | Yes | No | Yes | Yes |
| Canals and Laterals | No[1] | No | Yes | Yes |
| Conveyance Creeks | Yes | No | No | No |

(1) Juvenile fish may occasionally enter the canal system by bypassing screens, but are not normally present in the canal system.

Vegetation control, in and along the ditches and channels, is essential to the operation of the irrigation system for three reasons. First, plant growth impedes the efficient flow of water through the irrigation system. Second, bank side vegetation consumes water, thereby undermining purposes of the water conservation program. Third, plant growth provides cover for rodents which dig burrows in the ditch and channel banks. These burrows allow additional water losses.

The DWUA has an integrated pest management program for vegetation control which includes physical, mechanical, and chemical approaches. Vegetation control is performed on up to 30%

of the irrigation system each year. The DWUA uses the herbicide Rodeo, which is approved for aquatic use, but the DWUA presently only applies it to dry ditches. It is sprayed on vegetation, as well as spot applied to stumps. Spraying is typically done twice a year, once from March 15th to June 15th to deal with spring vegetation and again in mid-September to late October to deal with blackberry and salmonberry. Spraying is only done in approximately 30 miles of the 173 total miles of ditches in the irrigation system. Brushing includes the removal of woody debris through the use of mowers, weed eaters, machetes, and chainsaws. Burning uses a propane torch to ignite approximately a 20 foot flame trail, which is then controlled with shovels and water. A 100 gallon water tank is available for back-up safety. Burning is not used extensively because burn bans are often in effect.

Maintenance of diversion intakes consists of occasionally rearranging gravel in the Dungeness River. Riverbank stabilization features may also need to be repaired, but on a less frequent basis. Occasionally, water does not flow properly into diversion intakes due to shifts in river bed material that block the diversion intake or re-direct flow away from the diversion intake. These shifts in bed materials are caused by peak flow events, which are usually associated with winter rains and spring snow melt. However, shifts in bed material do not always block the diversion intake. The need for maintenance is not known until the low flow season. Therefore maintenance is usually performed during the low flow season.

The need to perform this maintenance is generally less than once a year per diversion intake. The DWUA usually has from several days to several weeks notice of this need and the work typically lasts for several hours. To clear the intake the DWUA will rearrange river bed materials using a tractor excavator from the bank or by physically entering the river with a bulldozer. Gravel will be pushed away from the diversion intake or rearranged to direct flow into the diversion intake, depending on the configuration of the bed materials.

The DWUA occasionally needs to repair riverbank revetments near the diversion intake to ensure the diversion intake is not eroded during flood events. This activity occurs on the following three diversion intakes: Highland, Agnew, and CCD. Repair usually entails adding additional rock or rip-rap to the streambank. The need to perform this maintenance is generally less than once a year per diversion intake. All required permits are obtained including, but not limited to, Army Corps of Engineers Sections 10 and 404, HPA, and SEPA if necessary.

Maintenance of diversion intakes, as well as intake channels and bypass channels, requires a Hydraulic Project Approval (HPA) from WDFW for in-river work. HPAs are required by RCW 77.55.110 for work in Waters of the State, and are intended to protect fish life. HPAs may include restrictions such as:

- Prohibiting heavy equipment in the water
- Prohibiting or limiting water crossings by heavy equipment
- Requiring heavy equipment used in water to be free of soil and external petroleum-based products
- Requiring gravel for berms to be from the water, or imported clean round gravel
- Requiring removed silt and gravel to be placed so it will not re-enter the water

- Prohibiting the removal of large woody debris
- Requiring erosion control methods to be used to prevent silt-laden water from entering the water

Once approved, HPAs related to agricultural irrigation can be designed to remain in effect in perpetuity; however, the permittee is required to notify WDFW 24-72 hours before beginning work. HPAs take approximately 45 days to obtain and there are procedures to obtain emergency HPAs when necessary via a 24-hour hotline. The status of HPAs for the six DWUA diversions is shown in Table 2-7 and the HPA for perpetual diversion maintenance for the Sequim-Prairie Tri-Irrigation diversions is included in Appendix G.

Table 2-7
HPA Status

| No. | Diversion | HPA Status |
|---|---|---|
| 1 | Agnew diversion at Dungeness RM 11.1 | Not applicable since WDFW maintains relevant facilities. |
| 2 | Highland diversion at Dungeness RM 10.9 | 1997 headgate redesign (under HPA #C3688) reduced maintenance needs. Have not needed to move/remove gravel since. Will apply for HPA in future if maintenance is required. |
| 3 | Sequim-Prairie Tri-Irrigation Company's Independent canal diversion at Dungeness RM 8.8 | HPA #E0284 for perpetual maintenance. Issued 3/28/2000 |
| 4 | CCD diversion at Dungeness RM 8.0 | Will apply for HPA for future maintenance. |
| 5 | Sequim-Prairie Tri-Irrigation Company's Sequim-Prairie canal diversion at Dungeness RM 7.2 | HPA #E0284 for perpetual maintenance. Issued 3/28/2000 |
| 6 | Agnew diversion at McDonnell CM 4.7 | Not applicable since do not use heavy equipment in creek or move/remove gravel or sediment. |

Maintenance of intake channels consists of occasionally rearranging or removing gravel or other sediment from the artificial channel itself, as well as vegetation control. Occasionally, gravel and other sediment builds up near the upstream end of the intake channel to the point where the DWUA must rearrange or remove it to keep water moving through the system. The DWUA will rearrange or remove the gravel and/or sediment by using a tractor excavator from the bank. Removed materials are placed on the land-side of the channel in locations where they will not re-enter the water. Vegetation control for intake channels consists of brushing, mowing, burning and spot application of herbicide on stumps.

Maintenance of fish screens is performed by WDFW personnel under contract to the DWUA. The WDFW routinely inspects diversions to ensure they meet current screening criteria and are operated properly. The WDFW also contracts out their services for routine and major maintenance of fish screens. The DWUA has contracted with WDFW since 1960 for these maintenance services. The inspection and maintenance program is headquartered at WDFWs Yakima Screen Shop, although they have a part time inspector and maintenance person in Sequim, WA.

Maintenance of bypass channels is rarely needed, but can include the rearranging of gravel and vegetation control as described for intake channels.

Maintenance of ditches consists of removing gravel and sediment; vegetation control; and converting open ditches to closed pipe. The DWUA will rearrange or remove the gravel and/or sediment by using a tractor excavator from the bank. Removed materials are placed on the land side of the ditch in locations where they will not reenter the water. Vegetation control consists of brushing, mowing, herbicides, and burning. Converting open ditches to closed pipe reduces seepage, reduces operations and maintenance costs, and improves water quality. The process involves laying a non-pressurized PVC pipe in the ditch, filling in the ditch with dirt, and seeding the ground. During construction, stormwater and erosion control practices, such as those recommended in the Ecology stormwater manual, are practiced.

The DWUA occasionally uses equipment such as tractor excavators, bulldozers, or mowers for some maintenance activities. When refueling any equipment near waterways, common sense is applied in order to prevent fuel spills. Currently, if a spill were to occur, the DWUA relies on the professional spill response program linked via the county's 911 system. This highly integrated system connects containment and clean up resources from road departments, fire departments, and the Coast Guard.

## 2.5 DWUA Authorities

The operation of the DWUA is governed by policies in the DWUA's Rules and Regulations. All of these policies are directed at "water users", which is defined as landowners using water from the DWUA irrigation system. Additionally, any policies designed to protect water quality are directed at all landowners' Covered Lands, even if they are not water users. DWUA and its member organizations maintain operational agreements between each other that provide further authority for DWUA to develop conservation programs, to seek conservation grants and funding on behalf of members, and to implement conservation programs on behalf of members.

Currently, the DWUA policies and regulations are communicated to all water users and select non water users by DWUA staff. Water users were informed of the policies when they were created, or when the water user joined the DWUA. Both water users and non water users are informed and/or reminded of the policies if violations occur. DWUA staff, on an ongoing basis, inform members about policy changes and other important issues through regular DWUA meetings. Policy violations are identified by "ditch riders" who perform daily inspections of the entire system during the irrigation season (April 15 to September 15) and daily inspections of all portions conveying stock water outside of the irrigation season. These daily inspections are required by insurance carriers to prevent or limit property damage due to accidental flooding by the ditches. Each of the irrigation districts and companies has their own ditch rider for a total of seven ditch riders. Upon finding any violation, ditch riders inform and/or remind the landowner of the policy, explain that the landowner's actions are a violation of the policy, and request compliance from the landowner. Ditch riders refer any uncorrected violations to Ecology. Additionally, when people apply for building permits on land near an irrigation ditch, Clallam County staff provide contact information and encourage applicants to contact the irrigation company or district to learn more about the ditch system.

In the past, Clallam County directly helped communicate DWUA policies to non water users. The county distributed a brochure titled "Living Along Ditches" to all new residents in the Action Area educating landowners about the irrigation system and their responsibility to protect DWUA facilities or water quality. That brochure is currently out of print.

Selected DWUA Rules and Regulations are presented in Appendix B.

# Section 3
# Covered Species and Habitat Types

## 3.1 Species Proposed for Coverage

In developing this CIDMP, the DWUA and TAT initially considered a wide range of sensitive species in Clallam County, including listed and un-listed fish, birds, mammals, amphibians and insects that were of potential interest for coverage. This overall list was narrowed to a specific species list for desired coverage under the Incidental Take Permit (ITP). This section lists the species initially considered, and identifies the particular species desired for coverage.

### 3.1.1 Initial Review of Species

The USFWS and NOAA Fisheries, under the authority of the ESA, have identified species considered threatened or endangered because of low population numbers or other significant threats to their survival (U.S. Fish and Wildlife Service 1994) as well as candidate species under consideration for formal listing (U.S Federal Register, 1996). Within Clallam County, the Services identified 18 species currently listed as threatened, endangered, or candidates for listing. These groups were prioritized as Tier 1 (Listed Species) and Tier 2 (Candidate Species) for potential coverage under the CIDMP (Table 3-1). The Services consider an additional 24 species in Clallam County to be species of concern. These species are listed as Tier 3 species in Table 3-1.

The Washington Department of Fish and Wildlife (WDFW) maintains a Priority Habitats and Species (PHS) list of species identified within the state of Washington requiring protective measures because of population status, sensitivity to habitat alteration, and/or recreational, commercial or tribal importance (Washington Department of Fish and Wildlife 1996). Based on distribution information from this list, 17 additional species with a state threatened, endangered, candidate or monitor status have the potential to occur in the vicinity of the covered lands. Of those potential species, WDFW identified seven special-status species with confirmed presence within the Action Area (WDFW 2002) including a peregrine falcon wintering territory, a great blue heron rookery, harlequin duck breeding territories along the Dungeness River, a merlin nest, and two osprey nests, all observed in the early to mid-1990s and likely present to date. Given the seasonal time period of use and location within the Action Area, the only PHS species deemed a candidate for CIDMP coverage under the ESA and CWA related to likely effects of DWUA activities was the bald eagle.

These species are listed in the Tier 3 priority grouping for potential coverage under the CIDMP (Table 3-1).

**Table 3-1**
**Species of Interest Reported to Occur in Clallam County**

| Common Name | Scientific Name | Listing Status | Tier for CIDMP Review: Tier 1 ESA Listed Species | Tier 2 Proposed/ Candidate Species | Tier 3 Concern/ Sensitive Species |
|---|---|---|---|---|---|
| ***Fish*** | | | | | |
| Pacific lamprey | *Lampetra tridentatus* | FSC | | | X |
| River lamprey | *Lampetra ayresi* | FSC, SC | | | X |
| Chum salmon | *Oncorhynchus keta* | FT, SC | X | | |
| Pink salmon | *Oncorhynchus gorbusca* | NW | | | X |
| Chinook salmon | *Oncorhynchus tshawytscha* | FT, SC | X | | |
| Coho salmon | *Oncorhynchus kisutch* | FSC | | | X |
| Steelhead trout | *Oncorhynchus mykiss* | NW, SC | | | X |
| Coastal cutthroat trout | *Oncorhynchus clarki clarki* | NW | | | |
| Bull trout char | *Salvelinus confluentus* | FT, SC | X | | |
| Dolly Varden char | *Salvelinus malma* | PSAT | X | | |
| Pygmy whitefish | *Prosopium coulteri* | SS | | | X |
| Olympic mudminnow | *Novumbra hubbsi* | SS | | | X |
| ***Amphibians*** | | | | | |
| Olympic torrent salamander | *Rhyacotriton olympicus* | FSC | | | X |
| Cascade torrent salamander | *Rhyacotriton cascadae* | SC | | | X |
| Dunn's salamander | *Plethodon dunni* | SC | | | X |
| Larch Mountain salamander | *Plethodon larselli* | SS | | | X |
| Van Dyke's salamander | *Plethodon vandykei* | FSC, SC | | | X |
| Cascades frog | *Rana cascadae* | FSC | | | X |
| Oregon spotted frog | *Rana pretiosa* | SE | | | X |
| Tailed frog | *Ascaphus truei* | FSC | | | X |
| Western toad | *Bufo boreas* | FSC, SC | | | X |
| ***Reptiles*** | | | | | |
| Northwestern pond turtle | *Clemmys marmorata marmorata* | SE | | | X |
| Green sea turtles | *Chelonia mydas* | FT | X | | |
| Letherback sea turtles | *Dermochelys coriacea* | FT | X | | |
| Loggerhead sea turtles | *Caretta caretta* | FT | X | | |
| Olive ridley sea turtles | *Lepidochelys olivacea* | FT | X | | |
| ***Birds*** | | | | | |
| Common loon | *Gavia immer* | SS | | | X |
| Merlin | *Falco columbarius* | SC | | | X |
| Marbled murrelet | *Brachyramphus marmoratus* | FT, ST | X | | |
| Bald eagle | *Haliaeetus leucocephalus* | FT, ST | X | | |
| Northern goshawk | *Accipiter gentilis* | FSC, SC | | | X |
| Northern spotted owl | *Strix occidentalis* | FT, SE | X | | |

| Table 3-1 (cont.)<br>Species of Interest Reported to Occur in Clallam County | | | | | |
|---|---|---|---|---|---|
| | | | Tier for CIDMP Review | | |
| | | | Tier 1 | Tier 2 | Tier 3 |
| **Common Name** | **Scientific Name** | **Listing Status** | **ESA Listed Species** | **Proposed/ Candidate Species** | **Concern/ Sensitive Species** |
| Vaux's swift | *Chaetura vauxi* | SC | | | X |
| Pileated woodpecker | *Dryocopus pileatus* | SC | | | X |
| Olive-sided flycatcher | *Contopus cooperi* | FSC | | | X |
| Willow flycatcher | *Empidonax traillii* | FSC | | | X |
| Yellow-billed cuckoo | *Coccyzus americanus* | FC, SC | | X | X |
| Peregrine falcon | *Falco peregrinus* | FSC, SS | | | X |
| Harlequin duck | *Histrionicus histrionicus* | FSC | | | X |
| Purple martin | *Progne subis* | SC | | | X |
| Osprey | *Pandion haliaetus* | SM | | | X |
| Great blue heron | *Ardea herodias* | SM | | | X |
| Brown Pelicans | *Pelecanus occidentalis* | FT | X | | |
| Short-tailed albatross | *Phoebastria albatrus* | FT | X | | |
| Aleutian Canada goose | *Branta canadensis leocopareia* | FSC | | | X |
| Cassin's auklet | *Ptychoramphus aleuticus* | FSC | | | X |
| Oregon vesper sparrow | *Pooectetes gramineus affinis* | FSC | | | X |
| Tufted puffin | *Fratercula cirrhata* | FSC | | | X |
| ***Mammals*** | | | | | |
| Merriam's Shrew | *Sorex merriami* | SC | | | |
| Mazama pocket gopher | *Thomomys mazama ssp.* | FC, SC | | X | |
| Long-eared myotis | *Myotis evotis* | FSC | | | X |
| Long-legged myotis | *Myotis volans* | FSC | | | X |
| Keen's myotis | *Myotis keenii* | SC | | | X |
| Townsend's big-eared bat | *Corynorhinus townsendii* | FSC, SC | | | X |
| Western gray squirrel | *Sciurus griseus* | ST | | | X |
| Pacific fisher | *Martes pennanti* | FSC, SE | | | X |
| Wolverine | *Gulo gulo* | FSC, SC | | | X |
| Gray wolf | *Canis lupus* | FE, SE | X | | |
| Grizzly bear | *Ursus arctos* | FT, SE | X | | |
| Canada lynx | *Lynx canadensis* | FT, ST | X | | |
| Northern sea otter | *Enhydra lutris kenyoni* | FSC | | | X |
| ***Insects*** | | | | | |
| Makah's cooper (butterfly) | *Lycaena mariposa charlottensis* | FSC | | | X |
| | **Species Tally:** | | **16** | **2** | **42** |

**Status Codes:**
PT = Proposed Threatened
NW = Not Warranted
PSAT =Proposed Similarity of Appearance to Threatened Species

**Federal**
FT = Threatened
FE = Endangered
FC = Candidate for Listing
FSC = Species of Concern

**State**
SE = Endangered
SC = Candidate for Listing
SM = State Monitor
ST = Threatened
SS = State Sensitive

### 3.1.2 Criteria for Selecting Covered Species

The following criteria were used to narrow this list of species shown in Table 3-1 to define the Covered Species for purposes of the CIDMP:

1. Species were not generally recommended for coverage under the CIDMP if the covered activities discussed in Section 2 were not anticipated to have an effect on the species or its habitat; or they were not likely to adversely affect the species or its habitat.
2. The CIDMP primarily addresses irrigation management and associated aquatic habitats and, therefore, focuses on aquatic species. Coverage for upland species was considered where irrigation district activities may directly affect the species or its habitat.
3. As a group, marine species are probably below the effect level and were, therefore, not recommended for coverage.
4. Only species known to occur or believed to have a high potential to occur within the Action Area defined in Section 1 were recommended for coverage.
5. With respect to terrestrial species, the effects will vary according to maintenance disturbance issues. Nesting or roosting site effects, prey base issues, wetland issues, and loss of habitat were considered. The approach for recommending coverage included the following criteria:
   - The species should be present or habitat available in the Action Area,
   - The DWUA operations should have the potential to adversely influence either the species or their habitats.
   - A realistic likelihood exists that a non-listed species might become listed.

### 3.1.3 Species Proposed for Coverage

Using the criteria discussed above, the DWUA and TAT narrowed the potential list of species. Information considered included historical and anticipated species distributions specific to the Action Area and consideration of the facilities and activities described in Section 2.

In general, Tier 1 and Tier 2 species were recommended for coverage if an adverse effect could be anticipated. Tier 3 species were recommended if they met the aforementioned criterion and if a potential for federal listing was foreseeable in the near future. Some Tier 3 species were also recommended for coverage if their habitat requirements were similar to other covered species and they would benefit from the habitat conservation measures provided under this Plan.

The species proposed for coverage under the ITPs include several listed species, as well non-listed species with the potential for future listing within the term of the ITPs. The DWUA is seeking coverage under Section 10 of the ESA for 11 aquatic species, 1 avian species, and 1 amphibian species. The species were subdivided into guilds of similar habitat use to facilitate the biological assessment of direct and indirect effects analysis. The six (6) guilds containing the species identified for coverage are listed below:

- **Salmonid Fish Guild**
  - Puget Sound Chinook Salmon (Threatened)
  - Puget Sound Coho Salmon (Species of Concern)
  - Odd-year Pink Salmon
  - Hood Canal Summer Chum Salmon (Threatened)
  - Fall Chum Salmon
  - Steelhead Trout
  - Pacific lamprey (Species of Concern)
  - River lamprey (Species of Concern)

- **Native Char Guild**
  - Coastal-Puget Sound Bull Trout (Threatened)
  - Dolly Varden Char (Proposed Similarity of Appearance to Threatened Species)

- **Cutthroat Trout Guild**
  - Coastal Cutthroat Trout

- **Upland Amphibian Guild**
  - Western toad (Species of Concern)

- **Terrestrial Bird Guild**
  - Bald Eagle (Threatened: Proposed De-listing)

As indicated above, some of the covered species are not currently listed under the ESA species. However, these species are in a common guild that would benefit from habitat conservation measures designed to minimize incidental take of a listed species, and are therefore also identified for species coverage under the CIDMP. For instance, the biological review teams rated pink and fall chum salmon and steelhead trout as not warranted for listing (Hard et, al. 1996, Johnson et, al. 1997, Busby et. al, 1996) but these species will benefit from habitat conservation measures for other salmonid fishes. They are included in the salmonid fish guild as covered species under the plan. The two lamprey species have similar habitat requirements as the salmonid fishes and these federal species of concern will also directly benefit from the salmonid conservation measures. They are included in the salmonid fish guild as covered species. Under the terms of the IA and ITPs, species that are not currently listed under the ESA will automatically become covered under the ITPs in the event of their future listing.

A number of currently listed or candidate species are not recommended for coverage under this program since an adverse effect of irrigation operations is not anticipated. For instance, listed marine reptiles and birds identified in Table 3-1 and certain listed or candidate mammals like the gray wolf, grizzly bear, Canada lynx, and the Mazama picket gopher did not have the populations distributed in the Action Area or were judged to lie below the adverse effects level of the Plan. Similarly, it appears unlikely the direct effects area would support the Northern spotted owl or the Marbled murrelet due to a lack of appropriate habitat features in the Action Area. Although specific ESA coverage for incidental take of these species is not included herein, the DWUA will continue to operate its activities to avoid "take" of these species.

It is common in multispecies conservation plans for improvement measures to benefit one group of species at the expense of another group. This CIDMP is built on the premise that conservation actions may benefit some species more than others and that the following criteria for prioritizing action items should apply:

- The first priority is to minimize taking of a listed species; and,
- The second priority is to maximize habitat for the greatest good of all covered species.

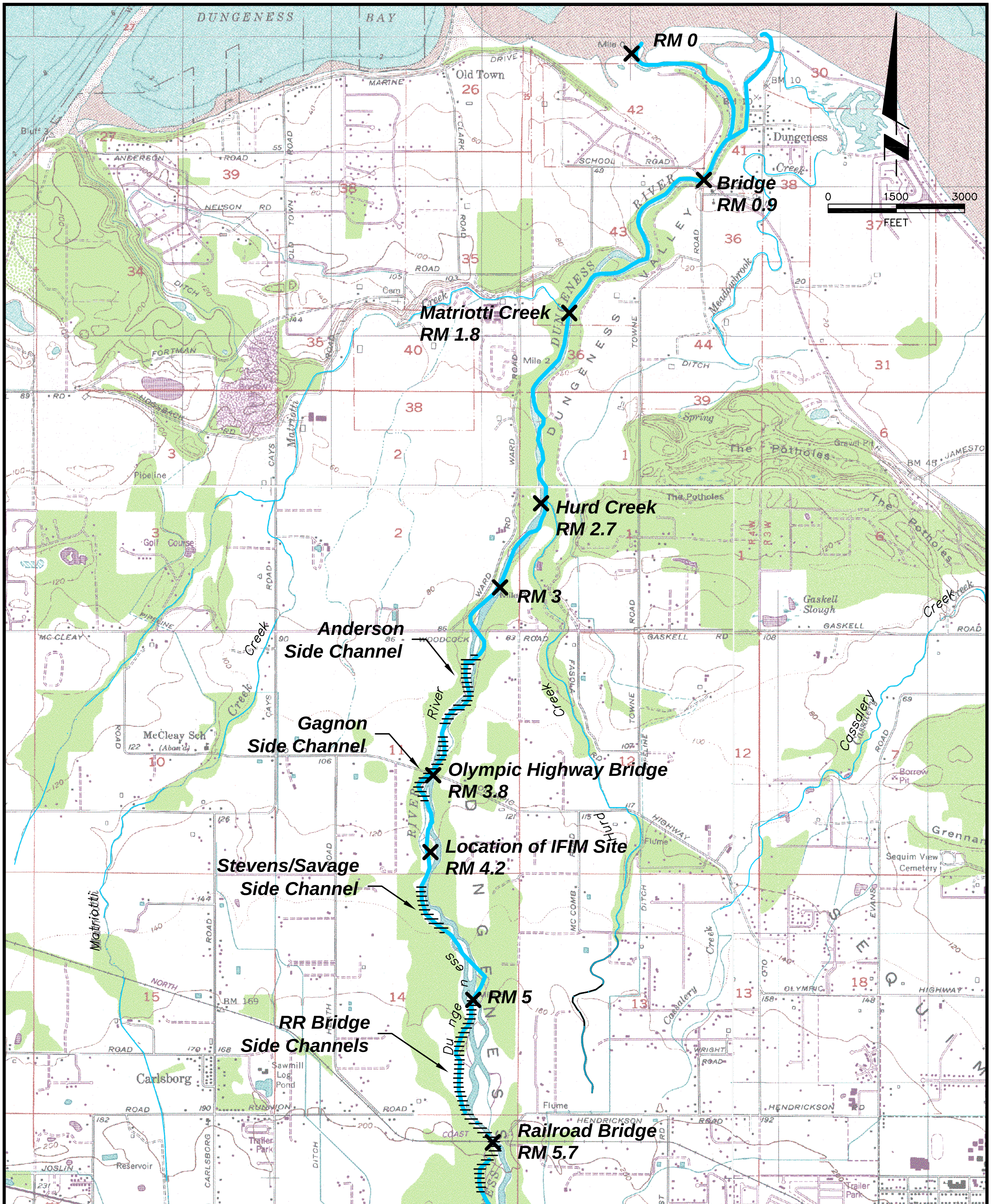
## 3.2 Habitat Types

The scale of anticipated effects of the CIDMP will depend upon: (1) the covered species present in the Action Area; (2) the timing and specific habitats used by various life history stages; and (3) the relative volume of water withdrawn or discharged with respect to the size of the various receiving waters. Therefore, the analysis segregates habitat types based on: (1) size and function of the various receiving water habitats, and (2) whether the receiving water is flowing or standing, and (3) whether the receiving water is dominated by fresh or estuarine conditions.

The current operations with the largest potential to affect aquatic habitats and these habitat types will be the primary focus of the CIDMP. However, some covered activities may influence upland habitats along the overland network of ditches. As such, the following eight key habitat types have been identified in the Action Area to be assessed as shown in Exhibits 3-1 and 3-2.

- Dungeness River mainstem
- Dungeness River side channel
- Diversion intake and bypass return channels
- Dungeness River tributaries
- Independent small streams
- Wetlands
- Dungeness Bay, Sequim Bay, and Strait of Juan de Fuca
- Upland areas

The Dungeness River mainstem habitat includes the main channel and riparian habitat from RM 11.8 downstream to the mouth of the river at RM 0.0 as it enters the bay. This section of river experiences the most direct influence of water withdrawal during low streamflow conditions. Dungeness River side channel habitats incorporate defined, high flow distributary channels that connect to the mainstem channel with either surface or groundwater. The side channels assessed will be the same as the defined side channels in the recent US Bureau of Reclamation report (Daraio et al. 2003). Specific habitats related to either intake channels to or bypass channels from the Water User Association diversions will also be evaluated. Small stream habitats in the Action Area have been divided into tributary streams discharging directly to the Dungeness River and independent streams discharging to the Strait of Juan de Fuca.




**LEGEND**

Reach of river where side channel is located

# Exhibit 3-1
# Dungeness River
# Key Habitat Features (1 of 2)

**CIDMP**

MONTGOMERY WATER GROUP, INC.

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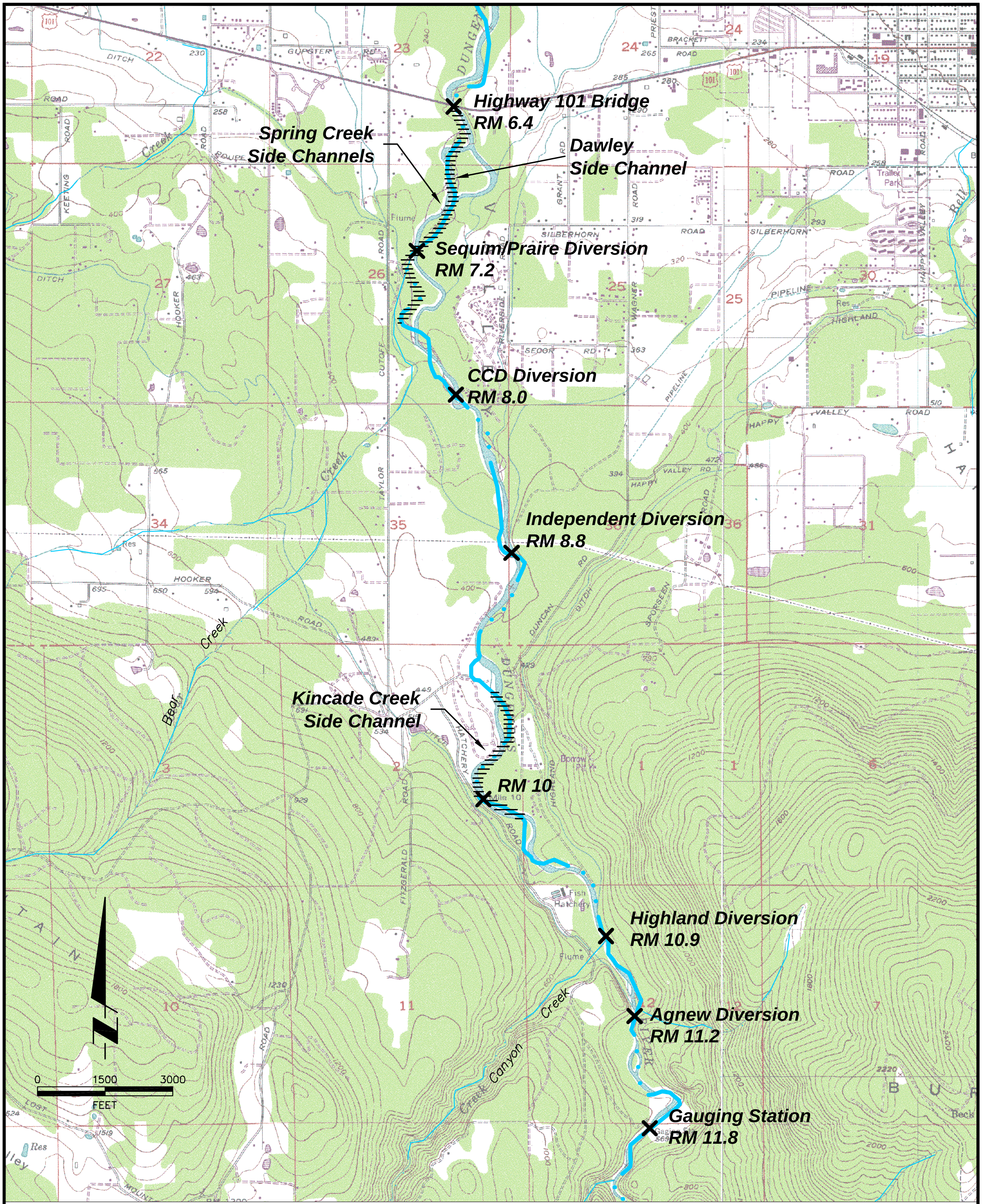


**LEGEND**

Reach of river where side channel is located

## Exhibit 3-2
## Dungeness River
## Key Habitat Features (2 of 2)

CIDMP

MONTGOMERY WATER GROUP, INC.

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Wetland habitats can experience an indirect influence of CIDMP activities and they will be assessed in accordance with Covered Species use and timing in relation to anticipated changes in water levels. The wetland assessment relies heavily on information developed for the current EIS of the DWUA's Comprehensive Water Conservation Plan. Ultimately, all waters from the Action Area drain into the Dungeness Bay or Sequim Bay Estuaries, or the Strait of Juan de Fuca. These estuarine and marine waters will also be reviewed for possible indirect effects of CIDMP actions.

Anticipated impacts will be assessed using each of these habitat types for the covered species during specific stages in their life history. The current baseline condition for various habitat types are provided in Section 4 and an evaluation of effects on species using these habitat features is available in Sections 5 and 7.

## 3.3 Biological Information for Covered Fish Species

This section describes life histories and distributions of important fish species in the Action Area within the Salmonid Fish, Native Char and Coastal Cutthroat Trout Guilds identified in Section 3.1.3. This section also addresses known limiting factors and the value of each type of watercourse as habitat. A large portion of the information presented on limiting factors is derived from a recent study by Washington State Conservation Commission (Haring 1999).

### 3.3.1 Fish Life Histories and Distribution

Important anadromous salmonid fish species occurring in the project area include: Chinook salmon *(Oncorhynchus tshawytsch*a), pink salmon *(O. gorbuscha),* coho salmon *(O. kisutc*h), chum salmon *(O. keta*), bull trout *(Salvelinus confluentu*s), Dolly Varden char *(S. malma malm*a), steelhead trout *(O. mykis*s), and coastal cutthroat trout *(O. clark*i) (Orsborn and Ralph 1994). These species have varied life histories, but the salmon, bull trout, and Dolly Varden migrate upstream as adults to spawn in the summer and fall whereas the steelhead and rainbow trout tend to spawn in the late winter or spring. Other anadromous fish species likely present in the Dungeness River system, like the Pacific lamprey and river lamprey (*Lampretra tridentatus* and *L .ayresi*), may benefit from the CIDMP habitat conservation measures designed to minimize irrigation effects on salmonid fishes. The life histories, known distribution and current status of these species are also summarized in this section.

Juveniles from all salmonid species tend to outmigrate in the spring and summer (Exhibit 3-3). The various species use different areas of the project area. Nearly all species use the mainstem Dungeness River, with some using specific tributaries (Exhibit 3-4). The Dungeness project area has some anadromous species whose populations are considered healthy. However, other populations are less healthy with three stocks listed as Threatened under the ESA (Table 3-1). In addition to the listed stocks, Haring (1999) states that fall chum, both summer and winter steelhead, and Upper Dungeness pink salmon stocks are depressed and numbers of Lower Dungeness pink salmon are at critical levels. A measure of the condition of the various species is indicated by the number escaping to spawn in the system (Table 3-2).

## Exhibit 3-3
## Periods of Life History Stage Use of Salmonid Fishes in the Dungeness River

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chinook Salmon (Spring/Summer Run)** | | | | | | | | | | | | |
| Upstream Migration | | | | | X | X | X | X | x | | | |
| Spawning | | | | | | | | X | X | x | | |
| Emergence | x | X | | | | | | | | | | |
| Rearing | x | x | X | X | x | x | x | x | x | x | x | x |
| Outmigration | | | | x | X | X | x | | | | | |
| **Coho Salmon** | | | | | | | | | | | | |
| Migration | x | | | | | | | | | x | X | x |
| Spawning | X | x | | | | | | | | x | x | X |
| Emergence | | | X | X | x | | | | | | | |
| Rearing | X | X | X | X | X | X | X | X | X | X | X | X |
| Outmigration | | | | x | X | X | | | | | | |
| **Pink Salmon (Odd year run; Upper and Lower Dungeness Stocks)** | | | | | | | | | | | | |
| Migration | | | | | | | x | X | X | x | | |
| Spawning | | | | | | | | x | X | x | | |
| Emergence | | | x | X | x | | | | | | | |
| Rearing | | | x | X | x | | | | | | | |
| Outmigration | | | x | X | x | | | | | | | |
| **Summer Chum Salmon** | | | | | | | | | | | | |
| Migration | | | | | | | | X | | | | |
| Spawning | | | | | | | | | X | X | | |
| Emergence | | | x | X | X | x | | | | | | |
| Rearing | | | x | X | X | x | | | | | | |
| Outmigration | | | x | X | X | x | | | | | | |
| **Fall Chum Salmon** | | | | | | | | | | | | |
| Migration | | | | | | | | x | x | x | X | X |
| Spawning | x | | | | | | | x | x | x | X | X |
| Emergence | | | x | X | X | x | | | | | | |
| Rearing | | | x | X | X | x | | | | | | |
| Outmigration | | | x | X | X | x | | | | | | |
| **Steelhead Trout (Winter and Summer Run)** | | | | | | | | | | | | |
| Migration | x | X | X | X | x | x | X | X | x | x | x | x |
| Spawning | | x | x | X | X | x | | | | | | |
| Emergence | | | | | | X | x | x | | | | |
| Rearing | X | X | X | X | X | X | X | X | X | X | X | X |
| Outmigration | | | | X | X | x | | | | | | |
| **Coastal Cutthroat Trout (Eastern Strait)** | | | | | | | | | | | | |
| Migration | | | | | | | | | | x | x | x |
| Spawning | x | X | X | x | | | | | | | | |
| Emergence | | | | x | X | x | | | | | | |
| Rearing | X | X | X | X | X | X | X | X | X | X | X | X |
| Outmigration | | | | | | | | | | | | |
| **Native Char (Bull Trout and Dolly Varden)** | | | | | | | | | | | | |
| Migration | | | x | x | x | | | | x | x | x | |
| Spawning | | | | | | | | | x | X | x | |
| Emergence | | | | X | X | | | | | | | |
| Rearing | X | X | X | X | X | X | X | X | X | X | X | X |
| Outmigration | | | | | | | | | | | | |

Sources: Williams et al., (1975), Sandercock (1991), Hiss (1993), USFWS (1994), Osborn and Ralph (1994), McHendry et al. (1996), Goin (1998), WDFW (1998), Haring (1999) Foster Wheeler (2003), Ogg pers. Comm.. (2005)

| | |
|---|---|
| x | Present in non-peak quantities |
| X | Present in peak quantities |
| (shaded) | Approximate low river flow period during the irrigation season |

## Exhibit 3-4
## Anadromous Species Assumed Present in the Action Area

| Species/Stock | Dungeness River | | | | | | | | | | | Independent Streams | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Side Channels | | | | | | Tributaries | | | | | | | | | | | | |
| | **Mainstem** | **Gagnon** | **Anderson** | **Stevens/Savage** | **L.East Railroad Bridge** | **Dawley** | **Kinkade** | **Matriotti** | **Hurd** | **Bear** | **Canyon** | **Meadowbrook** | **Bell** | **Gierin** | **Cassalery** | **Cooper** | **McDonnell** | **Siebert** | **Beebe** | **Johnson** |
| Chinook Salmon | | | | | | | | | | | | | | | | | | | | |
| Dungeness Sp/Su | X | X | X | | X | X | X | | | | X | | | | | | | | | |
| Coho Salmon | | | | | | | | | | | | | | | | | | | | |
| Dungeness | X | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Chum Salmon | | | | | | | | | | | | | | | | | | | | |
| Dungeness Su | X | | | | | | | X | **X** | | | | | | | | | | | |
| Dungeness Fall | X | | | | X | | | X | | X | | ? | ? | ? | ? | ? | ? | ? | X | |
| Pink Salmon (odd-yr. only) | | | | | | | | | | | | | | | | | | | | |
| Upper Dungeness | X | | | | | | | | X | | | | | | | | | | | |
| Lower Dungeness | X | | | | X | X | X | X | X | | | | | | | | | | X | |
| Steelhead Trout | | | | | | | | | | | | | | | | | | | | |
| Dungeness Su | X | | | | | | | | | | | | | | | | | | | |
| Dungeness Wi | X | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Native Char (Bull trout/Dolly Varden) | | | | | | | | | | | | | | | | | | | | |
| Dungeness/Gray Wolf | T | | | | | | | | | | X | | X | | | | | | | |
| Coastal Cutthrout Trout | | | | | | | | | | | | | | | | | | | | |
| Eastern Strait | X | | | | | | | X | | | | X | X | | X | | X | X | | X |
| Lamprey | X | | | | X | | | | | | | | | | | | | | | |

T) Transportation Corridor
X) Confirmed Presence
?) Potential but Unconfirmed Presence
(Modified from Foster Wheeler, 2003)

Sp = Spring
Su = Summer
Wi = Winter

## 3.3.2 Current Status

### *Chinook Salmon*

Chinook salmon in the Dungeness River are spring/summer-run fish. This designation refers to the season they enter the river to spawn (Exhibit 3-3). Historically, adult spring Chinook migrated into the Dungeness River in May to rest and hold in the river system until they were ready to spawn in mid-August into early October. Currently, the spring/summer Chinook enter the river in July through September and either hold for a few months or spawn soon after entry. Chinook salmon have been observed throughout the river to the impassable falls at river mile (RM) 18.7 and in the Greywolf River up to RM 6.1, although the Greywolf River is thought to be passable up to RM 8.0 (Haring 1999). In more recent years, two thirds of the adult Chinook salmon run have spawned in the mainstem downstream of Canyon Creek (RM 11.1). Adult Chinook salmon also have been observed in the lower reaches of Canyon Creek (Exhibit 3-4 and 3-5).

In the Dungeness, juvenile spring Chinook are considered an ocean-type fish with the greatest preponderance of fish outmigrating from freshwater as sub-yearlings during their first spring. Given the low elevation of most of the Chinook spawning in the Dungeness River system, juvenile spring Chinook are emerging and growing to a size appropriate for early emigration. Myers et al (1998) report less than 2 percent of the spring run continue to rear in freshwater throughout the year and migrate the subsequent spring as yearling fish. Although still a minor fraction, recent data indicate the percent of overwintering Chinook is in the range of 15 to 30 percent (Rot 2003).

Before European settlement, adult Chinook salmon runs in the Dungeness may have ranged from around 13,000 to 26,000 fish (Lichatowich 1992, Jamestown S'Klallam Tribe 2003). Severe depletions in the Dungeness spring/summer run were noted as early as 1909 (Lichatowich [1993] cited in Entrix 2000). Between 1986 and 1998, Dungeness River spring/summer Chinook salmon runs ranged from 40 to 335 fish (Table 3-2) with less than 60 fish in three of those years. The Dungeness Chinook run, as a subpopulation of the Puget Sound Evolutionarily Significant Unit (ESU) was listed on March 24, 1999 as a threatened species under the ESA. The 5-year geometric mean of numbers escaping to the spawning grounds at the time of listing was 105 fish (Myers et al. 1998). Run sizes have steadily increased since the time of listing as a result of improved instream flow regimes, improved freshwater and ocean conditions, as well as the potential contribution of the lower Dungeness captive brood stock program. Between 1999 and 2004, the number of reported spawning adults in the Dungeness River ranged between 75 and 953 fish (Chitwood 2004). Trend lines of Chinook salmon redd counts and numbers of adult spawners are shown in Exhibits 3-6 through 3-8. The current 5-year geometric mean numbers of spawners through the fall of 2004 is calculated as 525 fish. Although a recent positive trend in population status is encouraging, the level of abundance remains low with respect to historic levels.

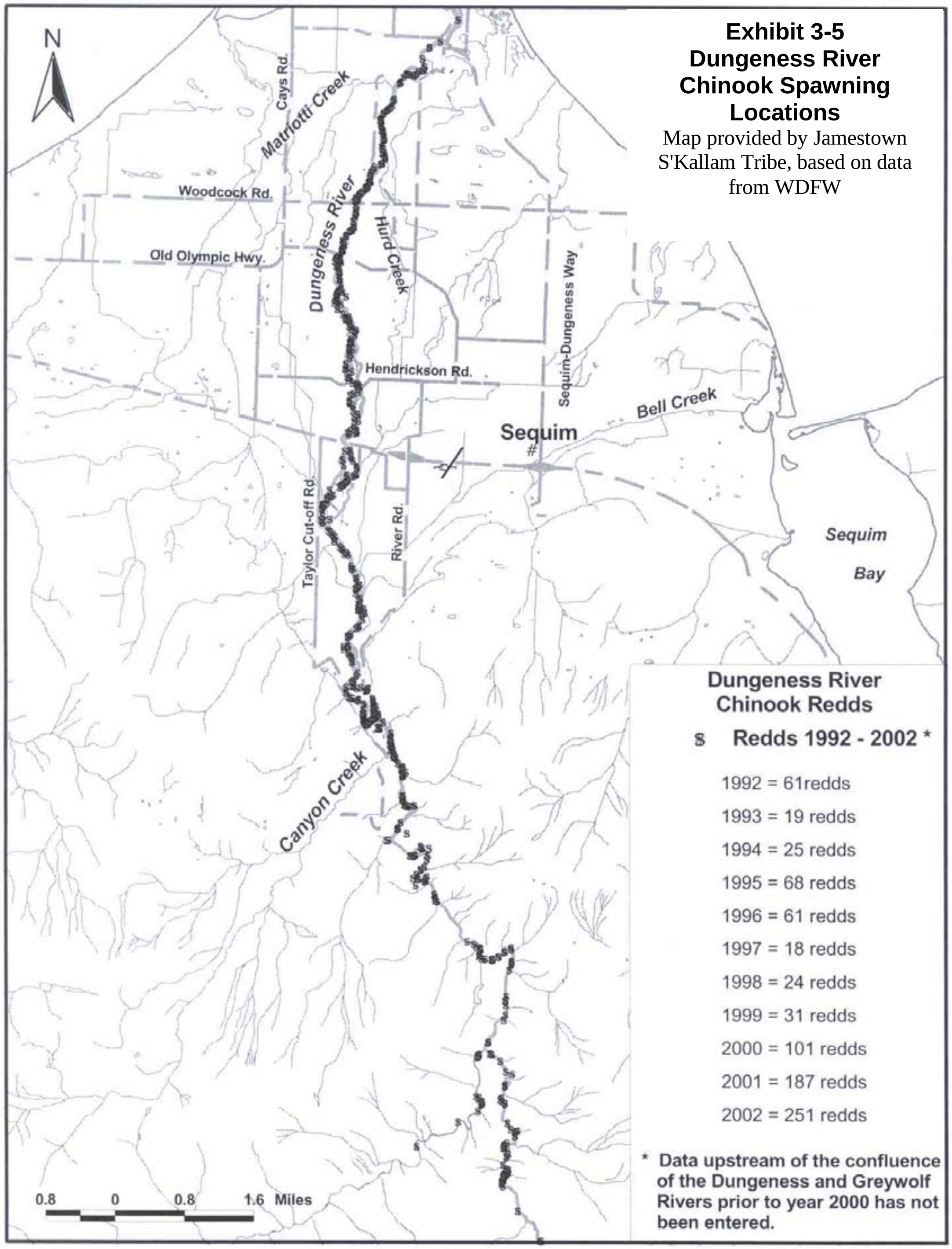


Exhibit 3-5
Dungeness River
Chinook Spawning
Locations
Map provided by Jamestown S'Kallam Tribe, based on data from WDFW
N
Cays Rd.
Matriotti Creek
Woodcock Rd.
Old Olympic Hwy.
Dungeness River
Hurd Creek
Sequim-Dungeness Way
Hendrickson Rd.
Bell Creek
Sequim
Taylor Cut-off Rd.
River Rd.
Sequim
Bay
Canyon Creek
Dungeness River
Chinook Redds
Redds 1992 - 2002 *
1992 = 61redds
1993 = 19 redds
1994 = 25 redds
1995 = 68 redds
1996 = 61 redds
1997 = 18 redds
1998 = 24 redds
1999 = 31 redds
2000 = 101 redds
2001 = 187 redds
2002 = 251 redds
* Data upstream of the confluence of the Dungeness and Greywolf Rivers prior to year 2000 has not been entered.
0.8 0 0.8 1.6 Miles

| Table 3-2<br>Dungeness River Spawning Escapements of Wild Anadromous Salmonids | | | |
|---|---|---|---|
| **Species** | **Years** | **Escapements** | **Source** |
| Chinook (spring) | 1986 - 1998 | 40 - 335 | Marlow et al. 2001 |
| | 1999 - 2004 | 75 - 953 | Chitwood 2004 |
| Pink (odd-year only) | 1959 - 1979 | 14,400 - 400,000 | WDFW and WDWTIT 1998 |
| | 1981 - 1997 | 1,700 - 10,900 | WDFW and WWTIT 1998 |
| | 1999 - 2001 | 7,300 - 81,400 | Chitwood 2003 |
| Coho (natural) | 1980 - 1987 | 1,000 - 2,400 | WDFW and WWTIT 1998 |
| | 1999 - 2001 | 1,000 - 5,000 | Chitwood 2002, WDFW and Tribes, 2002 |
| Coho (hatchery) | 1988 - 1998 | 6,200 - 22,200 | WDFW and WWTIT 1998 |
| | 1999 - 2001 | 3,900 - 28,800 | WDFW and Tribes, 2002 |
| Chum (fall-normal) | 1982 - 1998 | 85 - 1,955 | WDF et al. 1993 |
| | 1999 - 2003 | 38 - 243 | WDFW and Tribes, 2002 |
| Chum (summer) | 1999 – 2000 | <3 | WDFW and PNPPT, 2001 |
| | 1999 – 2003 | <100 | Chitwood, 2003 |
| Steelhead | 1987 - 1992 | 176 - 483 | Johnson 1988, 1990, McHenry et al. 1996, Goin 1998 |
| | 1999 - 2001 | 600 - 1,200 | Chitwood 2003 |

WWTIT = Western Washington Treaty Indian Tribes
Pre-season forecast and forecasting methods summary document (WDFW and Tribes, co-producers 2002)

**Exhibit 3-6**
**Annual Counts of Chinook Salmon Escapement and Redds in Dungeness River**

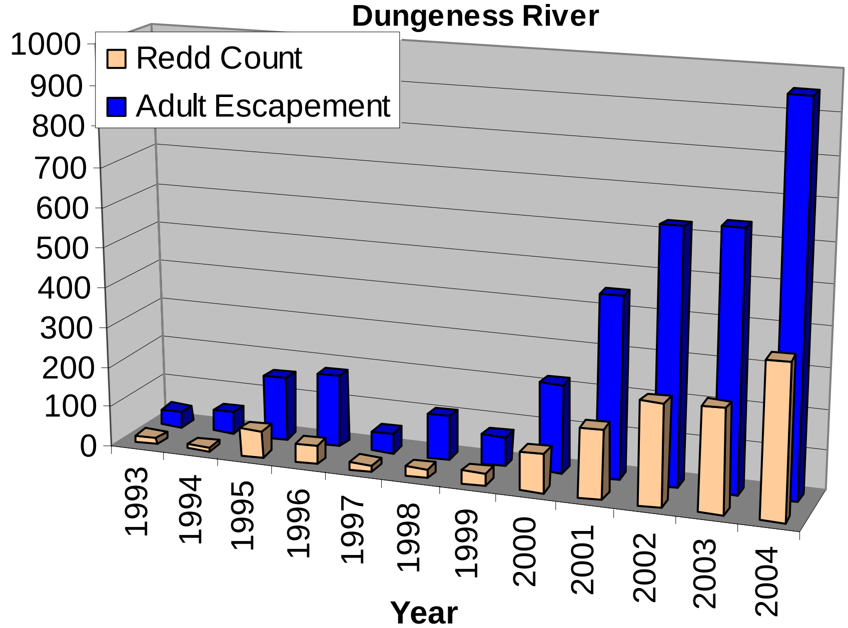


Exhibit 3-7
Trend Line of Chinook Escapement and Redd Counts in the Dungeness River

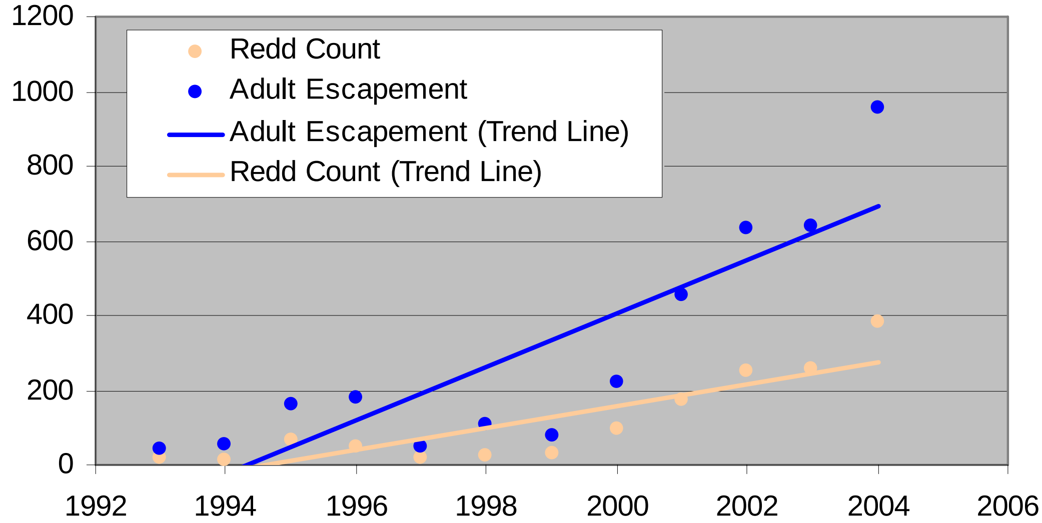
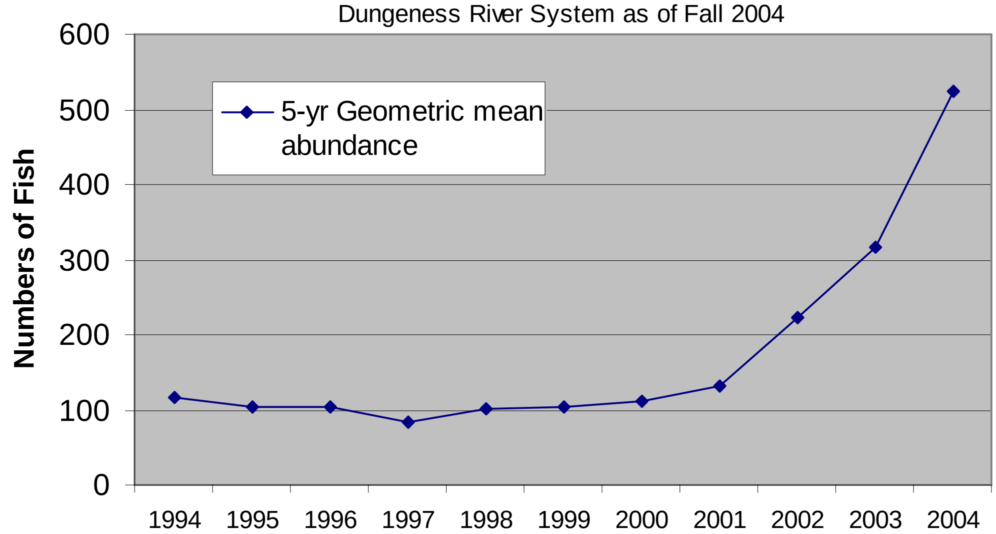



Exhibit 3-8
Five (5)-yr Geometric mean abundance of Chinook salmon spawners[1] in the Dungeness River System as of Fall 2004




1) Fish escapement estimates from Jamestown S'Klallam Tribe (Chitwood 2004)

A modified version of the Ecosystem Diagnostic and Treatment (EDT) methodology, "EDT-Lite," was recently performed for the Dungeness River Watershed (MBI, 2002). EDT computes three population performance metrics including: (1) abundance, (2) productivity, and (3) life history diversity, based on perceived freshwater, estuarine and marine habitat conditions. These parameters are consistent with the metrics promoted by the Puget Sound Technical Recovery Teams (PS TRTS) to measure the viability and recovery of salmonid fish populations (McElhany et al. 2000).

EDT-Lite for the Dungeness River calculated abundance and productivity under the following five scenarios:

1. Current (patient) conditions with harvest,
2. Current (patient) conditions without harvest,
3. Historic (template) conditions,
4. Properly functioning freshwater conditions (PFC) without harvest, and
5. Properly functioning freshwater plus historic estuarine conditions (PFC+) without harvest.

The EDT model output includes Beverton-Holt curves for the spawner-recruit relationships and estimates of abundance and productivity for the five diagnostic scenarios. The different S/R curves for Current (patient), Historic (template), PFC, and PFC+ conditions are provided in Exhibit 3-9 and summarized in Table 3-3. Baseline conditions for this assessment include EDT scenario (#1) current conditions with harvest. There is no existing terminal fisheries (fisheries in Dungeness Bay or at the mouth of the river) targeting Dungeness Chinook salmon. The current harvest is considered incidental to other fisheries and the current exploitation rates for the Dungeness Chinook are estimated to run near 30 percent (PS TRT 2003). The results in Exhibit 3-9 are based on assumptions of reduced population performance not including harvest (EDT April 2002 Draft). The diagonal line represents 1:1 equilibrium spawning populations where fish are simply replacing themselves. Surplus fish to the population exist where the curves exceed the 1:1 line, due to high productivity experienced at low population levels.

**Exhibit 3-9 Hypothetical Chinook Spawner-Recruit Relationship Curves**

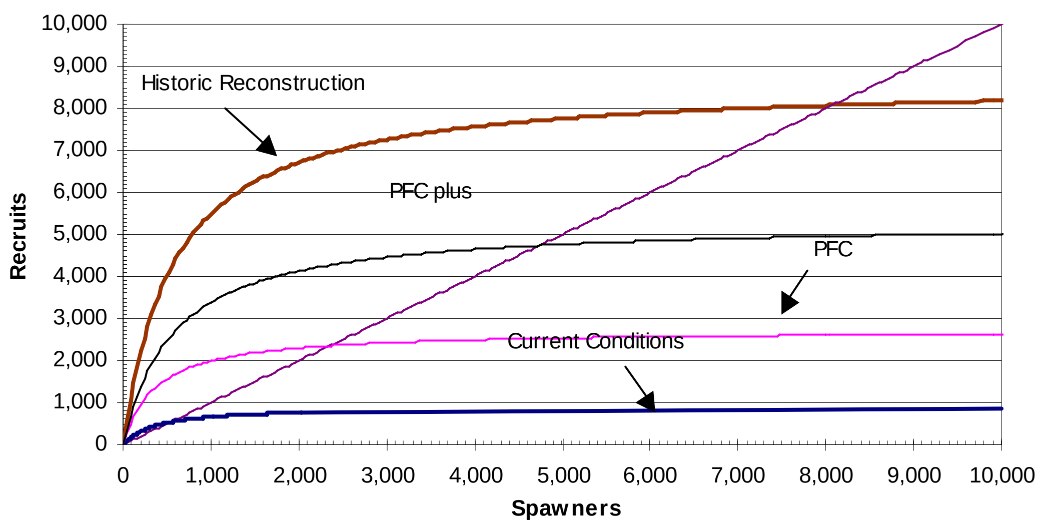


**Table 3-3**
**Comparison of Chinook Abundance and Productivity**

| Model Scenario | Abundance at Point of Maximum Surplus (Adults) | B-H Productivity Recruits/Spawner (R/S) | Abundance at Equlibrium Spawning (Adults, $N_{eq}$ |
|---|---|---|---|
| Historic Template | 1,660 | 15.0:1 | 8,073 |
| PFC + | 1,160 | 9.3:1 | 4,735 |
| PFC | 640 | 7.4:1 | 2,353 |
| Current (w/o harvest) | 210 | 2.5:1 | 543 |
| Current w/ harvest) | 130 | 1.9:1 | 238 |
| **Latest Returns** | **Abundance Escapement (Adults)[1]** | **Productivity Recruits/Spawner (R/S)[2]** | **Population Growth Rate (λ)[2]** |
| 1997 | 50 | 12.3:1 | 1.008 |
| 1998 | 110 | 9.1:1 | 1.029 |
| 1999 | 75 | 11.0:1 | 0.959 |
| 2000 | 218 | | 1.010 |
| 2001 | 453 | | 1.120 |
| 2002 | 663 | | 1.088 |
| 2003 | 640 | | 1.096 |
| 2004 | 953 | | 1.060 |
| 5-year Geo Mean | 525 | 3.3:1 | 1.074 |
| Escapement Goal: | 945 | | |
| QET[3] | 63 | | |

(1) DRMT website: http://www/olympus.net/community/dungenessws
(2) PS TRT (2003) Dungeness Chinook Productivity and Abundance Model (Version 6.4)
(3) Quasi-Extinction Threshold

Escapement planning targets have recently been developed for the Dungeness River Chinook salmon population as draft "recovery goals" based on abundance and productivity (defined as the number of returning adults produced per spawner) data (Puget Sound Technical Recovery Team (TRT), 2002). The targets for chinook abundance and productivity developed for the Dungeness River watershed, based on preliminary results generated by the EDT method, range between 1,200 and 4,700 fish at associated productivity estimates of 3:1 and 1:1, respectively (Jamestown S'Klallam Tribe 2003).

The co-managers (WDFW and tribes) have established an annual target spawning escapement population for Dungeness Chinook salmon of 945 spawners. The fall 2004 escapement exceeded the annual target for the first time in recent history.

### *Chum Salmon*

In the Action Area, chum salmon commonly occur as two distinct groups known as summer-run and fall-run. Summer-run chum salmon are usually larger and older than the fall-run chum. They spawn in the mainstem of streams. Fall chum salmon spawn later and often use small spring-fed waters or conversely, streams high in the watershed network because of moderated temperatures. Fry emerge in March and April (Entrix 2000). Fry of both summer and fall stocks migrate directly to the ocean with little or no residence time in freshwater. They rear in the estuarine environment before going to sea for 3 to 4 years (Salo 1991).

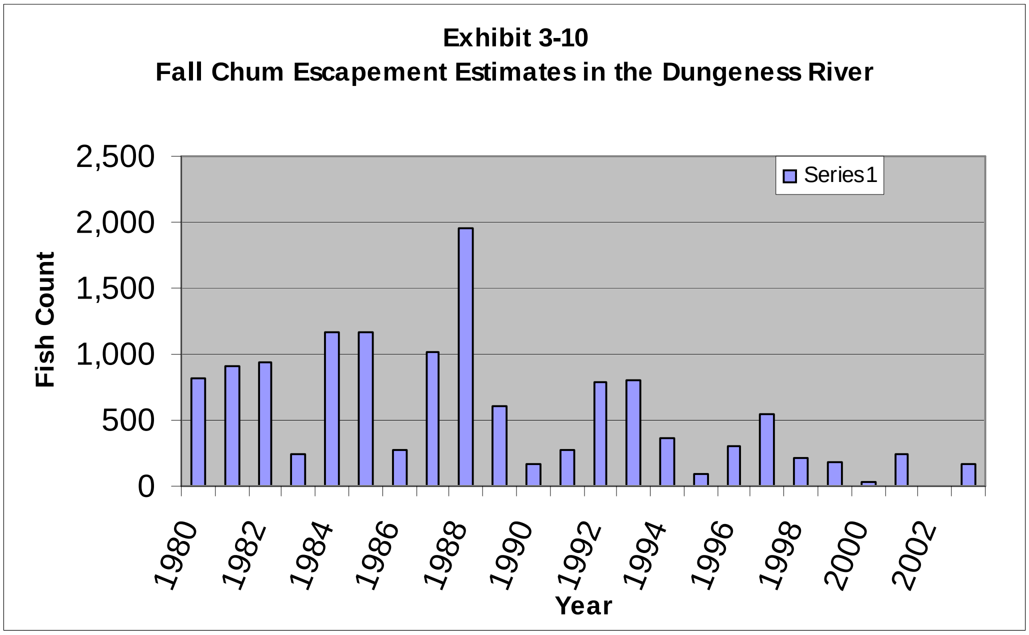
***Dungeness Summer-Run Chum:*** This run is thought to enter the Dungeness River in August to spawn in the main channel from September into October. These fish are the most western of the summer-run chum salmon in Puget Sound and the Strait of Juan de Fuca. Summer-run chum salmon in the Dungeness are an independent population of the Hood Canal Summer-Run ESU. Their population numbers are very low (Table 3-2). This run was listed under the ESA on March 24, 1999, as threatened. Adult summer-run chum salmon have been observed in the Dungeness River up to RM 10.8, and up to RM 0.5 in both Matriotti and Hurd Creeks (Haring 1999). As a rough estimate, Chitwood (2002) believes they number less than 100 fish in the Dungeness River. Spawning surveys during 1999 and 2000 annually recorded less than 3 summer chum salmon in the lower 3.3 miles of the Dungeness River mainstem (WDFW and Point No Point Treaty Tribes 2001).

A small run of summer chum returns to Sequim Bay. Since 1999 this run has produced between 7 and 262 adult recruits and averaged 92 adults. This 4-year average has been used as the forecast for the 2003 run size to Sequim Bay (Strait of Juan de Fuca summary of 2003 Forecasts and Forecasting Methods).

***Dungeness River/East Strait Tributary Fall Chum*****:** This run is more abundant than the summer run. They enter the Dungeness River in September and spawn in the side channels into November and December (Jamestown S'Klallam Tribe as quoted in Entrix 2000). Fall-run chum salmon spawning occurs in the Dungeness River upstream to RM 11.8, in Bear Creek (below Taylor Cutoff Road), in Matriotti Creek (documented only to RM 0.9, but perhaps as far upstream as U.S. Highway 101), in Beebe Creek to its upper reaches, and perhaps in Siebert Creek (in the 1940s, up to RM 0.8). The presence of chum in McDonnell, Cassalery, Bell, and Gierin Creeks may have occurred historically before these streams were altered (McHenry et al. 1996; Haring 1999).

Chum fry migrate to the Dungeness estuary in a distinctly bimodal pattern, with peaks in movement in the first and last weeks of April (Hiss 1995). The outmigration pattern lends evidence to the concept of both an early fall and a late fall upriver stock of chum salmon in the Dungeness River (McHenry et al. 1996).

Fall-run chum salmon were anecdotally noted as being "incredibly numerous" in most streams in the project area, historically. The Dungeness River Technical Advisory Group (Haring 1999) noted the stock status should now be considered as "critical" because of the few returns. The run size is highly variable ranging from a low of 20 to a high of 1,955 adults since the late 1960s. The current run size in the Dungeness River is estimated to range between 38 and 243 adult recruits averaging slightly over 155 fish (Table 3-2). The 2003 forecast for the fall run chum recruits in the Dungeness River is 170 fish (Strait of Juan de Fuca summary of 2003 Forecasts and Forecasting Methods). See Exhibit 3-10.




## *Coho Salmon*

Dungeness River coho salmon populations are dominated by Dungeness hatchery production. Natural coho production has been documented in Bell Creek and its tributaries in the lower 3.0 miles; in Gierin Creek and its tributaries to mile 2.7; in Cassalery Creek to mile 2.9; in the Dungeness River and associated side channels to mile 18.7; in Matriotti Creek to the Agnew ditch at RM 6.8; in Beebe Creek for the first 0.6 mile; and in Bear Creak for 1.0 mile. Coho salmon are known to spawn in McDonnell Creek up to RM 5.1; and are presumed to spawn up to RM 9.0 in Pederson Creek; to RM 3.6 in Seibert Creek to RM 8.5; and in West Fork Siebert Creek to RM 2.0 (Haring 1999) (Exhibit 3-4).

