SKAGIT
BRIEFING BOOK

Prepared By,

The Hatchery Scientific Review Group, et al.

May 20, 2002
# Table of Contents

- **INTRODUCTION** ............................................................ 1
- **SKAGIT SPRING CHINOOK** ............................................. 7
  - Habitat Status ........................................................... 7
  - Stock Status ............................................................. 9
  - Management Goals ................................................... 17
  - Current Hatchery Programs ..................................... 20
- **SAUK RIVER SUMMER CHINOOK** ............................... 33
  - Habitat Status ........................................................ 33
  - Stock Status ............................................................ 34
  - Management Goals ................................................ 38
- **SKAGIT RIVER SUMMER CHINOOK** ............................. 40
  - Habitat Status ........................................................ 40
  - Stock Status ............................................................ 41
  - Management Goals ................................................ 45
  - Current Hatchery Programs ..................................... 47
- **SKAGIT RIVER FALL CHINOOK** .................................. 54
  - Habitat Status ........................................................ 54
  - Stock Status ............................................................ 55
  - Management Goals ................................................ 59
  - Current Hatchery Programs ..................................... 62
- **SKAGIT AND BAKER RIVER COHO** ............................. 69
  - Habitat Status ........................................................ 69
  - Stock Status ............................................................ 71
  - Management Goals ................................................ 76
  - Current Hatchery Programs ..................................... 80
- **SKAGIT RIVER ODD YEAR PINK** ................................. 100
  - Habitat Status ........................................................ 100
  - Stock Status ............................................................ 101
  - Management Goals ................................................ 104
- **SKAGIT RIVER EVEN YEAR PINK** ............................... 106
  - Habitat Status ........................................................ 106
  - Stock Status ............................................................ 107
  - Management Goals ................................................ 110
- **BAKER RIVER SOCKEYE** ............................................. 112
  - Habitat Status ........................................................ 112
  - Stock Status ............................................................ 113
  - Management Goals ................................................ 116
  - Current Hatchery Programs ..................................... 119
Table of Contents

- **SKAGIT RIVERINE-TYPE SOCKEYE** ................................................................. 131
  - HABITAT STATUS .......................................................................................... 131
  - STOCK STATUS ............................................................................................ 132
  - MANAGEMENT GOALS ................................................................................. 135
- **SKAGIT RIVER CHUM** .................................................................................. 137
  - HABITAT STATUS ........................................................................................ 137
  - STOCK STATUS ............................................................................................ 138
  - MANAGEMENT GOALS ................................................................................. 141
- **SKAGIT RIVER WINTER STEELHEAD** ......................................................... 143
  - HABITAT STATUS ........................................................................................ 143
  - STOCK STATUS ............................................................................................ 144
  - MANAGEMENT GOALS ................................................................................. 147
- **SKAGIT RIVER HATCHERY WINTER STEELHEAD** ...................................... 150
  - HABITAT STATUS ........................................................................................ 150
  - STOCK STATUS ............................................................................................ 151
  - MANAGEMENT GOALS ................................................................................. 154
  - CURRENT HATCHERY PROGRAMS .................................................................. 157
- **SKAGIT RIVER SUMMER STEELHEAD** ........................................................ 168
  - HABITAT STATUS ........................................................................................ 168
  - STOCK STATUS ............................................................................................ 169
  - MANAGEMENT GOALS ................................................................................. 172
- **SKAGIT RIVER SEA-RUN CUTTHROAT TROUT** .......................................... 174
  - HABITAT STATUS ........................................................................................ 174
  - STOCK STATUS ............................................................................................ 175
  - MANAGEMENT GOALS ................................................................................. 178
- **SKAGIT RIVER DOLLY VARDEN/BULL TROUT** ............................................ 180
  - HABITAT STATUS ........................................................................................ 180
  - STOCK STATUS ............................................................................................ 181
  - MANAGEMENT GOALS ................................................................................. 185
- **APPENDIX – ADDITIONAL INFORMATION ON BAKER BASIN STOCKS** .... 188
Introduction

Regional Habitat Description

Provide a general narrative description of the regional landscape. This description should include, if available: watershed topography, rivers and significant tributaries, land ownership, and land use. Feel free to use maps. We ask that this description be as concise as possible.

Skagit River

The Skagit River basin drains approximately 8,030 km² (3,190 mi²) of the North Cascade Mountains of Washington State and British Columbia. Major tributaries include the Sauk, Suiattle, White Chuck, Baker, and Cascade Rivers. Elevations in the basin range from sea level to about 3,275 m (10,775 ft) on Mt Baker. Numerous peaks in the basin exceed 2,500 m in elevation. Average annual rainfall ranges from about 90 cm (35 in) at Mt. Vernon on the lower flood plain, to over 460 cm (180 in) at higher elevations in the vicinity of Glacier Peak. Several vegetation zones occur in the study area. As defined in Franklin and Dyrness (1973), most of the lower elevations are in the western hemlock zone and the Puget Sound area. These forest zones typically include western hemlock, Douglas fir, western red cedar, and Sitka spruce. Deciduous species in this area include red alder, black cottonwood, and big leaf maple. Middle elevations are in the Pacific silver fir zone, and higher elevations are in the alpine fir zone.

About 1590 km² (615 mi², 19%) of the basin is in private and State of Washington ownerships. Land uses are dominantly agricultural and urban in the lower flood plain and delta areas, and upland areas are generally commercial forests. About 3680 km² (1420 mi², 44%) of the basin lies within the federally-owned North Cascades National Park, Mt. Baker and Ross Lake National Recreation Areas, and Glacier Peak Wilderness Area; the U.S. Forest Service controls an additional 1960 km² (755 mi², 24%) of the basin in the Mt Baker-Snoqualmie National Forest. Approximately 1040 km² (400 mi², 13%) of the basin is in the Province of British Columbia.

Access to anadromous fishes is generally confined to streams at elevations below 700 m (2300 ft). Unrestricted access to the Baker River system has been eliminated by the installation of two hydroelectric dams, but anadromous fish production – primarily coho and sockeye salmon – in maintained through trapping and hauling operations, in addition to the maintenance of sockeye spawning beaches and smolt bypass trapping. Three hydroelectric dams regulate flows in the upper Skagit River, the first near the town of Newhalem. No anadromous stocks were known to utilize the Skagit River above the current location of the Gorge Power plant. Salmonid stocks present in the basin include chinook salmon, coho salmon, sockeye salmon, chum salmon, pink salmon, steelhead trout, cutthroat trout and DollyVarden/bull char.

Baker River

The Baker river project has two dams, one creates Baker Lake and the other creates Lake Shannon. Mt. Baker is the defining feature of the region. Mountains border most of the upper Baker River region. (See Puget Sound Energy, Doug Bruland for more info.)

---

1. Provided by Brett Barkdull, WDFW
2. Information provided by PSE and Gary Sprague, WDFW
The Baker River enters the Skagit River at river mile 56.5, at the town of Concrete. The Baker River is about 32 miles long, with about 114 tributaries with 314 miles. Only 14 miles of the 32 miles of the Baker River have flowing water. The Baker River has two large hydropower dams and one fish barrier dam. The fish barrier dam is located 0.25 miles from the mouth of the Baker River. Adjacent to the fish barrier dam is an fish trap for adult fish moving upstream. The Lower Baker Powerhouse is located at river mile (RM) 0.9, Lower Baker Dam is at RM 1.1. Lake Shannon is the reservoir behind Lower Baker Dam, it extends 8.1 miles up to Upper Baker Dam at RM 9.1. Baker Lake is the 10.1 mile reservoir behind Upper Baker Dam. When Baker Lake is full it extends to just beyond RM 19. Prior to construction of Upper Baker Dam there was a natural lake between RM 16 and 18, this was the historic Baker Lake. There are 20 tributaries to Lake Shannon with 96.35 miles. Baker Lake has 17 tributaries, with 129.5 miles. There are 13 miles of the Baker River above Baker Lake, with 25 tributaries and 88 miles.

The Baker River Basin has a drainage area of 297 square miles. The drainage area included snowfields on Mount Baker and Mount Shuksan. The Baker River originates in the North Cascades National Park. The river passes into the Mount Baker National Forest lands at about RM 22, 3 miles above Baker Lake. The Baker River then enters the upper reservoir (Baker Lake) and has Shannon, Swift, Boulder, Noisy, Park, and Sandy creeks as major tributaries. Baker Lake is bordered on the north and east by North Cascades National Park and the south and west by Mount Baker National Forest service land and Puget Sound Energy land, with some private ownership. There is both developed and undeveloped camping along both shores. Lake Shannon starts at the tailrace of the Baker dam and has Rocky, Diversion, and Bear creeks as major tributaries. Land surrounding Lake Shannon is likely owned by a combination of the following groups: US Forest Service, Lone Star, Trillium Corp., Puget Sound Energy, and private ownership. There is limited undeveloped camping along both shores of Lake Shannon.

**HABITAT CONDITION**

Are there exceptions or “islands” of habitat that are in better or worse condition and do not correspond with the habitat ratings given in question? (Refers to Habitat Ratings under each stock heading in the following chapters)

In general, the headwater areas of the Skagit River and its major tributaries originate from the North Cascades National Park, National Recreation Area or one of several designated wilderness areas and are in near pristine condition. As you move downstream of these protected areas down the watershed toward first rural and then urban areas including Mt Vernon and Burlington, the anthropogenic impacts to the watershed both accumulate and increase in frequency, and the cumulative impacts to the associated streams and their habitats multiply. The most degraded habitats occur in the lower mainstem and estuary where cumulative impacts are greatest and major hydromodifications have occurred to prevent flooding, allow farming and settlement. Much of the rearing capacity for all species has been lost in the lower river below Sedro-Woolly and it has been estimated that 70% of the original Skagit Estuary has been lost.

Within these impacted areas are mosaics of habitat qualities. Some streams and reaches are lower in quality due to point disturbances, which have impacted habitat qualities more or less. These individual disturbances or lack thereof are far to numerous to list individually especially for stocks that depend on multiple habitat types and/or as in the case of coho salmon, the whole watershed for its productivity.

---

3. Provided by Brett Barkdull, WDFW
Specific habitat comments pertaining to individual reaches are as follows:

**Skagit River above Gorge Reservoir:** See Mark Downen’s work.

**Skagit River Newhalem to Marblemount:** Three dams regulate the flows in this reach, the first just above the town of Newhalem. The dams impact this reach by obstructing sediment movement and intercepting woody debris recruitment that has led to down cutting of the streambed, isolation of off-channel habitat, and a loss of spawning gravels. In spite of this a large percentage of the spawning population for chinook, chum, and pink salmon occur in this reach due to the stability. Some impacts have occurred due to hydromodification. Tributaries are generally in excellent condition and productive.

**Skagit River Marblemount to mouth of Sauk River:** This is a highly productive reach for all species due to the extensive floodplain development in spite of the many impacts due to hydromodification, forest practices and suburbanization. Tributaries are generally in poor shape except for Illabot Creek, which originates in the Glacier Peak Wilderness.

**Skagit River, Sauk River to Alder Creek:** This confined reach that was once only modestly productive is generally in poor condition due to cumulative impacts. Tributaries are in poor shape due to forest practices.

**Skagit River below Alder Creek:** This was once a highly productive reach for all species due to the extensive floodplain development but is no longer. Extensive hydromodification has occurred throughout this reach. The Ross Island/Day Creek Slough area is still mostly intact and extremely productive. The tributaries have all been heavily impacted by forest practices, and farming impacts and suburbanization has further degraded the Nookachamps system.

**Skagit River Estuary:** Approximately 70% of the original area has been lost due to diking; much of the rest is degraded. The area bracketed by Tom Moore and Freshwater Sloughs on the South Fork Skagit near Milltown is the only area marginally functional.

**Cascade River:** The upper Cascade River is in excellent condition with only isolated impacts mostly due to roads. Some forestry related activity has occurred, but is currently in recovery. The lower Cascade is more heavily impacted by forest practices and by hydromodification on the left bank by private landowners and by the WDFW Cascade River hatchery near the mouth. A productive tributary for most species.

**Sauk River Above Darrington:** The upper Sauk above Darrington is generally in excellent condition but has had impacts due to roads and forestry, and by hydromodification at two small communities, Bedal and Forgotten Mountain. Forestry activities continue. Spawning and rearing habitat quality is high but decreases in quality downstream of the White Chuck River due to gradient. A productive reach for most species.

**Sauk River below Darrington to the mouth of the Suiattle River (Sauk Prairie).** This is a highly productive reach for all species due to the extensive floodplain development in the unconfined reach above the mouth of the Suiattle River. Moderate to high impacts to the tributaries due to forestry, farming and by private residences.

**Sauk River, Suiattle to mouth:** Habitat quality is much lower in the confined reach below the Suiattle River due to forestry practices, increasing human impacts, hydromodification and glacial...
flour from the Suiattle River. Tributaries are generally in moderate to poor shape. Not nearly as productive reach as Sauk Prairie.

**White Chuck River**: The White Chuck River is glacial in nature and high in gradient with moderate turbidity due to glacial flour during summer. Habitat is nearly pristine but low in productivity for most species except char.

**Suiattle River**: The Suiattle River is a glacial river with extremely high turbidity during summer. The glacial flour has a natural impact on habitat quality in the Suiattle River, the Sauk River below its confluence, and the Skagit River below the confluence of the Sauk River. The impact seems to be increasing recently as glaciers recede on Glacier Peak. Significant floodplain development in this basin. Spawning occurs in the clear water tributaries of this drainage and the spawning habitat is mostly pristine. Big, Tenas, Straight, Circle, and Lime Creeks, important spawning tributaries, have all been impacted to various degrees in the past by forestry related activities; all are currently in recovery. Forestry impacts increase in the lower river where most land is privately owned. A moderately productive tributary.

**Baker River**: The Baker River originates from The North Cascades National Park and then flows into two reservoirs, first Baker Lake and then Lake Shannon. Fish are trapped at a weir near Concrete and transported to Baker Lake; Sockeye are released into two artificial “spawning beaches” where they are held and forced to spawn. The fry are then trapped and released into Baker Lake. Other species are released into the lake to spawn naturally. The river above Baker Lake is in near pristine condition and very productive for coho and char. Baker lake is very productive for sockeye but is somewhat impacted by heavy recreational use. Fish can only get into Lake Shannon if spilled at upper Baker Dam. Fish production is limited in this system by the inefficient juvenile collection facilities at the two dams.

**Habitat Improvement**

**What habitat improvement projects could elevate the rating for this sub-region or the “islands” of inferior production? If so, please list them and indicate if they are in the proposed or planning stages. (Refers to Habitat Ratings under each stock heading in the following chapters)**

See Hayman/Castle/Walsh

- A complete fish passage inventory of manmade structures in the Skagit basin has been completed, and efforts are underway to repair fish passage barriers.
- Restoration of the hydromodified reaches of the Skagit basin by removing riprap and diking and allowing natural channel forming process to occur. In planning and implementation
- Estuary restoration. In planning
- Enforcement of environmental regulations. Not even proposed
- Minimum riparian buffers on all fish bearing streams. Planning stage

---

4. Provided by Brett Barkdull, WDFW
FUTURE EXPECTATIONS

Do you see the quality of the habitat in this region become better or worse in the next ten to twelve years? Fifty years? What are the long-term goals for habitat in this sub-region? (Refers to Habitat Ratings under each stock heading in the following chapters)

I believe the quality of habitat in this region will stay about the same in the next ten to twelve years even though major restoration efforts are currently underway. I think in the short-term, restoration efforts will be offset by habitat losses due to growth.

The long term may very well be a mixed bag. As growth continues into rural areas many habitats will continue to be degraded. But there has been a recent recognition (or at least there is some discussion and action) of the importance of the floodplain and estuary habitats and major efforts are being discussed in the case of the estuary, and efforts are underway in the floodplain, to purchase and restore these areas. If these efforts are successful, and if habitat protection measures that are currently in place are enforced, the future may very well be bright even though large habitat losses may occur in localized areas. These are very big if's. The long-term agency goal is no net loss of habitat.

ADDITIONAL INFORMATION

What other habitat information should the Scientific Group consider (for example, salmonid or non-salmonid stocks not native to the watershed)? Please describe. (Refers to Habitat Ratings under each stock heading in the following chapters)

See Hayman/ Castle/Walsh info on Baker River FERC relicensing.

Fish History in the Baker Basin

In 1896 the state constructed a hatchery on a tributary to the historic Baker Lake. The hatchery was for the propagation of sockeye salmon. The facility was purchased in 1899 by the United States Fish Commission (later Bureau of Fisheries). The Fish Commission propagated sockeye, coho, and chinook salmon. In 1924 construction on Lower Baker Dam began. Sockeye returns to the Baker River decreased and the salmon activities were halted in 1934. The facility was used to raise trout for several years. At least as early as 1914 sockeye salmon eggs were being shipped out of the Baker River Basin. Shipments of eggs went to a variety of locations. Baker sockeye were released in number of locations including Grandy Creek, Grandy Lake, Day Creek, Pilchuck Creek, Illabot Creek, Skagit River, Lake McMurray, Lake Cavanaugh, Quilcene Hatchery, Little White Salmon Hatchery – for Spirit Lake, Big Lake, Clear Lake, Lake Stevens, Bacon Creek, Diobsud Creek, Lake Samish, Issaquah Creek, Cedar River, Seattle Laboratory, Samish Hatchery, Green River Hatchery, Startup Hatchery, Bear Creek (King Co.), Lake Washington, Mason Lake, Isabella Lake, Purdy Lake, Lake Pleasant, Beaver Lake, Big Quilcene River, and Lake Ozette (Kemmerick, 1945).

After Lower Baker Dam was built fish were trapped near the power house and transported over the dam via a tram and released into Lake Shannon. Fish could then swim upstream to the historic Baker Lake. Construction of Upper Baker dam began in 1956 and was completed in 1959. With construction of the upper dam the following features were added; the fish barrier

5. Provided by Brett Barkdull, WDFW
6. Provided by Brett Barkdull and Gary Sprague, WDFW
dam, adult trap and haul (truck) facilities, smolt trapping and piping facilities, and the sockeye spawning beaches (1 and 2). The first sockeye spawning beach facility began operation in 1957.

Sockeye Spawning Beaches:
While in 1913 a survey identified sockeye as spawning primarily in the Baker River, above the historic Baker Lake, surveys in 1954 and 1955 identified 99 percent of the Baker sockeye spawning on the shores of Baker Lake. The spawning locations corresponded with locations with water temperatures that were different (cooler in the summer?) than most Baker Lake water. It was believed that the temperature difference was due to upwelling spring water. With the level of the new Baker Lake being up to 60 feet higher than the historic Baker Lake, and due to the fluctuating reservoir water level it was determined that spawning habitat would need to be created. Based on work in British Columbia (Quesnel Field Station, Cultus Lake) an experimental artificial sockeye spawning beach (Beach 1) was constructed adjacent to Channel Creek.

Spawning Beach No. 1 was first used in 1957. The facility was sized to hold 100 sockeye (50 pairs). The facility is a concrete pond with a head box. It was designed to created upwelling water through gravel in the section with the fish. For the first year of operation the survival from egg to fry was estimated to be 43 percent. Based on this construction of Baker Sockeye Spawning Beach No. 2 began in 1958, and completed in 1959. Beach No. 2 was sized as a production facility, it is an earthen pond. It is 150 feet long by 100 feet wide. Beach No. 3 was constructed alongside Beach No. 2 in 1966. Beach No. 3 was first used in 1967. Beaches No.2 and No. 3 were sized to hold a total of 3,000 adult sockeye. This number was evidently based on the average escapement of sockeye after 1926. In 1972 two additional methods of incubating sockeye used. This was due to the large return of sockeye. An incubation box was used in Channel Creek, and pond trays were used.

In the late 1980s concern arose about the potential for the Baker River, above Baker Lake, to shift and use the an old channel, which is now Channel Creek. If the Baker River returned to this old channel it would likely run through the Spawning Beach facility. Some of this was related to issues with a Forest Service bridge, which was later removed. Due to this concern a plan was developed to relocate the spawning beaches. The result was the construction of Baker Sockeye Spawning Beach No. 4 (also know as the new beach, and Beaches 1, 2, and 3 are known as the old beaches). Beach No. 4 is located below Upper Baker Dam, alongside Lake Shannon and Sulphur Creek. While Spawning Beach No. 3 is still in use, it is used at a lower capacity due to the lack of funding for operations. Beach No. 2 is not currently used due to limited water supply and maintenance needs. Beach No. 1 has not been used since 1964.
# Skagit Spring Chinook

## Habitat Status

### Habitat Rating

*Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th></th>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cascade River Spring Chinook</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hatchery</td>
<td></td>
<td>Hatchery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wild</td>
<td></td>
<td>Wild</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td><strong>Sauk River Spring Chinook</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hatchery</td>
<td></td>
<td>Hatchery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wild</td>
<td></td>
<td>Wild</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>H</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td><strong>Suiattle River Spring Chinook</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hatchery</td>
<td></td>
<td>Hatchery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wild</td>
<td></td>
<td>Wild</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>H</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td><strong>Skagit River Hatchery Spring Chinook</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hatchery</td>
<td>N/A</td>
<td>Hatchery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wild</td>
<td>N/A</td>
<td>Wild</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>N/A</td>
<td>N/A</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

---

7. Provided by Brett Barkdull, WDFW
These habitat ratings are:

1. **High (H) = Healthy**: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.

2. **Medium (M) = Limiting**: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.

3. **Low (L) = Inadequate**: The target stock is unproductive and the population will go extinct, even without terminal harvest.

**Habitat Condition/Habitat Improvement/Future Expectations/Additional Information**

*(Please refer to the Introduction section)*
**STOCK STATUS**

**TRENDS**

*Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.*

**Cascade River Spring Chinook**

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>113</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>380</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>133</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>218</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>269</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>135</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>205</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>168</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>173</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>225</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>208</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>308</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>323</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>273</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>625</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1992-2001 escapement methodology uses cumulative redds built by stock x 2.5 fish per redd.*

---

8. Information provided by Pete Castle (WDFW), Bob Hayman (SSC) and Charmane Ashbrook (WDFW). GDU and SASSI documents were also used.
## Sauk River Spring Chinook

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>336</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1968</td>
<td>147</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td>978</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>1066</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>610</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1973</td>
<td>1255</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>108</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td>300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td>173</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>411</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>404</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td>411</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>590</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>394</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>277</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td>202</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>238</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>1818</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>737</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>815</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>870</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>668</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>557</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>747</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>580</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>323</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>130</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>190</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>408</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>305</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>290</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>388</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>543</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1994-2001 escapement methodology uses cumulative redds built by stock x 2.5 fish per redd*
### Suiattle River Spring Chinook

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>818</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1968</td>
<td>761</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td>830</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>1020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>1468</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td>1804</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1973</td>
<td>577</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>355</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td>326</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td>460</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>407</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>548</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td>344</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>816</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>581</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>476</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td>352</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>345</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>716</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>806</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>729</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>740</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>514</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>685</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>354</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>201</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>292</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>167</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>440</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>435</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>428</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>473</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>208</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>360</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>688</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1994-2001 escapement methodology uses cumulative redds built by stock x 2.5 fish per redd*
Skagit Hatchery Spring Chinook

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival (Recovery)</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>138</td>
<td>95</td>
<td>43</td>
</tr>
<tr>
<td>1986</td>
<td>419</td>
<td>247</td>
<td>172</td>
</tr>
<tr>
<td>1987</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>672</td>
<td>217</td>
<td>455</td>
</tr>
<tr>
<td>1993</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Skagit River Hatchery Subyearling Spring Chinook

Skagit Hatchery Yearling Spring Chinook

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival (Recovery)</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>135</td>
<td>98</td>
<td>37</td>
</tr>
<tr>
<td>1982</td>
<td>282</td>
<td>276</td>
<td>46</td>
</tr>
<tr>
<td>1983</td>
<td>69</td>
<td>63</td>
<td>6</td>
</tr>
<tr>
<td>1984</td>
<td>133</td>
<td>102</td>
<td>31</td>
</tr>
<tr>
<td>1985</td>
<td>1,219.00</td>
<td>831</td>
<td>388</td>
</tr>
<tr>
<td>1986</td>
<td>448</td>
<td>305</td>
<td>143</td>
</tr>
<tr>
<td>1987</td>
<td>929</td>
<td>635</td>
<td>294</td>
</tr>
<tr>
<td>1988</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>1,339.00</td>
<td>728</td>
<td>604</td>
</tr>
<tr>
<td>1991</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>438</td>
<td>193</td>
<td>242</td>
</tr>
</tbody>
</table>

Skagit Hatchery Yearling Spring Chinook
AGE CLASS STRUCTURE

What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

The three wild spring chinook stocks (Cascade, Sauk River, and Suiattle) in the Skagit Region are managed as a composite group. From 1984 through 2000, 51% of these three stocks have had a yearling outmigrant life history. Yearling outmigrants comprised 48% of the outmigration in 1999. Spring chinook adults return from two to five years of age. Biologists theorize the percentage of three-year olds has increased annually because of a decrease in five-year olds. With less exploitation on chinook stocks, the percentage of three-year olds will likely decrease and more fish will return as four and five year olds. In line with this theory, the 1998 brood year three-year old returns did not survive as well as expected. The 1998 brood year yearling outmigrants survived at half the expected rate. Recently, ocean survival has been higher; this may result from lower U.S. and Canadian fisheries exploitation rates.