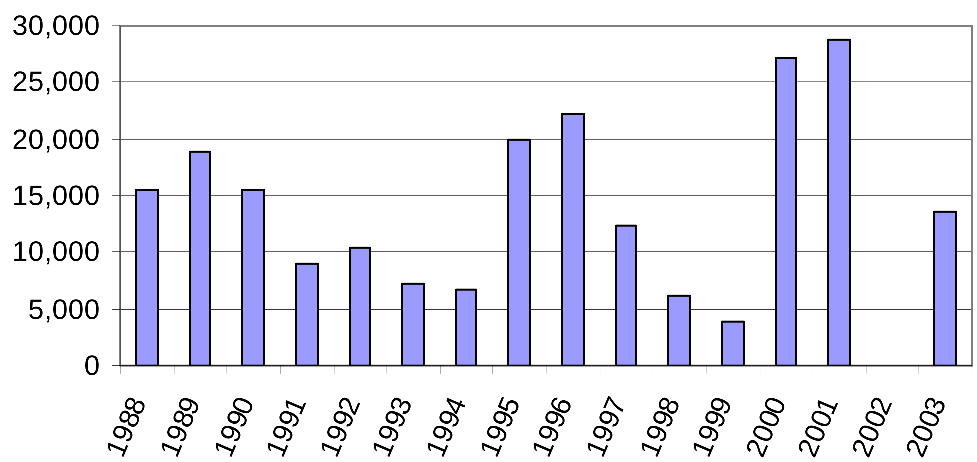
The life history of coho salmon differs from other salmon species. They have a uniformly longer juvenile freshwater phase compared to other salmon and outmigrate as yearlings about 18 months after emergence. Coho fry may occupy backwaters, side channels, and small creeks too small for adults. The fry typically reside in pools and establish territories. Streams with wood, stones, and other complex structures will support more fry than habitat features in simple channels. Juveniles prefer slow-moving streams with large areas of slack water. They often use overflow channels that are not connected to the Dungeness River, and are found in small isolated pools in the watershed (Hirschi and Reed 1998). Juvenile coho salmon were present throughout the year in all side channels sampled by Hirschi and Reed (1998).

The lower Dungeness River contains some of the most productive coho salmon habitats in the region. Spring Creek, a tributary of Dawley side channel, which is between RM 6.4 (the Highway 101 bridge) and RM 7.2 (the Sequim/Prairie diversion) is especially important habitat (WDFW unpublished cited in Hirschi and Reed 1998).

Coho salmon in the Puget Sound ESU were reviewed for potential listing under the ESA, but the listing was determined to be unwarranted (Weitkamp et al. 1995). Based on uncertainties with the influence of hatchery coho on natural stocks, the species remains a federal candidate for listing and they are currently under review status.

The Dungeness River stock of fall coho salmon is managed for hatchery production. Coho juveniles have been outplanted since 1902. The effects of the hatchery program on wild Dungeness coho salmon and the current status of the natural coho run are currently unknown. Since 1999, the number of adult coho recruits has been estimated to occur between 4,000 and 30,000 fish (Exhibit 3-11). The co-managers estimate the native run is approximately 25 percent of the total river return and forecast an adult return in 2003 of 6,770 natural and 18, 228 hatchery coho (Strait of Juan de Fuca Summary of 2003 Forecasts and Forecasting Methods).

**Exhibit 3-11**
**Coho Salmon Hatchery Escapment Estimates**




## *Pink Salmon*

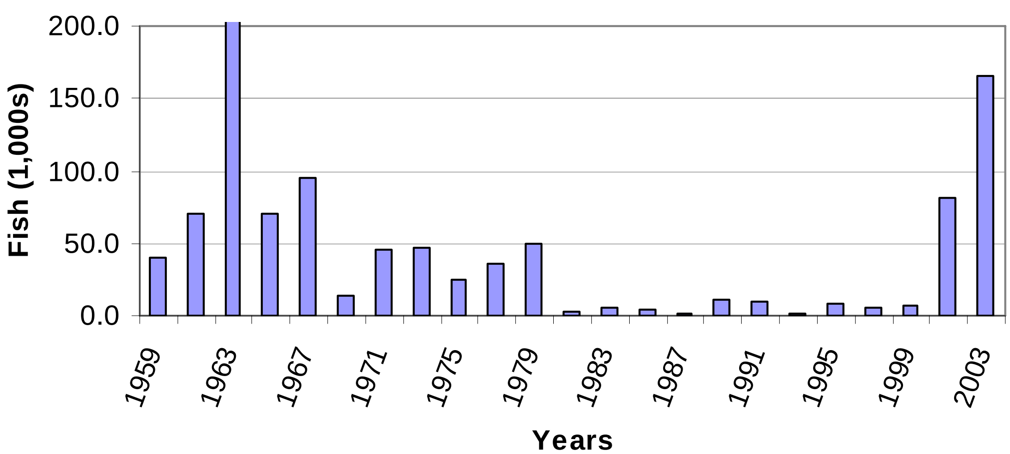
The Dungeness River supports a large run of pink salmon, comprised of two temporally and spatially separated components. The summer run stock enters the system early between July and September and spawns primarily in side channels and tributary waters in the upper Dungeness River above RM 10.0 and in Greywolf River downstream of RM 5.1 between mid-August and September (McHenry et al. 1996). The fall run stock, similar to other Puget Sound stocks, enters during August through October and spawns mid- September to late October in the mainstem river mostly up to RM 3.0 although some reach RM 6.0. They also use Matriotti Creek to RM 0.2 and Beebe Creek to RM 0.6. Meadow Creek, a stable side channel in the vicinity of the Sequim-Prairie Tri-Irrigation Company intake and bypass, tends to be a productive area for lower Dungeness pink salmon (Haring 1999).

Pink salmon have the simplest and least-varied life history of any Pacific salmon. Nearly all pink salmon stocks have a 2-year life cycle. Pink salmon return to the Dungeness

River during the summer low flow period of odd years. They are a component of the Puget Sound odd-year pink salmon ESU. This ESU was reviewed for potential listing under the ESA. The listing was found to be unwarranted (Johnson et al. 1999). Of the eight odd-year pink salmon runs in Washington included in the ESU, only the Dungeness River run was declining.

An estimate of the historical Dungeness pink salmon runs before European settlement ranges from 300,000 to 600,000 (Lichatowich 1992). An estimated 400,000 pink salmon returned to the Dungeness River in 1963 (Lichatowich 1992). However, this run is currently considered either depressed (Upper Dungeness) or critical (Lower Dungeness) because of recent low numbers of returning adults. Between 1959 and 1979, pink salmon spawning escapement to the Dungeness River averaged approximately 37,000 adults. Following a large flood event in the winter of 1979-1980, the run declined by an order of magnitude. Dry weather patterns, and poor freshwater and ocean conditions did not allow the population to rebound from these lows. The spawning population ranged between 1,700 and 10,900 fish while averaging 5,800 fish for the next two decades (Exhibit 3-12). The 2001 run broke out of the prior pattern with a return of 81,400 adults. Based on the strength of the last run, the co-managers are forecasting a 2003 return of 165,000 fish (Strait of Juan de Fuca summary of 2003 Forecasts and Forecasting Methods).

**Exhibit 3-12**
**Pink Salmon Escapement in the Dungeness River**




## *Steelhead and Rainbow Trout*

*Oncorhynchus mykiss* has both a resident form (rainbow trout) that does not migrate to salt water and a sea-run form, known as steelhead trout. Rainbow trout may be found throughout the Dungeness River drainage in considerable numbers. Both summer- and winter-run steelhead trout are present in the Dungeness River.

***Summer-run Steelhead Trout:*** There is very little quantitative information on the current or historic status of the summer steelhead in the Dungeness River. Escapement estimates are not available, however, sport harvest ranged between 8 and 47 fish between 1986 and 1991 (WDFW et al. 1994). Summer steelhead use the mainstem river. Goin (1998) suggests the Dungeness summer steelhead are an upper river stock using mainstem habitat upstream of RM 15.0 up to RM 18.7, where there is an impassible falls. They enter the river annually between July and October with spawning occurring in February and March. Although the current and historic abundance is unknown, based on personal observations, Goin (1998) estimated the prior spawning population was in the range of 250 to 400 fish. He estimated the run size in the mid-1990s was on the order of 75 fish. Chitwood (2002) suggests the 2001 summer steelhead run in the Dungeness River may have been between 100 and 200 fish.

***Winter-run Steelhead Trout*** Winter steelhead use both the lower and upper main river to RM 18.7 and are presumed to have the same distribution as Coho salmon in Bell, Gierin, Cassalery, Meadowbrook, Matriotti, Beebe, and Bear creeks (Haring 1999). Escapement estimates for this stock in the late 1980s and early 1990s ranged from 176 to 438 wild winter steelhead (McHenry et al 1996). Winter steelhead enter the Dungeness River from December to May, with peak spawning from February to June. Redd counts in the late 1990s suggest a Dungeness River spawning population of approximately 350 adults (Goin 1998). Chitwood (2002) estimates the current winter steelhead run in the Dungeness River is between 500 and 1,000 fish. Like many stocks, the baseline period indicates slightly higher numbers of fish currently than estimated in the last two decades. The co-managers do not provide a forecast for this stock.

Juvenile steelhead trout can spend up to two years or more in freshwater prior to emigrating to marine life history phases. This stream-type rearing life history strategy makes steelhead trout more susceptible to freshwater habitat conditions than most of the other anadromous salmonid species. Busby et al. (1996) classified both the summer and winter run steelhead stocks in the Dungeness River system as components of the Puget Sound Steelhead trout ESU. NOAA's review of the stock status for potential listing of this ESU under the ESA concluded the ESU is not likely to become endangered in the foreseeable future and that listing was not warranted (Busby et al. 1996). Two concerns for the ESU were noted however, including the low numbers and lack of information related to summer-run fish and the prevalence of hatchery introductions. Extensive plants of both native and non-native steelhead stocks have occurred in the past. The effects of hatchery practices on the steelhead runs are difficult to quantify, but it is likely some loss of genetic diversity has occurred (McHenry et al 1996). Approximately 60 to 80 percent of the run is estimated to be made up of non-native steelhead (Busby et al. 1996).

### *Cutthroat Trout*

Coastal cutthroat trout are considered in a separate guild from the other anadromous salmonid fishes based on its preference and use of small tributary streams for spawning and rearing.

***Coastal Cutthroat Trout:*** Cutthroat trout in all watercourses in the project area are considered to be members of the Eastern Strait stock (WDFW and Western Washington Treaty Indian Tribes 2000). These fish have been documented in the Dungeness and Greywolf Rivers and their tributaries; in Johnson, Bell, Gierin, Cassalery, McDonnell, and Siebert creeks; as well as several unnamed independent streams (Clallam County Streamkeepers 2003, Foster Wheeler, 2003).

The anadromous cutthroat trout in the Eastern Strait enter coastal streams in the fall. Coastal cutthroat trout in the Dungeness River system can enter any time between mid-September and mid-November with most fish entering late in the fall period. The time when spawning occurs is largely unknown, but is thought to fall between January and April with peaks mid-February to mid-March regardless of the entry time. Goin (1998) estimated historic sea-run cutthroat trout spawning populations between 300 and 400 fish. No anadromous coastal cutthroat trout are presently released from hatcheries into the Puget Sound ESU.

The adults spawn in small tributaries and headwater streams generally upstream of Coho salmon and steelhead spawning areas. Selection of these sites may be related to reduced competition for suitable spawning sites and reduced interactions between young-of-the-year cutthroat trout and other salmonids. Reduced competition at this early life-history stage may be particularly important since coastal cutthroat trout typically emerge later and at a smaller size than other species (Johnston 1982, Griffith 1988). Fry begin to emerge between March and June, with peak emergence in mid-April. Fry quickly migrate to channel margins and backwater areas where they remain throughout summer.

Like steelhead, coastal cutthroat trout spend more time in the freshwater environment and make more extensive use of this habitat than do most other of the anadromous salmonid fishes. Sea-run cutthroat trout typically spend 2 to 5 years rearing in freshwater prior to making their initial seaward migration. Anadromous forms may also spend only brief periods offshore during summer months and often return to estuaries or freshwater streams by fall or winter (Trotter 1989). These fish make extensive use of river basins including large and small river systems, with a diversity of stream gradients, estuaries, sloughs, ponds, and lakes, throughout all or a large portion of their life cycle. In general, coastal cutthroat trout exhibit considerable variation in age and size at maturity.

Based on distinctive life history patterns and consistent genetic information, coastal cutthroat trout in the Dungeness River system are considered part of the Puget Sound ESU. NOAA reviewed this ESU in 1999 and judged its status for listing under the ESA as unwarranted at that time (Johnson et al. 1999). Given the lack of data concerning current or historic abundance and the widespread habitat degradation that has reduced habitat capacity compared to historic levels, the NOAA biological review team expressed a high level of uncertainty with their conclusion. As such, the coastal cutthroat trout ESU remains under review. Resident and fluvial life history forms of cutthroat trout occur throughout the basin. These life history forms are not currently under consideration for inclusion with the ESU.

### *Native Char*

***Bull Trout and Dolly Varden*** are closely related species that are nearly indistinguishable visually and, therefore, are grouped together and managed as "char". Both species reside in the Action Area as discussed below. The following information is derived from reviews in Brown (1994), Goetz (1994), and McPhail and Baxter (1996). Bull trout are emphasized in this discussion because they were listed in 1999 as a threatened species under the ESA. Dolly Varden are included as proposed threatened in the similarity of appearance rule [66 FR 1628].

The Washington State Salmonid Stock Inventory for Bull trout/Dolly Varden. SaSSI report [Washington Department of Fish and Wildlife (WDFW), et. al 1998] identified four stocks of char in streams that enter the Strait of Juan de Fuca based on the geographical location of their spawning populations. One of these stocks: the Dungeness/Greywolf (distinct from the Upper Dungeness stock identified above RM 18.8) occurs in the Action Area. No genetic information is available for any of these stocks, and no information is available about their migration and spawning time.

The Dungeness/Greywolf stock is thought to consist of anadromous, fluvial, and resident life history forms. Its status is unknown, but WDFW biologists captured and identified char identified as bull trout at the Dungeness hatchery (RM 10.5) in 1996, at RM 16.0 in the Dungeness River in 1994, and at RM 1.0 in the Greywolf River in 1994. Anecdotal information provided in the SaSSI document indicates char were once very common and widespread; anglers are reported to say char are still widespread, but not very common (WDFW et. al. 1998).

Other anecdotal notes in Haring (1999) include observations of adult char in Canyon Creek near the Agnew ditch in 1998, and in upper Bell Creek. Haring (1999) also considers Cassalery and Gierin creeks to be potential char habitat, although char have not been observed in either creek.

### *Lamprey*

Lamprey are ancient, jawless species found in coastal streams from California to Alaska (Morrow 1976). Pacific and river lamprey are two of the most common lamprey species in Pacific Northwest waters. Both species are anadromous and they have freshwater habitat requirements similar to some of the Pacific salmon. Since they would benefit from habitat conservation measures proposed herein, the Pacific and River lamprey are considered for coverage under the CIDMP.

Little information exists regarding the Pacific or river lamprey historic or current population status in the Dungeness River system or vicinity. Though the absolute historical population sizes of the lamprey are not known, it is assumed the species have experienced population declines similar to other waters in the region. Because little is known about these species in the Dungeness River, the effects of the CIDMP should be evaluated based on knowledge of the species periodicity and life history requirements and, where applicable, the results of more detailed habitat assessments for other species and life stages deemed similar to that for lamprey.

A petition to list these species, among others, under the ESA and to designate critical habitat in Oregon, California and Washington was submitted by conservation groups in January 2003. The USFWS has not initiated a status review of the petitioned lamprey in the Pacific Northwest due to a lack of funds. The Pacific lamprey and the river lamprey remain federal species of concern and could become listed species in the future.

***Pacific Lamprey.*** The Pacific lamprey is one of the most primitive fishes found in the region. Like Pacific salmon, this lamprey is a native anadromous fish that spawns in fresh water, with the majority of growth and adult maturation occurring in salt water. Pacific lamprey is the predominant lamprey in the coastal streams of Puget Sound. In saltwater, lamprey adults are parasitic on adult fishes, and feed in the ocean for 1.5 to 4 years before migrating to their natal streams to spawn (Kan 1975, Simpson and Wallace 1982; Starke and Dalen 1995).

Adult Pacific lamprey return to fresh water between April and June and complete their upstream migration by September (Beamish 1980). As such, adults are likely present in the lower Dungeness River in spring and summer months.

According to the BPA et al. 1994, adult Pacific lamprey in the Columbia River system average 54 cm (21 inches) total length when migrating inward from the sea and attain a maximum length of 68 cm (27 inches). Pacific lamprey are considered weak swimmers; their burst swimming speed has been measured at 7 feet per second compared to 22 feet per second for Chinook (Bell 1990). While their maximum speed is slow compared to salmonids, they are able to use their mouth to cling to rock surfaces and slowly creep upstream in velocities that they would not otherwise be able to surmount. Adult Pacific lamprey move upstream into headwater areas, often through rapids and over waterfalls. They have been observed to readily ascend Denil-type fish ladders designed for passage of adult salmonids (Slatick and Basham 1985). During their spawning migration in fresh water, adult lamprey do not feed, but utilize body reserves and may shrink 20 percent in body size from the time of freshwater entry to spawning (Beamish 1980).

Following river entry in spring and summer, adult Pacific lamprey over winter in deep pool habitat and spawn the following spring. Pacific lamprey spawning in rivers on the coast of Oregon usually occurs in May when water temperatures are between 10ºC (50ºF) and 15ºC (59ºF) (Close et al. 1995). In the Babine River system in British Columbia, Pacific lamprey were observed spawning from June through the end of July (Farlinger and Beamish 1984). Spawning areas are located in low gradient reaches in mainstem and tributary pool tailouts and usually just upstream of riffles (Simpson and Wallace 1982). Lamprey are also known to spawn below falls. Spawning occurs over predominantly gravel substrates with a mixture of pebbles and sand. Similar to salmonids, incubating lamprey embryos are susceptible to smothering by fine sediments, and increases in suspended sediments can decrease egg survival. Adult lamprey spawn in gravel areas with mean column water velocities of 1.5 to 3.0 feet per second (Kan 1975). Most adult lamprey die shortly after spawning (Scott and Crossman 1973; Wydoski and Whitney

1979), but there have been observations of some repeat spawning for the Pacific lamprey (Michael 1984).

Similar to salmonids, temperature controls the time to hatch and emergence of larvae. At a water temperature of 14.4ºC (58ºF), Pletcher (1963 *in* Close et al. 1995) observed embryos hatching after 19 days and the larvae left the gravel substrate approximately 2 to 3 weeks after hatching. However, other researchers note the time period can be up to 5 to 6 weeks. Pacific lamprey larvae emerge from the gravel nests after hatching and drift downstream to settle in slow backwater areas. The larval lamprey, termed ammocoetes, drift into areas of slow current and burrow into mud and sand deposits. The highest densities of ammocoetes are found along the channel margins, where they inhabit burrows in predominantly mud substrate. Higher densities of ammocoetes are also found in lower sections of rivers with low gradients opposed to upper watershed, higher gradient reaches (Richards 1980 *in* Close et. al. 1995). As they grow, ammocoetes may find new areas to burrow, colonizing subsequent areas downstream. Movement of ammocoetes occurs primarily at night and most downstream movement occurs in the spring when flows are the highest (Beamish and Levings 1991). The larval stage may extend from 4 to 7 years; during this time the ammocoetes are blind, toothless, sedentary, and feed by filtering detritus, diatoms, algae and other food particles while burrowed in the mud (Simpson and Wallace 1982; Starke and Dalen 1995). Larval lamprey undergo metamorphosis in late summer and fall to a juvenile stage that begins transition to a parasitic lifestyle by developing eyes, teeth and a rasping tongue. Pacific lamprey are usually about 12 to 30 cm (5 to 12 inches) in length at metamorphosis (Wydoski and Whitney 1979, Beamish 1980). Metamorphosis occurs over a 6-to-8 week period. After transformation, the lamprey move into areas with faster currents where the juveniles hold in cobble and boulder substrates before migrating to the ocean. The juveniles can begin out migrating during late fall, but the majority over winter and migrate downstream to the ocean in April and May (Beamish and Levings 1991). Juvenile Pacific lamprey rely on currents to be carried downstream during their out migration to the ocean. High flows appear to initiate downstream movement (Beamish and Levings 1991). Even small increases in flow rate appear sufficient to initiate downstream migration (Beamish and Levings 1991).

During their downstream migration, as Pacific lamprey approach the estuary, young adults may attach themselves to salmonid smolts (Parker 1994 *in* Starke and Dalen 1995). During their study of the survival rate of hatchery-released juvenile Chinook in the Green River, Wetherall (1971) observed between 0.15 percent and 1.5 percent of the juvenile Chinook in the estuary exhibited lamprey wounds. Seven percent of Chinook juveniles captured in the Duwamish estuary exhibited lamprey scars in a study by Matsada et al. (1968). Young adult Pacific lamprey have been observed feeding on salmonid smolts in estuarine areas, but the incidence of feeding on salmonid smolts is thought to be low. When young adult Pacific lamprey enter salt water, they typically move to water deeper than 230 feet (Beamish 1980).

The size and health of the existing population of Pacific lamprey is largely unknown, since there have been no detailed quantitative surveys completed in the Dungeness River system. The Pacific lamprey is included in the CIDMP as an un-listed, federal species of concern based on a general decline across the region.

***River Lamprey.*** River lamprey (L. ayersi) are included in the CIDMP as an un-listed, federal species of concern and a state candidate species based on a general decline across the region. Population status and abundance for this species in the Dungeness River system is unknown.

River lamprey, like Pacific lamprey, is a native anadromous fish that spawns in fresh water, has a freshwater juvenile rearing phase, and then migrates to the ocean where they grow and mature before returning to fresh water for spawning. Like Pacific lamprey, river lamprey are parasitic and have been known to cause injury and death to juvenile salmon (Beamish 1980). One clear distinction between the two species is that adult river lamprey are smaller than Pacific lamprey, reaching an average length of only 30 cm [12 inches] ((Scott and Crossman 1973; Wydoski and Whitney 1979).

River lamprey have not been extensively studied. The existing information suggests a life history pattern similar to that of Pacific lamprey, although river lamprey have a life span several years shorter than Pacific lamprey (Beamish 1980). The larvae of this species are also called ammocoetes, which are blind and toothless, and generally feed on algae and microscopic organisms. It is unknown how long river lamprey ammocoetes reside in fresh water before metamorphosing to a juvenile stage and transitioning to a parasitic lifestyle. Based on incidental catches of both river lamprey and Pacific lamprey in other regional streams, the abundance of river lamprey appears to be much lower than Pacific lamprey (Jeanes and Hilgert 1998). The size and health of the existing population of river lamprey in the Dungeness River system are largely unknown. As a result, the potential effects of the CIDMP should be evaluated based on similarity in life stage periodicity and life history requirements to Pacific lamprey and, where applicable, the results of more detailed habitat assessment for other species and life stages deemed similar to that for river lamprey.

According to Beamish (1980) adult river lamprey return from the ocean to fresh water between September and later winter, with the adults apparently holding until the following spring when spawning occurs (April through June). The period of immigration of adult river lamprey into the Dungeness River is unknown. Spawning presumably occurs over gravel areas similar to those used by Pacific lamprey. Since adult river lamprey are small, they will also likely be weak swimmers. Like Pacific lamprey, they are capable of clinging to rock surfaces and slowly working their way upstream with their mouth.

After migrating upstream between September and late winter, adult river lamprey over winter and spawn the following spring from April to June (Beamish 1980). Spawning areas are likely similar to those used by Pacific lamprey, which are areas located in low gradient reaches in mainstem and tributary pool tailouts and riffles. Spawning likely occurs over predominantly gravel substrates with a mixture of pebbles and sand. River lamprey die after spawning; there has been no documentation of repeat spawning as for

Pacific lamprey (Beamish 1980). Incubation, hatching and emergence timing is presumed to be similar to Pacific lamprey.

Little is known about the rearing behavior of river lamprey, although it is assumed to be similar to Pacific lamprey. Based on Pacific lamprey data, larvae of river lamprey likely emerge from gravel nests approximately 2 to 6 weeks after hatching depending upon water temperatures and drift downstream to settle in slow backwater areas. The larval ammocoetes drift into areas of slow current and burrow into mud and sand deposits. As they grow, ammocoetes may find new areas to burrow, colonizing areas downstream. The length of the larval stage of river lamprey has not been documented; Pacific lamprey may remain as ammocoetes for up to 7 years. After metamorphosis in late July (Beamish 1980), the young adults likely hold in cobble and boulder substrates before migrating to the ocean the following year from May to July. Little is known about the behavior of downstream migrating river lamprey. However, because of similarity in life history patterns to Pacific lamprey, parasitism on juvenile salmonids seems likely as the young river lamprey adults out-migrate to the ocean.

## 3.4 Biological Information for Covered Upland Species

### 3.4.1 Bald Eagle

The bald eagle *(Haliaeetus leucocephalus)* is currently listed as a federally threatened species in the lower 48 conterminous states in the United States. This species has been listed since 1967 as either threatened or endangered under the ESA of 1973 and its predecessor, the Endangered Species Preservation Act of 1966. As of July 1999, the USFWS proposed to remove the bald eagle from the list, since available data indicate the species has recovered (50 CFR, Part 17, FR 64 (128): 36453-36464). The species remains federally listed as threatened until review of the federal proposal and formal delisting process is completed.

Bald eagles are present within the covered area. The lower Dungeness River area and estuary serve primarily as breeding and foraging areas for resident and migratory eagles. Functional uses of the Action Area for bald eagles are described below:

***Breeding:*** The bald eagle nesting is most common along saltwater, lakes and rivers in western Washington. Nests are usually located in uneven-aged forest stands. Grubb (1980) found the majority of nests in western Washington located in predominantly coniferous forests. Nests are usually located in the tallest tree within the stand, ensuring an open flight path and a structure capable of supporting a large nest, which may weigh more than 2 tons (Stalmaster 1987). Bald eagle nests are most often associated with aquatic foraging areas. Douglas-fir and Sitka spruce within 275 m (900 ft) of open water and black cottonwood near rivers are often used as nest trees (Anderson et al. 1986). In western Washington, Grubb (1980) found 55 percent of nests within 45m (150 ft) and 92 percent within 180m (600 ft) of a shoreline.

Bald eagle nesting territories have been identified in the Action Area, adjacent to many of the irrigation ditches (WDFW, PHS database). There are 11 active bald eagle nesting territories within the Action Area. Ten of these active territories are located within 245m

(800 ft) of an irrigation ditch that may fall within covered activities considered herein, depending on the conservation action taken (Foster Wheeler, 2003).

Eagles typically lay two eggs, which are normally incubated for a month. Both sexes share in incubation, with the female conducting the majority of daytime incubation (Johnsgaud 1990). Newly hatched juveniles require constant care from adults. With time, adults leave the young unattended for increasing lengths of time, until the young leave the nest at 10 to 12 weeks of age.

***Foraging:*** Database information received from the WDFW includes documented bald eagle use of habitats along the mainstem river and within the estuary, throughout the Action Area (WDFW 1997). Bald eagles feed in the area primarily on salmon carcasses along the mainstem river, tributaries and independent streams and the abundance of food in shallow areas in the estuary. Eagles will prey on gulls and waterfowl as well as fish and shellfish (City of Everett 1997).

***Roosting:*** Wintering bald eagles potentially occur within the estuary and lower Dungeness River from 31 October through 31 March, annually. Wintering bald eagles in the vicinity of the Action Area often congregate in communal roosts to sleep or avoid extreme weather conditions. Many of the roost sites are traditional, used year after year. They are usually located in stands containing the tallest and most open-structured trees available. In a study of 26 roost sites in Washington, Watson and Pierce (1998) found four tree species, western redcedar, black cottonwood, western hemlock and Douglas-fir, to be the dominant roost stands. To protect themselves from inclement weather, bald eagles will roost in areas sheltered from wind, such as depressions or leeward slopes.

### 3.4.2 Western Toad

The western toad has become a species of concern in recent years due to declines in populations. It currently does not have regulatory status with either the state or the USFWS. It is listed as a federal species of concern and a state candidate for listing. Western toads can be found in a variety of upland habitats from prairies to old-growth conifer forests. Optimal areas may consist of areas with moderate to dense undergrowth in more humid areas (Nussbaum et al. 1983). Western toads are pond-breeders, and require an aquatic system for reproduction. They will use spring and wetland pools, ponds, lakes and slow-moving portions of streams (Nussbaum et al. 1983).

***Breeding:*** Breeding may begin as early as January and could continue to early July in high elevation areas (Blaustein et al. 1995). Adult western toads will congregate at traditional breeding waters, which are usually a specific cover or area of a lake or wetland (Blaustein et al. 1995). Since there is evidence suggesting toads display fidelity to breeding sites, the loss of wetlands containing breeding sites may cause local decreases in populations. Western toads are explosive communal breeders. Mating usually takes place within 10m (33 ft) of shore and is completed within a week (Blaustein et al 1995). Eggs are deposited in two gelatinous strings of up to 12,000 eggs or more per female along shallow edges of lakes or ponds in water less than 0.5m (1.6ft) deep (Corkran and Thoms 1996). Embryos develop and hatch within 3 to 10 days. The tadpoles metamorphose by late September (Nessbaum et al. 1983; Leonard et al. 1993). Western toad tadpoles commonly form huge schools, numbering from hundreds to thousands of individuals. They seek warm, shallow portions of pools, wetlands and lakes.

***Foraging:*** Although breeding is dependant upon aquatic systems, metamorphs and adults are terrestrial and forage in upland habitats (O'Connell et al. 1993). They may wander great distances from water. Their primary habitat is low density hardwood and conifer forest stands where they favor open canopy (Brown 1985, Hagar et al. 1995). Associated foraging habitat includes down logs and woody debris. Adults spend their day buried in loose soil, concealed under woody debris, grass and shrubs or in burrows of other animals (Leonard et al. 1995; Corkran and Thoms 1996).

Although western toads have not been recorded within the Action Area, the area is classified as core zone habitat for the toad (Washington Gap Analysis, 2003). The potential for western toad to occur in the Action Area is high.

# Section 4
# Baseline Conditions

This section describes baseline conditions for water quality, flow and other important attributes of the Comprehensive Irrigation District Management Plan (CIDMP). The Services' implementing regulations define baseline conditions as the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. See 50 C.F.R. § 402.02 (definition of "effects of action"). The DWUA notes that a range of actions have been carried out in recent years to improve flow conditions and water quality. These prior activities have contributed to the current baseline condition. Therefore, voluntary actions previously undertaken by DWUA have resulted in an improved baseline relative to historic conditions.

Section 5, *Assessment of Existing Effects on Water Quality and Aquatic Resources*, uses baseline conditions as the reference state and assesses whether the Dungeness Water User Association (DWUA) operations have the potential for ongoing effects relative to the baseline condition. Section 7, *Predicted Effects of Conservation Measures*, will also use the baseline condition to judge the influence of future conservation measures on Covered Species.

This Section is organized as follows:

4.1 Baseline Conditions for Streamflow (includes subsections on mainstem Dungeness River, side channels, tributaries, and independent streams, respectively)

4.2 Baseline Conditions for Wetlands

4.3 Baseline Conditions for Aquatic Habitat in the Dungeness River

4.4 Baseline Conditions for Upland Habitat

4.5 Baseline Conditions for Water Quality

## 4.1 Baseline Conditions for Streamflow

For purposes of discussing flow conditions, the baseline period for the CIDMP is a summary of the most recent conditions during the water years between 1999 and 2002. This 4-year period allows an understanding of a range of annual variability in conditions rather than the risk of using one year for establishing baseline conditions that may or may not represent normal conditions for the current situation in the basin. For instance, it includes drought conditions during 2001 as well as very wet weather conditions during 1999. It is also a period representing DWUA water withdrawal operations under the Trust Water Rights Memorandum of Understanding, instituted in 1998. It is not known how well this baseline period will reflect hydrologic conditions in the future since the effect of climate variability (El Nino, La Nina, Pacific Decadal Oscillation) and climate change (warming) is not predictable at this time.

Baseline conditions are most frequently discussed in relation to the late summer and early fall low flow period when the demand for water peaks and water availability is most restrictive. The

Dungeness Instream Flow Group judged spawning Chinook salmon to be the most sensitive species and life-history phase using the mainstem Dungeness River during the low flow period (Hiss 1993 – Appendix C). Since the spawning period generally ranges from early August to mid October, this time-period is defined for the aquatic and hydrological assessments as the baseline-period.

### 4.1.1 Dungeness River Mainstem

The Dungeness River basin originates in the Olympic Mountain Range within the Olympic National Park. Streamflow in the Dungeness River results from snowmelt and runoff from rainfall that occurs in the basin. The river exits the foothills and mountainous area at the upper end of the project area, and is measured at a USGS gaging station (#12048000) located at RM 11.8. A few tributaries are present downstream of the gaging station but most of the streamflow in the Dungeness River is produced upstream of, and measured at, the gaging station. Peak streamflows typically occur in winter as a result of warm frontal rains on an existing snow pack and again in late spring and early summer during the period of peak snowmelt runoff. Low flows occur in late summer and last through early fall periods until fall rains begin. The USGS and USBR have summarized the hydrological characteristics of the basin in England (1999), Simonds and Sinclair (2002), Bounty et al. (2002) and Daraio et al. (2003). Streamflows in the lower river reach (downstream of RM 11.8) are a function of runoff or flow at RM 11.8, the volume of water diverted for irrigation purposes between RM 11.0 and 6.9, the inflow from small tributaries and the amount of flux between the surface and groundwater layers. For the purposes of establishing baseline conditions, hydrologic data for three specific locations in the Dungeness River are compared. Those locations are as follows:

- The USGS gaging station #12048000 Dungeness River near Sequim, WA located at RM 11.8, upstream of all diversion points.
- The reach between RM 11.0 and 6.9, where diversions by DWUA members occur.
- The upper IFIM study site on the Dungeness River mainstem at RM 4.2.

#### *Streamflow at USGS Gage Site at RM 11.8*

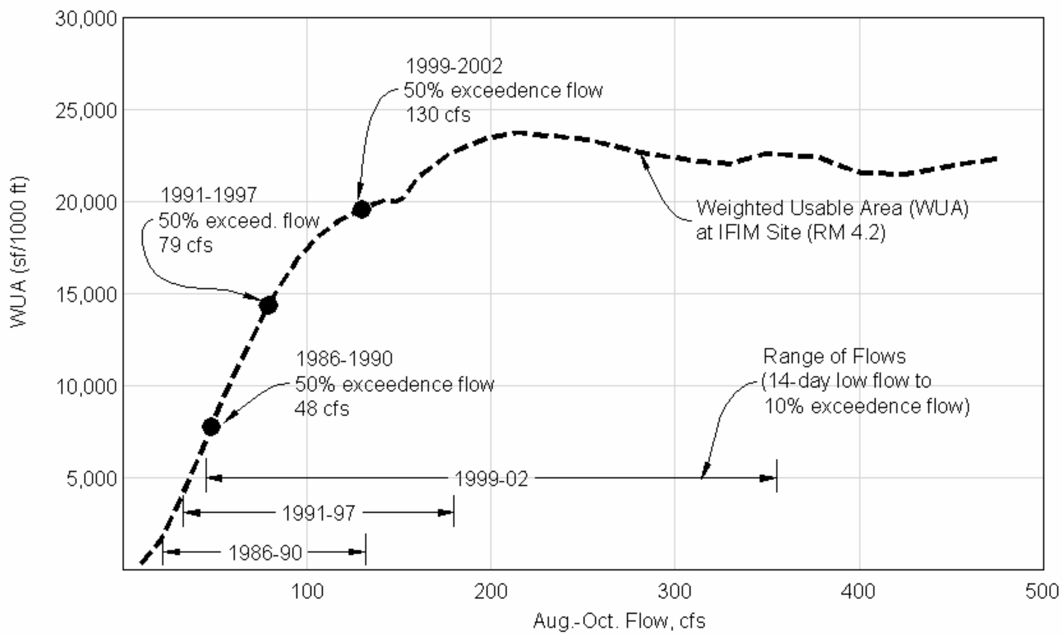
England (1999) provides flow duration curves for this site during the period-of-record, up to the time of his report [1923 – 1930; 1937 – 1998] for the August – October low flow season. The minimum, mean and maximum flow observations during this time-period were 66, 216, and 2,480 cfs, respectively. Percent exceedance levels (the percentage of time a flow is equaled or exceeded on an annual basis) are summarized below and shown during three time periods in relation to an index of habitat as weighted usable area (WUA) for spawning Chinook salmon in Exhibit 4-1.

- 90 % exceedance = 109 cfs
- 50 % exceedance = 177 cfs
- 10 % exceedance = 356 cfs

For the purposes of the CIDMP, three evaluation periods of the recent flow record were reviewed to isolate the effects of variable weather patterns on streamflow conditions as well as the effects of changes in water withdrawals in the lower river basin over the years. The three periods reviewed include:

- Period 1: 1986 to 1990
- Period 2: 1991 to 1997
- Period 3: 1999 to 2002

Exhibit 4-1
Comparison of Instream Flow to Chinook Weighted Usable Area (WUA) at Upper IFIM Site




Evaluation Period 1, from 1986-1990 represents a low streamflow period combined with relatively high water withdrawals by DWUA members. This period occurred prior to a concerted effort to implement water conservation measures by the DWUA. It can be regarded as one of the worst-case conditions for instream flows during recent times. Evaluation Period 2, from 1991 to 1997, also had lower than normal flows, but one where water conservation measures were initially implemented to reduce Dungeness River withdrawals. Evaluation Period 3, from 1999 to 2002, represents a period of higher than normal flows and after implementation of a number of water conservation measures including installation of pipelines and reregulating reservoirs, implementation of an agreement to limit diversions during low streamflow periods and changes in cropping patterns and land use in the DWUA service area.

Period 3 is regarded as the baseline condition for ESA purposes since it occurs after the listing of Chinook and chum salmon and bull trout and it represents a period after implementation of the Trust Water Right Agreement. It includes both a very wet year (1999) and a very dry year with low streamflows (2001). Evaluation Period 3 can be regarded as one of the best-case conditions during contemporary times for instream flows. Higher than average streamflows prevailed during Period 3 even under 2001 drought conditions.

The data indicate Periods 1 and 2, from the mid-1980s to mid-1990s, had lower streamflows at the USGS gage site compared to historic average conditions represented by the USGS flow statistics. These time periods occurred during a warm, dry period influenced by the Pacific Decadal Oscillation (PDO). The PDO switched to a cool, wet phase in the mid-1990s and as a result, Period 3 shows higher than average streamflows. Flow conditions during the late summer and early fall low flow season for these three periods in recent times are summarized in Table 4-1. The streamflow is presented for 15-day time-frames during the low flow season and represent median flows during each 15-day time frame and evaluation period. These flows are also compared to long-term median flows from the gage record for the same 15-day time-period. The gage record is much longer and includes both drought and wet conditions. Flow statistics from the August – October time period are also listed in Table 4-1.

Table 4-1
Streamflow at the USGS Gage Site at RM 11.8
During Three Evaluation Periods

| Bi-Weekly Time Period | Median Flow during Period 1 (‘86-‘90) (cfs) | Median Flow during Period 2 ('91 -'97) (cfs) | Median Flow during Period 3(1) ('99 -'02) (cfs) | Median Flow during period of record(2) (cfs) |
|---|---|---|---|---|
| Jul 1-15 | 431 | 476 | 683 | 543 |
| Jul 16-31 | 334 | 361 | 570 | 382 |
| Aug 1-15 | 236 | 250 | 456 | 275 |
| Aug 16-31 | 177 | 190 | 342 | 201 |
| Sep 1-15 | 134 | 158 | 210 | 164 |
| Sep 16-30 | 121 | 149 | 169 | 146 |
| Oct 1-15 | 114 | 116 | 142 | 137 |
| Oct 16-31 | 182 | 158 | 172 | 164 |
| Flow Statistics for Aug-Oct time period during each Evaluation Period | | | | |
| Median (50% Exceedance) | 184 | 306 | 178 | |
| 14-day Low Flow | 73 | 70 | 78 | |
| High (10% Exceedance) | 332 | 550 | 320 | |

(1) Period 3 represents baseline conditions
(2) Data from USGS Sta. 1204800

### *Irrigation Diversions*

Irrigation diversions have decreased in recent years as a result of habitat conservation measures instituted by the DWUA and less water demand (Section 2.2.3) and the use of temporary water right leases during critical low flow periods. Diversions by DWUA members during the three evaluation periods are shown in Table 4-2. The reduction in diversions from Evaluation Period 1 to 3 ranges between 38 and 52 cfs during the low-flow season.

| Table 4-2<br>Total Dungeness River Flow Diverted (Semi-monthly Median; cfs) | | | | | |
|---|---|---|---|---|---|
| | Period 1<br>('86 -'90) | Period 2<br>('91 -'97) | Period 3<br>('99 -'02) | Change from Period 1 - 3<br>cfs | <br>% |
| Jul 1-15 | 112 | 84 | 67 | -45 | -40% |
| Jul 16-31 | 110 | 88 | 67 | -43 | -39% |
| Aug 1-15 | 110 | 84 | 64 | -46 | -42% |
| Aug 16-31 | 107 | 76 | 55 | -52 | -49% |
| Sep 1-15 | 88 | 64 | 46 | -42 | -48% |
| Sep 16-30 | 70 | 43 | 26 | -44 | -63% |
| Oct 1-15 | 59 | 39 | 21 | -38 | -64% |
| Oct 16-31 | 54 | 37 | 16 | -38 | -70% |

The irrigation data used to prepare estimates of diversions for Evaluation Periods 1 and 2 was compiled from records kept by the DWUA, Department of Ecology, the Jamestown S'Klallam Tribe, MWG and the USGS. Most of the data recorded during those periods was on a once weekly basis until 1996, when more frequent data were collected. The diversions shown for Periods 1 and 2 are estimates based upon limited data.

The Trust Water Right MOU went into effect in 1998 limiting the water withdrawals to no more than 50 percent of the streamflow measured at the USGS gage site at RM 11.8. Since 1998, the highest average withdrawal over a bi-weekly period during the low flow season of August to October annually has been 25 percent of the natural streamflow. Since implementation of the Trust Water Right MOU, the daily instantaneous withdrawal during the low flow season has ranged from <1 to 38 percent and averaged 13 percent of the streamflow. A summary of the percentage of Dungeness River flow diverted by the DWUA during the three evaluation periods is presented in Table 4-3.

| Table 4-3<br>Percent Dungeness River Water Diverted (Semi-monthly Median; cfs) | | | | | |
|---|---|---|---|---|---|
| | Period 1<br>('86 - '90) | Period 2<br>('91 - '97) | Period 3<br>('99 - '02) | Change Period 1 - 3<br>Absolute % | <br>Relative % |
| Jul 1-15 | 27% | 20% | 13% | -14% | -52% |
| Jul 16-31 | 35% | 26% | 16% | -19% | -54% |
| Aug 1-15 | 49% | 36% | 20% | -29% | -59% |
| Aug 16-31 | 62% | 43% | 22% | -40% | -65% |
| Sep 1-15 | 66% | 43% | 25% | -41% | -62% |
| Sep 16-30 | 62% | 36% | 17% | -45% | -73% |
| Oct 1-15 | 53% | 38% | 18% | -35% | -66% |
| Oct 16-31 | 41% | 30% | 12% | -29% | -71% |

### *Losses to Groundwater Downstream of USGS Gage*

Simonds and Sinclair (2002) measured the loss to groundwater as a function of surface water elevations and head loss through five study reaches in the mainstem Dungeness River (Table 4-4). Although the data were noted to be highly variable, certain reaches routinely lost or gained flow. Overall, they noted a consistent trend of natural flow reductions between the USGS gage at RM 11.8 and the Old Olympic Highway Bridge at

RM 3.7 as a result of losses to groundwater. The magnitude of the loss was variable but it generally decreased as the main channel flow decreased (Simonds and Sinclair, 2002).

**Table 4-4**
**Change in Dungeness River Mainstem Flow Rates due to Groundwater Flux in Five Study Reaches**

| Description | | | Main Channel | | |
|---|---|---|---|---|---|
| Reach | RM | Location | Flux (cfs) | Change (%) | Change per mile, cfs |
| 1 | 11.8 to 8.1 | USGS Gage to Dungeness Meadows | - 8 to 15 | - 4 to 6 % | - 2.1 to 4.1 |
| 2 | 8.1 to 5.5 | Dungeness Meadows to RR Bridge | + 1 to 9 | +0.5 to 3 % | +0.23 to 3.5 |
| 3 | 5.5 to 3.7 | RR Bridge to New Old Olympic Hwy Bridge | - 1 to 24 | - 1 to 8 % | - 0.54 to 12.8 |
| 4 | 3.7 to 2.9 | New Old Olympic Hwy Bridge to Woodcock Rd | + 9 to 16 | + 5 to 6 % | +12.2 to 21.1 |
| 5 | 2.9 to 0.7 | Woodcock Rd to Schoolhouse Bridge | - 5 to 11 | - 2.8 to 4 % | - 2.1 to 5.2 |

Note: Irrigation diversions occur from RM 11.0 to 6.9.
Modified from Simonds and Sinclair (2002) and individual flow measurements are within an estimated accuracy of +/- 3% of the total flow.

### *Anticipated Flow at the Upper IFIM Site*

Streamflow at the upper Instream Flow Incremental Methodology (IFIM) study site at RM 4.2 as described in Appendix C is a function of (1) surface water inflow at the USGS gage (RM 11.8); (2) the amount of water withdrawn for irrigation purposes between RM 11.0 and 6.9; (3) the natural flow in the channel gained or lost to groundwater between RM 11.8 and 4.2; and (4) the contribution by tributaries.

An estimate of the streamflow present at RM 4.2 for the three evaluation periods was prepared. To simplify the calculations, and given the highly variable changes noted in Reaches 1-3 in Table 4-4, an approximation of 10 percent natural flow loss between the USGS gage and the instream flow study site was used. This approach provided slightly lower (conservative) flow estimates at RM 4.2 along the full range of available low flow conditions compared to using the USGS equations for variable groundwater losses in this reach (Simonds and Sinclair 2002). Flow contribution by tributaries was ignored as they are small in the late summer and early fall low-flow season.

The results of an analysis of instream flow presented on a semi-monthly basis for the three evaluation periods versus a relative index of available habitat defined as weighted usable area (WUA) for Chinook spawning habitat at the IFIM site are presented in Table 4-5 and illustrated in Exhibit 4-1. Both the mean semi-monthly flow and the range of semi-monthly flows experienced during each evaluation period are plotted against the index of weighted usable area for Chinook salmon spawning. The exhibit illustrates an increase in instream flow and WUA from each time-period reflecting the implementation of water conservation measures. Other factors also contribute to the increase such as a change in cropping patterns and increased streamflow due to climatic conditions.

**Table 4-5**
**Changes in Dungeness River Summer Flows at the Upper IFIM Site[1] over Various Periods and Resulting Changes in WUA ($ft^2$/1,000 ft)**

| | (Semi-monthly Mean; cfs) | | | | | | | | | Priority Life History Stage |
|---|---|---|---|---|---|---|---|---|---|---|
| | Instream Flow (cfs) | | | IFIM Recom. Flow CFS | Change in Instream Flow Characteristics from Period 1 to 3 | | | | | |
| | | | | | Increase in Dungeness R. Flow | | | Increase in WUA[2] | | |
| | Period 1 '86-'90 | Period 2 '91-'97 | Period 3 '99-'02 | | CFS | % | Factor | $ft^2$/1000 | Factor | |
| Jul 1-15 | 278 | 345 | 546 | 475 | 267 | 96% | 1.96 | | | |
| Jul 16-31 | 194 | 239 | 445 | 475 | 251 | 129% | 2.29 | | | |
| Aug 1-15 | 106 | 144 | 345 | 180 | 239 | 225% | 3.25 | 4,411 | 1.24 | Chinook spawning season in Dungeness River |
| Aug16-31 | 57 | 98 | 252 | 180 | 195 | 342% | 4.42 | 13,319 | 2.33 | Chinook spawning season in Dungeness River |
| Sep 1-15 | 36 | 81 | 144 | 180 | 107 | 294% | 3.94 | 15,115 | 4.06 | Chinook spawning season in Dungeness River |
| Sep 16-30 | 41 | 92 | 127 | 180 | 85 | 206% | 3.06 | 13,385 | 3.18 | Chinook spawning season in Dungeness River |
| Oct 1-15 | 47 | 66 | 106 | 180 | 60 | 128% | 2.28 | 10,417 | 2.36 | Chinook spawning season in Dungeness River |
| Oct 16-31 | 112 | 106 | 138 | 180 | 26 | 23% | 1.23 | | | |

(1) Assumed flow at upper IFIM site = [(USGS gage reading - % loss to groundwater in Reach 1) - (total irrigation diversions) - (% loss to groundwater in Reaches 2 and 3 to RM 4.1) after the USGS (Simonds and Sinclair 2002).
(2) Estimated Increase in the Index of Weighted Useable Area for Fall Chinook Spawning since the 1990s; Period 1 after Wampler and Hess, 1991; Hiss 1993.

Additional detail on the mean semi-monthly instream flow at the upper IFIM site (RM 4.2) during the baseline period is provided in Table 4-6. Also provided in the table is the Index of Weighted Usable Area (WUA) for Chinook salmon spawning for each bi-weekly flow (Wampler and Hiss 1991).

Table 4-6
Mean Bi-weekly Flows Estimated at the Upper IFIM Site
During the Baseline Period (1999 - 2002)

| | USGS Gage (cfs) | Diverted (cfs) | Natural Loss (cfs) | Upper IFIM Site (cfs) | Index of WUA(1) ($ft^2$/1,000 ft) |
|---|---|---|---|---|---|
| Jul 1 - 15 | 683 | 67 | 71 | 546 | N/A (not spawning season) |
| Jul 15 -31 | 570 | 67 | 58 | 445 | N/A (not spawning season) |
| Aug 1 - 15 | 456 | 64 | 46 | 345 | 22,481 |
| Aug 16 - 31 | 342 | 55 | 34 | 252 | 23,320 |
| Sep 1 - 15 | 210 | 46 | 20 | 144 | 20,043 |
| Sep 16 - 30 | 169 | 26 | 17 | 127 | 19,512 |
| Oct 1 - 15 | 142 | 21 | 14 | 106 | 18,071 |
| Oct 16 – 31 | 172 | 16 | 18 | 138 | N/A (not spawning season) |

(1) Estimated Index of Weighted Useable Area (WUA) for Chinook spawning after Wampler and Hiss, 1991; Hiss 1993. The recommended instream flow level of 180 cfs corresponds to a WUA of 22,683 ft2 per 1,000 lineal ft. of stream.

The mean bi-weekly streamflows at the upper IFIM study site at RM 4.2 ranged between 106 and 345 cfs during the Chinook salmon spawning season (1 August to 15 October, annually) for the baseline period of 1999-2002. These flow rates correspond to WUA approximations of available spawning habitat between 18,000 and 23,300 $ft^2$/1,000 ft of stream or between 80 and 103 percent of the WUA [22,683 $ft^2$/1,000 ft] at the recommended spawning flow of 180 cfs. During the drought year of 2001, summer low flows during the lowest 14-day period were 45 cfs, 7,145 $ft^2$/1,000 ft or 31 percent of the available spawning habitat at 180 cfs. Without irrigation withdrawals during this period, the natural instream flow level was estimated to provide 73 cfs, 13,293 $ft^2$/1,000 ft or 59 percent of the available spawning habitat at 180 cfs.

An expanded view of streamflows on an annual basis during the baseline period to assess the influence of various weather patterns and precipitation on water yield is presented in Table 4-7. The frequency of time on a daily basis streamflows at the IFIM site fell below 100 and 60 cfs, respectively, is also shown in the Table. A flow of 100 cfs represents approximately 75 percent, and 60 cfs approximates 50 percent of the maximum spawning habitat available at the recommended instream flow level.

On average, the current withdrawal pattern is providing a good level of instream flows for spawning salmonid fishes during the low flow season of the year. However, during drought conditions, withdrawals are adding to low flow stresses and reducing available spawning habitat.

## Table 4-7
## Dungeness River Streamflow and WUA for Chinook Spawning at Upper IFIM Site During the Baseline Period

| Date | 1999 USGS (cfs) | 1999 Diversions (cfs) | 1999 IFIM Site (cfs) | 1999 WUA Index | 1999 WUA % of Max. | 2000 USGS (cfs) | 2000 Diversions (cfs) | 2000 IFIM Site (cfs) | 2000 WUA Index | 2000 WUA % of Max. |
|---|---|---|---|---|---|---|---|---|---|---|
| July 1-15 | 1,331 | 62 | 1,136 | | | 499 | 63 | 386 | | |
| July 16-31 | 1,145 | 64 | 966 | | | 457 | 69 | 342 | | |
| Aug 1-15 | 1,026 | 66 | 858 | 24,112 | 106% | 330 | 59 | 238 | 24,540 | 108% |
| Aug 16-31 | 720 | 51 | 597 | 25,942 | 114% | 225 | 55 | 147 | 20,079 | 89% |
| Sept 1-15 | 370 | 50 | 284 | 22,649 | 100% | 174 | 44 | 113 | 18,653 | 82% |
| Sept 16-30 | 275 | 33 | 214 | 23,673 | 104% | 162 | 21 | 125 | 19,403 | 86% |
| Oct 1-15 | 220 | 24 | 174 | 22,299 | 98% | 141 | 19 | 108 | 18,260 | 81% |
| Oct 15-31 | 220 | 18 | 180 | | | 234 | 19 | 192 | | |
| **Estimated frequency(1)** | | **Days** | **Percent** | | | | **Days** | **Percent** | | |
| < 100 cfs | | 0 | 0% | | | | 9 | 12% | | |
| < 60 cfs | | 0 | 0% | | | | 0 | 0% | | |

| Date | 2001 USGS (cfs) | 2001 Diversions (cfs) | 2001 IFIM Site (cfs) | 2001 WUA Index | 2001 WUA % of Max. | 2002 USGS (cfs) | 2002 Diversions (cfs) | 2002 IFIM Site (cfs) | 2002 WUA Index | 2002 WUA % of Max. |
|---|---|---|---|---|---|---|---|---|---|---|
| July 1-15 | 325 | 65 | 227 | | | 578 | 76 | 444 | | |
| July 16-31 | 227 | 57 | 147 | | | 451 | 78 | 328 | | |
| Aug 1-15 | 195 | 59(2) | 117 | 18,926 | 83% | 271 | 72 | 171 | 22,107 | 97% |
| Aug 16-31 | 201 | 46(2) | 134 | 19,804 | 87% | 221 | 67 | 132 | 19,740 | 87% |
| Sept 1-15 | 118 | 37(2) | 69 | 12,526 | 55% | 177 | 53 | 106 | 18,071 | 80% |
| Sept 16-30 | 97 | 31 | 57 | 10,001 | 44% | 144 | 17 | 112 | 18,585 | 82% |
| Oct 1-15 | 82 | 28 | 46 | 7,399 | 33% | 125 | 15 | 97 | 17,105 | 75% |
| Oct 15-31 | 130 | 25 | 92 | | | | | | | |
| **Estimated frequency(1)** | | **Days** | **Percent** | | | | **Days** | **Percent** | | |
| < 100 cfs | | 52 | 68% | | | | 16 | 21% | | |
| < 60 cfs | | 33 | 43% | | | | 0 | 0% | | |

(1) Estimated frequency at the upper IFIM study site during Chinook salmon spawning period (August 1st - October 15th) Continue to improve water quality through converting open ditches to closed pipe

(2) Diversions for 2001 are less than what would typically occur. 5 cfs was leased by Ecology for the period of August 1st to September 15th.

### 4.1.2 Dungeness River Side Channels

Side channels offer considerable spawning and rearing habitat for many of the covered fish species listed in the Salmonid Fish, Native Char and Cutthroat Trout guilds. It is one of the key habitat types that will be assessed in Sections 5 and 7, herein. All of the covered species associated with aquatic habitat guilds are anticipated to use side-channel habitats during part of their life history.

The US Bureau of Reclamation (USBR) in cooperation with the Jamestown S'Klallam Tribe recently conducted a comprehensive study of major side channels of the Dungeness River (Daraio, et al. 2003). Results from this research are summarized below for the purposes of describing current baseline habitat conditions. Side channels were separated into two categories depending upon whether the connection to the main river channel was surface water or groundwater related. A list of the side channels including the river mile of their initiation point and whether they exhibited a surface water or groundwater connection to the mainstem is provided in Table 4-8.

Table 4-8
Dungeness River Side Channels

| Side Channel | Connection Point Upstream – Downstream | Connection to the Mainstem |
|---|---|---|
| Kinkade Cr. | RM 10.2 – 9.5 | Surface Water |
| Spring Cr. | RM 7.5 – 6.4 | Groundwater |
| Dawley | RM 6.9 – 6.2 | Surface Water |
| Upper East RR Bridge | RM 5.9 – 5.7 | Groundwater |
| Upper West RR Bridge | RM 5.9 – 5.7 | Groundwater |
| Lower East RR Bridge | RM 5.4 – 4.8 | Surface Water |
| Stevens/Savage | RM 4.7 – 4.4 | Surface Water |
| Gagnon East | RM 4.0 – 3.6 | Groundwater at low flow |
| Gagnon West | RM 3.9 –3.6 | Groundwater |
| Anderson | RM 3.6 – 3.3 | Surface Water |

Streamflow in the side channels is dependent upon surface water volumes in the mainstem. Groundwater flow to the side channels is a function of the head differential between water surface elevations in the mainstem and the elevation of the side channel. Similarly, surface water connections occur when the mainstem exceeds the thalweg elevation of the side channel initiation or hydraulic control point. Surface water connections are more sensitive than groundwater connections to mainstem river flow changes. The USBR study provided a comprehensive review of the various side channel elevations, the critical mainstem flows needed for connection at each channel, as well as an estimate of the mainstem river flows needed to provide sufficient water in the side channels to sustain viable aquatic habitat.

A summary of the results of their study is provided in Tables 4-9 through 4-11. Hydrographs of the surface and groundwater fed side channels during the June to October, 2002 study period are provided in Exhibits 4-2 and 4-3, respectively. Surface water flows ranged from approximately 2 to 147 cfs, while groundwater-fed side channels were less than 2 cfs during the study period.

**Table 4-9**
**Characteristics of Surface Water Connected Side Channels**

| Parameter | Anderson | Stevens/ Savage | Lower East RR Bridge | Dawley | Kinkade East | Kinkade Middle | Kinkade West |
|---|---|---|---|---|---|---|---|
| ***Discharge (cfs)*** | | | | | | | |
| Max. | 37.0 | 111.2 | 130.3 | 84.2 | 147.0 | 69.5 | 59.0 |
| Min. | 5.0 | 1.8 | 29.0 | 19.5 | 55.8 | 18.8 | 5.7 |
| ***Velocity (fps)*** | | | | | | | |
| Max. | 4.0 | 2.5 | 4.1 | 3.1 | 4.2 | 5.6 | 3.9 |
| Min. | 2.4 | 0.2 | 1.7 | 1.2 | 2.8 | 2.6 | 0.9 |
| ***Depth (ft.)*** | | | | | | | |
| Max. | 1.4 | 3.3 | 2.7 | 2.4 | 3.3 | 1.6 | 4.8 |
| Min. | 0.6 | 1.8 | 1.7 | 1.7 | 2.5 | 0.9 | 2.1 |
| ***Width (ft.)*** | | | | | | | |
| Max. | 15.6 | 28.6 | 29.8 | 28.4 | 32.3 | 25.5 | 46.5 |
| Min. | 7.7 | 25.7 | 24.9 | 23.3 | 26.6 | 22.1 | 31.1 |

**Table 4-10**
**Characteristics of Groundwater Connected Side Channels**

| Parameter | Anderson | Gagnon West | Gagnon East | Upper RR Bridge | East Upper RR Bridge | West Spring Creek |
|---|---|---|---|---|---|---|
| **Discharge (cfs)** | | | | | | |
| Max. | 1.29 | 1.21 | 0.39 | 0.40 | 0.62 | 1.61 |
| Min. | 0.08 | 0.17 | 0.02 | 0.12 | 0.21 | 0.06 |
| ***Velocity (fps)*** | | | | | | |
| Max. | 1.29 | 0.41 | 0.26 | 0.27 | 0.15 | 0.41 |
| Min. | 0.27 | 0.11 | 0.03 | 0.07 | 0.10 | 0.05 |
| ***Depth (ft.)*** | | | | | | |
| Max. | 0.4 | 0.9 | 0.9 | 0.7 | 1,7 | 0.9 |
| Min. | 0.2 | 0.5 | 0.7 | 0.6 | 1.3 | 0.8 |
| ***Width (ft.)*** | | | | | | |
| Max. | 7.2 | 11.5 | 4.9 | 14.1 | 11.8 | 21.7 |
| Min. | 6.4 | 10.0 | 2.6 | 11.7 | 8.4 | 11.5 |

## Table 4-11
## Minimum Flow Required in Surface Water Connected Side Channels for Fish Habitat

| Species | Depth Preference (ft) | Velocity Preference (ft/s) | Stevens / Savage Minimum Discharge ($ft^3/s$) | | Lower East RRB Minimum Discharge ($ft^3/s$) | | Dawley Minimum Discharge ($ft^3/s$) | | Kinkade East Minimum Discharge ($ft^3/s$) | | Kinkade West Minimum Discharge ($ft^3/s$) | | Range Minimum Discharge ($ft^3/s$) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Side Channel[(1)] | Main Channel[(2)] | Side Channel[(1)] | Main Channel[(2)] | Side Channel[(1)] | Main Channel[(2)] | Side Channel[(1)] | Main Channel[(2)] | Side Channel[(1)] | Main Channel[(2)] | Side Channel[(1)] | Main Channel[(2)] |
| ***Steelhead*** | | | | | | | | | | | | | | |
| Spawning | >1.0 | 1.9 – 2.5 | 65 | 360 | 35 | 110 | 40 | 230 | 20 | 30 | 25 | 250 | 20 – 65 | 30 - 360 |
| Juvenile | >2.0 | 2.2 – 2.6 | 85 | 440 | 55 | 180 | 55 | 360 | 35 | 50 | 35 | 360 | 35 - 85 | 50 – 440 |
| Adult | >1.7 | 1.5 – 1.8 | 45 | 200 | 37 | 110 | 27 | 120 | 15 | 20 | 11 | 150 | 11 - 45 | 20 – 200 |
| ***Char*** | | | | | | | | | | | | | | |
| Juvenile | >1.75 | 0.8 – 3.0 | 18 | 160 | 35 | 110 | 25 | 115 | | | 3 | 120 | 3 – 35 | 110 –160 |
| ***Coho*** | | | | | | | | | | | | | | |
| Spawning | 0.95 – 3.4 | 0.75 – 2.0 | 17 | 150 | <37 | <110 | 15 | 80 | <20 | <30 | 4 | 120 | 4 - 37 | 30 – 150 |
| Juvenile | 0.5 – 2.25 | < 0.4 | <8 | <120 | - | - | < 3 | <20 | - | - | <2 | <115 | 2 - 8 | 20 – 120 |
| ***Chinook*** | | | | | | | | | | | | | | |
| Spawning[(3)] | 1.2 – 3.4 | 1.75 – 3.0 | 60 | 340 | 30 | 105 | 35 | 180 | 30 | 40 | 20 | 240 | 20 - 60 | 40 – 340 |
| Juvenile | 1.5 – 2.25 | 1.55 – 1.8 | - | - | 25 | 95 | 30 | 160 | <35 | <50 | - | - | 25 - 35 | 50 – 160 |
| ***Pink*** | | | | | | | | | | | | | | |
| Spawning | 1.0 – 2.7 | 1.3 – 2.3 | 35 | 240 | 20 | 80 | 20 | 100 | <40 | <60 | 5 | 120 | 5 - 40 | 60 – 240 |
| Range | | | 8 - 85 | 120 - 440 | 20 - 55 | 80 – 180 | 3 - 55 | 20 - 360 | 15 – 40 | 20 - 60 | 2 - 35 | 115-360 | 2 - 85 | 20 – 440 |

(1) Flows required in side channel to provide specific habitat conditions for covered fish species.
(2) Subsequent flows required in the mainstem in order to provide the required flows in the side channels.
(3) Flows for Chinook spawning are highlighted since this is the highest priority habitat and acts as a surrogate for habitat needs of other species.