Scale analysis of adult Sauk River spring chinook natural spawners shows a significant level (as much as 50%) of the yearling-type outmigration pattern based upon the GSI samples collected from 1986-1990. This level of yearling outmigration is high relative to other naturally spawning chinook stocks in Puget Sound.

Scale analysis of adult Suiattle spring chinook natural spawners shows a significant level (61.6%) of the yearling-type outmigration pattern based upon the GSI samples collected from 1986-1990. This level of yearling outmigration is high relative to other naturally spawning chinook stocks in Puget Sound. Yearling outmigrants comprised 54% of the Suiattle spring chinook outmigration in 1999.

PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION

Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

The estimated number of chinook hatchery spawners within the natural spawning fish population is 2%.

Extensive carcass surveys have occurred since 1984. Genetic studies indicate introgression has not occurred. There has been one documented hatchery fish found in carcass surveys of the upper Cascade spring chinook stock. This was a coded wire tagged stray from the Stillaguamish River. Biologists have observed hatchery spring chinook spawning in the lower Cascade River. However, when the hatchery program was discontinued no hatchery spring chinook were observed spawning in the river.

PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY

For hatchery stocks- what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?
No Skagit Hatchery spring chinook eggs, fry, or adults are collected from wild fish or transferred from another hatchery. This program is done entirely at the Marblemount Hatchery.

**INDEX STOCK**

*Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.*

One hundred fifty thousand Marblemount yearling spring chinook are used as a Double Index Tag (DIT) group. Half (75,000) are adipose fin clipped and coded wire tagged and half (75,000) coded wire tagged only. DIT groups provide selective harvest estimates for fish management. The 75,000 yearlings that are adipose fin clipped and coded wire tagged also serve as an index group for wild yearling spring chinook (Cascade, Sauk, and Suiattle).

The entire sub yearling program, 250,000 fish, are adipose fin clipped and coded wire tagged. They serve as an index group for wild subyearling spring chinook.

Sauk, Cascade, and Suiattle spring chinook most closely align with the Marblemount Hatchery spring chinook. The purpose of the hatchery stock is to serve as an index stock. Originally, the intention was for the hatchery spring chinook to be an index for Suiattle spring chinook. However, volunteer Cascade River spring chinook were mixed with the Suiattle spring chinook. Although genetic work shows the hatchery spring chinook most closely align with Suiattle native spring chinook, the Suiattle baseline slightly differs from the hatchery spring chinook baseline.

**Biological Significance**

**STOCK ORIGIN**

*Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?*

- a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or
- b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been?) or
- c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or
- d. Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? or
- e. Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?

Skagit Hatchery spring chinook derive from wild Skagit River spring chinook collected from Sauk River tributaries from 1976 to 1982.

Cascade spring chinook are considered native and genetically unique. A genetic baseline is currently being developed for the upper Cascade spring chinook stock. Green River stock has been the only non-local introduction since 1951. These introductions were from the Marblemount Hatchery so releases occurred in the...
in the lower Cascade River, not in the upper Cascade River where the native spring chinook are located. To reach the upper Cascade River, the fish go through a large cascade at river mile six. The current genetic baseline (approximately 80 fish) qualifies Cascade spring chinook as a unique stock.

Sauk River spring chinook are considered native and genetically unique. Green River fall chinook stock released from Marblemount Hatchery has been the only non-local introduction since 1951. Interaction with the Sauk River spring chinook is unlikely because of watershed geography and fish release point. Green River introductions have not been made from Marblemount for eight years.

Suiattle River spring chinook are considered native and genetically unique. Green River fall chinook stock has been the only non-local introduction since 1951.

**BIOLOGICAL ATTRIBUTES**

*Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.?) Use the following questions to guide your answer:*

  a. *Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or*
  b. *Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or*
  c. *Are all known biological attributes shared with other GDUs?*

Upper Cascade River spring chinook spawning has been documented from river mile 7.8 to 18.6 and in Found and Kindy creeks. Between river mile 2.5 and 7.8, the Cascade River is confined by a gorge. The gorge area is characterized by rubble, boulders, and increased water velocity; conditions not conducive to spawning. Some natural spawning occurs in the lower 2.5 miles of the Cascade River, but much of this spawning is likely the result of hatchery strays. The Skagit Hatchery is located on Clark Creek near Cascade river mile 1.0. Upper Cascade chinook are one of three stocks within their GDU that spawn early; they spawn from August to early September. Generally, this stock spawns in clear water tributaries in the upper watersheds where the gradients are moderate to high and the water temperatures are colder (49-53°F). Annual rainfall in this area ranges from 80-120 inches per year (Pacific Northwest River Basins Commission 1970).

Upper Sauk River spring chinook spawning has been documented from Sauk river mile 31.9 to 41.2, up to river mile 4 in the South Fork Sauk, and up to river mile 10.4 in the Whitechuck River. The spring chinook spawners in the upper Sauk are geographically separated from the summer chinook spawners in the lower Sauk by an 10 mile area of fast riffles with a bottom composition of mostly rubble and boulder with scattered gravel sections (WRIA Stream Catalog), where very little chinook spawning occurs (Sauk river mile 21.2 to 31.9). Lower Sauk River summer chinook spawn from river mile 0.0 to 21.2 and in Dan Creek, and their timing is similar to the upper Skagit River summer stock. Upper Sauk chinook are one of three stocks within their GDU that spawn early; they spawn from mid-August through mid-September. Generally, this stock spawns in clear water tributaries in the upper watersheds where the gradients are moderate to high and the water temperatures are colder (49-53°F). Annual rainfall in this area ranges from 80-120 inches per year (Pacific Northwest River Basins Commission 1970).
Suiattle spring chinook spawn in the Suiattle mainstem and associated tributaries, the most important include: Big, Tenas, Buck, Straight, Lime, Downey, and Sulphur creeks. To a lesser extent, spawning also occurs in Circle and Milk creeks. Geographically, the spawning population of the Suiattle is closest to lower Sauk River summer chinook, as the mouth of the Suiattle River empties into the Sauk River around river mile 13. However, Suiattle chinook have not been observed spawning below Suiattle river mile 7.8, where Big Creek enters the Suiattle River, resulting in a 7.8 mile separation of spawning populations in addition to the spawn timing differences between these two stocks.

Suiattle spring chinook spawn the earliest of the stocks within their GDU; they begin spawning in late July and continue to early September. Generally, this stock spawns in clear water tributaries in the upper watersheds where the gradients are moderate to high and the water temperatures are colder (49-53°F). Annual rainfall in this area ranges from 80-120 inches per year (Pacific Northwest River Basins Commission 1970).

**Population Subdivisions**

**How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:**

a. **How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?**

b. **What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.**

c. **What is the total number of stocks within the same GDU as the stock under consideration?**

d. **What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?**

Cascade River spring chinook are listed in SASSI as Upper Cascade River spring chinook. They belong to the Stillaguamish and Skagit GDU. Eight naturally spawning stocks and one hatchery stock belong to this GDU. The Stillaguamish and Skagit basins have divergent geographical spawning distributions, entry and spawn timing and environmental conditions.

Sauk River Spring Chinook are listed in SASSI as Upper Sauk River spring chinook. They belong to the Stillaguamish and Skagit GDU. Eight naturally spawning stocks and one hatchery stock belong to this GDU. The Stillaguamish and Skagit basins have divergent geographical spawning distributions, entry and spawn timing and environmental conditions.

Suiattle spring chinook are listed in SASSI as Suiattle spring chinook. They belong to the Stillaguamish and Skagit GDU. Eight naturally spawning stocks and one hatchery stock belong to this GDU. The Stillaguamish and Skagit basins have divergent geographical spawning distributions, entry and spawn timing and environmental conditions.
MANAGEMENT GOALS

Harvest and Conservation

For each hatchery stock program, is the program goal conservation, harvest or both?

The hatchery spring chinook program goal is to provide an index stock.

Harvest

Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:

- High – harvest opportunity each year, spread over seasons
- Medium – opportunity most years, for some seasons
- Low – occasional opportunity, single run
- 0 – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Opportunity</td>
<td>L</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

Conservation

What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.

The conservation goals for all three wild spring chinook is to increase natural spawning in their respective rivers.

Production

For hatchery programs, please summarize the production goals:

a. How many fish at what size are planned for release? Transferred off-station?

Plant 150,000 fish @ 10/lb into the Skagit River in April
Plant 250,000 fish @  70/lb into the Skagit River in June

All fish are reared and released from the Marblemount Hatchery.

b. Where are eggs taken and incubated? Where are fish reared and released?

Spring chinook are spawned, reared and released entirely at the Marblemount Hatchery.

---

9. Information provided by Pete Castle (WDFW) and Bob Hayman (SSC). GDU and SASSI documents were also used
c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

The hatchery program has remained stable in recent years.

d. Is the duration of this program clearly defined?

The program duration is defined as ongoing.

Other Goals

Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.

Skagit Hatchery spring chinook are used as an indicator stock for wild yearling and subyearling spring chinook (Cascade, Sauk and Suiattle). Excess live spring chinook adults are used for a stock introduction test and for nutrient enhancement, both occur in Baker Lake.

Monitoring and Evaluation

Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.

Monitoring and evaluation methods include: fish tickets for monitoring catch; spawning surveys; smolt trapping; counting fish at Baker River trap; and estuarine surveys. Carcasses found during spawning surveys are measured and sampled for scales, otoliths, and coded wire tags.

Goal Achievement

Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?

Wild Skagit River chinook stock conservation goals are not being met despite low harvest goals. Spawning escapement goals are being achieved for chinook but spawning escapement for the past decade (1990’s) has been poor compared to the 1980’s. Annual goals for Skagit spring chinook have not been achieved for past 34 years.

Pete Castle recommends that each spring chinook stock have its own goal. For instance, Suiattle spring chinook have met their escapement goal of 700 fish but because spring chinook are examined as a composite, since the Sauk and Suiattle have not met their escapement goal, the spring chinook escapement goal has not been achieved.

Conflicts

Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?
Not a conflict. Management practices are designed to meet the goals. Present habitat conditions might restrict ability to meet our goals. All chinook stocks are likely affected by the estuary; the estuary is 30% its historical size because of the dikes. Biologists believe the estuary is a limiting factor for all chinook stock production.

Other comments: Habitat condition prevents goals from being met; recommend removing dikes and adding trees to the upper watershed. Flood control measures hinder creek and estuarine conditions. Forest conservation goals are in conflict with salmon conservation goals.

**Incorporating Adaptive Management**

*Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?*

We cannot easily change our goals when we receive new information. Inertia exists. Further, supporting data in a timely fashion does not drive management—more information obtained for these stocks does not necessarily change management philosophy. Examples include: the management strategy for spring chinook does not change to cover breadth of run; if we determine the Suiattle spring chinook goal has been reached, we cannot change the overall goal for chinook because of the composite management style; institutionalization persists ("We fish for spring chinook this time of year and that’s how it is"); some stocks are caught incidentally to a much greater extent than we initially thought.
CURRENT HATCHERY PROGRAMS

Skagit Hatchery Spring Chinook – Marblemount Hatchery

**FACILITY**

**Description**
Describe the property location and ownership. Give the funding and operating organization names, approximate size of the property (acres), number of buildings, any unique attributes of the site worth noting.

Marblemount Hatchery is located one mile east of Highway 20 and the town of Marblemount on Fish Hatchery Road. It is on the Cascade River about one mile upstream from the confluence of Cascade and Skagit rivers. Clark Creek passes through and Jordan River skirts this site. The land is owned by WDFW. There are three residences, one hatchery building and an old storage building. There are two pump intakes, one gravity intake and five wells (four work). The State General Fund supports this facility.

Currently the incubation room has 66 new vertical incubators and 16 new indoor starter tanks. There are 21 10’ X 100’ X 3’ raceways, 4 large asphalt rearing ponds, 1 large earthen rearing pond, and 1 large asphalt adult trapping and holding pond.

**Primary Goal**
What is the primary goal of the facility? (Examples: conservation of Shirley creek summer chum because of degraded habitat, harvest augmentation of Michael River coho salmon primarily for north Puget Sound commercial fisheries, community education)

The Marblemount Hatchery spring chinook are an index stock for wild Skagit spring chinook. Harvest is allowed for marine but not for in-river fisheries. Living surplus adults are currently used for nutrient enhancement and a chinook introduction test in the Baker River watershed.

**Associated Stocks**
What stocks of fish are handled and/or reared at this facility?

Marblemount Hatchery rears spring, summer and fall chinook (all Skagit River origin), coho (Skagit, Minter, and Wallace river origin), winter-run steelhead (Chambers Creek origin). Skagit River wild rainbow were reared once at this facility.

**Water Supply**
Describe the water supply, including the following components:

10. Information provided by Darrell Mills, Steve Stout, and Kevin Kurris, WDFW

b. If surface water, is it fish- or specific-pathogen free? Do you experience problems with “dirty water” that limits your ability to reach your goals?

c. Surface water intake structures on station – are they screened or sited in a way that excludes fish or other animals from entering the water supply?

d. If you use surface water, is there adequate water in the by-pass reach throughout the year?

e. Are there unique physical characteristics of the water supply on site or nearby that you feel should be noted?

Marblemount Hatchery has four water sources available most of the year; well water and Clark, Cascade, and Jordan creeks. These water supplies may be manipulated, to some degree, to control temperature, turbidity, acclimation and attraction. All the hatchery out-flow is combined into a single outlet channel where adults return and are trapped.

Out of five wells, four produce between 400 and 1000 gpm per pump for the incubation building and as many as six 10’x100’ ponds. Sand build up is likely the cause for decreasing well water production, and has led to additional pumping costs in order to activate more wells to achieve minimum flows. Temperatures are stable at ~47 degrees. No water chemistry profile is available.

Clark Creek is spring fed and pumps up to 2500 gpm. This water’s excellent quality, water temperature (40-55°F), and dependable flow make it ideal for starting fish. Because adult fish can ascend the Clark Creek during high water events it is not considered fish or pathogen free. No water chemistry profile is available. Although the screens exclude fish and are believed to be compliant, they are submerged and hard to clean and maintain. There are no dewatering problems below the intake.

Cascade River water is gravity fed into a settling pond and four pumps deliver it to the ponds. Each pump delivers 2500 gpm. The temperature ranges from the low 30° to mid 50° Fahrenheit. No water chemistry profile is available. The water is not pathogen free. The intake screens, located along the riverbank have compliant screens and the intake does not result in dewatering of the Cascade River. There is no in-river dam or weir. The Cascade River intake is normally shut down from May to July to improve attraction into the hatchery outlet channel. The intake sands in and needs maintenance.

Jordan Creek water is gravity fed and used for about six months out the year. The flows have remained relatively unchanged over the years, but, seasonally flows can change rapidly. High winter flows and heavy bed-loads force this intake to be shut down in the fall. Jordan Creek provides about 8000 gpm and is used May through September. Temperatures range from 38 °F to 65°F. No chemistry water profile is available. The water is not pathogen free. The intake structure is in very poor shape due to constant debris/gravel abrasion. Although hatchery intake screens are not thought to put wild fish at risk, no fish ladder exists at the intake and concern has been expressed about adult access into Jordan Creek during the May to September period. The creek can dewater below the intake in late summer.

Pathogen Combatant Methods and History

Describe the fish health/pathogen history, including the following components:

a. How often does a fish health professional visit your site?
b. What is the most significant fish health problem at your facility (this could be a fish pathogen, inability to correct a situation, poor water, etc.)?

c. Have you had any significant epizootics on your facility? Please explain. Were you able to isolate the affected containers? Sanitize the effluent?

d. Do you have a history of viral isolations at your facility in the past five years? This excludes epizootics as described above.

e. Do you disinfect equipment between rearing units or banks of ponds? What method do you use?

f. Are you able to keep distinct lots or stocks of fish physically separated? Please answer for each of these life stages – adults, eggs, and juveniles.

a. The area Fish Health Specialist is on-site at least once per month (often every two to three weeks) and is available whenever needed.

b. There are no unusual fish health concerns at Marblemount. The most common isolations are Cold-temp disease in the Wallace River coho stock and the winter steelhead, and BKD in the yearling chinook. These outbreaks are generally manageable.

c. There have been no significant epizootics.

d. There have been no viral isolations in the past 5 years.

e. Equipment is disinfected between ponds by use of iodophor.

f. Adult chinook stocks are held in separate holding ponds prior to spawning. Steelhead and coho are separated only by run timing but there is overlap between the runs. 5,000 eggs per tray are eyed and then hatched in “telephone booth” vertical incubators that provide some isolation. Juveniles are reared in common lots once they are ponded. The exception to this is spring chinook that may be segregated according to ELISA results. If possible, “lows” are kept for the yearling program. When necessary, “mediums” are kept to supplement “lows” for the sub-yearling smolt program.

Pollution Abatement

Describe the waste removal/pollution abatement system including the following components:

a. What is the general frequency of pond cleaning?

b. How is pond waste disposed of (vacuum, brush, dry and remove, etc.)?

c. Describe pollution abatement pond or settling pond, if one exists.

d. Status of permits for discharging pollutants?

e. Any particular challenges you would like to share on this subject?

a. Ideally, all rearing ponds are cleaned weekly, but staffing shortfalls can prevent this.

b. There is no formal abatement system at Marblemount. Pond waste is vacuumed and disposed onto the uplands.

c. None exists.

d. Marblemount has a permit and is currently in compliance with NPDES discharge requirements.

e. None.

Education

Please give details regarding the following:

a. Is your facility open to the public?

b. Do you have signs, pamphlets, or other materials for the public to self-tour?
c. Do hatchery staff or others schedule and conduct tours of the facility?
d. Are there citizen involvement opportunities such as volunteer programs, student internships, etc?
e. Are hatchery operations visible to facility visitors?
f. Do other fish and wildlife programs use the facility?
g. Do you have regular involvement with community or school groups?
h. Do you give fish or eggs to educational groups? If so, please estimate the amount of time this activity takes.

a. The hatchery is open to the public and has a small information center in the hatchery building.
b. There are generally few or no handouts available.
c. The crew will give tours as frequently as time and staff allow as this is good for public relations and educational to the public.
d. Local citizens and sports groups are involved with various projects within the basin including caring for steelhead at the Davis Slough acclimation site.
e. Most operations at the facility are open to the public viewing, with the exception of the incubation building, which is open by invitation only for security and safety reasons.
f. Other WDFW staff occasionally utilizes the site as a staging ground for local basin surveys, etc.
g. The hatchery staff are involved with local schools, primarily via the “Salmon in the Classroom program (aquarium salmon programs). Staff constraints limit the time spent in this arena. The hatchery staff spends approximately 50-60 hours per year with educational groups, both at and away from the hatchery. In addition, contact with the general public frequently involves staff interaction with local salmon and steelhead fishers. The hatchery is the “go-to” site for local fishing information. As time allows, the hatchery staff assist with regional staff to do stream surveys, etc.
h. Yes. We supply 12,750 eyed coho salmon eggs to local groups and schools. The hatchery staff spends approximately 50-60 hours per year with educational groups, both at and away from the hatchery.

**General Administration**

a. Does key staff have a good understanding of the facility goals, budget, and expenditures? If not, what tools do you need for correcting this?
b. Is new relevant information from research and other sources made available to hatchery staff and used for attaining goals?
c. As fish culture and other related scientific understanding evolves, are you able to make changes to your programs? If not, what ideas do you have for changing this?
d. Are there state or federal laws that constrain the program, such as numbers and size of smolts produced?

a. The staff at Marblemount understand the facility and goals well but not the budget. New developments and research are shared with the crew and made available primarily through Olympia, the regional office staff or the Complex Manager.
b. We believe we are kept abreast of specific and relevant information that we use to attain our goals.
c. Believe so.
d. The size of our program is set by WDFW biologists’ agreement with the Skagit System Coop.

**Other Facility Issues**

a. **What are your predator control methods/facilities (nets, wires, etc)? Do you have unresolved predator problems?**
b. **Describe how you inventory your fish (frequency, size of weight sample, etc.).**
c. **How do you keep your inventory and other data? (Hatpro, spreadsheets of your own, agency forms, etc.)**
d. **How do you decide which food to use (mandatory contract, fish health recommendations, etc.)?**
e. **How do you store your feed?**
f. **Does your facility have any habitat improvements on site (wetlands, riparian improvements, etc.)?**

---

a. All rearing ponds are covered with netting to exclude avian predators.
b. Eggs and/or fish are typically inventoried at multiple life-stages and mileposts. Green eggs are enumerated upon taking. Eyed eggs are enumerated down to hatch. Button-up fry are enumerated at ponding by subtracting loss from the lot. Fry, fingerlings and smolts are enumerated at each split, tagging or hauling event. In addition, automatic counters are used to count out-migrants from the coho ponds.
c. Data is recorded on standardized WDFW forms as well as spreadsheets and forms created at Marblemount.
d. Choices of feed fed are largely based upon past performance of program fish to test lots of feed. Cold temperatures and sometimes turbid water mandate a high performance diet so cost is not a primary factor in dictating diet choice.
e. Feed is stored according to the manufacturers specific recommendation. It may be frozen or kept in a cool-dry place as required for best storage life.
f. Yes, the Habitat Division will be re-connecting an off-channel slough, located on station, with the Cascade River.