## Exhibit 4-2
### Side Channel Hydrographs (surface water fed)

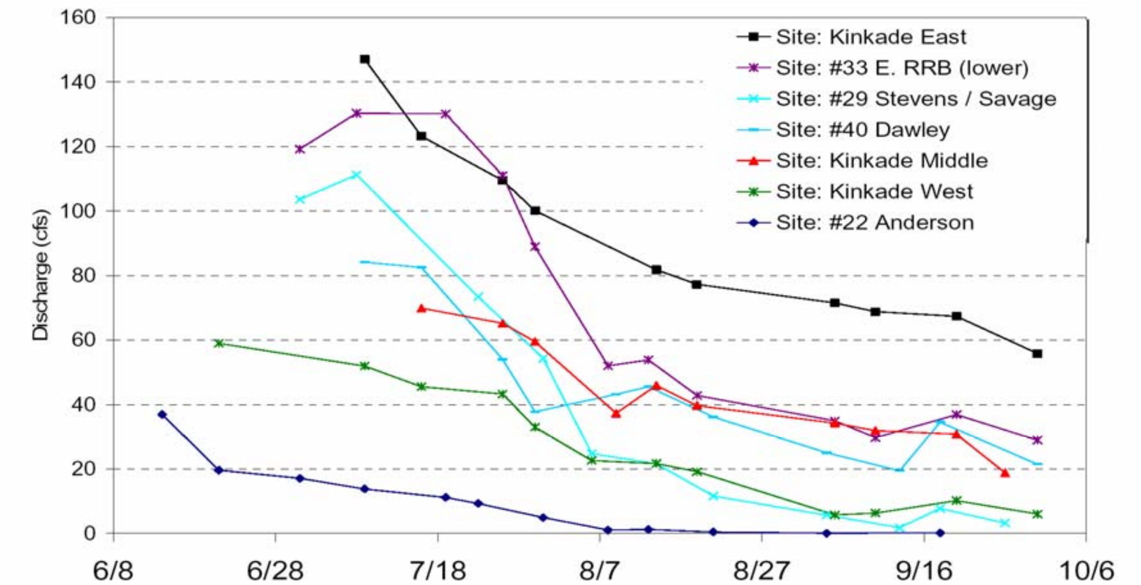



**Figure 10. Hydrographs of side channels that have a surface water and groundwater connection throughout most or all of the study period.**

## Exhibit 4-3
### Side Channel Hydrographs (Groundwater Fed)

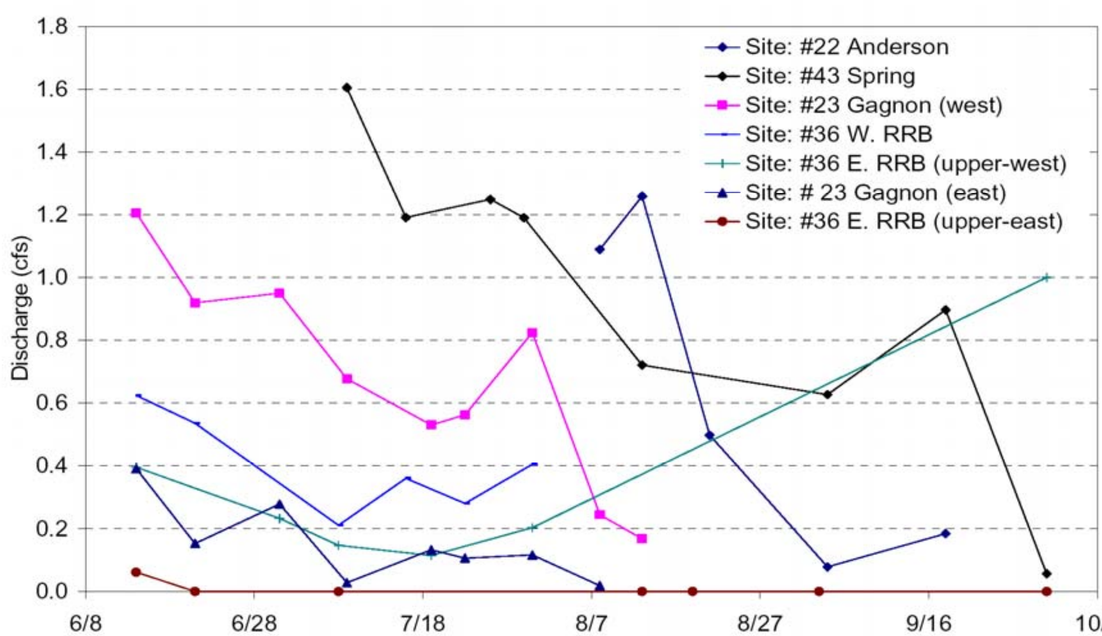
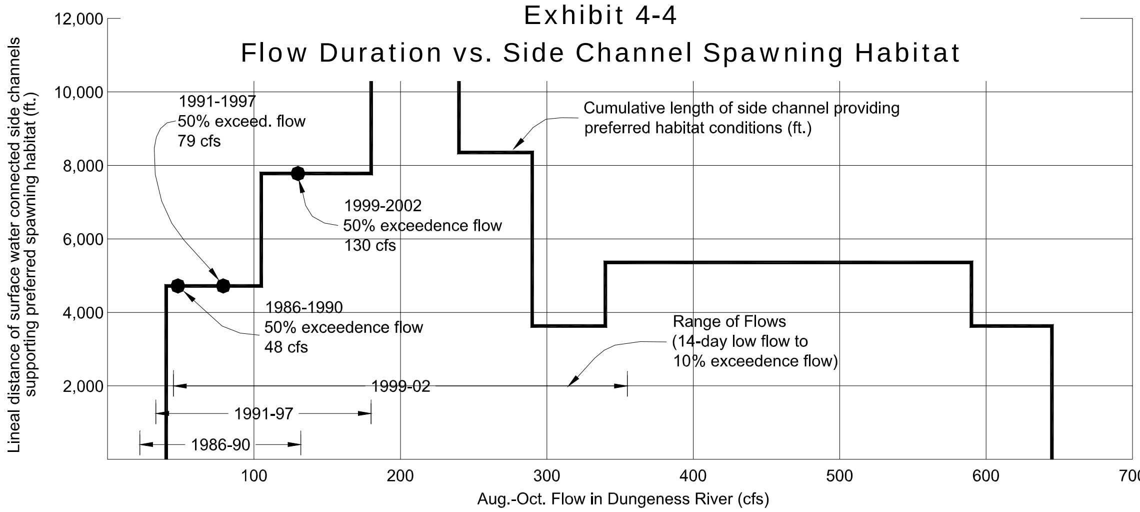



**Figure 11. Hydrographs of side channels that have only a groundwater connection throughout the study period (no surface water connection).**

* Source for Exhibits 4-2 and 4-3 *USBR Side Channel Study (Daraio et. al. 2003).*

Data in Table 4-11 for surface water connections indicate a wide range of mainstem river flows are needed to support preferred habitat conditions for various life history stages of salmonid fish species in the side channels during the 2002 irrigation season. The priority species and life history stage for streamflow management purposes was determined to be spawning Chinook salmon present during early August through early October, as highlighted in gray in Table 4-11. Habitat conditions with respect to preferred depths and velocities for spawning Chinook salmon can be achieved between 20 and 60 cfs in the side channels. These flows can be supported in various side channels when the mainstem river flow at the USGS gage site (RM 11.8) falls between 40 and 340 cfs. The lineal distance of side channels supporting preferred Chinook spawning conditions at various mainstem flow rates is plotted against the low flow season flow duration curve for the USGS gage site (England 1999) in Exhibit 4-4.

Exhibit 4-4
Flow Duration vs. Side Channel Spawning Habitat




The 50 percent exceedance flow at the USGS gaging station during the August to October time of 177 cfs would potentially support preferred spawning conditions in half of the surface water connected side channels. Up to 58 percent of the available side channel lineal distance offers appropriate spawning conditions at 177 cfs. The 50 percent exceedance level is approximately the same as the 180 cfs flow rate selected as the recommended instream flow for mainstem habitat (Hiss 1993). The USBR concluded that at 180 cfs, 3 out of 5 surface water connected side channels were connected to the mainstem and offer suitable habitat conditions. The recommended instream flow level, therefore, provides a good level of surface water connected side channel habitat in addition to mainstem habitat for Chinook salmon spawning. As shown in Table 4-12, it also provides decent levels of habitat for other species and life stages during the low flow season. However, the 50 percent exceedance flow is too high to support preferred rearing habitat conditions for coho salmon in the surface water connected side channels.

The USBR concluded each side channel is unique and may need a different range of mainstem flow to achieve desirable habitat conditions (Daraio et al. 2003). Further, the relationship between the side channel connection, available habitat and mainstem flow is dynamic and constantly changing. Given the differences in connections and the dynamic nature of the various side channels, the USBR recommend using multiple side channels rather than one or two as a system parameter to represent current overall conditions of the lower Dungeness River.

**Table 4-12**
**Maximum Cumulative Surface Water Connected Side Channel Habitat Available at Mainstem River Flows**

| Parameter | Adult Chinook Spawning | Juvenile Chinook Rearing | Adult Pink Spawning | Juvenile Coho Rearing | Juvenile Steelhead Rearing | Juvenile Char Rearing |
|---|---|---|---|---|---|---|
| Maximum Available Habitat at USGS gage | 180–240 cfs | <50 cfs | 120-130 cfs | <20 cfs | 40 - 85 cfs | 180-240 cfs |
| Peak (%) of Available Side Channel Habitat at any flow | 58% | 24% | 83% | 52% | 24% | 91% |
| % of Maximum Available Habitat at 50% Exceedance Level of 180 cfs | 58% | 19% | 58% | 0% | 16% | 91% |
| 50% Exceedance Level provides (%) of Maximum Available Habitat | 100% | 79% | 70% | 0% | 67% | 100% |

Modified from Daraio et al 2003.

### *Kinkade Side Channel*

Water is conveyed from the mainstem into Kinkade Side Channel through three separate flow paths (Kinkade East, Middle and West). Currently, the riverbed of Kinkade Side Channel is lower than the mainstem riverbed. As a result, a high likelihood exists the side channel will become the main channel and the mainstem will become a side channel at some point in the future.

### *Spring Creek Side Channel*

The entrance to Spring Creek Side Channel is cutoff from the mainstem by the Dungeness Meadows Levee. Thus, it does not have a surface flow connection to the mainstem at any normal flow elevation. The current channel bed is approximately 4 feet higher than the mainstem. Therefore, it appears the water source for this side channel is from a natural spring. Fish have access to the side channel. Chinook and coho salmon and trout species were observed in 2000 (Rot 2003).

### *Dawley Side Channel*

The Sequim-Prairie Tri-Irrigation Company maintains a surface connection to the mainstem river upstream of the Dawley Side Channel to provide flow to their diversion. A portion of the diverted flow bypasses the irrigation ditch and enters the Dawley Side Channel. This side channel should remain fairly stable if the mainstem connection is maintained. The upper side channel is slightly lower than the main channel so it is currently vulnerable during floods to the potential for increasing flows. Dawley side channel is one of the only side channels where juvenile Chinook salmon have been found during all months and it is the only off-channel habitat with known Chinook spawning in 1997 (Hirschi and Reed 1998). Maintaining flow in the side channel, even in times of extreme low flow, is important for its use by Chinook salmon (Hirschi and Reed 1998). Coho salmon were the predominate species found using the Dawley side channel, but Chinook and pink salmon and trout species were also routinely found (Rot 2003).

### *Railroad Bridge Side Channels*

Three side channels form in this very dynamic section of river; Upper East RRB, Upper West RRB and Lower East RRB. This reach is located where a major transition in channel gradient begins to occur. The river's capacity to transport sediment and wood becomes reduced at this location and the mainstem channel is constantly migrating in response to changes in sediment and woody debris deposition. Connections to side channels at this location are highly dependent upon the location of the low flow channel in the active flood plain. The upstream entrance to this side channel is open at least part of the year, but the channel goes dry for half its length when mainstem river levels drop below 240 cfs at the USGS gaging station. The lower side channel supported considerable surface water flow throughout the USBR 2002 study period, while the upper side channels did not exhibit a surface water connection.

Chum salmon have been observed spawning in riffle habitat in this side channel. The lower reaches provide juvenile coho habitat during low flows. Chinook may also use pools in the lower reaches of this side channel (Hirschi and Reed 1998). Coho salmon dominated the species catch in this side channel complex, but Chinook and chum salmon, trout and lamprey species were also present (Rot 2003).

### *Stevens/Savage Side Channel*

The upstream end of Stevens/Savage Side Channel is currently 7 ft. higher than the mainstem riverbed, making it very sensitive to flow level changes in the mainstem channel. The side channel appears to lose its surface water connection when mainstem flows fall below approximately 105 cfs at the USGS gaging station. Groundwater likely supports side channel flow when the mainstem drops below 105 cfs. The side channel is also vulnerable to lateral shifts in the mainstem channel. The surface connection is maintained when the low flow main channel passes adjacent to its entrance. The connection is lost when the channel migrates away from the entrance. Groundwater appears to maintain the side channel during periods when the mainstem migrates toward the opposite bank.

### *Gagnon Side Channel*

This side channel is located on the west side of the mainstem river downstream of the Olympic Highway Bridge. Two flow paths occur (East and West Gagnon), but neither provided a surface water connection throughout the study period. Apparently, the side channel becomes disconnected from the mainstem when the river falls below 200 cfs at the USGS gaging station (Foster Wheeler 2003). Both side channels near the upstream end are approximately 3 feet higher in elevation than the mainstem riverbed, contributing to the absence of a surface water connection at low flows. It is likely these side channels will only have a surface water connection at high river flows. Salmonid fish species have been found in this side channel during all streamflows even when the channel is not connected to the river for extended periods. The upper reaches of the channel become dry during intermittent flows. Much of this side channel is pool habitat formed by embedded wood (Hirschi and Reed 1998). The EPA life-history study (Rot 2003) found primarily coho salmon in this side channel, but Chinook and juvenile trout species were also present.

#### *Anderson Side Channel*

The Anderson Side Channel supported a surface water connection during the initial snowmelt period when river flows were relatively high. The surface flow connection was lost during August, 2002 when the mainstem flows fell below 156 cfs at the USGS gaging station. The groundwater connection, however, was maintained. Historically, this side channel has existed at least since the 1942 set of aerial photographs. The photos also indicate the surface water connection is only maintained during low river flows when the mainstem channel passes along the entrance to the side channel, as it currently exists. Chinook and coho salmon and resident trout have been observed in this side channel routinely since 1999 (Rot 2003). Juvenile coho salmon are the most abundant.

### 4.1.3 Dungeness Tributary Streams

The following tributaries of the Dungeness River fall within the Action Area. Stream segments are included in either the direct or indirect-effects areas as shown in Exhibit 1-2.

#### *Bear Creek*

*(**Note:** There are two Bear Creeks. One is a direct tributary to the Dungeness River. The other is an indirect tributary via Matriotti Creek. This section discusses the former.)*

Bear Creek is a medium-sized stream entering the Dungeness River on the right side at RM 7.3. Its bankfull width (BFW) near the mouth is approximately 50 ft. and bankfull depth is 2.7 ft. (Clallam County Streamkeepers' unpublished database 2003). A low dam used for irrigation pumping immediately upstream of its confluence with the Dungeness River blocked upstream fish passage until the late 1990s, when river aggradation at the mouth eliminated the barrier (Foster Wheeler 2003). Stormwater flows and sediment, augmented by irrigation ditch water, are conveyed from Bear Creek to the Dungeness River during peak flow events.

Streamflow at the mouth of Bear Creek during the low flow season has ranged from 1.0 to 14.4 cfs and averaged 6.8 cfs since 2000. The discharge at the mouth is approximately 2 cfs lower on average than flow at a station 2.5 river miles upstream. This finding indicates a general loss to the groundwater system in the lower reach of the stream under low flow conditions.

Based on benthic invertebrate sampling at 4 locations in Bear Creek, B-IBI scores ranged between 40 and 48 over a three-year period since 2000. These results indicate good to excellent water quality and habitat conditions currently occur in this stream and its south fork (Clallam County Streamkeepers' unpublished database, 2003).

Salmonid fish species including anadromous and resident life history phases have been observed throughout the lowermost 5.1 miles of Bear Creek. Adult and juvenile coho salmon, juvenile winter steelhead have been identified in the presence of other unidentified trout and salmon species. Sculpin (Cottidae) and bullhead (Ictaluridae) have also been observed throughout the stream (Clallam County Streamkeepers' unpublished database, 2003).

### *Hurd Creek*

This creek is a short, low-gradient tributary entering the Dungeness River on the left side at RM 2.7. It provides high-quality rearing and refuge habitat for various fish species (Haring 1999). The majority of spawning and rearing habitat in the creek occurs in the lowermost 0.25 miles downstream from Woodcock Road. Prior to 1999, adult salmonid fish migration was blocked by an artificial impassable barrier operated by the Washington State Department of Fish and Wildlife (WDFW) Hurd Creek Hatchery. Both adult and juvenile access was restored in 1999. The Technical Advisory Group (TAG) established for the Dungeness River suggests there is little spawning upstream of Woodcock Road, but some juveniles have been noted upstream of this point (Haring 1999).

### *Matriotti Creek*

Matriotti Creek is the largest low-elevation tributary to the Dungeness River entering the River on the right side at RM 1.9. A 3-ft drop in Matriotti Creek, created by the Agnew ditch at RM 6.8 acts as a partial barrier to fish passage. Haring (1999) suggests this feature precludes migratory fish from the uppermost 0.5 miles of Matriotti Creek. A similar barrier exists at a culvert at Mariposa Lane at RM 6.1 (A. Tabaei, Clallam County Conservation District, pers. comm. August, 2003).

Streamflows have been recorded between 7 (1961) and 23cfs (1980) at Ward Rd. (PSCRBT 1991). Ecology operated a stand-alone streamflow gage on Matriotti Creek at the Olympic Game Farm from November 1999 to November 2000. The information is available in their River and Streamflow Monitoring database as gage 18D060. Daily streamflows were recorded between the range of 10 and 50 cfs, but normally occurred around 15 cfs during that time period.

Coho smolt counts in 1999 through 2004 ranged between 4,600 and 9,000 smolts at a density of 0.440 to 0.859 smolts/$m^2$ of stream habitat (Table 4-13). These densities are consistent with the high end of literature values for coho salmon. This smolt production rate could be generated from 93 to 179 spawning salmon assuming average fecundity and freshwater egg to smolt survival rates. From the small amount of smolt yield data, it appears Matriotti Creek annually supported between 75 and 150 successfully spawning coho salmon over this time period.

**Table 4-13**
**Estimated Numbers of Juvenile and Adult Fish in Matriotti Creek (WRIA 18-0021)**

| Survey Period | Coho Salmon | | | Steelhead Trout | | | Cutthroat Trout | | |
|---|---|---|---|---|---|---|---|---|---|
| | Adult Spawners(1) | Smolt Yield | Smolt Densities | Adult Spawners(2) | Smolt Yield | Smolt Densities | Adult Spawners(3) | Smolt Yield | Smolt Densities |
| ’96-‘97 | 78 | | | 113 | | | 102 | | |
| ’97-‘98 | 98 | 3885 | 0.3679 | 56 | 1353 | 0.1281 | 64 | 510 | 0.0483 |
| '98-'99 | 93 | 4895 | 0.4635 | 37 | 676 | 0.0640 | 137 | 321 | 0.0304 |
| '99-'00 | -- | 4656 | 0.4409 | | 448 | 0.0424 | -- | 684 | 0.0648 |
| '00-'01 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| '01-'02 | 179 | -- | -- | 42 | -- | -- | 85 | -- | -- |
| ’02-03 | 120 | 8963 | 0.8488 | 52 | 508 | 0.0481 | 69 | 424 | 0.0402 |
| ’03-‘04 | -- | 5991 | 0.5673 | | 619 | 0.0586 | | 345 | 0.0327 |
| Average | 114 | 5678 | 0.54 | 60 | 721 | 0.070 | 91 | 457 | 0.040 |
| Range | 78 – 179 | 3885-8963 | 0.37-0.85 | 37 – 113 | 448-1353 | 0.04-0.13 | 64-137 | 321-684 | 0.03-0.06 |
| St. Deviation | 40 | 1985 | 0.19 | 30 | 365 | 0.030 | 29 | 147 | 0.010 |

(1) Coho salmon adult estimate of 75 to 150 spawners is based on juvenile density observations at a rate of 50 smolts per spawner
(2) Steelhead trout adult estimates of 30 to 60 spawners is based on juvenile density observations at a rate of 12 smolts per spawner
(3) Cutthroat trout adults estimates of 60 to 120 spawners is based on juvenile density observations at a rate of 5 smolts per spawner
At an assumed average toe-of-bank stream width of 7 meters; the area surveyed equates to 0.86 miles

Steelhead smolt counts in Matriotti Creek from the 1998 through 2004 outmigrant surveys ranged between 448 and 1353 smolts at a density of 0.042 to 0.128 smolts/ $m^2$. The 1998 densities are in the range of average literature values for steelhead smolt production from regional streams but the average smolt density during baseline conditions is lower than expected for typical steelhead production. Based on the average number of smolts typically produced per spawner, it appears Matriotti Creek supported between 30 and 60 spawning steelhead trout per year over this period.

Cutthroat trout smolt yields during the baseline period ranged between 321 and 684 outmigrants in Matriotti Creek. The resulting densities of 0.030 to 0.065 smolts/$m^2$ compare well with regional literature values. This smolt production rate could be generated from 64 to 137 spawning trout assuming average fecundity and freshwater egg to smolt survival rates. Based on one standard deviation around the average, Matriotti Creek may have currently supported between 60 and 120 spawning cutthroat trout per year.

### *Beebe Creek*

Beebe Creek is an artificially constructed stream channel lying in a relic side channel of the Dungeness River. It currently flows approximately 1.0 river miles in length through the Olympic Game Farm. Beebe Creek enters into the north side of Matriotti Creek, which then enters the west side of the Dungeness River. It provides high quality spawning and rearing habitat for salmonid fishes including natural runs of coho, fall chum and lower river pink salmon as well as winter steelhead trout. Beebe Creek represents very stable habitat features in the lower Dungeness River valley. Fall chum spawning surveys conducted by WDFW personal and volunteer groups recorded a maximum annual tally of 265 and 1,062 live and dead fish in Beebe Creek during the baseline period (WDFW spawning ground surveys; R. Cooper 2005).

### 4.1.4 Independent Small Streams

Independent streams drain directly into the Strait of Juan de Fuca in the Action Area, separate from the Dungeness River. As a result of the irrigation system in the area, streamflows in the independent streams have increased seasonally over natural conditions due to direct or indirect water discharges from the Dungeness River (such as irrigation groundwater recharge, tailwater, or stormwater flows) (Haring 1999). Haring (1999) also indicated although artificial recharge of surface waters may increase habitat for fish, it is also possible the increased flow levels could cause bedload movement, bank erosion, loss of large woody debris, and other adverse habitat changes).

#### *Siebert Creek*

Siebert Creek lies along the westernmost edge of the Action Area. It flows in a northerly direction for approximately 12 miles before emptying into the Strait of Juan de Fuca. Only the lowermost 0.5 river miles, downstream of the Agnew tailwater discharge, falls within the direct-effects area of the project. There are 31 miles of mainstem and tributary streams in the Siebert Creek subwatershed with stream gradients between 0.4 and 2.1 percent (Clallam County Streamkeepers' unpublished database 2003). Its bankfull width (BFW) near the mouth is approximately 33 ft. and bankfull depth is 2.2 ft. (Clallam County Streamkeepers' unpublished database 2003). The lower reaches of this stream in the Action Area contains both moderate and low gradient habitats draining lands managed primarily for timber harvest, agriculture and real estate development.

The subwatershed consists of a drainage area of 15.5 $mi^2$ with a mean annual flow of 17.8 cfs. The mean annual minimum flow is 7.0 cfs and the mean annual maximum flow is 35.6 cfs. During a 16-yr period of record between 1952 and 1969, the lowest 1-day low flow at a USGS operated gage on the creek was 2 cfs, while the highest instantaneous peak flow was 1,620 cfs (PSCRBT 1991). Mean flow during the low flow months of August through October ranged from 0.7 to 5.6 cfs and averaged 2.7 cfs at a station 0.6 miles upstream of its mouth (Clallam County Streamkeepers' unpublished database 2003). Annual flow duration statistics for the period of record indicate the following exceedance levels (PNWRBC Puget Sound and Adjacent Waters (1970):

- 1% Exceedance 640 cfs
- 10% Exceedance 36 cfs
- 50% Exceedance 8.8 cfs
- 90% Exceedance 3.1 cfs
- 99% Exceedance 2.3 cfs

Since September 2002, Ecology operated the gage and the information is available in their River and Streamflow Monitoring database as gage 18L060. Contributions to streamflow include groundwater influx that was measured at 2.3 cfs on October 7, 1997 (Thomas et al. 1999) and seasonal tailwater discharge. A tailwater release of 0.1 cfs into Siebert Creek was measured by the Agnew Water District at RM 0.5 during 1997.

Based on invertebrate sampling at 3 locations in Siebert Creek, the benthic index of biological integrity (B-IBI) scores ranged between 36 and 44 over a three-year period since 2000. These scores indicate fair to good water quality and habitat conditions currently occur in the lowermost 3.8 stream miles (Clallam County Streamkeepers' unpublished database, 2003). In September 1994, Ecology evaluated the macroinvertebrate communities of Siebert Creek immediately downstream of the US 101 Highway bridge as part of their stream bioassessment program (Ecology freshwater biological monitoring database, 1994). They similarly found a B-IBI index score of 37, representing good, natural biological conditions for the gravel-cobble dominated substrate at the site.

Siebert Creek supports coho salmon, as well as winter steelhead and cutthroat trout. It also has the potential to produce chum salmon (McHenry et al. 1996). Salmonid fish species including anadromous and resident life history phases have been observed throughout the lowermost 4 miles of Siebert Creek. Juvenile coho salmon and cutthroat trout have been identified as well as other unidentified salmonid species (Clallam County Streamkeepers' unpublished database, 2003). The juvenile fish populations have been documented at low densities, which according to Haring (1999), may be a consequence of degraded habitat and channel conditions. The majority of fish observed in the creek are riffle-dependent species, including steelhead and cutthroat trout. Coho salmon prefer pools, which are in short supply in Siebert Creek. Hence, coho occur in unusually small proportions compared to other species (McHenry cited in Haring 1999).

Habitat surveys of the lower Siebert Creek system indicate highly unstable spawning and rearing habitat with signs of bed scour and little available spawning gravel (McHenry et al. 1996). Siebert Creek was stocked with non-native sub-yearling and yearling coho from 1952 to 1981 (WDFW et al. 1994).

WDFW spawning surveys conducted at an index survey site between RM 0.9 and 4.2 annually since 1984 show the number of coho redds have ranged between 1 and 60 and averaged 23 redds per year (Table 4-14). This total equates to approximately 7.0 coho redds per mile in the index area. Estimates of potential redd construction along un-surveyed waters in Siebert Creek, were made by extrapolating the mean of the index redd survey data, less one standard deviation, or 2.1 coho redds per mile to the balance of accessible waters. From this approach, it appears Siebert Creek may have supported a spawning population in the range of 50 to 110 coho salmon annually since 1984. Smolt counts since 1999 ranged between 511 and 3,235, with a density of 0.010 to 0.0634 smolts/ $m^2$. This level of smolt production is an order of magnitude lower than literature values of typical smolt densities in regional western Washington streams. The number of smolts produced per spawner is also low.

Steelhead smolt counts in Siebert Creek from 1998 to 2004 ranged between 513 and 1626 smolts at a density of 0.010 to 0.032 smolts/$m^2$. These densities are typical of average literature values for steelhead smolt production from regional streams. Based on the average number of smolts typically produced per spawner, it appears Siebert Creek may be supporting between 40 and 110 spawning steelhead trout per year. This estimate is higher than the abundance of 20 returning steelhead noted in the mid-1980s (McHenry et al. 1996). Siebert Creek has also received considerable, but unquantified releases of artificially propagated steelhead trout (WDFW et al. 1994).

The total number of cutthroat trout smolts observed between 1998 and 2004 in Siebert Creek ranged from a low of 17 upward to 271 outmigrants. The resulting densities of 0.003 to 0.0053 smolts/m$^2$ are low compared to regional literature values. Based on the average number of smolts typically produced per spawner, Siebert Creek may be currently supporting between 5 and 50 spawning cutthroat trout per year.

Based on spawning ground surveys, it appears the historic small numbers of fall chum salmon no longer exist in this drainage (McHenry 1992).

Emery Creek, a seasonal tributary to Siebert Creek, is not known to directly support anadromous fish. A migration barrier occurs immediately upstream of its mouth (Foster Wheeler, 2003).

Table 4-14
Estimated Numbers of Juvenile and Adult Fish in Siebert Creek (WRIA 18-0173)

| Year Surveyed | Coho Salmon | | | | Steelhead Trout | | | Cutthroat Trout | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Redd Counts | Adult Spawners(1) | Smolt Yield | Smolt Densities | Adult Spawners(2) | Smolt Yield | Smolt Densities | Adult Spawners(3) | Smolt Yield | Smolt Densities |
| '83-'84 | | | - | - | - | - | - | - | - | - |
| '84-'85 | 41 | 82 | - | - | - | - | - | - | - | - |
| '85-'86 | 11 | 22 | - | - | - | - | - | - | - | - |
| '86-'87 | 42 | 84 | - | - | - | - | - | - | - | - |
| '87-'88 | 16 | 32 | - | - | - | - | - | - | - | - |
| '88-'89 | 37 | 74 | - | - | - | - | - | - | - | - |
| '89-'90 | 43 | 86 | - | - | - | - | - | - | - | - |
| '90-'91 | 5 | 10 | - | - | - | - | - | - | - | - |
| '91-'92 | 60 | 120 | - | - | - | - | - | - | - | - |
| '92-'93 | 20 | 40 | - | - | - | - | - | - | - | - |
| '93-'94 | 3 | 6 | - | - | - | - | - | - | - | - |
| '94-'95 | 23 | 46 | - | - | - | - | - | - | - | - |
| '95-'96 | 9 | 18 | - | - | | - | - | - | - | - |
| '96-'97 | 1 | 2 | - | - | 136 | - | - | 54 | | |
| '97-'98 | 17 | 34 | 358 | 0.0070 | 46 | 1626 | 0.0319 | 9 | 271 | 0.0053 |
| '98-'99 | 17 | 34 | 717 | 0.0140 | 78 | 551 | 0.0108 | 29 | 44 | 0.0009 |
| '99-'00 | 8 | 16 | 511 | 0.0100 | | 937 | 0.0184 | | 145 | 0.0028 |
| '00-'01 | 34 | 68 | | | 43 | | | 45 | | |
| '01-'02 | 12 | 24 | 3235 | 0.0634 | 63 | 513 | 0.0101 | 25 | 224 | 0.0044 |
| ‘02-'03 | 34 | 68 | 1915 | 0.0375 | 81 | 758 | 0.0149 | 3 | 125 | 0.0024 |
| ‘03-'04 | 32 | 64 | 2966 | 0.0581 | | 975 | 0.0191 | | 17 | 0.0003 |
| ’04-‘05 | 10 | 20 | | | | | | | | |
| Average | 23 | 45 | 1617 | 0.030 | 74 | 893 | 0.018 | 28 | 138 | 0.003 |
| Range | 1 – 60 | 2 – 120 | 358-3235 | 0.01-0.06 | 43 – 136 | 551-1626 | 0.01 – 0.03 | 3 – 54 | 17 – 271 | 0.00-0.01 |
| St. Deviation | 16 | 32 | 1276 | 0.030 | 34 | 406 | 0.008 | 23 | 99 | 0.002 |

(1) Adult coho salmon abundance estimates of 50 - 115 spawners are based on long-term average +/- 1.0 St. Deviation of WDFW index redd counts, an expansion of 2 adults per redd + an extrapolation of the average index count less one standard deviation to the balance of the accessible habitat [WDFW Redd Index Survey from RM 0.9 to 4.2; 3.3 total miles surveyed of 11.9 miles; 51,040 m2].

(2) Adult steelhead trout abundance estimates of 40 to110 spawners are based on subsequent years' smolt yield data at 12 smolts/spawner

(3) Adult cutthroat trout abundance estimates of 40 - 70 spawners are based subsequent years' smolt yield data at 5 smolts per spawner.

Available stream area = 51,040 m$^2$. An assumed production area of 11.9 miles equates to an average toe-of-bank stream width of 2.7 m.

### *McDonnell Creek*

McDonnell Creek is located between Siebert Creek on the west and Dungeness River to the east. Its length is 14 miles and watershed area is 23 square miles.

The stream is confined and channelized in the lowlands from the Agnew ditch to Highway 101. Upstream of the irrigation diversion, McDonnell Creek becomes a sinuous stream with good rearing and spawning habitat with large woody debris loading. McDonnell Creek has been used for irrigation water conveyance between RM 4.7 and 3.2, since 1927. According to the Jamestown Tribe, the current management of the irrigation diversion dam results in a block to upstream juvenile migration during low-flow summer months and the fish bypass system is potentially detrimental to downstream migrants during the same period. For the purposes of this assessment, flow conveyance is considered part of the background habitat conditions.

Existing flow data show a range from less than 1 cfs during low flow periods to a high of 25 cfs during periods of spring snowmelt at US 101 above the Agnew irrigation diversion. Flow at the mouth has ranged between 2 and 28 cfs (PSCRBT 1991, JS'KT 1994). Ecology currently operates a continuous flow monitoring gage in McDonnell Cr. at the US 101 Highway bridge identified as gage 18P070. The period of record is late February 2003 to present. The mean daily stream flows ranged between 1.5 and an estimated 264 cfs since 2003 with an annual median flow of less than 3 cfs. These measurements represent streamflows downstream of the Agnew irrigation diversion in McDonnell Creek at RM 3.2. Agnew Irrigation District, in cooperation with Ecology, also installed a continuous flow monitoring gage on the irrigation outtake at McDonnell Creek. The ditch gage was installed spring of 2003, after the stream gage was installed.

Anadromous salmonid fish stocks known to inhabit McDonnell Creek include coho salmon, winter steelhead and coastal cutthroat trout (WDFW et al. 1994, WDFW spawning ground database, 2004). McDonnell Creek was consistently supplemented with coho hatchery yearlings from 1952 until 1981. The other fish stocks are considered native runs. Anadromous fish have access to RM 5.2 where an impassible falls blocks further upstream migration.

WDFW spawning surveys conducted at an index survey site between RM 1.7 and 4.4 annually since 1984 show the number of coho redds have ranged between 4 and 75 and averaged 27 redds per year (Table 4-15). This total is approximately 10 coho redds per mile. Estimates of potential redd construction along un-surveyed waters in McDonnell Creek were made by extrapolating the mean of the index redd survey data, less one standard deviation, or 1.85 coho redds per mile, to the balance of accessible waters. From this approach, it appears McDonnell Creek supported a spawning population in the range of 25 to 110 coho salmon annually since 1984. Smolt counts since 1999 have ranged between 378 and 4,453 total smolts at a density of 0.011 to 0.128 smolts/$m^2$. The highest level of smolt production in 1999 is less than half of average literature values of typical smolt production in regional western Washington streams. Thus, it does not appear McDonnell Creek is currently supporting a full seeding capacity for coho salmon.

**Table 4-15**
**Estimated Numbers of Juvenile and Adult Fish in McDonnell Creek (WRIA 18-0160)**

| | Coho Salmon | | | | Steelhead Trout | | | | Cutthroat Trout | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year Surveyed | Redd Count | Adult Spawners[1] | Smolt Yield | Smolt Densities | Redd Count | Adult Spawners[2] | Smolt Yield | Smolt Densities | Adult Spawners[3] | Smolt Yield | Smolt Densities |
| '79-'80 | | - | - | - | 180 | 286 | - | | - | - | |
| '80-'81 | | - | - | - | 205 | 325 | - | | - | - | |
| '81-'82 | | - | - | - | 182 | 288 | - | | - | - | |
| '82-'83 | | - | - | - | 109 | 173 | - | | - | - | |
| '83-'84 | 25 | 50 | - | - | 82 | 130 | - | | - | - | |
| '84-'85 | 20 | 40 | - | - | 86 | 136 | - | | - | - | |
| '85-'86 | 75 | 150 | - | - | 40 | 64 | - | | - | - | |
| '86-'87 | 4 | 8 | - | - | | - | - | | - | - | |
| '87-'88 | 68 | 136 | - | - | | - | - | | - | - | |
| '88-'89 | 57 | 114 | - | - | | - | - | | - | - | |
| '89-'90 | 5 | 10 | - | - | | - | - | | - | - | |
| '90-'91 | 54 | 108 | - | - | | - | - | | - | - | |
| '91-'92 | 20 | 40 | - | - | | - | - | | - | - | |
| '92-'93 | 13 | 26 | - | - | | - | - | | - | - | |
| '93-'94 | 13 | 26 | - | - | | - | - | | | - | |
| '94-'95 | 18 | 36 | - | - | | - | - | | | - | |
| '95-'96 | 18 | 36 | - | - | | | - | | | - | |
| '96-'97 | 9 | 18 | - | - | 98 | 155 | - | | | - | |
| '97-'98 | 25 | 50 | - | - | 176 | 279 | - | | 25 | - | |
| '98-'99 | 11 | 22 | 4,453 | 0.1284 | 199 | 308 | 1,861 | 0.0537 | 61 | 127 | 0.0037 |
| '99-'00 | 4 | 8 | 378 | 0.0109 | 134 | 217 | 3,352 | 0.0967 | | 304 | 0.0088 |
| '00-'01 | 50 | 100 | - | | 157 | 253 | - | | | - | |
| '01-'02 | 14 | 28 | - | | 93 | 143 | - | | | - | |
| "02-'03 | 46 | 92 | - | | 77 | 125 | - | | | - | |
| '03-'04 | 16 | 32 | - | | 39 | 62 | - | | | - | |
| ’04-‘05 | 12 | 24 | | | 18 | 29 | | | | | |
| Average | | | | | | | | | | | |
| Range | 27 | 53 | 2,416 | 0.070 | 117 | 186 | 2,607 | 0.075 | 43 | 216 | 0.006 |
| St. Deviation | 4-75 | 8 – 150 | 378-4,453 | 0.01-0.13 | 18205 | 29 – 325 | 1,861-3,352 | 0.05-0.10 | 25 - 61 | 127 - 304 | 0.004-0.009 |
| | 22 | 44 | 2,881 | 0.083 | 60 | 95 | 1,054 | 0.030 | 25 | 125 | 0.004 |

(1) Adult coho salmon abundance estimates of 25 to 110 spawners are based on redd counts, an expansion of 2 adults per redd and an extrapolation of the average index count, less one standard deviation, to the balance of the accessible habitat in the basin. [WDFW Redd Index Survey from RM 1.7 to 4.4; 2.7 total miles surveyed of a total of 6.7 miles; 34,672 m2]

(2) Steelhead trout adult abundance estimates of 100 to 300 spawners are based on the long-term average +/- 1.0 St. Deviation of redd counts, an expansion of 1.6 adults per redd per WDFW spawner data. [WDFW Redd Index Survey from RM 0.0 to 5.4 plus additional supplemental surveys along the total accessible stream length [McDonnell Creek from RM 0.0 to 6.7; 6.7 total miles]

(3) Cutthroat trout adult abundance estimates of 20 to 70 spawners are based on WDFW subsequent years' smolt yield data at a rate of 5 smolts per spawner.

Available stream area = 34,672 $m^2$. An assumed production area of 6.7 miles equates to an average toe-of-bank stream width of 3.2 m.

Counts of adult steelhead redds in McDonnell Creek between the mouth and RM 5.4 since 1979 ranged from 18 to 205 and averaged 117 redds annually (WDFW 2004). This total equates to an average of approximately 22 redds per mile in the index area. The index site encompasses nearly 81 percent of the entire accessible area in McDonnell Creek. WDFW data imply the number of steelhead spawners averaged 1.6 fish per redd. Based on the redd data, it appears McDonnell Creek supported in the range of 80 to 300 steelhead trout over this time period. Smolt counts in 1999 and 2000 ranged between 1,861 and 3,352 smolts at a density of 0.054 to 0.097 smolts/$m^2$. These densities are slightly less than average literature values for steelhead smolt production from regional streams. This smolt production rate could be generated from 155 to 279 spawning trout assuming average fecundity and freshwater egg to smolt survival rates. Based on the redd and spawner count data, it appears McDonnell Creek has supported between 100 and 300 spawning steelhead trout annually since 1979.

Cutthroat trout smolts yields ranged between 127 and 304 outmigrants during 1999 and 2000 surveys in McDonnell Creek. The resulting densities of 0.004 to 0.09 smolts/$m^2$ are low compared to regional literature values. McDonnell Creek may be currently supporting in the range of 20 to 70 spawning cutthroat trout per year.

Although fall chum salmon are thought to have occurred in the creek historically, there is little documented information to confirm this belief. There are no observations in WDFW's spawning ground database indicating the presence of adult chum in McDonnell Creek (McHenry et al. 1996). The presence of chum may either have been assumed or they no longer exist in this drainage.

### *Cassalery Creek*

Cassalery Creek is a small, independent drainage to the Strait of Juan de Fuca between Dungeness Bay and Sequim Bay. Cassalery Creek is approximately 4 miles long with an additional 3 miles of tributary waters. It drains low-elevation land on the east side of the lower Dungeness Valley. The stream supports low-gradient and low velocities (Entrix 2000). Stream gradients fall between 0.7 and 1.7 percent in the lowermost 1.6 miles of the drainage (Clallam County Streamkeeper's unpublished database 2003). Most of Cassalery Creek has been artificially straightened and confined (USBR 2002). Its bankfull width (BFW) near the mouth is approximately 24 ft. and bankfull depth is 1.3 ft. (Clallam County Streamkeeper's unpublished database 2003). The creek is predominantly groundwater-fed with limited direct inputs from the irrigation system. Surface water flow data obtained for 1999 through 2001 at the 0.5 RM gage measured flows in September and October of between 1.2 to 2.0 cfs. Spring (April and May) flows for 1999 through 2001 were 1.5 to 5.6 cfs (Clallam County Streamkeeper's unpublished database 2003). A groundwater discharge to Cassalery Creek of 3.55 cfs was measured on October 7, 1997 (Thomas et al. 1999). Because there are no tailwater discharges of unused irrigation water, Cassalery Creek is considered to lie in the indirect-effects area of the Action Area.

Landowners' use of water from the creek for irrigation and pond maintenance has influenced instream flows, but the effects have not been quantified (Haring 1999). A culvert at the mouth of this creek limits the interaction of the creek with salt water. Flooding of the creek due to frequent blockage of this culvert also may affect juvenile fish rearing in the lower reaches of the creek (Haring 1999).

Based on benthic invertebrate sampling at 4 locations in Cassalery Creek, B-IBI scores ranging between 12 and 30 over a three-year period since 1999. These data suggest water quality and habitat conditions are currently fair to very poor in this stream downstream of RM 1.6 (Clallam County Steamkeepers' unpublished database, 2003).

Anadromous fish species thought to use Cassalery Creek include coho salmon and steelhead and cutthroat trout. Chum salmon may have historically used Cassalery Creek (PSCRBT 1991). Coho smolt counts in 1999 and 2000 were 189 and 672 smolts, respectively, at a density of 0.048 to 0.170 smolts/m$^2$ (Table 4-16). The highest level of smolt production in 2000 is approximately half of average literature values of typical smolt production in regional western Washington streams. Based on literature values for the average number of smolts produced per spawner under normal conditions, Cassalery Creek should be supporting between 2 and 15 spawning coho salmon per year.

Table 4-16
Estimated Numbers of Juvenile and Adult Fish in Cassalery Creek (WRIA 18-0015)

| | Coho Salmon | | | Steelhead Trout | | | Cutthroat Trout | | |
|---|---|---|---|---|---|---|---|---|---|
| Year Surveyed | Adult Spawners(1) | Smolt Yield | Smolt Densities | Adult Spawners(2) | Smolt Yield | Smolt Densities | Adult Spawners(3) | Smolt Yield | Smolt Densities |
| '96-'97 | 4 | | | 0 | | | 17 | | |
| '97-'98 | 13 | | | 0 | | | 48 | | |
| '98-'99 | | 189 | 0.0571 | | 0 | 0.0000 | | 84 | 0.0212 |
| '99-'00 | | 672 | 0.2029 | | 0 | 0.0000 | | 240 | 0.0606 |
| Average | 9 | 431 | 0.109 | 0 | 0 | 0.00 | 32 | 162 | 0.041 |
| Range | 4 - 13 | 189 - 672 | 0.06-0.20 | | | | 17 - 48 | 84 - 240 | 0.02-0.06 |
| St. Deviation | 6 | 342 | 0.086 | 0 | 0 | 0.00 | 22 | 110 | 0.028 |

(1) Coho salmon adult estimate of 2 to 15 spawners is based on juvenile density observations at a rate of 50 smolts per spawner
(2) Steelhead trout adult estimates of no spawners are based on juvenile density observations at a rate of 12 smolts per spawner
(3) Cutthroat trout adults estimate of 10to 55 spawners is based on juvenile density observations at a rate of 5 smolts per spawner
At an assumed average toe-of-bank stream width of 1.5 meters; the area surveyed equates to 1.6 miles

Steelhead trout smolts were not reported during surveys conducted in 1999 and 2000 in Cassalery Creek, but cutthroat trout smolts ranged between 84 and 240 smolts at a density of 0.021 to 0.061 smolts/m$^2$. These densities are higher than average literature values for cutthroat trout. Cassalery Creek may be currently supporting between 10 and 55 spawning cutthroat trout per year.

### *Gierin Creek*

Gierin Creek is a small, independent drainage to the Strait of Juan de Fuca between Dungeness Bay and Sequim Bay. Discharge to the Strait occurs after the stream flows through a large wetland complex, most of which is located on the Graysmarsh property. There are 8.3 miles of streams and tributaries in the Gierin Creek watershed. The lower-most mile was shortened and channeled at the time of installation of a tide-gate at the mouth of the relocated creek in about 1910. The tide gate prevents most, but not all, salt water from entering the system. According to Haring (1999), it may also impair fish passage at certain tidal stages, and as a result, may prevent migrating salmonid fishes from accessing historically important spawning and rearing habitat. A fish ladder at RM 1.3 provides upstream passage for adult fish. However, it is unknown if juvenile fish can successfully migrate upstream past this structure.

Groundwater return flows from irrigation diversions of Dungeness River water influence the surface waters in Gierin Creek. Tailwater from the Sequim Prairie Tri-Irrigation Company ditches feed the headwaters of Gierin Creek. Gierin Creek winds through a pond on the north side of Holland Road and then into the marsh at Graysmarsh Farms prior to discharging into the Strait of Juan de Fuca.

In 1997, the Sequim-Prairie Tri-Irrigation Company measured the average seasonal tailwater contribution as 0.17 cfs at RM 2.55 and 0.55 cfs at RM 2.62. According to Graysmarsh LLC data, seasonal (August to October) tailwater from Sequim-Prairie Tri-Irrigation Company's Eureka canal measured (at RM 2.62) ranged between 0.0 and 1.5 cfs and averaged 0.47 cfs during 1997 and 1998. During the most recent baseline period (1999 to 2002) it ranged between 0.0 and 1.3 cfs while averaging 0.43 cfs.

In addition, Gierin Creek receives considerable inflow from groundwater throughout its length. A groundwater discharge to Gierin Creek of 0.84 cfs was measured on October 7, 1997 (Thomas et al. 1999). Based on this single measurement, the USGS estimated the average groundwater inflow to be 0.69 cfs/mile. Groundwater is reduced locally by up-gradient withdrawals from public and private wells and from improvements in operations of the irrigation canals and ditches. Changes in land use and farming practices have also influenced groundwater over the past several decades.

The USGS made miscellaneous streamflow measurements in Gierin Creek in 1952, 1961, during the 1978/1979 water year and again in 1997. More recently, Graysmarsh personnel have developed an ongoing program of collecting measurements of surface water streamflows on an every other week basis since April 1997. In the late 1970s, Gierin Creek supported a minimum-recorded flow of 2.2 cfs and maximum of 6.1 cfs (PSCRBT 1991) at a station 0.2 mi downstream of Holland Rd. During this time, the highest flows occurred in the summer and fall and low flows occurred in the winter and spring, probably due to high tailwater return flows during the irrigation season. Presently, the hydrology of the creek has returned to a more normal seasonal streamflow pattern in response to alterations in irrigation ditch management. Data since 1997 indicate low flow in Gierin Creek typically occurs in late summer and early fall until the rainfall intensity increases. High flows typically occur during late winter and early spring.

AESI (1999) summarized the Graysmarsh LLC flow data in Gierin Creek from April 1997 to March 1998. At that time, surface water flows at Holland Road ranged from 0.8 to 3.2 cfs and the baseflow was estimated to be 1.0 cfs (AESI 1999). The range of streamflow data was less than the levels recorded two decades earlier, but comparisons are difficult due to differences in sampling frequency and weather patterns. During this time-period seasonal tailwater releases into the creek remained fairly consistent ranging between 0.0 to 1.5 cfs and averaging 0.47 cfs.

Graysmarsh LLC continues to collect bi-weekly (every other week) measurements of streamflow at 10 stations in or near Gierin Creek. This record is fairly continuous since April 1997. The data are summarized in Tables 4-17 and 4-18 and attached as Appendix D.

The monthly average surface water flow measured from lower Gierin Creek and from Einarsen Springs discharging into the Gierin Creek wetland during the baseline period ranged between 1 and 2 cfs and averaged 1.3 cfs (Table 4-18). The monthly average discharge from the wetland to the Strait of Juan de Fuca ranged between 5 and 10 cfs and averaged 6.9 cfs. As such, on average an additional 5.5 cfs of either surface or groundwater source is finding its way to the wetland.

Table 4-17
Gierin Creek Low Flow Discharge (Aug-Oct# 1997–2002)

| | STA 1 Tailwater (cfs) | STA 3 Gierin Cr. At Holland Rd (cfs) | Percent Tailwater* (%) | STA 4 Holland Road Trib (cfs) | STA 3 + 4 Lk. Sugarma Inflow (cfs) | STA 5 Lk. Sugarma Outflow (cfs) | STA 6 Hi-line Ditch (cfs) | STA 5 + 6 Total Lk. Outflow (cfs) | STA 8 + 9 Einarsen Springs (cfs) |
|---|---|---|---|---|---|---|---|---|---|
| ***Annual Seasonal Discharge*** | | | | | | | | | |
| 1997 | 0.59 | 1.79 | 33% | 0.35 | 2.14 | 1.55 | 0.52 | 2.07 | 0.52 |
| 1998 | 0.33 | 1.06 | 31% | 0.26 | 1.31 | 0.47 | 0.98 | 1.45 | 0.49 |
| 1999 | 0.52 | 1.16 | 45% | 0.21 | 1.37 | 0.71 | 0.49 | 1.20 | 0.44 |
| 2000 | 0.29 | 0.86 | 33% | 0.16 | 1.02 | 0.60 | 0.31 | 0.91 | 0.32 |
| 2001 | 0.23 | 0.54 | 43% | 0.14 | 0.68 | 0.54 | 0.00 | 0.54 | 0.19 |
| 2002 | 0.57 | 0.81 | 70% | 0.11 | 0.91 | 0.87 | 0.00 | 0.87 | 0.14 |
| mean | 0.42 | 1.03 | 43% | 0.21 | 1.24 | 0.79 | 0.38 | 1.17 | 0.35 |
| ***Baseline Conditions 1999 – 2002*** | | | | | | | | | |
| Min | 0.00 | 0.23 | 0% | 0.08 | 0.31 | 0.22 | 0.00 | 0.22 | 0.00 |
| Max | 1.30 | 1.84 | 71% | 0.27 | 2.11 | 1.21 | 0.92 | 2.13 | 0.47 |
| Mean | 0.40 | 0.84 | 48% | 0.16 | 1.00 | 0.68 | 0.20 | 0.88 | 0.27 |

(#) Every other week measurements; observations, N = 6 per season, except N = 7 per season in 1997 and 2000; after Graysmarsh LLC, 2003
(*) Percent tailwater represents from Sequim-Prairie Tri-Irrigation Company's Eureka canal. It should be viewed as a minimum value since additional tailwater occurs sporadically from the Sequim-Prairie canal upstream of Station 3.

Table 4-18
Flows To and From Graysmarsh Wetland

| | Measured surface water flows to the Gierin Cr. Wetland (cfs) | Additional unmeasured flows to the Gierin Creek wetland (cfs) | Wetland discharge at Gierin Creek Tidegate (cfs) |
|---|---|---|---|
| Annual Mean | 1 to 2 | 4 to 7 | 5 to 9 |
| Monthly Mean | 1 to 2 | 4 to 8 | 5 to 10 |
| Instantaneous Flow | 0.6 to 2.9 | 1 to 13 | 2 to 15 |
| Average(1) | 1.4 | 5.8 | 7.3 |
| Baseline Period(2) | 1.3 | 5.5 | 6.9 |

(1) Water Year average during the period of record October 1997 to September 2002
(2) Water Year average during the baseline period October 1999 to September 2002

Physical habitat features in Gierin Creek were assessed by Hadley (2002) as described in Appendix D. Good levels of riparian shade, overhead cover, freshwater rearing habitat and small patches of suitable spawning habitat are available between the creek outlet and Sugarma Lake at RM 1.3. Upstream of the lake moderate quality rearing and marginal spawning habitat exist up to RM 1.8. Further upstream property owners and adjacent land uses heavily influence the channel. Gierin Creek provides some limited rearing habitat but only poor quality spawning opportunities upstream of RM 1.8 (Hadley 2002).

Anadromous fish species known to use Gierin Creek include coho salmon and cutthroat trout. Steelhead and resident rainbow trout are likely present. Unfed hatchery juvenile coho salmon of Dungeness River stock were planted in Gierin Creek during the summers of 1988, 1989 and 1990 with the intent of supplementing low abundances of existing runs and establishing self-sustaining populations of coho salmon. Fish surveys conducted in the spring of 1989 to assess over winter survival and growth of the planted coho salmon and subsequent smolt out-migration collected 1,596 coho smolts produced from the stream and another 220 smolts from the Highline Ditch. These fish out migrated through Goose Ponds to enter the straits. Accounting for uncollected smolts, Moriarity (1989) estimated a total out-migration of 1,907 coho salmon from Gierin Creek in the spring of 1989. Assuming an average toe-of-bank width of 1.5 m, the smolt yield would represent approximately 0.4389, smolts/$m^2$ in the creek downstream of RM 1.8. Such a smolt yield would be consistent with a high rate of coho production from small streams (Zillges 1977). At an average survival rate of 100 smolts per redd, the coho smolt yield of nearly 1,900 fish could be produced from 38 successful spawners. Based on current data and available habitat is appears Gierin Creek is capable of producing a coho smolt yield that could be supported by a spawning escapement between 30 and 50 coho spawners.

The numbers of coastal cutthroat trout using Gierin Creek are unknown. Graysmarsh staff have noticed adult coastal cutthroat trout returning to Gierin Creek in late summer, with mid-winter spawning activity in upper Gierin Creek and spring presence of out-migrating smolts at the tidegate and at Goose Pond (Moriarity 1997). In May 1979, beach seine sets in Sugarma Lake captured 136 yearling cutthroat trout (98 – 218mm), 130 coho salmon (99 – 165mm) and 7 rainbow trout (119 – 218mm) fork length in a mark and recapture experiment (as reported in Moriarity 1997).

### *Bell Creek*

Bell Creek is a small stream running approximately 4 miles long located near the mouth of Sequim Bay. Stream gradients fall between 0.7 and 1.7 percent in the lowermost 2 miles of the drainage (Clallam County Streamkeepers' unpublished database 2003). Spot measurements of streamflows near the mouth collected intermittently since August 1999 have ranged between 0.1 to 6.7 cfs. The DWUA uses Bell Creek for conveying water downstream of the U.S. 101 highway crossing. A diversion just upstream of Carrie Blake Park diverts up to 50 percent of the streamflow (Ecology website for WRIA 18 database, 2003).

Originally, this small stream was likely an ephemeral stream fed by rain. The current summer and early fall low-flow stream discharge is considered to be a function of irrigation influences (Delorm 1999). The Highland Irrigation District provides most of the water to this creek in the summer and fall. Additional discharges including 0.1 cfs of treated wastewater from the City of Sequim have also increased low flows in the creek. Stormwater runoff from increasing development within the Bell Creek watershed is a concern, with increased incidence of flood events in Sequim in recent years (Haring 1999). Conversely, reductions of irrigated acreage and conveyance losses have both decreased groundwater infiltration to Bell Creek likely decreasing low streamflows and potentially increasing water temperatures (Haring 1999).

Based on benthic invertebrate sampling at 4 locations in Bell Creek, B-IBI scores ranged between 10 and 28 over a three-year period since 1999. These data suggest water quality and habitat conditions are currently fair to very poor in this stream downstream of RM 1.8 (Clallam County Steamkeepers' unpublished database, 2003).

Anadromous salmonid fish species thought to utilize the Bell Creek drainage include coho and possibly chum salmon as well as steelhead and cutthroat trout. A waterfall at RM 3.0 blocks access to upstream areas by anadromous fish. Fish migration is also affected by low flow (Haring 1999). Coho salmon use Bell Creek to spawn in October through November and for year-round rearing. Hiss (1993) prioritized coho rearing during the months of February through September for assessing streamflow needs. Smolt surveys in Bell Creek during 1999 and 2000 collected coho salmon, steelhead and cutthroat trout. Coho were the most abundant ranging between 359 and 1,094 smolts at a density of 0.102 to 0.310 smolts/$m^2$. A range of 110 to 233 cutthroat (0.031 to 0.066 smolts/ $m^2$) and 14 to 219 steelhead trout (0.004 to 0.062 smolts/$m^2$) were also observed (Table 4-19). The data imply Bell Creek smolt yields could be supported by 5 and 25 coho, 0 and 22 steelhead, and 15 to 50 cutthroat trout spawners per year. It is important to note, local schools have been releasing aquarium-raised coho salmon fry to Bell Creek for nearly a decade. These releases may be adding to the smolt counts.

Table 4-19
Estimated Numbers of Juvenile and Adult Fish in Bell Creek

| Year Surveyed | Coho Salmon | | | Steelhead Trout | | | Cutthroat Trout | | |
|---|---|---|---|---|---|---|---|---|---|
| | Adult Spawners(1) | Smolt Yield | Smolt Densities | Adult Spawners(2) | Smolt Yield | Smolt Densities | Adult Spawners(3) | Smolt Yield | Smolt Densities |
| '97-'98 | 22 | | | 18 | | | 47 | | |
| '98-'99 | 7 | 1,094 | 0.2590 | 1 | 219 | 0.0518 | 22 | 233 | 0.0552 |
| '99-'00 | -- | 359 | 0.0850 | | 14 | 0.0033 | | 110 | 0.0260 |
| '00-'01 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| '01-'02 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Average | 15 | 727 | 0.172 | 10 | 117 | 0.028 | 34 | 172 | 0.041 |
| Range | 7 - 22 | 359-1,094 | 0.09-0.26 | 1 – 18 | 14-219 | 0.00-0.05 | 22 - 47 | 110-233 | 0.03-0.06 |
| St. Deviation | 10 | 520 | 0.123 | 11 | 145 | 0.034 | 17 | 87 | 0.021 |

(1) Coho salmon adult abundance estimate of 5 to 25 spawners is based on juvenile density observations at a rate of 50 smolts per spawner

(2) Steelhead trout adult abundance estimate of no spawners is based on juvenile density observations at a rate of 12 smolts per spawner

(3) Cutthroat trout adults abundance estimate of 15 to 50 spawners is based on juvenile density observations at a rate of 5 smolts per spawner

At an assumed average toe-of-bank stream width of 2.7 m; the area surveyed of 4,224 $m^2$ equates to1.0 miles

### *Johnson Creek*

Johnson Creek is 7.4 miles long. It begins near the top of Burnt Hill, and flows north to northeast into Sequim Bay at Pitship Point. The creek drains approximately 4.72 square miles (Ecology 1994). Over its lowermost 1.5 miles, Johnson Creek supports a relatively steep stream gradient of 2.5 percent (USFWS 1993). Historic flow measurements noted in the DQ plan (Ecology 1994) indicate surface water streamflows peak at approximately 10 cfs, but generally range between 2 and 6 cfs. Streamflows at the mouth of Johnson Creek (RM 0.0) as reported in the Streamkeepers database were between 1.7 and 6.3 cfs for the fall of 1999 through spring 2002. The Highland Irrigation District measured an average seasonal tailwater discharge into Johnson Creek at RM 1.6 of 1.4 cfs in 1997.

Downstream of this point, Johnson Creek lies within the direct-effects area of the Action Area.

Anadromous fish stocks reportedly using Johnson Creek include coho salmon and winter steelhead stocks from Sequim Bay, and unspecified stocks of coastal cutthroat trout and chum salmon (USFWS 1993). No survey data exist regarding fish abundance.

### *Meadowbrook Creek*

This relatively short and low-gradient drainage historically discharged into the Dungeness River. Prior to construction of levees along the Dungeness mainstem, Meadowbrook Creek was influenced by frequent flooding of the Dungeness River. In 1999, shoreline erosion moved the mouth of Meadowbrook Creek 1,400 feet east (Haring 1999). Instead of emptying into the Dungeness River, it now drains directly into the Bay. Water temperature in this creek often exceeds optimal levels for spawning and rearing salmon (Haring 1999). Haring (1999) reported irrigation increased the instream flows of Meadowbrook Creek via groundwater inputs. He also assumed coho salmon use this watercourse for spawning and steelhead trout use it for both spawning and rearing. He could find no reported evidence of fish access problems. Tailwater discharge DDM13 occurs into Meadowbrook creek at RM 1.5. Downstream of this point, the creek falls within the direct-effects area of the CIDMP.

During monthly flow measurement in 1979, the USGS found the discharge in Meadowbrook Creek ranged between 4 and 6 cfs (USGS 1999). Ecology collected a limited number of flow measurements in Meadowbrook Creek in the fall of 1999 through summer of 2000 that ranged between 3.9 and 4.8 cfs (Shedd 2001). Since the creek consists of heavy instream vegetation, flow measurements were very difficult to provide a consistent stage and discharge relationship and reliable long-term flow estimates could not be made. Since groundwater discharges support the flow in Meadowbrook Creek, Ecology expects a relatively constant flow pattern throughout the year between 4 and 6 cfs (Shedd 2001).

WDFW surveys of Meadowbrook Creek for 5 consecutive years during 1996 to 2000 indicate smolt yields ranging between 80 and 814 coho salmon, 18 and 170 steelhead trout and 5 and 62 searun cutthroat trout outmigrants (WDFW spawning ground surveys; R. Cooper 2005). The amount of available habitat is unknown, so WDFW did not formulate smolt density estimates for any of the species. At an average survival rate of 100 smolts per redd, the coho smolt yield could be produced from 2 to 16 successful spawners. Similarly, the steelhead smolt yield could be supported by 2 to 14 successful spawners assuming an average of 24 smolts per redd. The observed cutthroat trout smolt abundance could be produced from the average yield of up to 5 successful redds or 10 adult spawners. Based on current data it appears Meadowbrook Creek is capable of producing a smolt yields that could be supported by a spawning escapement between 5 and 17 adult coho salmon, 2 to 10 steelhead trout and 0 to 10 cutthroat trout.

### *Cooper Creek*

Cooper Creek is a relatively small independent drainage to saltwater between Sequim Bay and the Dungeness River. It flows for about 1 mile, draining low elevation areas similar to other neighboring drainages. This creek is influenced by irrigation water from the Dungeness River delivered through groundwater recharge, so it is included in the indirect-effects area.

Although there are no survey data, Haring (1999) suggests Cooper Creek supports juvenile coho salmon and adult cutthroat trout in the lower reaches. In 1995, a tide gate at the mouth of the creek was partially opened to allow fish passage. The creek is associated with about 10 acres of tidal marsh as part of the large Cassalery/Cooper Creek wetland complex. A dike road presently separates the two wetlands. A water level control structure located in a tidal channel within the estuary, designed to maintain high water levels for a fish rearing pond and to attract waterfowl, restricts fish access into and out of approximately four acres of salt marsh. No other impediments to fish passage are known to exist in Cooper Creek.

The majority of Cooper Creek has been channelized. The frequency of good pools and large woody debris is sparse. Riparian conditions are generally poor. The streamside vegetation is composed primarily of reed canary grass, willow, wild rose, and a few alder.

### 4.1.5 Dungeness Bay

Dungeness Bay receives direct runoff from the Dungeness River and from a number of independent creeks including Meadowbrook Creek and four irrigation tailwater discharges. The bay is tidally influenced, turning the lower portions of the independent creeks into sloughs. Streamflow in the sloughs is a function of tidal elevations and during semi-diurnal high tides, they may experience reverse flows. Channel substrate features in the sloughs and upper estuary change from erosional to depositional. The concentration of saline waters is also a function of tidal exchange as salt-water intrusion may extend into many of the stream mouths. Tidal influence is believed to extend into the Dungeness River to a point slightly downstream of the Schoolhouse Bridge at RM 0.9 (Bountry et al. 2002).

The estuarine waters of Dungeness Bay are formed by a large protective sand spit west and north of the mouth of the Dungeness River. Long shore sediment transport, as a result of prevailing westerly winds in the Strait of Juan de Fuca, delivers coarse and fine-grained sediments from west to east around the river discharge. This action over time has developed the 5-mile long Dungeness Spit. Its size is dynamic as a direct function of long-shore sediment supply and freshwater runoff patterns. Two internal sand spits; Cline and Graveyard (Deadman's) spit formed by recurrent, strong northeast wind storms from the Straits of Georgia, separate the bay into an inner and outer portion. A large part of inner Dungeness Bay is an intertidal backshore marsh.

The bay is considered part of the indirect effects area of the CIDMP. It is influenced primarily by a reduction of freshwater streamflows commensurate with the irrigation diversions and locally, through the quality of tailwater discharges. The primary water quality concern is related to fecal coliform loadings transported by the ditches as described in Section 4.5.3. In 1997, the Washington State Department of Health (DOH) initially detected increasing levels of fecal coliforms in Dungeness Bay as part of its monitoring activities related to commercial shellfish beds. In May of 2000, the DOH closed 300 acres of the bay to commercial harvest. An additional 100 acres were closed in 2001. In June 2002, Ecology released the TMDL for fecal coliform in the Lower Dungeness Watershed (Ecology 2002). A separate TMDL for Dungeness Bay was released in April 2004.

## 4.2 Baseline Conditions for Wetlands

This section is intended to provide a basis for understanding the current wetland conditions in the Action Area as a potential habitat type for covered species. Wetlands and their functioning processes in the project area are described. Covered species of concern potentially using wetland habitats include the western toad (*Bufo boreas*), that could potentially use open water portions of wetlands for breeding. Summer and winter rearing life-history stages of juvenile salmonid fishes may also use wetlands, if a wetland is connected to stream corridors.

Wetlands in the Action Area are cataloged in the Clallam County database (CCDCP 2003) and have been extensively described in the Comprehensive Water Conservation Plan FEIS (Foster Wheeler 2003) and in Clallam County (1995). Wetlands, generally including swamps, marshes, bogs, fens and similar areas, are ecologically important because of their (1) beneficial effect on water quality, (2) moderation of flow regimes by retaining and gradually releasing water, (3) value as fish and wildlife habitat and (4) botanical diversity.