**Facility Wish List and Other Comments**

a. **What is the most-needed piece or pieces of equipment for your facility and why?**
b. **What capital improvements are most needed at your facility and why?**
c. **What do you think would be the most valuable use of your facility?**
d. **Is there anything else that we have not covered that you would like to add?**

---

**Marblemount Hatchery:** The facility and program need include:

1. Upgraded adult pond to facilitate handling and sorting of wild and hatchery fish.
2. Pollution Abatement pond with associated pumps, plumbing, etc.
4. Well field redevelopment to improve pump capacity and efficiency. (High Priority)
5. Improve all intake structures; especially Jordan Creek. (High Priority)
6. In depth GSI analysis of Spring Chinook stocks, both HOR and NOR within the greater Skagit Basin to determine if hatchery stock has diverged from wild population.
7. Clarification of program goals in light of recreational chinook harvest ban in the Skagit River.
8. Additional (steelhead) out-migrant counters.
9. Redevelop asphalt rearing channels into mid-sized ponds.
10. Security fence around 10 x 100’ adult chinook holding ponds.
11. Full staffing level (we operate at ~60% staffing in past years)

Stock Information

Broodstock

Broodstock Description

Describe the broodstock as follows: (These may be a repeat of some questions asked under stock status - you may refer to those answers or cut and paste.)

a. How was the broodstock chosen?
b. Do you consider it an integrated (goal is to maintain a single gene pool and prevent divergence) or segregated (isolated in the hatchery, managed to restrict gene flow) population?
c. Does this broodstock have a history of reportable pathogens?
d. Are you able to collect representative samples each year of the population, with respect to size, age, sex ratio, and run and spawn timing? If not, please explain the limitation.

a. This is an ongoing program and has been in existence for over 20 years at Marblemount. The hatchery broodstock, now entirely of hatchery origin, originally derived from Skagit River Spring Chinook stocks in the Sauk River drainage.
b. It is genetically segregated from wild Skagit spring chinook and only hatchery origin broodstock is spawned.
c. There are no cases of reportable pathogens in this stock.
d. The adults volunteer to the hatchery trap and are selected randomly across the entire run without consideration of size, age or timing.

Broodstock Collection Process

Describe the broodstock collection process, including the following components. Differentiate by Natural Origin Recruit (NOR) and Hatchery Origin Recruit (HOR) if they are collected in a different manner:

a. Describe/give the location of adult collection relative to the physical plant where fish are held or spawned?
b. Describe how fish are collected (ladder, sorter, trap, in river, etc.)
c. Do you have the ability to handle or sort individual fish? If so, please describe your process.
d. If you transport adults from one site to another, describe method of transport. Have you had problems with mortality from handling because of this?
e. If the fish enter the adult holding structure on their own, describe the process for handling and counting. Include details on how and when you pass fish upstream, and about your ability to do so.
f. In what type of container do you hold these adults? Is it covered? Do you use overhead sprinklers? Do you have a problem with predation?
g. Which water supply is used for this purpose?
h. Are you able to hold these fish within recommended guidelines for temperature, water flow, and density?
i. Do you have adequate security?
j. How do you deal with numbers of fish in excess of your egg take needs? Do you feel you have the tools you need for this?
a. Adult chinook are trapped volitionally, from approximately May 1 to August 15th, in the adult trap located at Marblemount Hatchery.
b. The trap is located at the outlet channel of the hatchery and may operate on a mix of all hatchery water sources. Clark Creek water is the predominant attraction water used to improve attraction and trapping.
c. The adults are sorted, by hand, as they collect in the adult trap. All fish are checked for internal tags (wanded) or external clips, weighed, measured and inoculated with erythromycin.
d. Fish identified as “wild” are transported back to the Cascade River via garbage can (few fish) or fish tanker with an adult dump gate. There is no direct mortality from the process of planting fish back into the Cascade River.
e. The pond is not equipped with a power crowder so crowding and sorting are done by hand. The handling/sorting process is extremely labor intensive and hard on fish and crew alike. All fish are grabbed by hand or dip net. Formalin treatment is required to keep fungus growth under control. Loss is seldom a problem. Adults kept for spawning are inoculated with erythromycin (females only @ 20mg/Kg) and then moved via inner tube bags into a tank truck and then into 10’ x 100’ x 3.5’ covered (visqueen) rearing ponds to mature. Fish arriving early may receive a second inoculation at a later date.
f. Adults kept for spawning are moved into 10’ x 100’ x 3.5’ covered (visqueen) rearing ponds to mature. There are no sprinklers.
g. Fish are held on well water.
h. Loadings and temperatures do not appear to be a limiting factor.
i. Security has not been adequate in the past. The adults are vulnerable to poaching at any time and we have experienced losses (of inoculated fish!) in the past.
j. Excess adults are surplused as they return to the hatchery. We endeavor to keep spawners that are proportionately representative of the entire run. Additional adults are kept to allow for unforeseen adult losses and to allow for egg culling of higher ELISA lots (Note: WDFW uses an Optical Density, OD, reading of BKD antigens to rate egg units as High, Moderate, Low and Below Low) and eggs in excess of broodstock needs (those outside of a “normal” bell-shaped-curve). Surplus adults are planted live into Baker Lake (up to 2000 fish) to spawn live and enhance the nutrient load of Baker Lake and/or they are donated to the Skagit Tribes for subsistence and ceremonial purposes.

**Adult Handling**

**Please describe how you handle adults:**

a. What is the method for choosing and mating your broodstock (include how many adults of each sex are used per mating)?
   i. What are the spawner selection protocols (e.g. random, size, ripeness, wild or hatchery origin)?
ii. Record how the gametes are handled (pooling of milt and/or eggs? If so, how?). What is the mating scheme (e.g. 1:1, factorial, multiple pooling?)

b. Do you use anesthesia?

c. Describe the pathogen-sampling regime.

d. Describe mark sampling program, if any.

e. Is there any other biological sampling done on adults?

f. How do you dispose of spawning waste?

g. How do you dispose of pre-spawning mortalities?

h. How do you dispose of spawned adults?

---

a. Fish set aside for maturation and subsequent spawning are selected randomly, but, with some attempt to conserve and represent the natural run timing. When the fish are first trapped it is generally not possible to accurately determine the sex of the fish. As the adults ripen they are sorted, killed by club, and spawned weekly. Pairs are mated (one to one mating) randomly without regard to size or age. Each female receives a back-up male after about 1 minute. Each back-up male is also used as a primary male in another mating.
b. Fish are not anesthetized.
c. All carcasses are measured, weighed, scale sampled, ELISA sampled and mark sampled and 60 ovarian fluids, Kidney and spleen samples are collected for viral sampling and certification. Each egg lot is segregated to allow culling and/or pooling pending ELISA OD results.
d. All fish are wanded to verify that they are hatchery origin but tags are no longer read prior to spawning. Post spawning tag reading is used to verify the hatchery and stock origin of the population.
e. See “c” above.
f. Spawning waste, e.g. blood and sperm are allowed to drain into the creek.
g. Pre and post spawn adults are buried because they are injected with erythromycin.
h. See “g” Surplus live adults are transported, live, into Baker Lake to spawn naturally in the tributaries of Baker Lake. This is done to test this stock for re-introduction into the Baker system as well as to provide a source of nutrient enhancement.

**Incubation**

**Green Eggs**

Please describe your method for putting down green eggs:

a. Do you have adequate “clean” and “dirty” areas for handling eggs?
b. Describe your water hardening procedure.
c. Describe your green egg enumeration process.
d. Where are these eggs incubated (What type of incubator, water supply used)?
e. Do you incubate in single-family units? If you had the capacity, would that be desirable?
f. How many eggs per incubation unit?
g. What is the typical flow used?

---

a. Marblemount Hatchery is equipped with “telephone booth” style vertical incubators which afford between-stack isolation of egg lots.
b. The eggs are moved from the spawning pond into the incubation room as separate gametes where they are fertilized in single-family units. After the eggs are fertilized, as described above, they are pre-rinsed in iodophor, weight sampled and placed in vertical incubators to water-harden in iodophor for one hour.

c. The eggs are sub-sampled via gram scale.

d. The eggs are incubated, on well water, in single-family units (typically ~ 4,500 eggs) to allow culling and/or pooling of “High, Moderate, Low and Below Low” ELISA OD groups.

e. See “d”

f. Numbers are adjusted at eyeing and 5,000 eggs per tray are put down to hatch.

g. Flows set at 3.5 gpm and formalin is administered on an e/o day cycle at a 1:600 inflow.

**Eyed Eggs**

Please describe your methods for handling and putting down eyed eggs:

a. How do you monitor egg development? (Temperature units, visual check, fish pathologist check, etc.)

b. Have you had any chronic (or difficult to control) losses of eggs to the eyed stage? If so, please explain.

c. How do you dispose of dead eggs?

d. Do you disinfect eyed eggs prior to putting down to hatch?

e. What type of container do you use for hatching?

f. Do you use any type of substrate?

g. What is your loading density? (eggs per unit)

a. When the eggs develop a strong eye, as determined by visual cues, they are agitated to shock and then are picked in an automatic picker the next day.

b. There have been no chronic or unexplained egg losses.

c. Dead eggs are utilized for nutrient enhancement.

d. Eyed eggs are not disinfected prior to hatching.

e. Eggs are then enumerated and weighed back into vertical incubators, equipped with “Vexar” (trademark) substrate, to hatch at a rate of 5,000 eggs per tray. High, Moderate, Low and Below Low ELISA OD lots are segregated for additional management at button-up and ponding if needed. Flows are maintained at 3.5 gpm per stack.

f. See “e”

g. See “e”

**Other Issues**

Other incubation questions:

a. Is your water temperature regime similar to that in the natural environment?

b. Are eggs incubated under environmental conditions that tend to maximize individual fitness of fry? (e.g. allow volitional ponding of fry, incubate under environmental conditions that simulate the natural rearing environment)

c. Do you heat or cool your water during incubation? If so, please explain what you do and the purpose of the temperature manipulation.

d. Do you cull eggs during incubation for any purpose? (ELISA results, spawn timing, etc.)

e. Are excess eggs/fry culled randomly when necessary?

f. How do you deal with eggs in excess of your egg take needs?
g. Do fry have the ability to emerge volitionally?
h. If you have to remove fry from rearing units, how do you determine appropriate stage of development (Temperature units, visual check, pathologist check, etc.)?

a. The eggs are incubated and hatched on well water, which does not reflect the varying temperatures and conditions of local surface water.
b. Unknown.
c. Incubation water is not heated or cooled.
d. Surplus eggs are culled at the eyed egg stage to eliminate as many of the higher titer ELISA OD egg units as possible.
e. Any additional surplus eggs are culled to assure that the fish kept for the program represented, as much as possible, the largest total parent base and the natural spawn timing of the stock.
f. Culled eggs are all buried on site.
g. Fry cannot emerge volitionally.
h. Fry are ponded when the yolk slit has closed.

Rearing Conditions

a. Explain what type of container this stock is rearing in from first ponding to release (size and types of each kind of rearing unit).
b. What water supply is used for rearing this stock (from first ponding to release)?
c. Are the rearing units covered?
d. Do you attempt to provide any type of “natural rearing” for this stock (cover, substrate, food, etc.)? Please describe.
e. How do you decide which fish to combine in a rearing unit (individual families, results of ELISA, size of fish, etc.)?
f. What do you use for keeping fish within recommended density and/or poundage targets (Flow Index, Density Index, pounds/gallon/minute, etc.)?
g. Are you typically able to stay at or below this guideline? If not, what are your limiting factors?
h. Are fish produced similar to natural fish in size, growth rate, morphology, behavior physiological status, health, etc.?

a. All fry are forced-ponded at Marblemount when their yolk slit has closed. They are ponded by age group into either starter tanks in the hatchery building or into 10 x 100’ raceways outside.
b. In the hatchery the fish are started on well water. Outside they are started on Clark Creek water.
c. The outside ponds are covered.
d. There is no “natures” habitat provided.
e. In addition to age groups, the fry are combined by ELISA OD results. For the yearling program we use only the lowest OD fish in an attempt to keep BKD levels at a low level during rearing. “Moderates and any additional Lows or Below Lows are used for the Zero-smolt program and these too are pooled for rearing.
f. Due to the abundance of water and space all program fish are reared at conservative loadings and densities, as compared to Piper, teal. Flows and densities are not a limiting factor at Marblemount.
g. Yes. See “f”
h. The spring chinook yearlings and fingerlings are larger and do not mimic the size of natural spring chinook as seen at the WDFW screw traps in place at RM 17 in the lower Skagit River.

**Fish Health**

a. Do you use any prophylactic treatments? If so, describe drug/chemical used, targeted pathogen, life stage treated, and method of delivery.
b. Do you vaccinate this stock? If so, for what pathogen and with what vaccine?
c. Are you able to remove and enumerate mortalities easily? If not, what are your limitations?
d. Is this stock sampled for pathogens at spawning?
e. Do you or your fish health specialist perform any fish health assessments on this stock? If so, what sort and at what frequency?
f. What is your most challenging fish health problem with this stock? If you could, what would you do to resolve the problem?

---

a. See “Broodstock Collection Process” section
b. See “Broodstock Collection Process” section
c. Yes, mortality are picked by hand or vacuumed.
d. See “Adult Handling” section
e. See “Pathogen Combatant Methods and History” section.
f. Bacterial Kidney Disease in the yearling component of this program is our primary pathogen of concern. Losses can be low to moderate depending upon the year. Not sure how to lessen the effects.

**Marking**

a. Is this stock marked or tagged in any way prior to release? Please describe (numbers, replications, quality control).
b. What is the purpose of this mark or tag?
c. How many years has it been identified in this way?
d. Are there historic marks or tags we should know about?

---

a. Both the yearling and sub-yearling components of this program are identifiable as hatchery fish with adipose clips and wire tags. Tag retention is assessed after the fish are clipped and tagged.
b. The Marblemount yearling spring chinook program (150,000 fish) are a double index tag (DIT) group. Half are given an adipose clip and coded-wire tag and half only a coded-wire tag. All subyearlings (250,000 fish) are given an ad-cwt mark for production evaluation. All fish are wanded and mark sampled upon return.
c. These groups have been marked like this since about 1995.
d. Unknown.

**Release/Transfer**

a. How is time of release decided?
b. How do you measure the size of fish at release (fish per pound, average length, other)?
c. What is the typical size range in millimeters of these fish at release? If you do not know the size range, what is average weight?
d. What other smolt quality monitoring do you perform, if any (fish pathologist checks, on-going research projects, smoltification indicators, etc.)?
e. Are fish released with adequate imprinting to facility or desired stream reach?
f. Describe your on-station release procedure for this stock (volitional vs. forced, time of day, typical date, length of time of release, etc.).
g. If you truck this stock off station, where do they go (acclimation pond, stream plant, transfer to another facility, etc.)?
h. Are you or others able to monitor the fish after they enter the river (snorkeling, smolt trapping downstream, etc.)?
i. Do you have any idea if these fish have interactions with other salmonids in the receiving environment? If so, what do you know?

a. All fish (0+ and 1+) are normally released at times and sizes as shown in the FBD.
b. Fish are measured in fish per pound at release.
c. Yearlings average about 10 fish per pound and sub-yearlings average about 70 fish per pound at release.
d. Behavioral and physical characteristics are monitored prior to release to assure that a majority of the fish are ready to migrate at the designated time.
e. We try to improve the imprinting of these fish by managing the water source from which they are reared and released in. See “f” below.
f. All program Spring Chinook are started on well water and/or Clark Creek water. Primary rearing is done in 10 x 100’ raceways and as the fish grow they may receive a mix of Cascade River water as well as Jordan Creek water. The fish destined for the sub-yearlings are switched to Clark Creek water for several weeks prior to release to improve imprinting to the hatchery trap out-fall which is located on Clark Creek. These fish are initially volitionally released from the 10 X 100 ponds. The final release of this group is a forced. Fish destined for yearling release are reared to about 50/LB in the 10 x 100 raceways on a similar mix of hatchery water(s) as the sub-yearlings. At 50 fish per pound the fish are transferred via fish pump to a large asphalt rearing pond. These fish are switched to Clark Creek water for several weeks prior to release to improve imprinting to the hatchery trap out-fall which is located on Clark Creek. Their release is volitional.
g. These fish are not trucked.
h. Fish, which have migrated into the river, are monitored at screw traps located in the lower Skagit River. These traps have been in operation for 12 years, and from January through late summer since 1997
i. We see no interactions as the fish migrate quickly out of the area.

**Adult Migration**

Migration of returning adults
a. *Is the straying of hatchery fish into the wild controlled?*
b. *Is the attraction of wild fish into the hatchery minimized?*

a. There is no physical way to bar returning adults from passing the hatchery trap outfall channel and continuing upstream.
b. To improve imprinting and homing faithfulness, all pre-migrants are reared on Clark Creek water as much as possible. Adults Spring Chinook of “wild” origin are rare and
may simply be unmarked hatchery springs. All wild fish are returned to the Cascade River to spawn naturally.
Sauk River Summer Chinook

**Habitat Status**

**Habitat Rating**

Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th></th>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hatchery</td>
<td>Wild</td>
<td>Hatchery</td>
<td>Wild</td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:

1. **High (H) = Healthy:** Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.
2. **Medium (M) = Limiting:** The target stock is productive enough for the population to sustain itself at a low level terminal harvest.
3. **Low (L) = Inadequate:** The target stock is unproductive and the population will go extinct, even without terminal harvest.

**Habitat Condition/Habitat Improvement/Future Expectations/Additional Information**

*(Please refer to the Introduction section)*

---

11. Provided by Brett Barkdoll, WDFW
STOCK STATUS

TRENDS

Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.

<table>
<thead>
<tr>
<th>Sauk River Summer Chinook</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year</strong></td>
<td><strong>Survival</strong></td>
</tr>
<tr>
<td>1974</td>
<td>1082</td>
</tr>
<tr>
<td>1975</td>
<td>964</td>
</tr>
<tr>
<td>1976</td>
<td>1770</td>
</tr>
<tr>
<td>1977</td>
<td>926</td>
</tr>
<tr>
<td>1978</td>
<td>1640</td>
</tr>
<tr>
<td>1979</td>
<td>1636</td>
</tr>
<tr>
<td>1980</td>
<td>2738</td>
</tr>
<tr>
<td>1981</td>
<td>1702</td>
</tr>
<tr>
<td>1982</td>
<td>1133</td>
</tr>
<tr>
<td>1983</td>
<td>375</td>
</tr>
<tr>
<td>1984</td>
<td>680</td>
</tr>
<tr>
<td>1985</td>
<td>515</td>
</tr>
<tr>
<td>1986</td>
<td>1143</td>
</tr>
<tr>
<td>1987</td>
<td>792</td>
</tr>
<tr>
<td>1988</td>
<td>1052</td>
</tr>
<tr>
<td>1989</td>
<td>449</td>
</tr>
<tr>
<td>1990</td>
<td>1294</td>
</tr>
<tr>
<td>1991</td>
<td>658</td>
</tr>
<tr>
<td>1992</td>
<td>469</td>
</tr>
<tr>
<td>1993</td>
<td>209</td>
</tr>
<tr>
<td>1994</td>
<td>100</td>
</tr>
<tr>
<td>1995</td>
<td>263</td>
</tr>
<tr>
<td>1996</td>
<td>1103</td>
</tr>
<tr>
<td>1997</td>
<td>295</td>
</tr>
<tr>
<td>1998</td>
<td>469</td>
</tr>
<tr>
<td>1999</td>
<td>295</td>
</tr>
<tr>
<td>2000</td>
<td>576</td>
</tr>
<tr>
<td>2001</td>
<td>1103</td>
</tr>
</tbody>
</table>

12. Information provided by Pete Castle (WDFW) and Bob Hayman (SSC). GDU and SASSI documents were also used.
AGE CLASS STRUCTURE

What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

Sauk River summer chinook return as two to five year-olds. There are not many carcass recoveries because less sampling is possible for this stock. Outmigrants may be yearling or zeroes but the existing limited data indicates there is not as high of a yearling component for the composite summer and fall chinook Skagit Region stocks as exist for the composite spring chinook Skagit Region stocks.

PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION

Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

Carcass sampling indicates hatchery fish do not spawn with Sauk River summer chinook.

PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY

For hatchery stocks—what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?

Not applicable

INDEX STOCK

Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.

No. The index stock that most closely aligns with is this stock is the Skagit River hatchery summer chinook group. At one time, managers tried to exclude stocks at the hatchery based on timing but springs, summers, and falls got intermixed such that hatchery summer chinook did not electrophoretically match wild summer chinook. Because of this a new hatchery summer chinook program that relies on wild summer chinook began with the 1995 brood.

Biological Significance

STOCK ORIGIN

Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?

a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or

b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been)? or
c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or
d. Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? or
e. Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?

All chinook stocks are considered native and genetically unique. Green River fall chinook have been the only non-local introduction since 1951. Green River fall chinook introductions ceased eight years ago. Although there was overlap with the last summer chinook and early fall chinook returns, it appears unlikely that Green river returnees would have co-mingled with Sauk River summer chinook because of water type differences; Green river fall chinook were raised on Clark Creek or Cascade River water and not Sauk River water.

BIOLOGICAL ATTRIBUTES

Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.)? Use the following questions to guide your answer:

a. Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or
b. Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or
c. Are all known biological attributes shared with other GDUs?

Lower Sauk River summer chinook spawn from river mile 0.0 to 21.2 and in Dan Creek, and their timing is similar to the upper Skagit River summer stock. This stock usually spawns in September (which is the same spawn timing as the Stillaguamish summer chinook) and lower in the watershed, where the gradients are low to moderate and the mean annual rainfall is 70-80 inches (Pacific Northwest River Basins Commission 1970).

POPULATION SUBDIVISIONS

How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:

a. How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?
b. What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.
c. What is the total number of stocks within the same GDU as the stock under consideration?
d. What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?

The Sauk River summer chinook are listed as Lower Sauk River summer chinook stock and fall within the Stillaguamish and Skagit GDU. Eight naturally spawning stocks and one hatchery stock belong to this GDU. The Stillaguamish and Skagit basins have divergent geographical spawning distributions, entry and spawn timing and environmental conditions. In addition, Sauk River summer chinook spawn below the town of Darrington. Lower Sauk summer chinook are
more similar to North Fork Stillaguamish summer chinook than they are to other Skagit watershed stocks.
MANAGEMENT GOALS

Harvest and Conservation

For each hatchery stock program, is the program goal conservation, harvest or both?

No hatchery program for this stock.

Harvest

Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:
- High – harvest opportunity each year, spread over seasons
- Medium – opportunity most years, for some seasons
- Low – occasional opportunity, single run
- 0 – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Opportunity</td>
<td>L</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

Conservation

What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.

The conservation goal is to increase natural spawning.

Production

For hatchery programs, please summarize the production goals:

a. How many fish at what size are planned for release? Transferred off-station?

No hatchery program.

b. Where are eggs taken and incubated? Where are fish reared and released?

Not Applicable

c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

Not Applicable

---

13. Information provided by Pete Castle (WDFW) and Bob Hayman (SSC). GDU and SASSI documents were also used.
d. Is the duration of this program clearly defined?

Not Applicable

**Other Goals**

*Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.*

No information provided

**Monitoring and Evaluation**

*Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.*

No information provided

**Goal Achievement**

*Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?*

No information provided

**Conflicts**

*Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?*

No information provided

**Incorporating Adaptive Management**

*Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?*

No information provided
Skagit River Summer Chinook

Habitat Status¹⁴

Habitat Rating

Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th></th>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hatchery</td>
<td>Wild</td>
<td>Hatchery</td>
<td>Wild</td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>H/H/M/L</td>
<td>H/M/L</td>
<td>H/M/L</td>
<td>L</td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:

1. **High (H) = Healthy**: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.
2. **Medium (M) = Limiting**: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.
3. **Low (L) = Inadequate**: The target stock is unproductive and the population will go extinct, even without terminal harvest.