Wetlands in the project area are fed by both surface water runoff and groundwater discharges. Sources of additional water to many wetlands in the project area are direct discharges from irrigation systems (tailwater) and increases in shallow aquifer recharge from leaking irrigation ditches (CCDCP 1995, PSCRBT 1991).

Generally, wetlands in the project area are subject to federal, state and local regulation regardless of water source. For example, Clallam County regulates wetlands whether they are natural or artificially created (or enlarged) due to irrigation in the region. An important exception is wetlands intentionally created, such as the irrigation ditches, are not subject to County regulation.

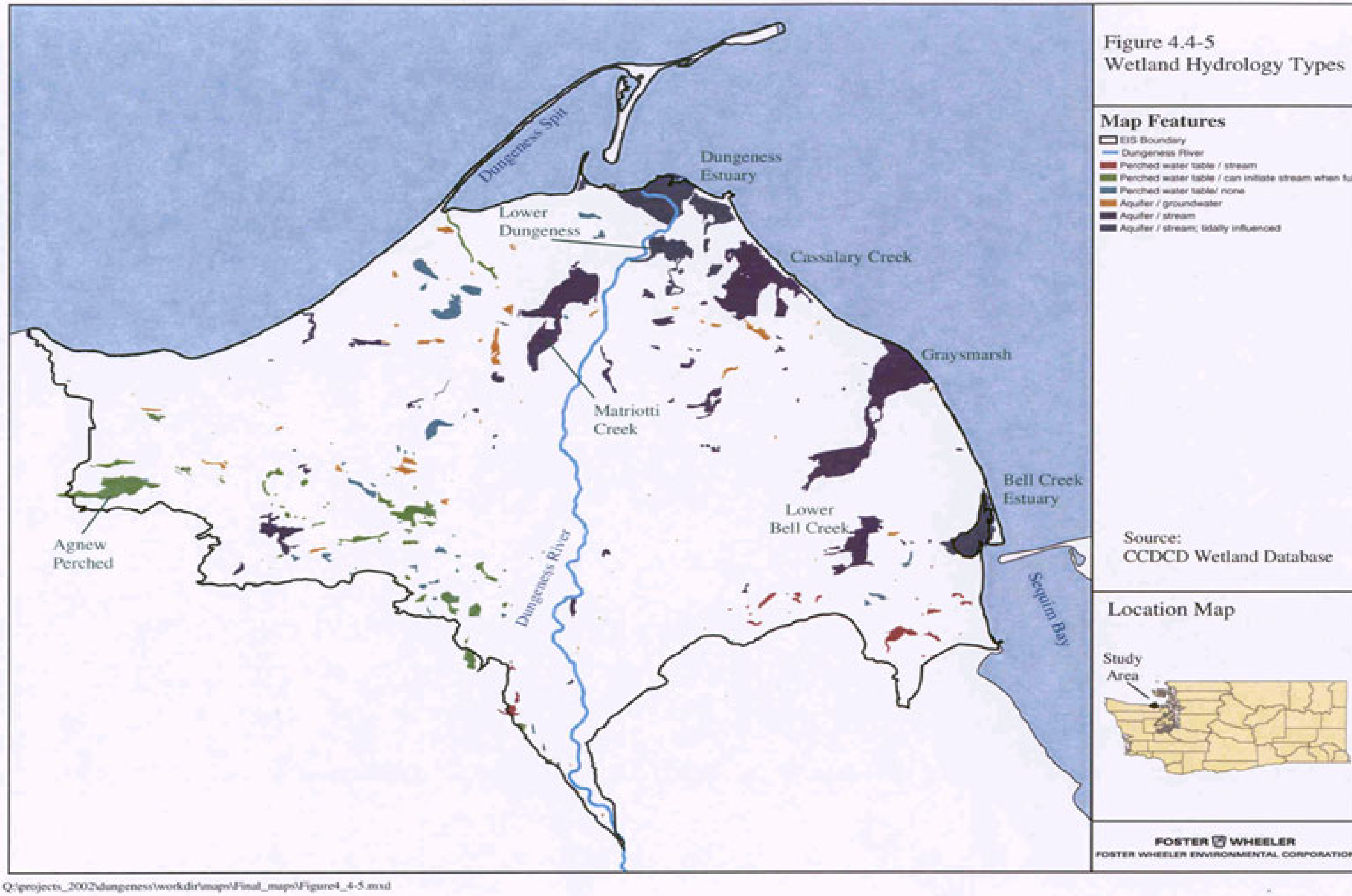
### 4.2.1 Wetlands in the Action Area

The Clallam County wetland database is the primary source of information for wetlands in the project area. There are 265 wetlands or wetland complexes, covering a total of 2,732 acres, within the project area (Exhibit 4-5). The estimated size of each wetland in the Clallam County database is based on aerial photo interpretation, the National Wetland Inventory, and local knowledge (CCDCP 1995). The wetlands in the planning area range from 0.1 acre to 405 acres in size.

Nine wetlands (less than 4 percent of the total number) are larger than 100 acres and account for 60 percent of the wetland acreage in the project area. They are discussed in detail in the FEIS (Foster Wheeler, 2003) and will be summarized individually in the following sections for context with the CIDMP. Approximately 96 percent of the wetlands are smaller than 100 acres and 45 percent of the wetlands are less than one acre in size.

## Exhibit 4-5

## Location of Wetlands




Source: Draft FEIS for Comprehensive Water Program

Wetlands are broadly classified in a hydrogeomorphic system as riverine, lacustrine, estuarine, or palustrine (Cowardin et al. 1979). The project area includes mostly estuarine and palustrine wetlands. Estuarine wetlands occur along salt water in the intertidal, subtidal or backshore zones. Palustrine wetlands are associated with low gradient, slack freshwater systems, not classified as riverine, lacustrine, or estuarine. They are usually dominated by trees, shrubs, persistent emergent vegetation, and emergent mosses or lichens.

Many of the wetlands in the project area are complexes of several types of vegetation types. The largest wetlands have many vegetation types and strata creating complex habitats. The interspersion of vegetation classes in wetlands provides habitat edges that increase the suitability for some wildlife species (Hruby et al. 1999). For example, suitable habitat for many species of plants and animals is partially dependent on having several types of vegetation. Open water within forested or emergent vegetative types makes wetlands more attractive to amphibians.

While there are many vegetation types in the wetland database, six types account for 93 percent of the acreage in the project area as follows:

- Palustrine Emergent Wetlands 58%
- Palustrine Forested Wetlands 19%
- Palustrine Scrub Shrub Wetlands 5%
- Estuarine Wetlands 5%
- Palustrine Open-Water Wetlands 2%

Fifty-eight percent of the wetland area, or 1,597 acres, is palustrine emergent wetland (PEM) dominated by herbaceous vegetative cover. This type of wetland may provide habitat for small mammals, invertebrates, amphibians, and some birds. If it contains small ponds or is adjacent to open water, it could provide additional habitat for amphibians and birds (Hruby et. al., 1999). An emergent wetland may also provide other functions such as sediment, nutrient, or contaminant removal.

The next largest acreage cover is palustrine forested wetland (PFO), accounting for 522 acres or 19 percent of the wetland acres. A forested wetland provides habitat for birds and mammals, particularly if it is a partially open canopy. A forested wetland adjacent to other types of vegetative units would provide additional habitat. Open water adjacent to a forest could improve suitability of the habitat for bird species or provide habitat for additional species of birds or mammals (Hruby et al. 1999).

Palustrine scrub-shrub (PSS) accounts for 127 acres, or 5 percent of the total wetland acres.

Approximately, 66 acres or 2 percent of total wetlands are open water within palustrine wetland (POW). Water cover is important to bird and amphibian species richness. Depth, duration, and frequency of water cover influence bird species composition (Richter et al. 1996). Open-water areas within the wetlands in the Action Area are mostly very small. The size of open water portions of wetlands ranges from 0.1 acre, to less than 5 acres. Only 3 wetlands (1%) possess more than 2 acres of open water and 16 wetlands (another 6%) support between 1 and 2 acres of open water. Eighty one open-water areas are less than one acre in size and many of these wetlands are categorized as ditches or ponds. Small open-water areas enhance the value of bird and amphibian habitat but may not be large enough to include large numbers of waterfowl.

Estuarine (E) wetlands, influenced by tides and fresh water, account for 125 acres or 5 percent of the total wetlands. Estuarine wetlands are considered one of the most productive types of wetland and may provide excellent habitat for birds and fish.

Wetlands in the Action Area are classified into 6 hydrologic types according to the source and outflow of water. The flow of water through a wetland has implications for the hydrologic, biologic, and biogeochemical functions. The hydrology types were determined for each wetland depending on the source of the water and on the position in the area landscape for the Clallam County wetland analysis (CCDCD 1995). The hydrologic types can be found in the FEIS for the Comprehensive Plan. (Foster Wheeler 2003).

Seventy-five percent of the wetland acreage in the Action Area is primarily fed by the shallow aquifer (Hydrologic Types 4, 5, and 6). The hydrologic function of these wetlands could be affected by changes in groundwater levels. The remaining 25 percent of the wetland acreage is primarily fed by surface water runoff or a shallow, perched water table. It is not expected these wetlands would be affected by groundwater level changes. However, changes in amounts of runoff from rain, irrigation tailwater, or irrigation leakage in the local area could influence these wetlands.

### 4.2.2 Wetlands Larger than 100 Acres

According to the Clallam County database, eight wetlands in the Action Area are larger than 100 acres. They are described in detail in the FEIS (Foster Wheeler, 2003) and briefly summarized below:

#### *Graysmarsh/Gierin Creek*

The largest of the wetland complexes, located along Gierin Creek, includes Graysmarsh. The entire complex is listed as 405 acres in the Clallam County database. An evaluation of the hydrology of the Graysmarsh wetland was performed by AESI (1999). Graysmarsh is fed primarily by direct groundwater discharge from shallow aquifers to the marsh and secondarily by Gierin Creek. Gierin Creek flows are supported by groundwater discharge and irrigation tailwater return flows during the irrigation season of April 15 to September 15. The shallow groundwater may be enhanced with recharge from irrigation discharges and other sources (refer to Section 4.1.4 for a discussion of Gierin Creek hydrology). Groundwater also discharges into the marsh in the form of concentrated springs such as Einarsen Springs and by means of diffuse subsurface discharge.

Einarsen Springs discharges at the toe of a slope along the western edge of the marsh, where the aquifer daylights. Flow of Einarsen Springs is enhanced by two wells that penetrate fine-grained marsh and older deposits, resulting in water flow under artesian conditions from a low elevation aquifer. Average annual flows from bi-weekly spot measurements at Einarsen Springs have ranged from 0.28 cfs in 2000/2001 to 0.55 cfs in the 1997/1998 water year.

Several other diffuse springs also support the hydrology of the Graysmarsh wetland. These springs contribute to surface water flow over large areas and most are not possible to gage individually. The discharge from diffuse springs is captured in the total marsh discharge measured at the tide gate. The annual average unmeasured flow during the baseline period ranged between 4 and 6 cfs while averaging 5.5 cfs over 3 water years. Average annual discharge data for Einarsen Springs, the tide gate and the balance of unmeasured flows are presented in Table 4-20. Leakage from irrigation canals in the local area is believed to affect local recharge to the shallow aquifer (AESI 1999, Ecology 1999). There is also saltwater input from the Strait of Juan de Fuca that is controlled with the tide gate.

Table 4-20
Average Annual Discharge From Graysmarsh Tide Gate, Einarsen Springs, and Unmeasured Diffuse Groundwater Sources

| Water Year | Precipitation | Graysmarsh Tide Gate (cfs) | Einarsen Springs (cfs) | Unmeasured Flows (cfs)[(1)] |
|---|---|---|---|---|
| 1997/1998 | Average | 8.9 | 0.55 | 7.3 |
| 1998/1999 | Wet | 8.2 | 0.50 | 6.5 |
| 1999/2000 | Wet | 7.0 | 0.38 | 5.8 |
| 2000/2001 | Dry | 5.3 | 0.28 | 4.2 |
| 2001/2002 | Wet | 6.6 | 0.31 | 5.2 |
| **Mean[(2)]** | | | | |
| **Period of Record (97–02)** | | **7.2 ∀1.4** | **0.38 ∀ 0.20** | **5.8 ∀1.2** |
| **Baseline Period (99-02)** | | **6.3 ∀0.9** | **0.30 ∀ 0.21** | **5.0 ∀0.8** |

(1) Unmeasured discharge is calculated as the difference between the tide gate discharge and the total of Gierin Creek [downstream of Sugarma Lake] and Einarsen Springs.

(2) Mean data are presented as the average and one standard deviation of all measurements.

Table modified from unpublished Grashmarsh LLC flow records.

As a result of Gierin Creek channelization and the installation of the tide gate, the owners need to periodically dredge sediments from Gierin Creek to maintain desired open-water components (Foster Wheeler 2003).

The wetland includes approximately 260 acres of emergent wetland, 115 acres of forested wetland, 26 acres of scrub-shrub wetland, and 5 acres of open water in four separate areas (Foster Wheeler 2003). The largest area of open water is 3.6 acres (Clallam County database 2002). The northernmost part of the wetland remains brackish. In some years, the back-shore berm is topped via wave action at high tide, during storms. The salt marsh is approximately 30 acres. There is a gradient of salt marsh to freshwater plants going inland.

The current private owners actively alter the vegetation in Graysmarsh to improve waterfowl habitat. Livestock are not allowed, and commercial agriculture does not occur in the marsh, though both ranching and commercial agriculture are conducted on adjacent parcels of Graysmarsh property. Waterfowl habitat is maintained through growing barley both in the wetland and in adjacent agricultural fields, growing berry crops in adjacent fields, mowing large areas of reed canary grass and cattails in the marsh area, and also dredging the marsh channels (Foster Wheeler 2003).

Because Graysmarsh has several vegetation types (forest, shrub, emergent, open water) and is adjacent to the Strait of Juan de Fuca, it provides diverse habitat for many species, including known habitat for Covered Species such as, Bald eagles, anadromous salmonid fishes, and potential habitat for the western toad. There are reported Bald eagle nesting territories near the wetland (WDFW 2002). Three significant plant communities tolerant of dry conditions and largely restricted in range to the Olympic rain shadow area were also found in Graysmarsh (Moriarty 1997). These communities may provide habitat for upland species.

### *Cassalery Creek*

The second largest wetland complex includes the mouth of Cassalery Creek. It is close to and influenced by the Strait of Juan de Fuca. In a 1859 survey of the area, the wetland was noted as a salt marsh and grass swamp. The portion closest to the Strait was also noted as a salt marsh in 1914 (Eckert 1998). The wetland is categorized as a Clallam County Hydrologic Type 5, indicating the source is primarily groundwater and the outflow is to a stream. There are now residences and a road between the majority of the wetland and the Strait of Juan de Fuca. The soils are mapped as the Lummi Series and Mukilteo Muck Series. Both are poorly drained soils and are classified as hydric.

The wetland is estimated to be 329 acres and it is likely to have some upland inclusions. Seventy-seven percent (256 acres) consists of emergent vegetation, 9 percent is scrub shrub, 6 percent is open water, 5 percent is considered estuarine, and 2 percent is forested (a 7-acre grove of large trees). At least half of the water areas are ditches at the edge of the wetland adjacent to the residential area along the Strait of Juan de Fuca. Cooper Creek bisects the wetland and leaves the wetland at the coast. Cassalery Creek runs through the eastern portion of the wetland and has a small estuary at its mouth. Because this wetland has a small creek, moderately interspersed vegetation types, and is adjacent to the Strait of Juan de Fuca, it provides potential habitat for Covered Species including Bald eagles, amphibians like the western toad, as well as anadromous salmonid fishes in the various fish guilds. Some of the land is grazed and farmed and other parts have been developed for homes. Residences, roads, and other farmed or grazed areas surround the wetland.

### *Matriotti Creek Complex*

The third largest wetland complex is about a mile from the Strait of Juan de Fuca, south of Matriotti Creek, and close to Matriotti Creek's confluence with the Dungeness River. It is listed as 267 acres in the Clallam County database. The wetland is Clallam County

Hydrologic Type 5, indicating it is fed by the aquifer and it discharges to a stream. There are two small, tributaries to Matriotti Creek flowing through the wetland: Lotzgesell and Woodcock. The wetland provides habitat for Covered fish species including anadromous salmonid fishes. The tributaries also provide freshwater habitat, at least seasonally. The streambanks are partially farmed and only partially vegetated with shrubs or trees, reducing the quality of the stream habitat for fish and wildlife. Only a small amount of acreage is in open water ponds limiting its potential for the western toad. Nevertheless, the area is listed as providing habitat for waterfowl and hence bald eagle foraging, possibly because crops provide a food source. The soils are mapped as Bellingham, Mukilteo, and Puget. All three are poorly drained, hydric soils that are either organic or formed in alluvium.

This wetland is a palustrine emergent wetland (PEM) used for pasture or farmland, including a wildlife exhibit farm. Because there are several buildings (including residences) within the 267 acres, inclusions of upland areas are likely within the overall mapped wetland acreage. A developed upland area separating the wetland from the Dungeness River lies to the east. Matriotti Creek lies adjacent to the north. The other surrounding land is farmed, grazed, or developed.

#### *Dungeness Estuary*

The next largest wetland is at the mouth of the Dungeness River. This wetland was mapped as a salt marsh in 1914 (Eckert 1998). It is estimated to contain approximately 227 acres and is Hydrologic Type 6, indicating it is fed by the aquifer and discharges to marine waters. The soils are mapped as Beach and Lummi Series. The Beach Series is gravelly sand with some tidal marshland and the Lummi Series is a poorly drained, hydric-soil formed in marine sediment and alluvium (USDA 1987). Half of this wetland is estuarine with tidal influence that provides excellent habitat for Covered bird and fish species. It could offer estuarine rearing opportunities especially for the ocean-type pink, chum and Chinook salmon during their seaward migration. A third of the area is farmed with emergent vegetation, 10 percent is the forested riparian area adjacent to the Dungeness River and the remainder includes the river, a small pond, and scrub-shrub areas. A residential road bisects the wetland along the western side of the Dungeness River. The wetland is adjacent to the Dungeness National Wildlife Refuge and otherwise surrounded by roads, housing, and farms. Habitat for bald eagles, and the western toad is likely present (WDFW 2002).

The Dungeness estuarine wetland is connected to the 80-acre wetland formed where Meadowbrook Creek originally flowed into the Dungeness River. The wetlands are separated by a road but hydrologically connected. The habitat for Covered Species is effectively connected, greatly enhancing the quality of the potential wildlife habitat in the area.

#### *Bell Creek Estuary*

A 115 acres wetland at the mouth of Bell Creek is known as Washington Harbor Lagoon. It is almost entirely open to salt water and it is affected by tidal and wave action. A small portion of the wetland at the mouth of Bell Creek is influenced by both fresh and salt water. The wetland is Hydrologic Class 6, indicating it is fed by groundwater and it discharges to marine waters. Marine vegetation types predominate, largely seaweed and algae.

There are small areas of emergent plants where Bell Creek flows into the wetland. Stream connected habitat in the wetland exists for Covered fish species. Bald eagle nesting territories are present (WDFW 2002). The habitat quality is good, primarily due to open water components. Adjacent to the wetland is a forested area along the coast that enhances the opportunity for the western toad habitat during its upland stage. More than 50 percent of the wetland is surrounded by farm or roads. The balance of the wetland is adjacent to Sequim Bay.

#### *Lower Bell*

Another wetland of approximately 115 acres in size is upstream from the estuary of Bell Creek. The wetland is Hydrologic Class 5, indicating it is fed by groundwater and supplements surface water streamflow in its discharge. Three-quarters of the wetland is emergent vegetation, farmed or grazed, and one-quarter is forested. It is also adjacent to a large forested area that provides a continuation of habitat. There are two small open-water areas in the wetland; one in the forested area and one in the emergent area that offer potential breeding habitat for the western toad. The majority of the buffer is farmed, grazed, or roaded. Bell Creek and a tributary of Bell Creek bisect the wetland and provide habitat for Covered fish species. The portion of the wetland upstream of the fork of Bell Creek and its tributary does not have the potential to perform as many wetland functions as the lower section due to low streamflows and poor riparian habitat quality.

#### *Lower Dungeness*

Just south of the Dungeness estuary wetland is a small, 102-acre wetland associated with the lower Dungeness River. The wetland is comprised of Lummi Series soils that are poorly drained and hydric. The eastern edge of the wetland includes Meadowbrook Creek. More than half of the wetland is farmed or grazed with emergent vegetation. The rest is forested or scrub-shrub, primarily in the Meadowbrook riparian zone. Meadowbrook provides habitat for Covered fish species. The groundwater-fed wetland discharges to Meadowbrook Creek and the Dungeness River.

#### *Agnew Perched*

Only one wetland larger than 100 acres in the Action Area is a perched wetland not fed by the shallow aquifer. This 103 acre wetland lies immediately south of Highway 101, between McDonald and Siebert Creeks. Sixty percent of the wetland is emergent with a few small ponds, and it is farmed or grazed. The remaining 40 percent is forested with a small scrub-shrub component. It is Clallam County Hydrologic Class 2, indicating it is perched on till with a surface water discharge to a stream when the wetland fills in winter. This wetland type may support a stream until June or July potentially offering overwinter habitat for Covered fish species. Three Agnew irrigation ditches traverse small parts of the wetland. The trees and the irrigation ditches may provide habitat for the western toad but the area is not recorded as having any notable wildlife habitat.

### 4.2.3 Wetland Functional Assessments

Wetlands perform considerable beneficial functions in a watershed. Functioning processes fall into three broad categories: hydrologic, biogeochemical, and habitat. The hydrologic function is related to water flow, including timing and duration, across the landscape. The biogeochemical function includes the maintenance and improvement of water quality. Habitat includes all species of animals and plants.

The following functions were assessed in the FEIS and by Clallam County (Foster Wheeler 2003):

- ***Sediment Removal:*** Sediments are removed when water velocity is reduced and the particles settle out of the water column. This process is generally performed by flow detention or by filtration and physical blockage of vegetation.
- ***Nutrient and Contaminant Removal:*** Wetlands primarily remove nutrients and contaminated materials through physical entrapment on plant tissue and chemical binding on soil particles and by nitrification and denitrification in alternating aerobic and anoxic conditions (Mitsch and Gosselink 1993).
- ***Peak Flow Reduction:*** Wetlands slow and store water by retaining runoff from the watershed during high water events. Without retention/detention surface water could flow downstream causing floods. The potential to perform this function is considered to be affected by the shape of the wetland (a bowl holds more than a plate), the constriction of the outflow (something to hold back the flow), the size capacity of the area not already inundated, and the density of woody vegetation.
- ***Production and Export:*** Wetlands are generally thought to export organic material to adjacent waters via excess primary production. This process provides a food source for the aquatic system (Mitch and Gosselink 1993). To perform this function, a wetland needs vegetative cover and a mechanism to move the organic matter to adjacent water systems.
- ***Recharging Groundwater:*** Wetlands provide a source of recharge to groundwater. Their ability to perform this function is influenced by their capacity to retain water and the permeability of the soil type.
- ***General Habitat:*** General habitat is the suitability of the wetland for use by a broad range of animal species. This function incorporates the habitat needs for invertebrates as well as macro-fauna. Complexity in wetland vegetation, interspersed upland and wetland communities, and amount of open water and its distribution within the wetland all benefit the suitability of general habitat components in wetlands.
- ***Invertebrates and Amphibian Habitat:*** A lack of development in the wetland or its buffer, the availability of plant litter, the amount of open water, and its distribution within the wetland increase the benefit of this habitat function. Most of the

amphibians found in the Action Area require ponds or wetlands for breeding and rearing of young, similar to the needs of the western toad (Leonard et al. 1993).

- ***Fish Habitat:*** This function requires surface water connection to the ocean for anadromous but not for resident fish. The function is influenced by the type, quality, and variety of open water.
- ***Wetland Birds:*** Wetland-associated birds rely on the wetland ecosystems for their habitat. The factors influencing bird habitat are a wetland's proximity to a stream or the Strait of Juan de Fuca, development in the wetland or its buffer, open water in the wetland, vegetation structure, and food sources.
- ***Wetland Mammals:*** The factors contributing to this function are the quantity of open water and its distribution within the wetland, development in the wetland and its buffers, and connectivity to other wetlands and natural areas.

Each function was assessed on a qualitative basis using available information in the FEIS (Foster Wheeler 2003). The eight wetlands larger than 100 acres in size were given ratings of high, medium, or low for their potential to perform functions based on the factors listed above (see FEIS Table 4.4-2 for further details). The functions most important for the Covered Species [western toad, bald eagle and anadromous fishes] include general habitat, fish habitat, and amphibian habitat. These functions will be evaluated in Sections 5.0 and 7.0 of the CIDMP.

## 4.3 Baseline Conditions for Aquatic Habitat in the Dungeness River

Habitat for successful fish production in the mainstem Dungeness River downstream of RM 11.0 related to spawning and rearing life history stages is described in the following section with respect to streamflow conditions, substrate quantity and quality, water temperature, water quality, pool frequency, pool depths for holding and refuge, and large woody debris characteristics. These characteristics are summarized, where possible, for the baseline period of 1999 to 2002, but put into context of the historical changes to the river.

Changes to the river channel began prior to the 1900s, but have been extensive since World War II. The river has been diked, bridged, constrained with armoring, and even bulldozed to "clean" the channel and provide flood control. Partly because of these activities and increases in sediment supply from headwater areas, the river began to aggrade in the low gradient sections along the ancestral alluvial fan (Haring 1999). PSCRBT (1991) identified bank erosion, bedload aggradation, braiding of the channel, and lack of off-channel habitat as major habitat concerns throughout the Dungeness River. Aggradation requires higher flows to achieve depths for fish passage and to provide access to side channels. Flow requirements for passage indicate the current channel conditions resulting from hydro-modification may pose a greater impact than historic conditions (Haring 1999). The floodplain of the Dungeness River is intensively constrained by dikes, bridges, and road crossings that restrict the export of sediment from the channel. Historically, frequent flooding of the floodplain allowed sediment to exit the system through the watersheds of Meadowbrook, Cassalery, and Cooper Creeks, whereas now, all sediment in the system is routed through the Dungeness mainstem into Dungeness Bay. The

Dungeness River Restoration Work Group (1997) included remedies for these constrictions among its recommended projects.

### 4.3.1 Streamflow and Fish Habitat

Salmonid fish production in the Dungeness River has been affected by water withdrawals for irrigation, industrial, and domestic use. Impacts to salmonids from irrigation diversions have been identified since the early 1900s (Haring 1999). Removal of water either directly from the Dungeness River or from wells, hydraulically connected to river flows, reduces the amount of streamflow needed for salmonid fish migrations, spawning and rearing habitat, and survival (Haring 1999). The Dungeness River is listed as a 1998 303(d) water quality limited stream with respect to instream flows.

Changes in withdrawal regimes in the last decade (Section 4.1.1) have improved flow conditions in the river compared to prior decades. The differences in available habitat features occurring under natural flows and under current instream flow levels are most pronounced during extreme low flow periods or drought conditions (Section 5.0).

#### *Upstream Migration*

The primary fish access concern in the Dungeness River mainstem is low streamflows during the late summer and early fall periods that have a potential to impede adult salmon migration and decrease useable juvenile habitat in the lower river (PSCRBT 1991, Lichatowich 1992, Orsborn and Ralph 1992). As flows decrease in August and September, the potential for development of fish passage barriers in shallow riffles increases. Low streamflows have the potential to delay or prevent adult pink and Chinook and summer Chum salmon from reaching preferred spawning areas (Wampler and Hiss 1991). Bedload aggradation in sections of the lower river over the last few decades has made the channel shallower and wider than normal. This situation accentuates the potential concern of low stream volumes for upstream adult passage.

Anadromous fish access in the Dungeness River has been affected by a century of wood removal and riparian forest harvest, allowing rapid migration of the channel during flood events and resulting in extensive riffle exposure during low flow periods (Haring 1999). Broad riffle habitats offer the most risk to fish passage concerns. Streamflow depths, along the thalweg through the riffle, less than 3/4ths a fish body depth may create a migration delay if the length of the low flow passage area is considerable. Thompson (1972) provided minimum depth criteria ranging from 0.4 to 0.8 feet deep, depending on the species and size of the fish. The Bureau of Reclamation (Bountry et al. 2002) study provides data from 60 channel cross sections in the lower river. The shallowest cross sections appear to be cross section. Number 31 (RM 5.2.) and Number 38 (RM 6.3) in the vicinity of Railroad bridge park and immediately downstream of SR 101 bridge, respectively. The streamflows should provide a minimum depth criteria of 0.8 feet in the thalweg of these cross sections. In 1997, the DRRWG implied the reach between Hurd Creek (RM 2.7) upstream to Woodcock Bridge (RM 3.25), presented an obstacle to adult migration during periods of extended low flow where the discharge over riffles was less than 0.5 ft. in some places. The channel characteristics in the alluvial portions of the river are constantly changing. The estimate of flows needed to provide appropriate passage conditions for all species mentioned above is a simple approximation of when streamflows would approach levels for upstream passage concerns.

### *Spawning Habitat*

Historically, spawning habitat in reaches subject to water withdrawals was reduced substantially compared to pre-withdrawal conditions (Haring 1999). Streamflows remain a concern for adequate spawning habitat under the current flow agreement, especially during drought conditions.

An instream flow study using the Instream Flow Incremental Methodology (IFIM) approach was conducted by the USFWS during 1988 and 1989 (Wampler and Hiss 1991) for two sites in the mainstem Dungeness (RM 2.3 and 4.2). The two sites were selected to represent habitat conditions for river reaches from RM 1.8 to 2.5 and RM 3.3 to 6.4, respectively. Both of these reaches are downstream of the five diversions on the mainstem. The IFIM approach provides information about the relationship between discharge and aquatic habitat for various life stages of key fish species. For the Dungeness River, these species included Chinook, pink, and coho salmon, steelhead, and bull trout. The IFIM can be used as a tool for evaluating the discharge/habitat relationship, but additional factors such as groundwater interactions, water quality, variation in baseflow, channel geomorphology, and other factors need to be considered in an overall evaluation of habitat (Orsborn and Ralph 1992). Although the IFIM study was limited, the DRMT and the Jamestown S'Klallam Tribe have agreed to use the Chinook salmon spawning relationship between flow in the river and Weighted Usable Area (WUA) as a measure of habitat. This approach allows a consistent comparison method across alternatives and at the same time focuses on the most critical fish population at its most critical life stage in the Dungeness River (DRMT 2000).

Chinook salmon spawn during the low flow period of 1 August to 15 October. . According to WDFW survey records, Chinook salmon spawning over the last decade in the Lower Dungeness River (RM 0.0 – 6.4) peaked anywhere between the first week of September and the first week of October. Peak spawning activity in the mid-river spawning area (RM 6.4 – 10.8) exhibits a slightly more narrow range, varying from the first week of September to the third week of September. Average estimated low flow levels during 2-week intervals at the upper instream flow study site [RM 4.2] during the 1999 – 2002 baseline period provided between 80 and 103 percent of the recommended Chinook salmon spawning Weighted Usable Area (WUA) at the 180 cfs instream flow level (Hiss 1993)[See Section 4.1.1]. Baseline flow levels in August at the instream flow study site (RM 4.2) generally exceeded the peak of the habitat versus flow curve (Exhibit 4-1). Conversely, baseline flows in September at RM 4.2 were less than the recommended 180 cfs flow level and the corresponding habitat indices with diversions were slightly less [4 to 14 %] than habitat indices estimated without diversions (Tables 4-21 and 4-22). The lowest flow period of the year during baseline conditions routinely occurred during the first 2 weeks of October. Chinook spawning habitat indices during this time interval averaged 80 percent of the WUA at the recommended instream flow level with irrigation diversions compared to 86 percent without such withdrawals.

**Table 4-21**
**Baseline Chinook Spawning WUA and Flow at Upper IFIM Study Site (1999 – 2002)**

| Period | | 1999 - 2002 Baseline Period | | | 2001 Drought Conditions | | |
|---|---|---|---|---|---|---|---|
| | | Mean Flow[(1)] (cfs) | Chinook Spawning WUA (ft2/1,000 ft) | Percent of Recommended WUA (%) | Mean Flow[(2)] (cfs) | Chinook Spawning WUA (ft2/1,000 ft) | Percent of Recommended WUA [(2)] (%) |
| Aug | 1 - 15 | 345 | 22481 | 99% | 118 | 18994 | 84% |
| Aug | 16 - 31 | 252 | 23320 | 103% | 136 | 19868 | 88% |
| Sept | 1 - 15 | 144 | 20043 | 88% | 70 | 12731 | 56% |
| Sept | 16 - 30 | 127 | 19512 | 86% | 57 | 10001 | 44% |
| Oct | 1 - 15 | 106 | 18077 | 80% | 47 | 7654 | 34% |
| Season mean: | | 195 | 20687 | 91% | 86 | 13850 | 61% |
| Recommended: | | 180 | 22683 | | 180 | 22683 | |

(1) Average estimated 2-week flow at RM 4.2 for baseline period of 1999 - 2002. The baseline period was generally wetter than normal.
(2) Average estimated 2-week flow at RM 4.2 during 2001 drought.

**Table 4-22**
**Estimated Chinook Spawning WUA and Flow at the Upper IFIM Study Site (1999 – 2002) Without Irrigation Water Diversions**

| Period | | 1999 - 2002 Baseline Period | | | 2001 Drought Conditions | | |
|---|---|---|---|---|---|---|---|
| | | Mean Flow[(1)] (cfs) | Chinook Spawning WUA ($ft^2$/1,000 ft) | Percent Recommended WUA (%) | Mean Flow[(2)] (cfs) | Chinook Spawning WUA ($ft^2$/1,000 ft) | Percent Recommended WUA[(2)] (%) |
| Aug | 1 - 15 | 409 | 21550 | 95% | 177 | 22491 | 99% |
| Aug | 16 - 31 | 307 | 22318 | 98% | 182 | 22785 | 100% |
| Sept | 1 - 15 | 190 | 23192 | 102% | 107 | 18165 | 80% |
| Sept | 16 - 30 | 153 | 20451 | 90% | 88 | 15863 | 70% |
| Oct | 1 - 15 | 127 | 19512 | 86% | 75 | 13668 | 60% |
| Season mean: | | 237 | 21405 | 94% | 126 | 18594 | 82% |
| Recommended: | | 180 | 22683 | | 180 | 22683 | |

(1) Average estimated 2-week flow at RM 4.2 for period of 1999 - 2002 without diversions. The baseline period was generally wetter than normal.
(2) Average estimated 2-week flow at RM 4.2 during 2001 drought without diversions

However, the comparative difference between habitat levels is amplified under drought conditions. During the 2001 drought, instream flow levels at RM 4.2 were estimated during the lowest 14-day period to range as low as 45 cfs (MWG 2003) representing 31 percent of the WUA at the recommended spawning flow. Without diversion, natural flow levels at RM 4.2 are estimated to have provided approximately 73 cfs or 59 percent of the habitat index during this same period. This flow level corresponds to approximately 81 cfs at the USGS gage site; a flow that occurs naturally less than 1 percent of the time (England 1999). On average, during the 10-week spawning period under the 2001 drought, the current instream flow regime was estimated to provide 21 percent less WUA than the seasonal mean estimated for natural river flows.

In naturally producing systems, the amount of spawning habitat does not usually limit the population size of most salmonid fish species, with the exception of pink and chum salmon. Sufficient spawning space is available in most cases to seed the amount of available rearing habitat, where density dependent factors begin to control population numbers. The long-term average number of spawners needed to fill the available rearing space is considered the full seeding carrying capacity of a stream. A comparison of the indices of Chinook habitat as represented by WUA indicate spawning habitat exceeds rearing habitat at the peak of each habitat versus flow curve [WUA = 23,732 $ft^2$/1,000 ft vs. 3,209 $ft^2$/1,000 ft of river] (Wampler and Hiss 1991.) These indices illustrate that summer low flow rearing habitat conditions in the river are more likely to limit Chinook population numbers than spawning habitat capacity.

For example, according to a summary of regional research conducted with respect to Chinook salmon production potential, the Stream Enhancement Research Committee (SERC) (Marshall et. al. 1980) reported subyearling Chinook salmon smolt yields from multiple year data sets in large river systems in British Columbia and Idaho ranging between 2,250 to 12,600 smolts/km with a mean of 5,200 smolts/km. Besides stream space, the production of smolts may be proportional to water temperature, nutrient availability, the level of mineralization and the degree of habitat complexity. These factors introduce sources of variability and, hence, the range of reported smolt yield estimates in the regional literature is wide. Using the maximum reported smolt yield of 12,600 smolts/km, the annual number of smolts potentially produced in the Dungeness River would be on the order of 509,000 smolts. In Chapman's pristine production methodology (Chapman 1981) it was assumed a successful redd would yield approximately 200 subyearling smolts. Applied to the Dungeness River, the 509,000 smolts could be produced from 2,545 redds. At a site-specific factor of 2.5 fish per redd, the spawning escapement needed to produce an estimate of the maximum rearing habitat capacity would be approximately 6,400 fish (Table 4-23). This number compares favorably with other estimates of the range of Chinook escapement desired as recovery planning targets for the river (NOAA Fisheries 2002, S'Klallam Tribe 2003).

**Table 4- 23**
**Range of Dungeness River Chinook Run Size Estimates**

| Name | Low | Mean | High |
|---|---|---|---|
| Chinook Historical Run Size Estimates [1] | 13,000 | - | 26,000 |
| NOAA Fisheries; Planning Recovery Goals[2] | 4,700 | - | 8,100 |
| Tribal Targets after EDT Model [3] | 1,200 | - | 4,700 |
| Rearing habitat capacity estimate downstream of River Mile 17.9 [4] | 1,300 | 3,000 | 7,300 |
| Rearing habitat capacity estimate downstream of River Mile 10.0 [5] | 450 | 1,050 | 2,535 |
| Annual Escapement Goal [6] | - | 945 | - |
| Current Spawning Escapement Estimates [7] | 75 | 313 | 640 |
| Spawning Escapement Estimates during period of listing [8] | 50 | 104 | 183 |

(1) Chinook Historical Run Size Estimates (Lichatowich 2002; Jamestown S'Klallam Tribe 2003)
(2) NOAA Fisheries; Planning Recovery Goals (Ruckelshaus et al. 2002)
(3) Tribal Targets after EDT Model (Jamestown S'Klallam Tribe 2003); Restoration Strategy
(4) Rearing habitat capacity estimate downstream of EDT River Mile 17.9 including 11.0 RM of tributary habitat after Marshall et al. 1980 at 2,250 smolts/km minimum; 5,200 smolts/km mean; 12,600 smolts/km maximum and 200 smolts/redd, 2.5 fish/redd.
(5) Rearing habitat capacity estimate downstream of EDT River Mile 10.0 after Marshall et al. 1980 at 2,250 smolts/km minimum.; 5,200 smolts/km mean; 12,600 smolts/km maximum and 200 smolts/redd, 2.5 fish/redd
(6) WDFW and Western Washington Treaty Tribes (co-managers) annual escapement goal
(7) Current Spawning Escapement Estimates (1999 - 2003) mean = 5-yr geometric mean number of spawners
(8) Spawning Escapement Estimates during period of listing (1995 - 1999) mean = 5-yr geometric mean number of spawners

**Table 4-24**
**Mainstem Flows Providing Maximum Rearing Habitat during the August to October Low Flow Period**

| Rearing Species | Study | Mainstem Flow (cfs) | Comments |
|---|---|---|---|
| Chinook | IFIM<br>Side Channel | 50<br><50 | Max. WUA at upper IFIM study site<br>Based on cumulative length of side channels contributing suitable habitat |
| Coho | IFIM<br>Side Channel | 20<br><20 | Max. WUA at upper IFIM study site<br>Based on cumulative length of side channels contributing suitable habitat |
| Steelhead | IFIM<br>Side Channel | 120<br>50 | Max. WUA at upper IFIM study site<br>Based on cumulative length of side channels contributing suitable habitat |
| Native char | IFIM<br>Side Channel | 160<br>160 | Max. WUA at upper IFIM study site<br>Based on cumulative length of side channels contributing suitable habitat |

Data as per IFIM and Side channel studies (after Wampler and Hiss 1991; Dariao et al 2003).

***Rearing Habitat:*** Historically, rearing habitat in reaches subject to water withdrawals was reduced substantially compared to pre-withdrawal conditions. Streamflows remain a concern for adequate rearing habitat under the current flow agreement, especially during drought conditions.

Rearing juvenile salmonids have been observed trapped in pools or other low spots along the margin of the wetted channel during low flow conditions (Haring 1999). Fish mortality may become a concern as water levels decrease (Haring 1999). The most abundant species rearing in the mainstem Dungeness River during the low flow period of August through October include stream-type coho salmon, as well as steelhead and cutthroat trout. Although considered ocean-maturing fish, some Chinook salmon juveniles may not have completed their outmigration from freshwater and may also be present in the system.

The results of the instream flow study (Wampler and Hiss 1991) for rearing salmonid fishes indicates less water is needed to provide appropriate rearing habitat than spawning habitat conditions during the low flow period of the year (Table 4-24). Average low flow levels during 2-week intervals at the upper instream flow study site [RM 4.2] during the 1999 – 2002 baseline period provided between 75 and 303 percent of the rearing WUA at the recommended 180 cfs instream flow level (Hiss 1993) [See Section 4.1.1]. The lowest flow period of the year during baseline conditions occurred during the first 2 weeks of October. Salmonid fish rearing habitat during this time interval ranged from 96 to 134 percent of the WUA at the recommended instream flow level. On average, during the 10-week spawning period over the 4-year baseline period, the current instream flow regime is providing more habitat than the recommended WUA, whether or not irrigation diversions are considered (Table 4-23).

| Table 4-25 Dungeness River Reach Subdivision in Lower 10.5 Miles | | |
|---|---|---|
| **Reach** | **River Miles** | **Major Landmarks** |
| 1 | 0.0 to 2.6 | ACOE and Olympic Game Farm Levees, Schoolhouse Bridge |
| 2 | 2.6 to 4.6 | Burlingame and Woodcock Bridges |
| 3 | 4.6 to 7.0 | Highway 101 and Railroad Bridges |
| 4 | 7.0 to 9.0 | Dungeness Meadows Subdivision and Levee |
| 5 | 9.0 to 10.5 | Kinkade Island and Fish Hatchery |
| Upper | > 10.5 | Upstream of the Fish Hatchery |

However, during the 2001 drought, instream flow levels at RM 4.2 were estimated during the lowest 14-day period to range as low as 45 cfs [48 to 143 percent of the WUA at the recommended rearing flow depending upon the species considered] (MWG 2003). Without diversion, natural flow levels at RM 4.2 would have provided approximately 73 cfs [82 to 167 percent of the rearing habitat index] during this same period. This flow level corresponds to approximately 81 cfs at the USGS gage site; a flow that occurs naturally less than 1 percent of the time (England 1999).

Flows providing the maximum benefits to rearing salmonid fishes fall below the recommended flow level of 180 cfs for the August to October low flow period. As described above, and as illustrated in Table 4-24, the instream flow modeling effort suggests rearing habitat conditions likely limit Chinook salmon population numbers more than spawning habitat capacity.

### 4.3.2 Substrate Quantity and Quality

The USBR (Bountry et. al. 2002) collected sediment size data from 33 gravel bars along the lower Dungeness and Greywolf rivers to qualitatively evaluate the suitability of the river channel sediments as spawning habitat for anadromous fish species in the lower river. Approximately 28 of these sites fall within the Action Area, downstream of RM 10.9. They subdivided the lower river into five stream reaches based on differences in physical characteristics as shown below in Table 4-25.

Salmonid fishes typically spawn in gravels with sediment sizes ranging from 8 to 100 mm [0.3 to 4.0 inches], but the size depends on the species preference, the size of the fish and the velocity of the water over the redd site. Based on their size, the Chinook salmon select the most coarse-grained sediment for spawning and pink salmon use the finest sediment sizes compared to all of the other salmonid species.

The percent of the sampled gravel bars with sufficient gravel sizes for five anadromous salmonid fish species is shown in Table 4-26.

Two sample sites were too coarse grained to serve as spawning gravel for any of the five anadromous fish species present in the Dungeness River, one near the Dungeness River Meadows Levee in Reach 4 and one just downstream from the confluence with Canyon Creek at RM 10.5. In general, Reach 3 offered the least amount of salmonid fish habitat of any other reach in the lower river. Only 50 percent of the sampled sites were regarded as suitable, while the other half would not serve as viable spawning sites for adult salmonids. None of the sites in Reach 3 were considered to fall within optimum spawning substrate quality. Conversely, the best spawning gravels in terms of appropriate sizes were located near the mouth in Reach 1 [RM 0.0 to RM 2.6] and along Reach 5 [RM 9.0 to RM 10.5].

Table 4-26
Percentage of Sampled Gravel Bars with Suitable Gravel Size for Spawning

| Species | Optimum(1) | Suitable(2) | Unsuitable |
|---|---|---|---|
| Chinook | 50 | 93 | 7 |
| Coho | 25 | 50 | 50 |
| Chum – summer | 46 | 92 | 8 |
| Chum – fall | 46 | 93 | 7 |
| Steelhead | 39 | 61 | 39 |
| Pink – lower | 22 | 39 | 61 |
| Pink – upper | 0 | 0 | 100 |

Modified from Bountry et al. 2002.
(1) Sampled bed materials are less than the mean $D_{50}$ of reported spawning gravels in the region (Kondolf and Wolman (1993). These sites are probably best suited for spawning for each species.
(2) Sampled bed materials are less than the max. $D_{50}$ of reported spawning gravels in the region (Kondolf and Wolman (1993). These sites are suitable but perhaps less than optimum for spawning for each species.

### 4.3.3 Large Woody Debris

The US Bureau of Reclamation estimated relative woody debris levels in the Dungeness River from 2000 aerial photography (Bountry et al. 2002). They subdivided the lower river into five stream reaches based on differences in physical characteristics as shown in Table 4-25.

Of the five reaches surveyed in the lower river, Reach 3 appears to contain the largest amount of wood and Reach 1 the least. Woody debris is common in Reach 4 overall, but it is sparse in the section adjacent to the upstream end of the Dungeness Meadow levee. In most reaches, woody debris is concentrated in areas where there are multiple channels and the river is sinuous, rather than in areas where the channel is constricted and the river runs straight. More woody debris occurs in the channel today than during the mid-1960s (Bountry et al. 2002).

The comparison in wood volumes over the last 40 years may be influenced by prior mechanical clearing of wood from the channel. Large woody debris historically was removed from the Dungeness River for flood control and stable log jams are now very scarce in the lower 10.8 miles of the river (Orsborn and Ralph 1994). Removal of the wood also resulted in increased velocities, erosion, and channel instability, as well as a reduction in pool frequency, sediment storage capacity, and side channel habitat.

Counts of wood debris, loading rates or volumes are not quantified during the USBR study. However, wood abundance is estimated in relative terms. A comparison of the five reaches is provided below.

Large woody debris in Reach 5 is concentrated along the outside of meander bends and is nearly absent along the straight sections. Large log jams exist at the two upstream meander bends in the reach, at the head of Kinkade Creek, at the entrances to the numerous side channels on Kinkade Island, and at the southwest corner of Kinkade Island.

Woody debris is common in Reach 4, but is not as prevalent as it is in Reach 3. Woody debris is concentrated at the broad meanders upstream and downstream of the Dungeness Meadows Levee. Very few piles of large woody debris are preserved upstream of about RM 8 (upstream of the Dungeness Meadows Levee) than compared to the reach downstream of this point. The majority of woody debris preserved along the straight section adjacent to the levee is located on high, elevated bars that do not appear to be accessed by the river except during large floods.

Woody debris is abundant along Reach 3, especially along the insides of meander bends and at the entrances to side channels. Large piles of interconnected logs are common. These are preserved both in the center of the main channel, on gravel bars in the main channel, and along side and overflow channels. Woody debris has been anchored by the Jamestown S'Klallam Tribe along the east bank upstream of the Railroad Bridge to protect an interpretive center and amphitheater. Woody debris also has been placed along the west bank on the Severson's property downstream of Railroad Bridge to slow bank erosion. In addition, large jams were placed by the Tribe at the entrance to a side channel on the west side upstream of the bridge to prevent a potential channel change into the side channel.

Overall, woody debris does not seem to be as common in Reach 2 as it is in the upstream Reach 3. Woody debris is present, especially along the outside of meander bends upstream of Woodcock Bridge.

Natural woody debris in the channel is nearly absent from Reach 1 except at meander bends, along Dungeness Bay, and at the mouth of the river. While the riparian forest is nearly continuous throughout this reach, it is dominated primarily by young deciduous trees. Instream habitat complexity is minimal in some places because of the lack of woody debris accumulations. The area containing the most debris is the relatively tight meander along the remnant of a Pleistocene deposit. Along straight sections of the reach, small pieces of wood are stranded on elevated longitudinal bars. In recent years, several logs have been cabled to the west bank along the Olympic Game Farm Levee.

### 4.3.4 Pool Depths for Holding and Refuge

There is a general lack of good quality pools (numbers, size, and depth) in the lower Dungeness River for juvenile rearing, adult holding and stream energy dissipation A reduction in the historical availability of pools has been attributed to a depletion of stable log jams and concentration of flows by diking and man-made constrictions (Dungeness River Restoration Work Group, 1997).

Similarly, residual pool depths are generally shallow in the lower Dungeness River likely as a function of reduced large woody debris or other channel structure and an increase in bedload deposition from high sediment supplies in the upper watershed. A lack of residual pool depths greater than 1 meter (3.28 ft) in depth for adult holding, and juvenile summer and winter rearing have been noted as limiting factors for salmonid fish production in the mainstem river (Haring 1999).

## 4.4 Baseline Conditions for Upland Habitat

Upland habitat within the Covered Lands consists of all acreage across the Action Area at elevations exceeding riparian zones associated with stream corridors and wetlands discussed above. The entire network of DWUA ditches and conveyance structures and subsequent maintenance activities have the potential to influence upland habitat and their associated biological resources. Covered species of concern using upland habitats include the bald eagle (*Haliaeetus leococephalus*) and during certain life history stages, the western toad (*Bufo boreas*).

The upland areas in the Action Area have undergone considerable change since European settlement. A brief summary of historic changes and the current baseline conditions are discussed below.

"The Sequim-Dungeness area has gone from forest [and prairie] to farm to back yard in 150 years." (Eckert 1998). After Euro-American settlement in the mid-1800s, agricultural settlements flourished in the Sequim-Dungeness area for over a century. The population growth, common to much of western Washington during the 1960s and 1970s, dramatically changed the demographics and accordingly, the land use of the project area. Agricultural land use has decreased significantly through conversion to rural residential communities. "During the past 20 years, the unincorporated area of the Sequim-Dungeness region has grown almost five times more in population than the City of Sequim, the area's only incorporated city. More than 9,300 people moved into areas outside of the City, while only 2,000 moved into the City of Sequim. Nearly 70 percent of the regional planning area population lives in a rural area" (Clallam County 1995).

The highest residential density is within the City of Sequim, followed by the communities of Dungeness, Carlsborg, and smaller concentrations of development (Sunland, Bell Hill, etc.). Commercial and light industrial development generally follows the U.S. Highway 101 corridor, although Carlsborg, now an urban growth area, off Highway 101, is the site of the only industrial park in the area. The Sequim-Dungeness Regional Plan directs growth by means of a designated "urban growth area," limiting the availability of public services. Land use development is also directed by the Clallam County zoning codes, the County-Wide Comprehensive Plan (Clallam County 1995), and the Critical Areas Ordinance. Of the 13,158 acres of agricultural land in the study area, 5,400 are currently irrigated (Ecology 1999). Common types of crops include hay, grain, berries, orchard fruits, and turf (CCDCP 2002). Lavender has increased in importance as well (Sequim Chamber of Commerce 2000). Land use changes in the last 30 years have resulted in a significant decrease of farming and of related irrigation. Agriculture has been replaced with rural residential development to a large extent (Eckert 1998), and where agriculture persists, flood irrigation is not used (DWUA 2001).

The Covered Lands encompass a variety of upland habitat types from coniferous forests to marine shoreline. More than 304 species of terrestrial wildlife (250 birds, 41 mammals, 8 amphibians, and 5 reptiles) have been documented at Dungeness National Wildlife Refuge located immediately north of the Action Area (USFWS 1984). Many of the species observed in the area are associated with marine/intertidal habitats, but the Covered Activities will have only an indirect influence on these habitats.

Upland forested habitats in the Covered Lands offer potential core terrestrial and forage habitat for juvenile and adult western toads (O'Connell et al. 1993). The primary upland habitat for the toads is low density hardwood and conifer forest stands where they favor open canopy (Brown 1985, Hagar et al. 1995). Associated foraging habitat includes down logs and woody debris.

## 4.5 Baseline Conditions for Water Quality

### 4.5.1 Water Quality Regulatory Framework

Surface water quality is regulated under the federal Clean Water Act 33 U.S.C. 1251 (CWA). The purpose is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The CWA is administered by the U.S. Environmental Protection Agency (EPA), although the EPA has authority to delegate its responsibility to individual states. In Washington State, EPA has delegated its CWA authority to the State Department of Ecology (Ecology). Ecology regulates water quality under Chapter 90.48 RCW, the Water Pollution Control Act and Chapter 173-201A WAC, the Water Quality Standards for Surface Waters of the State of Washington.

The process to achieve water quality is to set water quality standards, to monitor for compliance for those standards, and to develop compliance strategies if the standards are not met. Ecology has set standards for eight indicators: Bacteria; dissolved oxygen; total dissolved gas; temperature; pH; turbidity; toxic, radioactive, and deleterious materials; and aesthetic values. The standards are both numeric and narrative and are determined by the water body's designated use for aquatic life and recreation. For freshwater, there are six levels of aquatic life use (char, core salmon/trout, non-core salmon/trout, salmon/trout rearing, redband trout, and warm water species) and three levels of recreational use (extraordinary primary, primary, and secondary). For marine water, there are four levels of aquatic life use (extraordinary, excellent, good, and fair) and two levels of recreational use (primary and secondary). The water quality standards for the Action Area are shown in Table 4-27.

It should be noted the water quality standards have recently changed. Ecology adopted revised water quality standards on June 25, 2003 and sent the revised standards to EPA for approval. While EPA has not yet granted full approval, Ecology considers the revised standards to be the current standards. The standards in Table 4-27 are these revised standards. There are only two differences between the previous and the revised standards for the Action Area. The first difference is that for freshwater temperature for "non-core salmon/trout aquatic and primary recreation uses", the threshold is now 17.5 degrees Celsius rather than 18.0. The second difference is that for marine fecal coliform for "extraordinary aquatic and primary recreation uses", the threshold is now 41 colonies, rather than 43, per 100 mL for which no more than 10% of the samples can exceed.

**Table 4-27**
**Washington State Water Quality Standards for the Action Area**

| Indicator | | Freshwater: Core Salmon/Trout Aquatic and Extraordinary Recreation Use[1] | Freshwater: Non-Core Salmon/Trout Aquatic and Primary Recreation Use[2] | Marine: Extraordinary Aquatic and Primary Recreation Use[3] |
|---|---|---|---|---|
| Bacteria (Fecal Coliform) | Shall not exceed a geometric mean value of (number of colonies/100 mL): | 50 | 100 | 14 |
| | With not more than 10% of samples exceeding (number of colonies/100 mL): | 100 | 200 | 41 |
| Dissolved Oxygen | Shall exceed (mg/L): | 9.5 | 8.0 | 7.0 |
| Temperature | Shall not exceed, due to human activities (degrees Celsius): When natural conditions exceed this value, no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3 degrees Celsius. | 16.0 | 17.5 | 13.0 |
| pH | Shall be within the range of (pH units): | 6.5-8.5 | 6.5-8.5 | 7.0-8.5 |
| | Human-caused variation shall be within the range of less than (pH units): | 0.2 | 0.5 | 0.2 |
| Turbidity | When background turbidity is 50 NTU or less, shall not exceed background turbidity by (NTU): | 5 | 5 | 5 |
| | When background turbidity is more than 50 NTU, shall not have more than an increase of: | 10% | 10% | 10% |
| Total Dissolved Gas | Shall not exceed 110 percent of saturation at any point of sample collection. | | | |
| Toxic, Radioactive, or Deleterious Material | Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health. See WAC for numeric criteria for 28 toxic substances. | | | |
| Aesthetics | Aesthetic values shall not be impaired by the presence of materials of their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste. | | | |

(1) Roughly analogous to Class AA freshwater under the previous water quality standards.
(2) Roughly analogous to Class A freshwater under the previous water quality standards.
(3) Roughly analogous to Class AA marine under the previous water quality standards.

Every two years Ecology assesses State water bodies to determine if water quality standards are being met. Under a recently adopted protocol, Ecology categorizes each water body within five categories and publishes the results in a report called the Water Quality Assessment, a portion of which was previously called the 1998 303(d) list. The five water quality categories are:

- **Category 5 -** Polluted waters that require a TMDL, which sets the maximum level of pollutant loading at which the water body will meet standards. This category is what the 1998 303(d) list represented under the previous protocol for assessing if water bodies meet water quality standards.
- **Category 4 -** Polluted waters that do not require a TMDL:
  - Category 4a - Has a TMDL
  - Category 4b - Has a pollution control plan
  - Category 4c - Impaired by a non-pollutant (i.e. fish passage, instream flow, etc.)

- **Category 3 –** No data submitted
- **Category 2** - Waters of concern
- **Category 1** - Meets tested standards for clean waters

Ecology released preliminary results for the 2002/2004 Water Quality Assessment in February of 2004. At the time water quality data for this CIDMP was assembled, the assessment being updated based on comments received from a second round of public review. The Candidate Water Quality Assessment was to be sent to EPA for approval, which was anticipated to be complete in 2005. The 2002/2004 assessment was based on the previous water quality standards; future assessments will then be based on the revised standards.

The compliance strategy for point source pollution (contaminants entering a water body from discrete sources) is accomplished by requiring discharge permits limiting pollutant loading under the National Pollutant Discharge Elimination System (NPDES) program. The compliance strategy for non-point source pollution (contaminants entering from non-discrete sources) is largely accomplished by voluntary Best Management Practices (BMPs), although mandatory enforcement is possible in some cases.

Non-point source pollution is the main category of pollutant loading in the CIDMP Action Area. Ecology divides non-point pollution into six categories: agriculture, urban pollution, forestry, recreation, hydromodification, and loss of aquatic ecosystems. Agriculture and urban pollution are the two categories affecting the CIDMP Action Area the most.

Agricultural non-point pollution is addressed primarily by BMPs, although state laws exist for dairy farms and pesticide use. Dairy farms are required to create waste management plans with technical assistance provided by conservation districts. Pesticide use is regulated by the Washington State Department of Agriculture.

Urban non-point pollution includes stormwater, septic systems, pet waste, roads, development, construction, household pesticides, and lawn and garden fertilizers. The primary urban pollution types affecting the CIDMP Action Area are stormwater and septic systems. Stormwater is regulated by counties and cities with stormwater manuals and ordinances, and usually incorporates pollutant loading potential from roads, development and construction. Local health districts regulate septic systems by issuing installation permits and inspecting suspected failing systems although this program is not currently well funded. Household pesticides are unregulated in use; however, the U.S. EPA approves pesticide active ingredients. Pet waste is largely unregulated, unless local jurisdictions enact mandatory scoop laws.

### 4.5.2 Water Quality Monitoring

This section documents current water quality monitoring activities within the Action Area. Some historical monitoring is also included. An overview of monitoring activities is presented in Table 4-28. The water bodies are grouped into five categories: Dungeness River mainstem, Dungeness River tributaries, independent creeks, DWUA irrigation system, and bays.

The Dungeness River has three direct tributaries within the CIDMP Action Area, all of which are designated as non-core salmon/trout aquatic use and primary recreation use.

**Table 4-28**
**Water Quality Monitoring Activities by Organization**

| Waterbody | WQ Indicator | WA Dept of Health | WA Dept of Ecology | Jamestown S'Klallam Tribe | Clallam County Stream-keepers | Clallam Cons. District |
|---|---|---|---|---|---|---|
| **Dungeness River Mainstem** | | | | | | |
| Dungeness River | Fecal Coliform | | X | X | | |
| | Streamflow | | X | X | | |
| | Temperature | | X | X | | |
| | 10 indicators(1) | | X | | | |
| **Dungeness River Tributaries** | | | | | | |
| Lotzgesell Creek | Fecal coliform | | | X | | |
| | Temperature | | | X | | |
| | Streamflow | | | X | | |
| Matriotti Creek | Fecal coliform | | | X | | |
| | Temperature | | | X | | |
| | Streamflow | | X(3) | X | | |
| Mudd Creek | Fecal coliform | | | X | | |
| | Temperature | | | X | | |
| | Streamflow | | | X | | |
| **Independent Creeks** | | | | | | |
| Bell Creek | Fecal coliform | | | X | X | |
| | Temperature | | | X | X | |
| | Streamflow | | | X | | |
| | 6 indicators2 | | | | X | |
| Cassalery Creek | Fecal coliform | | | | X | |
| | Temperature | | | | X | |
| | 6 indicators2 | | | | X | |
| Johnson Creek | Fecal Coliform | | | X | | |
| | Streamflow | | | X | | |
| | Temperature | | | X | | |
| McDonnell Creek | Temperature | | X | | | |
| | Streamflow | | X | | | |
| Meadowbrook Creek & Slough | Fecal Coliform | | | X | | |
| | Temperature | | | X | | |
| | Streamflow | | | X | | |
| Siebert Creek | Streamflow | | X | | | |
| | Fecal Coliform | | | | X | |
| | Temperature | | | | X | |
| | 6 indicators(2) | | | | X | |
| **DWUA Irrigation System** | | | | | | |
| 30 irrigation ditch/tailwater sites | Fecal coliform | | X(3) | | X(3) (on behalf of Clallam Conservation District) | X(3) (Stream-keepers) |
| | Streamflow | | X(3) | | X(3) (on behalf of Clallam Conservation District) | X(3) (Stream-keepers) |
| Clallam-Cline-Dungeness Diversion | Temperature | | X | | | |
| | Streamflow | | X | | | |
| Sequim-Prairie Tri-Irrigation Company's Independent Canal Diversion | Temperature | | X | | | |
| | Streamflow | | X | | | |
| Agnew Diversion | Temperature | | X | | | |
| | Streamflow | | X | | | |
| Sequim-Prairie Tri-Irrigation Company's Sequim-Prairie Canal Diversion | Temperature | | X | | | |
| | Streamflow | | X | | | |
| Highland Diversion | Temperature | | X | | | |
| | Streamflow | | X | | | |
| 7 Cline Irrigation District ditches | Fecal coliform | | X | | | |
| | Streamflow | | X | | | |
| **Bays** | | | | | | |
| Dungeness Bay | Fecal Coliform (also temp & salinity) | X | X | | | |
| Sequim Bay | Fecal Coliform (also temp & salinity) | X | | | | |

(1) pH, conductivity, DO, turbidity, TSS, ammonia, nitrate plus nitrite, total nitrogen, total phosphorus, soluble reactive phosphorus
(2) pH, conductivity, DO concentration, DO % saturation, turbidity, nitrate
(3) Monitoring is not currently conducted

### *Dungeness River Mainstem*

The Dungeness River mainstem is designated as non-core salmon/trout aquatic use and primary recreation use throughout most of the Action Area (from River Mile 0.0 to River Mile 10.8). A small portion of the river within the Action Area (from River Mile 10.8 to River Mile 11.2) is designated as core salmon/trout aquatic use and extraordinary recreational use. The Dungeness mainstem is monitored by Ecology and the Jamestown S'Klallam Tribe (Tribe). Ecology has reviewed this monitoring data for the 2002/2004 Integrated Water Quality Assessment Report.

Ecology monitors the Dungeness mainstem via "basin" monitoring stations at two locations: one at RM 1.0 (#18A050) and another at RM 6.9 (#18A070). Water quality indicators monitored monthly at both locations include fecal coliform, temperature, pH, conductivity, dissolved oxygen, turbidity, total suspended solids, ammonia, nitrate plus nitrite, total nitrogen, total phosphorus, and soluble reactive phosphorus. Additionally, continuous streamflow has been measured at the RM 1.0 location since November of 1999. Ecology also monitored the lower portion of the mainstem, as part of the 2004 Dungeness Bay TMDL for fecal coliform and stream flow.

The Jamestown S'Klallam Tribe monitors the Dungeness mainstem at three locations (RM 0.3, 0.8 and 3.2) for its current monitoring program. Water quality indicators monitored monthly include fecal coliform, streamflow, and temperature. This monitoring program is scheduled for October 2002 to October 2007 and is designed to characterize fecal coliform bacteria concentrations, identify major bacterial loading sources, and track improvements or changes in water quality. The Tribe also conducted water quality monitoring from 1999 to 2000 as part of the Dungeness River/Matriotti Creek TMDL.

### *Dungeness River Tributaries*

These direct tributaries are Bear (not to be confused with the Bear Creek which is an *indirect* tributary via Matriotti Creek), Hurd and Matriotti, creeks. Of these direct tributaries, only Matriotti Creek is monitored. Monitoring is being conducted on two indirect tributaries to the Dungeness River via Matriotti Creek. These indirect tributaries are Lotzgesell and Mudd Creeks.

The Jamestown S'Klallam Tribe conducts all this monitoring. Water quality indicators monitored monthly include fecal coliform, streamflow, and temperature. This monitoring is scheduled for October 2002 to October 2007 and is designed to characterize fecal coliform bacteria concentrations, identify major bacterial loading sources, and track impairments or changes in water quality. Ecology has reviewed these monitoring data for the 2002/2004 Integrated Water Quality Assessment Report.

Matriotti Creek is currently monitored by the Tribe and was until recently also monitored by Ecology. The Tribe monitors the creek at ten locations (RM 0.1, 0.3, 0.7, 1.45, 1.9, 1.95, 3.2, 3.8, 4.8, and 6.9) for its current monitoring program. Water quality indicators monitored monthly include fecal coliform, streamflow, and temperature. This monitoring program is scheduled for October 2002 to October 2007 and is designed to characterize fecal coliform bacteria concentrations, identify major bacterial loading sources, and track improvements or changes in water quality. The Tribe also conducted water quality monitoring from 1999 to 2000 as part of the Dungeness River/Matriotti Creek TMDL.

Matriotti Creek was monitored for continuous streamflow near the Olympic Game Farm (site #18D060) by Ecology from November 1999 to November 2000.

### *Independent Creeks*

There are nine independent creeks within the CIDMP Action Area. The nine creeks are Bell, Cassalery, Cooper, Gierin, Golden Sands Slough, Johnson, McDonnell, Meadowbrook, and Siebert creeks. Water quality monitoring is performed on six of these creeks. Ecology has reviewed this monitoring data for the 2002/2004 Integrated Water Quality Assessment Report.

The creeks are designated as non-core salmon/trout aquatic use and primary recreation use.

Bell Creek is monitored by the Tribe and the Clallam County Streamkeepers (Streamkeepers). The Tribe monitors the creek at eight locations for its current monitoring program (although streamflow is only monitored at one of these locations). Water quality indicators monitored monthly include fecal coliform, streamflow, and temperature. One site (the “DOT mitigation site”) has a continuous temperature gage. This monitoring program is scheduled for January 2003 to January 2007 and is designed to identify major bacterial loading sources and establish a water quality baseline. The Streamkeepers monitor the creek at several locations as part of its basic monitoring program that began in 1996. Water quality parameters monitored approximately quarterly include fecal coliform, temperature, pH, conductivity, dissolved oxygen concentration, dissolved oxygen percent saturation, turbidity, and nitrate. Some sites have been monitored since before 1996.

Cassalery Creek is monitored by the Streamkeepers at several locations as part of its basic monitoring program that began in 1996. Water quality indicators monitored approximately quarterly include fecal coliform, temperature, pH, conductivity, dissolved oxygen concentration, dissolved oxygen percent saturation, turbidity, and nitrate. Some sites have been monitored since before 1996.

Johnson Creek is monitored by the Tribe at one location (50 feet upstream of the mouth) for its current monitoring program. Water quality indicators monitored monthly include fecal coliform, streamflow, and temperature. This monitoring program is scheduled for January 2003 to January 2007 and is designed to identify major bacterial loading sources and establish a water quality baseline.

Meadowbrook Creek and Slough are monitored by the Tribe at eight locations for its current monitoring program. Five locations are on the creek (RM 0.2, 0.3, 0.8, 1.75, and 1.95) and three locations are on the slough (RM 0.05, 0.2, and 0.45). Water quality indicators monitored monthly include fecal coliform, streamflow, and temperature. This monitoring program is scheduled for October 2002 to October 2007 and is designed to characterize fecal coliform bacteria concentrations, identify major bacterial loading sources, and track improvements or changes in water quality. The Tribe also conducted water quality monitoring from 1999 to 2000 as part of the Dungeness River/Matriotti Creek TMDL.

McDonnell Creek is monitored by Ecology, which installed a streamflow gage in 2003. This gage also measures continuous temperature.

Siebert Creek is monitored by Ecology and the Streamkeepers. Ecology has one station (#18L060 – near the Old Olympic Highway) where continuous streamflow has been measured since September 2002. The Streamkeepers monitor the creek at several locations as part of its basic monitoring program that began in 1996. Water quality indicators monitored approximately quarterly include fecal coliform, temperature, pH, conductivity, dissolved oxygen concentration, dissolved oxygen percent saturation, turbidity, and nitrate. Some sites have been monitored since before 1996.

#### *DWUA Irrigation System*

The DWUA irrigation system consists of 173 miles of ditches. These irrigation ditches are designated as non-core salmon/trout aquatic use and primary recreation use. The irrigation system has recently been monitored by Ecology and by the Streamkeepers on behalf of the Clallam Conservation District. Ecology has reviewed this monitoring data for the 2002/2004 Integrated Water Quality Assessment Report.

Ecology monitored the irrigation system as part of the 2002 Lower Dungeness Watershed TMDL study. Indicators monitored included fecal coliform and streamflow. Ecology also monitored seven irrigation ditches in the Cline Irrigation District for fecal coliform and streamflow as part of the 2004 Dungeness Bay TMDL.

Clallam County Streamkeepers monitored the irrigation system on behalf of the Clallam Conservation District for a project to identify ditch segments to convert to pipe and tailwater locations to treat via wetlands to improve water quality related to fecal coliform. From 2000 to 2002, approximately 30 ditch locations throughout the Action Area were monitored monthly for fecal coliform and streamflow during the irrigation season. The ditch locations included both tailwater sites and ditch segments.

#### *Bays*

There are two bays in the Action Area: Dungeness Bay and Sequim Bay. Both are designated as extraordinary aquatic use and primary recreation use, which requires the highest water quality standards. Water quality monitoring is performed by the Washington State Department of Health (DOH) and Ecology. Ecology has reviewed this monitoring data for the 2002/2004 Integrated Water Quality Assessment Report.

Dungeness Bay has been monitored by (DOH) since 1989 as part of its commercial shellfish harvest safety program. DOH monitors for fecal coliform, temperature, and salinity at 13 stations in the inner and outer bay. Sampling is done six times a year, approximately every other month. The Bay was also monitored by Ecology for fecal coliform as part of the 2004 Dungeness Bay TMDL.

Sequim Bay has been monitored by (DOH) since 1989 as part of its commercial shellfish harvest safety program. DOH monitors for fecal coliform, temperature, and salinity at 26 stations in the bay. Sampling is done six times a year, approximately every other month.

### 4.5.3 Identified Water Quality Concerns

This section documents identified water quality concerns within the Action Area. An overview of this material is presented in Table 4-29. The water bodies are grouped into five categories: Dungeness River mainstem, Dungeness River tributaries, independent creeks, DWUA irrigation system, and bays.

The identified concerns discussed in this section are based on the 1998 303(d) list and the two TMDLs in effect in the Action Area. The identified concerns are not based on the 2002/2004 Water Quality Assessment since the assessment was still preliminary at the time this information was compiled. At that time, the preliminary 2002/2004 Water Quality Assessment showed new concerns for the Dungeness River (Category 4c for bioassessment); Bell Creek (Category 5 for dissolved oxygen, Category 4c for bioassessment); Casselary Creek (Category 5 for dissolved oxygen, Category 4c for bioassessment); Siebert Creek (Category 5 for dissolved oxygen, Category 4c for bioassessment); and Dungeness Bay (Category 4c for fish habitat). One apparent improvement is for Sequim Bay which no longer shows a concern for pH.

**The lack of an identified water quality concern does not necessarily mean the water body meets water quality standards. Rather, it could mean the water body is not monitored or that monitoring data was not submitted to Ecology.** The primary water quality concern identified for the action area relates to fecal coliform. In 1997, the Washington State Department of Health (DOH) detected increasing levels of fecal coliforms in Dungeness Bay as part of its monitoring activities related to commercial shellfish beds. In May of 2000, the DOH closed 300 acres of the bay to commercial harvest. An additional 100 acres were closed in 2001. A Response Team, led by the county, was formed. The Response Team conducted monitoring and found fecal coliform exceedances in most tributaries to the bay. In June of 2001, a Clean Water District was formed by ordinance (Clallam County Ordinance 27.16) to address the fecal coliform problem and any other water quality concerns. Under the ordinance, the Response Team was re-named the Clean Water Workgroup and a Clean Water Strategy was created addressing the fecal coliform problem in the Dungeness watershed and bay. The Clean Water Strategy outlines specific mitigation activities and their funding sources.

In June 2002, Ecology released a TMDL (watershed TMDL) for fecal coliform in the Lower Dungeness Watershed (which begins at River Mile 3.2). This TMDL was originally undertaken for Matriotti Creek, however during its development exceedances were discovered in other water bodies not on the 1998 303(d) list. These additional water bodies were then incorporated into the TMDL. The TMDL sets fecal coliform concentration reduction goals for various waterbody segments and identifies the Clean Water Strategy as the primary means of achieving water quality standards over time. The TMDL states it anticipates water quality standards will be met by 2007 (TMDL pg 22).

A separate TMDL for fecal coliform for Dungeness Bay (Bay TMDL) was released by Ecology in March of 2004. As part of this TMDL, monitoring was performed in the bay itself, lower portions of the Dungeness River mainstem, and seven Cline Irrigation District irrigation ditches with outfalls to the inner bay. (As noted elsewhere, not all these outfalls are considered tailwater returns since several of the ditches only discharge stormwater to the bay and not tailwater, which is defined as residual irrigation water.) The Bay TMDL sets fecal coliform concentration goals for the bay, the river, and the ditches. The clean up plan for the Bay TMDL identifies several focuses including source tracking, agricultural BMPs, irrigation ditch pipelining, tailwater/stormwater treatment, enforcement, and actions to reduce loading from septic systems and pet waste. The clean up plan also states that the Clean Water Strategy will be updated to reflect these focuses and to serve as a detailed implementation plan for both the bay and watershed TMDLs.

Water quality concerns identified for the Dungeness River mainstem relate to streamflow and fecal coliform. The Dungeness River mainstem is on the 1998 303(d) list for streamflow. While not technically on the 1998 303(d) list for fecal coliform, the mainstem has exceeded fecal coliform water quality standards and a fecal coliform TMDL was released by Ecology in June 2002. The Watershed TMDL set fecal coliform loading reduction targets for four points in the mainstem. The loading reductions are 9% at River Mile 0.1, 29% at River Mile 0.3, 47% at River Mile 0.8, and 29% at River Mile 1.0.

Table 4-29
Identified Water Quality Concerns

| Water Body | Identified Concerns |
|---|---|
| **Dungeness River Mainstem** | |
| Dungeness River | Fecal coliform exceedances, although not on 1998 303(d) list for fecal coliform. TMDL requires 9-47% fecal coliform loading reduction in various segments. 1998 303(d) list for instream flow. |
| **Dungeness River Tributaries** | |
| Bear Creek | None identified. |
| Hurd Creek | None identified. |
| Lotzgesell Creek | Fecal coliform exceedances, although not on 1998 303(d) list. |
| Matriotti Creek | 1998 303(d) list for fecal coliform. TMDL requires 78% fecal coliform loading reduction. |
| Mudd Creek | Fecal coliform exceedances, although not on 1998 303(d) list. |
| **Independent Creeks** | |
| Bell Creek | 1998 303(d) list for fecal coliform. TMDL likely by 2010. |
| Cassalery Creek | 1998 303(d) list for fecal coliform. TMDL likely by 2010. |
| Cooper Creek | Fecal coliform exceedances, although not on 1998 303(d) list. TMDL requires 28% fecal coliform loading reduction. |
| Gierin Creek | None identified. |
| Golden Sands Slough | Fecal coliform exceedances, although not on 1998 303(d) list. TMDL requires 82% fecal coliform loading reduction. |
| Johnson Creek | 1998 303(d) list for fecal coliform. TMDL likely by 2010. |
| McDonnell Creek | None identified. |
| Meadowbrook Creek & Slough | Fecal coliform exceedances, although not on 1998 303(d) list. TMDL requires 59% fecal coliform loading reduction. |
| Siebert Creek | None identified. |
| **DWUA Irrigation System** | |
| Irrigation Ditch #1 (495 Marine Drive Road) | Fecal coliform exceedances, although not on 1998 303(d) list. TMDL requires 33% fecal coliform loading reduction. |
| Irrigation Ditch #2 (182 Marine Drive Road) | Fecal coliform exceedances, although not on 1998 303(d) list. TMDL requires 84% fecal coliform loading reduction. |
| **Bays** | |
| Dungeness Bay | Fecal coliform exceedances. TMDL requires 24 – 28% fecal coliform loading reduction (for the annual time period) in various zones. |
| Sequim Bay | 1998 303(d) list for dissolved oxygen and pH. TMDL likely by 2010. |

Water quality concerns identified for Dungeness River Tributaries relate to fecal coliform. Lotzgesell Creek has been identified with fecal coliform concerns, although it is not technically on the 1998 303(d) list. The Watershed TMDL did not recommend a particular fecal coliform reduction, but instead recommends continued monitoring to evaluate BMP improvements. Matriotti Creek has been identified with significant fecal coliform concerns. The creek is on the 1998 303(d) list and has been identified as the primary contributor of fecal coliform to the Dungeness River. The Watershed TMDL has set loading reduction targets to reduce the fecal coliform loading by 78%. Mudd Creek has been identified with fecal coliform concerns, although it is not technically on the 1998 303(d) list. The Watershed TMDL did not recommend a particular fecal coliform reduction, but recommends investigating potential sources, especially septic systems.

Water quality concerns identified for independent creeks relate to fecal coliform. Bell Creek is on the 1998 303(d) list for fecal coliform and a TMDL is needed to establish target loading allocations. Its TMDL is not currently scheduled, but is expected by approximately 2010. Similarly, Cassalery Creek is on the 1998 303(d) list for fecal coliform and will have a TMDL prepared by approximately 2010. Cooper Creek has fecal coliform concerns, although it is not technically on the 1998 303(d) list. The Watershed TMDL set loading reduction targets of 28% Golden Sands Slough has fecal coliform concerns, although it is not on the 1998 303(d) list. Its target loading reduction from the Watershed TMDL is 82%. Johnson Creek is on the 1998 303(d) list for fecal coliform and its TMDL is expected by 2010. Meadowbrook Creek and Slough have fecal coliform concerns, although they are not on the 1998 303(d). The Watershed TMDL set loading reduction targets of 59%.

Water quality concerns identified for the irrigation system relate to fecal coliform. The Watershed TMDL identifies two ditches with high levels of fecal coliform bacteria. The ditches are labeled as Ditch #1 and Ditch #2 in the Watershed TMDL and are west of Cline Spit. Ditch #1 is located at 495 Marine Drive Road on the south side of the road. Ditch #2 is located on the beach close to 182 Marine Drive Road. Both ditches are tailwater returns for the Cline Irrigation District. These ditches are not on the 1998 303(d) list, although the Watershed TMDL set loading reduction targets of 33% and 84% respectively. The Bay TMDL identified six ditches in the Cline Irrigation District as exceeding fecal coliform standards. The Bay TMDL set fecal coliform loading reduction targets for these ditches ranging from 33% to 97%. Two of these six ditches in the Bay TMDL are the two ditches from the Watershed TMDL.

Water quality concerns identified for Dungeness Bay are fecal coliform exceedances. The Bay TMDL sets concentration reduction goals for three sub-area zones in the bay. The reduction goals are presented for four time periods: annual, November-February, March-July, and August-October. For the River Mouth Closure zone, the reduction goal is 28% for the annual time period and 60% for the most stringent reductions which are in March-July. For the Convergence zone, the reduction goal is 24% for the annual time period and 65% for the most stringent reductions which is November-February. For the West Inner Bay zone, there is only a reduction goal for the November-February time period; that reduction goal is 41%.

Water quality concerns identified for Sequim Bay relate to dissolved oxygen and pH. The bay is on the 1998 303(d) list for both of these indicators and a TMDL is expected by 2010.

# Section 5
# Assessment of Existing Effects On Water Quality and Aquatic Resources

In this chapter, effects of the DWUA facilities, water withdrawals and routine operations [Covered Activities] on the Covered Species and their habitats are evaluated in comparison to baseline conditions. The assessment of future effects is organized according to the influence of the major irrigation activities on seven distinct habitat types as discussed in the baseline conditions in Chapter 4. The direct and indirect effects of DWUA related to water diversion and use on specific habitat types are evaluated in Section 5.1. The physical interaction of facilities (intakes, screens, and structures) with the river, as well as operation and maintenance are addressed in Section 5.2. Operation and maintenance of the network of canals, laterals and ditches is assessed in Section 5.3. Tailwater and the influence on water quality is evaluated in Section 5.4. The effects on water quality are discussed in Section 5.5.

To guide the effects assessment, the matrix of possible effects of the DWUA's activities on salmonid habitat pathways and indicators [Table 4 of the CIDMP guidance manual] was prepared for each of the facilities withdrawing water from the Dungeness River (Appendix E). The irrigation districts' activities including diversion facilities, delivery systems, as well as routine operation and maintenance activities were reviewed with the TAT in relation to the potential to influence water quality, habitat access, habitat elements, channel dynamics, changes in base streamflows, watershed conditions and subpopulation characteristics of the Covered Species. The matrix was completed with relative ratings of high, medium or low potential to influence each of the pathways and indicators as shown in Appendix E. This matrix was used as a scoping phase. A list of specific issues was developed for each of the irrigation districts or companies based on the outcome of the Table 4 Matrix and from discussions with the TAT, and these issues formed the basis for analysis in this CIDMP.

## 5.1 Water Diversion and Use

### 5.1.1 Dungeness River Mainstem Habitat

The lower Dungeness River mainstem habitat downstream of RM 11.0 is low gradient, large channel habitat extensively used for freshwater spawning and rearing life-history phases by Covered Species in the salmonid fish guild (SFG) including Chinook, coho, chum and pink salmon, steelhead trout and Pacific and river lamprey. It is also used as a migration corridor for covered species in the native char (NCG) and coastal cutthroat trout (CCG) guilds. Bald eagles also use the mainstem river corridor for foraging on salmon carcasses. The key issue to address in the mainstem habitat includes the influence of water withdrawals on instream flow as it affects migration, spawning, and rearing habitat and water quality.

In lieu of the CIDMP, the DWUA would operate the water withdrawals according to the existing Trust Water Agreement in a manner consistent with the way they have operated during the baseline period since 1999. Water is currently withdrawn from 5 diversion points on the mainstem river between RM 11.0 to RM 6.9. As described in Chapter 4, the current withdrawal rates are substantially reduced compared to diversions of water as recently as the 1980s and mid 1990s. The baseline situation indicates withdrawals during the annual low flow season of August through October are providing a good level of spring chinook spawning habitat measured as an index of weighted usable area (WUA) at the upper IFIM site (RM 4.2) compared to natural flows without diversions under normal conditions. Exceptions may occur during extreme low flow periods and during drought conditions when ongoing withdrawals can decrease available spawning and rearing habitat for covered fish species. Some potential exists when flows fall below 180 cfs as measured at the upper IFIM site at RM 4.2 that irrigation withdrawals could result in negative effects on aquatic habitat. However, these effects are likely to be more pronounced when natural streamflow levels decrease below approximately 100 cfs at the upper IFIM study site (Figure 4-1). The lowermost portion of the WUA versus flow curve below 100 cfs offers the greatest incremental change in habitat with respect to changes in streamflow. This flow level is anticipated to occur on the order of 10 percent of the time at the IFIM site during the August to October time period (extrapolated from England 1999).

Effects of ongoing water withdrawals on pathways and indices of Dungeness River mainstem habitat are described below:

### *Water Quality*

The influence of water withdrawals on mainstem river water quality is primarily related to reduced water volumes during the low flow season available for aeration, dilution of contaminants and moderation of water temperature. It is possible reduced streamflows could increase surface water temperatures slightly due to the reduced nature of channel cross sections and delayed travel time to the estuary.

However, beneficial conditions exist that help moderate the potential for temperature increases, include riparian zone conditions, groundwater exchange and a short distance to the estuary. While riparian conditions are less than ideal, the existing riparian stand structure offers a degree of shading and blocking of incoming and outgoing radiation along the corridor. Groundwater exchange in the lower river also keeps surface water temperatures relatively cool.

River particle travel time to the estuary during low flows in the lower 11 miles is generally very quick (< ½ day) and delays in travel time with flow reductions are assumed to be negligible in relation to the potential to warm water temperatures. The worst case flow reductions estimated at RM 4.2 during the 14-day low flow period of the 2001 drought with ongoing diversions were approximately 38 percent lower than flows might have been without diversions. Given the channel cross-sections in the lower river, the travel time to the estuary would have remained less than ¾ day during these conditions.

Water quality records at RM 1.0 and RM 6.9 during the drought conditions of 2001 do not indicate a concern for water quality compliance with state temperature standards. The Water Quality Index (WQI) for stream temperature at both stations during low flow periods under baseline conditions are very good, with ratings between 97 and 100 (Ecology 2003). The instantaneous peak maximum stream temperature during continuous summer monitoring in 2002 was 17.8$^{o}$C. A typical daily variation of stream temperatures fell between 3$^{o}$C and 5$^{o}$C during the drought.

### *Habitat Access*

Adult spring/summer Chinook salmon migrate into the river between May and September and hold in pools until they are ready to spawn as early as mid-August through mid-October. This holding period increases risks for survival when summer flows decline and pool depths decrease.

Deep pools are developed via river flow scour energy generally enhanced by means of channel roughness and flow constrictions. Large woody debris, boulders and narrow channel widths contribute to pool development in deformable bed materials. Channel and pool formation primarily occur during high flow events. Pools can be subsequently filled with movement of bedload materials. Bedload transport is also episodic, occurring most frequently during high streamflow events. Irrigation diversions should not have an influence on overall pool formation and maintenance channel processes during peak river flows.

Irrigation diversions, however, have the potential to reduce low streamflow levels and subsequently to reduce the depth of water in holding pools. Existing holding pools in the lower Dungeness River are currently in short supply and they are relatively shallow. The potential effect of ongoing withdrawals is probably not measurable during the May through mid-August holding period, since streamflows remain fairly high. During the baseline period withdrawals averaged 9 percent with a single maximum daily diversion of 25 percent of the flow at the USGS site between May and mid-August. Based on USBR and USGS channel cross-sections and rating curve constants (Daraio et al. 2003) a 9 percent reduction in flow may represent up to a 1 to 3 percent change in water surface elevations depending upon the cross section. Holding pools generally include water greater than a meter deep (3.3 ft). A 3 percent change in water surface elevation would represent less than 0.1 ft (approximately 1 inch) change in pool depth for the shallowest holding pools. The single daily greatest change during the baseline period corresponds to an 11 percent reduction in pool water surface elevations (approximately 4 inches) during drought conditions in 2001 at a flow equivalent to the 99 % exceedance level for the April to July time period (England 1999). This flow level is estimated to occur approximately 1 percent of the time during the migration period. Such reductions would have a negligible effect with respect to the quality and quantity of available holding pools for staging adult fish in the lower Dungeness River.

Another effect of decreased flows is the potential for streamflow barriers to adult passage at shallow riffles (Wampler and Hiss 1991). Broad, shallow riffles with potential for low flow passage delays have been described in Section 4. Minimum passage criteria of 0.4

to 0.8 ft for adult spring Chinook salmon, after Thompson (1972), were used to represent the entire salmonid fish guild, as well as the coastal cutthroat trout and native char guilds, since Chinook are the largest and most sensitive species within the guild to streamflow levels at critical riffles. A minimum thalwag water depth of 0.8 ft was used to indicate when passage might become a concern in shallow riffles for covered fish species.

Mean daily baseline flows at the USGS gaging station during the May through mid-August migration period ranged from an absolute low of 181 cfs to a peak flow of 2,190 cfs. The seasonal mean flows ranged between 330 cfs during a dry water year [2001] and 1,100 cfs during a wet water year [1999] over the 4-yr baseline period. These flows were reduced between 3 and 25 percent while averaging 13 percent lower in the Dungeness River following water diversions during the baseline period. The resulting instream flows at the IFIM study site, extrapolated to water surface elevations at the shallow riffle cross sections downstream, provided more than 0.8 feet of thalweg passage depths for the upstream passage of adult Chinook salmon at all flows during the migration season.

Native char use the lower Dungeness River as a transportation corridor to access upstream spawning and rearing habitats, although some amount of rearing may occur downstream of RM 11.0. Based on recent telemetry tracking studies, the time of entry for upstream migrating adult char occurs during late fall and spring (L. Ogg, pers. comm. 2005). Spawning for the upriver stock typically occurs in late fall when stream temperatures decrease below $8^{o}$C to $10^{o}$C. Streamflows designed to accommodate passage of spring Chinook salmon during the low flow months of August through October will serve as appropriate flows to pass native char entering the Dungeness River system as early as October in any given year.

Although there have been no analyses specifically targeting lamprey passage in the Dungeness River, inference can be made from the results of studies for other species. In particular, passage requirements for salmonid species can be used to assess potential effects of withdrawals on lamprey passage. Because of the lamprey's unique morphology and ability to utilize their mouth parts to assist in upstream passage, the flow conditions affording passage for spring Chinook salmon should provide suitable conditions for upstream passage of both of the covered lamprey species.

### *Habitat Elements*

The initial scoping effort for the CIDMP identified the potential for water diversions to primarily affect pool and off channel habitats (Appendix E). For an assessment of diversion effects on these habitat features refer to discussions of holding pools in the Habitat Access in Section 5.1.1. and the Dungeness River Side Channel Habitat in Section 5.1.2. Habitat is further discussed below in relation to its functional use for fish spawning, incubation and rearing.

***Spawning Habitat***. The Dungeness River Management Team (DRMT) and the Jamestown S'Klallam Tribe (JSKT) have agreed to use the Chinook salmon spawning relationship between flow in the river and weighted usable area (WUA) from the instream flow study (Wampler and Hiss 1991) as a measure of generic salmonid fish habitat during the low flow season. This approach allows a consistent comparison across alternatives and at the same time focuses on the most critical fish population at its most critical life stage in the Dungeness River (DRMT 2000). Chinook spawning flow is a good surrogate for all of the covered species in the salmonid fish, native char and coastal cutthroat trout guilds in the mainstem Dungeness River habitat.

Current operations of the irrigation system, prior to implementation of the CIDMP conservation measures, may, in the view of the Services, result in some negative impacts to spawning habitat conditions during extreme low flows in the Dungeness River. The low flow levels during 2-week intervals at the upper instream flow study site [RM 4.2] during the 1999 – 2002 baseline period ranged between 33 and 114 percent of the recommended chinook salmon spawning WUA at the 180 cfs instream flow level (Hiss 1993) [See Section 4.3.1; Table 4-22]. Flow levels in early August at the instream flow study site with irrigation withdrawals are comparable to instream flows without the withdrawals, since the stream discharge levels in August generally close to the peak of the habitat versus flow curve (Figure 4-1).

Conversely, spawning habitat was slightly less [4 to 14 %] in September at RM 4.2 with irrigation withdrawals than without irrigation withdrawals, but spawning habitat was maintained at 86 to 88 percent of the recommended WUA (Tables 4-21 and 4-22). The lowest flow period of the year during baseline conditions occurred during the first 2 weeks of October. Chinook spawning habitat during this time interval averaged 80 percent of the WUA at the recommended instream flow level with irrigation diversions compared to 86 percent without such withdrawals.

However, during the 2001 drought, instream flow levels at RM 4.2 were estimated during the lowest 14-day period to range as low as 45 cfs or 31 percent of the WUA at the recommended spawning flow occurred during the first two weeks of October (MWG 2003). Without diversion, natural flow levels at RM 4.2 would have provided approximately 73 cfs or 59 percent of the habitat index during this same period. This flow level corresponds to approximately 82 cfs at the USGS gage site; a flow that occurs naturally less than 1 percent of the time (England 1999). It is important to note, however, that during periods of these observations, no listed species were observed as being actually killed or injured.

Under the Trust Water Rights Agreement, the Dungeness-Sequim Water Users Association agreed to curtail streamflow withdrawals to less than 50 percent of the flow at the USGS station. The USGS gage is used since it has a long-term record and will likely be a permanent monitoring site. In the Dungeness-Quilcene (DQ) plan, the DWUA agreed to work to maintain 100 cfs at the upper IFIM site during late summer. Recently, the DWUA has voluntarily managed withdrawals to ensure instream flows do not fall below 60 cfs. For context, flows below 100 cfs at the USGS station [RM11.8] occur less than 5 percent of the time in nature between August and October (the seasonal 95% exceedance flow level, after England 1999). During the 2001 drought, natural flows at the USGS gage were below 100 cfs for a nearly continuous 36 day period between September 17th and October 22nd. The water users association members withdrew an instantaneous maximum of 38 percent of the water reported at the USGS gage on October

9th. The average diversion during this time period was 33 percent of the water at the gage and the estimated average flow at the upper instream flow site was 49 cfs during the 36-day period.

The influence of the withdrawal on spawning habitat during the drought was similar to the discussion above, where diversions reduced the index of WUA by a maximum of 28 percent compared to the level potentially achieved without diversions. Actual influence of the habitat reduction on the successful rate of spawning, incubation and fry recruitment cannot be determined due to the compounding effect of multiple factors that influence population size. The correlation between a reduction in habitat and reductions in numbers of fish is further complicated since the baseline spawning populations are not at sufficient levels to fully seed the available rearing space.

As noted in Section 3, the general types of habitat used for lamprey spawning are similar to those used by salmonid fishes. Hence, water withdrawals during drought conditions in the river may result in some reduction in lamprey spawning habitat compared to habitat availability without diversions. However, there is no information regarding specific locations used by lamprey or the timing of spawning and therefore the degree of impact is unknown. Due to the small body size of lamprey, it is assumed adverse effects of irrigation diversions would be similar, if not less, than for salmonid fish spawning.

***Rearing Habitat.*** Streamflows remain a potential concern for adequate rearing habitat under the current flow agreement during extreme low flow conditions. Fish mortality may become a concern as water levels decrease (Haring 1999).

The most abundant species rearing in the lower mainstem Dungeness River during the low flow period of August through October include juvenile stream-type coho salmon, although Chinook salmon, steelhead, and cutthroat trout and native char will also be present. Between October 1997 and September 1998, 67 percent of juvenile salmonid fishes collected were coho salmon (Hirshi and Reed 1998). This prevalence coho salmon was 79 percent of the collected numbers of salmonids between November 1999 and September 2000 study (Rot 2003).

A small percent of the juvenile Chinook salmon will overwinter and outmigrate the subsequent spring (Myers et al. 1998). Between 15 and 30 percent of the annual total of Chinook salmon were caught between November and March during the 1999/2000 and 1997/1998 studies, respectively (Hirshi and Reed 1998, Rot 2003). So, Chinook salmon juveniles may also be found during the low flow period of August through October and through the winter periods.

The instream flow study (Wampler and Hiss 1991) for the lower river evaluated rearing habitat conditions for chinook, coho, steelhead and Dolly Varden char in braided sections of the river intended to represent both mainstem and side channel habitats. The results of the study indicate less water is needed to provide appropriate rearing habitat than spawning habitat during the low flow period of the year (Table 4-24). The indices of rearing habitat vary widely between the species. Fish populations for all of the species modeled in the instream flow study are generally considered to be rearing limited.

Average low flow levels during 2-week intervals at the upper instream flow study site [RM 4.2] during the 1999 – 2002 baseline period provided between 75 and 303 percent of the rearing WUA at the recommended 180 cfs instream flow level depending upon the species in question (Hiss 1993) (Table 5-1). Under normal low flow conditions, the low end of the baseline range is providing a slightly greater index of rearing habitat for Chinook and coho salmon and less for steelhead trout (-6%) and char (-3%) compared to anticipated flows without diversions.

Table 5-1
Range of Weighted Usable Area (WUA) as a Percent of the Rearing Habitat Index at Recommended Flows (180 cfs) for Juvenile Rearing Salmonid Fishes during the Low Flow Season

| Species | Baseline conditions | Without diversions |
|---|---|---|
| Chinook salmon | 96 – 106 % | 90 – 204 % |
| Coho salmon | 109 – 303 % | 81 – 317 % |
| Steelhead trout | 75 – 116 % | 81 – 116 % |
| Dolly Varden char | 91 – 109 % | 94 – 113 % |

The lowest flow period of the year during baseline conditions has routinely occurred during the first 2 weeks of October. Salmonid fish rearing habitat during this time interval ranged from 96 to 135 percent of the WUA at the 180 cfs recommended instream flow level depending upon the species.

However, during the 2001 drought, instream flow levels at RM 4.2 were estimated during the lowest 14-day period to range as low as 45 cfs. This flow level represents a low of 48 percent of the steelhead rearing habitat index (WUA) to a high of 176 percent of the Chinook rearing habitat at the recommended rearing flow for this time period (Table 5-2). Without diversion, natural flow levels at RM 4.2 would have provided approximately 73 cfs or between 82 to 167 percent of the steelhead and Chinook rearing habitat index, respectively. This flow level corresponds to approximately 82 cfs at the USGS gage site; a flow that occurs naturally less than 1 percent of the time between August and October (England 1999).

Table 5-2
Range of Weighted Usable Area (WUA) as a Percent of the Rearing Habitat Index at Recommended Flows (180 cfs) for Juvenile Rearing Salmonid Fishes during the Lowest 14-day Period of the 2001 Drought

| Species | Baseline 2001 Conditions (Q = 45 cfs at RM 4.2) | Without 2001 Diversions (Q = 73 cfs at RM 4.2) |
|---|---|---|
| Chinook salmon | 176% | 167% |
| Coho salmon | 143% | 133% |
| Steelhead trout | 48% | 82% |
| Dolly Varden char | 57% | 82% |

As an example of a worst-case scenario of ongoing water withdrawals, during the first two weeks of October of the 2001 drought, steelhead juvenile rearing habitat would be reduced on the order of 34 percent, Dolly Varden rearing habitat would be reduced 25 percent, while Chinook and coho juvenile rearing habitats would be improved by 9 percent to 10 percent, respectively, compared to anticipated flows at the upper IFIM site without diversions. The influence of such habitat changes on the successful rate of smolt production and subsequent adult recruitment cannot be determined due to the compounding effect of multiple factors that influence population size. Under baseline conditions, the available rearing habitat is not considered fully-seeded. However, over time populations may approach full-seeding carrying capacity and reductions in populations of covered species may be commensurate with the loss of rearing habitat space.

In summary, during the low flow season of August through October, the instream flow model suggests rearing habitat at the upper instream flow study site (RM 4.2) under average baseline conditions is projected to reduce the low end of Dolly Varden char and steelhead trout habitat (WUA) by 3 to 6 percent respectively. Under worst-case drought conditions occurring less than 1 percent of the time, rearing habitat would be reduced on the order of 25 to 34 percent for Dolly Varden char and steelhead trout, respectively. Rearing habitat for Chinook and coho salmon is predicted to be enhanced under both average baseline and drought conditions compared to habitat area for these species at the recommended 180 cfs flow level.

Freshwater rearing habitat for native char is thought to be concentrated upstream of RM 11.0 in cold water environments (L. Orr, pers. comm. 2005). Although the lower mainstem Dungeness River is considered a corridor for migrating life histories of native char, it is possible some amount of foraging and seasonal rearing occurs downstream of RM 11.0. Winter rearing [November through March] was judged to be the most important life history stage for native char in the lower Dungeness River in determining the priority for instream flow recommendations (Hiss 1993). Water diversions have the least amount of effect on winter streamflows due to the small amount of maintenance flows diverted and the large volumes of natural flows in the river. Low streamflows occasionally occur in winter months during periods of very cold, clear weather when surface water runoff diminishes. The lowest daily winter season flow at the USGS station during the baseline period ranged from 108 cfs in 2001 to 158 cfs in 2000. Irrigation diversions during winter low flow periods reduced Dolly Varden char rearing habitat indices between 3 and 9 percent compared to estimated habitat at natural river flows. Char rearing habitat, as measured by WUA, was maintained during the single day lowest flows between 67 and 96 percent of the recommended WUA at 475 cfs. During more normal baseline flows, char habitat averaged between 81 and 101 percent of the recommended WUA at 475 cfs and winter diversions reduced habitat by 1 to 2 percent compared to estimates of natural river flows at the IFIM site.

Because larval lamprey may rear in fresh water for up to 7 years, theoretically, they will be more vulnerable to low flow conditions than salmonid species (which have a much shorter freshwater rearing period). Drought conditions will likely occur at some point during the freshwater residence period for lamprey species. By reducing flows during drought conditions, water withdrawals could potentially decrease lamprey rearing habitat on the, based on the approximate flow reductions experienced in late September and early October, 2001. Such a reduction would not necessarily influence baseline population numbers of lamprey unless they were at some level approaching carrying capacity.

The effects of low stream flows on water quality parameters that might influence fish rearing conditions are discussed in Section 5.7.

### *Channel Dynamics*

Channel dynamics and habitat maintenance features are primarily influenced by peak discharges in the Dungeness River which are not influenced to any degree by the irrigation system. Water diversions have the most pronounced effect on streamflows during the summer low flow season. The low flow concern with respect to channel structure is primarily related to channel widths and depths. Water withdrawals may have an influence on channel widths and depths depending upon channel shape. Broad flat cross sections, characteristic of riffle habitat, will show a larger effect on width and depth than narrow incised channels, characteristic of pools and runs. The effect of irrigation withdrawals on pool and riffle depth has been presented for the mainstem Dungeness River in Section 5.1.1, Habitat Access and for Dungeness River side channels in Section 5.1.2.

### *Base Flow*

For the purposes of the CIDMP document, base flow is synonymous with seasonal low flow defined as the baseline condition between August 1$^{st}$ and October 15$^{th}$. The baseline has been presented in Section 4.1.1 and the influence of water withdrawals at the upper IFIM site at RM 4.2 has been discussed under Section 5.1.1, Habitat Elements: Spawning Habitat and Rearing Habitat above. A summary of the bi-weekly flow conditions with and without diversions is provided in Tables 4-21 and 4-22.

### *Subpopulation Characteristics*

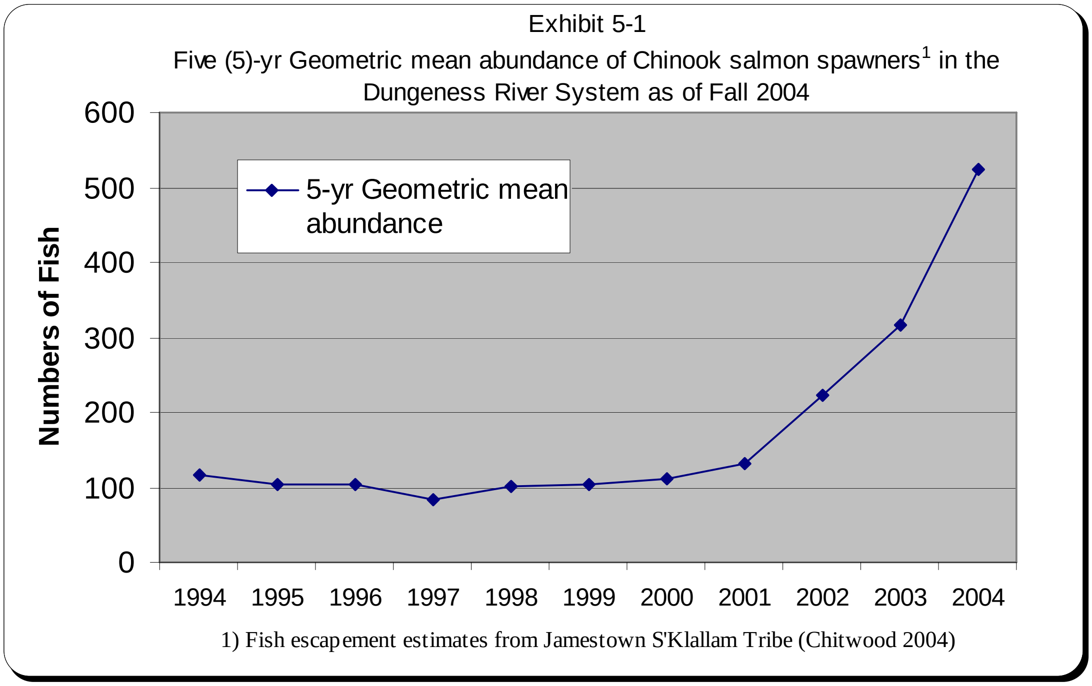
Subpopulation characteristics refer to viable salmonid population data relative to the Dungeness River subpopulation of the Puget Sound ESU. The characteristics of interest include indices of habitat for: 1) population size (abundance), 2) productivity (recruits per spawner (R/S), population growth rate ($\lambda$) and life history stage survival characteristics), 3) life history diversity and 4) genetic integrity. The Puget Sound Technical Recovery Team (TRT), working with the “Shared Salmon Strategies” planning framework is currently in the process of defining productivity and abundance levels for sustaining viable spawning populations for the Dungeness River subpopulation of Chinook salmon (Ruckelshaus et al. 2002). The TRT has developed draft fish-based targets for recovery of Chinook salmon populations in the Puget Sound ESU including the Dungeness River subpopulation in accordance with VSP characteristics described by McElhany et al. (2000). Information is currently lacking to make a quantitative assessment of the effect of irrigation withdrawals on subpopulation characteristics. “EDT-lite” was performed for spring Chinook salmon in the Dungeness River in an attempt to approximate relative differences in subpopulation performance characteristics between various restoration and protection measures (MBI, 2004). The results are described in the subsequent sections.

***Population Size (Abundance).*** The TRT predicted an equilibrium abundance level ($N_{eq}$) (one returning adult produced per spawner) for Dungeness River Chinook salmon using: (1) a population viability analysis (PVA) based on abundance, growth rate variance, and an extinction threshold as well as (2) a habitat productivity viability analysis (HPVA) based on how many fish that properly functioning habitat characteristics in the watershed should be able to support (Ruckelshaus et al. 2002). The TRT's draft planning range for equilibrium spawner abundance in the Dungeness River lies between 4,700 and 8,000 Chinook spawners. The Jamestown S'Klallam tribe in the 2003 Dungeness River Restoration Strategy provided additional escapement planning targets with enhanced productivity (from one to three returning adults per spawner) between 1,200 and 4,700 Chinook salmon (Table 4-23). Both the TRT and Jamestown S'Klallam Tribe recovery planning targets are supported by the EDT modeling scenarios for: (1) properly functioning conditions [PFC], (2) properly functioning habitat conditions plus estuarine function [PFC+] and (3) historic population reconstruction estimates [Template].

The Washington Department of Fish and Wildlife in collaboration with the western Washington Treaty Tribes as co-managers have established an annual spawning escapement objective of 945 spring Chinook spawners for the Dungeness River. The fall of 2004 spawner abundance was the first year in recent history to achieve the escapement goal.

The availability of rearing habitat may often limit the population size of Chinook salmon due to density dependent factors. A rough approximation of rearing capacity is shown in Table 4-23 for reference. In a review of regional literature Marshall et al. (1980) summarized the estimated range and mean densities of outmigrating Chinook salmon smolts from various large river basins in the Pacific Northwest at 2,250 smolts/km minimum, 5,200 smolts/km mean, and 12,600 smolts/km maximum production of juvenile outmigrants. The authors found juvenile Chinook densities in large mainstem rivers reported as the number of outmigrants per lineal distance were more accurate than densities reported on an area basis (Marshall et al. 1980). Based on the available stream length reported in the EDT reaches, the number of potential spawners supporting the smolt yields are estimated using a reasonable average of 200 chinook smolts per redd (Chapman 1986) and a stream-specific male to female spawning ratio of 2.5 adults per redd (DRMT 2004). The rearing habitat assessment suggests up to 28.9 miles of accessible habitat in the Dungeness River system has the potential to support between 1,300 and 7,300 spawners, while averaging 3,000 successful spawners (1,200 redds) if the rearing habitat is considered acceptable quality throughout the channel network.

The current population sizes for Covered Species in the lower Dungeness River system are considered under-seeded and below carrying capacity compared to historic number of fish. As an example, refer to the current Chinook salmon population estimates, the historic run size estimates and the TRT or Jamestown S'Klallam tribal recover planning targets for Dungeness River Chinook salmon shown in Table 4-23. As such, density dependent factors that may normally dictate a given population size emigrating from freshwater systems are likely not functioning at the current level of abundance. Although population sizes for most of these species (except for chum and pink salmon) are considered to be rearing-limited, seeding levels are currently critical and any loss of potential spawners would result in a direct opportunity loss for rebuilding the various stocks. The most recent trend lines for many of the species are upward from very low population levels in the 1980s and 1990s. For example, the 5-yr. geometric mean abundance for spring Chinook escapement in the river is shown in Exhibit 5-1. The graph indicates a steady declining trend was reversed in 1997 with a consistently improving trend since. Improved freshwater and ocean conditions, restoration efforts and harvest restrictions have all contributed to increased numbers of returning fish.




Current water withdrawals are considerably reduced compared to levels of diverted water in the 1980s and 1990s, such that instream flow levels during the summer/fall low flow season are trending upward and providing, on average, a good level of fish spawning and rearing habitat (Exhibit 4-1). Chinook rearing habitat is not anticipated to decrease under baseline withdrawal conditions compared to natural flow rates (Section 5.1.1). Chinook spawning habitat (WUA) is estimated to average approximately 2.4 percent less than WUA indices under natural river flows during the low flow spawning season.

The worst-case analysis indicates water use operations during 2001 drought conditions under the current Trust Water Agreement have been found to reduce spawning habitat approximately 26 percent for two periods in late September and early October compared to habitat estimated during natural river flows. The largest single-day relative difference during the 2001 drought between flows at RM 4.2 under withdrawals versus natural flow levels was 29 percent. Since habitat carrying capacity includes the concept of long-term production around a central mean, use of average habitat reductions rather than worst-case analyses is appropriate for the assessment of population sizes.

There is insufficient information to quantitatively address the potential loss or gain to fish population numbers compared to baseline conditions with ongoing water use operations. However, EDT results suggest improvements to base flow levels in the lower Dungeness River could improve the equilibrium spawning abundance [$N_{eq}$] for Chinook salmon by 25 percent on a relative basis (MBI 2004).

A variety of reasons exist why habitat and populations do not always directly correspond with each other. As such, the CIDMP is a habitat-based, rather than a population-based assessment in its habitat conservation planning process. As shown in Exhibit 5-1, stream flows in the lower Dungeness River under baseline water withdrawal conditions have not prevented short-term increases in Chinook salmon population growth. Whether irrigation operations will allow Chinook population expansion to the estimated draft planning target levels recommended by the TRT and Jamestown S'Klallam Tribe is unknown.

***Population Growth and Survival.*** The population growth rates are increasing for the Dungeness River subpopulations of spring Chinook salmon, implying the current baseline habitat conditions in the lower river are allowing fish populations to expand (Table 3-3). The 10-year population growth rate ($\lambda$) from 1991 to 2000 for spring Chinook salmon in the Dungeness River is positive at 1.03 (NOAA Fisheries; February 26, 2003). The population growth rate is higher at $\lambda = 1.04$ using spawner data from the Dungeness River through the fall of 2004. The 5-year geometric mean abundance of Chinook salmon spawner in the Dungeness River has increased five-fold since the species was listed in 1999 (Exhibit 5-1). This growth rate means the spawning population is currently providing more spawning recruits than simply replacing itself. In isolation, this factor implies survival rates between various life stages are increasing compared to prior decades. Streamflows in the lower Dungeness River under baseline conditions have not prevented short-term Chinook salmon population growth. Nevertheless, population abundance remains well below levels considered to represent full-seeding capacity or recovery planning targets (refer to Table 4-23). EDT results suggest improvements to base flow levels in the lower Dungeness River could improve the productivity reported as adult recruits per spawner [R/S] for Chinook salmon by 20 percent compared to current conditions on a relative basis (MBI 2004).

***Diversity.*** Loss of life-history diversity has been prevalent for the various species since the early 1900s. Current diversity of life history expressions has been described for the various species in Section 3. Ongoing water withdrawals are **not** anticipated to alter such diversity from the current baseline conditions.

Diversity as a metric under the EDT model represents the percent of reaches used by a certain life-history stage, so it is more related to spatial and temporal distribution as a surrogate of life history diversity. The existing EDT diversity level for Chinook salmon suggests 68 percent of the reaches currently contribute to the production of various life history stages (MBI 2004). EDT results suggest improvements to base flow levels in the lower Dungeness River could improve diversity for Chinook salmon by 29 percent on a relative basis (MBI 2004).

***Genetic Integrity.*** Genetic integrity of the various stocks has been most heavily influenced with extirpation of specific stocks or certain life-history strategies, and via fisheries management decisions related to hatchery plants, use of non-native brood stock, basin transfers and harvest management programs. Ongoing water diversion should have little adverse influence on genetic integrity of the current stocks in the Dungeness River under baseline operations.

### 5.1.2 Dungeness River Side Channels

Side channels are an integral part of the lower Dungeness River downstream of RM 11.0 offering important fish spawning and rearing habitat. All of the Covered Species associated with aquatic habitat guilds are anticipated to use side-channel habitats during part of their life history. Bald eagles also use side channel corridors for foraging on salmon carcasses.

Ten major side channels, categorized as either surface water or groundwater connections to the mainstem river, were summarized in Section 4.1.2; Baseline Conditions for Dungeness River Side Channels. Since Daraio et al. (2003) established that surface water connected side channels were more sensitive to changing streamflow conditions in the mainstem river than groundwater connected side channels, this assessment focuses on the influence of water withdrawals on seven major surface water connected side channels.

The key issues to address in the side channel habitat include the influence of water withdrawals on: (1) side channel connectivity with the mainstem river and the point of flow initiation, and (2) the volume of water in the side channel as it affects migration, spawning, and rearing habitat and water quality.

#### *Side Channel Connectivity with the Mainstem River*

Streamflow in the side channels is dependent upon surface water volumes and bed elevations in the mainstem. Surface water connections occur when the mainstem river elevations are high enough to flow into the side channels. The various side channel elevations and the critical mainstem flows needed for connection at each channel in 2002 have been provided in the USBR side channel report (Daraio et al. 2003) as summarized in Table 4-11 [Section 4.1.2].

At the time, four of seven surface water-connected side channels, comprising 77 percent of the lineal distance of off channel habitat in USBR surveyed reaches, remained connected with the mainstem under almost all river flow conditions. The Kinkade East and Kinkade West side channels were lower in elevation than the mainstem and exhibited the possibility of becoming the dominant flow path in the future. The Dawley side channel was maintained and continues to be maintained at its upstream connection with the mainstem to provide water to the irrigation diversion located in the side channel. The lower eastside Railroad Bridge side channel was generally connected at all flows when the mainstem channel was flowing adjacent to its entrance. If the mainstem migrates laterally across its flood plain in the future, the flow in the Railroad Bridge side channel will only be maintained by groundwater connections. Surface water connections to three other representative side channels showed sensitivity to stream flow elevation levels in the mainstem river. According to Daraio et al. (2003), the Gagnon East side channel lost its connection with the mainstem below 200 cfs at the USGS gaging site. Similarly, Anderson and Stevens/Savage became disconnected at 160 cfs and 105 cfs, respectively. All three of these side channels are located downstream of the DWUA points of diversion.

The dynamic nature of stream flows and channels will continue to alter the specific side channel and mainstem characteristics. Nevertheless, it is assumed, on average, throughout the length of the lower Dungeness River, the side channel survey data collected by the USBR in 2002 will represent general conditions in the lower river.

The bi-weekly average discharges at the USGS gaging station at RM 11.8 during the low flow baseline evaluation period of August 1st through October 15th 1999 to 2002 are shown below in Table 5-3 in comparison to the same statistics during the 2001 drought. The time frame and percent of lineal side channel habitat lost with decreasing streamflows is also summarized in Table 5-3.

Table 5-3
Availability of Side Channel Connections to the
Mainstem Dungeness River during Late Summer Low Flow Periods

| | Baseline Flow Conditions | | | Drought Flow Conditions | | |
|---|---|---|---|---|---|---|
| Period | Flows at the USGS Station RM 11.8 (1999-2002) | Flows at the upper IFIM Site RM 4.2 (1999-2002)[1] | Disconnected Side Channel (% of total length surveyed) | Flow Levels At the USGS Station RM 11.8 (2001) | Flows at upper IFIM site RM 4.2 (2001)[1] | Disconnected Side Channel (% of total length surveyed) |
| Aug 1–15 | 456 cfs | 345 cfs | 0% | 195 cfs | 118 cfs | 7% |
| Aug 16-31 | 342 cfs | 252 cfs | 0% | 201 cfs | 136 cfs | 7% |
| Sept 1-15 | 210 cfs | 144 cfs | 0% | 118 cfs | 70 cfs | 15% |
| Sept 16-30 | 169 cfs | 127 cfs | 7% | 97 cfs | 57 cfs | 23% |
| Oct 1-15 | 142 cfs | 106 cfs | 15% | 82 cfs | 47 cfs | 23% |
| Seasonal mean | 264 cfs | 195 cfs | 0% | 139 cfs | 86 cfs | 15% |

(1) Estimates based on average water withdrawals during the time period and 10% loss rate to groundwater.

The data imply under baseline conditions the current streamflow may be low enough to disconnect the Gagnon and Anderson side channels (15 percent of the representative side channel distance surveyed) during late September and early October, annually. During drought cycles, like the one experienced in 2001, side channel connections may be lost earlier in the low flow season. The three side channels may be disconnected approximately three and a half weeks (range of one to six weeks) earlier with diversions than what is estimated to occur during natural conditions. Presumably all of these side channels would have been disconnected under natural flow conditions, with the exception of the Stevens/Savage side channel (8% of the surveyed side channel length; Daraio et al. 2003). Surface water in the Stevens/Savage side channel remained connected with the mainstem during the entire 1999 low flow season; a very wet water year. Groundwater maintains a small amount of flow in all of the side channels when a surface water connection is lost.

### *Water Volumes Needed to Sustain Aquatic Habitats*

Although flow connections to the side channels are important, a sufficient volume of water to create desirable aquatic habitat conditions may be more critical. An estimate of the mainstem river flows needed to provide sufficient water in the side channels to sustain viable aquatic habitat has been provided in the USBR side channel report (Daraio et al. 2003) as summarized in Table 4-11 [Section 4.1.2].

Data in Table 4-11 for surface water connections indicate a wide range of mainstem river flows are needed to support preferred habitat conditions for various life history stages of covered fish species in the side channels. The USBR concluded each side channel is unique and may need a different range of mainstem flow to achieve desirable habitat conditions (Daraio et al. 2003). Further, the relationship between the side channel connection, available habitat and mainstem flow is dynamic and constantly changing. Given the differences in connections and the dynamic nature of the various side channels, this assessment used multiple side channels rather than one or two as a system parameter to represent current overall conditions in the lower Dungeness River.

The priority species and life history stage for streamflow management purposes was determined to be spawning Chinook salmon present during early August through early October. Habitat conditions with respect to preferred depths and velocities for spawning Chinook salmon can be achieved between 20 and 60 cfs in the side channels. These flows can be supported in various side channels when the mainstem river flow at the USGS gage site (RM 11.8) falls between a minimum of 40 and a maximum of 640 cfs. The lineal distance of side channels supporting preferred Chinook spawning conditions at various mainstem flow rates is plotted against the low flow season flow exceedance levels in Exhibit 4-4. The greatest amount of side channel distance, 58 percent of the total providing preferred Chinook spawning flows, is available when the river flow at the USGS gage is between 160 and 280 cfs. The 50 percent exceedance flow, during the August to October time, of 177 cfs at the USGS gaging station (England 1999) lies within the maximum side channel habitat range. The 50 percent exceedance level is approximately the same as the 180 cfs flow rate selected as the recommended instream flow for mainstem habitat during the late summer time-period (Hiss 1993). The recommended instream flow level of 180 cfs, therefore, provides a good level of surface water connected side channel habitat in addition to mainstem habitat for Chinook salmon spawning. As shown in Table 4-12, the 50 percent exceedance level also provides decent levels of habitat for other species and life stages during the low flow season. However, according to the habitat criteria the USBR used, the 50 percent exceedance flow is too high to support preferred rearing habitat conditions for coho salmon in surface water connected side channels.

The length of accessible side-channel areas in the lower Dungeness River will be reduced by an average of 23 percent during drought conditions compared to estimated natural river flows. Since, this analysis is based on physical changes in side-channel habitat, the results should be applicable to habitat considerations for all of the Covered Species using the side channels during that time period, including lamprey. The provision of instream flows as specified in the Trust Water Agreement will likely maintain important lamprey rearing habitats in the river during normal low flow and drought conditions.

### 5.1.3 Dungeness Bay

Aquatic species in the salmonid, native char and coastal cutthroat trout fish guilds including Chinook, coho, chum and pink salmon, steelhead and cutthroat trout, native char and Pacific and river lamprey use the estuary as a nursery area and transportation corridor. Chinook, coho, chum and pink salmon juveniles will typically rear for longer periods of time in the nearshore environments of the bay than the trout species. Bald eagles also use the Bay for foraging. The key issue to address in the estuary habitat includes the influence of water withdrawals on the freshwater discharge plume and its effect on estuarine habitat and water quality.

The influence of water withdrawals on habitat in Dungeness Bay is thought to be minor and indirect. The DWUA is currently consuming between 5 and 35 percent and averaging 20 percent of the natural river flow entering the lower Dungeness River at RM 11.8 during the low flow season (August 1 – October 15). As a function of reduced water surface elevations in the mainstem river, and therefore less pressure head, there is greater net influx of groundwater to the river along its length with diversions than under conditions without diversions. In addition, a small amount of the diverted water is returned to the lower Dungeness River via tailwater discharges. Dungeness River tributary contributions to the estuary are not altered as a result of irrigation diversions. As a consequence of these factors, an average of 20 percent withdrawal between RM 11.0 and RM 6.9 does not equate to a 20 percent freshwater reduction to the estuary.

Reduced river flow to estuaries has been found to influence the size and potentially beneficial influences of cover and/or feeding habitats of discharge plumes for outmigrating salmonid smolts (Casillias 2002). Lower river levels could also influence the distance of saltwater intrusion into the river during periods of high tides and low river flow, as well as decrease the capacity of the river to dilute and transport contaminants.

There is insufficient information to quantify the effects of diversions on the aforementioned habitat factors. The following discussion is therefore, qualitative in nature. Tidal influence is thought to currently extend to the Schoolhouse Bridge at RM 0.7 in the mainstem. An increase in channel slope at this location makes a small change in river flow unlikely to alter the current zone of tidal influence (USBR 2002). Water quality constituents in the mainstem river are reportedly very good. Sampling of water quality constituents at two stations operated by Ecology in the lower river, has not identified water quality standard exceedances during the baseline period (other than fecal coliform levels), even during the 2001 drought year that would influence covered species. Ecology rates the Water Quality Index (WQI) of the river very high. Sampling has detected fecal coliform levels higher that state standards and TMDL for the Dungeness River/Matriotti Creek requires coliform level reductions in the mainstem river. However, such bacterial levels are not usually a detriment to covered fish species. This information implies ongoing water diversions are not having an adverse effect on water quality parameters that have the ability to influence covered species habitat.

The fish, shellfish and waterfowl prey base of the bald eagles found to inhabit the vicinity of the Dungeness River estuary are not expected to be affected by the water withdrawals.

Existing or suitable bald eagle nest or roost trees would not be influenced. Therefore, ongoing water withdrawals would not have an effect on bald eagles and take or harm to the species is not anticipated. Improvements to adult returns of salmonid fishes in the estuary will also indirectly improve the prey base for bald eagles.

## 5.2 Diversion Facilities

Water User Association diversion facilities are located in the lower Dungeness River between RM 6.9 and RM 11.0. Each facility has been described in detail in Section 2. The facilities are located either along banks of or in constructed intake canals adjacent to the mainstem river or in maintained side channels to the river. All of the Covered Species in the salmonid fish, native char and cutthroat trout guilds and bald eagles in the terrestrial bird guild that use the mainstem Dungeness and side channel habitats during part of their life history have the potential to be either directly or indirectly influenced. The key issues to address include the effects of the facilities on Covered Species related to: (1) modifications of habitat features in the intake and bypass return canals, (2) physical interactions with screens, head gates, or canals, (3) entrainment of fish into the series of distribution flow lines and ditches and (4) the influence of facilities maintenance on habitat features.

### 5.2.1 Habitat Modifications

#### *Intake Channels*

The Agnew, Highland, and Sequim-Prairie Tri-Irrigation District constructed intake channels to divert water from the mainstem river. Some of these facilities and have screening facilities and headgates offset from the mainstem river. Fish have access to and utilize the created off-channel habitats. On an occasional basis, following major flood events, the intake channels require maintenance to keep water flowing in the canals. Work under HPAs occurs primarily to remove bedload materials that have reduced intake channel capacity. Maintenance activities have been described in Section 2.4.

#### *Bypass Return Channels*

Fish are guided from the screening surfaces into a bypass channel and returned to the mainstem river. The bypass return channels vary in distance with each facility. Some offer valuable habitat conditions for off-channel spawning or rearing. Agnew has a long sinuous low gradient bypass channel that could offer spawning and rearing habitat for coho salmon and cutthroat trout. Although shorter in distance, the Highland bypass canal similarly offers fairly good spawning and rearing habitat. Historically, flows in the bypass canals were inconsistent and could be terminated by facilities operations. Under the current baseline conditions, the DWUA is voluntarily maintaining flow continuation in bypass channels.

The low gradient habitat in the bypass channels also tends to trap fine sediments diverted from the mainstem river. Heavy silt loads were noted in the Agnew bypass canal. This situation has perhaps both a positive and a negative effect. Deposition of fine sediment loads in the bypass canals reduces loading in the mainstem river. In effect, the bypass canal can act like a flood plain for the mainstem river. The reduction of mainstem loading of fine sediment due to deposition in the bypass channels, however, is not likely to have a measurable influence on mainstem habitats. Deposition of such fines in the bypass, however, reduces the value habitat in these reaches for fish spawning and rearing.

### *Side Channel Intake Channels*

The Sequim-Prairie Irrigation District point of diversion from the mainstem Dungeness River occurs at the head of the Dawley Side Channel. Approximately, 1,500 ft downstream in the side channel a seasonal average of 7.6 cfs (Foster Wheeler 2003) of flow continues ahead into the intake facility, while the balance of flow bypasses the intake and continues downstream as part of the lower end of the Dawley side channel. The intake lies approximately 40 percent of the distance down the channel. If, during low flow events, the withdrawal diverts 33 percent of the side channel flow and assuming this action reduces rearing space downstream in the Dawley Side channel by a third, the potential lost production space in the side channel would equate to approximately a 20 percent loss of surface area compared to natural river flowing conditions under baseline conditions.

The Dawley side channel is one of the most productive channels for fish production and it supports known spawning and rearing areas for Chinook, coho and pink salmon and trout species (Hirschi and Reed 1998; US EPA, life-history study 1998 v. 2000). Undoubtedly, it is well-used by other Covered Species. Since the side channel and intake channel co-exist, DWUA's voluntary effort to maintain streamflows to the Sequim-Prairie intake facility benefits flow continuation and habitat stability in the side channel. Maintaining flow in the side channel, even in times of extreme low flow, is important for its use by Chinook salmon (Hirschi and Reed 1998).

The initiation of suitable spawning and rearing habitat in the lower Dawley side channel during the 2002 survey was estimated to occur between 15 and 40 cfs and between 3 and 55 cfs, respectively depending upon the species (Daraio et al. 2003). The subsequent mainstem flow as measured at the USGS station to sustain the initiation of side channel spawning during baseline operating conditions fell between 80 and 230 cfs. A slightly wider range, between 20 and 360 cfs in the mainstem river, would support suitable side channel rearing conditions. The lowest flow measured in the lower Dawley side channel during the summer of 2002 was 20 cfs (Daraio et al. 2003) and the lowest flow at the USGS gage during their study period was 127 cfs. England's review of the USGS gage statistics indicates a flow level of 80 cfs rarely occurs at the gage (>99% exceedance), suggesting that spawning and rearing habitat conditions are maintained in the Dawley side channel at nearly all current mainstem flow levels.

The irrigation district maintains the depth of the entrance of the Dawley side channel to ensure the year-round provision for flow continuation and water stability in the side channel. This action offers a potential benefit to ongoing spawning and rearing habitat conditions throughout the 3,630-foot side channel that may not occur routinely under natural conditions. The side channel offers sufficient rearing habitat under baseline conditions to produce Chinook subyearling, coho yearling, cutthroat trout 2+ age smolts, and pink salmon. Although the juvenile rearing production potential of the side channel may be approximately 20 percent higher in the absence of the withdrawal, the later production may not be sustainable on an annual basis if routine maintenance did not keep the side channel entrance open.

#### *Mainstem Intake Structures*

Clallam-Cline and the Highland Districts divert water directly from the banks of the mainstem river. Adverse influences related to intake channels do not occur at either of these facilities. Localized bank hardening occurs to support the diversion structures. Bank hardening is considerable at the Highland intake since it is located on the outside of a bend in the river that at high flows experiences peak erosive forces. Conversely, the Clallam-Cline intake is located in a low energy site of the river requiring far less supporting structure. Bypass channels for both of these structures are very short compared to the other facilities.

The physical effects of the intake facilities on Covered Species are addressed in Section 5.2.2. Habitat features either beneficially or potentially adversely influenced with these intake facilities are very small. The influence on Covered Species and their habitats are un-measurable and likely negligible.

### 5.2.2 Physical Interactions

The DWUA intake structures are screened to prevent the entrainment of fish into the distribution network of canals, laterals and ditches. Most of the screens are either rotating drum or a flat plate incline type of screening assembly. The Association contracts with WDFW, Yakima Screen Shop, to annually maintain and upgrade the screening facilities when needed. In addition, a 'ditch rider' performs daily inspections of all screen facilities to monitor facility operations and perform cleaning and maintenance duties. Properly designed, operated and maintained screens should perform well with respect to fish passage and guidance efficiencies in these systems.

A screening investigation report from Patrick Schille of the WDFW Yakima Screen Shop dated October 1, 2001 is appended (Appendix F). This letter report outlines the status of the screens as of the fall of 2001. Throughout the 1990s all of the screens had been either replaced with state-of-the-art designs or upgraded to accommodate changes in screening criteria or deterioration of the physical structures.

In the fall of 2001, brush seal material had eroded away due to heavy silt accumulation allowing some fish to pass screens. The screens were retrofitted with new rubber seals that perform better in situations with heavy silt loads. At that time, the YSS provided a list of items noted or concerns to provide enhanced protection of the fisheries resources throughout the entire diversion system [from the point of diversion, to the screens and through the bypass returns to the river]. Specific lists of recommendations for each facility are provided in Appendix F.

### 5.2.3 In-River Maintenance Activities and HPA Coordination

The Association has an occasional need to redistribute bedload in the river and side channels to keep water flowing to their points of diversion. These operations are described as a Covered Activity in Section 2.4. The DWUA operates under HPA permits for such activities with requests from the resource managers for 72-hr. notification and coordination.

The lower Dungeness River morphology includes low gradient alluvial and floodplain channels where coarse sediment deposition is the norm. Dynamic, shifting (avulsing) channels make flow continuation for some of the diversions a challenge. Maintenance work in this regard occurs in the mainstem, side channel and intake channel habitats. All of the fish species guilds have the potential to be influenced.