Habitat Condition/Habitat Improvement/Future Expectations/Additional Information

*(Please refer to the Introduction section)*

¹⁴. Provided by Brett Barkdull, WDFW
Stock Status\textsuperscript{15}

TRENDS

.Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.

\begin{tabular}{|c|c|c|c|}
\hline
Year & Survival & Catch & Escapement \\
\hline
1974 & 8389 & & \\
1975 & 7171 & & \\
1976 & 6760 & & \\
1977 & 5807 & & \\
1978 & 8448 & & \\
1979 & 7841 & & \\
1980 & 12399 & & \\
1981 & 4233 & & \\
1982 & 6845 & & \\
1983 & 5197 & & \\
1984 & 9642 & & \\
1985 & 13801 & & \\
1986 & 12181 & & \\
1987 & 5982 & & \\
1988 & 8077 & & \\
1989 & 4781 & & \\
1990 & 11793 & & \\
1991 & 3656 & & \\
1992 & 5548 & & \\
1993 & 4654 & & \\
1994 & 4565 & & \\
1995 & 5948 & & \\
1996 & 7989 & & \\
1997 & 4168 & & \\
1998 & 11761 & & \\
1999 & 3586 & & \\
2000 & 13092 & & \\
2001 & 10084 & & \\
\hline
\end{tabular}

\begin{center}
\textbf{Stock Status\textsuperscript{15}}
\end{center}

\textit{...Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.}

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>8389</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td>7171</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td>6760</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>5807</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>8448</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td>7841</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>12399</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>4233</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>6845</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td>5197</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>9642</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>13801</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>12181</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>5982</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>8077</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>4781</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>11793</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>3656</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>5548</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>4654</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>4565</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>5948</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>7989</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>4168</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>11761</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>3586</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>13092</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>10084</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\textit{15. Information provided by Pete Castle, WDFW}
AGE CLASS STRUCTURE

What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

Outmigration strategies of the upper Skagit summer chinook have been examined by scale pattern analysis. The predominant outmigration pattern appears to be subyearlings. A low percentage (0-16%) of returning adults possess a yearling-type outmigration scale pattern, and that low level might be due to hatchery strays (Smith, 1994).

Chinook return at two to five years of age. The percentage of three-year olds has increased annually. This is likely because there has been a decrease in five-year olds. With less exploitation on chinook stocks, the percentage of three-year olds will likely decrease and more fish will return as four and five year olds.

PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION

Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

In general, Skagit River wild chinook stocks do not have hatchery fish spawning with them. The upper Skagit summer chinook are supplemented with hatchery production, but production from this program is expected to return to the original spawning area and does not return to a hatchery facility.

PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY

For hatchery stocks- what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?

The first Skagit summer hatchery program began in 1975, when wild broodstock were collected from the upper Skagit for rearing and release from Skagit Hatchery. The program failed because consistent coded-wire tagging was not provided for each brood, and the spawn timing overlapped with a non-native (Green River) fall chinook stock propagated at the Skagit Hatchery. The timing overlap resulted in hybridization that led to the loss of genetic integrity of the Skagit Hatchery summer chinook stock. Electrophoretic analysis showed no significant difference between the pre-1990 Skagit Hatchery summer chinook baseline and Green River Hatchery chinook baseline (Ann Marshall, unpublished data). The pre-1990 summer chinook stock and the Green River fall chinook stock are no longer maintained at the Skagit Hatchery.

The current hatchery program is derived 100% from wild Skagit summer chinook stock collected in the Skagit River near Concrete.

INDEX STOCK

Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.

The hatchery program provides an index stock for this stock.
Biological Significance

**STOCK ORIGIN**
Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?

- Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or
- Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been)? or
- Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or
- Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? or
- Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?

All chinook stocks are considered native and genetically unique. Green River fall chinook stock has been the only non-local introduction since 1951.

**BIOLOGICAL ATTRIBUTES**
Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.?) Use the following questions to guide your answer:

- Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or
- Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or
- Are all known biological attributes shared with other GDUs?

In the mainstem Skagit River, upper Skagit summer chinook spawn from river mile 67.2 to 93. Summer chinook spawning has also been documented in Illabot, Diobsud, Bacon, Goodell, and Falls creeks. This stock usually spawns from early September through mid-October. They spawn lower in the watershed, where the gradients are low to moderate and the mean annual rainfall is 70-80 inches (Pacific Northwest River Basins Commission 1970).

**POPULATION SUBDIVISIONS**
How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:

- How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?
- What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.
- What is the total number of stocks within the same GDU as the stock under consideration?
d. What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?

The Skagit Summer Chinook are listed as upper Skagit River summer chinook stock and fall within the Stillaguamish and Skagit GDU. Eight naturally spawning stocks and one hatchery stock belong to this GDU. The Stillaguamish and Skagit basins have divergent geographical spawning distributions, entry and spawn timing and environmental conditions.
MANAGEMENT GOALS

Harvest and Conservation

For each hatchery stock program, is the program goal conservation, harvest or both?

Not Provided

Harvest

Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:

- **High** – harvest opportunity each year, spread over seasons
- **Medium** – opportunity most years, for some seasons
- **Low** – occasional opportunity, single run
- **0** – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Opportunity</td>
<td>L</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

Conservation

What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.

The conservation goal is to increase natural spawning.

Production

For hatchery programs, please summarize the production goals:

a. How many fish at what size are planned for release? Transferred off-station?

The planting goal is 200,000 fish @ 75/pound released from County Line Pond near Newhalem in June.

b. Where are eggs taken and incubated? Where are fish reared and released?

All summer chinook are spawned and reared at Marblemount from adults captured in the upper Skagit River between RM 80 and 84. The fish are released at County Line Pond on the upper Skagit River at ~RM 94.

c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

16. Information provided by Pete Castle (WDFW) and Bob Hayman (SSC). GDU and SASSI documents were also used.
The program is new. It started in 1995.

_d. Is the duration of this program clearly defined?_

The program duration is defined as ongoing at this time.

**Other Goals**

_Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc._

The summer chinook program is a wild-stock indicator groups used to monitor the wild Skagit stock.

**Monitoring and Evaluation**

_Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe._

Not Provided

**Goal Achievement**

_Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?_

Not Provided

**Conflicts**

_Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?_

Not Provided

**Incorporating Adaptive Management**

_Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?_

Not Provided
CURRENT HATCHERY PROGRAMS

Skagit Hatchery Summer Chinook – Marblemount Hatchery

FACILITY
(See “Skagit Hatchery Spring Chinook – Marblemount Hatchery” Section of Skagit Region Spring Chinook, Current Hatchery Programs, page 17)

STOCK INFORMATION

Broodstock

Broodstock Description
Describe the broodstock as follows: (These may be a repeat of some questions asked under stock status - you may refer to those answers or cut and paste.)

a. How was the broodstock chosen?
b. Do you consider it an integrated (goal is to maintain a single gene pool and prevent divergence) or segregated (isolated in the hatchery, managed to restrict gene flow) population?
c. Does this broodstock have a history of reportable pathogens?
d. Are you able to collect representative samples each year of the population, with respect to size, age, sex ratio, and run and spawn timing? If not, please explain the limitation.

a. This is a new program at Marblemount and has been at Marblemount since the 1995 brood. The broodstock are collected entirely from the spawning grounds on the upper Skagit River between RM 80 and 84. Wild origin fish are used primarily but some F1 recruits have been incorporated into the population.
b. The intent of the program is to keep the stock integrated with the wild population. There are no cases of reportable pathogens in this stock.
c. There is no reportable pathogen history in this stock.
d. Adults are collected at random and over the length of the spawning season, by net, from the normal spawning and holding reaches on the upper Skagit River and are sorted only to achieve an approximately equal sex ratio. Approximately 80 total adults (40 pairs) are collected for the program.

Broodstock Collection Process

Describe the broodstock collection process, including the following components. Differentiate by Natural Origin Recruit (NOR) and Hatchery Origin Recruit (HOR) if they are collected in a different manner:

17. Information provided by Darrell Mills, Steve Stout, and Kevin Kurris, WDFW
a. Describe/give the location of adult collection relative to the physical plant where fish are held or spawned?
b. Describe how fish are collected (ladder, sorter, trap, in river, etc.)
c. Do you have the ability to handle or sort individual fish? If so, please describe your process.
d. If you transport adults from one site to another, describe method of transport. Have you had problems with mortality from handling because of this?
e. If the fish enter the adult holding structure on their own, describe the process for handling and counting. Include details on how and when you pass fish upstream, and about your ability to do so.
f. In what type of container do you hold these adults? Is it covered? Do you use overhead sprinklers? Do you have a problem with predation?
g. Which water supply is used for this purpose?
h. Are you able to hold these fish within recommended guidelines for temperature, water flow, and density?
i. Do you have adequate security?
j. How do you deal with numbers of fish in excess of your egg take needs? Do you feel you have the tools you need for this?

a. Summer Chinook are collected by net between RM 80 and 84 from adults holding in the upper Skagit River.
b. Sufficient adults are collected by gill net to produce an egg take of approximately 275,000 green eggs. Some F1s may be utilized. All are wanded before being kept.
c. Green adults are carried from the river to a tank truck in innertube fish tubes. They are placed in a 1,000 gallon tanker and hauled to Marblemount where they are held in the same manner as the Spring Chinook.
d. Adults are transported to the tanker truck via fish tubes (inner-tube bags). The fish handle well with this method.
e. Not Applicable.
f. Same as spring chinook.
g. Same as spring chinook.
h. Same as spring chinook.
i. Same as spring chinook.
j. There are no surplus fish collected.

Adult Handling

Please describe how you handle adults:

a. What is the method for choosing and mating your broodstock (include how many adults of each sex are used per mating)?
   i. What are the spawner selection protocols (e.g. random, size, ripeness, wild or hatchery origin?)?
   ii. Record how the gametes are handled (pooling of milt and/or eggs? If so, how?). What is the mating scheme (e.g. 1:1, factorial, multiple pooling?)
b. Do you use anesthesia?
c. Describe the pathogen-sampling regime.
d. Describe mark sampling program, if any.
e. Is there any other biological sampling done on adults?
f. How do you dispose of spawning waste?
g. How do you dispose of pre-spawning mortalities?

h. How do you dispose of spawned adults?

a. Fish collected by net in the river are held for maturation and subsequent spawning and are selected randomly when spawned. As the adults ripen up they are sorted, killed by club, and spawned weekly. Pairs are mated (one to one mating) randomly without regard to size or age. Each female receives a back-up male after about 1 minute. Each back-up male is also used as a primary male in another mating.

b. Fish are killed, by club, prior to spawning.

c. All carcasses are measured, weighed, scale sampled, and 60 fish viral sample is collected.

d. There are no marked fish collected from the river.

e. See section “c” above.

f. Spawning waste, e.g. blood and sperm are allowed to drain into the creek.

g. Pre and post spawn adults are used for nutrient enhancement.

h. Ditto “g”

Incubation

Green Eggs

Please describe your method for putting down green eggs:

- Do you have adequate “clean” and “dirty” areas for handling eggs?
- Describe your water hardening procedure.
- Describe your green egg enumeration process.
- Where are these eggs incubated (What type of incubator, water supply used)?
- Do you incubate in single-family units? If you had the capacity, would that be desirable?
- How many eggs per incubation unit?
- What is the typical flow used?

a. There is adequate separation of the clean and dirty areas of the hatchery.

b. The eggs are moved from the spawning pond into the incubation room as separate gametes where they are fertilized in single family units. After the eggs are fertilized, utilizing a primary and a backup male whenever possible, they are pre-rinsed in iodophor.

c. They are then weight sampled by gram scale and placed in vertical incubators to water-harden in iodophor for one hour.

d. The eggs are incubated, on well water, in single family units (typically ~ 4,500 eggs) in telephone-booth style vertical incubators.

e. See “d” above.

f. See “d” above. Numbers are adjusted at eyeing and 5,000 eggs per tray are put down to hatch.

g. Flows are set at 3.5 gpm and formalin is administered on an e/o day cycle at a 1:600 inflow.

Eyed Eggs

Please describe your methods for handling and putting down eyed eggs:

- How do you monitor egg development? (Temperature units, visual check, fish pathologist check, etc.)
b. Have you had any chronic (or difficult to control) losses of eggs to the eyed stage? If so, please explain.
c. How do you dispose of dead eggs?
d. Do you disinfect eyed eggs prior to putting down to hatch?
e. What type of container do you use for hatching?
f. Do you use any type of substrate?
g. What is your loading density? (eggs per unit)

a. When the eggs develop a strong eye, as determined by visual cues, they are agitated to shock and then are picked in an automatic picker the next day.
b. There has been no unusual, chronic or unexplained egg loss.
c. Dead eggs are used for nutrient enhancement.
d. Eggs are not disinfected prior to hatching.
e. Eggs are hatched in vertical incubators with “Vexar” (trademark) substrate.
f. See “c” above.
g. Eggs are then weighed back into vertical incubators, equipped with substrate, to hatch at a rate of 5,000 eggs per tray. Flows are maintained at 3.5 gpm per stack.

Other Issues

Other incubation questions:

a. Is your water temperature regime similar to that in the natural environment?
b. Are eggs incubated under environmental conditions that tend to maximize individual fitness of fry? (e.g. allow volitional ponding of fry, incubate under environmental conditions that simulate the natural rearing environment)
c. Do you heat or cool your water during incubation? If so, please explain what you do and the purpose of the temperature manipulation.
d. Do you cull eggs during incubation for any purpose? (ELISA results, spawn timing, etc.)
e. Are excess eggs/fry culled randomly when necessary?
f. How do you deal with eggs in excess of your egg take needs?
g. Do fry have the ability to emerge volitionally?
h. If you have to remove fry from rearing units, how do you determine appropriate stage of development (Temperature units, visual check, pathologist check, etc.)?

a. The eggs are incubated and hatched on well water, which does not reflect the varying temperatures and conditions of local surface water.
b. Unknown.
c. Water is not heated or cooled.
d. The eggs are not culled for any reason.
e. Not at all.
f. None exist.
g. Fry are forced ponded when the yolk slit has closed.
h. See “g” above.

Rearing Conditions

a. Explain what type of container this stock is rearing in from first ponding to release (size and types of each kind of rearing unit).
b. What water supply is used for rearing this stock (from first ponding to release)?
c. Are the rearing units covered?
d. Do you attempt to provide any type of “natural rearing” for this stock (cover, substrate, food, etc.)? Please describe.
e. How do you decide which fish to combine in a rearing unit (individual families, results of ELISA, size of fish, etc.)?
f. What do you use for keeping fish within recommended density and/or poundage targets (Flow Index, Density Index, pounds/gallon/minute, etc.)?
g. Are you typically able to stay at or below this guideline? If not, what are your limiting factors?
h. Are fish produced similar to natural fish in size, growth rate, morphology, behavior physiological status, health, etc.?

a. All fry are forced-ponded when their yolk slit has closed. They are ponded by age group into starter tanks in the hatchery building and eventually into 10 x 100’ raceways outside.
b. In the hatchery the fish are started on well water. Outside they are reared on well water to minimize homing fidelity to the hatchery when they return.
c. The ponds are covered.
d. There is no “natures” environment provided.
e. Fish are started in smaller groups, roughly by age and eventually combined after sizes equal out by feed manipulation.
f. Due to the abundance of water and space, program fish are reared at conservative loadings and densities, as compared to Piper, et. al. Flows and densities are not a limiting factor at Marblemount.
g. See “f” above.
h. These fish are released as small fingerlings in an attempt to mimic the size of natural origin chinook smolts seen at the WDFW screw traps in place at RM 17 in the lower Skagit River.

Fish Health

a. Do you use any prophylactic treatments? If so, describe drug/chemical used, targeted pathogen, life stage treated, and method of delivery.
b. Do you vaccinate this stock? If so, for what pathogen and with what vaccine?
c. Are you able to remove and enumerate mortalities easily? If not, what are your limitations?
d. Is this stock sampled for pathogens at spawning?
e. Do you or your fish health specialist perform any fish health assessments on this stock? If so, what sort and at what frequency?
f. What is your most challenging fish health problem with this stock? If you could, what would you do to resolve the problem?

a. None.
b. No.
c. Yes, via dip nets or vacuum.
d. Yes, via ovarian fluid, kidney and spleen samples.
e. The fish health specialist checks this stock routinely.
f. There are no unusual or serious fish health problems with this stock. See sections 5 and 12 for additional information.

Marking
a. Is this stock marked or tagged in any way prior to release? Please describe (numbers, replications, quality control).
b. What is the purpose of this mark or tag?
c. How many years has it been identified in this way?
d. Are there historic marks or tags we should know about?

a. Yes, these fish are 100% ad-cwt marked. Tag retention is assessed after the fish are clipped and tagged.
b. Stock index evaluation.
c. Since the program began with the 1995 brood.
d. None.

Release/Transfer
a. How is time of release decided?
b. How do you measure the size of fish at release (fish per pound, average length, other)?
c. What is the typical size range in millimeters of these fish at release? If you do not know the size range, what is average weight?
d. What other smolt quality monitoring do you perform, if any (fish pathologist checks, on-going research projects, smoltification indicators, etc.)?
e. Are fish released with adequate imprinting to facility or desired stream reach?
f. Describe your on-station release procedure for this stock (volitional vs. forced, time of day, typical date, length of time of release, etc.).
g. If you truck this stock off station, where do they go (acclimation pond, stream plant, transfer to another facility, etc.)?
h. Are you or others able to monitor the fish after they enter the river (snorkeling, smolt trapping downstream, etc.).
i. Do you have any idea if these fish have interactions with other salmonids in the receiving environment? If so, what do you know?

a. In order to maximize the value of these program fish as a wild indicator stock, the fish are reared and released at a time and size (75/lb in June) that approximates their wild counterpart as much as is practical.
b. The fish are sub-sampled and weighed in fish per pound then weighed by displacement into tank trucks to transfer to the acclimation site.
c. Approximately 75 fish/pound.
d. External cues and behavior.
e. The fish are reared on well water at Mablemount to limit their ability to home back to Marblemount as adults. The fish are transferred via pump and tanker truck off station, to County Line Pond, on the upper Skagit River, for acclimation and forced release after about 3 weeks.
f. See “e” above.
g. See “e” above.
h. The passage of these fish is monitored at a screw trap in the lower Skagit River.
i. We do not see interaction.

**Adult Migration**

*Migration of returning adults*

a. *Is the straying of hatchery fish into the wild controlled?*
b. *Is the attraction of wild fish into the hatchery minimized?*

---

a. This program is intended to be a fully integrated program and there is no desire to have adults return to the hatchery.
b. The fish are reared on well water at Mablemount to limit their homing fidelity, of hatchery reared-wild-origin fish, back to Marblemount as adults.
Skagit River Fall Chinook

Habitat Status¹⁸

Habitat Rating

Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hatchery</td>
<td>Wild</td>
<td>Hatchery</td>
<td>Wild</td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>L</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:
1. **High (H) = Healthy**: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.
2. **Medium (M) = Limiting**: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.
3. **Low (L) = Inadequate**: The target stock is unproductive and the population will go extinct, even without terminal harvest.

Habitat Condition/Habitat Improvement/Future Expectations/Additional Information

(Please refer to the Introduction section)

¹⁸. Provided by Brett Barkdoll, WDFW
Stock Status

Trends

Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td></td>
<td>3116</td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td></td>
<td>3185</td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td></td>
<td>5590</td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td></td>
<td>2485</td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td></td>
<td>2987</td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td></td>
<td>3829</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td>4921</td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td></td>
<td>2348</td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td></td>
<td>1932</td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td></td>
<td>1315</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td></td>
<td>2306</td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td></td>
<td>1686</td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td></td>
<td>4584</td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td></td>
<td>2635</td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td></td>
<td>2339</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td></td>
<td>1454</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td></td>
<td>3705</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td></td>
<td>1510</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td></td>
<td>1331</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td></td>
<td>942</td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td></td>
<td>884</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
<td>666</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td></td>
<td>1521</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td>499</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td></td>
<td>2388</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td>1043</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td>3262</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td>2606</td>
<td></td>
</tr>
</tbody>
</table>

*There is no coded wire tag data for the Skagit River fall chinook because the hatchery program did not begin until 1998. Previous coded wire tag data was for Green River origin fall chinook, which is no longer applicable.

19 Provided by Pete Castle, the GDU Technical Report, Darrell Mills, and Charmane Ashbrook, WDFW
**AGE CLASS STRUCTURE**

*What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.*

Skagit Region wild chinook stocks are managed as two composite groups. The Skagit River fall and summer chinook and the Sauk River summer chinook are managed as one of the two composite groups. (The other composite group consists of Cascade River, Sauk River, and Suiattle River spring chinook.)

Wild fall chinook smolts outmigrate as subyearlings or yearlings. In some years, the yearling outmigrant component has been as high as 30%. Adults return at ages two to five. In previous decades three year old return has been high, which is likely because there was a decrease in five year olds. With less exploitation from Canadian and U.S. fisheries the percentage of three-year olds will likely decrease and more fish will return as four and five year olds; the 2001 increase in five year old adult appears to support this theory.

**PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION**

*Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.*

There may be Skagit hatchery-origin fall chinook fish spawning with the natural fish. Hatchery and natural fall chinook are genetically the same stock. Hatchery fall chinook releases occur in the spawning zone of the wild fall chinook. In 2001 biologists noted many hatchery fish spawning with the natural fish. Plants of non-native stocks (primarily Green River origin) into the Skagit watershed include: annual releases of from 150k to over 1 million fingerlings (1956-57, 1959-65, 1970) into the mainstem Skagit, about 88k fingerlings into Etach Creek (lower Skagit, 1976), 0.5 million fingerlings and 1.7 million unfed-fry into the Sauk River (1965), 433k fingerlings into the Baker River (1950’s) and 5 million fingerlings and 2 million unfed-fry into Finney Creek (mid-1950’s to mid 1960’s). Other non-native plants include: 72k Spring Creek fingerlings into Sandy Creek and 137k Spring Creek fingerlings into the Baker River.

**PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY**

*For hatchery stocks- what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?*

The entire stock derives from wild Skagit fall chinook stock collected in the Skagit River near Concrete.

**INDEX STOCK**

*Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.*

This is an index stock for Skagit River fall chinook.
Biological Significance

**STOCK ORIGIN**

Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?

a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or
b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been)? or
c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or
d. Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? or
e. Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?

All chinook stocks are considered native and genetically unique. Green River fall chinook stock has been the only non-local introduction since 1951. Green River fall chinook introductions ceased eight years ago.

**BIOLOGICAL ATTRIBUTES**

Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.)? Use the following questions to guide your answer:

a. Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or
b. Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or
c. Are all known biological attributes shared with other GDUs?

Lower Skagit fall chinook spawning has been documented from river mile 22 to 67.2, including the Baker River, Finney Creek, and Day Creek. Few redds per mile occur from river mile 56.5 to 67.2 in the mainstem Skagit River, which might be related to an increased sediment load transferred from the Sauk watershed to this section of the Skagit since 1975 (Pete Castle, WDFW, personal communication). This stock spawns from mid-September through October, which is similar to most of the stocks in the south Puget Sound chinook GDU. Skagit River fall chinook spawn in the low mainstem in a low gradient. Annual precipitation in this area averages 40-70 inches (Pacific Northwest River Basins Commission 1970).

**POPULATION SUBDIVISIONS**

How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:

a. How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?
b. What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.

c. What is the total number of stocks within the same GDU as the stock under consideration?

d. What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?

The Skagit Fall Chinook are listed in SASSI as the Skagit River fall chinook stock. They belong to the Stillaguamish and Skagit GDU. Eight naturally spawning stocks and one hatchery stock belong to this GDU. The Stillaguamish and Skagit basins have divergent geographical spawning distributions, entry and spawn timing and environmental conditions.
**MANAGEMENT GOALS**

**Harvest and Conservation**

*For each hatchery stock program, is the program goal conservation, harvest or both?*

The fall chinook hatchery program is to provide an index stock.

**Harvest**

*Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:*

- **High** – harvest opportunity each year, spread over seasons
- **Medium** – opportunity most years, for some seasons
- **Low** – occasional opportunity, single run
- **0** – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Opportunity</td>
<td>L</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

**Conservation**

*What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.*

Naturally spawning chinook stocks are in the rebuilding mode. The goal for the wild Skagit River fall chinook is to attain and maintain healthy stocks. The co-managers have recently agreed to recovery goals for chinook. The goals for the Skagit River hatchery fall chinook program are to maintain its health and to serve as an index for wild Skagit River fall chinook. Skagit River hatchery fall chinook are harvested only if there is an escapement overage. Usually extra fish are given to food banks, tribes, or allowed to spawn naturally. Genetically, the wild and hatchery stocks pretty much the same.

**Production**

*For hatchery programs, please summarize the production goals:*

a. **How many fish at what size are planned for release? Transferred off-station?**

The planting goal is 222,000 fish @ 150/pound released into the Baker River in June.

b. **Where are eggs taken and incubated? Where are fish reared and released?**

---

20. Provided by Pete Castle, the GDU Technical Report, Darrell Mills, and Charmane Ashbrook, WDFW
All fall chinook are spawned and reared at Marblemount from adults captured on the lower Skagit River between RM 32 and 40. The fish are released at the Baker River Trap on the lower Skagit River at RM ~56.5.

c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

The program is new. It started in 1998.

d. Is the duration of this program clearly defined?

The program duration is defined as ongoing.

Other Goals

Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.

The hatchery fall chinook program is a wild-stock index group and monitors the wild Skagit River fall chinook. In addition, the return of spring chinook provides salmon to the tribes for the “First Salmon Ceremony.” The wild fall chinook goals are to maintain a healthy population and hopefully have a surplus for tribal and non-tribal harvest.

Monitoring and Evaluation

Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.

Monitoring and evaluation methods include: fish tickets for monitoring catch; spawning surveys; smolt trapping; counting fish at Baker River trap; and estuarine surveys. Carcasses collected from spawning surveys are checked for coded wire tags and measured. In addition, scales and otoliths are collected.

Goal Achievement

Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?

Fall chinook stocks goals are not met on an annual basis, despite the low harvest goal. Spawning escapement goals are achieved 50% of the time; however, the past decade (1990’s) has been poor compared to the 1980’s.

Conflicts

Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?
Management practices are designed to meet the goals. Present habitat conditions might restrict our ability to meet our goals. All chinook stocks could be affected in the estuary because diking reduced the estuary by 30%.

Other issues include the need to add trees to the upper watershed; flood control measures hinder creek and estuarine conditions; and forest conservation goals conflict with salmon conservation goals.

**Incorporating Adaptive Management**

*Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?*

*We cannot easily change our goals when we receive new information. Inertia exists. Further, supporting data in a timely fashion does not drive management—more information does not necessarily change our management philosophy. In addition, some stocks are caught incidentally to a much greater extent than we thought.*
CURRENT HATCHERY PROGRAMS

Skagit Hatchery Fall Chinook – Marblemount Hatchery

FACILITY
(See “Skagit Hatchery Spring Chinook – Marblemount Hatchery” Section of Skagit Region Spring Chinook, Current Hatchery Programs page 17)

STOCK INFORMATION

Broodstock

Broodstock Description
Describe the broodstock as follows: (These may be a repeat of some questions asked under stock status - you may refer to those answers or cut and paste.)
  a. How was the broodstock chosen?
  b. Do you consider it an integrated (goal is to maintain a single gene pool and prevent divergence) or segregated (isolated in the hatchery, managed to restrict gene flow) population?
  c. Does this broodstock have a history of reportable pathogens?
  d. Are you able to collect representative samples each year of the population, with respect to size, age, sex ratio, and run and spawn timing? If not, please explain the limitation.

a. The current fall chinook program at Marblemount began with the 1998 brood. It replaces a Green River stock program eliminated (returning adults collected but not spawned) approximately 7 years ago. The broodstock are now collected entirely from the spawning grounds on the lower Skagit River between RM 32 and 40. Wild origin fish are used primarily but some F1 recruits may be incorporated into the population in the future.
b. The intent of the program is to keep the stock integrated with the wild population. There are no cases of reportable pathogens in this stock.
c. There is no reportable pathogen history for this stock.
d. Adults are netted randomly throughout the spawning season from the normal spawning and holding reaches on the lower Skagit. Fish are sorted to achieve an approximately equal sex ratio. Approximately 80 total adults (40 pairs) are collected for the program.

Broodstock Collection Process
Describe the broodstock collection process, including the following components. Differentiate by Natural Origin Recruit (NOR) and Hatchery Origin Recruit (HOR) if they are collected in a different manner:
  a. Describe/give the location of adult collection relative to the physical plant where fish are held or spawned?

21. Provided by Pete Castle, the GDU Technical Report, Darrell Mills, and Charmane Ashbrook, WDFW
b. Describe how fish are collected (ladder, sorter, trap, in river, etc.)
c. Do you have the ability to handle or sort individual fish? If so, please describe your process.
d. If you transport adults from one site to another, describe method of transport. Have you had problems with mortality from handling because of this?
e. If the fish enter the adult holding structure on their own, describe the process for handling and counting. Include details on how and when you pass fish upstream, and about your ability to do so.
f. In what type of container do you hold these adults? Is it covered? Do you use overhead sprinklers? Do you have a problem with predation?
g. Which water supply is used for this purpose?
h. Are you able to hold these fish within recommended guidelines for temperature, water flow, and density?
i. Do you have adequate security?
j. How do you deal with numbers of fish in excess of your egg take needs? Do you feel you have the tools you need for this?

**Adult Handling**

Please describe how you handle adults:

a. What is the method for choosing and mating your broodstock (include how many adults of each sex are used per mating)?
   i. What are the spawner selection protocols (e.g. random, size, ripeness, wild or hatchery origin?)?
   ii. Record how the gametes are handled (pooling of milt and/or eggs? If so, how?). What is the mating scheme (e.g. 1:1, factorial, multiple pooling?)

b. Do you use anesthesia?
c. Describe the pathogen-sampling regime.
d. Describe mark sampling program, if any.
e. Is there any other biological sampling done on adults?
f. How do you dispose of spawning waste?

---

a. Fall Chinook are collected by net between RM 32 and 40 from adults holding in the lower Skagit River.
b. Sufficient adults are collected by gill net to produce an egg take of approximately 280,000 green eggs. All fish are checked for presence of a cwt and only unclipped/untagged fish are used.
c. Green adults are carried from the river to a tank truck in rubber fish tubes. They are placed in a 1,000 gallon tanker and hauled to Marblemount and held in the same manner as the spring chinook. Ripe males may be spawned live and released. Gametes are shipped to the hatchery on ice.
d. Adults are transported to the tanker truck via fish tubes. The fish handle well with this method.
e. Not Applicable.
f. Same as spring and summer chinook
g. Same as spring and summer chinook.
h. Same as spring and summer chinook.
i. Same as spring and summer chinook.
j. There are no surplus fish collected.
g. How do you dispose of pre-spawning mortalities?

h. How do you dispose of spawned adults?

a. Fish collected by net in the river, held until ripe and randomly selected for spawning. Fish are sorted weekly and ripe fish killed by club. Pairs are mated (one to one mating) randomly without regard to size or age. Each female receives a back-up male after about 1 minute. Each back-up male is also used as a primary male in another mating.

b. Fish are killed with a club prior to spawning.

c. All carcasses are measured, weighed, scale sampled, and a 60 fish viral sample is collected.

d. There are no marked fish collected from the river.

e. See section “c” above.

f. Spawning waste, e.g. blood and sperm are allowed to drain into the creek.

g. Pre and post spawn adults are used for nutrient enhancement.

h. Ditto “g”

**Incubation**

**Green Eggs**

Please describe your method for putting down green eggs:

a. Do you have adequate “clean” and “dirty” areas for handling eggs?

b. Describe your water hardening procedure.

c. Describe your green egg enumeration process.

d. Where are these eggs incubated (What type of incubator, water supply used)?

e. Do you incubate in single-family units? If you had the capacity, would that be desirable?

f. How many eggs per incubation unit?

g. What is the typical flow used?

a. There is adequate separation of the clean and dirty areas of the hatchery.

b. The eggs are moved from the spawning pond into the incubation room as separate gametes where they are fertilized in single family units. After the eggs are fertilized, utilizing a primary and a backup male whenever possible, they are pre-rinsed in iodophor.

c. They are then weight sampled by gram scale and placed in vertical incubators to water-harden in iodophor for one hour.

d. The eggs are incubated, on well water, in single family units (typically ~ 4,500 eggs) in telephone-booth style vertical incubators.

e. See “d” above.

f. See “d” above. Numbers are adjusted at eyeing and 5,000 eggs per tray are put down to hatch.

g. Flows are set at 3.5 gpm and formalin is administered on an e/o day cycle at a 1:600 inflow.

**Eyed Eggs**

Please describe your methods for handling and putting down eyed eggs:

a. How do you monitor egg development? (Temperature units, visual check, fish pathologist check, etc.)
b. Have you had any chronic (or difficult to control) losses of eggs to the eyed stage? If so, please explain.
c. How do you dispose of dead eggs?
d. Do you disinfect eyed eggs prior to putting down to hatch?
e. What type of container do you use for hatching?
f. Do you use any type of substrate?
g. What is your loading density? (eggs per unit)

a. When the eggs develop a strong eye, as determined by visual cues, they are agitated to shock and then are picked in an automatic picker the next day.
b. There has been no unusual, chronic or unexplained egg loss.
c. Dead eggs are used for nutrient enhancement.
d. Eggs are not disinfected prior to hatching.
e. Eggs are hatched in vertical incubators with “Vexar” (trademark) substrate.
f. See “c” above.
g. Eggs are then weighed back into vertical incubators, equipped with substrate, to hatch at a rate of 5,000 eggs per tray. Flows are maintained at 3.5 gpm per stack.

Other Issues

Other incubation questions:
a. Is your water temperature regime similar to that in the natural environment?
b. Are eggs incubated under environmental conditions that tend to maximize individual fitness of fry? (e.g. allow volitional ponding of fry, incubate under environmental conditions that simulate the natural rearing environment)
c. Do you heat or cool your water during incubation? If so, please explain what you do and the purpose of the temperature manipulation.
d. Do you cull eggs during incubation for any purpose? (ELISA results, spawn timing, etc.)
e. Are excess eggs/fry culled randomly when necessary?
f. How do you deal with eggs in excess of your egg take needs?
g. Do fry have the ability to emerge volitionally?
h. If you have to remove fry from rearing units, how do you determine appropriate stage of development (Temperature units, visual check, pathologist check, etc.)?

a. The eggs are incubated and hatched on well water, which does not reflect the varying temperatures and conditions of local surface water.
b. Unknown.
c. Water is not heated or cooled.
d. The eggs are not culled for any reason.
e. Not at all.
f. None exist.
g. Fry are forced ponded when the yolk slit has closed.
h. See “g” above.

Rearing Conditions

a. Explain what type of container this stock is rearing in from first ponding to release (size and types of each kind of rearing unit).
b. What water supply is used for rearing this stock (from first ponding to release)?
c. Are the rearing units covered?
d. Do you attempt to provide any type of “natural rearing” for this stock (cover, substrate, food, etc.)? Please describe.
e. How do you decide which fish to combine in a rearing unit (individual families, results of ELISA, size of fish, etc.)?
f. What do you use for keeping fish within recommended density and/or poundage targets (Flow Index, Density Index, pounds/gallon/minute, etc.)?
g. Are you typically able to stay at or below this guideline? If not, what are your limiting factors?
h. Are fish produced similar to natural fish in size, growth rate, morphology, behavior, physiological status, health, etc.?

a. All fry are forced-ponded when their yolk slit has closed. They are ponded by age group into starter tanks in the hatchery building and eventually into 10 x 100’ raceways outside.
b. In the hatchery the fish are started on well water. Outside they are reared on well water to minimize homing fidelity to the hatchery when they return.
c. The ponds are covered.
d. There is no “natures” environment provided.
e. Fish are started in smaller groups, roughly by age and eventually combined after sizes equal out by feed manipulation.
f. Due to the abundance of water and space, program fish are reared at conservative loadings and densities, as compared to Piper, et. al. Flows and densities are not a limiting factor at Marblemount.
g. See “f” above.
h. These fish are released as small fingerlings in an attempt to mimic the size of natural origin chinook smolts seen at the WDFW screw traps in place at RM 17 in the lower Skagit River.

Fish Health

a. Do you use any prophylactic treatments? If so, describe drug/chemical used, targeted pathogen, life stage treated, and method of delivery.
b. Do you vaccinate this stock? If so, for what pathogen and with what vaccine?
c. Are you able to remove and enumerate mortalities easily? If not, what are your limitations?
d. Is this stock sampled for pathogens at spawning?
e. Do you or your fish health specialist perform any fish health assessments on this stock? If so, what sort and at what frequency?
f. What is your most challenging fish health problem with this stock? If you could, what would you do to resolve the problem?

a. None.
b. No.
c. Yes, via dip nets or vacuum.
d. Yes, via ovarian fluid, kidney and spleen samples.
e. The fish health specialist checks this stock routinely.
f. There are no unusual or serious fish health problems with this stock. See sections 5 and 12 for additional information.

**Marking**

- **a.** Is this stock marked or tagged in any way prior to release? Please describe (numbers, replications, quality control).
- **b.** What is the purpose of this mark or tag?
- **c.** How many years has it been identified in this way?
- **d.** Are there historic marks or tags we should know about?

  a. Skagit River fall chinook are 100% ad-cwt marked. Tag retention is assessed after the fish are clipped and tagged.
  b. Stock index evaluation.
  c. Since the program began with the 1998 brood.
  d. None.

**Release/Transfer**

- **a.** How is time of release decided?
- **b.** How do you measure the size of fish at release (fish per pound, average length, other)?
- **c.** What is the typical size range in millimeters of these fish at release? If you do not know the size range, what is average weight?
- **d.** What other smolt quality monitoring do you perform, if any (fish pathologist checks, on-going research projects, smoltification indicators, etc.)?
- **e.** Are fish released with adequate imprinting to facility or desired stream reach?
- **f.** Describe your on-station release procedure for this stock (volitional vs. forced, time of day, typical date, length of time of release, etc.).
- **g.** If you truck this stock off station, where do they go (acclimation pond, stream plant, transfer to another facility, etc.)?
- **h.** Are you or others able to monitor the fish after they enter the river (snorkeling, smolt trapping downstream, etc.)?
- **i.** Do you have any idea if these fish have interactions with other salmonids in the receiving environment? If so, what do you know?

  a. In order to maximize the value of these program fish as a wild indicator stock, the fish are reared and released at a time and size (~150/lb in May) that approximates their wild counterpart as much as is practical.
  b. The fish are sub-sampled and weighed in fish per pound then weighed by displacement into tank trucks to transfer to the acclimation site.
  c. Approximately 150 fish/pound.
  d. External cues and behavior.
  e. The fish are reared on well water at Mablemount to limit their ability to home back to Marblemount as adults. The fish are transferred via pump and tanker truck off station, to the Baker Trap, on the lower Skagit River, for acclimation and forced release after about 3 days.
  f. See “e” above.
  g. See “e” above.
h. The passage of these fish is monitored at a screw trap in the lower Skagit River. In the future, it may be possible to acclimate these fish at the proposed Grandy Creek Steelhead Acclimation facility, near the Baker site.

i. We do not see interaction.

**Adult Migration**

*Migration of returning adults*

a. *Is the straying of hatchery fish into the wild controlled?*

b. *Is the attraction of wild fish into the hatchery minimized?*

---

a. This program is intended to be a fully integrated program and there is no desire to have adults return to the hatchery.

b. The fish are reared on well water at Mablemount to limit their homing fidelity, of hatchery reared-wild-origin fish, back to Marblemount as adults.
Habitat Rating

Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th></th>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hatchery</td>
<td>Hatchery</td>
<td>Hatchery</td>
<td>Hatchery</td>
</tr>
<tr>
<td>Skagit River Coho</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>Rating (H/M/L)</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

Skagit Coho in the Baker Basin (former Baker stock likely extinct)

<table>
<thead>
<tr>
<th></th>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hatchery</td>
<td>Hatchery</td>
<td>Hatchery</td>
<td>Hatchery</td>
</tr>
<tr>
<td>Skagit Coho in the Baker Basin (former Baker stock likely extinct)</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>Rating (H/M/L)</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

Skagit River Hatchery Coho and Baker River Hatchery Coho

(No Information Provided)

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:

1. **High (H) = Healthy**: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.

2. **Medium (M) = Limiting**: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.

3. **Low (L) = Inadequate**: The target stock is unproductive and the population will go extinct, even without terminal harvest.

22. Provided by Brett Barkdull, WDFW
Habitat Condition/Habitat Improvement/Future Expectations/Additional Information

(Please refer to the Introduction section)
STOCK STATUS

TRENDS

Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.

Skagit River Coho

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td></td>
<td>15000</td>
<td></td>
</tr>
<tr>
<td>1968</td>
<td></td>
<td>21000</td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td></td>
<td>10000</td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td></td>
<td>21000</td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td></td>
<td>14000</td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td></td>
<td>14000</td>
<td></td>
</tr>
<tr>
<td>1973</td>
<td></td>
<td>15000</td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td></td>
<td>31000</td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td></td>
<td>10000</td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td></td>
<td>16000</td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td></td>
<td>94600</td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td></td>
<td>38900</td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td></td>
<td>66100</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td>65200</td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td></td>
<td>49700</td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td></td>
<td>28700</td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td></td>
<td>63600</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td></td>
<td>97600</td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td></td>
<td>64700</td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td></td>
<td>101700</td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td></td>
<td>112000</td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td></td>
<td>64300</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td></td>
<td>64400</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td></td>
<td>30400</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td></td>
<td>27200</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td></td>
<td>19600</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td></td>
<td>39200</td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td></td>
<td>75100</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
<td>41700</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td></td>
<td>23100</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td>21700</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td></td>
<td>69800</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td>25200</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td>58100</td>
<td></td>
</tr>
</tbody>
</table>

23. Information provided by Pete Castle (WDFW), Bob Hayman (SSC) and Charmane Ashbrook (WDFW). GDU and SASSI documents were also used.
# Skagit River Hatchery Coho

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival (Recovery)</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>1130</td>
<td>440</td>
<td>390</td>
</tr>
<tr>
<td>1972</td>
<td>3714</td>
<td>3895</td>
<td>2019</td>
</tr>
<tr>
<td>1973</td>
<td>3499</td>
<td>2793</td>
<td>706</td>
</tr>
<tr>
<td>1974</td>
<td>4718</td>
<td>3498</td>
<td>1220</td>
</tr>
<tr>
<td>1975</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>9859</td>
<td>4833</td>
<td>5026</td>
</tr>
<tr>
<td>1982</td>
<td>5685</td>
<td>4587</td>
<td>1099</td>
</tr>
<tr>
<td>1983</td>
<td>7788</td>
<td>5885</td>
<td>1913</td>
</tr>
<tr>
<td>1984</td>
<td>29593</td>
<td>16200</td>
<td>13353</td>
</tr>
<tr>
<td>1985</td>
<td>4834</td>
<td>3303</td>
<td>1531</td>
</tr>
<tr>
<td>1986</td>
<td>3411</td>
<td>2540</td>
<td>891</td>
</tr>
<tr>
<td>1987</td>
<td>4534</td>
<td>3315</td>
<td>1219</td>
</tr>
<tr>
<td>1988</td>
<td>1243</td>
<td>801</td>
<td>440</td>
</tr>
<tr>
<td>1989</td>
<td>2259</td>
<td>1462</td>
<td>797</td>
</tr>
<tr>
<td>1990</td>
<td>953</td>
<td>477</td>
<td>616</td>
</tr>
<tr>
<td>1991</td>
<td>9578</td>
<td>5032</td>
<td>4546</td>
</tr>
<tr>
<td>1992</td>
<td>594</td>
<td>413</td>
<td>181</td>
</tr>
<tr>
<td>1993</td>
<td>2781</td>
<td>1495</td>
<td>1286</td>
</tr>
<tr>
<td>1994</td>
<td>4829</td>
<td>2046</td>
<td>2783</td>
</tr>
</tbody>
</table>

![Graph showing data](image-url)
### Baker River Hatchery Coho

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival (Recovery)</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>743</td>
<td>395</td>
<td>348</td>
</tr>
<tr>
<td>1972</td>
<td>2853</td>
<td>1638</td>
<td>1215</td>
</tr>
<tr>
<td>1973</td>
<td>2022</td>
<td>1496</td>
<td>526</td>
</tr>
<tr>
<td>1974</td>
<td>2615</td>
<td>1818</td>
<td>797</td>
</tr>
<tr>
<td>1975</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>3993</td>
<td>1989</td>
<td>2004</td>
</tr>
<tr>
<td>1982</td>
<td>4126</td>
<td>2929</td>
<td>1197</td>
</tr>
<tr>
<td>1983</td>
<td>8035</td>
<td>4115</td>
<td>3920</td>
</tr>
<tr>
<td>1984</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>1797</td>
<td>727</td>
<td>1070</td>
</tr>
<tr>
<td>1994</td>
<td>1022</td>
<td>228</td>
<td>794</td>
</tr>
</tbody>
</table>

![Baker River Hatchery Coho Chart]
AGE CLASS STRUCTURE

What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

Age class structure will not change because 99% of coho are three-year olds.

PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION

Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

Biologists estimate a 1% straying rate of hatchery fish.

PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY

For hatchery stocks- what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?

Marblemount and Net Pen Coho Program: 100% Marblemount Hatchery stock of Skagit origin, for basin and net pen programs. This stock was derived primarily from wild Skagit coho collected in Skagit River tributaries in approximately 1946. The stock is now maintained entirely from hatchery-origin returnees to the Marblemount Hatchery.

Baker Lake Net Pen Coho Program: Most likely Skagit River or Marblemount hatchery strays. The original Baker Lake stock is believed to be extinct. Brood stock are randomly selected from the Baker River adult trap, and spawned at the Sulphur Creek hatchery. Emergent fry are released into Lake Shannon or reared at Lake Shannon net pens.

INDEX STOCK

Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.

The coho released from Marblemount Hatchery are an index stock for wild coho. Beginning in 1995 the coho at Marblemount Hatchery became a Double Index Tag (DIT) group.

At Baker Lake Net Pens the fish are mass-marked with an adipose clip. Some of the fish are also freeze branded for mark recapture studies in Baker Lake and Lake Shannon.

Biological Significance

STOCK ORIGIN

Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?

a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or
b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been?)? or
c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or
d. Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? or
e. Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?

A rack was placed across the Cascade River when the hatchery began in 1945. This stock is local. Introductions have been from nearby hatcheries (e.g. Skykomish) when the egg take was short.

**BIOLOGICAL ATTRIBUTES**

Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.?) Use the following questions to guide your answer:

a. Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or
b. Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or
c. Are all known biological attributes shared with other GDUs?

A rack was placed across the Cascade River when the hatchery began in 1945. This stock is local with introductions from nearby hatcheries such as Skykomish when the egg take was short. GDU information does not currently exist for wild Skagit River coho.

**POPULATION SUBDIVISIONS**

How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:

a. How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?
b. What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.
c. What is the total number of stocks within the same GDU as the stock under consideration?
d. What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?

Not applicable for the hatchery coho stocks.

Although wild Skagit River coho are genetically unique from Canadian stocks, we do not know if they are genetically unique from other Puget Sound stocks. Start-up efforts are underway to develop genetic baseline information for Puget Sound coho stocks.
**MANAGEMENT GOALS**

**Harvest and Conservation**

*For each hatchery stock program, is the program goal conservation, harvest or both?*

The program goals for coho are conservation (primarily an index stock) and harvest.