### 5.2.4 McDonnell Creek Diversion Facilities

The Agnew Irrigation District operates a small diversion dam on McDonnell Creek at RM 3.2 immediately upstream of SR 101. The facility is described in detail in Section 2.3.1. The covered species and timing of life histories present in McDonnell Creek are presented in Section 4.1.4. Irrigation flow conveyance and the potential for false attraction of returning adult fish are subsequently discussed in Section 5.4.2.

The diversion consists of a small concrete dam with a steep-pass (Denil) fish ladder located at the point of diversion. Flow is diverted from the dam into a short canal and to a fish screen facility. A rotating drum screen with a fish bypass pipe prevents fish from entering the canal.

*Diversion Facility*

The McDonnell Creek channel is downcutting (eroding downward) downstream of the diversion dam. The erosion is likely an effect of channel constriction from the diversion canal leading to the fish screen and by channelization and large riprap placed for the dam and SR 101. The channel erosion extends downstream to a point well below the bridge. Some of the downcutting may be attributed to the dam intercepting sediment supply however the dam is currently full of sediment and does not appear to trap additional sediment. The overall influence of channel degradation on the abundance of returning adults is not likely measurable.

## 5.3 Canals and Laterals

This subsection discusses the influence of covered activities along the water distribution network on Covered Species. Species using upland, wetland and small stream habitats including bald eagle, western toad, coho salmon, steelhead and cutthroat trout are addressed. The key issues to assess include ditch maintenance activities and the contribution of water from the ditches to groundwater, surface water and wetlands.

The irrigation system has an artificial effect of augmenting low flow small stream discharges and wetland surface areas via tailwater releases and seepage from the water conveyance structures. The irrigation influence on these surface water systems under baseline operating conditions has been described in Sections 4.1.4 and 4.2. On-going hydrologic modeling as part of the CWCP FEIS is currently addressing groundwater and surface water augmentation volumes.

The effects of current irrigation operation entail the transfer of water from the Dungeness River mainstem to dispersed groundwater, surface water and wetland systems in the Action Area.

### 5.3.1 Ditch Maintenance

The Association members maintain the water distribution network of canals, laterals and ditches to minimize vegetative growth that reduce hydraulic capacity and efficiency. The actions related to ditch maintenance and vegetation control include brushing, mowing, sediment removal, burning and application of herbicide, primarily Rodeo® as described in Section 2.4. Brushing, mowing and sediment removal are typically performed with machinery alongside the canals.

Vegetation control is performed on up to 30% of the irrigation system each year. The DWUA use the herbicide Rodeo® in dry ditches by spraying directly on vegetation and via spot application to stumps. Spraying is typically done twice a year, once from March $15^{th}$ to June $15^{th}$ to deal with spring vegetation and again in mid-September to late October to deal with blackberry and salmonberry. Spraying is only performed along 17 percent of ditch miles in the irrigation system. Brushing includes the removal of woody debris through the use of mowers, weed eaters, machetes, and chainsaws. Burning is not used extensively.

The opportunity to influence upland, wetland and small stream habitats and associated Covered Species is low, since the removal or placement of materials during ditch maintenance does not occur in these locations. Short-term influences of human related disturbances and water quality in the ditches can occur during maintenance activities, including disturbance and redistribution of sediments, with increases in turbidity and possibly compounds associated with the sediments. The influence of maintenance activities on water quality is included in the discussion of tailwater discharges to receiving waters (see Section 5.4 below).

The DWUA apply Rodeo® for vegetation control since it is EPA approved for use in aquatic systems and it has been rated non-toxic to non-vegetative species. Although it is safe to use under flowing water conditions, the DWUA apply it above the high water line and to dry portions of ditches. It differs slightly from Roundup® in its chemical composition since it includes a non-petroleum-based surfactant. This modification reduces its toxicity to non-target species compared to Roundup.® Based on its chemical properties and application use of Rodeo® does not pose a direct or indirect risk to Covered Species.

### *Upland Habitat*

Ongoing ditch maintenance in a manner consistent with current baseline conditions would have little effect on bald eagles or their habitat and would not significantly influence their prey base. No large mature trees would be removed as a result of maintenance activities, though some small trees and shrubs are routinely removed during system maintenance. Activities associated with work along the canals and ditches are typical of normal ongoing agricultural practices. Noise and human disturbances are likely the largest influence on the eagles, but these activities are not anticipated to change compared to the background situation and they are small compared to the overall human activity in the area.

### *Wetland Habitat*

Ongoing ditch maintenance in a manner consistent with current baseline conditions is not anticipated to influence wetlands unless suspended sediments or contaminants are discharged via tailwater to wetlands. The influence of maintenance activities on wetlands is included in the discussion of tailwater discharges to receiving waters (see Section 5.4, below). As such, ditch maintenance would have little effect on the western toad or their habitat and would not significantly influence their breeding phase in wetlands. Similarly, wetlands connected to surface water streams may offer rearing habitat and winter refuge to Covered fish species. Ongoing ditch maintenance is not anticipated to influence Covered fish species or their habitats.

## 5.3.2 Contribution of Diverted Water to Other Sources

Seepage of diverted irrigation water from the distribution network of canals and laterals occurs primarily from unlined ditches. In 1996, the volume of contributed water to other sources was estimated to run between 12 and 24 cfs (generally less than 30 percent of the amount diverted) during the low flow months of August and September (Table 2-4). Over the years, this water has altered the normal hydrological characteristics of small streams, wetlands and groundwater by seasonally increasing groundwater recharge. Surface water volumes have benefited and low summer flows have been augmented in various creeks as a result of elevated aquifer levels as well as with the discharge of tailwater [discussed in Section 5.4]. Details of augmented streamflows in the small tributaries and independent streams in the Action Area have been highlighted in Section 4.1.3 and 4.1.4, respectively. The issue of groundwater elevations and contribution to surface water bodies was evaluated as one of the primary topics of the FEIS for the DWUA Water Conservation Plan (Foster Wheeler, 2003).

The Association members have been performing water conservation activities throughout the irrigation system in lower Dungeness River valley since the early 1990s. This action includes lining and replacement of open ditches with closed pipe to reduce seepage, reduce operations and maintenance costs, and to improve water quality. Currently, nearly 55 miles of the distribution network (32 %) is piped (Section 2.3).

#### *Wetland Habitat*

Approximately half of the wetland acreage in the Action Area is fed by groundwater from the shallow aquifer (Foster Wheeler 2003). These wetlands could be influenced by groundwater levels. The remaining half of the wetland acreage is primarily fed by surface water runoff and water close to the surface lying over an impermeable subsurface layer. These perched wetlands are unlikely to be affected by water levels in the shallow aquifer but they could be influenced by changes in amounts of runoff or irrigation leakage in the local area.

Continued irrigation operations under baseline activities offer no change in wetland acreage or habitat functions presented in Section 4 and therefore, no change in habitat conditions or use by Covered Species is anticipated. The influence of proposed habitat conservation measures on wetlands are included in Section 7.

#### *Small Stream Habitat*

Many of the small streams in the Action Area are currently directly or indirectly benefiting from seepage in the irrigation system. Some streams that may naturally have had intermittent seasonal discharges are currently perennial as a result of ongoing irrigation operations. Perennial streamflows offer greater habitat capacity and production potential for Covered fish species than intermittent streams.

Ongoing irrigation operations consistent with baseline conditions offer no change in small stream discharges or habitat functions as presented in Section 4. Therefore, no change in habitat conditions or use by Covered Species is anticipated in the Dungeness River tributaries and Independent small streams. The influence of proposed habitat conservation measures on small streams is included in Section 7.

## 5.4 Tailwater and Conveyance

This subsection discusses the influence of tailwater discharges to local streams and the conveyance of irrigation water in independent small streams on Covered Species.

### 5.4.1 Tailwater Discharge

The DWUA members discharge tailwater from the irrigation system into tributary and independent small streams, wetlands, groundwater and into saltwater. Maps of the location of current tailwater discharge are shown in Exhibit 2-6 and summarized in Table 5-4, below.

Tailwater discharged from the irrigation system is monitored on a daily basis, recorded by the DWUA on at least a weekly basis and compiled in an annual flow report. The annual flow reports summarize diversions, Dungeness River flow, tailwater, percentage of diversions to Dungeness River flow, percentage of tailwater to diversions, changes in irrigated land, improvements to systems and other relevant information. A comparison of tailwater quantities to DWUA diversions is shown on Exhibits 2-7 through 2-9 for 1996, 1999 and 2001. The quantity of tailwater has declined slightly over that time period and it currently runs about 8 cfs during the peak irrigation season.

Similar to seepage from the water conveyance system, tailwater has had a direct influence on artificially augmenting small streamflow levels, wetlands and groundwater recharge.

Habitat conservation measures performed since the early 1990s have currently reduced the number of tailwater discharge points to only 25 locations as shown in Table 5-4.

Table 5-4
Tailwater Receiving Waterbodies

| Type of Receiving Body | Location | Qty |
|---|---|---|
| Stream/River | Dungeness R., Bell Cr. Johnson Cr. Gierin Cr. | 7 |
| Wetland | Woods Cr. Dungeness Bay, Sequim Bay | 4 |
| Saltwater | Strait of Juan de Fuca; Dungeness Bay | 6 |
| Groundwater | Strait of Juan de Fuca, Dungeness Bay, Sequim Bay, Siebert Cr. Matriotti Cr. Cassalery Cr. Unnamed Cr. | 8 |
| | **Total** | **25** |

Streamflow levels are currently artificially enhanced in Bell, Johnson and Gierin creeks as a result of direct tailwater discharges during the low flow season of the year. Similarly, streamflows may also be augmented in Siebert, Matriotti, Cassalery and Woods creeks indirectly due to tailwater discharges to groundwater and wetlands.

Un-listed Covered species with life history phases potentially using these surface water systems including coho salmon, steelhead trout, cutthroat trout and the western toad are currently benefiting from ongoing irrigation operations. Tailwater discharges in combination with groundwater supplementation may be creating perennial streams that were historically ephemeral streams.

Approximately 32.5 miles of Dungeness River tributary and small stream habitat exist within the Action Area. Estimates of the potential annual number of spawning adult fish in small streams has been presented in Tables 4-13 through 4-19. Spawning escapement for Dungeness River tributaries and small independent streams near covered lands in comparison to the mainstem Dungeness River are provided in Table 7-3. The estimated number of annual adult escapement to small streams is significant, but small in comparison to fish using the mainstem river habitats.

### 5.4.2 Conveyance in Natural Stream Channels

Irrigation conveyance of diverted Dungeness River water in natural stream channels that is subsequently re-diverted for use further downstream, occurs in two independent small streams in the Action Area including McDonnell and Bell Creeks and to a lesser extent Bear (both creeks), Agnew, Gieren, and Hurd Creeks. The key issue to assess is if the supplemented flow creates a false attraction of anadromous fish species homing to Dungeness River water in either of the creeks. The Covered Species of interest during the baseline period include coho salmon and steelhead and cutthroat trout.

### *McDonnell Creek*

Several miles downstream of the Dungeness River diversion along the Agnew main canal, the District spills water into McDonnell Creek at RM 4.7. The District estimates flow conveyance between 0.5 and 2.5 cfs. The District operates a small diversion dam on the creek at RM 3.2 located just upstream of Hwy 101 that picks up the spilled flow and McDonnell Creek flow. Although information is lacking, the District believes the volume of conveyed water is generally in line with the withdrawal volume. The Agnew Irrigation District is currently installing measurement equipment to assess input and withdrawal of water in McDonnell Creek. The District holds a 5 cfs water right for diversion from McDonnell Creek and a legal right to use natural channels for conveyance of irrigation water. Flow conveyance has occurred in the creek since 1927 and it is considered part of the background conditions.

The source of irrigation water from the Agnew main canal includes water from the Dungeness River, but it also includes infiltration water from Bear, Matriotti and Cassidy creeks. Flow conveyance can occur annually from mid-April through mid-September; however, mid-June to mid-September is more typical (Exhibit 5-2). During peak spring runoff McDonnell Creek runs upward to 25 cfs. The peak rate of flow conveyance would be on the order of 10 percent of the natural flow rate in the creek. In the summer, McDonnell Creek has a low flow discharge of approximately 1 cfs. During these periods peak flow conveyance in the creek can run 2.5 times the natural flow rate.

The life history information of species likely present in McDonnell Creek (Exhibit 5-2) indicate that flow conveyance may influence late summer rearing of juvenile Coho salmon, steelhead and cutthroat trout and perhaps late emergence of steelhead fry. The augmented streamflow during summer months should provide additional rearing space and improved carrying capacity between RM 3.2 to 4.7 compared to natural conditions. This action should benefit future smolt yields of all three of the covered species along 1.5 miles of creek, if summer low flow rearing habitat is limiting the production potential. Conversely, waters from blended sources have the potential to attract returning adults fish, originally headed to other basins, into McDonnell Creek. Adult coho, winter steelhead and cutthroat return to McDonnell Creek in the fall when flow conveyance is not occurring. There have been no observations in the creek of spring/summer Chinook, summer chum salmon or summer steelhead trout that may enter freshwater streams during summer months. False attraction of these species to McDonnell Creek remains unknown.

Water source imprinting assists adults in returning to the natal streams. It is possible juvenile fish in McDonnell Creek, imprinting on a blended water source prior to emigration, may not recognize the natural source upon subsequent return as adults. Rearing juvenile fish imprint on a blended water source from mid-June to mid-September and a natural water source from mid-September to mid-June annually. The most critical period for imprinting may be during the juvenile outmigration period, which occurs during spring months of April through June. Although flow conveyance can occur during this period, it is not the typical peak period of conveyance and natural streamflows will dominate the water volume.

**Exhibit 5-2**
**McDonnell Creek Flow Conveyance Timing vs. Life History Stage Periodicity of Species Present under Baseline Conditions in the Creek**

| Species Present | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Coho Salmon*** | | | | | | | | | | | | |
| Entry | x | | | | | | | | | | **X** | x |
| Spawning | **X** | x | | | | | | | | | | **X** |
| Emergence | | | **X** | **X** | x | | | | | | | |
| Rearing | x | x | x | x | x | x | x | x | x | x | x | x |
| Outmigration | | | | **X** | **X** | x | | | | | | |
| ***Winter Steelhead Trout*** | | | | | | | | | | | | |
| Entry | x | **X** | **X** | **X** | x | | | | | | | x |
| Spawning | | x | x | x | **X** | x | | | | | | |
| Emergence | | | | | | **X** | x | x | | | | |
| Rearing | x | x | x | x | x | x | x | x | x | x | x | x |
| Outmigration | | | | **X** | **X** | x | | | | | | |
| ***Coastal Cutthroat Trout (Eastern Strait)*** | | | | | | | | | | | | |
| Entry | | | | | | | | | | X | X | X |
| Spawning | x | **X** | **X** | x | | | | | | | | |
| Emergence | | | | x | x | x | | | | | | |
| Rearing | x | x | x | x | x | x | x | x | x | x | x | x |
| Outmigration | | | | | | | | | | | | |
| ***Flow Conveyance Period*** | | | | x | x | **X** | **X** | **X** | **X** | | | |

x Present in non-peak quantities

**X** Present in peak quantities

(light shading) Infrequent and small level of conveyance relative to natural streamflows

(medium shading) Typical onset of annual conveyance; percent of input to natural flows is moderate

(dark shading) Peak period of conveyance, input flows dominate the hydrograph.

The estimated annual return of anadromous salmonid fishes to McDonnell Creek include between 25 to 110 coho, 100 to 300 winter steelhead and 20 to 70 coastal cutthroat trout spawners per year (Section 4.1.4). Steelhead trout experienced a decline in numbers in McDonnell Creek in the mid-1980s but they rebounded in the 1990s. Current estimates of juvenile fish densities in McDonnell Creek during baseline conditions are comparable to average literature values for steelhead production from regional streams. These data imply flow conveyance has not hindered the upward trend in steelhead stock abundance that has occurred in the creek since low returns in the mid-1980s. The mid-1980s was a period of dry weather patterns and poor ocean survival. There is little information to infer whether or not flow conveyance in McDonnell Creek is having an adverse influence on Covered Species in McDonnell Creek. False attraction remains an unknown and un-quantifiable effect.

*Bell Creek*

The anticipated effects of potential false attraction due to summer irrigation conveyance flows in Bell Creek is similar to the prior discussion in McDonnell Creek. Bell Creek is smaller than McDonnell Creek, but the relative proportions and timing of conveyance water is the same order of magnitude. Since, Bell Creek currently supports the same species composition and periodicity of life history stages, although in fewer numbers as McDonnell Creek, the assessment of conveyance effects remains the same for both creeks.

*Miscellaneous Other Creeks*

The relative proportions of natural stream flow and irrigation conveyance waters and timing of conveyance in all the other creeks receiving increased stream flows (Section 2.2.7) are similar to the information discussed above for McDonnell Creek. However, the reaches of these other creeks do not include salmonid fish use, so there are not anticipated effects on covered species.

## 5.5 Effects on Water Quality

### 5.5.1 Pollutant Loading Sources

In understanding the water quality concerns within the CIDMP Action Area, it is important to distinguish between loading potential from the DWUA itself and from other entities. This distinction is important, especially in identifying actions the DWUA can take to protect water quality. The DWUA has control over its own activities, but has limited to no control over the activities of other entities. The DWUA does perform activities that have a potential for intermittent impacts on water quality. However, since most of the irrigation system consists of open ditches, the system is vulnerable to pollutant loading from a wide variety of other entities. Fecal coliform is an example of this issue since it is the primary water quality problem in the CIDMP Action Area. The DWUA is not a direct source of fecal coliform loading, however the open nature of the ditches means that fecal coliform from failing septic systems, livestock and other sources can access ditches and be conveyed to other water bodies.

In 1992 Ecology provided a letter to the Eureka Ditch Company, a member of DWUA[1] in regards to responsibility for water quality in irrigation ditches. The letter indicated that an irrigation company is not necessarily responsible for maintaining water quality as water flows through irrigation ditches. Instead, the parties discharging pollutants, or with authority to prevent the pollution, would have this responsibility. During development of this CIDMP Ecology representatives reviewed the 1992 letter and concluded that it no longer accurately represents Ecology policy in its role under the federal Clean Water Act,

[1] Now part of the Sequim Prairie Tri Irrigation Company

due to subsequent court decisions and developments in the area of stormwater management. DWUA representatives have pointed out; however, that DWUA does not have the kind of enforcement authorities that would be needed to take action against third parties that discharge pollutants to irrigation ditches. DWUA is able to take actions with regard to its own activities to the extent they may affect water quality, and can assist other state and local agencies in educating the public on these issues. Further information is provided below.

Table 5-5 below provides an overview of potential pollutant loading sources, distinguishing between DWUA activities and non-DWUA activities that have a potential effect on water quality. Non-DWUA activities are further distinguished between those that are agricultural in nature and those that are non-agricultural. Content from the table is discussed further in the sections that follow.

Table 5-5
Potential Pollutant Loading Sources

| Pollutant | DWUA Activity | Non-DWUA Activity | |
|---|---|---|---|
| | | Agricultural | Non-Agricultural |
| Fecal Coliform | N/A | ■ Dairy farm animal waste applied to fields<br>■ Animal access to waterbodies | ■ Failing septic systems<br>■ Pets, domestic animals, livestock, wildlife |
| Pesticides | ■ Ditch maintenance with herbicides | ■ Farm pesticides | ■ Home and garden pesticides<br>■ Roadside maintenance |
| Oil, Grease, Fuel | ■ Ditch maintenance with heavy equipment<br>■ Ditches located next to roads | ■ Farm equipment | ■ Roads, parking lots<br>■ Commercial businesses |
| Turbidity (from sediments) | ■ Maintenance of diversion facilities and ditches<br>■ Increased flow in ditches at beginning of irrigation season<br>■ Access roads | ■ Exposed soil in fields<br>■ Roads<br>■ Animal access to waterbodies | ■ Development<br>■ Roads & parking lots<br>■ Animal access to waterbodies<br>■ Timber harvest |
| Temperature | ■ Diversion of water<br>■ Tailwater returns<br>■ Vegetative removal in/near ditches<br>■ | ■ Runoff of irrigation water<br>■ Lack of shade due to removal of streamside vegetation | ■ Stormwater contribution<br>■ Lack of shade due to removal of streamside vegetation |
| Nutrients | N/A | ■ Chemical fertilizer and dairy wastes<br>■ Animal access to waterbodies | ■ Failing septic systems<br>■ Pets, domestic animals, livestock, wildlife<br>■ Fertilizer on golf courses/residences<br>■ Yard waste<br>■ Fish hatcheries<br>■ Forest management in headwaters |

### 5.5.2 DWUA Activities Related to Water Quality

#### *Stormwater*

Stormwater is not a pollutant in itself, but it can carry other pollutants that are listed in the table above. Stormwater containing various pollutants is intercepted by many of the open ditches within the DWUA irrigation system. This is particularly true for the DWUA ditches located alongside roads and along hillsides. Without the presence of irrigation ditches, this stormwater would otherwise find other paths to streams or, in some cases, infiltrate down to groundwater. The SWUA has an active program to convert open ditches to buried pipes. While the main objective of this piping is water conservation, it has significant water quality benefits since closed pipes do not provide access for pollutant loading, including stormwater loading. In fact, some of the pipelining projects were chosen and prioritized because of their water quality benefits. Currently approximately 55 miles of the 173 miles of the irrigation system are closed pipe. Six and one-half miles of open irrigation ditch were replaced with pipe since 1999 primarily for water quality improvement. The conservation program calls for approximately 60 miles of additional piping.

The DWUA further works to protect against stormwater pollution by requiring water users' irrigation distribution systems to be in closed pipes. The DWUA is responsible for delivering water to the water user (usually the high point for each 40 acre parcel). Any further water user distribution system is the responsibility of the landowner and must be in closed pipes. This policy is detailed in Policy Number 22 of the DWUA's Rules and Regulations which states that members "shall be required to operate and maintain their own piped enclosed distribution system in a reasonable manner." Most DWUA members have a cost share policy whereby they will install pipe purchased by water users.

The DWUA also works to keep stormwater out of the irrigation system by forbidding the delivery of stormwater to irrigation ditches. Policy Number 18b of the DWUA's Rules and Regulations states that, "diverting drainage from roofs, driveways, roads, parking lots and drainage ditches into the water conveyance system is strictly prohibited." As described in more detail in Section 2.5, DWUA policies are communicated to all water users and select non water users by DWUA staff, monitored daily year round on all irrigation ditches containing water by ditch riders, and uncorrected violations are referred to Ecology.

#### *Fecal Coliform*

The DWUA works to protect water quality by requiring landowners to keep livestock out of irrigation ditches. Policy Number 18a of the DWUA's Rules and Regulations states that, "water users or any other person or persons are prohibited from introducing pollutants, including but not limited to animal waste, into the Association's water delivery conveyance system." Landowners are allowed to choose their method of livestock restriction, including fencing. As described in more detail in Section 2.5, DWUA policies are communicated to all water users and select non water users by DWUA staff, monitored daily year round on all irrigation ditches containing water by ditch riders, and uncorrected violations are referred to Ecology. The DWUA also works to protect against fecal coliform loading by prioritizing converting ditches to closed pipe in areas with fecal coliform concerns.

### *Pesticides*

The DWUA uses herbicide for ditch maintenance. A detailed description of the DWUA's use of Rodeo is provided in Section 2.4. The DWUA reserves the right to use alternative pesticides in compliance with State, federal and local regulations, where warranted. However, as described above, such applications should have no effect on Covered Species due to their properties and application protocols.

The Washington State Department of Agriculture (WSDA) strictly regulates pesticide use and the DWUA carefully manages its pesticide use to comply with all state laws. Any individual applying pesticides must have a pesticide application license. (DWUA applicators maintain Public Operator licenses.) Obtaining a license requires a self-study program administered by Washington State University (WSU) and multiple exams. (DWUA applicators take the Law and Safety exam and the Aquatic Pest Control for Irrigation Ditches exam.) License holders must complete 40 hours of continuing education over five years. Licensees not completing their continuing education are required to retest every five years. Pesticide dealers are not allowed to sell pesticides without first examining the license of the purchaser. The applicator must maintain records every time pesticides are applied. The records are quite detailed including exact application site, total area treated, quantity of pesticide used, and pesticide concentration among other information.

The DWUA has selected Rodeo because it is considered one of the most benign herbicides, as demonstrated by the fact that it is approved for use in aquatic environments. (As an added precaution, the DWUA drains the ditches before application of Rodeo.) The active ingredient in Rodeo is Glyphosate, which is the same active ingredient in the common household herbicide Roundup. The primary difference between Rodeo and Roundup is that Rodeo does not contain a petroleum-based surfactant. The DWUA adds a soybean oil based surfactant when applying Rodeo. Glyphosate breaks down rapidly in the environment, having a half-life in soil of 32 days and a half-life in water of 8 days (National Pesticide Telecommunications Network Fact Sheet & Monsanto Fact Sheet). Glyphosate is considered "low in toxicity" to animals; "slightly to practically nontoxic" to fish and invertebrates; and is "not likely to bioaccumulate" according to the National Pesticide Information Center which is a collaboration between the U.S EPA and Oregon State University. In view of these considerations, herbicide applications likely have no effect on Covered Species.

An alternative to herbicide use is manual removal using equipment (i.e., excavators, mowers, weedeaters) which has the downside of potentially contributing grease, oil and fuel to the water, as well as contributing sediment by disturbing and loosening soils. Another alternative is burning; however, burn bans frequently prevent the use of the method.

The DWUA also works to ensure that individual landowners applying herbicides to their own land do not impair the irrigation system. Policy Number 19 of the DWUA's Rules and Regulations states that "it is illegal for a property owner to apply any herbicide not approved by WSDA and labeled for aquatic use to an irrigation ditch." As described in more detail in Section 2.5, DWUA policies are communicated to all water users and select non water users by DWUA staff, monitored daily year round on all irrigation ditches containing water by ditch riders, and uncorrected violations are referred to Ecology. This particular policy is more difficult to monitor since ditch riders can not verify the type of herbicide being applied by a landowner.

### *Oil, Grease, and Fuel*

The DWUA uses heavy equipment alongside ditches and occasionally in the Dungeness River, as described in Section 2.4. This has the potential to contribute small quantities of oil, grease, and fuel to the water system. Heavy equipment, such as mowers, is used alongside the irrigation ditches to control nuisance vegetation. When refueling equipment near ditches, common sense is applied in order to prevent fuel spills. If a spill were to occur, the DWUA relies on the professional spill response program linked via the county's 911 system. This highly integrated system connects containment and clean up resources from road departments, fire departments, and the Coast Guard.

Oil, grease, and fuel may gain access to irrigation ditches since in some locations the DWUA ditches are along the side of roads. Therefore, they are susceptible to loading of these pollutants by vehicles on the road.

### *Turbidity*

The DWUA may contribute sediment to water bodies, and thereby affect turbidity, in three ways: maintenance of diversion facilities or ditches, increased flow in ditches at the beginning of the irrigation season, and road erosion. Sediment may be dislodged during maintenance of the diversion facilities or the ditches. Sediment can also be dislodged at the beginning of the irrigation season when flows in the ditches are increased. DWUA access roads that are dirt or gravel may contribute these materials to waterbodies via stormwater. The contribution of sediments may be of concern when the ditches contain water, although sediments loaded into dry ditches may contribute to increased turbidity once ditches become watered. The DWUA primarily waters the ditches during the irrigation season (April 15 to September 15), although some ditches are watered year round for stock watering. Stormwater and rainfall also make the ditches watered at various times besides the irrigation season.

### *Temperature*

The DWUA may affect temperature due to diversions, tailwater discharges, and vegetation removal. Diversions affect water temperature since the original source has less volume and therefore it is more susceptible to increased temperature. Similarly, irrigation tailwater is often warmer than the receiving water since its smaller volume, relative to the receiving water, heats more quickly. However, the volume of tailwater generated by the DWUA is typically very small in comparison with the volume (flow rate) of the receiving water body, and temperature effects of tailwater are believed to be small or non-measurable in most instances. Vegetation removed near the ditches results in less shade and therefore higher water temperatures. As discussed earlier, vegetation removal is necessary to keep the ditches clear for conveyance of irrigation water. It should be noted most of these temperature effects will be reduced by the conservation piping program, since piping reduces diversions and tailwater discharges.

### 5.5.3 Non-DWUA Activities Related to Water Quality

#### *Agricultural Related*

It should be noted that the Clallam Conservation District serves as a technical resource for all agricultural related water quality concerns. An MOU between the Clallam Conservation District, Ecology, and the Washington State Conservation Commission details the process for how agricultural water quality complaints are handled. All complaints from individuals, the Conservation District, or other agencies are directed to Ecology for validation. Violations requiring immediate corrective action are handled by Ecology through informal measures or formal enforcement. Operators of farms with violations not requiring immediate corrective action are informed that technical assistance is available from the Conservation District. If the farm operator requests assistance from the Conservation District, they have six months to prepare, and 18 months to implement, a Water Quality Management Plan. If the farm operator does not rectify the problem themselves or with assistance from the Conservation District, Ecology pursues corrective action through informal measures or formal enforcement. The Conservation District has a similar agreement with Clallam County whereby the Conservation District tries to address the problem before fully engaging Ecology.

- ***Run-off.*** Runoff from agricultural lands can be a vehicle for pollutant loading. The Clallam Conservation District works with farms to lessen the effect runoff has on water quality. The style of agriculture and type of crops grown in the CIDMP Action Area generally does not produce high volumes of runoff, except during occasional storm events. Adequate riparian vegetation can help prevent runoff and its contaminants from reaching streams.

- ***Fecal Coliform.*** Fecal coliform can be contributed from agricultural sources in two ways: dairy farm animal waste applied to fields and animal access to water bodies.

  Dairy farms have the potential to contribute waste because cows are typically confined and therefore large volumes of waste are collected, stored, and applied to fields. The wastes are generally applied in liquid form. The Dairy Nutrient Management Act (Chapter 90.64 RCW) requires every dairy farm to create a Dairy Nutrient Management Plan. These plans address how to keep dairy waste from contaminating water bodies and groundwater. Conservation districts provide technical assistance for plan preparation and implementation. They have had cost share programs that pay for as much as 75% of the costs of implementing Best Management Practices (BMPs). Typical structural BMPs include improved waste storage structures, such as concrete slabs and lagoons; improved waste transfer and application equipment; riparian exclusion fencing; and roof runoff management systems on farm buildings. Stored waste is applied to fields during the growing season. The application amount is variable depending on crop type, soil type, and manure nutrient analysis. There are five (5) dairy farms within the DWUA, all of which are working with the Clallam Conservation District to manage their waste.

Manure is typically applied on fields as a fertilizer. However, this practice is not common except on dairy farms in the CIDMP Action Area. One hay farmer occasionally applies liquid manure from a dairy to his fields. There is a small amount of seed crop activity that may use manure fertilizer.

Animal access to waterbodies may contribute to fecal coliform loading. As mentioned above, all dairy farmers are required to create a Dairy Nutrient Management Plan, which addresses keeping livestock out of water bodies. Access to waterbodies by other animals (such as non-commercial farm animals and pets) can also contribute to fecal coliform loading. As mentioned earlier, DWUA Policy Number 18a requires landowners to keep animals out of the irrigation system. The policy states that "water users or any other person or persons are prohibited from introducing pollutants, including but not limited to animal waste, into the Association's water delivery conveyance system." Landowners are allowed to choose their method of livestock restriction, including fencing. DWUA policies are communicated to water users by the DWUA and to non water users with the help of the county; monitored by the DWUA; and referred to proper authorities when necessary by the DWUA. Adequate riparian vegetation buffers can add further pollution protection.

- ***Pesticides.*** Pesticide use by landowners could contribute to water quality concerns. It is difficult to quantify how much pesticide use occurs, but it is believed to be relatively minor. The type of application and limited use indicates that any pesticide use is not likely to reach irrigation ditches. No pesticides, or other chemicals, are applied using irrigation water. Hay is the primary crop in the CIDMP Action Area and pesticides are not used extensively in hay production, although herbicides are used on alfalfa.

  Landowners are forbidden to apply herbicides not approved for aquatic use to the irrigation system. Policy Number 19 of the DWUA's Rules and Regulations states that, "it is illegal for a property owner to apply any herbicide not approved by WSDA and labeled for aquatic use to an irrigation ditch." As noted earlier, DWUA policies are communicated to water users by the DWUA and to non water users with the help of the county; monitored by the DWUA; and referred to proper authorities when necessary by the DWUA.

- ***Oil, Grease, and Fuel***. Farming has the potential to contribute small quantities of oil, grease, and fuel to the water system through the use of heavy farm equipment such as tractors, harvest equipment, and mowers. If this equipment is used near the water and the equipment is leaking fluid, that fluid might gain access to the water. However, it is believed this type of pollutant contribution is minimal.

- ***Turbidity.*** Farming can contribute sediment to water bodies, and thereby affect turbidity, in three ways: exposed field soils, roads, and animal access to water bodies. Exposed field soils can potentially be eroded by water or wind into water bodies. This soil erosion issue is not very applicable to the CIDMP Action Area since the primary crop is hay and little, if any, cultivated land in the Action Area is classified as highly erodible. Hay is a perennial crop which covers the field and leaves little soil exposed. Roads often are dirt or gravel roads and stormwater can transport these materials into waterbodies. Animals gaining access to water bodies can contribute to and stir up sediment. As mentioned above, there are multiple processes working to keep animals out of water bodies. Landowners could help prevent sediment from reaching the water by ensuring adequate riparian vegetative buffers.
- ***Temperature.*** Water users can contribute to increased water temperatures by runoff of unused irrigation water to the irrigation system or streams. Irrigation runoff is often warmer than the receiving water since its smaller volume, relative to the receiving water, heats more quickly. Most irrigation uses sprinkler technology and the primary crop is hay. This combination of factors limits the amount of runoff from irrigation, and prevents temperature impacts from this source, for most of the acreage irrigated. Landowners can also affect water temperature if they remove vegetation to the streams edge. Water temperatures will increase since lack of vegetation results in less shade.
- ***Nutrients.*** Agricultural activities may add nutrients to water bodies through the use of chemical fertilizers or the application of manure (farm animal waste). Most farm land in the area does not receive intensive applications of fertilizer or manure, as noted previously. Animal access to waterbodies can also contribute nutrients, however, as noted above, several processes currently address restricting animal access.

### *Non-Agricultural Related*

- ***Stormwater.*** Stormwater is a significant contributor of pollutants from non-agricultural activities. The rapid growth in Clallam County is increasing the effect of stormwater as the higher percentage of impervious surfaces mean higher runoff. Adequate riparian vegetation could help reduce the pollutants in stormwater from reaching water bodies. This is only applicable to stormwater reaching water bodies via unmanaged routes, rather than via sewer systems.
- ***Fecal Coliform.*** Fecal coliform can be contributed from non-agricultural sources in two ways: failing septic systems; and pets, domestic animals, wildlife, and livestock.

  Failing septic systems can contribute to the fecal coliform problem. The majority of the population in the Action Area relies on septic systems instead of sewer systems. Systems can fail due to improper design, maintenance, and operation. The TMDL identifies correction of failing septic systems as one of the main strategies to address the fecal coliform problem. The Clallam County Environmental Health Division addresses failing septic systems by providing technical assistance, homeowner outreach, and enforcement. They are developing a septic system operations and maintenance program and are experimenting with grant-funded cost share incentives for septic system improvements.

Fecal coliform contributions from pets, domestic animals, livestock, and wildlife (including ducks and geese) can contribute to the fecal coliform problem. Rapid conversion of agricultural land to residences increases the number of household pets with access to waterbodies. The proliferation of small non-commercial farms with a few horses or llamas increases the number of domestic animals not covered by farm plans. The Clallam Conservation District is working on outreach to educate non-commercial farmers. Livestock may access waterbodies or may contribute fecal coliform through stormwater runoff. As mentioned earlier, the DWUA has a policy requiring landowners to keep all animals out of the irrigation system. The TMDL acknowledges that wildlife sources are difficult to control and suggests focusing efforts on controllable sources such as failing septic systems and livestock.

- ***Pesticides.*** Pesticide loading can occur from two sources in the non-agricultural setting: household pesticides and roadside maintenance activities. Pesticide use by homeowners is widespread for lawn and garden care. A variety of pesticides are widely available at home and garden stores and hardware stores. Unlike professional pesticide applicators, homeowners are not trained in pesticide application and some may over apply pesticides because they either do not read labels or intentionally over apply erroneously believing that more is better. Herbicides are sometimes used as a means to control roadside vegetation. The alternative to chemical control is mechanical methods, such as those practiced by the Clallam County Road Department. Mechanical methods can contribute to sediment and turbidity problems.
- ***Oil, Grease and Fuel.*** Oil, grease, and fuel are contributed by roads, parking lots, and commercial businesses via stormwater. Vehicles on roads and parking lots drip oil, grease, and fuel and stormwater events wash these contaminants into water bodies. This loading potential is particularly high for irrigation ditches located alongside roads. Commercial businesses such gas stations, car dealerships, and auto repair shops can leak these materials as well.
- ***Turbidity.*** Sediments can be contributed to water bodies, and thereby affect turbidity, in four ways: development; roads and parking lots; animal access to water bodies; and timber harvest. Development disturbs soils by grading activity and loose particles are then washed into water bodies by stormwater. The City of Sequim has, and Clallam County is working towards, stormwater ordinances that limit this loading source with BMPs such as requiring construction buffering material. Road and parking lot material often decomposes into smaller particles such as grit and is transported by stormwater. Domestic animals gaining access to water bodies can contribute to and stir up sediment. Timber harvest can contribute sediments, although no-cut riparian buffers, as required by the Forest Practices Act (Chapter 76.09 RCW), mitigate this effect. Adequate riparian vegetative buffers can help prevent sediment from reaching water bodies.
- ***Temperature.*** Temperature can be elevated by two causes: stormwater and removal of streamside vegetation. Stormwater elevates water temperature since it is usually a higher temperature than the receiving water body. Stormwater temperatures are

elevated due to their smaller volume, relative to the receiving water body, and because they often run over warm surfaces such as roads. Removal of streamside vegetation can increase water temperatures due to the associated loss of shade. Timber harvesting can contribute to loss of streamside vegetation, although no-cut riparian buffers, as required by the Forest Practices Act (Chapter 76.09 RCW), mitigate this effect.

- ***Nutrients.*** Nutrients can be contributed by six sources in the non-agricultural setting: failing septic systems; pets, domestic animals, wildlife, and livestock; residential or golf course fertilizer; dumping of yard waste; fish hatcheries; and forest management activities. As previously mentioned, septic systems are in wide use in the county and since they contribute fecal coliform contamination, it is reasonable to assume they may also contribute nutrients. Pets, domestic animals, wildlife, and livestock with access to water bodies can similarly contribute nutrients. Chemical fertilizers used on golf courses and residences can be washed into water bodies by stormwater. The practice of dumping yard waste, such as grass clippings, along irrigation ditches can contribute nutrients and result in biological oxygen demand problems downstream as the organic material decomposes. There is a fish hatchery on Hurd Creek that has the potential to add nutrients to that creek. Finally, some forest management activities may utilize chemical fertilizer.

# Section 6 Habitat Conservation Measures and Water Quality Actions

Section 2 of this Comprehensive Irrigation District Management Plan (CIDMP) described existing irrigation facilities and current irrigation operational practices associated with the Dungeness River Agricultural Water Users Association (DWUA). This section identifies a set of actions the DWUA intends to pursue, subject to the availability of funding, to improve habitat conditions for covered species and water quality in the Action Area. These actions are divided into two groups. The first group is Habitat Conservation Measures[1] aimed at protecting and improving habitat conditions for covered species. The Habitat Conservation Measures are listed in Table 6-1. The second group is Water Quality Actions aimed at protecting and improving water quality. The Water Quality Actions were **not** designed to address Endangered Species Act issues. The Water Quality Actions are listed in Table 6-2.

In the course of developing this Plan, certain other potential actions have been identified that may have merit but would require further study. These actions are discussed in the text of Section 6 but are not listed in Tables 6-1 or 6-2.

It should be noted that there is a high degree of consistency between these activities and the recommendations from the Irrigation Water Management section of the WRIA 18 Watershed Plan, which is included in Appendix J.

**Table 6-1**
**Habitat Conservation Measures**

| No. | District/ Company | Measure | Can be funded by DWUA Members alone? [1] |
|---|---|---|---|
| HCM-1 | All | Reduce diversions from Dungeness River per goals in Tables 6-3 to 6-10. This will be done mainly through pipelining and other actions in the DWUA Water Conservation Plan. Additional actions such as water leasing, voluntary reductions in usage and/or construction of storage capacity can also be used to reduce diversions for purposes of HCM-1. | No |
| HCM-2 | Agnew | Modify headgate on Agnew District's diversion facilities on the Dungeness River. [2] | Yes |
| HCM-3 | Sequim-Prairie Tri-Irrigation Company | Modify culvert on Sequim-Prairie Tri-Irrigation Company's Independent bypass channel associated with diversion facilities on Dungeness River. | Yes |
| HCM-4 | Highland | Modify headgate on Highland District's diversion facilities on the Dungeness River. | Yes |
| HCM-5 | Agnew | Improve McDonnell Creek downstream fish passage by realigning fish bypass pipeline. [2] | Yes |
| HCM-6 | Agnew | Inspect McDonnell Creek fish ladder daily and remove debris. | Yes |
| HCM-7 | All | Carry out Yakima Screen Shop Recommendations for diversion facilities from the 2001 report. | No |
| HCM-8 | All | Establish new agency notification and redd protection procedures related to working in-water. | Yes |
| HCM-9 | All | Steam clean or pressure wash all heavy equipment before entering the Dungeness River. Also perform visual inspection to verify no major fluid leaks are present. (Same as WQ-2) | Yes |
| HCM-10 | All | Establish a 100-foot buffer away from waters for refueling heavy equipment, mowers, etc. (Same as WQ-3) | Yes |
| HCM-11 | All | Create a formal spill response plan, including requiring spill containment equipment under certain conditions. (Same as WQ-4). | Yes |
| HCM-12 | All | Continue to contract with WDFW for fish screen maintenance to ensure proper maintenance. | Yes |
| HCM-13 | All | The DWUA will not intentionally dewater intake and bypass channels. | Yes |

(1) For more information on funding of actions, see Section 8.

(2) This project involves the Agnew District head gate. It is separate from a potential DFW project to replace the shared DFW/Agnew intake gate and relocate the fish screen.

**Table 6-2**
**Water Quality Actions**

| No. | District/ Company | Action | Can be funded by DWUA Members alone? [1] |
|---|---|---|---|
| WQ -1 | All | Improve water quality by converting open ditches to closed pipes (closely related to HCM-1 and DWUA Water Conservation Plan). | No |
| WQ-2 | All | Steam clean or pressure wash all heavy equipment before entering the Dungeness River. Also perform visual inspection to verify no major fluid leaks are present. (Same as HCM-9) | Yes |
| WQ-3 | All | Establish a 100-foot buffer away from waters for refueling heavy equipment, mowers, etc. (Same as HCM-10) | Yes |
| WQ-4 | All | Create a formal spill response plan, including requiring spill containment equipment under certain conditions. (Same as HCM-11). | Yes |
| WQ -5 | All | Continue integrated pest management plan including responsible use of herbicide in a manner that protects water quality. | Yes |
| WQ -6 | All | Strive to perform ditch maintenance during the non-irrigation season, when ditches are less likely to be watered or contain less water. | Yes |
| WQ -7 | All | Continue to publicize and monitor compliance of DWUA Policy #19 stating it is illegal to apply herbicides not approved for aquatic use to the irrigation system. | Yes |
| WQ -8 | All | Continue to require (and monitor compliance) that water users owned distribution systems are comprised of closed pipe. (DWUA Policy #22) Also continue the cost share program for installing this pipe. | Yes |
| WQ -9 | All | Continue to publicize and monitor compliance of DWUA Policy #18a stating it is illegal to introduce any pollutant, including animal waste, to the irrigation system. | Yes |
| WQ -10 | All | Continue to publicize and monitor compliance of DWUA Policy #18b stating it is illegal to direct stormwater drainage into the irrigation system. | Yes |
| WQ -11 | All | Continue to work with other organizations on clean water programs relevant to irrigation activities. | Yes |

(1) For more information on funding of actions, see Section 8.

## 6.1 Reduced Diversion from Dungeness River

- ***HCM-1: Reduce diversions from Dungeness River per tables 6-3 to 6-10.*** The DWUA desires to reduce its surface water diversions from the Dungeness River on an average, peak and annual basis. This action and the associated increase in flow of the Dungeness River is considered to be the primary element of this CIDMP and the action with the greatest benefit to fisheries. It should be noted that water quality benefits closely related to this habitat conservation measure are discussed under Water Quality Action No. 1 (WQ-1). The DWUA has identified goals for limiting its diversions to the quantities shown in Tables 6-3 through 6-10.

  The following points apply to Tables 6-3 to 6-10:

  - The diversion goals will be phased in over a period of time. As explained in Section 8, full implementation of these diversion goals could be achieved at 20 years from the issuance of an ITP, although progress could proceed faster if funding were secured faster than anticipated. There is one exception to this phasing: reductions in stock water use to 12 cfs from September 16 through October 31 can likely be achieved early in the implementation period.[1]
  - The proposed diversion goals are designed to protect habitat conditions at the upper IFIM site (RM 4.2), however the USGS gage site (RM 11.8) will be used as the management control point, including DWUA operational decisions, monitoring and compliance. The decision to use the USGS gage as the management control point was made to provide a point of measurement that is long-term, will be maintained in the future, and is consistent with the Trust Water Rights Agreement.
  - The tables are organized into eight time periods, with differing goals on average and peak DWUA diversions. Each table displays a range of flows that may occur during a specific time period as measured at the USGS gage site, as well as the percent exceedance for each flow level. The tables show the diversion goals, and the estimated effect at the upper IFIM site (accounting for diversions and losses to groundwater).
  - The tables use the assumption that 10 percent of the flow measured at the USGS gage is lost to groundwater between the USGS gage site and the upper IFIM site. This is consistent with the analysis presented in the discussion of losses to groundwater downstream of the USGS gage, in Section 4.1.1 of this CIDMP. The assumption was based on analysis originally performed by Simonds and Sinclair (2002). However, it should be recognized that losses to groundwater may vary, over the range of flows presented.
  - An "exceedance" value is given in the second column of each table. The flow values at the USGS gage and the upper IFIM site can be expected to be exceeded that percentage of the time. For example, in Table 6-3 displaying conditions in April and May, flows can be expected to be greater than 300 cfs at the USGS gage (first column), and greater than 220 cfs at the upper IFIM site (far right column) in 67 years out of 100 (67% exceedance,

[1] During the remaining months outside irrigation season, the limit will remain 20 cfs. This quantity is needed for maintenance purposes to keep the ditches free of rodent burrows and control vegetation in the ditches.

shown in the second column). In the same table, flows can be expected to be greater than 215 cfs and 144 cfs respectively, in 90 years out of 100 (90 percent exceedance).

- Wherever the tables display a sharp change in the maximum diversion, the diversion quantity shown is intended to be pro-rated proportionately with the associated change in river flows. For example, in Tables 6-3 and 6-4, when flows at the USGS gage fall from 620 to 600 cfs, the maximum diversion goal will fall from 80 to 70 cfs in incremental steps. In this particular example, every increment of 10 cfs in flow represents a reduction in maximum diversion of 5 cfs.
- The diversion goals are based on desired flow targets at the upper IFIM site (RM 4.2) throughout irrigation season. During spring and early summer, the optimum instream flows at the upper IFIM site identified in the USFWS IFIM study are used as a flow target (475 cfs from April – July). That flow target can be met between 21 and 41 percent of the time in these months. It is estimated that the mean flow in June and July will be 445 cfs after irrigation diversions, which is close to the target of 475 cfs.
- For the remainder of irrigation season, the optimum instream flow at the upper IFIM site identified in the IFIM study is 180 cfs. However, this flow could not be achieved for long periods in most years even under natural conditions if there were no diversions from the Dungeness River. Therefore diversion goals for late summer and early fall are proposed that will keep the median flow at the upper IFIM site above or near 100 cfs, and will almost never allow flow to drop below 60 cfs. These flow targets were selected because 100 cfs represents 75 percent of the optimum weighted useable area (WUA) from the IFIM study, and 60 cfs represents 50 percent of optimum WUA, at the upper IFIM site.
- Diversions are measured on a very accurate and frequent basis with flumes and data loggers. The average diversion (shown in Tables 6-3 through 6-10) will be calculated over a 2 week time period throughout the irrigation season. The calculation will be performed using hourly flow information. The maximum diversion is a short-term diversion that may occur because of rising river levels causing an inadvertent increase in diversions or to make up a shortfall that may have occurred because of dropping river levels or interruptions in diversions or high demands. It is not anticipated this maximum will be met for much time as it will create the need for lower-than-average diversions for some part of the 2-week calculation period.

These goals are more stringent than those agreed to under the MOU on Trust Water Rights. If these goals can be achieved, DWUA could reduce its diversions to a quantity less than 50 percent of the flow of the Dungeness River as measured at the USGS gage, as allowable under the MOU. In recent years DWUA has carefully managed its diversions to meet irrigation needs while minimizing impacts on the river and it has not been necessary to take 50% of the flow. However, implementation of these new goals on diversions would further reduce DWUA's diversions. In addition, if climate conditions change and natural flows in the Dungeness River are reduced, these goals would constrain diversions much more than under current diversion limits applicable to the DWUA.

DWUA will continue to seek voluntary agreements among its members in the face of droughts to prioritize water uses. This has been successful in past years, including 2005. However, in doing so DWUA must avoid implementing coercive, discriminatory rules and policies that would be contrary to state law and DWUA authorities.

Tables 6-3 and 6-4 display the time period from the onset of irrigation season on April 15 through the end of July. At this time, flows in the Dungeness River are at their highest, due to runoff from snowmelt in the Olympic Mountains. Higher diversions during this time period help the DWUA saturate canal banks to reduce infiltration losses later in the year, as well as to control canal bank vegetation.

The IFIM study indicated an optimal flow of 475 cfs in the Dungeness River at the upper IFIM site during this entire time period. However, as shown by the USGS gage flows and percent exceedance, this condition is not always met even in the absence of DWUA diversions.

During this time period, DWUA's ultimate goal is to limit its diversions to no more than 80 cfs when flows at the USGS gage are 620 or higher, which corresponds to an estimated flow of 478 cfs at the upper IFIM site. When flows at the USGS gage fall to 600 cfs, the average diversion will drop to 65 cfs and the maximum diversion will drop to 70 cfs. When flows at the USGS gage drop to 550 cfs, the average diversion goal will be 50 cfs and the maximum diversion goal will be 55 cfs. During the April-May time period, median flows at the USGS gage are on the order of 374 cfs (50% exceedance). Median flows during June and July are much higher (550 cfs). However, the table shows flows at the USGS gage down to 148 cfs in April and May, and 166 cfs in June and July to illustrate potential worst case flow conditions. For all levels of flow at the USGS gage, and associated diversions, the resulting flows at the upper IFIM site are shown in the far right column.

A different range in the goal is shown for the remainder of the irrigation season. During this time period, flows in the Dungeness River drop as the snowmelt period comes to an end. At the same time, substantial quantities of water are needed for irrigation during this time period. Tables 6-5 through 6-7 show DWUA goals during the time periods August 1-15, August 16-31; and September 1-15, respectively. Diversions would be gradually reduced, when flows in the Dungeness River drop to progressively lower levels. Since flow levels in the river vary from year to year, this approach provides a means to match irrigation diversions to the fluctuating flow conditions that affect fish habitat. Under some flow conditions, the maximum diversion may be as low as 25 cfs. Under low flow conditions, the diversions shown here are lower than the diversions currently allowed under the MOU on Trust Water Rights. As noted above, the objective is to ensure that a flow of at least 100 cfs is maintained at the upper IFIM site at least one half the time; and that flows almost never drop below 60 cfs.

Diversion of water for irrigation purposes ceases on September 15. From then until April 15, diversions are limited to water needed for stock watering and other non-irrigation uses. Tables 6-8 through 6-10 show the time periods September 16-30, October 1-31 and November 1 - April 14, respectively. The diversion goals are no more than 12 cfs from September 16 to October 31; and 20 cfs from November 1 to April 14. Under rare flow conditions, diversions during the November 1 – April 14 time period may be reduced below 20 cfs, in order to maintain a flow of at least 60 cfs at the upper IFIM site.

**Table 6-3**
**Proposed Diversion Goals (April 15 – May 31)**
**(All Values in cfs Except Where Noted)**

| Streamflow at USGS Gage at RM 11.8 | Percent Exceedance[1] for April-May | Current Diversion Limits (Maximum)[2] | New Diversion Goals | | Loss to Groundwater[3] | Estimated Streamflow at Upper IFIM Site with New Diversion Goals (Average) |
|---|---|---|---|---|---|---|
| | | | Limit on Average Diversion | Limit on Max Diversion | | |
| ≥ 766 | ≤ 10% | 156 | 80 | 80 | ≥ 77 | ≥ 609 |
| 620 | 19% | 156 | 80 | 80 | 62 | 478 |
| 600 | 21% | 156 | 65 | 70 | 60 | 475 |
| 550 | 26% | 156 | 50 | 55 | 55 | 445 |
| 500 | 31% | 156 | 50 | 55 | 50 | 400 |
| 450 | 37% | 156 | 50 | 55 | 45 | 355 |
| 374 | 50% | 156 | 50 | 55 | 37 | 287 |
| 300 | 67% | 150 | 50 | 55 | 30 | 220 |
| 215 | 90% | 107 | 50 | 55 | 22 | 144 |
| 148 | 99% | 74 | 50 | 55 | 15 | 83 |

(1) Based on long-term flow records, natural flows exceed this amount x% of the time in this portion of the season. The median row is highlighted.
(2) Memorandum of Understanding on Trust Water Rights
(3) Groundwater loss between River Mile 11.8 and 4.2 estimated as 10% of flow at USGS gage.
(4) Prorate allowable diversions when Dungeness River flow is between 550 – 620 cfs at USGS gage.

**Table 6-4**
**Proposed Diversion Goals (June 1 –July 31)**
**(All Values in cfs Except Where Noted)**

| Streamflow at USGS Gage at RM 11.8 | Percent Exceedance[1] for June-July | Current Diversion Limits (Maximum)[2] | New Diversion Goals | | Loss to Groundwater[3] | Estimated Streamflow at Upper IFIM Site with New Diversion Goals (Average) |
|---|---|---|---|---|---|---|
| | | | Limit on Average Diversion | Limit on Max Diversion | | |
| ≥ 998 | ≤ 10% | 156 | 80 | 80 | ≥ 100 | ≥ 818 |
| 620 | 38% | 156 | 80 | 80 | 62 | 478 |
| 600 | 41% | 156 | 65 | 70 | 60 | 475 |
| 550 | 50% | 156 | 50 | 55 | 55 | 445 |
| 500 | 58% | 156 | 50 | 55 | 50 | 400 |
| 400 | 76% | 156 | 50 | 55 | 40 | 310 |
| 311 | 90% | 155 | 50 | 55 | 31 | 230 |
| 166 | 99% | 83 | 50 | 55 | 17 | 100 |

(1) Based on long-term flow records, natural flows exceed this amount x% of the time in this portion of the season. The median row is highlighted.
(2) Memorandum of Understanding on Trust Water Rights
(3) Groundwater loss between River Mile 11.8 and 4.2 estimated as 10% of flow at USGS gage.
(4) Prorate goals when Dungeness River flow is between 550 – 620 cfs at USGS gage.

**Table 6-5**
**Proposed Diversion Goals (August 1-15)**
**(All Values in cfs Except Where Noted)**

| Streamflow at USGS Gage at RM 11.8 | Percent Exceedance[1] for August 1-15 | Current Diversion Limits (Maximum)[2] | New Diversion Goals | | Loss to Groundwater[3] | Estimated Streamflow at Upper IFIM Site with New Diversion Goals (Average) |
|---|---|---|---|---|---|---|
| | | | Limit on Average Diversion | Limit on Max Diversion | | |
| ≥ 455 | ≤ 10% | 156 | 50 | 55 | ≥ 46 | ≥ 360 |
| 350 | 25% | 156 | 50 | 55 | 35 | 265 |
| 300 | 40% | 150 | 50 | 55 | 30 | 220 |
| 275 | 50% | 137 | 50 | 55 | 28 | 198 |
| 256 | 53% | 128 | 50 | 55 | 26 | 180 |
| 200 | 83% | 100 | 50 | 55 | 20 | 130 |
| 186 | 90% | 93 | 50 | 55 | 19 | 117 |
| 167 | 95% | 83 | 50 | 55 | 17 | 100 |
| 132 | 99% | 66 | 50 | 55 | 13 | 69 |

(1) Based on long-term flow records, natural flows exceed this amount x% of the time in this portion of the season. The median row is highlighted.
(2) Memorandum of Understanding on Trust Water Rights
(3) Groundwater loss between River Mile 11.8 and 4.2 estimated as 10% of flow at USGS gage.

**Table 6-6**
**Proposed Diversion Goals (August 16-31)**
**(All Values in cfs Except Where Noted)**

| Streamflow at USGS Gage at RM 11.8 | Percent Exceedance[1] for August 16-31 | Current Diversion Limits (Maximum)[2] | New Diversion Goals | | Loss to Groundwater[3] | Estimated Streamflow at Upper IFIM Site with New Diversion Goals (Average) |
|---|---|---|---|---|---|---|
| | | | Limit on Average Diversion | Limit on Max Diversion | | |
| ≥ 345 | ≤ 10% | 156 | 50 | 55 | ≥ 35 | ≥ 261 |
| 300 | 16% | 150 | 50 | 55 | 30 | 220 |
| 256 | 27% | 128 | 50 | 55 | 26 | 180 |
| 206 | 50% | 103 | 50 | 55 | 21 | 135 |
| 180 | 64% | 90 | 50 | 55 | 18 | 112 |
| 167 | 74% | 83 | 50 | 55 | 17 | 100 |
| 160 | 80% | 80 | 50 | 55 | 16 | 94 |
| 143 | 90% | 71 | 50 | 55 | 14 | 79 |
| 120 | 98% | 60 | 48 | 48 | 12 | 60 |
| 113 | 99% | 56 | 42 | 42 | 11 | 60 |

(1) Based on long-term flow records, natural flows exceed this amount x% of the time in this portion of the season. The median row is highlighted.
(2) Memorandum of Understanding on Trust Water
(3) Groundwater loss between River Mile 11.8 and 4.2 estimated as 10% of flow at USGS gage.
(4) Prorate goals when Dungeness River flow is between 113 – 143 cfs at USGS gage.

**Table 6-7**
**Proposed Diversion Goals (Sept 1-15)**
**(All Values in cfs Except Where Noted)**

| Streamflow at USGS Gage at RM 11.8 | Percent Exceedance[1] for September 1-15 | Current Diversion Limits (Maximum)[2] | New Diversion Goals | | Loss to Groundwater[3] | Estimated Streamflow at Upper IFIM Site with New Diversion Goals (Average) |
|---|---|---|---|---|---|---|
| | | | Limit on Average Diversion | Limit on Max Diversion | | |
| ≥ 265 | ≤ 10% | 132 | 50 | 55 | ≥ 27 | ≥ 189 |
| 256 | 12% | 128 | 50 | 55 | 26 | 180 |
| 200 | 29% | 100 | 50 | 55 | 20 | 130 |
| 180 | 39% | 90 | 50 | 55 | 18 | 112 |
| 167 | 48% | 83 | 50 | 55 | 17 | 100 |
| 164 | 50% | 82 | 48 | 53 | 16 | 100 |
| 140 | 76% | 70 | 48 | 53 | 14 | 78 |
| 121 | 90% | 60 | 48 | 48 | 12 | 61 |
| 110 | 95% | 55 | 39 | 39 | 11 | 60 |
| 94 | 99% | 47 | 25 | 25 | 9 | 60 |

(1) Based on long-term flow records, natural flows exceed this amount x% of the time in this portion of the season. The median row is highlighted.
(2) Memorandum of Understanding on Trust Water Rights
(3) Groundwater loss between River Mile 11.8 and 4.2 estimated as 10% of flow at USGS gage.
(4) Prorate goals when Dungeness River flow is between 94 – 140 cfs at USGS gage.

**Table 6-8**
**Proposed Diversion Goals (Sept 16-30)**
**(All Values in cfs Except Where Noted)**

| Streamflow at USGS Gage at RM 11.8 | Percent Exceedance [1] for September 16-30 | Current Diversion Limits (Maximum) [2] | New Diversion Goals | | Loss to Groundwater[3] | Estimated Streamflow at Upper IFIM Site with New Diversion Goals (Average) |
|---|---|---|---|---|---|---|
| | | | Limit on Average Diversion | Limit on Max Diversion | | |
| ≥ 241 | ≤ 10% | n/a | 12 | 12 | ≥ 24 | ≥ 205 |
| 222 | 12% | n/a | 12 | 12 | 22 | 188 |
| 200 | 16% | n/a | 12 | 12 | 20 | 168 |
| 180 | 24% | n/a | 12 | 12 | 18 | 150 |
| 160 | 38% | n/a | 12 | 12 | 16 | 132 |
| 145 | 50% | n/a | 12 | 12 | 15 | 119 |
| 133 | 60% | n/a | 12 | 12 | 13 | 108 |
| 120 | 72% | n/a | 12 | 12 | 12 | 96 |
| 110 | 83% | n/a | 12 | 12 | 11 | 87 |
| 101 | 90% | n/a | 12 | 12 | 10 | 79 |
| 89 | 98% | n/a | 12 | 12 | 9 | 68 |
| 82 | 99% | n/a | 12 | 12 | 8 | 62 |

(1) Based on long-term flow records, natural flows exceed this amount x% of the time in this portion of the season. The median row is highlighted.
(2) Memorandum of Understanding on Trust Water Rights – The MOU only addresses irrigation water from April 15 to Sept 15.
(3) Groundwater loss between River Mile 11.8 and 4.2 estimated as 10% of flow at USGS gage.

**Table 6-9**
**Proposed Diversion Goals (October 1-31)**
**(All Values in cfs Except Where Noted)**

| Streamflow at USGS Gage at RM 11.8 | Percent Exceedance[1] for October 1-15 | Current Diversion Limits (Maximum)[2] | New Diversion Goals: Limit on Average Diversion | New Diversion Goals: Limit on Max Diversion | Loss to Groundwater[3] | Estimated Streamflow at Upper IFIM Site with New Diversion Goals (Average) |
|---|---|---|---|---|---|---|
| ≥ 300 | ≤ 10% | n/a | 12 | 12 | ≥ 30 | ≥ 258 |
| 222 | 18% | n/a | 12 | 12 | 22 | 188 |
| 200 | 23% | n/a | 12 | 12 | 20 | 168 |
| 180 | 28% | n/a | 12 | 12 | 18 | 150 |
| 160 | 35% | n/a | 12 | 12 | 16 | 132 |
| 137 | 50% | n/a | 12 | 12 | 14 | 111 |
| 133 | 53% | n/a | 12 | 12 | 13 | 108 |
| 120 | 64% | n/a | 12 | 12 | 12 | 96 |
| 95 | 90% | n/a | 12 | 12 | 10 | 74 |
| 89 | 96% | n/a | 12 | 12 | 9 | 680 |
| 80 | 99% | n/a | 12 | 12 | 8 | 60 |

(1) Based on long-term flow records, natural flows exceed this amount x% of the time in this portion of the season. The median row is highlighted.
(2) Memorandum of Understanding on Trust Water Rights – The MOU only addresses irrigation water from April 15 to Sept 15.
(3) Groundwater loss between River Mile 11.8 and 4.2 estimated as 10% of flow at USGS gage.

**Table 6-10**
**Proposed Diversion Goals (Nov. 1 - April 14)**
**(All Values in cfs Except Where Noted)**

| Streamflow at USGS Gage at RM 11.8 | Percent Exceedance[1] for October 16-30[5] | Current Diversion Limits (Maximum)[2] | New Diversion Goals: Limit on Average Diversion | New Diversion Goals: Limit on Max Diversion | Loss to Groundwater[3] | Estimated Streamflow at Upper IFIM Site with New Diversion Goals (Average) |
|---|---|---|---|---|---|---|
| ≥ 450 | ≤ 10% | n/a | 20 | 20 | ≥ 45 | ≥ 385 |
| 222 | 33% | n/a | 20 | 20 | 22 | 180 |
| 200 | 38% | n/a | 20 | 20 | 20 | 160 |
| 180 | 44% | n/a | 20 | 20 | 18 | 142 |
| 164 | 50% | n/a | 20 | 20 | 16 | 128 |
| 140 | 63% | n/a | 20 | 20 | 14 | 106 |
| 133 | 67% | n/a | 20 | 20 | 13 | 100 |
| 120 | 74% | n/a | 20 | 20 | 12 | 88 |
| 97 | 90% | n/a | 20 | 20 | 10 | 67 |
| 89 | 94% | n/a | 20 | 20 | 9 | 60 |
| 73 | 99% | n/a | 6 | 6 | 7 | 60 |

(1) Based on long-term flow records, natural flows exceed this amount x% of the time in this portion of the season. The median row is highlighted.
(2) Memorandum of Understanding on Trust Water Rights – The MOU only addresses irrigation water from April 15 to Sept 15.
(3) Groundwater loss between River Mile 11.8 and 4.2 estimated as 10% of flow at USGS gage.
(4) Prorate goals when Dungeness River flow is between 73 – 89 cfs at USGS gage.
(5) These exceedance percentages are just for Oct 16-Oct 30, while the rest of the information in the table is for Oct 16-April 14.

### 6.1.1 Implementation of 1999 Water Conservation Plan

The *Dungeness River Agricultural Water Users Association Comprehensive Water Conservation Plan* (CWCP) (MWG, 1999) presented a series of potential projects the DWUA could implement that would conserve water and improve operations. Implementation of the Water Conservation Plan provides the primary mechanism to achieve the diversion reductions described under Habitat Conservation Measure HCM-1.