**Harvest**

*Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:*

- **High** – harvest opportunity each year, spread over seasons
- **Medium** – opportunity most years, for some seasons
- **Low** – occasional opportunity, single run
- **0** – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>Opportunity</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conservation**

*What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.*

The goal is to maintain healthy stocks.

**Production**

*For hatchery programs, please summarize the production goals:
*a. How many fish at what size are planned for release? Transferred off-station?*

**Coho: Skagit stock**

*Plant:*
250,000 @ 17fppo into the Cascade River in May/June.
100,000 @ 25fppo into Indian Slough (near La Conner) in February (Skagit System Coop)

*Transfer out:*
30,000 @ 25fppo into Oak Harbor Pen in February
5,000 @ 25fppo into Roche Harbor Pen in February
150,000 @ 25fppo into Fidalgo Net Pen in February (not in 2002, may be discontinued)
12,750 eyed eggs to misc. coops and schools.

---

24. Information provided by Pete Castle (WDFW) and Bob Hayman (SSC). GDU and SASSI documents were also used.
Coho: Minter Creek and Wallace River stocks

Transfer in:
750,000 green eggs from Wallace River
750,000 eyed eggs from Minter Creek

Transfer out:
~750,000 Minter Creek stock fry @ 400/lb to Skookumchuck *
~750,000 Wallace River stock fry @ 400/lb to Skookumchuck *

* Note: in 2002, 500,000 fish will be transferred @ 200/lb to allow clipping at Skookumchuck.

Baker Lake Coho: 100,000 + fed fry released into Lake Shannon (unmarked). 15,000 freeze branded + ad-clipped smolts (15/lb.) are released into the reservoirs. 35,000 ad-clipped smolts (15/lb.) are released into Baker River below dams.

b. Where are eggs taken and incubated? Where are fish reared and released?

Skagit River Coho are spawned and reared at Marblemount. Some are released on station and others are transferred to various marine net pens and the Indian Slough release site.

Wallace River and Minter Creek Coho are shipped in as green eggs (via Wallace) or eyed eggs (via Minter), transferred to and reared at the Skookumchuck Ponds, and transferred to and released from the South Sound Net Pens.

Baker Lake Coho are spawned and reared at Sulphur Creek hatchery, then transferred to Lake Shannon net pens in October and reared until spring release.

c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

The Skagit release program is stable at this time. The South Sound support program is in flux at this time. The coop net pen program is decreasing due to lack of support/interest from the cooperators.

Baker Coho: This program has remained relatively unchanged for the last 10 years. Some adjustments have been made to timing of transfer to net pens and numbers of fish used for mark recapture studies. Broodstock numbers have varied depending on run size.

d. Is the duration of this program clearly defined?

The program(s) duration is defined as ongoing.

Baker Coho: The Program is ongoing and subject to change. Management decisions are made by the Baker River Committee.
Other Goals

Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.

The hatchery coho program is an index stock and supports various school, tribal and net pen projects as well as marine and freshwater sport and commercial harvests. The net pens support an important local recreational fishery. The South Sound Net Pen support program provides early rearing capacity currently not available in the South Sound. These fish provide important sport and commercial harvest opportunity for the tribal and non-tribal fishers. The Squaxin Tribal harvest opportunity, which this program supports, is mandated mitigation.

Baker Lake These coho are utilized for various studies in the Basin. They are used as sockeye surrogates to test the juvenile fish traps within the reservoirs, and remain a valuable source of fish for future studies relating to fish passage issues within the reservoirs.

Monitoring and Evaluation

Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.

Monitoring and evaluation methods include: fish tickets for monitoring catch; spawning surveys; smolt trapping; counting fish at Baker River trap; and estuarine surveys.

Goal Achievement

Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?

Coho are doing all right. We would like to see more adult return so there can be greater harvest.

Conflicts

Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?

Habitat condition prevents goals from being met; biologists recommend removing dikes and adding trees to the upper watershed. Flood control measures hinder creek and estuarine conditions. Forest conservation goals conflict with salmon conservation goals.

Incorporating Adaptive Management

Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?

We cannot easily change our goals when we receive new information. Inertia exists. Further, supporting data in a timely fashion does not drive management. For example, wild coho
spawning information was underestimated from 1986 through 1990, but management changes did not occur until the mid 1990’s.
CURRENT HATCHERY PROGRAMS

Skagit River Hatchery Coho – Marblemount Hatchery and Cooperative Net Pens

FACILITY – MARBLEMOUNT HATCHERY

Description
Describe the property location and ownership. Give the funding and operating organization names, approximate size of the property (acres), number of buildings, any unique attributes of the site worth noting.

Marblemount Hatchery handles coho. This facility has already been discussed in the hatchery spring chinook section. (See “Skagit Hatchery Spring Chinook – Marblemount Hatchery” Section of Skagit Region Spring Chinook, Current Hatchery Programs page 17)

FACILITY – COOPERATIVE NET PENS

Description
Describe the property location and ownership. Give the funding and operating organization names, approximate size of the property (acres), number of buildings, any unique attributes of the site worth noting.

Three privately owned cooperative net pen sites are located at Oak Harbor, Roche Harbor and Fidalgo Bay. Fidalgo Net Pen is not active in 2002 and may be discontinued due to permitting, cooperator staffing and other issues. The rest of the information provided in this section

Primary Goal
What is the primary goal of the facility? (Examples: conservation of Shirley creek summer chum because of degraded habitat, harvest augmentation of Michael River coho salmon primarily for north Puget Sound commercial fisheries, community education)

The goal of the net pens is to provide coho harvest opportunity (primarily sport) in the Puget Sound and areas near the net pens.

Associated Stocks
What stocks of fish are handled and/or reared at this facility?

The cooperative net pens rear Marblemount Hatchery Skagit-origin coho.

Water Supply
Describe the water supply, including the following components:

25. Information provided by Darrell Mills, Steve Stout, and Kevin Karris, WDFW
b. If surface water, is it fish- or specific-pathogen free? Do you experience problems with “dirty water” that limits your ability to reach your goals?
c. Surface water intake structures on station – are they screened or sited in a way that excludes fish or other animals from entering the water supply?
d. If you use surface water, is there adequate water in the by-pass reach throughout the year?
e. Are there unique physical characteristics of the water supply on site or nearby that you feel should be noted?

The pens at Roche Harbor, Fidalgo Bay and Oak Harbor are located in the ambient marine waters of northern Puget Sound.

**Pathogen Combatant Methods and History**

Describe the fish health/pathogen history, including the following components:

a. How often does a fish health professional visit your site?
b. What is the most significant fish health problem at your facility (this could be a fish pathogen, inability to correct a situation, poor water, etc.)?
c. Have you had any significant epizootics on your facility? Please explain. Were you able to isolate the affected containers? Sanitize the effluent?
d. Do you have a history of viral isolations at your facility in the past five years? This excludes epizootics as described above.
e. Do you disinfect equipment between rearing units or banks of ponds? What method do you use?
f. Are you able to keep distinct lots or stocks of fish physically separated? Please answer for each of these life stages – adults, eggs, and juveniles.

a. Fish destined for the net pens are given a pre-transfer health check, but due to limitations in manpower, they are not routinely checked after words unless otherwise needed
b. There are no significant fish health problems.
c. None
d. None
e. No disinfection.
f. Not applicable.

**Pollution Abatement**

Describe the waste removal/pollution abatement system including the following components:

a. What is the general frequency of pond cleaning?
b. How is pond waste disposed of (vacuum, brush, dry and remove, etc.)?
c. Describe pollution abatement pond or settling pond, if one exists.
d. Status of permits for discharging pollutants?
e. Any particular challenges you would like to share on this subject?

a. Except for drying the nets between lots of fish, there are no formal cleaning activities.
b. None
c. None

d. These sites are not covered by NPDES discharge permits.

e. None

**Education**

Please give details regarding the following:

a. Is your facility open to the public?

b. Do you have signs, pamphlets, or other materials for the public to self-tour?

c. Do hatchery staff or others schedule and conduct tours of the facility?

d. Are there citizen involvement opportunities such as volunteer programs, student interns, etc?

e. Are hatchery operations visible to facility visitors?

f. Do other fish and wildlife programs use the facility?

g. Do you have regular involvement with community or school groups?

h. Do you give fish or eggs to educational groups? If so, please estimate the amount of time this activity takes.

---

a. All three sites are located in public marinas and are viewable by the public.

b. None.

c. Other than the cooperators, there are no WDFW staff on duty at these sites.

d. The pens are operated as cooperative efforts by local citizens.

e. Yes

f. No

g. Yes, see d

h. Not Applicable

**General Administration**

a. Does key staff have a good understanding of the facility goals, budget, and expenditures? If not, what tools do you need for correcting this?

b. Is new relevant information from research and other sources made available to hatchery staff and used for attaining goals?

c. As fish culture and other related scientific understanding evolves, are you able to make changes to your programs? If not, what ideas do you have for changing this?

d. Are there state or federal laws that constrain the program, such as numbers and size of smolts produced?

---

a. The staff have a good understanding of the facility and goals with the exception of the budget. All information on new developments and research is shared with the crew as it made available primarily through Olympia, the Regional office staff or the Complex Manager.

b. We believe we are kept abreast of specific and relevant information that we use to attain our goals.

c. Believe so.

d. Program size is set by WDFW biologists in agreement with the Skagit System Coop.
Other Facility Issues

a. What are your predator control methods/facilities (nets, wires, etc)? Do you have unresolved predator problems?
b. Describe how you inventory your fish (frequency, size of weight sample, etc.).
c. How do you keep your inventory and other data? (Hatpro, spreadsheets of your own, agency forms, etc.)
d. How do you decide which food to use (mandatory contract, fish health recommendations, etc.)?
e. How do you store your feed?
f. Does your facility have any habitat improvements on site (wetlands, riparian improvements, etc.)?

---

a. All pens are covered to exclude avian predators.
b. Fish are inventoried volumetrically into tanker trucks prior to shipment to the pens. Loss is subtracted from fish received to calculate the remaining population. Fish are released without being inventoried again.
c. Data is recorded on standardized WDFW forms as well as spreadsheets and forms created at Marblemount.
d. Coho are normally fed a dry diet (Clarks’ Fry or other appropriate feeds). Feed is delivered periodically to the sites and stored unfrozen.

Facility Wish List and Other Comments

a. What is the most-needed piece or pieces of equipment for your facility and why?
b. What capital improvements are most needed at your facility and why?
c. What do you think would be the most valuable use of your facility?
d. Is there anything else that we have not covered that you would like to add?

---

Not applicable for cooperative net pens.

Stock Information

Broodstock

Broodstock Description

Describe the broodstock as follows: (These may be a repeat of some questions asked under stock status - you may refer to those answers or cut and paste.)

a. How was the broodstock chosen?
b. Do you consider it an integrated (goal is to maintain a single gene pool and prevent divergence) or segregated (isolated in the hatchery, managed to restrict gene flow) population?
c. Does this broodstock have a history of reportable pathogens?
d. Are you are able to collect representative samples each year of the population, with respect to size, age, sex ratio, and run and spawn timing? If not, please explain the limitation.
Marblemount Program
a. The Marblemount program is ongoing and has been in existence for 56 years. The broodstock is collected entirely from hatchery origin adults returning to the Marblemount Hatchery.
b. The stock is of local origin and is segregated from the wild population. Only hatchery fish are spawned.
c. There has been one case of a reportable pathogen in this stock—a single IHN-V isolation 10 years ago.
d. The hatchery is able to collect adults from the entire run and incorporate them into the program egg take.

South Sound Net Pen Support Program
a. The South Sound Net Pen support program fish originates with eggs from both Minter Creek and Wallace River hatcheries.
b. Not Applicable
c. No
d. Not Applicable

Broodstock Collection Process
Describe the broodstock collection process, including the following components. Differentiate by Natural Origin Recruit (NOR) and Hatchery Origin Recruit (HOR) if they are collected in a different manner:

a. Describe/give the location of adult collection relative to the physical plant where fish are held or spawned?
b. Describe how fish are collected (ladder, sorter, trap, in river, etc.)
c. Do you have the ability to handle or sort individual fish? If so, please describe your process.
d. If you transport adults from one site to another, describe method of transport. Have you had problems with mortality from handling because of this?
e. If the fish enter the adult holding structure on their own, describe the process for handling and counting. Include details on how and when you pass fish upstream, and about your ability to do so.
f. In what type of container do you hold these adults? Is it covered? Do you use overhead sprinklers? Do you have a problem with predation?
g. Which water supply is used for this purpose?
h. Are you able to hold these fish within recommended guidelines for temperature, water flow, and density?
i. Do you have adequate security?
j. How do you deal with numbers of fish in excess of your egg take needs? Do you feel you have the tools you need for this?

Marblemount Stock:

a. Adult coho are trapped volitionally, from approximately September 1 to December 31st, in the adult trap located at Marblemount Hatchery.
b. The trap is located at the outlet channel of the hatchery and may operate on a mix of all hatchery water sources. Clark Creek water is the predominant attraction water used to improve attraction and trapping.
c. The adults are sorted, by hand, as they collect in the adult trap. All fish are checked for internal tags (wanded) or external clips. Individual fish are not sorted until they are ready to spawn. At this time the fish are dipped a few at a time for sorting by hand. Ripe fish are then killed with a club. Fish identified as “wild” are transported back to the Cascade River via garbage can (few fish) or fish tanker with an adult dump gate. Several hundred wild-origin adults are trapped and transported every year. The pond is not well equipped with a power crowder and the handling-sorting process is extremely labor intensive.

d. Not Applicable

e. See section “c” above.

f. The adults are held and spawned directly in the trapping pond.

g. Clark Creek water is the predominant attraction water used to improve attraction and trapping.

h. Unknown.

i. The adults are vulnerable to poaching at any time and we have experienced losses in the past.

j. Excess adults are surplused as they return to the hatchery and are distributed through various outlets including food banks, contract vendors, nutrient enhancement and the tribes. We endeavor to keep spawners that are proportionately representative of the entire run but this is difficult as the fish are all kept in one pond, the trap pond, prior to spawning. Excess adults are surplused as they return to the hatchery.

Note: The above questions do not apply to the South Sound Net Pen coho support program.

Adult Handling

Please describe how you handle adults:

a. What is the method for choosing and mating your broodstock (include how many adults of each sex are used per mating)?
   i. What are the spawner selection protocols (e.g. random, size, ripeness, wild or hatchery origin?)?
   ii. Record how the gametes are handled (pooling of milt and/or eggs? If so, how?). What is the mating scheme (e.g. 1:1, factorial, multiple pooling?)

b. Do you use anesthesia?

c. Describe the pathogen-sampling regime.

d. Describe mark sampling program, if any.

e. Is there any other biological sampling done on adults?

f. How do you dispose of spawning waste?

g. How do you dispose of pre-spawning mortalities?

h. How do you dispose of spawned adults?

Marblemount Stock:

a. All returning adults are trapped, held and spawned from the adult trap pond. Spawners are selected, at random, from the general population as they ripen and it is not possible to segregate fish by return timing. Only HORs are used. Fish are spawned in 5 fish pools. All NORs are set aside and then returned to the Cascade River via garbage can or fish tanker. There is no direct return line to the river. Several hundred “wild” coho return to the hatchery.

b. No anesthesia is used.

c. Viral samples are collected from 60 fish over the season.
d. All carcasses are mark sampled and heads recovered for tag dissection. As this is an index stock, all fish are wanded also.

e. No.

f. Blood and sperm are washed down the drain at the site.

g. Nutrient enhancement.

h. Spawned carcasses are used for nutrient enhancement. Surplus fish are used for nutrient enhancement, food banks or are sold to the contract buyer.

Note: The above questions do not apply to the South Sound Net Pen coho support program.

**Incubation**

**Green Eggs**

Please describe your method for putting down green eggs:

a. Do you have adequate “clean” and “dirty” areas for handling eggs?

b. Describe your water hardening procedure.

c. Describe your green egg enumeration process.

d. Where are these eggs incubated (What type of incubator, water supply used)?

e. Do you incubate in single-family units? If you had the capacity, would that be desirable?

f. How many eggs per incubation unit?

g. What is the typical flow used?

Marblemount Stock: Similar to chinook except eggs are incubated in pooled lots at about 8,000 eggs per tray. There is no particular benefit to incubation in single family units.

Minter Creek Hatchery Stock: N.A.: Received as eyed eggs from Minter Creek.

Wallace River Hatchery Stock: Same as Marblemount stock coho.

**Eyed Eggs**

Please describe your methods for handling and putting down eyed eggs:

a. How do you monitor egg development? (Temperature units, visual check, fish pathologist check, etc.)

b. Have you had any chronic (or difficult to control) losses of eggs to the eyed stage? If so, please explain.

c. How do you dispose of dead eggs?

d. Do you disinfect eyed eggs prior to putting down to hatch?

e. What type of container do you use for hatching?

f. Do you use any type of substrate?

g. What is your loading density? (eggs per unit)

Marblemount Stock: Similar to chinook. Eggs are culled so that fish may be kept that represent the normal run timing of the returning adults as much as possible.
**Minter Creek Hatchery Stock:** Same as Marblemount coho except no eggs are culled. When the eggs are received from Minter Creek they are disinfected for 15 minutes in 1:100 iodophor prior to being placed in the incubators.

**Wallace River Hatchery Stock:** Same as Marblemount coho except no eggs are culled.

**Other Issues**

**Other incubation questions:**

- a. Is your water temperature regime similar to that in the natural environment?
- b. Are eggs incubated under environmental conditions that tend to maximize individual fitness of fry? (e.g. allow volitional ponding of fry, incubate under environmental conditions that simulate the natural rearing environment)
- c. Do you heat or cool your water during incubation? If so, please explain what you do and the purpose of the temperature manipulation.
- d. Do you cull eggs during incubation for any purpose? (ELISA results, spawn timing, etc.)
- e. Are excess eggs/fry culled randomly when necessary?
- f. How do you deal with eggs in excess of your egg take needs?
- g. Do fry have the ability to emerge volitionally?
- h. If you have to remove fry from rearing units, how do you determine appropriate stage of development (Temperature units, visual check, pathologist check, etc.)?

**Marblemount Stock:** Same as fall and summer chinook.

**Minter/Wallace Stock:** Same as fall and summer chinook.

**Rearing Conditions**

- a. Explain what type of container this stock is rearing in from first ponding to release (size and types of each kind of rearing unit).
- b. What water supply is used for rearing this stock (from first ponding to release)?
- c. Are the rearing units covered?
- d. Do you attempt to provide any type of “natural rearing” for this stock (cover, substrate, food, etc.)? Please describe.
- e. How do you decide which fish to combine in a rearing unit (individual families, results of ELISA, size of fish, etc.)?
- f. What do you use for keeping fish within recommended density and/or poundage targets (Flow Index, Density Index, pounds/gallon/minute, etc.)?
- g. Are you typically able to stay at or below this guideline? If not, what are your limiting factors?
- h. Are fish produced similar to natural fish in size, growth rate, morphology, behavior physiological status, health, etc.?

**Marblemount Stock:**

- a. All fry are forced-ponded at Marblemount when their yolk slit has closed. They are ponded by age group into either starter tanks in the hatchery building or into 10 x 100’ raceways outside.
b. In the hatchery the fish are started on well water. Outside they are started on Clark Creek water.
c. All exterior ponds are covered.
d. There are no “natures” rearing fixtures in the ponds.
e. Fish are combined by relative age at first and eventually combined for final rearing.
f. Due to the abundance of water and space all program coho are reared at conservative loadings and densities, as compared to Piper, et. al. Flows and densities are not a limiting factor at Marblemount.
g. See section “f” above.
h. The coho yearlings and fingerlings are larger and do not mimic the size of natural coho as seen at the WDFW traps in place at RM 17 in the lower Skagit River.

**Minter/Wallace Stock:** Fish for South Sound support are reared the same as the Marblemount fish with the exception of question 16. “h” above.

**Coop Net Pens Coho Stock:** The coho are reared in woven nylon nets in ambient marine waters. As a routine, these fish are not inoculated for vibrio during shipment and they have few disease problems in the net pens.

**Fish Health**

a. Do you use any prophylactic treatments? If so, describe drug/chemical used, targeted pathogen, life stage treated, and method of delivery.
b. Do you vaccinate this stock? If so, for what pathogen and with what vaccine?
c. Are you able to remove and enumerate mortalities easily? If not, what are your limitations?
d. Is this stock sampled for pathogens at spawning?
e. Do you or your fish health specialist perform any fish health assessments on this stock? If so, what sort and at what frequency?
f. What is your most challenging fish health problem with this stock? If you could, what would you do to resolve the problem?

**Marblemount Stock:**

a. None.
b. No.
c. Yes, at the hatchery. At the net pens mortality can be difficult to collect and enumerate due to net depth and water clarity.
d. Yes, at all egg-take sites.
e. The fish health specialist checks the fish several times per month, more often if needed. This stock can experience cold-temp disease during early rearing and low levels of BKD as they approach yearling size. All fish are given a fish health check prior to shipment but, due to limited manpower, the marine net pen fish are not routinely checked after they are shipped unless specific health issues arise.

**Marking**

a. Is this stock marked or tagged in any way prior to release? Please describe (numbers, replications, quality control).
b. What is the purpose of this mark or tag?
c. How many years has it been identified in this way?
d. **Are there historic marks or tags we should know about?**

### Marblemount Stock:

- **a.** The Marblemount release group is a double-index group and 100% of the fish are clipped and/or wire tagged. The local net pen fish are now mass-marked. The South Sound Net Pen support coho fish are not clipped prior to shipment to Skookumchuck.
- **b.** Double index and harvest opportunity.
- **c.** The Marblemount coho have been an index for over 20 years. The net pen fish have all been mass-marked since 1993. Oak Harbor was ad-cwt’d in 1990, ‘96 and ‘97. Roche Harbor coho were ad-cwt’d in 1989, ’90 and ’91.
- **d.** Unknown.

### Release/Transfer

- **a.** How is time of release decided?
- **b.** How do you measure the size of fish at release (fish per pound, average length, other)?
- **c.** What is the typical size range in millimeters of these fish at release? If you do not know the size range, what is average weight?
- **d.** What other smolt quality monitoring do you perform, if any (fish pathologist checks, on-going research projects, smoltification indicators, etc.)?
- **e.** Are fish released with adequate imprinting to facility or desired stream reach?
- **f.** Describe your on-station release procedure for this stock (volitional vs. forced, time of day, typical date, length of time of release, etc.).
- **g.** If you truck this stock off station, where do they go (acclimation pond, stream plant, transfer to another facility, etc.)?
- **h.** Are you or others able to monitor the fish after they enter the river (snorkeling, smolt trapping downstream, etc.)?
- **i.** Do you have any idea if these fish have interactions with other salmonids in the receiving environment? If so, what do you know?

### Marblemount Stock:

- **a.** The on-site Marblemount released coho are liberated as yearlings after the steelhead have been released in order to allow imprinting the coho onto Clark Creek water (which is also used for steelhead imprinting). See question “e” below.
- **b.** The fish are weighed in fish per pound.
- **c.** The length is not typically collected. On-station releases are about 17 fish/pound. Indian Slough releases are about 25 fish/pound. Net pen releases are about 12 fish/pound.
- **d.** Visual cues and behavior are used to assess smoltification. Indian Slough coho are not well smolted but seem to tolerate sea water well (as determined by harvest success of returning fish).
- **e.** We endeavor to improve imprinting on the hatchery site.
- **f.** Prior to release, the coho to be taken off of Cascade River water and put on Clark Creek water for final imprinting and acclimation purposes. Prior to the switch, much of the Clark Creek water is used for imprinting on the steelhead and chinook program fish. The coho are reared on Clark Creek water for several weeks prior to release and are released volitionally through automatic counters purchased by the HSRG. The fish reared in the net pens are forced released in May at 12 fish/pound. The fish are sufficiently imprinted on the release sites that they afford a localized recreational opportunity at the sites.
g. The fish released at Indian Slough are trucked to Indian Slough Bridge, at tide water on Padilla Bay and directly released with no imprinting. They are sufficiently imprinted on the release site to afford a localized tribal harvest opportunity.

h. The passage of these fish is monitored at a screw trap in the lower Skagit River.

i. Unknown.

**Minter/Wallace Stock:** These fish are shipped to Skookumchuck at ~ 400/lb. in 1,600 to 2,000 gallon tankers at a rate of .3 lbs of fish/gallon of tank capacity.

**Adult Migration**

**Migration of returning adults**

a. *Is the straying of hatchery fish into the wild controlled?*

b. *Is the attraction of wild fish into the hatchery minimized?*

**Marblemount Stock:**

a. At Marblemount Hatchery there is no physical way to bar returning adults from passing the hatchery trap outfall channel and continuing upstream. At the net pens there is no mechanism to limit straying into other watersheds. Targeted harvests reduce the number of fish likely to stray

b. To improve imprinting and homing fidelity, all pre-migrants are reared on Clark Creek water as much as possible. All wild coho are returned to the Cascade River to spawn naturally.
Baker River Hatchery Coho – Baker Lake Hatchery

**Facility – Baker Lake Net Pens and PSE Facility**

**Description**
Describe the property location and ownership. Give the funding and operating organization names, approximate size of the property (acres), number of buildings, any unique attributes of the site worth noting.

Baker Coho. Net pens are located within the forebay of Lower Baker Dam in Lake Shannon. They consist of 10 floating pen frames and a floating storage building. They are accessed by boat. The Sulphur creek hatchery is located adjacent to the sockeye spawning beach #4 below the Upper Baker Dam along Sulphur Creek. It is on Private land (Puget Sound Energy) in a gated compound. The hatchery has an asphalt lined rearing pond (100 x 30 x 5), 3 raceways, 5 circulars, 2 fry raceway troughs, and several outbuildings. Water source is a spring fed through a head box and underground pipes. Water temps remain relatively constant at 45-49 degrees F. Spring may have surface water continuity (unknown), but remains pathogen free.

**Primary Goal**
What is the primary goal of the facility? (Examples: conservation of Shirley creek summer chum because of degraded habitat, harvest augmentation of Michael River coho salmon primarily for north Puget Sound commercial fisheries, community education)

The Baker Coho program was initiated as a supplementation program with secondary benefit of providing smolts for fish passage studies (surrogates for sockeye smolts).

**Associated Stocks**
What stocks of fish are handled and/or reared at this facility?

Baker River Coho

**Water Supply**
Describe the water supply, including the following components:


b. If surface water, is it fish- or specific-pathogen free? Do you experience problems with “dirty water” that limits your ability to reach your goals?

c. Surface water intake structures on station – are they screened or sited in a way that excludes fish or other animals from entering the water supply?

d. If you use surface water, is there adequate water in the by-pass reach throughout the year?

e. Are there unique physical characteristics of the water supply on site or nearby that you feel should be noted?
a. Sulphur Creek Hatchery is supplied by a spring. Water flow is stable and not a limiting factor for rearing fish. Temperature is relatively constant ranging from 46-49 degrees F. Water is gravity transport only. The net pens are in the forebay of lake Shannon. Water temperatures fluctuate throughout the year, however the fish are not reared there during the warm summer months.
b. The spring appears to be pathogen free, but has not been verified. The domestic tunnel spring, a backup water source adjacent to the Sulphur spring, has been periodically tested and is pathogen free. Some sand intrusion is evident due to an unstable hillside above the intake.
c. Yes
d. N/A
e. N/A

Pathogen Combatant Methods and History

Describe the fish health/pathogen history, including the following components:

a. How often does a fish health professional visit your site?
b. What is the most significant fish health problem at your facility (this could be a fish pathogen, inability to correct a situation, poor water, etc.)?
c. Have you had any significant epizootics on your facility? Please explain. Were you able to isolate the affected containers? Sanitize the effluent?
d. Do you have a history of viral isolations at your facility in the past five years? This excludes epizootics as described above.
e. Do you disinfect equipment between rearing units or banks of ponds? What method do you use?
f. Are you able to keep distinct lots or stocks of fish physically separated? Please answer for each of these life stages – adults, eggs, and juveniles.

a. A WDFW pathologist is available any time and visits frequently to check fish.
b. Limited fish health issues. Occasional treatments for external parasites (usually in rainbow trout received from Arlington hatchery) We have been injecting coho brood stock with Gallimycin to prevent Bacterial Kidney Disease.
c. No
d. Yes. We rear Sockeye on station and protect other fish species from potential IHNV infection
e. All rearing facilities are disinfected with iodophore before use. All brushes and nets are isolated to each pond or raceway.
f. Yes. All stocks remain isolated, and all efforts are made to avoid cross contamination.

Pollution Abatement

Describe the waste removal/pollution abatement system including the following components:

a. What is the general frequency of pond cleaning?
b. How is pond waste disposed of (vacuum, brush, dry and remove, etc.)?
c. Describe pollution abatement pond or settling pond, if one exists.
d. Status of permits for discharging pollutants?
e. Any particular challenges you would like to share on this subject?

a. Daily brushing in raceways to weekly brushing in trout pond.
b. Both vacuum and brush.
c. None
d. None
e. No

Education

Please give details regarding the following:

a. Is your facility open to the public?
b. Do you have signs, pamphlets, or other materials for the public to self-tour?
c. Do hatchery staff or others schedule and conduct tours of the facility?
d. Are there citizen involvement opportunities such as volunteer programs, student interns, etc?
e. Are hatchery operations visible to facility visitors?
f. Do other fish and wildlife programs use the facility?
g. Do you have regular involvement with community or school groups?
h. Do you give fish or eggs to educational groups? If so, please estimate the amount of time this activity takes.

a. No. Only to invited visitors
b. No.
c. Yes.
d. No.
e. Net pens can be viewed from shore. Other facilities are within gated compound.
f. Yes. All our programs are Cooperative efforts with other agencies.
g. Yes. Trout are made available for charity fund raising events.
h. No, but see comment above.

General Administration

a. Does key staff have a good understanding of the facility goals, budget, and expenditures? If not, what tools do you need for correcting this?
b. Is new relevant information from research and other sources made available to hatchery staff and used for attaining goals?
c. As fish culture and other related scientific understanding evolves, are you able to make changes to your programs? If not, what ideas do you have for changing this?
d. Are there state or federal laws that constrain the program, such as numbers and size of smolts produced?

a. Yes.
b. Yes. Staff attends various fish related conferences and workshops.
c. Yes.
d. Yes. Our whole program is scrutinized by several agencies within the Baker River Committee.

Other Facility Issues

a. What are your predator control methods/facilities (nets, wires, etc)? Do you have unresolved predator problems?
b. Describe how you inventory your fish (frequency, size of weight sample, etc).
c. How do you keep your inventory and other data? (Hatpro, spreadsheets of your own, agency forms, etc.)
d. How do you decide which food to use (mandatory contract, fish health recommendations, etc.)?
e. How do you store your feed?
f. Does your facility have any habitat improvements on site (wetlands, riparian improvements, etc.)?

a. Bird netting screens on all facilities. Secured from mammal intrusions also. (exception: trout pond is not completely secure from birds or mammals, however there does not seem to be significant loss from predators.
b. Weights are taken bi-monthly.
c. Monthly forms and electronic spreadsheets.
d. Fish health recommendations
e. Dry trout feed stored in warehouse. Semi moist feed kept in freezers.
f. N/A

**Facility Wish List and Other Comments**

a. What is the most-needed piece or pieces of equipment for your facility and why?
b. What capital improvements are most needed at your facility and why?
c. What do you think would be the most valuable use of your facility?
d. Is there anything else that we have not covered that you would like to add?

None

**Stock Information**

**Broodstock**

**Broodstock Description**

Describe the broodstock as follows: (These may be a repeat of some questions asked under stock status - you may refer to those answers or cut and paste.)

a. How was the broodstock chosen?
b. Do you consider it an integrated (goal is to maintain a single gene pool and prevent divergence) or segregated (isolated in the hatchery, managed to restrict gene flow) population?
c. Does this broodstock have a history of reportable pathogens?
d. Are you able to collect representative samples each year of the population, with respect to size, age, sex ratio, and run and spawn timing? If not, please explain the limitation.

Baker Coho:
Broodstock are taken from entries into adult trap on Baker R. We try to keep program integrated as much as possible. BKD has been found in Coho in the past. Fish are selected randomly over the full run.
Broodstock Collection Process

Describe the broodstock collection process, including the following components. Differentiate by Natural Origin Recruit (NOR) and Hatchery Origin Recruit (HOR) if they are collected in a different manner:

a. Describe/give the location of adult collection relative to the physical plant where fish are held or spawned?

b. Describe how fish are collected (ladder, sorter, trap, in river, etc.)

c. Do you have the ability to handle or sort individual fish? If so, please describe your process.

d. If you transport adults from one site to another, describe method of transport. Have you had problems with mortality from handling because of this?

e. If the fish enter the adult holding structure on their own, describe the process for handling and counting. Include details on how and when you pass fish upstream, and about your ability to do so.

f. In what type of container do you hold these adults? Is it covered? Do you use overhead sprinklers? Do you have a problem with predation?

g. Which water supply is used for this purpose?

h. Are you able to hold these fish within recommended guidelines for temperature, water flow, and density?

i. Do you have adequate security?

j. How do you deal with numbers of fish in excess of your egg take needs? Do you feel you have the tools you need for this?

Baker Coho: Refer to answer given for Baker River Sockeye.

Adult Handling

Please describe how you handle adults:

a. What is the method for choosing and mating your broodstock (include how many adults of each sex are used per mating)?
   i. What are the spawner selection protocols (e.g. random, size, ripeness, wild or hatchery origin)?
   ii. Record how the gametes are handled (pooling of milt and/or eggs? If so, how?). What is the mating scheme (e.g. 1:1, factorial, multiple pooling?)

b. Do you use anesthesia?

c. Describe the pathogen-sampling regime.

d. Describe mark sampling program, if any.

e. Is there any other biological sampling done on adults?

f. How do you dispose of spawning waste?

g. How do you dispose of pre-spawning mortalities?

h. How do you dispose of spawned adults?

a. Fish are all checked weekly for ripeness. Ovarian fluid drained off, eggs weighed. Male milt individually collected into dixie cups. Spawned at a 1 to 1 ratio of males to females with a delayed (15 second) back up male. Each females eggs are water hardened in individual buckets for one hour and then transferred to incubation trays within a raceway.

b. Fish are killed and spawned.

c. Kidney, spleen and ovarian fluid virology sampling
d. These fish are no longer coded wire tagged. Scales are taken. Lengths also.
e. None
f. Buried.
g. Placed into Baker Lake tributary streams for nutrient enhancement
h. Placed into Baker Lake tributary streams for nutrient enhancement

**Incubation**

**Green Eggs**

Please describe your method for putting down green eggs:

- Do you have adequate “clean” and “dirty” areas for handling eggs?
- Describe your water hardening procedure.
- Describe your green egg enumeration process.
- Where are these eggs incubated (What type of incubator, water supply used)?
- Do you incubate in single-family units? If you had the capacity, would that be desirable?
- How many eggs per incubation unit?
- What is the typical flow used?

**Baker Coho:** Fish are all checked weekly for ripeness. Ovarian fluid drained off, eggs weighed. Male milt individually collected into dixie cups. Spawned at a 1 to 1 ratio of males to females with a delayed (15 second) back up male. Each females eggs are water hardened in individual buckets within iodophore solution for one hour and then transferred to incubation trays within a raceway. 2 to 3 females eggs are placed on each tray.

**Eyed Eggs**

Please describe your methods for handling and putting down eyed eggs:

- How do you monitor egg development? (Temperature units, visual check, fish pathologist check, etc.)
- Have you had any chronic (or difficult to control) losses of eggs to the eyed stage? If so, please explain.
- How do you dispose of dead eggs?
- Do you disinfect eyed eggs prior to putting down to hatch?
- What type of container do you use for hatching?
- Do you use any type of substrate?
- What is your loading density? (eggs per unit)

**Baker Coho:** Eggs are monitored visually and compared with temperature units. We have had some difficulty with blanks. We don’t know at this time if they did not fertilize or died early in development. Procedures have been scrutinized by various agencies with limited success. We may be using vertical stacks next year to eliminate possible problems associated with raceway incubators. Dead eggs are buried. We do not disinfect eyed eggs. Hatched fish (alevins) move off the trays and seek sanctuary beneath plastic biosaddle substrate. Swim up fry move over a barrier wall and enter the rearing chamber for feeding.
Other Issues

Other incubation questions:

a. Is your water temperature regime similar to that in the natural environment?
b. Are eggs incubated under environmental conditions that tend to maximize individual fitness of fry? (e.g. allow volitional ponding of fry, incubate under environmental conditions that simulate the natural rearing environment)
c. Do you heat or cool your water during incubation? If so, please explain what you do and the purpose of the temperature manipulation.
d. Do you cull eggs during incubation for any purpose? (ELISA results, spawn timing, etc.)
e. Are excess eggs/fry culled randomly when necessary?
f. How do you deal with eggs in excess of your egg take needs?
g. Do fry have the ability to emerge volitionally?
h. If you have to remove fry from rearing units, how do you determine appropriate stage of development (Temperature units, visual check, pathologist check, etc.)?

a. Yes.
b. Yes. See above
c. No
d. No
e. No
f. We collect brood stock appropriate for our take needs.
g. Yes. See above
h. Fry swim up and feed volitionally, therefore no sorting is necessary.

Rearing Conditions

a. Explain what type of container this stock is rearing in from first ponding to release (size and types of each kind of rearing unit).
b. What water supply is used for rearing this stock (from first ponding to release)?
c. Are the rearing units covered?
d. Do you attempt to provide any type of “natural rearing” for this stock (cover, substrate, food, etc.)? Please describe.
e. How do you decide which fish to combine in a rearing unit (individual families, results of ELISA, size of fish, etc.)?
f. What do you use for keeping fish within recommended density and/or poundage targets (Flow Index, Density Index, pounds/gallon/minute, etc.)?
g. Are you typically able to stay at or below this guideline? If not, what are your limiting factors?
h. Are fish produced similar to natural fish in size, growth rate, morphology, behavior physiological status, health, etc.?

a. Fry are reared in a confined section of the large (8 x 3 x 100) raceway. Sections are opened as fish size increases. In the fall the coho are transferred to net pen (12 x 10 x 16) nets to over-winter and released in the spring.
b. Sulphur springs at Sulphur Creek Hatchery. Ambient lake water at the net pens.
c. Covered with bird netting
d. No
c. All the same  
f. Density index.  
g. We have plenty of space so fish are kept at low densities  
h. No. They tend to be larger than wild coho emigrating from the lake.

**Fish Health**

a. Do you use any prophylactic treatments? If so, describe drug/chemical used, targeted pathogen, life stage treated, and method of delivery.  
b. Do you vaccinate this stock? If so, for what pathogen and with what vaccine?  
c. Are you able to remove and enumerate mortalities easily? If not, what are your limitations?  
d. Is this stock sampled for pathogens at spawning?  
e. Do you or your fish health specialist perform any fish health assessments on this stock? If so, what sort and at what frequency?  
f. What is your most challenging fish health problem with this stock? If you could, what would you do to resolve the problem?

---

**Marking**

a. Is this stock marked or tagged in any way prior to release? Please describe (numbers, replications, quality control).  
b. What is the purpose of this mark or tag?  
c. How many years has it been identified in this way?  
d. Are there historic marks or tags we should know about?

---

a. Coho brood stock females are given prophylactic treatments of Gallimycin at the adult trap before entering the holding area to prevent BKD.  
b. No  
c. Yes  
d. Yes. Kidney spleen and ovarian fluid for various tests including BKD.  
e. See above  
f. BKD. We have not seen a recent outbreak so everything seems to be working.

---

a. Early released fry to Lake Shannon are not marked. All retained fish are ad-clipped and may be freeze branded. Currently 60k fish are retained and clipped. Of those fish, two groups of 5k are freeze branded for Baker lake fish passage evaluation and one group of 5 K are branded for Lake Shannon fish passage evaluation for a total of 15k freeze branded fish. More fish may be needed in future years for additional mark recapture studies relating to re-licensing issues.  
b. See above  
c. Has been ongoing for 10 years  
d. Yes. In 2001 16 individual brand groups were marked for a specific fish passage study. More fish may be needed in future years for additional mark recapture studies relating to re-licensing issues.
Release/Transfer

a. How is time of release decided?
b. How do you measure the size of fish at release (fish per pound, average length, other)?
c. What is the typical size range in millimeters of these fish at release? If you do not know the size range, what is average weight?
d. What other smolt quality monitoring do you perform, if any (fish pathologist checks, on-going research projects, smoltification indicators, etc.)?
e. Are fish released with adequate imprinting to facility or desired stream reach?
f. Describe your on-station release procedure for this stock (volitional vs. forced, time of day, typical date, length of time of release, etc.).
g. If you truck this stock off station, where do they go (acclimation pond, stream plant, transfer to another facility, etc.)?
h. Are you or others able to monitor the fish after they enter the river (snorkeling, smolt trapping downstream, etc.)?
i. Do you have any idea if these fish have interactions with other salmonids in the receiving environment? If so, what do you know?

a. Set at fixed dates determined by BRCM. April 15 for freeze brand study groups, June 15 for Skagit River releases.
b. Fish per pound
c. Lengths are not usually taken. They average 15 fish/lb at release.
d. Observation
e. Yes. All fish have an opportunity to imprint on Baker water.
f. Net pen fish are trucked and released at the confluence of Baker R. and Skagit R. Study fish are trucked and released into Lake Shannon or Baker Lake depending on study design.
g. N/A
h. Yes. Fish may be intercepted at a smolt trap stationed within the Skagit R. near Mount Vernon.
i. No.

Adult Migration

Migration of returning adults

a. Is the straying of hatchery fish into the wild controlled?
b. Is the attraction of wild fish into the hatchery minimized?

a. Juvenile fed fry in excess of our program needs are released into Lake Shannon to rear. There are no Adult coho placed into lake Shannon to spawn so the impact to wild coho are minimal. We have no control over straying of adult hatchery coho that are returning to the Baker adult trap.
b. All adult coho that enter the Baker trap are considered baker fish and placed into the lake or used for our broodstock. No effort is made to select only ad-clipped coho for broodstock (Procedure is random selection from all Baker trap Coho.)
HABITAT STATUS\textsuperscript{26}

Habitat Rating

Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th></th>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hatchery</td>
<td>Wild</td>
<td>Hatchery</td>
<td>Hatchery</td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>M—½ H and ½ L</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:

1. **High (H)** = Healthy: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.
2. **Medium (M)** = Limiting: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.
3. **Low (L)** = Inadequate: The target stock is unproductive and the population will go extinct, even without terminal harvest.

Habitat Condition/Habitat Improvement/Future Expectations/Additional Information

(Please refer to the Introduction section)
Stock Status

Trends

Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td></td>
<td>100000</td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td></td>
<td>100000</td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td></td>
<td>300000</td>
<td></td>
</tr>
<tr>
<td>1973</td>
<td></td>
<td>250000</td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td></td>
<td>100000</td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td></td>
<td>500000</td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td></td>
<td>300000</td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td></td>
<td>100000</td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td></td>
<td>470000</td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td></td>
<td>710000</td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td></td>
<td>590000</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td></td>
<td>400000</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td></td>
<td>350000</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td></td>
<td>530000</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
<td>857000</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td>600000</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td>320000</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td>894061</td>
<td></td>
</tr>
</tbody>
</table>

Information supplied by Don Hendrick (WDFW), Pete Castle (WDFW), and Bob Hayman (SSC)
**AGE CLASS STRUCTURE**

What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

This is an odd year stock.

**PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION**

Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

No hatchery origin fish are planted in the Skagit River.

**PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY**

For hatchery stocks- what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?

No hatchery origin fish planted in the Skagit River.

**INDEX STOCK**

Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.

Not Applicable

**Biological Significance**

**STOCK ORIGIN**

Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?

a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or

b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been)? or

c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or

d. Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? or

e. Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?

There have been little or no out of basin introductions
**BIOLOGICAL ATTRIBUTES**

*Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.?) Use the following questions to guide your answer:*

  a. Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or
  b. Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or
  c. Are all known biological attributes shared with other GDUs?

No change in biological attributes has been observed. The Skagit River pink stock belongs to the Puget Sound/Lower Fraser River GDU. Timing, adult size, habitat characteristics, and rate of maturation are shared with other pink salmon GDUs.

The Skagit, Stillaguamish, and Snohomish rivers enter interconnected marine waterways that provide an opportunity for returning pink salmon to access any of the three river systems. Adult pink salmon enter the Skagit, Stillaguamish, Snohomish, Puyallup, Nisqually, and Dungeness (fall stock) rivers and Hood Canal, primarily between late July and early October, with the peak coming in late August. Spawning may begin in late August in some headwater areas, but occurs during September and October in most mainstem areas, peaking in early October. The return time of adults is typical fall-run pink salmon timing and the adult size is considered large (greater than 40cm POH length). This stock migrates a considerable distance upstream and spawns extensively on mainstem riffles and in tributary streams.

**POPULATION SUBDIVISIONS**

*How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:*

  a. How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?
  b. What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.
  c. What is the total number of stocks within the same GDU as the stock under consideration?
  d. What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?

Skagit River Pinks are listed in SASSI as one stock, although originally two were proposed, upper Sauk and Suiattle, because of different habitat and spawn timing.
Management Goals

Harvest and Conservation

For each hatchery stock program, is the program goal conservation, harvest or both?

Not applicable.

Harvest

Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:

High – harvest opportunity each year, spread over seasons
Medium – opportunity most years, for some seasons
Low – occasional opportunity, single run
0 – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>Opportunity</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conservation

What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.

The goal is to maintain healthy stocks.

Production

For hatchery programs, please summarize the production goals:

a. How many fish at what size are planned for release? Transferred off-station?

Not applicable

b. Where are eggs taken and incubated? Where are fish reared and released?

Not applicable

c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

Not applicable

28. Information supplied by Don Hendrick (WDFW), Pete Castle (WDFW), and Bob Hayman (SSC)
d. Is the duration of this program clearly defined?

Not applicable

Other Goals

Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.

None mentioned.

Monitoring and Evaluation

Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.

Monitoring and evaluation methods include: spawning surveys; smolt trapping; counting fish at Baker River trap; and estuarine surveys.

Goal Achievement

Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?

Yes, the current goals are being achieved.

Conflicts

Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?

Habitat condition prevents goals from being met; recommend removing dikes and adding trees to the upper watershed. Flood control measures hinder creek and estuarine conditions. Forest conservation goals are in conflict with salmon conservation goals.

Incorporating Adaptive Management

Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?

We cannot easily change our goals when we receive new information. Inertia exists. Further, supporting data in a timely fashion does not drive management.
Habitat Status

Habitat Rating

Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th></th>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hatchery</td>
<td>Wild</td>
<td>Hatchery</td>
<td>Wild</td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>M—½ H and ½ L</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:
1. **High (H) = Healthy**: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.
2. **Medium (M) = Limiting**: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.
3. **Low (L) = Inadequate**: The target stock is unproductive and the population will go extinct, even without terminal harvest.