Water conservation projects fall into the following categories:

- Replace open ditches with pipelines,
- Construct regulating reservoirs,
- Combine irrigation delivery systems,
- Construct additional measuring weirs and control structures,
- Increase maintenance of open canal systems,
- Eliminate long reaches of canal and switch end users to groundwater,
- Prepare drought response plans for water-short years, and
- Start educational program to reduce water use.

The main opportunities for water savings are reducing conveyance losses through unlined ditches and reducing tailwater discharged at the very end of the various ditch systems.

The total cost of all projects in the CWCP is approximately $14.2 million. Projects listed in the CWCP are summarized in Appendix L. Appendix L also lists projects that have been completed since the CWCP was issued in 1999. The CWCP should be consulted for a more detailed description of the proposed water conservation measures.

Potential water savings from the CWCP were estimated at 29.9 cfs[2] based on conditions and practices prevalent in 1996/97.

By 2003, 7.2 cfs of these savings have already been achieved through implementation of projects identified in the CWCP. 3.2 cfs of these savings have been accomplished through pipelining projects and the remaining 4.0 cfs of these savings are from other types of projects including regulating reservoirs and operational changes. Given these savings already achieved, approximately 22.7 cfs remains to be achieved through further implementation of the CWCP. However, this is likely a low estimate, since some of the measures already used to reduce diversions were not included in the CWCP.

The estimated reduction in diversions with implementation of the water conservation projects does not account for other water conservation measures implemented by the DWUA, which include better maintenance and management of the irrigation system, drought management during low streamflow periods and on-farm water conservation measures including piping and construction of on-farm reservoirs. In addition, diversions

[2] The original CWCP estimated 33.4 cfs in savings. This has been reduced, due to elimination of two projects, the conversion of water supply for Cline Irrigation District at the north end of their system from surface water to groundwater and the reuse of treated wastewater. Those projects are not favored by the SDWUA and will likely not be undertaken.

change in response to crop demands and changing crop patterns or changes in land use. As discussed in Section 1.3.1, there has been a gradual decline of irrigated land, as farmland is converted to other uses.

### 6.1.2 Water Rights Leasing, Storage and Other Techniques

In addition to the implementation of the comprehensive water conservation plan, other techniques are available to contribute to meeting the diversion limitations under Habitat Conservation Measure HCM-1. For example, in recent years the State of Washington has made funds available to lease water rights from irrigators in the Sequim-Dungeness area. The water leased is left in the Dungeness River, rather than being diverted, for the affected time period. Split-season leases have been used to provide for harvest of the first hay crop of the season while reducing late season diversions. During the 2001 drought this technique removed 1,000 acres from irrigation from August 1 to September 15. Similar leases have been negotiated for years 2003-05. For this three-year program, leases for more than 1,400 acres of farmland have been negotiated that reduce diversions by 10 cfs between August 1 and September 15. This can be particularly important in years when flows in the Dungeness River are unusually low.

The WRIA 18 Watershed Planning Unit has been developing a plan under the State's Watershed Planning Program (Chapter 90.82 RCW). One element of this plan is consideration of storage opportunities that could also reduce late-season diversions. At this time a study of storage sites has been completed and funding needs identified. For example, the proposed Atterberry Irrigation Reservoir could reduce diversions by 8 cfs from August 15 to September 15 at a cost of $3.4 million. If a storage site is developed, this will also contribute to the DWUA's ability to achieve the diversion limitations under Habitat Conservation Measure HCM-1. The DWUA will continue to participate in discussions of storage opportunities.

In selected years, depending on weather conditions, commodity prices, and other factors, some landowners may choose to voluntarily cut back on irrigating certain lands. In the event not all water conservation projects can be constructed to meet the implementation schedule described in Section 8, such voluntary cutbacks can help provide the flexibility needed to bridge the gap until permanent measures can be put in place through construction projects.

## 6.2 Diversion Facilities and Related Practices

A description of the DWUA irrigation diversion facilities and their operations is contained in Section 2.3. The following paragraphs describe potential improvements to the facilities and operation and maintenance of those facilities.

### 6.2.1 Modifications to Diversion Structures, Screens and Bypasses

This section describes potential modifications to existing DWUA diversion facilities.

#### *Shared Agnew/WDFW Diversion on Dungeness River*

Of the shared facilities, Agnew Irrigation District operates the intake gate, pipeline and fish screen structure. WDFW operates the diversion and intake channel to the gate.

- ***HCM-2: Modify headgate on Agnew District's diversion facilities on the Dungeness River.*** The action identified for this CIDMP on Agnew controlled facilities is to reduce direct effects potentially caused by the intake gate. The action is to submerge the outlet of the gate to reduce the velocity of water discharging at the base of the gate and reduce the potential for physical impact by fish against the concrete structure. The submergence will be achieved by constructing a low weir at the outlet, allowing water to discharge from under the gate into a pool.

  This action is different from a potential WDFW project related to these diversion facilities. WDFW is currently preparing a study of the diversion and is considering moving the fish screen structure closer to the river. That action would likely entail replacing the intake gate, and allow only screened water to flow through the Agnew pipeline. Agnew Irrigation District is not currently participating in the WDFW study and will likely not be required to provide funding assistance to WDFW to implement the improvements to the shared facilities.

#### *Sequim-Prairie Tri-Irrigation Company's Independent Canal Diversion*

- ***HCM-3: Modify culvert on Sequim-Prairie Tri-Irrigation Company's Independent Canal bypass channel associated with diversion facilities on Dungeness River.*** An action to conserve listed species is to improve the outlet conditions of the culvert downstream of the fish screen on the fish bypass. A high velocity flow exits the culvert onto the downstream channel without an outlet pool to reduce the velocity. The proposed action is to construct a step pool at the outlet of the culvert.

- ***Potential Action: Eliminate diversion structure on Dungeness River.*** A potential action to minimize effects of Sequim-Prairie Tri-Irrigation Company's Independent Canal diversion structure is to obtain the water required to operate the Independent Canal from the Highland Irrigation District canal. The current diversion would be eliminated with this project.

  A brief review of the feasibility of the project was performed for this CIDMP and presented to the CIDMP Technical Advisory Team. Two alternative projects were identified that would close off the Independent Canal intake channel and supply water to the Independent Canal from the Highland canal. It was determined that either alternative is feasible. Although technically feasible, a subsequent reduction in flow in the Dungeness River between the Highland diversion and the location of the Independent Canal diversion will need to be assessed to determine permitting acceptability. Any operational change such as this would probably require filing a water rights change application with Ecology.

The DWUA is willing to consider joint withdrawal from a single point of diversion for the Highland and Sequim-Prairie Tri-Irrigation Companies, if funding is available and if there is consensus the project would reduce potential direct effects on listed species. However, at this time it is not known whether these conditions will be met, so this measure should be considered provisional. Therefore, this action is not included as a Habitat Conservation Measure at this time, and DWUA makes no formal commitment to this action.

### *Highland Diversion*

- ***HCM-4: Modify headgate on Highland District's diversion facilities on the Dungeness River.*** An action to conserve listed species is to modify the operation of the intake gate. The gate is similar to the gate at the Agnew diversion and it is proposed to construct a small weir downstream of the outlet to submerge the high velocity jet at the base of the gate.

### *McDonnell Creek Diversion*

- ***Pursue data gathering and alternatives identified in the McDonnell Creek technical report.*** A workgroup of TAT members was established to address issues related to McDonnell Creek. There are two main habitat issues: the effects of the current dam and its operation on juvenile fish passage and the potential that flow augmentation using Dungeness River water may inadvertently attract Dungeness River fish to McDonnell Creek.

  The workgroup resulted in a technical report detailing the feasibility, effects, and costs of three alternatives including: 1) no change in operations; 2) rehabilitating the diversion dam for improved fish passage; and 3) reconfiguring Agnew's distribution system so McDonnell Creek is not used for conveyance, including partial or full dam removal.

  The DWUA is interested is pursuing both Alternatives 2 and 3, which are not mutually exclusive. The report recommends gathering additional specific data to determine whether Alternative 3, which is the alternative preferred by WDFW and the Jamestown S'Kallam Tribe, is warranted given its cost. DWUA will pursue gathering this data and determining a course of action, although this is a not formal commitment associated with the Incidental Take Permit.

  The complete technical report, including a memo from the Jamestown S'Klallam Tribe expressing their concerns about McDonnell Creek, can be found in Appendix K.

- ***HCM-5: Improve McDonnell Creek downstream fish passage by realigning fish bypass pipeline.*** To improve the fish bypass system, the fish bypass pipe will be realigned to discharge into a deeper pool. The fish bypass system will be reconfigured with assistance of WDFW and this action is subject to WDFW approval and participation, as they have a contract to perform maintenance of the fish screen structures.

- ***HCM-6: Inspect McDonnell Creek fish ladder daily and remove debris.*** The current fish ladder on McDonnell Creek is prone to clogging from debris because of its narrow width. When clogged the fish ladder is not effective. The action proposed by the DWUA is to inspect the fish ladder and remove debris during the daily ditch-rider rounds throughout the year.

#### *All Diversions – Yakima Screen Shop Recommendations*

- ***HCM-7: Carry out the Yakima Screen Shop Recommendations for diversion facilities from the 2001 report.*** The Yakima Screen Shop, which performs regular maintenance on the fish screens, performed an evaluation of all diversion facilities (not just the fish screens) in the fall of 2001. The resulting report, *Dungeness River Screening Investigation and Report*, lists recommendations for each diversion (see Appendix F). Some recommendations are specific equipment modifications, such as installing a new fish screen. Other recommendations suggest investigating possible changes, such as possibly moving a fish screen closer to the diversion intake. The DWUA hopes to carry out the recommendations in the report, to the extent funding for these improvements can be secured.

### 6.2.2 Maintenance of Dungeness River Intakes

Section 2.4 described occasional, short-duration activities involving use of heavy equipment in or near water ways. The DWUA plans to follow procedures that protect fish habitat and water quality when using heavy equipment for these purposes. The DWUA anticipates documenting the following existing and new procedures into a formal statement of procedures, to be followed by all DWUA members and their respective staff.

- ***HCM-8: Establish new agency notification and redd protection procedures related to working in-water.*** In addition to the standard notification of WDFW under Hydraulic Project Approvals (HPAs), the DWUA will endeavor to avoid redd disturbance by doing the following:

  - ♦ For areas where redds could be present (e.g. the Dungeness River and intake channels), the DWUA will try to anticipate maintenance needs in order to perform work m during non spawning and incubation periods whenever possible. This is not always possible since many maintenance needs are not apparent until the low flow season, which overlaps with the spawning season.

- ♦ If work must be performed during spawning and incubation periods, the DWUA will check for the presence of redds in the work area before entering the river by doing the following:

  - Review the spawning survey data from WDFW's weekly Chinook surveys performed from August to October. Jamestown S'Klallam Tribe (JST) documents the location of redds using a GPS system based on survey flags placed by WDFW.
  - Look for spawning survey flags indicating redds. WDFW marks the location of redds with a flag on a tree or other structure on the riverbank.
  - Request a public agency or JST provide a professional biologist to check for redds. The DWUA will keep an updated list of at least four biologists available for this task. Likely candidates include biologists from the Tribe, WDFW, USFWS and NOAA Fisheries.
  - Hold an annual redd identification training by a professional biologist from a public agency or JST at the beginning of spawning season for appropriate DWUA staff.

- ♦ If a redd is identified in the work area, the DWUA will consider options for postponing or avoiding the maintenance work, such as delivering less water, routing water through other diversions, or other creative solutions.
- ♦ If a redd is identified in the work area and the DWUA determines that maintenance must be performed, the DWUA will work with USFWS, NOAA Fisheries, and WDFW to find a mutually agreeable solution which allows the DWUA to exercise their legal water right, while minimizing impacts to the redd.

- ■ ***HCM-9: Steam clean or pressure wash all heavy equipment before entering the Dungeness River. Also perform visual inspection to verify no major fluid leaks are present (Same as WQ-2).*** The DWUA may require that all heavy equipment is either steam cleaned or pressure washed prior to entering the Dungeness River or any other water way. Furthermore, equipment operators will perform a visual inspection to verify that no major fluid leaks are present. This policy will be followed regardless of whether the heavy equipment is owned, rented, or contracted by the irrigation district or company.
- ■ ***HCM-10: Establish a 100-foot buffer away from waters for refueling heavy equipment, mowers, etc (Same as WQ-4).*** During occasional, short-duration activities involving heavy equipment and mowers in or near water ways (see Section 2.4), the DWUA plans to establish a one-hundred (100) foot buffer from the Dungeness River, intake channels, and bypass channels where re-fueling of heavy equipment is prohibited. To the extent that occasional on-site maintenance activities or repairs are needed, the buffer will also apply to these activities. However, this buffer will not apply to emergency repairs of heavy equipment in the event a breakdown occurs in the field and the equipment cannot be moved under its own power.

- ***HCM-11: Create a formal spill response plan, including requiring spill containment equipment under certain conditions. (Same as WQ-4)*** The DWUA plans to create a formal written spill response plan. The plan will require that operators using heavy equipment in waterways (see Section 2.4) have spill containment booms on site and are trained in their use. This requirement elevates the DWUA's role in immediate response to a spill. The plan will also document that the DWUA relies significantly on the professional spill response program linked via the county's 911 system. That highly integrated system connects containment and clean up resources from road departments, fire departments, and the Coast Guard. The plan will also require that equipment operators report any spill to Ecology.

### 6.2.3 Screen Maintenance and Water Levels in Intake and Bypass Channels

- ***HCM-12: Continue to contract with WDFW for fish screen maintenance to ensure proper maintenance.*** The DWUA currently contracts with WDFW for maintenance of the fish screens. The DWUA does not anticipate changing this arrangement because of WDFW's expertise with fish screens. No change in operation or maintenance practices is recommended.

- ***HCM-13: The DWUA will not intentionally dewater intake and bypass channels.*** Intake and bypass channels are accessible to fish and are sometimes used as rearing habitat. Therefore, the DWUA will protect this fish habitat by not intentionally dewatering the channels. It should be noted that the DWUA does not have control over natural processes that could affect the water level in the channels. For example, a storm event might shift gravel in the Dungeness River and partially or fully block the intake, which could temporarily lessen or stop flows into the intake channel. In that case, the DWUA would unblock the intake and restore flows.

## 6.3 Water Quality Actions Involving Ditch Maintenance and Tailwater

- ***WQ-1: Improve water quality by converting open ditches to closed pipes.*** This measure is closely related to HCM-1. The DWUA's commitment to the pipelining component of its water conservation plan has significant water quality benefits. Pipelining is the cornerstone of the water quality protection program, and projects are chosen with both water conservation and water quality benefits in mind. Since the conservation program converts open ditches to closed pipes, this action prevents possible interception of contaminant loads by the irrigation system. This benefit is perhaps the strongest element of the water quality protection program. Pipelining reduces tailwater volume since stormwater does not have access to pipes such as it currently does to ditches. This conservation measure will benefit water quality since tailwater can contain contaminants from the surrounding environment. Some level of contaminant loading will continue unless the entire system is connected to closed pipe. By reducing tailwater, pipelining also limits potential temperature impacts.

- ***WQ-2: Steam clean or pressure wash all heavy equipment before entering the Dungeness River. Also perform visual inspection to verify no major fluid leaks are present (Same as HCM-9).*** The DWUA may require that all heavy equipment is either steam cleaned or pressure washed prior to entering the Dungeness River or any other water way. Furthermore, equipment operators will perform a visual inspection to verify that no major fluid leaks are present. This policy will be followed regardless of whether the heavy equipment is owned, rented, or contracted by the irrigation district or company.

- ***WQ-3: Establish a 100-foot buffer away from water for refueling heavy equipment, mowers, etc (Same as HCM-10).*** During occasional, short-duration activities involving heavy equipment and mowers in or near water ways (see Section 2.4), the DWUA plans to establish a one-hundred (100) foot buffer from the Dungeness River, intake channels, and bypass channels where re-fueling of heavy equipment is prohibited. To the extent that occasional on-site maintenance activities or repairs are needed, the buffer will also apply to these activities. However, this buffer will not apply to emergency repairs of heavy equipment in the event a breakdown occurs in the field and the equipment cannot be moved under its own power.

- ***WQ-4: Create a formal spill response plan, including requiring spill containment equipment under certain conditions. (Same as HCM-11)*** The DWUA plans to create a formal written spill response plan. The plan will require that operators using heavy equipment in waterways (see Section 2.4) have spill containment booms on site and are trained in their use. This requirement elevates the DWUA's role in immediate response to a spill. The plan will also document that the DWUA relies significantly on the professional spill response program linked via the county's 911 system. That highly integrated system connects containment and clean up resources from road departments, fire departments, and the Coast Guard. The plan will also require that equipment operators report any spill to Ecology.

- ***WQ-5: Continue integrated pest management plan, including responsible herbicide use in a manner that protects water quality.*** The DWUA will continue its integrated pest management program for vegetation control, which combines physical, mechanical, and chemical approaches. Section 2.4 contains a detailed discussion of that program including the DWUA's responsible use of Rodeo which helps protect water quality. The DWUA will continue to comply with all state laws regarding pesticide use including only using pesticides approved by the Washington State Department of Agriculture (WSDOA) for aquatic uses, ensuring that applicators are licensed, and maintaining application records.

- ***WQ-6: Strive to perform ditch maintenance during the non-irrigation season when ditches are less likely to be watered or contain less water.*** The DWUA will follow procedures to protect water quality in its use of maintenance equipment on the banks or in close proximity to ditches. The DWUA plans to formalize the following existing and new procedures into a statement of procedures. The DWUA will strive to perform any ditch maintenance during the non-irrigation season, when ditches are de-watered, except when maintenance is required to be accomplished during the irrigation season.

- ***Potential Action: Construct artificial wetlands for selected tailwater discharges.*** The DWUA may explore the construction of artificial wetlands at selected locations to receive and detain tailwater prior to discharge to natural waters. Artificial wetlands can reduce loading of turbidity, fecal coliform, nutrients and pesticides to receiving waters. Depending on the configuration, they can also provide rearing habitat for Covered Species. In addition, constructed wetlands can partially offset potential reductions in wetlands related to implementation of the water conservation plan. Projects would be contingent on further assessment of feasibility and cost and may require outside sources of funding. At this time, DWUA cannot commit to carry these projects out but does plan further investigation of feasibility.

## 6.4 Policies and Coordinating Actions to Prevent Pollutant Loading from Landowners, Homeowners, Roads and Development

The DWUA will continue to work toward the prevention of the loading and interception of water quality loads. One means of accomplishing this objective is to continue to publicize, and monitor for compliance, policies in DWUA Rules and Regulations. As described in more detail in Section 2.5, DWUA policies are communicated to all water users and select non water users by DWUA staff, monitored daily during the irrigation season on all irrigation ditches by ditch riders, and uncorrected violations are referred to Ecology. In addition, the DWUA will continue working with other local and state organizations to coordinate efforts to improve water quality conditions through outreach, education and other means.

- ***WQ-7: Continue to publicize and monitor compliance of DWUA Policy #19 stating that it is illegal to apply herbicides not approved for aquatic use to the irrigation system.*** The DWUA will continue to provide information to its water users as well as non water using landowners whose property abuts irrigation ditches of their obligation to comply with SDWUA policies regarding use of pesticides in and around irrigation ditches. This includes reminding both water users and non water users in the Action Area that it is illegal to use herbicides not approved by WSDOA for aquatic uses, as stated in DWUA's Policy Number 19.

- ***WQ-8: Continue to require (and monitor compliance) that water user owned distribution systems are comprised of closed pipe. Also continue the cost share program for installing this pipe.*** Policy Number 22 requires water user owned distribution systems to be comprised of closed pipes, rather than open ditches. As previously discussed, closed pipes do not offer interception points for water quality loads. In support of this policy, DWUA members have cost-share programs for installing closed pipe for water users' distribution systems. The Clallam Conservation District also has a cost-share program.

- ***WQ-9: Continue to publicize and monitor compliance of DWUA Policy #18a stating it is illegal to introduce any pollutant, including animal waste, into the irrigation system.*** Policy Number 18a prohibits water users from introducing any pollutant, including animal waste, to the irrigation system. This policy requires water users to exclude livestock from ditches.

- ***WQ-10: Continue to publicize and monitor compliance of DWUA Policy #18b stating it is illegal to divert stormwater drainage into the irrigation system.*** Policy Number 18b prohibits diverting stormwater drainage into the irrigation system. The DWUA tries to be alert to illegal diversions and bring them to the attention of proper authorities.

- ***WQ-11: Continue to work with other organizations on clean water programs relevant to irrigation activities.*** The DWUA will continue to work with Clallam County, Clallam Conservation District, the City of Sequim, Ecology, JST and other organizations on clean water programs, as they relate to irrigation activities and potential pollutant loading to ditches from third parties, such as landowners, homeowners, septic systems, commercial sites, roads and development activities. The DWUA will contribute staff time to strategic planning activities, and contribute information for public-education documents associated with these programs. Together with other organizations, the DWUA currently contributes these activities for the County-led Clean Water Workgroup, which helps implement the County's Clean Water Strategy.

## 6.5 Alternative Actions Considered but Not Selected for Implementation

The preceding sections have presented a range of actions proposed by DWUA. Those actions are listed in Tables 6-1 and 6-2. Federal regulations for issuance of an Incidental Take Permit also require documentation of alternative measures considered but not planned for implementation. This section provides discussion of such alternatives.

A number of alternative Conservation Measures were considered in the course of Technical Advisory Team (TAT) discussions from January to October 2003. In addition, prior work on the Comprehensive Water Conservation Plan (MWG 1999) addressed a range of alternative actions with respect to water use efficiency. This section summarizes the alternative conservation measures that have been considered but are not planned for implementation.

- ***Eliminate diversions for agricultural irrigation from Dungeness River.*** If diversions of Dungeness River water were eliminated, this would either eliminate irrigated agriculture from the Sequim-Dungeness area; or require substitution of an alternative source of water supply. Associated issues include the following:
    - Elimination of irrigated agriculture from the region is not consistent with the overall objectives of the CIDMP or local comprehensive land use plans, which include providing for continuance of the long-term agricultural economy.
    - Alternative surface water supplies would have to be imported to the area from adjacent river basins at a prohibitive cost. This would simply transfer effects on streamflow and associated habitat from the Dungeness Basin to other river basins.
    - Development of a groundwater source of supply would require abandonment of an extensive and costly infrastructure system that has been developed over many decades as part of the surface water supply system. Groundwater development of the magnitude needed to provide irrigation water supply would be very costly in terms of both infrastructure costs and operational costs. In particular, the energy costs associated with pumping would be prohibitive, in comparison with the existing gravity delivery system. In addition, the shallower aquifers in the area are hydraulically connected to surface

water systems, including the Dungeness River, tributary creeks, independent creeks and wetlands. Pumping of shallower aquifers would result in undesirable impacts to these surface water features. Pumping of deeper aquifers at the magnitude required would potentially have impacts on other water users in the area and could degrade the quality of the groundwater resource both in terms of water quantity and water quality from seawater intrusion.

Given these considerations, and the availability of techniques to reduce surface water diversions as discussed in Section 6.1, the alternative of eliminating diversions from the Dungeness River will not be pursued further.

- ***Prioritize late season water diversions such that agricultural water users receive priority over non-agricultural and urban uses with a net reduction in water deliveries.*** DWUA has evaluated its legal authority to prioritize agricultural diversions over non-agricultural diversions, and concludes that it does not have the legal authority to do so. Such a prioritization scheme likely constitutes impermissible discrimination under Washington law. See *Neubert v. Yakima Tieton Irrigation Dist.*, 814 P.2d 199 (1991); see also *Baker v. Sunnyside Valley Irr. Dist.*, 221 P.2d 827 (1950). In *Neubert*, an irrigation district adopted a resolution that permitted it to interrupt water to general water users to ensure an adequate supply to certain users for frost protection purposes. In effect, the irrigation district attempted through resolution to prioritize frost water uses above other valid irrigation uses. The Washington Supreme Court struck this resolution down, stating that rules and regulations adopted by irrigation districts must be nondiscriminatory in their operation and effect, and free from coercive aspects.

  Aside from the need to avoid discrimination under Washington law, an equally important legal concept is that of first in time, first in right - meaning that "the first water appropriator is entitled to the quantity of water appropriated by him, to exclusion of subsequent claimants." See *Longmire v. Smith*, 67 P. 246 (1901); see also RCW § 90.03.010. As discussed in *Neubert*, irrigation districts may not interfere with senior water rights by subrogating them to junior water rights when the senior right is put to "beneficial use." The term "beneficial use" is broadly defined under Washington law to include irrigation, domestic and industrial uses. See RCW § 90.14.031. In the present case, a prioritization scheme that subrogates more senior domestic or industrial uses to junior agricultural uses would violate basic principles of the doctrine of appropriation.

  Based on the foregoing, DWUA concludes that it does not possess the legal authority under Washington law to prioritize agricultural uses over non-agricultural uses, nor does it possess authority to subrogate senior domestic and industrial users to junior agricultural users.

- ***Pursue alternative means of conserving water***, instead of those recommended in the Comprehensive Water Conservation Plan. Chapter 6 of the CWCP (MWG 1999) identified a wide range of structural improvements and non-structural activities that could be taken by DWUA to reduce diversions from the Dungeness River. Chapter 9 of the CWCP then identified a set of recommended water conservation measures, based primarily on cost-effectiveness (cost per unit of water saved, expressed as $$/cfs). For further documentation of the alternatives considered, see the CWCP.

- ***Avoid in-river work with heavy equipment under all circumstances.*** The Technical Advisory Team convened to assist in developing this CIDMP had extensive discussion on the need for in-river work to rearrange gravel bars adjacent to DWUA intake structures. The Dungeness River channel is highly dynamic. The main channel of the river can shift between the river's banks in response to storm events. In addition, water levels in the river fluctuate widely from high flow conditions to low-flow conditions. During low-flow conditions, if the main channel has migrated away from a given irrigation canal intake structures, water will not flow into the intake. Under these conditions, entire canal systems could become dewatered, such that irrigation supply water could be cut off to DWUA members. This would be inconsistent with the objectives of this CIDMP which include providing adequate water supply to support the agricultural economy in the area. Therefore this alternative will not be carried out. Occasional work by DWUA members to rearrange gravel within the river bed is needed to avoid this problem, and with proper procedures can be carried out with minimal risk to the Covered Species.

- ***Use non-petroleum-based hydraulic fluids in heavy equipment used for in-river work.*** The DWUA considered this measure but concluded it would be unnecessarily cumbersome while offering little benefit. Hydraulic fluids made from mineral oils and other products are not well-suited to high pressure hydraulic systems associated with heavy equipment. They do not lubricate as well as standard hydraulic fluids and wear out equipment. Irrigation activities involving in-river work are of a very limited duration, such as one-half to one hour, and are intermittent and infrequent. It is not cost-effective to change out hydraulic fluid for such a limited use. DWUA members typically hire a contractor for this work, and contractors do not typically use non-oil based products. For these reasons, this measure will not be implemented at this time. If products are improved or become more commonly used, DWUA may consider this measure in the future.

# Section 7
# Predicted Effects of Habitat Conservation Measures and Water Quality Actions

This section identifies the effects of Habitat Conservation Measures (HCMs) and Water Quality Actions (WQ), the DWUA will perform to improve habitat conditions for covered species and water quality in the Action Area. Please refer to Section 6 for detailed description of these measures and actions. The section is organized as follows:



## 7.1 Water Conservation Actions

Completion of some of the water conservation measures proposed in the 1999 *Dungeness River Agricultural Water Users Association Comprehensive Water Conservation Plan* (CWCP) as presented in (MWG, 1999) and summarized in Section 6, changes in cropping patterns and adherence to the Trust Water Right MOU with Ecology, have reduced diversions by approximately 25 cfs during peak season demand from the mid-1990s. Full implementation of the CWCP is designed to improve DWUA operations and conserve an additional 22.7 cfs during peak irrigation season diversions compared to baseline conditions.

HCM-1 represents the suite of outstanding actions under the 1999 CWCP and it would allow further reductions in the volume of water diverted from the river compared to baseline conditions, totaling 22.7 cfs during the peak irrigation season. These combined actions reduce irrigation diversions and offer opportunities to improve habitat, while allowing the DWUA to remain in the business of supplying water to its users. Reductions in irrigation withdrawals would increase the amount of water flowing in the mainstem Dungeness River downstream of RM 11.0 resulting in direct increases in aquatic habitats. Habitat changes are represented herein by an index of weighted usable area (WUA) from an instream flow study conducted at RM 4.2 (Hiss and Lichatowich, 1990; Wampler and Hiss, 1991; Hiss (1993a and b). WUA is used as a surrogate for the anticipated changes in habitat conditions based on habitat suitability criteria of the various fish species and life history stages with incremental changes in river discharge (Beecher 1989).

The increase in river discharge under HCM-1 would result in a direct increase in the index of aquatic habitat as represented by WUA for spawning, rearing and migratory life history stages of Covered fish species including listed and unlisted fish in the salmonid fish, cutthroat trout, and native char (bull trout) guilds. The greatest habitat benefit would occur during the late season, low-flow period and under drought conditions in the basin. River flow increases show direct improvements in the timing and duration of mainstem and side channel habitats and they may show indirect benefits for covered species in the nearshore marine habitats in Dungeness River. Minor adverse effects are anticipated in the tributary and small independent streams and in wetland habitats as a result of diversion reductions under HCM-1 influencing some of the covered species included in the salmonid fish, cutthroat trout and upland amphibian guilds. The beneficial and adverse effects are detailed in the section below titled HCM-1.

The DWUA has proposed water conservation actions under HCM 1 to reduce mainstem surface water diversions on a peak demand and average basis during the June through October time period compared to baseline levels. This reduction in diversions and subsequent increases in instream flow in the Dungeness River is considered to be the key element of the CIDMP and the action with the greatest benefit to covered fish species. The goal is to maintain the estimated instream flows at the upper Instream Flow Study site at levels exceeding 100 cfs (approximately 75% of the maximum spawning WUA) whenever possible, with a commitment to maintain estimated instream flow levels above 60 cfs. This flow level represents approximately 50 percent of the maximum Chinook salmon spawning WUA.

It should be emphasized that increasing flow in the Dungeness River will continue to move the hydrology closer to natural conditions in the mainstem as well as in the small streams and wetland habitats in the Action Area. Currently, the irrigation system is removing Dungeness River water and artificially recharging the shallow aquifer, wetlands and small streams via tailwater discharges and conveyance losses. The artificial transfer of water has also artificially transferred habitat for Covered Species from the Dungeness River to other aquatic systems throughout the Action Area. Reducing this water transfer through full implementation of HCM-1 will benefit Dungeness River mainstem habitat conditions, but at some cost to habitat in small streams and wetlands. Both the beneficial and adverse influence of the habitat conservation measures are addressed below.

- ***HCM-1: Reduce diversions from Dungeness River per Tables 6-3 to 6-10*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** River flow generally exceeds the recommended minimum instream flows in all months during the irrigation season up to August in most years. Under the maximum and average allowable diversion schedules, it is estimated the recommended instream flow level of 180 cfs at RM 4.2 during the August – mid-September time period will be met when the natural flow in the river as measured at the USGS gage station at RM 11.8 is 256 cfs or higher. From mid-September through the month of October the recommended instream flow level of 180 cfs will occur on average when the river flow is 222 cfs at the USGS gage. The percent exceedance values of such flows are shown in Tables 6-4 to 6-9 for consecutive 2-week periods during the low flow season. It is presumed streamflow increases under HCM-1 will continue to benefit spawning, rearing, and migratory life history phases of covered fish species in the Dungeness River mainstem and side channel habitats compared to baseline habitats. The effects of HCM-1 remain unchanged from baseline conditions, during time-periods when actual flows at the upper IFIM site exceed the recommended IFIM flows.

Natural river flows are often less than the recommended minimum instream flow during portions of the low summer flow period between August and October. Such excursions from the recommended flows are prevalent under drought conditions and they occur with or without the irrigation diversions. The assessment of effects presented in Section 5 indicates the ongoing influence of irrigation diversions is most prevalent on freshwater habitat under drought conditions. Diversions during baseline conditions can extend low flow situations by up to two weeks compared to natural conditions. The most frequent period of low river flow during the baseline period occurred routinely during the first two weeks of October and for an extended time during the months of September and October in the 2001 drought. A summary of the anticipated diversion schedule when there are insufficient natural levels of river flow to meet the recommended instream flows is also provided in Tables 6-3 through 6-10.

The DWUA reduced diversions from the Dungeness River over the last 30 years by increasing on-farm efficiency, by reducing conveyance losses wherever possible and more recently with the use of water right leasing programs during drought conditions. The diversions have dropped from a seasonal average of 150 cfs during flood irrigation to 56 cfs in 2001. The reduction in diversions has increased the streamflow in the Dungeness River and has increased fish habitat quality as a result. Further reductions in diversions, as proposed in HCM-1, would continue to increase streamflow and, therefore, improve habitat for covered fish species. The IFIM study (Wampler and Hiss 1991) indicates for Chinook salmon, in particular, additional diversion reductions of 22.7 cfs achievable through implementation of HCM-1, represent further improvement over baseline conditions. While the IFIM methodology does not furnish a complete understanding of flow needs for fish (Orsborn and Ralph 1994), it provides an indication of the relative importance of further incremental increases in the late season flow for covered fish species. Increases in streamflow, especially during drought conditions, may be beneficial, especially for improved upstream migration and access to side channels as summarized below.

#### *Spawning Habitat*

The future reduction in DWUA diversions is targeted to occur primarily during the periods when streamflows in the river are below the USFWS recommended instream flow level, including during periods of drought conditions. The resulting increase in habitat in the Dungeness River is shown in Exhibit 7-1. As an example of the most sensitive species and life history stage during the low flow season, the Weighted Usable Area (WUA) of spring Chinook spawning habitat is anticipated to increase 403 $ft^2$/1,000 lineal ft of stream [2%] at the 50 percent flow exceedance level. Conversely, it will increase by 1,951 $ft^2$/1,000 lineal ft of stream [27%] at the 99 percent flow exceedance level [equivalent to the 14-day low flow period experienced under baseline conditions].

As shown in Exhibit 7-1, the estimated lowest 14-day low flow of 60 cfs under HCM-1 exceeds the baseline 14-day lowest flow of 45 cfs by more than 30 percent. It also exceeds the 50 percent exceedance level experienced during the 1986 to 1990 time frame, when the instream flow study was undertaken. As such, the absolute lowest flow during any two week period under this conservation measure is anticipated to be higher than the median flow experienced during the late 1980s.

Weighted Useable Area (WUA) under the USFWS Instream Flow modeling approach is a relative incremental index of habitat. It does not quantitatively indicate a corresponding increase in population numbers. Nevertheless, the modeling assumes greater levels of habitat should provide an incremental benefit to populations of covered species, especially if the habitat is limiting current levels of fish production.

The median flow at the USGS gauge in late August and in early September provides 87 percent and 77 percent of the recommended Chinook salmon spawning habitat as modeled by IFIM at the upper instream flow study site under the proposed mean diversion limitations in Tables 6-7 and 6-8, respectively. Implementation of the CIDMP would achieve 75 percent WUA in approximately 8 out of every 10 years during late August and approximately 5 out of every 10 years in early September (Table 7-1).

**Exhibit 7-1**
**Comparison of Instream Flow to Chinook Spawning**
**Weighted Usable Area (WUA) at Upper IFIM Site –**
**Including Full Implementation of Habitat Conservation Measure 1**

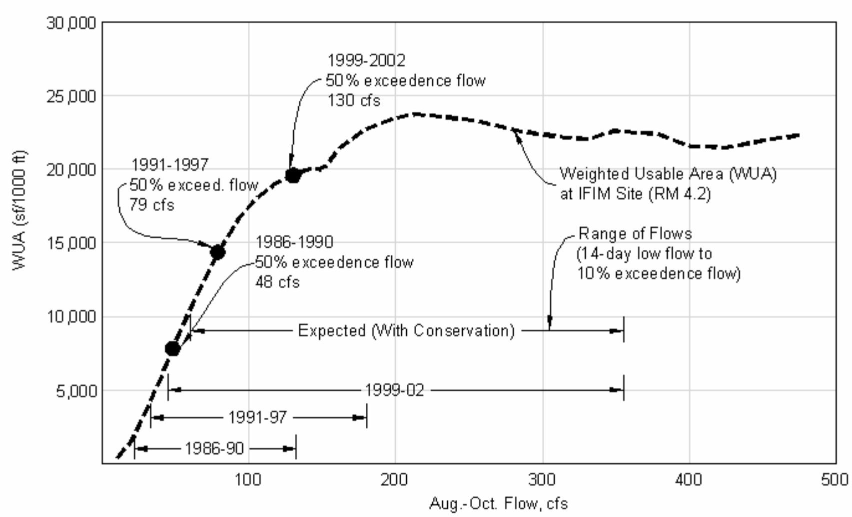


**Table 7-1**
**Frequency of Flows and WUA During Critical Chinook Spawning Periods Under Proposed Diversions**

| % Recommendation WUA | WUA Index ($ft^2$/1,000 ft) | IFIM Site (cfs) | Table 6-6 Average Withdrawal (cfs) | USGS Gaging (cfs) | Exceedance Level Aug 16-31 | Exceedance Anticipated Years/Decade |
|---|---|---|---|---|---|---|
| 47% | 10,680 | 60 | 42 | 113 | 99% | 10/10 |
| 47% | 10,680 | 60 | 48 | 120 | 95% | 10/10 |
| 64% | 14,418 | 79 | 50 | 143 | 90% | 9/10 |
| 70% | 15,878 | 88 | 50 | 153 | 84% | 8/10 |
| 75% | 17,012 | 96 | 50 | 163 | 77% | 8/10 |
| 80% | 18,416 | 107 | 50 | 174 | 69% | 7/10 |
| 85% | 19,281 | 123 | 50 | 192 | 58% | 6/10 |
| 87% | 19,836 | 135 | 50 | 206 | 50% | 5/10 |
| **% Recommendation WUA** | **WUA Index ($ft^2$/1,000 ft)** | **IFIM Site (cfs)** | **Table 6-7 Average Withdrawal (cfs)** | **USGS Gaging (cfs)** | **Exceedance Level Sept 1 - 15** | **Exceedance Anticipated Years/Decade** |
| ***Early September 1-15 Spawning Period*** | | | | | | |
| 47% | 10,680 | 60 | 25 | 94 | 99% | 10/10 |
| 47% | 10,680 | 60 | 39 | 110 | 95% | 10/10 |
| 48% | 10,885 | 61 | 48 | 121 | 90% | 9/10 |
| 70% | 15,878 | 88 | 48 | 151 | 64% | 6/10 |
| 75% | 17,012 | 96 | 48 | 163 | 51% | 5/10 |
| 77% | 17,503 | 100 | 48 | 164 | 50% | 5/10 |
| 80% | 18,146 | 107 | 50 | 174 | 42% | 4/10 |
| 85% | 19,281 | 123 | 50 | 192 | 31% | 3/10 |

### *Rearing Habitats*

The habitat level, as a percent of the recommended WUA during the August – October time period for each of the rearing species present for 2-week periods is shown in Table 7-2. The level of juvenile rearing habitat available for each species during the most frequent flow occurrences for each 2-week period ranges from 80 percent to 120 percent of the recommended WUA. The lowest amount of available habitat during median flow levels occurs for coho salmon and steelhead trout in early August. Greater levels of juvenile rearing habitat for both species occur at lower river flows than the median flow level for this time period.

**Table 7-2**
**Rearing Habitat Indices for Coho, Steelhead and Dolly Varden Char Under HCM-1**

| | Coho | Steelhead | Dolly Varden |
|---|---|---|---|
| **Percent WUA at the Median Flow Level (50% Exceedance)** | | | |
| August 1-15 | 80% | 85% | 96% |
| August 16-31 | 110% | 116% | 101% |
| September 1-15 | 122% | 112% | 94% |
| September 16-30 | 117% | 115% | 98% |
| October 1-15 | 120% | 113% | 95% |
| **Frequency of Occurrence at 85% of Recommended WUA[1]** | | | |
| August 1-15 | 100% | 98% | 97% |
| August 16-31 | 100% | 92% | 88% |
| September 1-15 | 100% | 81% | 69% |
| September 16-30 | 100% | 89% | 81% |
| October 1-15 | 100% | 84% | 72% |

(1) This frequency relates to when the river flows are below the recommended 180 cfs level. 85% of the recommended WUA occurs at 73 cfs for steelhead, 81 cfs for Dolly Varden, and is not applicable for coho juveniles.

The frequency of occurrence of the 85 percent recommended habitat level (85% recommended WUA) for each of the rearing species is also shown in Table 7-2. The data imply flow levels at the upper IFIM study site at RM 4.2 under proposed irrigation withdrawals do not fall below the 85 percent WUA level for juvenile coho salmon at any discharge experienced to date when the Dungeness River is below the recommended 180 cfs level. The 85 percent WUA habitat level for juvenile steelhead trout and Dolly Varden char occurs at 73 and 81 cfs at RM 4.2, respectively. This flow level is exceeded more than 81 percent of the time for steelhead trout, while the flow for Dolly Varden char is exceeded more than 69 percent of the time in any given 2-week period. It is anticipated the CIDMP proposed flow schedule will provide more than 85 percent of the recommended WAU in 10 out of any 10 year-period for juvenile coho salmon, 8 out of 10 for juvenile steelhead trout and 7 out of 10 for Dolly Varden char (a surrogate for native char including bull trout as a covered species).

### *Upstream Migration and Side Channel Habitat*

Instream flow increases of 22.7 cfs are considered a benefit to increased access and side channel production compared to baseline conditions. Additional assessment was performed to ensure the proposed flow increases in HCM-1 would not preclude adult upstream migration of covered species through critical riffles in the mainstem and into side channel areas as well as to ensure adequate spawning and rearing habitat occurred in the surveyed side channels. The assessment, included in Appendix M, shows the instream flow regimes proposed under HCM-1, especially during the low flow season, do not preclude upstream migration of the largest bodied salmonid fishes and do not materially alter the availability and duration of habitat conditions for various life history stages of covered species in the side channels.

The comparisons of habitat levels for spawning, rearing and access with anticipated flow changes, discussed above, are based on prior mainstem studies using the USFWS Instream Flow (IFIM) modeling approach and subsequent channel surveys as reported in Bounty et al. (2002) and in Daraio et al. (2003). Weighted Useable Area (WUA) in the IFIM modeling approach is a relative incremental index of habitat. It does not quantitatively indicate a corresponding increase in population numbers. Nevertheless, the modeling assumes greater levels of habitat should provide an incremental benefit to populations of covered species, especially if the habitat is limiting current levels of fish production. Ecosystem-Diagnosis-Treatment (EDT) models prepared for the Dungeness River were used to make judgments on fish abundance levels and potential changes with respect to the CIDMP proposed flow regimes.

EDT-Lite was performed for spring Chinook salmon in the Dungeness River to approximate the relative differences in population performance metrics (including abundance, productivity and life history diversity) between various proposed restoration and protection measures (MBI 2004). Water conservation measures proposed under HCM-1 were predicted to produce the highest increase in productivity and life history diversity changes and the 5$^{th}$ highest increase in Chinook salmon abundance of 31 potential restoration and/or protection measures assessed in the lower basin (Lestelle 2004). Water conservation was predicted to increase WUA of habitat in the channel and thereby: (1) increase juvenile rearing, prespawner migration and adult spawning habitat; (2) increase the likelihood spawning will occur outside the main channel thalweg, thus decreasing the risk of redd scour during freshets, and (3) increase the likelihood of water flow along stream margins and in side channels, improving edge habitat in association with the riparian corridor (Lestelle 2004). As such, water conservation measures proposed under HCM-1 were ranked as the top combined benefit action for the river in addressing Chinook recovery options

Achieving full implementation of the CWCP is estimated to occur over a twenty-year time-period. The DWUA commits to make incremental progress against flow reduction as shown in Tables 8-2 to 8-5 and discussed in Section 8, Implementation. The effects of ongoing, incremental reductions in diversions on covered fish species means continual steady improvement in freshwater habitat conditions should occur during the interim period, with the greatest level of improvements occurring during drought conditions.

***Adverse Effects:*** Seepage of diverted irrigation water from the distribution network of canals and laterals occurs primarily from unlined ditches. As of 2003, a total of 7.9 miles of canals and 46.5 miles of laterals, or 31 percent of the distribution network, was lined (Table 2.5). The volume of contributed water to groundwater, wetland and small streams over the baseline period was estimated to run between 10 and 22 cfs (generally less than 30 percent of the amount diverted) during the low flow months of August and September.

Over the years, this water has altered the normal hydrological characteristics of small streams, wetlands and groundwater by seasonally increasing groundwater recharge (Foster Wheeler 2003). Surface water volumes in standing water have benefited and low summer flows in various streams have been augmented as a result of elevated aquifer levels as well as with the discharge of tailwater, (as discussed in the Sections 5.3.2).

Details of augmented streamflows in the small tributaries and independent streams in the Action Area have been highlighted in the discussion of baseline conditions in Sections 4.1.3 and 4.1.4, respectively.

Although water conservation measures under HCM-1 will increase streamflows in the mainstem Dungeness River, full implementation of the CWCP will decrease indirect discharges and seepage to the shallow aquifer, local wetlands and small streams. The anticipated influences of this action on groundwater levels, wetlands and small streams are discussed below.

*Groundwater*

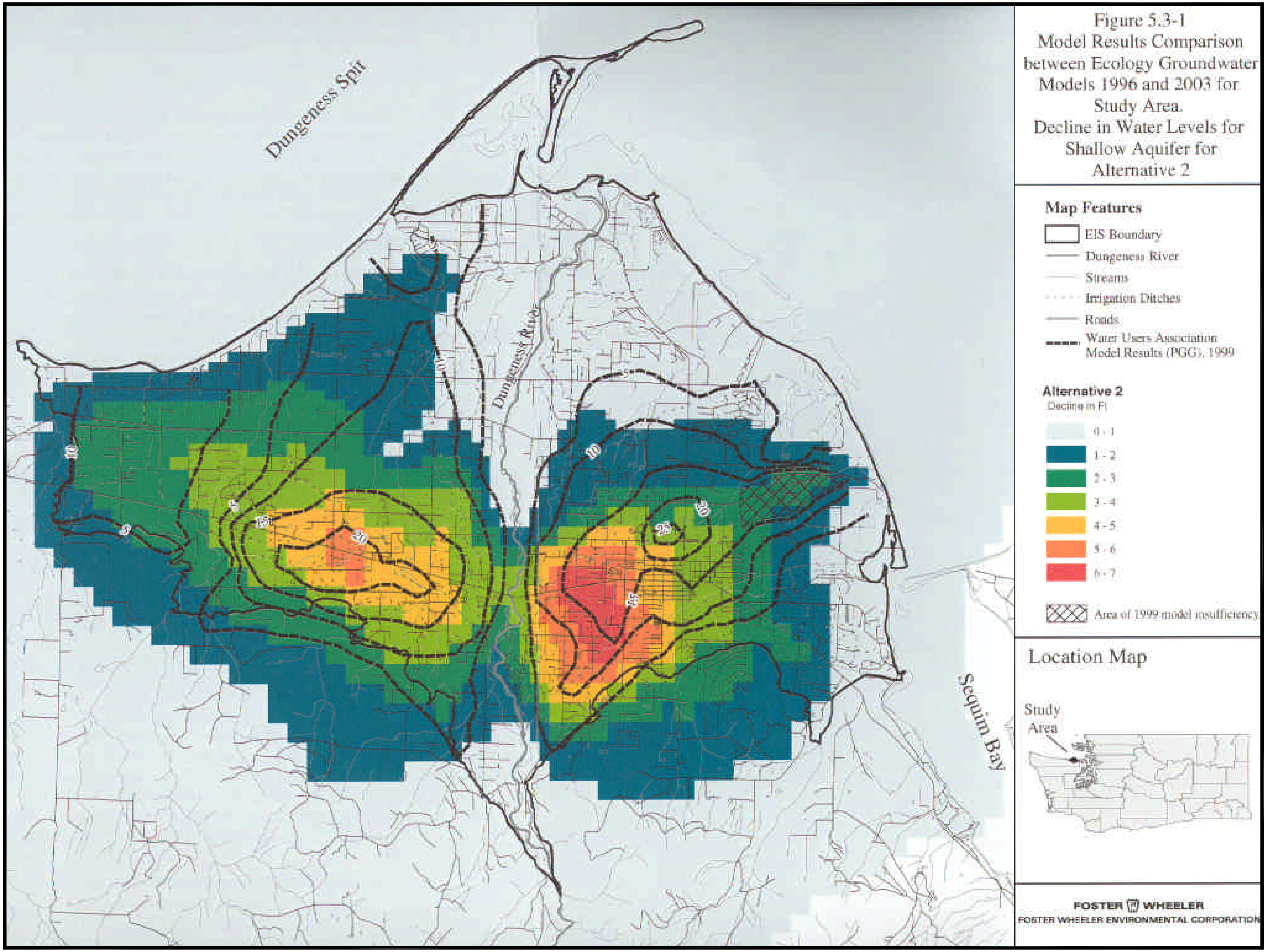
The issue of changes in groundwater elevations was evaluated as one of the primary topics of the FEIS for the DWUA Water Conservation Plan (Foster Wheeler, 2003). Implementation of HCM-1 will reduce the artificial irrigation conveyance recharge to the shallow aquifer. Reduction in groundwater recharge due to tightlining irrigation ditches will add to the ongoing losses in groundwater recharge due to increases in consumptive uses and pumping of shallow aquifer water for domestic and other human uses. The shallow aquifer is anticipated to decrease in the range of 0 to 7 feet with full implementation of the CWCP. The greatest reductions are forecast to occur in two concentric circles near the City of Sequim east of the Dungeness River and southwest of Carlsborg on the west side of the Dungeness River (Exhibit 7-2). Quantitative estimates for how much this reduction would seasonally influence wetland area were not attempted in the FEIS since it would vary with the location and hydrologic connectivity of each wetland. Anticipated flow changes in streams were estimated based on modeled changes in groundwater inputs and tailwater discharge reductions due to re-regulating reservoirs (FEIS Tables 5.3-6 to 5.3-11). See CIDMP Appendix H. The majority of small stream and wetland habitat lie down gradient of the anticipated 1-ft shallow aquifer reduction contour (Exhibit 7-2). As a consequence, most of the habitat in the Action Area is subject to the lowest range of the aquifer reductions.

*Wetland Habitat*

Approximately half of the wetland acreage in the Action Area is groundwater-fed from the shallow aquifer. These wetlands could be affected by changes in groundwater levels. The remaining half of the wetland acreage is primarily fed by runoff and water close to the surface over relatively impermeable subsurface materials, creating a perched water table. These wetlands are unlikely to be affected by groundwater level changes, but could be affected by changes in amounts of runoff or irrigation leakage in the immediate vicinity where perched wetlands occur. The effects for these two groups of wetlands were assessed according to their potential to perform hydrologic functions as shown in Table 4.4-2 of the FEIS (See CIDMP Appendix H).

**EXHIBIT 7-2**

Groundwater Decline Map




Source: FEIS for Comprehensive Water Conservation Program

A reduction in wetland area due to ongoing habitat conservation measures could have a potential adverse influence on the western toad (*Bufo boreas*). Although the presence of the western toad has not been confirmed in the lower Dungeness Valley, core habitat features exist. Since the western toad has the ability to become locally abundant, can live in a relatively wide variety of habitats, can disperse overland, and live many years as adults, this species may be less affected by land use practices than other anurans (Blaustein et al. 1995). However, they may be sensitive to loss of wetlands (Leonard et al. 1993). There is evidence suggesting western toads display fidelity to breeding sites (Hallock and Leonard 1997). The loss of wetland acreage containing suitable breeding sites may have the potential to limit the western toad population in the vicinity.

There is insufficient technical information to assess potential changes in wetland acreage and the distribution of open water and emergent wetland areas with changes in groundwater levels. The FEIS provides graphs of anticipated groundwater level changes in contour intervals of 0 to 7 ft. in the vicinity of the Action Area. As shown in Exhibit 7-3, the area with the greatest anticipated reductions in the shallow aquifer table overlap mostly small, perched wetlands with little connection to the regional groundwater systems (shallow aquifer) modeled in the FEIS. Portions of Upper Graysmarsh, Lower Bell Creek and a third aquifer-related wetland west of the Dungeness River overlap regions that may experience groundwater level reductions in the range of 1 to 3 feet.

As described in Section 6.3, the potential exists to expand or construct additional wetland areas for the retention/detention of tailwater to improve discharge water quality conditions. The wetlands would be located at existing tailwater discharge sites (Table 2-2) and may help offset potential future losses to wetlands as a result of water Conservation Measure No. 1. Implementation of HCM-1 will considerably decrease the volume of tailwater released compared to baseline conditions, so the amount of created wetlands may be small.

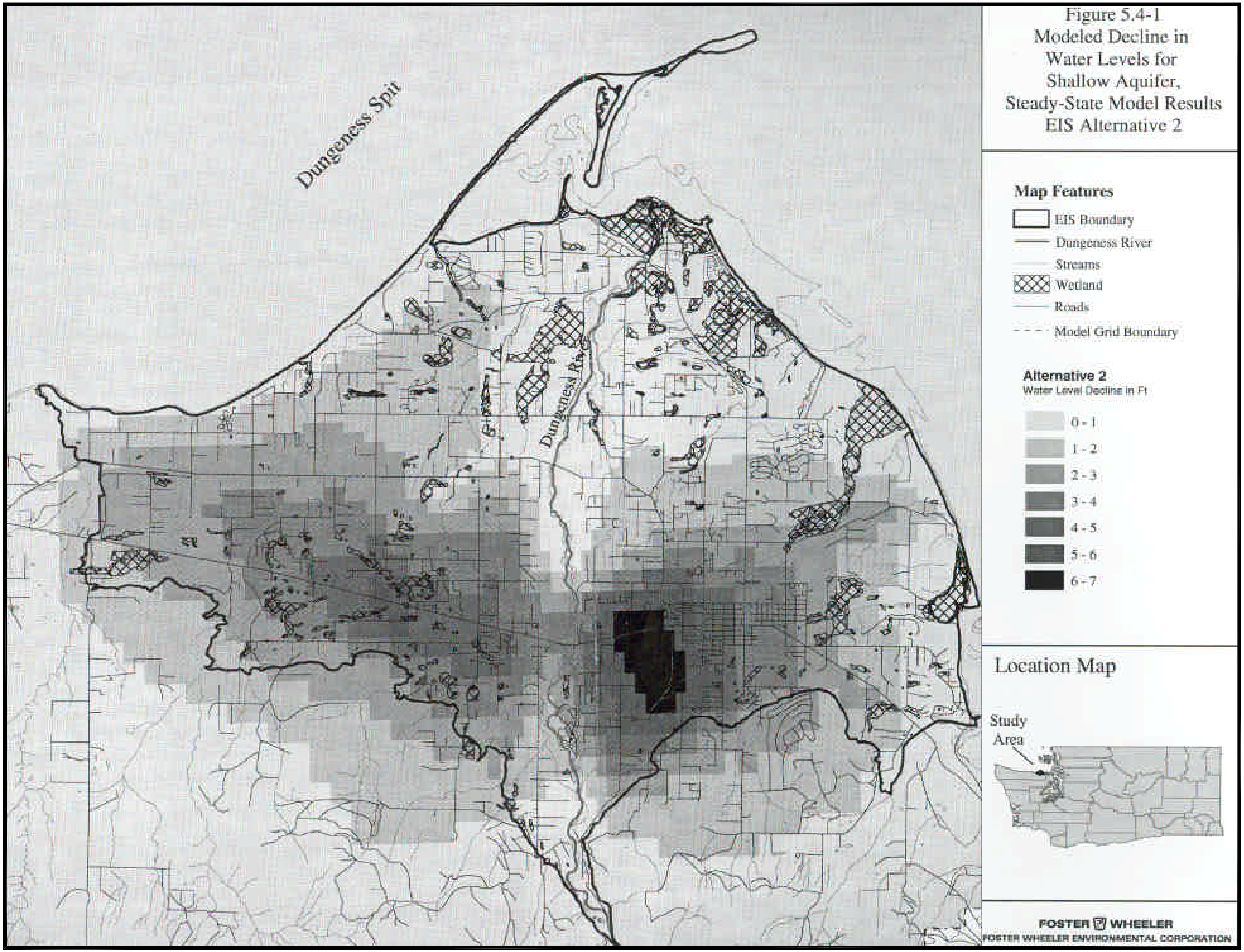
### *Small Stream Habitat*

The irrigation conveyance system has been supplying independent streams and tributaries to the Dungeness River with an artificial groundwater recharge source since the early 1900s. (FEIS Table 5.3-3, see CIDMP Appendix H).

Currently, groundwater levels as well as direct discharge of tailwater have a direct influence on summer low flows in small streams. The anticipated contribution of groundwater and tailwater sources to tributary and independent small streams is shown in Tables 7-3 and 7-4.

Implementation of water conservation measures by Association members would affect streamflows in the small creeks in the Action Area primarily by changing groundwater recharge associated with piping of ditches and with reduced levels of irrigation tailwater discharges. The reduction in groundwater recharge associated with ditch lining is predicted to cause a reduction in the water levels in the shallow aquifer from 1 to 5 feet. This reduction in shallow aquifer water levels in turn will likely impact the net groundwater contribution to small streams.

**EXHIBIT 7-3**
Groundwater Decline Map
with Wetland Locations




Source: FEIS for Comprehensive Water Conservation Program

**Table 7-3**
**Contribution of Tailwater and Groundwater to Small Streamflow and Estimated Flow Reductions due to CIDMP HCM-1**

| | Groundwater | | | Tailwater [2] | | | |
|---|---|---|---|---|---|---|---|
| | Contribution to Stream [1] (cfs) | Estimated Reduction [1] (cfs) | Estimated Reduction [1] (%) | Average Seasonal (cfs) | Single Un-gaged (cfs) | Estimated Reduction [3] (cfs) | Estimated Reduction [3] (%) |
| Bear Creek | - | - | - | - | 0.30 | - | 0.00 |
| Matriotti Creek | 3.4 | 1.3 | 38% | 1.16 | 1.50 | 0.41 | 35% |
| Hurd Creek | - | - | - | - | - | - | - |
| Siebert Creek | 3.2 | 0.0 | 0% | 0.11 | - | None | 0.00 |
| McDonnell Creek | 2.3 | 0.1 | 4% | - | 0.03 | None | 0.00 |
| Meadowbrook Cr. | - | - | - | 0.54 | - | 0.50 | 93% |
| Cassalery Creek | 3.6 | 0.40 | 11% | - | 0.01 | - | - |
| Gierin Creek | 0.8 | 0.10 | 13% | 0.72 | - | None | 0.00 |
| Bell Creek | 2.4 | 0.1 | 4% | 0.60 | 0.45 | 0.50 | 83% |
| Johnson Creek | 0.6- | 0.0 | 0% | 1.36 | - | - | - |

(1) Mean Annual Modeled Contribution under background conditions (Foster Wheeler 2003, FEIS Table 5.3-9)
(2) Tailwater as measured in 1997.
(3) Reduction from piping of ditches.

**Table 7-4**
**Anticipated Streamflow Conditions after Flow Reductions due to CIDMP HCM-1**

| | Streamflow [1] [Fall Range] | | | Resulting Streamflow [Fall Range] | |
|---|---|---|---|---|---|
| | Minimum (cfs) | Maximum (cfs) | Total Reduction[2] (cfs) | Minimum (cfs) | Maximum (cfs) |
| Bear Creek | 7.1 | 7.7 | 0.00 | 7.1 | 7.7 |
| Matriotti Creek | 1.8 | 14.9 | 1.7 | 0.1 | 13.2 |
| Hurd Creek | - | - | 0.72 | - | - |
| Siebert Creek | 2.7 | 3.3 | 0.00 | 2.7 | 3.3 |
| McDonnell Creek | 0.1 | 11.0 | 0.1 | 0.00 | 10.9 |
| Meadowbrook Creek | 1.1 | 5.2 | 0.50 | 0.6 | 4.7 |
| Cassalery Creek | 1.2 | 1.7 | 0.40 | 0.8 | 1.3 |
| Gierin Creek | 0.8 | 3.2 | 0.10 | 0.7 | 3.1 |
| Bell Creek | 0.8 | 2.6 | 0.6 | 0.2 | 2.0 |
| Johnson Creek | 0.3 | 4.9 | 0.00 | 0.30 | 4.90 |

(1) Range of streamflows reported during early fall, low flow season under baseline conditions (Foster Wheeler 2003, FEIS Table 5.3-9).
(2) Total streamflow reduction estimated for full implementation of HCM-1 from Table 7-3.

For streams such as Matriotti and Hurd creeks that are primarily groundwater fed, changes in recharge may result in a substantial loss in streamflow (FEIS Table 5.3-3, see CIDMP Appendix H). Tailwater discharges to Dungeness River tributaries and independent creeks have also been recognized as important components of instream flow (Thomas, et. al. 1999). Tailwater discharges to creeks are predicted to decrease with improved water conservation measures and efficiencies (Foster Wheeler 2003). Existing streamflow data for fall and spring, the estimated "current condition" groundwater contribution to streams and available tailwater discharge data have been summarized in the FEIS (Table 5.3-9, see CIDMP Appendix H).

### *Dungeness River Tributaries*

- ***Bear Creek:*** This creek was not modeled in the FEIS It is possible ditches lined within the Bear Creek watershed (Agnew District: laterals A-4, A-5 and A-6) could reduce groundwater recharge in this area by an estimated 0.37 cfs. Streamflows in Bear Creek might be reduced approximately 5 percent. The anticipated resulting streamflows during the fall season are shown in Table 7-4 and habitat for Covered fish species in Bear Creek is only anticipated to be minimally influenced.
- ***Matriotti Creek:*** Reductions in the groundwater contribution of 1.3 cfs (38%) and tailwater of 0.41 cfs (35%) are predicted to occur based upon 2003 model results. Because Matriotti Creek receives a considerable portion of its flow in the form of groundwater and tailwater release, the anticipated flow reductions from HCM-1 affect Matriotti more than any other of the small streams in the area (Foster Wheeler 2003). The anticipated resulting streamflows during the fall season between 0.1 and 13.2 cfs are shown in Table 7-4. Habitat for covered fish species in Matriotti Creek is anticipated to be materially influenced especially during base flow periods in September and October.
- ***Hurd Creek:*** This creek was not modeled in the FEIS. Since it depends upon groundwater for a considerable portion of its flow, a decline in groundwater contribution to the creek may occur as a result of full implementation of HCM-1. The magnitude of the effect is uncertain since modeling was not accomplished. No tailwater discharges currently occur in Hurd Creek so the adverse influence will not only occur due to groundwater reductions.

### *Independent Creeks*

- ***Siebert Creek:*** The average seasonal tailwater discharge in 1997 of 0.11 cfs was anticipated to remain unchanged in the FEIS modeling effort with respect to baseline conditions. No re-regulation reservoirs are planned that would affect tailwater discharge to Siebert Creek. Similarly, no net average annual change in groundwater contribution is expected as a result of full implementation of HCM-1. However, monthly reductions may approach 0.1 cfs in August. Because the hydrology of Siebert Creek is dominated by snowmelt and rainfall and it is located on the extreme western edge of the irrigation system, it is largely unaffected by proposed irrigation changes. The anticipated resulting streamflows during the fall season are shown in the Table 7-4. Habitat for Covered fish species in Siebert Creek is only anticipated to be minimally influenced.
- ***McDonnell Creek:*** The 2003 model simulations predict an average annual reduction in groundwater contribution of 0.1 cfs (4 percent of the groundwater contribution to the creek from irrigation) would occur. The model also predicts no change with respect to fall monthly groundwater contributions (Foster Wheeler 2003). The single un-gaged tailwater measurement of 0.03 cfs made in October 1997 was assumed to remain unchanged in the FEIS modeling effort with respect to baseline conditions. No

re-regulation reservoirs are planned that would affect tailwater discharge to McDonnell Creek. The resulting streamflows during the fall season are anticipated to range between 0.0 and 10.9 cfs. Habitat for Covered fish species in McDonnell Creek is only anticipated to be minimally influenced as a result of full implementation of HCM-1.

- ***Meadowbrook Creek:*** This creek was not modeled in the FEIS. The average seasonal tailwater discharge in 1997 was 0.52 cfs. The estimated reduction in tailwater discharge to the creek from re-regulation reservoir(s) is 0.5 cfs, capturing approximately 96 percent of the original tailwater discharge to Meadowbrook Creek. The resulting streamflow during the fall season is anticipated to range between 0.6 and 4.7 cfs. The fall season flow following full implementation of HCM-1 is estimated to range approximately 12 to 55 percent lower than during baseline conditions. Habitat for Covered fish species in Meadowbrook Creek is anticipated to be moderately influenced as a result of full implementation of HCM-1.
- ***Cassalery Creek:*** An average annual decline in groundwater contribution of 0.40 cfs (or 11 percent of the annual flow) is predicted to occur based upon 2003 model results. The reduction during fall months is anticipated to be slightly lower at 0.3 cfs. Although no average seasonal tailwater discharge measurements for Cassalery Creek are available, a single un-gaged flow measurement of 0.01 cfs was recorded for the creek in October 1997. The estimated reduction in tailwater discharge to the creek from re-regulation reservoir(s) is 0.3 cfs. The resulting streamflows during the fall season is anticipated to range between 0.8 and 1.3 cfs. Habitat for Covered fish species in Cassalery Creek is anticipated to be moderately influenced as a result of full implementation of HCM-1.
- ***Gierin Creek:*** A reduction in estimated groundwater contribution of 0.1 cfs (or 12.5 percent of the annual groundwater contribution to the creek) is predicted to occur based upon 2003 model results. Two tailwater discharge measurements are available for Gierin Creek. These measurements were obtained at separate gage locations along the creek and are reported as 0.17 and 0.55 cfs in 1997 (FEIS Table 5.3-7). There is no estimated reduction in tailwater discharge to the creek from re-regulation of the reservoir. The resulting streamflows during the fall season are anticipated to range between 0.7 and 3.1 cfs. Habitat for Covered fish species in Gierin Creek is anticipated to be minimally influenced as a result of groundwater reductions during implementation of HCM-1.
- ***Bell Creek:*** An average annual reduction in estimated groundwater contribution of 0.1 cfs is predicted to occur based upon 2003 model results. This reduction in groundwater contribution equates to a net annual change in groundwater contribution to the creek of 4 percent. Tailwater discharge to the creek in 1997 was measured at 0.60 cfs. The estimated reduction in tailwater discharge to the creek from re-regulation reservoir(s) is 0.5 cfs, capturing approximately 83 percent of the tailwater discharge to Bell Creek. The resulting streamflows during the fall season are anticipated to range between 0.2 and 2.0 cfs. Habitat for Covered fish species in Bell Creek is only anticipated to be minimally influenced as a result of full implementation of HCM-1.

- ***Johnson Creek:*** No net average annual reduction in groundwater is anticipated with full implementation of HCM-1; however, a small decline of 0.1 cfs is estimated to seasonally occur during the fall months. A cumulative tailwater discharge to Johnson Creek of 1.36 cfs was measured in 1997 1.36 cfs. No re-regulation reservoirs are planned that would affect tailwater discharge to Johnson Creek. The resulting streamflows during the fall season are anticipated to range between 0.3 and 4.9 cfs. Habitat for Covered fish species in Johnson Creek is anticipated to be minimally influenced as a result of full implementation of HCM-1.

### *Effects on Covered Species*

The benefit to Covered fish species, including stocks listed as threatened under the federal ESA and the critically low stocks of other salmonid species using the Dungeness River mainstem habitats discussed above in Section 7.1 must be put in context with a relatively minor adverse cumulative effect on fish using small stream habitats. The reduction in artificial groundwater recharge and decreased levels of tailwater discharge to small streams would reduce the habitat quality for covered fish species including coho salmon, steelhead and cutthroat trout compared to baseline conditions. Future groundwater recharge to small streams is expected to be reduced by increased groundwater utilization for human consumption, stock watering, and irrigation and by changes in infiltration recharge of the shallow aquifer. The effects of full implementation of HCM-1 on fish using small streams must be considered in conjunction with other ongoing factors influencing streams and habitat.

Small streams in the Action Area generally support anadromous fish species including coho salmon, winter-run steelhead and coastal cutthroat trout. Coastal cutthroat trout have been specifically identified as a separate guild for the purposes of this CIDMP since they exhibit a strong preference for using the small streams as preferred spawning and rearing habitat. Whereas coho salmon and steelhead trout will use the small streams, they have an equal or stronger utilization of large mainstem habitats. During initial biological reviews, it was determined none of the species using small streams warranted listing under the ESA. However, based on a level of uncertainty, they remain candidate species for future potential listing.

Estimates of the potential annual number of adult spawning escapement in Dungeness River tributary and independent small streams in comparison to the mainstem Dungeness River are provided in Table 7-5. Approximately 32.5 miles of tributary and small stream habitat compared to 12 miles of mainstem habitat exist within the Action Area. However, the mainstem area includes nearly continuous spawning and rearing habitat with substantially greater stream area, as a result of wide channel widths and an abundance of side and off-channel areas, compared to the small stream habitat. It also provides habitat for more species including Chinook, pink and chum salmon, native char and lamprey species that are known to currently exhibit limited use of the small streams. Conversely, the small stream habitat provides narrow stream widths, discontinuous spawning and rearing habitats and limited species use.

**Table 7-5**
**Current [Baseline] Spawning Escapement Estimates for Covered Fish Species**

| Species | Dungeness Mainstem(1) | Dungeness Tributaries(2) | Independent Streams (2) |
|---|---|---|---|
| Spring Chinook | 585 | | |
| Natural Coho(3) | 5,000 | 105 | 340 |
| Hatchery Coho | 18,400 | | |
| Fall Chum | 150 | 1,246 | |
| Summer Chum | <100 | | |
| Pink (Upper and Lower stocks) | 44,400 | | |
| Summer Steelhead | 150 | | |
| Winter Steelhead | 750 | 90 | 440 |
| Coastal Cutthroat | N/A | 120 | 155 |
| Native char | N/A | N/A | N/A |
| Pacific lamprey | N/A | N/A | N/A |
| River lamprey | N/A | N/A | N/A |
| **Total annual escapement (4)** | **<69,500** | **1,561** | **935** |

(1) Mean reported escapement during the baseline period including side channel habitat (see Section 3)
(2) Small stream fish escapements are estimated from available data, extrapolated to accessible stream miles in each stream within the Action Area per Table 4-13 to 4-19.
(3) Could include hatchery coho that are now spawning naturally.
(4) Excluding fish in the Dungeness River mainstem and small stream habitats without population data

The period of greatest risk for small streamflows occurs during the low flow season of late summer and early fall. Streamflows during this time-period could affect habitat for juvenile rearing life history stages of coho salmon, steelhead and cutthroat trout. If the current limiting factor for population levels is summer low flow space in the streams, further flow reductions could adversely influence the abundance of these candidate species in individual streams. Based on the FEIS modeling as summarized in Tables 7-3 and 7-4, streams in the Action Area may lose on average between 0 and 35 percent of their low flow volumes under HCM-1. The model suggests the streams with the greatest reliance on irrigation seepage include: Bell, Cassalery, Meadowbrook, and Matriotti creeks. Returning the creeks to more natural conditions would influence the periodicity of species use and would lower the production potential of resident and anadromous fish life history forms of coho salmon, steelhead trout and cutthroat trout in these streams compared to baseline conditions.

## 7.2 Diversion Facilities and Related Practices

The anticipated effects of proposed improvements to the facilities and operation and maintenance of those facilities on water quality and covered species is described in the following subsections.

### 7.2.1 Agnew Diversion

- ***HCM-2: Modify headgate on Agnew District's diversion facilities on the Dungeness River.*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** There have been no observations of juvenile fish loss or estimates of possible loss due to direct impact or de-scaling from the gate operation.

However, based on the consensus opinion of biologists, engineers and resource agency personnel, it was concluded a potential for injury exists and that an operational improvement could be made to minimize the potential injury of juvenile fish encountering the facility.

The EDT assessment of 31 proposed restoration and protection measures in the lower Dungeness River rank this measure near the bottom of all actions for each of the population performance measures since the effect on juvenile Chinook salmon is relatively small and limited in scope (Lestelle 2004). The model could not differentiate an overall improvement in the population performance metrics compared to baseline conditions.

Although there are insufficient data to quantify the benefit, the anticipated effect of HCM-2 will be a slight improvement in juvenile fish survival for covered species in the salmonid fish, native char and coastal cutthroat trout guilds compared to the baseline situation. This measure would provide immediate benefits and would offer interim protection until the fish screens are moved closer to the river point of diversion as contemplated under WDFW actions.

***Adverse Effects:*** There are no adverse effects anticipated under this Conservation Measure.

### 7.2.2 Sequim-Prairie Tri-Irrigation Company's Independent Canal Diversion

- ***HCM-3: Modify culvert on Sequim-Prairie Tri-Irrigation Company's Independent Canal bypass channel associated with diversion facilities on Dungeness River.*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** Downstream spawning and rearing habitat are currently scoured during high flow from the culvert outlet, limiting the production potential in the locale for covered fish species. The action of reducing downstream velocities with the use of a step pool will help stabilize local habitat and improve both the spawning and rearing production potential of the bypass channel. This activity could be performed quickly with immediate potential benefits for improved spawning opportunities and juvenile fish survival of Covered Species. See related improvement under HCM-13 concerning a commitment to provide continuation of intake and bypass channel flows.

  ***Adverse Effects:*** There are little adverse effects anticipated under HCM-3 with the exception of short-term effects during in-channel construction of the step pool. Any work within the ordinary high water mark of the channel will require an HPA that will guide the actions needed for minimizing effects during implementation.

- ***Potential Action: While not an official conservation measure, the DWUA will explore the possibility of eliminating direct effects of Sequim-Prairie Tri-Irrigation Company's Independent Canal diversion by obtaining the water required to operate***

***the Independent canal from the Highland Irrigation District canal. The current Independent Canal diversion would be eliminated with this project.*** (See full description of this HCM in Section 6).

A brief review of the feasibility of the project was performed for this CIDMP and presented to the CIDMP technical committee. Two alternative projects were identified that would close the Independent Canal intake channel and supply water to the Independent Canal from the Highland canal. Both alternatives were determined to be technically feasible.

***Beneficial Effects:*** The Independent Canal point of diversion is on the east bank of the Dungeness River at RM 8.8. It is located on the outside bend of the river that is influenced by high flow conditions in the mainstem channel. Channel modification to maintain water flow in the diversion canal is normal following peak flow events. Previous in-river maintenance activities have reportedly disturbed fish habitat and incubating redds. Refer to HCM-2 through HCM-13 for improvements in diversion intake maintenance procedures.

Combining the Highland and Independent Canal diversions would reduce the routine expense of in-river, diversion maintenance and associated habitat degradation related to maintaining flow in the Independent Canal diversion as well as operation and maintenance expenses related to the intake and screening facilities. The direct benefit to covered species is related to improved survival of embryos during redd disturbance, improved survival of fry related to either impingement or entrainment at the intake facility and potential increases in subsequent smolt production. As an example, the 5-yr geometric mean number of spring Chinook salmon redds in the Dungeness River as of 2004 is 210 redds. The loss of each redd would, therefore, represent slightly less than 0.5 percent of the geometric mean number of annual redds over the last five years. Unless other density-dependent factors are controlling population numbers, a 0.5 percent loss could equate to 0.5 percent less outmigrating smolts and 0.5 percent less fish returning to spawn for each redd eliminated. Although it is unlikely a redd is disturbed annually at this location, the assessment provides an estimate of potential loss on a per redd basis. There are no quantitative data to assess the potential loss of juvenile salmonids by means of impingement or entrainment at the Independent Canal intake facility. Removal of the facility would preclude any future potential of loss. Jointly operating irrigation diversions would also remain consistent with the overall CIDMP or CWCP objectives to combine operations where feasible.

***Adverse Effects:*** Although technically feasible, this project would result in a subsequent reduction in flow in the Dungeness River between the Highland diversion [RM 10.9] and the location of the Independent Canal diversion [RM 8.8]. To implement this project, withdrawal of water for the Independent Canal would occur 2.1 miles upstream from its current location. As shown in Table 7-6, the 7.5 cfs average low flow withdrawal from the Independent diversion would equate to a flow reduction between 7.0 and 7.5 cfs for 2.1 miles of mainstem habitat. This flow reduction represents approximately a 5 percent change in Dungeness River discharge at the 50 percent exceedance level and a 10 percent change at the 90 percent exceedance level measured at the USGS gaging station as reported in England (1999) for the August to October time frame.

**Table 7-6**
**Assessment of Instream Flow Changes Related to Eliminating the Independent Canal Diversion**

| | | Existing Conditions | | Independent Canal Diversion Eliminated | | | |
|---|---|---|---|---|---|---|---|
| Location | RM | Incremental cfs | River Flow cfs | Incremental cfs | River Flow cfs | Anticipated Change cfs | Anticipated Change (%) |
| ***50% Exceedance Flow Level*** | | | | | | | |
| USGS Gage Site 1/ | 11.8 | 177 | 177 | 177 | 177 | 0.0 | |
| Loss to Groundwater 4/ | | 4.4 | 173 | 4.4 | 173 | 0.0 | |
| Agnew Diversion 3/ | 11.0 | 14.4 | 158 | 14.4 | 158 | 0.0 | |
| Highland Diversion 3/ | 10.9 | 12.6 | 146 | 20.1 | 138 | -7.5 | -5.2% |
| Loss to Groundwater 4/ | | 3.2 | 142 | 3.0 | 135 | -7.3 | -5.2% |
| Kinkade Sidechannel | 10.2 | | 142 | | 135 | -7.3 | -5.2% |
| Kinkade Sidechannel | 9.5 | | | | | | |
| Loss to Groundwater 4/ | | 6.2 | 136 | 5.9 | 129 | -7.0 | -5.2% |
| Independent Canal Diversion 3/ | 8.8 | 7.5 | 129 | 0.0 | 129 | | |
| ***90 % Exceedance Flow Level*** | | | | | | | |
| USGS Gage Site 2/ | 11.8 | 109 | 109 | 109 | 109 | 0.0 | |
| Loss to Groundwater 4/ | | 2.7 | 106 | 2.7 | 106 | 0.0 | |
| Agnew Diversion 3/ | 11.0 | 14.4 | 92 | 14.4 | 92 | 0.0 | |
| Highland Diversion 3/ | 10.9 | 12.6 | 79 | 20.1 | 72 | -7.5 | -9.5% |
| Loss to Groundwater 4/ | | 1.7 | 78 | 1.6 | 70 | -7.3 | -9.5% |
| Kinkade Sidechannel | 10.2 | | 78 | | 70 | -7.3 | -9.5% |
| Kinkade Sidechannel | 9.5 | 3.4 | | | | | |
| Loss to Groundwater 4/ | | 7.5 | 74 | 3.0 | 67 | -7.0 | -9.5% |
| Independent Canal Diversion 3/ | 8.8 | 7.5 | 67 | 0.0 | 67 | | |

(1) Effects at 50% exceedance flow (177 cfs) during the Aug. – Oct time frame: 7 to 7.5 cfs or 5 % of the river Flow.
(2) Effects at 90% exceedance flow (109 cfs) during the Aug- Oct time frame; 7 to 7.5 cfs or 10 % of the river flow.
(3) Average diversions at the Agnew, Highland and Independent Canal outtakes during the 1991-1997 time period.
(4) Loss to groundwater is approximated at a rate of 0.031 of mainstem flow/mile between sites per Simonds and Sinclair 2002.

### *Effects on Covered Species*

The reach between the Highland and Independent Canal points of diversion include mainstem and side channel spawning and rearing habitat for all of the covered fish species. The three branches of the Kinkade side channel are located within this reach. A 5 to 10 percent change in streamflow does not equate directly to a similar change in habitat parameters. As an example, based on the USGS stage rating curves for the gage site, a reduction of this level equates to approximately a 1 to 3 percent change in mainstem river stage. Similarly, using the US Bureau of Reclamation rating curves for velocity, depth and width at cross sections in the Kinkade East and West side channels (Daraio et al. 2003), channel widths are anticipated to change 0 to 1 percent, depths would change 2 to 3 percent and velocities would change between 2 and 4 percent with subsequent 5 to 10 percent reductions, respectively, in river flow (Table 7-7). The Kinkade Middle side channel did not offer attainable spawning and rearing habitat features for covered fish species over the flow range studied of 94 to 465 cfs. As a result it is not further discussed herein.

**Table 7-7**
**Change in Kinkade Side Channel Habitat Parameters with a 5 to 10 Percent Reduction in Mainstem Flow**

| Side Channel | Habitat Parameter | Rating Curve Constant (b)[1/] | Relative Change in Habitat: 50% Exceedance Level | Relative Change in Habitat: 90% Exceedance Level |
|---|---|---|---|---|
| Reduction in Mainstem Discharge[2/] | | | 5% | 10% |
| Reduction in Stage[3/] | | 0.2600 | 1% | 3% |
| ***Kinkade – East*** | | | | |
| | Discharge (cfs) | 0.5526 | 3% | 5% |
| | Velocity (fps) | 0.4166 | 2% | 4% |
| | Depth (ft) | 0.2836 | 2% | 3% |
| | Width (ft) | 0.0626 | 0% | 1% |
| ***Kinkade – Middle*** | | | | |
| | Discharge (cfs) | 0.3847 | 2% | 4% |
| | Velocity (fps) | 0.4718 | 2% | 5% |
| | Depth (ft) | 0.4195 | 2% | 4% |
| | Width (ft) | 0.0904 | 0% | 1% |
| ***Kinkade – West*** | | | | |
| | Discharge (cfs) | 0.7743 | 4% | 7% |
| | Velocity (fps) | 0.3257 | 2% | 3% |
| | Depth (ft) | 0.2199 | 1% | 2% |
| | Width (ft) | 0.0762 | 0% | 1% |

(1) Side channel rating curve data from the USBR side channel report (Daraio et al. 2003)
(2) Change in mainstem flow between RM 10.9 and RM 8.8 under Conservation Measure-4 per Table 7-6.
(3) Example of change in mainstem river stage based on USGS rating curve constant.

Habitat features for covered fish species in the 2.1 mile reach between the Independent Canal and Highland diversions, including side channels important for spawning and rearing habitat, are anticipated to decrease on the order of 1 to 4 percent at river flow levels between the 90 and 50 percent exceedance levels during the low flow period in the river. The frequency of occurrence of suitable transportation, spawning and rearing habitat features with and without this possible project are likely imperceptible to the covered fish species. For example, the minimum depths in Kinkade East and West side channels at a 10 percent flow reduction would change approximately 0.1 ft., the minimum velocities would change between 0.0 and 0.1 fps and the minimum width would change between 0 and 1 foot. The influence of such small changes in habitat features on potential smolt production is likely not measurable.

If the upper instream flow study site is representative of the reach between the Independent Canal and Highland diversions, it confirms a 7.5 cfs flow reduction would be less than a 3 percent change in rearing WUA.

Large mainstem rivers should be capable of producing between 2,250 and 5,200 Chinook salmon smolts per kilometer of streambed (Marshall et. al. 1980). Using a 3 percent population reduction, the 2.1 miles of mainstem habitat could lose rearing space for between 230 and 525 juvenile Chinook salmon. This amount of juvenile production could be generated from 1 to 3 redds annually.

The EDT assessment of 31 proposed restoration and protection measures in the lower Dungeness River ranks the possible project near the bottom of all actions for each of the population performance measures since the effects on juvenile Chinook salmon are relatively small and limited in scope (Lestelle 2004). The model could not differentiate an overall net improvement in the population metrics compared to current conditions without the action.

### 7.2.3 Highland Diversion

- ***HCM-4 Modify headgate on Highland District's diversion facilities on the Dungeness River.*** (See full description of this HCM in Section 6).

  The beneficial and adverse effects of HCM-4 will be identical to those discussed under HCM-2 for the Agnew Diversion.

### 7.2.4 McDonnell Creek Diversion

- ***Pursue data gathering and alternatives identified in the McDonnell Creek technical report.*** (See full description of this HCM in Section 6).

  Beneficial Effects: The exact benefits to covered species will depend on whether McDonnell Creek Diversion Alternative 2, Alternative 3, or both are implemented, as well as the additional research related to the possibility of false attraction. Nevertheless, gathering the data and moving forward on either alternative will improve upstream passage and benefit returning adult coho, winter steelhead, and cutthroat trout spawners in the McDonnell Creek watershed. Delays in passage can have an adverse effect related to pre-spawning adult mortalities or successful redd completion due to reduced fish energy reserves. In addition, fish attempting upstream passage can get trapped in debris lodged in the ladder and directly lost to production. There are not quantitative data related to frequency of time the ladder may not be functioning properly or information related to pre-spawning mortalities. However, reducing hindrances to upstream migrations is considered a beneficial effect.

  Adverse Effects: The adverse effects depend on the alternative implemented. The short-term effects of any in-river modifications to the existing structures may have a temporary influence on water quality parameters, primarily turbidity and suspended solids. However, construction techniques including seasonal timing can be performed to mitigate the potential adverse construction impacts.

- ***HCM-5 Improve McDonnell Creek downstream fish passage by realigning fish bypass pipeline.*** (See full description of this HCM in Section 6).

***Beneficial Effects:*** Improving downstream passage of the bypass system will benefit juvenile coho salmon, winter steelhead and cutthroat trout outmigrants in the McDonnell Creek watershed. Juvenile fish entrained at the point of diversion are excluded from the water distribution network by means of rotating drum screens at the intake facility. Fish return to McDonnell Creek via a PVC bypass pipe downstream of the diversion dam and intake facility. The existing bypass pipe discharges into a small pool area at the base of a riprapped bank. At low streamflows a potential exists for juvenile fish to experience physical damage and injury at the discharge point.

There are no quantitative data related to frequency of time the bypass system may not be functioning properly or information related to juvenile fish injuries. Nevertheless, reducing hindrances to downstream migration is considered a beneficial effect. This measure could be performed relatively quickly and it will provide immediate benefits to some of the covered but un-listed fish species.

***Adverse Effects:*** There are no adverse effects anticipated under this Conservation Measure.

- ***HCM-6**: **Inspect McDonnell Creek fish ladder daily and remove debris.*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** The beneficial effects of maintaining the upstream fish passage facility in McDonnell Creek has been discussed earlier in this Section and they apply equally under this Conservation Measure. Daily attention to maintaining the Denil-type fish ladder should keep the fishway operational and minimize any potential for delays in adult migration to the spawning grounds.

  ***Adverse Effects:*** There are no adverse effects to Covered species anticipated under this Conservation Measure.

### 7.2.5 All Diversions

- ***HCM-7: Carry out Yakima Screen Shop Recommendations for diversion facilities from the 2001 report.*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** Improving screening facilities will benefit juvenile outmigrants of Covered fish Species in the Action Area. Juvenile fish entrained at the point of diversion are excluded from the water distribution network by means of either perforated plates or rotating drum screens at the intake facility. Recommended improvements are specific to each of the intake facilities, but in general the intent of this conservation measure is to minimize injury of juvenile life history stages of covered fish species to the maximum extent practicable.

  There are no quantitative data related to injury of fish at the intake facilities or data concerning screening or fish passage efficiencies. Although occasionally intake seals have become worn and fish have been found entrained in the canal system on the downstream side of the screens (Schille 2001). Improving screening efficiency and reducing periods of potential fish entrainment in the canal system is considered an un-quantified but beneficial effect.

***Adverse Effects:*** There are no adverse effects anticipated under this Conservation Measure.

### 7.2.6 Maintenance of Intakes

- ***HCM-8: Establish new agency notification and redd protection procedures related to working in-water.*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** The resource agencies and co-managers would like sufficient lead-time to schedule staff to assist during in-river maintenance activities of the DWUA members. The purpose is primarily related to avoiding the disturbance of existing fish redds and incubating embryos. Conservation Measure No. 8 is designed to improve the coordination of in-river maintenance activities compared to baseline operations under ongoing HPA permit procedures. The benefits of this measure to Covered fish species will be to minimize the inadvertent loss of embryos and to improve juvenile fish survival. As discussed in Section 7.2.2, the loss of one redd represents slightly more than 1 percent of the geometric mean number of annual Chinook salmon redds in the Dungeness River.

- ***HCM-9: Steam clean or pressure wash all heavy equipment before entering the Dungeness River. Also perform visual inspection to verify no major fluid leaks are present. (Same as WQ-2)*** (See full description of this HCM in Section 6).

- ***HCM-10: Establish a 100-foot buffer away from waters for refueling heavy equipment, mowers, etc. (Same as WQ-3)*** (See full description of this HCM in Section 6).

- ***HCM-11: Create a formal spill response plan, including requiring spill containment equipment under certain conditions. (Same as WQ-4).*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** Habitat Conservation Measures 9 and 11 are designed to minimize the inadvertent release of petrochemical products into pathways that can reach the Dungeness River and its habitats and to respond quickly in the event of a spill. In most forms, petroleum-based contaminants are toxic to aquatic and terrestrial life. Once in the environment, petroleum-based products can not be cleaned to any large degree and many forms are persistent such that decades of natural weathering are needed to reduce their toxic effect.

  There are no quantitative data to assess the potential for petrochemical releases into the Dungeness River, their duration in the environment or effects on Covered species. Nevertheless, a risk of inadvertent spills exists and these actions will help to minimize the risk. Additionally, having spill containment equipment on hand under certain circumstances will speed the response and lessen the impact if a spill were to occur.

***Adverse Effects:*** There are no adverse effects to Covered species anticipated under these conservation measures.

### 7.2.7 Screen Maintenance and Water Levels in Intake and Bypass Channels

- ***HCM-12: Continue to contract with WDFW for fish screen maintenance to ensure proper maintenance.*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** Although Conservation Measures No. 12 is not a change from baseline conditions, it reflects the DWUA's desire to continue this measure in future years. The benefits to Covered species include annual inspections of screening facilities and the ability to retrofit quick solutions if the screens are not properly functioning [refer to P. Schille, WDFW Yakima Screen Shop memorandum dated 1 October 2001).

  ***Adverse Effects:*** There are no adverse effects to Covered species anticipated under this Conservation Measure.

- ***HCM-13: The DWUA will not intentionally dewater intake and bypass channels***. (See full description of HCM on page 6-15 in Section 6).

  ***Beneficial Effects:*** The beneficial effects of maintaining streamflow in the intake and bypass channels is directly related to fish use of these habitats for spawning and rearing purposes. Off-channel rearing and winter refuge is especially important for a number of the Covered Species. Maintaining diverse habitat types in a watershed also assists in providing an expression of various life-history strategies and helps stabilize fish populations. Substantial quantities of habitat exist in the intake and bypass channels at many of the facilities. Flow continuation is essential for on-going fish production.

  ***Adverse Effects:*** There are no adverse effects to Covered species anticipated under this Conservation Measure.

## 7.3 Water Quality Actions Involving Ditch Maintenance and Tailwater

The remaining actions are Water Quality Actions. Their focus is improvement of water quality, rather than improvement of habitat for listed species. Therefore the remainder of this Section does not provide extensive documentation of anticipated effects on habitat for Covered Species.

- ***WQ-1: Improve water quality by converting open ditches to closed pipes (closely related to HCM-1 and DWUA Water Conservation Plan).*** (See full description of this HCM in Section 6).

***Beneficial Effects:*** This Water Quality Action will provide significant water quality benefits. This Action is also a major element of Habitat Conservation Measure HCM-1. It is discussed again here due to the water quality benefits. Pipelining prevents the possible interception of contaminant loads by the irrigation system. Pipelining also reduces tailwater volume since stormwater (and its associated contaminants) does not have access to pipes such as it currently does to ditches. Furthermore, the reduction in tailwater due to pipelining also limits potential temperature impacts.

***Adverse Effects:*** There are no adverse effects to Covered species anticipated under this action.

- ***WQ-2: Steam clean or pressure wash all heavy equipment before entering the Dungeness River. Also perform visual inspection to verify no major fluid leaks are present. (Same as HCM-9).*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** See discussion under WQ-4.

  ***Adverse Effects:*** See discussion under WQ-4.

- ***WQ-3: Establish a 100-foot buffer away from waters for refueling heavy equipment, mowers, etc. (Same as HCM-10).*** (See full description of this HCM in Section 6).

  ***Beneficial Effects****:* See discussion under WQ-4.

  ***Adverse Effects:*** See discussion under WQ-4.

- ***WQ-4: Create a formal spill response plan, including requiring spill containment equipment under certain conditions. (Same as HCM-11).*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** Water Quality Actions 2, 3, and 4 are designed to minimize the inadvertent release of petrochemical products into pathways that can reach the Dungeness River and its habitats and to respond quickly in the event of a spill. In most forms, petroleum-based contaminants are toxic to aquatic and terrestrial life. Once in the environment, petroleum-based products can not be cleaned to any large degree and many forms are persistent such that decades of natural weathering are needed to reduce their toxic effect.

  There are no quantitative data to assess the potential for petrochemical releases into the Dungeness River, their duration in the environment or effects on Covered species. Nevertheless, a risk of inadvertent spills exists and these actions will help to minimize the risk. Additionally, having spill containment equipment on hand under certain conditions will speed the response time and lessen the impact if a spill were to occur.

  ***Adverse Effects:*** There are no adverse effects to Covered species anticipated under these Actions.

- ***WQ-5****:* ***Continue integrated pest management plan including responsible use of herbicide in a manner that protects water quality.*** (See full description of this HCM in Section 6).

***Beneficial Effects:*** This Water Quality Action represents a commitment to continue existing practices. It helps minimize herbicide impacts to water quality, while performing the necessary function of invasive vegetation management. The DWUA's herbicides practices (described in detail in Sections 2.4 and 5.5.2) include following all state regulations, using a relatively benign aquatically approved product (currently Rodeo), and applying herbicides on non-watered ditches whenever possible. Covered species will receive indirect benefits through improved water quality.

***Adverse Effects:*** In comparison with baseline conditions, there are no adverse effects to Covered species anticipated under this Action.

- ***WQ-6 Strive to perform ditch maintenance during the non-irrigation season, when ditches are less likely to be watered or contain less water.*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** This Water Quality Action helps reduce potential turbidity impacts. Since ditch maintenance has the potential to introduce or loosen sediments in the ditches thereby increasing turbidity, performing this work while the ditches have no or reduced amounts of water in them lessens the potential impact.

  ***Adverse Effects:*** There are no adverse effects to Covered species anticipated under this action.

  - ***Possible Action: The DWUA will explore constructing wetland finishing ponds as a treatment method to make the subsequent discharge of selected tailwater to surface water bodies indirect rather than direct.*** (See full description of this HCM in Section 6).

    ***Beneficial Effects:*** Potential water quality benefits to local resources and Covered Species may ensue with the creation of wetland habitat and increasing artificial recharge to shallow groundwater sources. Currently the irrigation delivery system intercepts stormwater, animal wastes and other contaminants in the unlined portions of the canals and ditches. These contaminants are transported and discharged to surface water bodies at 25 tailwater locations throughout the Action Area (Table 2-2). This conceptual action includes disconnecting the direct surface water discharge of tailwater to freshwater streams and estuarine waters within Dungeness and Sequim Bays. Retaining/detaining tailwater in wetland finishing ponds would use natural [soil and vegetation] systems to filter the water prior to subsequent indirect discharge of the finished tailwater. Tailwater releases would take two pathways back to surface water bodies; wetland outflow or groundwater seepage. Retention/detention might add to local increases in shallow aquifer recharge prior to flowing to surface water bodies. The natural soil and vegetative filtering properties would generate improved tailwater conditions with respect to water quality parameters. Covered species would benefit indirectly from improved water quality conditions.

    An added benefit would be related to wetland creation and increased aquifer recharge. Reductions in both wetlands and shallow aquifer recharge are anticipated minor adverse effects of water Conservation Measure No. 1 associated with reduced levels of diversions and decreased interception of stormwater. As a result, use of constructed wetlands or expanding existing wetlands to retain tailwater will reduce the potential adverse effects on wetlands and the shallow aquifer as discussed in Conservation Measure No. 1.

***Adverse Effects:*** Although no adverse effects on water quality or Covered Species are anticipated with this possible action, the feasibility of expanding or developing new wetlands may be related to local site constraints and land purchases or easements.

## 7.4 Prevent Pollutant Loading from Landowners, Homeowners, Roads, and Development

- ***WQ-7: Continue to publicize and monitor compliance of SDWUA Policy No. 19 stating it is illegal to apply herbicides not approved for aquatic use to the irrigation system.*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** This Water Quality Action Measure helps keep pesticides that are not approved for aquatic use out of the irrigation system. Unlike the DWUA's licensed herbicide applicators, landowners adjacent to ditches are often not knowledgeable about appropriate herbicides techniques. Landowners, especially new residents as the area transitions from agricultural to residential, may not be aware that it is illegal to apply certain herbicides to ditches. Non-aquatically approved herbicides contain petroleum based surfactants, which are harmful to aquatic systems. The DWUA's efforts to publicize and monitor compliance for herbicide use make an important contribution to water quality.

  ***Adverse Effects:*** There are no adverse effects to Covered species anticipated under this action.

- ***WQ-8: Continue to require (and monitor compliance) that water users owned distribution systems are comprised of closed pipe. (DWUA Policy #22) Also continue the cost share program for installing this pipe.*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** This Water Quality Action helps reduce pollutant loading to the irrigation system and connected waterbodies. Closed pipes do not have access points for pollution; therefore DWUA Policy Number 22 contributes towards protecting water quality.

  ***Adverse Effects:*** There are no adverse effects to Covered species anticipated under this action.

- ***WQ-9: Continue to publicize and monitor compliance of DWUA Policy #18a stating it is illegal to introduce any pollutant, including animal waste, to the irrigation system.*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** This Water Quality Action helps reduce pollutant loading to the irrigation system and connected waterbodies.

***Adverse Effects:*** There are no adverse effects to Covered species anticipated under this Action.

- ***WQ-10 Continue to publicize and monitor compliance of DWUA Policy #18b stating it is illegal to direct stormwater drainage into the irrigation system.*** (See full description of this HCM in Section 66).

  ***Beneficial Effects:*** The DWUA's commitment to the pipelining component of its water conservation plan has significant water quality benefits. Pipelining is the cornerstone of the water quality protection program. Since the conservation program converts open ditches to closed pipes, this action prevents possible interception of contaminant loads by the irrigation system. This benefit is perhaps the strongest element of the water quality protection program. Pipelining reduces tailwater volume since stormwater does not have access to pipes such as it currently has to ditches. This will benefit water quality since tailwater can contain contaminants from the surrounding environment. Some level of contaminant loading will continue unless the entire system is connected to closed pipe. Pipelining also reduces potential temperature impacts due to the reductions in tailwater.

  Although Water Quality Actions No. 7 - No. 10 are not a change from baseline conditions, they reflect the DWUA's desire to commit to these policies as a keystone of the water quality program for the term of the CIDMP. Covered species will receive indirect benefits through improved water quality conditions.

  ***Adverse Effects:*** There are no adverse effects to Covered species anticipated by implementing this Action, however some level of stormwater interception will remain. A portion of the ditches will remain open even under full implementation of HCM-1 and illegal diversions of stormwater to the irrigation system will undoubtedly occur.

- ***WQ-11: Continue to work with other organizations on clean water programs*** *related to irrigation activities****.*** (See full description of this HCM in Section 6).

  ***Beneficial Effects:*** The beneficial effects of this action cannot be quantified, but it is anticipated this will assist in improving the overall quality of water in the Action Area.

  ***Adverse Effects:*** There are no adverse effects to Covered species anticipated under this action.

# Section 8 Implementation Framework

This section presents the framework that was proposed for implementation of the CIDMP. Additional provisions for implementation were intended to be included in implementing agreements between the DWUA, NOAA Fisheries, and USFWS. The original intent was to develop binding agreements that would identify actions to be carried out by DWUA and corresponding assurances from these agencies and Ecology regarding compliance with the Endangered Species Act and Clean Water Act. At the time this plan was finalized, suitable assurances had not been agreed to. Therefore, DWUA is not required to carry out the implementation program.

While DWUA has in good faith pursued ESA assurances through the CIDMP process, DWUA believes its ongoing activities fully comply with all laws, and nothing in this document is intended to suggest otherwise. This section identifies an implementation program DWUA could execute to further the conservation goals and objectives of this plan.

## 8.1 Implementation Schedule

Table 6-1 listed Habitat Conservation Measures and Table 6-2 listed Water Quality Actions. Tables 8-1 and 8-2 display the schedule that was proposed for implementation of the Habitat Conservation Measures and Water Quality Actions.

Tables 8-3 through 8-6 provide further detail on the proposed schedule for implementation of Habitat Conservation Measure HCM-1, regarding reduction in diversions from the Dungeness River. Diversion limitations were to be implemented over a 20-year period, in four stages. However, if funding were available that would allow water conservation projects to be constructed more rapidly, the DWUA could pursue more rapid achievement of the diversion limitation milestones.

**Table 8-1**
**Proposed Schedule for Implementing Habitat Conservation Measures**

| No. | Measure | Completion Date |
|---|---|---|
| HCM-1[1] | Reduce diversions from Dungeness River per Tables 6-3 to 6-10. This will be done mainly through pipelining and other actions in the DWUA Water Conservation Plan. Additional actions such as water leasing, voluntary reductions in usage and/or construction of storage capacity can also be used to reduce diversions for purposes of HCM-1. | Progressive reduction in five-year steps, with 100 % reduction achieved at 20 years from issuance of ITP (also see Tables 8-3 to 8-6). |
| HCM-2 | Modify headgate on Agnew District's diversion facilities on the Dungeness River. | 2 years from ITP |
| HCM-3 | Modify culvert on Sequim-Prairie Tri-Irrigation Company's Independent Canal bypass channel associated with diversion facilities on Dungeness River. | 2 years from ITP |
| HCM-4 | Modify headgate on Highland District's diversion facilities on the Dungeness River. | 2 years from ITP |
| HCM-5 | Improve McDonnell Creek downstream fish passage by realigning fish bypass pipeline. | 2 years from ITP |
| HCM-6 | Inspect McDonnell Creek fish ladder daily and remove debris. | Immediately upon issuance of ITP |
| HCM-7 | Carry out Yakima Screen Shop Recommendations for diversion facilities from the 2001 report. | 10 years from ITP |
| HCM-8 | Establish new agency notification and redd protection procedures related to working in-water. | Immediately upon issuance of ITP |
| HCM-9 | Steam clean or pressure wash all heavy equipment before entering the Dungeness River. Also perform visual inspection to verify no major fluid leaks are present. (Same as WQ-2) | Immediately upon issuance of ITP |
| HCM-10 | Establish a 100-foot buffer away from waters for refueling heavy equipment, mowers, etc. (Same as WQ-3) | Immediately upon issuance of ITP |
| HCM-11 | Create a formal spill response plan, including requiring spill containment equipment under certain conditions. (Same as WQ-4). | 1 year from ITP |
| HCM-12 | Continue to contract with WDFW for fish screen maintenance to ensure proper maintenance. | Immediately upon issuance of ITP |
| HCM-13 | The DWUA will not intentionally dewater intake and bypass channels | Immediately upon issuance of ITP |

(1) If funding is available that allows water conservation projects to be constructed more rapidly, the DWUA will pursue more rapid achievement of the diversion limitation milestones.

**Table 8-2**
**Proposed Schedule for Implementing Water Quality Actions**

| No. | Measure | Completion Date |
|---|---|---|
| WQ-1 | Improve water quality by converting open ditches to closed pipes (closely related to HCM-1 and DWUA Water Conservation Plan). | 20 years from ITP |
| WQ-2 | Steam clean or pressure wash all heavy equipment before entering the Dungeness River. Also perform visual inspection to verify no major fluid leaks are present. (Same as HCM-9) | Immediately upon issuance of ITP |
| WQ-3 | Establish a 100-foot buffer away from waters for refueling heavy equipment, mowers, etc. (Same as HCM-10) | Immediately upon issuance of ITP |
| WQ-4 | Create a formal spill response plan, including requiring spill containment equipment under certain conditions. (Same as HCM-11). | 1 year from ITP |
| WQ-5 | Continue integrated pest management plan including responsible use of herbicide in a manner that protects water quality. | Ongoing |
| WQ-6 | Strive to perform ditch maintenance during the non-irrigation season, when ditches are less likely to be watered or contain less water. | Ongoing |
| WQ-7 | Continue to publicize and monitor compliance of DWUA Policy #19 stating it is illegal to apply herbicides not approved for aquatic use to the irrigation system. | Ongoing |
| WQ-8 | Continue to require (and monitor compliance) that water users owned distribution systems are comprised of closed pipe. (DWUA Policy #22) Also continue the cost share program for installing this pipe. | Ongoing |
| WQ-9 | Continue to publicize and monitor compliance of DWUA Policy #18a stating it is illegal to introduce any pollutant, including animal waste, to the irrigation system. | Ongoing |
| WQ-10 | Continue to publicize and monitor compliance of DWUA Policy #18b stating it is illegal to direct stormwater drainage into the irrigation system. | Ongoing |
| WQ-11 | Continue to work with other organizations on clean water programs relevant to irrigation activities. | Ongoing |

**Table 8-3**
**Proposed Schedule for Achieving Diversion Reductions**
**April 15– July 31 (all values in cfs)**

| Dungeness River Flow at USGS Gage | Diversion Allowed at Year 1 | Diversion Allowed by Year 5 | Diversion Allowed by Year 10 | Diversion Allowed by Year 15 | Diversion Allowed by Year 20 |
|---|---|---|---|---|---|
| ≥ 620 | 80/80 | 80/80 | 80/80 | 80/80 | 80/80 |
| 600 | 75/80 | 71/75 | 69/70 | 67/70 | 65/70 |
| 148-550 | 75/80 | 70/75 | 65/70 | 55/60 | 50/55 |

*Note:* Diversions are listed as Average/Maximum Allowable Diversion. For more information, see Section 6.
Prorate allowable diversions when Dungeness River flow is between 550 – 620 cfs at USGS gage.

| Table 8-4<br>Proposed Schedule for Achieving Diversion Reductions August 1-31<br>(all values in cfs) | | | | | |
|---|---|---|---|---|---|
| **Dungeness River Flow at USGS Gage** | **Diversion Allowed at Year 1** | **Diversion Allowed by Year 5** | **Diversion Allowed by Year 10** | **Diversion Allowed by Year 15** | **Diversion Allowed by Year 20** |
| ≥ 143 | 70/75 | 65/70 | 60/65 | 55/60 | 50/55 |
| 120 | 60/60 | 55/55 | 52/52 | 50/50 | 48/48 |
| 113 | 53/53 | 48/48 | 46/46 | 44/44 | 42/42 |

*Note:* Diversions are listed as Average/Maximum Allowable Diversion. For more information, see Section 6.
Prorate allowable diversions when Dungeness River flow is between 113-143 cfs at USGS gage.

| Table 8-5<br>Proposed Schedule for Achieving Diversion Reductions<br>September 1-15<br>(all values in cfs) | | | | | |
|---|---|---|---|---|---|
| **Dungeness River Flow at USGS Gage** | **Diversion Allowed at Year 1** | **Diversion Allowed by Year 5** | **Diversion Allowed by Year 10** | **Diversion Allowed by Year 15** | **Diversion Allowed by Year 20** |
| ≥ 167 | 55/60 | 54/59 | 52/57 | 51/56 | 50/55 |
| 140 | 55/60 | 53/58 | 52/56 | 50/53 | 48/53 |
| 121 | 55/60 | 53/57 | 52/55 | 50/52 | 48/48 |
| 110 | 50/50 | 47/47 | 44/44 | 42/42 | 39/39 |
| 94 | 34/34 | 32/32 | 29/29 | 27/27 | 25/25 |

*Note:* Diversions are listed as Average/Maximum Allowable Diversion. For more information, see Section 6.
Prorate allowable diversions when Dungeness River flow is between 94-167 cfs at USGS gage.

| Table 8-6<br>Proposed Schedule for Achieving Diversion Reductions<br>Sept 16 – Oct. 31 (all values in cfs) | | | | | |
|---|---|---|---|---|---|
| **Dungeness River Flow at USGS Gage** | **Diversion Allowed at Year 1** | **Diversion Allowed by Year 5** | **Diversion Allowed by Year 10** | **Diversion Allowed by Year 15** | **Diversion Allowed by Year 20** |
| >80 | 12/12 | 12/12 | 12/12 | 12/12 | 12/12 |

*Note:* Diversions are listed as Average/Maximum Allowable Diversion. For more information, see Section 6.
Prorate allowable diversions when Dungeness River flow is between 73-89 cfs at USGS gage.

| Table 8-7<br>Proposed Schedule for Achieving Diversion Reductions<br>Nov. 1 – April 14 (all values in cfs) | | | | | |
|---|---|---|---|---|---|
| **Dungeness River Flow at USGS Gage** | **Diversion Allowed at Year 1** | **Diversion Allowed by Year 5** | **Diversion Allowed by Year 10** | **Diversion Allowed by Year 15** | **Diversion Allowed by Year 20** |
| >89 | 20/20 | 20/20 | 20/20 | 20/20 | 20/20 |
| 73 | 13/13 | 11/11 | 9/9 | 7/7 | 6/6 |

*Note:* Diversions are listed as Average/Maximum Allowable Diversion. For more information, see Section 6.
Prorate allowable diversions when Dungeness River flow is between 73-89 cfs at USGS gage.

### 8.1.1 Relationship between Schedule and Incidental Take Permit

As an outcome of the CIDMP process, the DWUA had intended to obtain an Incidental Take Permit (Permit) pursuant to Section 10 of the Endangered Species Act. The Incidental Take Permit was to be issued by USFWS and NOAA Fisheries. It was proposed by DWUA that the Permit be issued for a period of 35 years. This length of time is appropriate because the capital improvements associated with HCM-1 are long-lived. In order to fund these improvements, DWUA, funding agencies, and local landowners who may be asked to approve bond issues need to have assurances that the protections offered under Section 10 of the ESA will be correspondingly long-lived, including a substantial period of time after completion of improvements.

At the same time, the implementing agreement associated with the ITP was to create a direct linkage between achieving scheduled milestones in Table 8-1 and maintaining the protections offered by the federal government. The implementing agreement (see below) was to spell out the consequences in the event that the DWUA fails to meet its obligations on schedule. For example, failure to achieve milestones on time would result in cancellation of the Permit, and loss of protection under Section 10 of the ESA.

## 8.2 Implementing Agreement with Federal Services

The DWUA planned to execute an implementing agreement with USFWS and NOAA Fisheries, in regards to the terms and conditions for implementing the ESA-related aspects of the CIDMP. The implementing agreement was to cover the following:

- Obligations, benefits, rights, authorities, liabilities and privileges of the parties;
- Assignment of responsibility for planning, approving and implementing specific measures;
- Term of the agreement including provisions for permit suspension, revocation, or extension;
- Responsibility of USFWS, NOAA Fisheries, and the DWUA in monitoring and reporting;
- Process for handling adaptive management and changed circumstances;
- Process for amending the CIDMP if necessary; and
- Enforcement provisions and remedies, in the event that any party fails to perform its obligations under the CIDMP.

It should be noted that the Water Quality Actions listed in Tables 6-2 and 8-2 were not part of the HCP or implementing agreement. These are separate actions that have been developed through discussions with the Washington State Department of Ecology. A few of these actions overlap with Habitat Conservation Measures and these selected actions are part of the HCP and also appear in Tables 6-1 and 8-1.

## 8.3 Funding Needs and Sources

An estimate of costs to implement actions in the CIDMP is provided in Table 8-8. The estimated cost totals $16.4 million. However, it may not be necessary to incur all costs since some projects can be substituted for each other (e.g., specific pipelining projects vs. storage). The largest cost of $9 million will be for phased implementation of the Comprehensive Water Conservation Plan

(MWG 1999). This action is the primary element needed to achieve the diversion reductions listed as Habitat Conservation Measure HCM-1 in Table ES-1. A second major cost ($3.4 million) is for a proposed storage project to reduce diversions during the most critical flow period of August 15 to September 15. The third largest cost ($3 million) is for capital improvements to diversion structures. The remaining categories total $1 million for other activities addressed in this CIDMP.

Table 8-8
Estimated Costs for Implementation of CIDMP

| Item | Estimated Cost |
|---|---|
| Water conservation actions (pipelining of ditches and other infrastructure improvements to reduce water usage) | $9,000,000 |
| Storage reservoir (Atterberry) to reduce diversions in August and September | $3,400,000 |
| Major construction projects to improve diversion outtakes for fish habitat enhancement | $3,000,000 |
| Constructed wetlands to improve water quality at selected tailwater sites | $500,000 |
| Small construction projects to improve diversion outtakes for fish habitat enhancement | $300,000 |
| Training and equipment to improve operational practices related to channel maintenance to reduce potential habitat impacts | $100,000 |
| Training and equipment to support water quality monitoring activities in collaboration with other entities | $100,000 |
| **Total** | $16,400,000 |

Costs shown are preliminary estimates except water conservation costs from Comprehensive Water Conservation Plan (MWG, 1999). All costs are in 2003 dollars.

The DWUA has been successful in securing grants to carry out capital projects for water conservation and other purposes in recent years. It is anticipated that similar funding will be available for continued implementation of the water conservation plan, which is the primary action discussed in this CIDMP. It is also anticipated that funding can be obtained for the other actions listed in Section 6.

Since 1995 the DWUA has received the following funds for water conservation, fish passage, and water quality improvement:

Table 8-9
Funding Sources for Recent Water Conservation, Fish Passage, and Water Quality Capital Projects

| Year | Description | Funding Source | Agency Amount | In-Kind | Total Cost |
|---|---|---|---|---|---|
| 1995 | Cline-Clallam-Dungeness Fish Screen & Outtake, various small ditch sites (fish passage, flows) | DNR Jobs for the Environment | $298,500 | $116,300 | $414,800 |
| 1997-1999 | Pipelining and fish passage and bypass improvements. Agnew ID, Dungeness Co., Cline ID, Sequim Prairie Tri-District. | US Forest Service (WA-CERT) | $134,600 | $37,400 | $172,000 |
| 1999-2000 | Pipelining. Highland ID and Dungeness Co. | SRFB (WDFW State Salmon Habitat Restoration and Screening Funding) | $100,000 | $25,000 | $125,000 |
| 2001-2002 | Pipelining. Dungeness Co., Highland ID, Sequim Prairie Tri-District | SRFB | $169,500 | $31,500 | $201,000 |
| 2001-2002 | Pipelining; and tight-lining ditches. Agnew ID, Cline ID, Clallam Ditch Co., Sequim Prairie Tri-District. | SRFB | $207,600 | $37,100 | $244,700 |
| 2005 | Water efficiency improvements (CIDMP Implementation) | Appropriation by Washington State Legislature | $1.5 Million | N/A | $1.5 Million |
| 2005 | Pipelining Agnew I.D. | SRFB | $501,160 | $88,440 | $589,600 |

ID = Irrigation District; DNR = Dept. of Natural Resources; SRFB = Salmon Recovery Funding Board;
(1) Does not include additional capital projects funded entirely by irrigation districts and companies.

The following funding sources have been identified for implementation of CIDMP projects. It is anticipated that a combination of these sources will be used to fund the overall package of actions described in Section 6 of this CIDMP. The DWUA will make application to these sources promptly upon finalization of implementing agreements related to this CIDMP, and will continue to submit funding applications periodically to meet the implementation schedule described in Section 8.1.

- **Washington State Referendum 38 (Ecology)** –This fund operates on a basis of a maximum allowed funding of up to $2.5 million per irrigation district. Most of this amount is still available to the four irrigation districts that are members of the DWUA (private irrigation companies are not eligible for Referendum 38 funds). The fund offers a combination of grants and loans with a ten percent matching requirement. Based on information provided by Ecology Referendum 38 funds are currently approximately $25 million, but $20 million is committed to fund projects in the Yakima River Basin. For the current biennium (July 1, 2003 – June 30, 2005), $4 million is available for projects, but $1 million of this is set aside for the Yakima Basin.

  For purposes of this CIDMP, it is anticipated that up to $3 million may be available from this fund to support Habitat Conservation Measure HCM-1/Water Quality Action WQ-1 over the next five years. Additional funds could be available, depending on the level of competition from other districts in the State, and depending on whether the Washington State Legislature provides additional funds for Referendum 38.

- **Conservation District Funds for Irrigation Efficiency** – This source would fund water conservation projects. Referendum 38 funds have been made available for efficiency projects in a limited number of conservation districts. Clallam Conservation District would be involved for activities funded in Clallam County. The funds can be used for irrigation companies as well as districts. A portion of saved water must go to instream flows for some specified period of time.

- **Conservation District Funds for Water Quality** – This source has provided funding in the past for DWUA pipelining projects that offer water quality benefits, such as projects related to Water Quality Action WQ-1. If consideration of artificial wetland projects to treat tailwater result in specific project proposals, the DWUA will also apply to this source for funding of that work.

- **Washington State Centennial Clean Water Fund (Ecology)** – This source has also provided funding in the past for DWUA pipelining projects that offer water quality benefits. It is anticipated that some additional funds may be available to support additional pipelining measures related to Water Quality Action WQ-1. If consideration of artificial wetland projects to treat tailwater result in specific project proposals, the DWUA will also apply to this source for funding of those activities.

- **Washington State Salmon Recovery Fund --** DWUA will apply for funding for Habitat Conservation Measures to improve fish habitat, including water conservation projects modifications of diversion structures, fish bypass channels, etc. (Habitat Conservation Measures HCM-2; HCM-3; HCM-4; HCM-5, HCM-6, HCM-7)

- **Fisheries Restoration and Irrigation Mitigation Act (FRIMA) funding** - Federal funding being administered by USFWS for the Pacific Northwest States. DWUA will apply for funding to improve fish habitat, including modifications of diversion structures, fish bypass channels, etc.

- **Direct Appropriations from Washington State Legislature (capital budget)** – It is possible that DWUA, working through State agencies such as the Washington State Department of Agriculture; Washington State Department of Ecology; and/or Washington State Conservation Commission, could obtain specific allocations in the State capital budget for projects listed in Section 6. DWUA will explore this avenue, as part of a comprehensive funding package for CIDMP implementation.
- **Federal or State Funds Provided Indirectly through Jamestown S'Klallam Tribe** – Jamestown S'Klallam Tribe has indicated that it could potentially help to identify and apply for funding from agencies such as the U.S. Environmental Protection Agency; U.S. Department of Interior Bureau of Indian Affairs; and Washington State Salmon Recovery Funding Board to fund either water quality or habitat improvement projects. The DWUA will explore this avenue, as part of a comprehensive funding package for CIDMP implementation.
- **In-kind services or equipment** from Clallam County, Jamestown S'Klallam Tribe; Clallam Conservation District; and/or Ecology – in recent discussions of the water quality elements of this CIDMP, several entities have indicated a willingness to partner with DWUA on monitoring and public outreach related to water quality. For example, in-kind services could potentially be contributed in terms of equipment or laboratory services for water quality monitoring; and staffing or cost sharing for public outreach involving water quality. The DWUA will explore this avenue, as part of a comprehensive funding package for CIDMP implementation.
- **Direct or Indirect Appropriations from U.S. Congress** – It is possible that DWUA, working through State and federal agencies such as the Washington State Department of Agriculture; Washington State Department of Ecology; USFWS and NOAA Fisheries, could obtain specific allocations in the federal budget for projects listed in Section 6. DWUA will explore this avenue, as part of a comprehensive funding package for CIDMP implementation.
- **Local bond issues -** In the event that funding obtained from outside sources is inadequate to meet obligations under this CIDMP, the DWUA could seek passage of bond issues, backed by DWUA member assessments on landowners within the respective Irrigation District boundaries. Issuance of such bonds would be subject to a public vote, as per State law. Passage of bonds will be facilitated once the implementing agreements are in place, providing assurance to agricultural operators that their long-term viability is not threatened by potential regulatory actions, since bonds require a long-term commitment for payment of debt obligations. However, local bond issues alone can fund only a portion of the actions discussed in Section 6 of this CIDMP.

## 8.4 Monitoring Program

Two monitoring programs are presented in this CIDMP, one for water diversions and one for water quality. The purpose of the water diversion monitoring program is to gage the effectiveness of the CIDMP, and the Implementing Agreement associated with ESA related aspects of the Plan. The purpose of the water quality monitoring program is to determine the effect of tailwater discharges and other DWUA practices on temperature and turbidity. Both of these monitoring programs are described below.

### 8.4.1 Water Diversion Monitoring Program

A water diversion monitoring program is the best overall gage of the effectiveness of the CIDMP since reduced diversions are the single most important Habitat Conservation Measure (HCM-1) in the CIDMP. Reduced diversions strongly support the ESA since reductions increase fish habitat by increasing weighted usable area (WUA). Reduced diversions also strongly support the CWA since they are achieved primarily through pipelining, which has many water quality benefits including prevention of pollutant interception and reduction and/or elimination of tailwater discharges.

Enacting a water diversion monitoring program is straightforward since all necessary elements currently exist. All five DWUA diversions from the Dungeness River are currently gaged by Ecology and tailwater discharge volumes are measured by the DWUA. This data is compiled by the DWUA into annual reports. The quantitative reduction targets and their timetables are described in Section 8.1. The monitoring program entails comparing data from the Ecology gages to the reduction targets at the applicable timeframe. This program will gage the effectiveness of the primary Habitat Conservation Measure (HCM-1) and will help guide adaptive management efforts. It should be noted that funding for the five Dungeness gages may be unavailable after 2005, in which case new funding sources would need to be identified.

### 8.4.2 Water Quality Monitoring Program

Additional water quality-monitoring has been identified to determine the effect of tailwater discharges and other DWUA procedures on temperature and turbidity. In theory, DWUA operations have the potential to affect temperature and turbidity, and to a lesser degree hydrocarbon (fuel, oil, grease) loading. However, no data exists to verify whether the potential effect is indeed occurring. Therefore, a monitoring program will be designed to gather baseline data to determine if tailwater discharges have an effect on temperature and turbidity. Hydrocarbons will not be included in the monitoring program since hydrocarbon loading is sporadic and not efficiently or effectively addressed by a monitoring program. It should be noted that fecal coliform, while a significant problem in the Action Area, will be excluded from the monitoring program because the DWUA does not contribute fecal coliform and because fecal coliform is already monitored by several entities.

This water quality monitoring program is voluntary on the part of the DWUA and is contingent on securing partnerships and funding, as described below. Additionally, the water quality monitoring program is not connected to the ESA-related Incidental Take Permit and Implementing Agreement.

The water quality-monitoring program could be designed as follows (the exact design will be determined when the program is developed):

- **Parameters:**
  - Temperature would be monitored with continuous temperature recorders.
  - Turbidity would be taken monthly as a grab sample and sent to a laboratory for analysis.
  - Flow would be gaged if necessary to interpret the turbidity data.
- **Timing of Monitoring:**
  - Temperature: Continuous temperature gages would be installed for the entire irrigation season (April 15 to October 15). They would be removed in the fall to help prevent equipment damage. It is not necessary to monitor temperature year-round since the concern is warm temperature, which occurs during the summer months.
  - Turbidity: Samples would be taken monthly. Sampling would be conducted year round since the various factors (such as storm events) potentially affecting turbidity occur throughout the year. "Event monitoring" would also occur at various times such as the beginning of the irrigation season when the DWUA increases flows in the ditches and after large storm events, and when maintenance requires the use of equipment in the river.
  - Flow: Flow measurements would be taken at the time of the turbidity sample gathering.
- **Sites:**

  A representative sample, presumably three to five, of the 25-tailwater discharge sites would be selected jointly by Ecology and the DWUA. Selection criteria include the type of receiving body and feasibility of collecting samples. Each site would be monitored at the following four points:
  - Near the end of the ditch. This would establish the water quality of the tailwater.
  - On the receiving creek just upstream of the tailwater discharge. This would establish the water quality of the creek <u>before</u> the tailwater is discharged.
  - On the receiving creek downstream of the tailwater discharge. This would establish the water quality of the creek <u>after</u> the tailwater is discharged.
  - At the Dungeness River diversion. This would establish the water quality of the water entering the ditch of the associated tailwater discharge.
- **Duration of Program:** The monitoring program would occur for a minimum of three years. The DWUA, Ecology, and other interested parties would then collectively decide, based on data analysis, if the program should be continued.
- **Roles and Partnerships:** Responsibilities for implementing components of the monitoring program would be handled by several entities. The DWUA, as an in-kind contribution, would provide the labor required to collect turbidity field samples and to take flow measurements. Ecology would review the sampling plan (quality assurance project plan or QAPP), data analysis, and reports, as part of their

responsibilities under the CWA. The DWUA intends to seek partnerships with other entities to accomplish the remaining components including developing the sampling plan, processing the turbidity samples, analyzing all data, and preparing annual reports. Clallam County is a likely partner due to their pivotal role in local water quality issues, including having an Ecology-certified water quality lab.

- **Funding:** The DWUA intends to fund the monitoring program through a combination of grants and in-kind labor. The total cost of the program is not known at this point and will depend on the program's exact design. It is known that continuous water temperature data loggers cost approximately $120 each. Based on the number of monitoring points envisioned (20 points; 5 tailwater sites each monitored at 4 different points), the total cost for the data loggers would be $2,400. Grant funding could be sought from sources identified in Section 8.3 In-kind labor includes work performed by the DWUA and Ecology as described above under Roles and Responsibilities.

## 8.5 Foreseeable Circumstances

A variety of factors may change over the course of time in the Action Area addressed by this CIDMP. This section lists foreseeable circumstances that have been identified. The following section describes an adaptive management process that can be used in conjunction with implementation of the CIDMP.

Foreseeable circumstances that have been identified include the following:

- **Climate change.** Climate change has been identified as a factor that may affect temperature and precipitation in the Pacific Northwest. Modeling carried out by University of Washington researchers for the Cascade Range in Washington and Oregon indicates a potential for reduced snowpack due to changes in temperature and precipitation. This would result in lower flows in the summer months. While similar research has not been conducted for the Olympic Mountains, it is assumed that similar conclusions could be drawn for the Dungeness watershed.

  The USGS stream gauge in place on the Dungeness River is well-suited to detecting changes in stream flow over time, whether due to climate change or other circumstances. The framework for reducing diversions described in Section 6 of this CIDMP is designed to be responsive to flow conditions. During time periods when low flows occur, diversion limits are reduced, compared with time periods when higher flows occur. If the region experiences a systematic trend of declining snowpack and summertime stream flow, the actions described in Chapter 6 include corresponding reductions in diversions. This is an appropriate means of addressing potential climate change.

- **Improvements in screening technology.** As new improvements in screening technology become available, there will be new opportunities to reduce potential take associated with fish screens. DWUA’s screens are of relatively recent design and are considered to be highly effective in minimizing potential take at this time. DWUA will periodically assess the costs and benefits of capital improvements associated with fish screens, taking into account new technological improvements as they become available.

- **Major flood events.** In view of the historic flood record, it is foreseeable that large flood events may occur that could damage or destroy diversion or conveyance facilities. In the event such floods occur, the DWUA will notify the Services, and implement measures to minimize potential take that may occur as a result of damaged irrigation facilities. New facilities may be designed in consultation with the Services within the scope of available funding limitations. This commitment should not preclude DWUA or its members from undertaking emergency repairs necessary to prevent threats to life or property.

- **Changes in fish population distribution**. It is foreseeable that over the next 35 years, fish populations will increase in the Dungeness River, resulting in a broader distribution of listed species within the system. This increase could interact with DWUA's occasional operations using heavy equipment in the Dungeness River, if listed species more frequently use areas where these operations will occur. Habitat Conservation Measure HCM-8 establishes procedures for in-river work, including notification, training and scheduling, designed to minimize the potential for disturbing redds in the Dungeness River. This procedure appears effective in addressing this changed circumstance.

- **Changes in land use patterns.** Over the next 35 years, it is foreseeable that some covered lands will be converted from agricultural to urban land use. It is likewise foreseeable that the crops grown on irrigated lands will change from time to time, in response to market conditions. It is not known whether changes in land use or cropping patterns will result in a net reduction or increase in irrigation demand on covered lands over the next 35 years. If agricultural irrigation needs are reduced due to land conversion, the newly urbanized lands will still need a source of water supply for landscape irrigation and/or other uses. Therefore the diversion limitations described in this plan appear suitable in the event of this changed circumstance.

## 8.6 Adaptive Management Program

In this section, we outline the reporting, meeting, and other provisions that the applicant planned to implement to verify performance of conservation plan measures, and to address information gaps and uncertainties. The following processes were designed in view of the substantial conservation benefits associated with the proposed action, as well as the funding and staffing limitations likely faced by the applicant over the term of the ITPs. These processes are not binding, since agreements with the agencies were not concluded.

### 8.6.1 Monitoring

Section 8.4.1 describes DWUA's monitoring program, which includes use of the USGS gage on the Dungeness River for monitoring stream flow, use of equipment already installed to monitor diversions at each diversion point, and operational practices to monitor tailwater volumes. DWUA will compile this data over the course of each irrigation season. During irrigation season, DWUA will assess flow conditions on a weekly basis and will manage diversions accordingly to ensure the diversion limits described in Chapter 6 are not exceeded.

### 8.6.2 Reporting

DWUA planned to prepare an annual report to document compliance with permit terms. The report will be submitted to the Services by March 15 of each year. The report was to provide the following data, at a minimum, for the period from April 15 to October 15 of the previous year:

- A progress report summarizing the status of all Habitat Conservation Measures from Table 6-1 of the plan
- A description of capital projects completed during the previous 12 months to contribute towards compliance with the permit.
- A description of capital projects currently underway or planned for the coming 12 months to contribute towards compliance with the permit.
- A summary of available funding sources for continued progress towards completing capital projects over the next three years; as well as efforts to secure additional funding, if needed.
- An assessment of any issues expected in the next upcoming irrigation season that would interfere with either monitoring or compliance with diversion limits.
- Flow and diversion data for the previous year from April 15 – October 15. This data will include:
    - Daily average flows at the USGS Gage at River Mile 11.8 for each day from April 15 – October 15.
    - Total diversions from all DWUA diversion points on the Dungeness River for each semi-monthly period listed in Tables 6-3 to 6-9.
    - Total average diversion from all DWUA diversion points on the Dungeness River for each semi-monthly period.
    - Total maximum instantaneous diversion from all DWUA diversion points on the Dungeness River combined, for each semi-monthly period.
    - A brief description of how these values were calculated.
- A statement indicating whether full compliance with the diversion limits was achieved. In the event full compliance was not achieved, a description of the diversions that occurred, the cause of the exceedance, and measures that will be used to avoid further exceedance of diversion limits

In addition, in the event diversions do exceed allowable limits at any time, DWUA planned to report verbally to the Services within two business days of the time the exceedance is discovered and in no event more than five business days after the exceedance occurred. DWUA was to follow this up with a written explanation of the diversions that occurred, the cause of the exceedance, and measures that will be used to avoid further exceedance of diversion limits. This written explanation was to be provided within five business days after the event was discovered.

### 8.6.3 Meetings

DWUA planned to meet with the Services every year for the first two years; every other year for the next eight years, and then once every five years for the duration of the plan. The purpose of these meetings was to go over monitoring and reporting information, to discuss progress made on HCP implementation, to discuss schedule and funding status, and to discuss any other issues that may arise. During the context of these meetings, the Services may offer suggestions or advice on plan implementation. If deemed appropriate by both parties, DWUA was to make minor changes to the program that do not change diversion limits or capital requirements. In addition to these regularly-scheduled meetings, DWUA and the Services were to meet in the event catastrophic natural events occur that affect implementation, diversion limits are exceeded on a continuing or recurring basis, or at the request of either Service.

### 8.6.4 Changes to the Habitat Conservation Plan

DWUA has identified reasonably foreseeable circumstances in Section 8.5. For each of these circumstances, provisions have been built into the Habitat Conservation Plan to account for these changed circumstances. However, there is some potential that unforeseen circumstances could arise that may suggest a need for substantial changes to the Habitat Conservation Plan. In the event the Services believe substantive changes to the plan are necessary, the Services preserve their right to reinitiate consultation under Section 7 of the ESA in accordance with Agency regulations and policies in place at the time of the event giving rise to this need.