Habitat Condition/Habitat Improvement/Future Expectations/Additional Information

(Please refer to the Introduction section)

---

29. Provided by Brett Barkdoll, WDFW
 STOCK STATUS

TRENDS

*Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.*

No information available

30. Information supplied by Don Hendrick, WDFW
**AGE CLASS STRUCTURE**

What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

This is an even year stock.

**PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION**

Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

There are not hatchery plants of even year pink salmon in the Skagit River.

**PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY**

For hatchery stocks- what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?

Not applicable.

**INDEX STOCK**

Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.

No. There is not an index stock.

**Biological Significance**

**STOCK ORIGIN**

Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?

- a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or
- b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been?)? or
- c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or
- d. Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? or
- e. Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?

Even year pinks were imported from Alaska and British Columbia (Skeena stock) to the Samish Hatchery and planted in the Skagit River and other areas in Washington State in the 1950’s. In the
1980’s, even year pinks were observed spawning in the Skagit River. Even year pinks are treated as a wild stock because biologists think it unlikely that this stock derives from the 1950’s plants.

**BIOLOGICAL ATTRIBUTES**

*Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.?) Use the following questions to guide your answer:*

a. Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or
b. Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or
c. Are all known biological attributes shared with other GDUs?

Even year pinks are rare in Washington State. When the GDU technical report was published (1995) this stock was not known. Likely they would be similar to the Snohomish even-year GDU because of their return timing. Due to the rigid two year life cycle of pink salmon, this stock is reproductively isolated from odd year Puget Sound stocks.

**POPULATION SUBDIVISIONS**

*How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:*

a. How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?
b. What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.
c. What is the total number of stocks within the same GDU as the stock under consideration?
d. What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?

Spawning aggregates exist in the Snohomish and Stillaguamish in addition to the Skagit River. The Skagit even year pinks spawn in the lower river, near the towns of Rockport and Sedro Woolley. They are genetically similar to the Southeast Alaska GDU.
MANAGEMENT GOALS\textsuperscript{31}

Harvest and Conservation

For each hatchery stock program, is the program goal conservation, harvest or both?

Not applicable.

Harvest

Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:

- High – harvest opportunity each year, spread over seasons
- Medium – opportunity most years, for some seasons
- Low – occasional opportunity, single run
- 0 – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Opportunity</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

Conservation

What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.

The goal is to maintain healthy stocks.

Production

For hatchery programs, please summarize the production goals:

a. How many fish at what size are planned for release? Transferred off-station?

Not applicable

b. Where are eggs taken and incubated? Where are fish reared and released?

Not applicable

c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

Not applicable

\textsuperscript{31} Information supplied by Don Hendrick, WDFW
d. Is the duration of this program clearly defined?

Not applicable

Other Goals

Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.

None mentioned.

Monitoring and Evaluation

Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.

Monitoring and evaluation methods include: spawning surveys; smolt trapping; counting fish at Baker River trap; and estuarine surveys.

Goal Achievement

Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?

Other than the goal of maintaining the health of this stock, no goals were mentioned.

Conflicts

Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?

Biologists recommend removing dikes and adding trees to the upper watershed. Flood control measures hinder creek and estuarine conditions. Forest conservation goals are in conflict with salmon conservation goals.

Incorporating Adaptive Management

Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?

We cannot easily change our goals when we receive new information. Inertia exists. Further, supporting data in a timely fashion does not drive management.
Baker River Sockeye

HABITAT STATUS

Habitat Rating

Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th>Rating (H/M/L)</th>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hatchery</td>
<td>Hatchery</td>
<td>Hatchery</td>
<td>Hatchery</td>
</tr>
<tr>
<td></td>
<td>Wild</td>
<td>Wild</td>
<td>Wild</td>
<td>Wild</td>
</tr>
<tr>
<td>M</td>
<td>L</td>
<td>M/H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>L--artificial</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:
1. **High (H) = Healthy**: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.
2. **Medium (M) = Limiting**: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.
3. **Low (L) = Inadequate**: The target stock is unproductive and the population will go extinct, even without terminal harvest.

Habitat Condition/Habitat Improvement/Future Expectations/Additional Information

(Please refer to the Introduction section)
### Trends

Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>2931</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td>10031</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1973</td>
<td>3656</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>3611</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td>1303</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td>1558</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>1707</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>2716</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td>856</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>499</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>206</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>1869</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td>735</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>358</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>547</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>683</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>818</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>536</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>1976</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>480</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>2423</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>3811</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>15991</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>2155</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>7728</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>2418</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>13187</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>4654</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>10504</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Baker River sockeye escapement counts are Shannon Dam trap counts and not actual escapement to spawning beaches and Baker Lake.*

33. Information supplied by Don Hendrick (WDFW), Pete Castle (WDFW), and Bob Hayman (SSC)
AGE CLASS STRUCTURE
What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

No information provided.

PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION
Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

This population is comprised of a hatchery–wild mixture of unknown proportion.

PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY
For hatchery stocks- what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?

Baker River sockeye are 100% hatchery origin Baker River stock. There is no production capacity for this stock without direct human intervention.

INDEX STOCK
Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.

Sockeye are not coded wire tagged.

Biological Significance

STOCK ORIGIN
Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?

a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or
b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been)? or

c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or

d. Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? or

e. Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?
Baker River sockeye are considered native. Because of the dams in Baker Lake, their entire freshwater environment has changed. Baker River sockeye were blocked from returning to Baker Lake when the first dam was built (1927). The lower dam also blocked sockeye return to Baker Lake. After a few years, adults were trucked from the lowermost dam to Baker Lake. It is not known how the stock continued to survive from the time the dams were built until trucking began. The species continues to be artificially propagated through the spawning beaches. Historically, a hatchery at the mouth of Grandy Creek (Birds View Hatchery?) reared sockeye. However these fish were all exported.

**BIOLOGICAL ATTRIBUTES**

*Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.?) Use the following questions to guide your answer:*

a. Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or

b. Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or

c. Are all known biological attributes shared with other GDUs?

The Baker River sockeye return from three to five years of age. Trend analysis has not been done for this stock. Lake Washington sockeye originated from Baker Lake.

**POPULATION SUBDIVISIONS**

*How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:*

a. How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?

b. What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.

c. What is the total number of stocks within the same GDU as the stock under consideration?

d. What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?

There are two spawning aggregates of Baker River sockeye but one genetic population. The spawning aggregates consist of fish that spawn naturally in the lake and fish that spawn naturally on the artificial beaches.
MANAGEMENT GOALS

Harvest and Conservation

For each hatchery stock program, is the program goal conservation, harvest or both?
Both

Harvest

Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:
- High – harvest opportunity each year, spread over seasons
- Medium – opportunity most years, for some seasons
- Low – occasional opportunity, single run
- 0 – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Opportunity</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

Conservation

What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.

The goal is to maintain healthy stocks and to develop a mitigation program for Baker River sockeye.

Production

For hatchery programs, please summarize the production goals:
a. How many fish at what size are planned for release? Transferred off-station?

The program goal is to achieve 3000 returning adults back to the Baker Lake spawning beach. There are no specific juvenile production goals for this sockeye artificial spawning beach. The numbers of fry produced depends on the number of adults available, spawning success, fry emergence, and survival.

b. Where are eggs taken and incubated? Where are fish reared and released?

Baker River sockeye spawn naturally on artificial spawning beaches or in Baker Lake tributaries. All fry are collected and planted into Baker Lake for natural rearing.

34. Information supplied by Don Hendrick (WDFW), Pete Castle (WDFW), and Bob Hayman (SSC)
c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

The program is stable at this time.

d. Is the duration of this program clearly defined?

The program duration is defined as ongoing at this time.

**Other Goals**

*Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.*

Baker River sockeye is a unique stock and there is no natural rearing potential remaining in the Baker Basin without human intervention. This project protects this stock from total extinction. Excess adults are distributed to the Skagit System Tribal Cooperative for ceremonial and subsistence use via the trap and/or tribal net harvest.

Mitigation is also an important goal for the co-managers.

**Monitoring and Evaluation**

*Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.*

Monitoring and evaluation methods include: fish tickets for monitoring catch; spawning surveys; smolt trapping; counting fish at Baker River trap; and estuarine surveys.

**Goal Achievement**

*Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?*

Nothing mentioned.

**Conflicts**

*Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?*

Habitat condition prevents goals from being met; recommend removing dikes and adding trees to the upper watershed. Flood control measures hinder creek and estuarine conditions. Forest conservation goals conflict with salmon conservation goals.
Incorporating Adaptive Management

Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?

We cannot easily change our goals when we receive new information. Inertia exists. Further, supporting data in a timely fashion does not drive management.
CURRENT HATCHERY PROGRAMS

Baker River Sockeye – Baker Spawning Beaches

FACILITY

Description
Describe the property location and ownership. Give the funding and operating organization names, approximate size of the property (acres), number of buildings, any unique attributes of the site worth noting.

The Baker Spawning Beaches are located on the Baker River and are owned by Puget Sound Energy (PSE) as mitigation for two dams on the Baker River. The facility consists of an adult trap on the lower Baker River, and four artificial spawning beaches along Baker Lake and Shannon Lake. Beaches number 1, 2 and 3 are on Channel Creek, a spring fed water supply, at the upper end of Baker Lake. Beach #3 is the only operational beach there and the water quantity has been a concern the past few years. Beaches #1 and #2 never worked very well and are in disrepair. The intake is located on a spring then runs underground by gravity, through a 24” pipe to up-well in the pond. The outlet dumps into Channel Creek then out to Baker Lake. The site is on U.S. Forest Service property, is ~10 acres and is leased to Puget Sound Energy. There are three buildings, an “A” frame that used to be a residence, now in fair shape, a large galvanized storage building with cement slab, and a small, galvanized building over the intake screens at the intake. PSE owns all buildings and equipment. Because the Baker River has been unstable as far as its course near the delta and the risk to beaches 1, 2, & 3 was evident, beach #4 was built at the mouth of Sulfur Creek, just below the Baker Dam. The intake is on Forest Service property and is a spring source that feeds by gravity to a “denitro” tower, then on to beach #4. Effluent water drains into Sulfur Creek and the fry are collected and trucked up to Baker Lake daily during out-migration. Beach #4 was built to hold up to 3000 adult sockeye. After the first few years the beach was divided into 4 sections using hypolon curtains, for improved disease control (IHN-V). There is a 20 X 20 chemical storage building (chlorine and sodium thiosulfate) with two 1100 gallon tanks and containment, and an office/storage building at this site, both owned by Puget Sound Energy. WDFW with Puget Sound Energy, will build an additional incubation facility (vertical incubators) at this site in 2002 (in time for spawning). This will allow better disease control and facilitate other monitoring and evaluation efforts, such as marking, etc. This site is less than 10 acres and shares water with PSE's fish culture facility, just adjacent, where there are five circulars, 4 small raceways, two starter troughs, and an asphalt pond. There are 5 small buildings for office and storage space. PSE operates several small rearing ponds to rear coho for dam gulper testing and rainbow trout for recreational enhancement in the lakes.

Concerns
The facility is currently only receiving minimal funding. Also, the water supply for the facility is currently a problem. The water supply appears to be dependent on the location of the Baker River, rainfall, and snow melt. The water may be leaking around or under the water supply dam. Auxiliary pumping has been intermittently necessary for over 10 years. Two large diesel pumps

35. Information supplied by Don Hendrick (WDFW), Pete Castle (WDFW), Gary Sprague and Bob Hayman (SSC)
have been used in the past to pump water from lower in Channel Creek to the water supply reservoir. Currently, only one pump is available. Finally, Beach No. 1 is best described as an elephant trap. It hasn’t been used since 1964. Beach No. 2 is in need of maintenance. The last time it was used survival was unexpectedly low. Beach No. 3 needs the outlet structure rebuilt and some pipes may need replacing.

**Primary Goal**

*What is the primary goal of the facility? (Examples: conservation of Shirley creek summer chum because of degraded habitat, harvest augmentation of Michael River coho salmon primarily for north Puget Sound commercial fisheries, community education)*

The goal of this program is to maintain the unique Baker River sockeye, by artificial means, to achieve a return level of 3000 adults annually.

**Associated Stocks**

*What stocks of fish are handled and/or reared at this facility?*

Baker River Sockeye

**Water Supply**

*Describe the water supply, including the following components:*

- **a.** Each water source: Available flow – stable, increasing, decreasing? Spring, well, surface? Normal year’s temperature regime? Pumped or gravity flow? Water chemistry profile, if available?
- **b.** If surface water, is it fish- or specific-pathogen free? Do you experience problems with “dirty water” that limits your ability to reach your goals?
- **c.** Surface water intake structures on station – are they screened or sited in a way that excludes fish or other animals from entering the water supply?
- **d.** If you use surface water, is there adequate water in the by-pass reach throughout the year?
- **e.** Are there unique physical characteristics of the water supply on site or nearby that you feel should be noted?

- The water supply for both beach #3 and #4 is from springs. Beach #3 is fed by springs along Channel Creek. Beach #4 draws 47 degree water from springs that feed Sulphur Springs Creek and utilizes 10 cfs (~2.5 cfs per section). Water volume is not a limiting factor at the beach #4 site. Beach #3 utilizes from 1.5 to 2 cfs of spring water. (more when adults are present/less with just eggs) The temperatures range from the 30s to the 50s due to the large surface area of the spring intake pond. The site has a limited water supply that is subject to flow fluctuations for no apparent reason or season. It is necessary, at times, to supplement with creek water that is pumped into the spring intake supply. There is no water profile for either site.
- Water quality can be a concern at beach #4 due to an unstable hillside directly above the intake. On a number of occasions the hillside has sloughed off into the spring intake causing severe silting of the spawning beach. The slope has been armored with large rock but still remains a concern. The spring water from Sulphur Springs is believed to percolate from Baker Lake and its’ true pathogen (free) status is unknown (Gary Sprague, pers. comm.).
c. N.A. at both sites.
d. N.A. at both sites.

**Pathogen Combatant Methods and History**

Describe the fish health/pathogen history, including the following components:

a. How often does a fish health professional visit your site?
b. What is the most significant fish health problem at your facility (this could be a fish pathogen, inability to correct a situation, poor water, etc.)?
c. Have you had any significant epizootics on your facility? Please explain. Were you able to isolate the affected containers? Sanitize the effluent?
d. Do you have a history of viral isolations at your facility in the past five years? This excludes epizootics as described above.
e. Do you disinfect equipment between rearing units or banks of ponds? What method do you use?
f. Are you able to keep distinct lots or stocks of fish physically separated? Please answer for each of these life stages – adults, eggs, and juveniles.

a. The area Fish Health Specialist is on-site at least once per month, and generally, every two to three weeks, and is available anytime a need is identified.
b. IHN-V is the most significant fish health problem of emergent fry from the Spawning Beaches. The last major outbreak was in 2000.
c. Yes, IHN. We are unable to isolate the 4 units in beach 4 the impervious nature/design of the units. Beach #4 is divided into 4 separate sections via a hypolon plastic divider but the sections are not entirely distinct as water is able to pass from one section to another via the gravel and holes in the dividers. As a precaution, the spawning beaches are completely sanitized with chlorine between brood years. As adult spawners begin to die, they are removed from the beaches to remove potential IHN reservoirs. When fry begin to emerge from the gravel, weekly 60 fish samples (12 five fish pools) are collected from each beach sub-section. If the samples show 4 or more positive pools per 60 fish sample, the entire beach section may be destroyed.
d. See question “b” above.
e. Yes, chlorine.
f. With the exception of the physical separation of beach #3 and beach #4, no. The sub-units of beach #4 are not considered functionally separate units.

**Pollution Abatement**

Describe the waste removal/pollution abatement system including the following components:

a. What is the general frequency of pond cleaning?
b. How is pond waste disposed of (vacuum, brush, dry and remove, etc.)?
c. Describe pollution abatement pond or settling pond, if one exists.
d. Status of permits for discharging pollutants?
e. Any particular challenges you would like to share on this subject?

a. The beaches are chlorine sanitized and mechanically cleaned (with a small tractor) between brood years (once per year). Spawned-out adults are picked out by hand or net to reduce the IHN-V reservoir.
b. Adult carcasses are used for nutrient enhancement in the basin. Chlorinated/neutralized pond cleaning waste is collected in an outlet basin for settling and confirmation of complete neutralization. Clarified water is discharged into the creek and the solids are disposed of on the uplands.

c. No formal pond with the exception of the pond described in “b” above.

d. None.

e. Removing spawned-out adults is labor intensive and not always 100% effective (some missed).

**Education**

Please give details regarding the following:

a. Is your facility open to the public?

b. Do you have signs, pamphlets, or other materials for the public to self-tour?

c. Do hatchery staff or others schedule and conduct tours of the facility?

d. Are there citizen involvement opportunities such as volunteer programs, student interns, etc?

e. Are hatchery operations visible to facility visitors?

f. Do other fish and wildlife programs use the facility?

g. Do you have regular involvement with community or school groups?

h. Do you give fish or eggs to educational groups? If so, please estimate the amount of time this activity takes.

---

a. This site is on private land (Puget Sound Energy) and is accessible by invitation only.

Questions b thru h. Do not apply.

**General Administration**

a. Does key staff have a good understanding of the facility goals, budget, and expenditures? If not, what tools do you need for correcting this?

b. Is new relevant information from research and other sources made available to hatchery staff and used for attaining goals?

c. As fish culture and other related scientific understanding evolves, are you able to make changes to your programs? If not, what ideas do you have for changing this?

d. Are there state or federal laws that constrain the program, such as numbers and size of smolts produced?

---

a. The staff at Baker has an excellent understanding of the goals in that they are involved in the development of the goals. I have very little experience with the budget for the facility due to the fact that this is a PUD site the budget is developed by other entities.

b. New relevant information is very accessible through various sources and is used to set and attain goals. The program is managed by the Baker River Committee and the program has changed frequently in the past.

c. We endeavor to manage the program using the latest findings and information available.

d. The ESA, the Wild Salmonid policy, and agreements with Puget Sound Energy and the Skagit System COOP (tribes), all constrain the program.

**Other Facility Issues**
a. What are your predator control methods/facilities (nets, wires, etc)? Do you have unresolved predator problems?
b. Describe how you inventory your fish (frequency, size of weight sample, etc.).
c. How do you keep your inventory and other data? (Hatpro, spreadsheets of your own, agency forms, etc.)
d. How do you decide which food to use (mandatory contract, fish health recommendations, etc.)?
e. How do you store your feed?
f. Does your facility have any habitat improvements on site (wetlands, riparian improvements, etc.)?

a. Predator control is normally achieved by maintaining sufficient water depth over the spawning gravel. Peregrine falcons, mink and otter are the chief predators, of adult fish.
b. Adults are counted, by hand into the beaches. Juveniles are enumerated by with electronic counters from the beaches.
c. WDFW and site-specific spread sheets.
d. Sockeye are not fed at Baker Lake.
e. N.A.
f. No.

Facility Wish List and Other Comments
a. What is the most-needed piece or pieces of equipment for your facility and why?
b. What capital improvements are most needed at your facility and why?
c. What do you think would be the most valuable use of your facility?
d. Is there anything else that we have not covered that you would like to add?

The facility and program need include:

1. Better IHN-V control via other artificial propagation means such as vertical incubators, Kotoi boxes, etc.
2. Backup water supply for beach #4.
3. Redevelop spring water supply and site and utilize both to support other Skagit River programs if needed, e.g. hatchery steelhead, etc.

Stock Information

Broodstock

Broodstock Description
Describe the broodstock as follows: (These may be a repeat of some questions asked under stock status - you may refer to those answers or cut and paste.)

a. How was the broodstock chosen?
b. Do you consider it an integrated (goal is to maintain a single gene pool and prevent divergence) or segregated (isolated in the hatchery, managed to restrict gene flow) population?
c. Does this broodstock have a history of reportable pathogens?
d. Are you are able to collect representative samples each year of the population, with respect to size, age, sex ratio, and run and spawn timing? If not, please explain the limitation.

a. The sockeye for the program are collected entirely from volunteers to the Baker Lake trap.
b. It is considered an “integrated” stock although there is little or no truly wild production without human intervention. If the trap returns exceed the capacity of the spawning beaches then excess adults are placed in Baker Lake to spawn naturally.
c. This stock has recurrent IHN-V isolations and outbreaks.
d. The fish are trapped during the full season and incorporated proportionately into the brood stock.

**Broodstock Collection Process**

*Describe the broodstock collection process, including the following components. Differentiate by Natural Origin Recruit (NOR) and Hatchery Origin Recruit (HOR) if they are collected in a different manner:*

a. Describe/give the location of adult collection relative to the physical plant where fish are held or spawned?
b. Describe how fish are collected (ladder, sorter, trap, in river, etc.)
c. Do you have the ability to handle or sort individual fish? If so, please describe your process.
d. If you transport adults from one site to another, describe method of transport. Have you had problems with mortality from handling because of this?
e. If the fish enter the adult holding structure on their own, describe the process for handling and counting. Include details on how and when you pass fish upstream, and about your ability to do so.
f. In what type of container do you hold these adults? Is it covered? Do you use overhead sprinklers? Do you have a problem with predation?
g. Which water supply is used for this purpose?
h. Are you able to hold these fish within recommended guidelines for temperature, water flow, and density?
i. Do you have adequate security?
j. How do you deal with numbers of fish in excess of your egg take needs? Do you feel you have the tools you need for this?

a. Adult sockeye are trapped volitionally, from approximately the end of June through the end of August, in the adult trap located at RM .3 on the Baker River at the outlet of Lake Shannon.
b. The trap is small and there is no ability to segregate returning adults.
c. Most sockeye are transferred into the tank truck without handling. Other species are counted, measured and loaded into the tank truck by hand.
d. Adults are transferred into fish tankers via a water-to-water system. They are visually counted in the process. Power crowders are used to transfer the fish. Adults are hauled into either beach #3 (RM 19) or #4 (RM 9) or into Baker Lake to spawn naturally.
e. All other species, with the exception of chinook and hatchery steelhead, are hauled into Baker Lake to spawn naturally. They are crowded by the power crowders, dipped,
measured, mark sampled and counted, by hand, into the tank truck. 20% of the marked coho are inoculated with erythromycin and transferred, for broodstock, to PSE for their smolt gulper tests on the power dams. The trapping site is on PSE land and is secure.

f. Adult sockeye are held in either beach #3 (RM 19) or #4 (RM 9) until they spawn and die. The pond is not covered and sprinklers are not used. A maximum of 550 spawners are placed into beach #3 and up to 3,000 may be placed in #4. Excess adults are surplused as they return to the hatchery and are distributed to the tribes. We endeavor to keep spawners that are proportionately representative of the entire run but this is difficult as the fish are all kept in one pond, the trap pond, prior to spawning. The sockeye are loaded into the ponds according to run timing as much as possible following a bell curve loading plan.

g. All fish hold, spawn and incubate in spring water.

h. Density of adults is not a limiting factor.

i. The sites are on fenced PSE sites and are totally secure.

j. Surplus adults are passed into Baker Lake to spawn naturally or are donated to the Tribes.

Adult Handling

Please describe how you handle adults:

a. What is the method for choosing and mating your broodstock (include how many adults of each sex are used per mating)?
   i. What are the spawner selection protocols (e.g. random, size, ripeness, wild or hatchery origin?)?
   ii. Record how the gametes are handled (pooling of milt and/or eggs? If so, how?). What is the mating scheme (e.g. 1:1, factorial, multiple pooling?)

b. Do you use anesthesia?

c. Describe the pathogen-sampling regime.

d. Describe mark sampling program, if any.

e. Is there any other biological sampling done on adults?

f. How do you dispose of spawning waste?

g. How do you dispose of pre-spawning mortalities?

h. How do you dispose of spawned adults?

a. The sockeye for the program are collected entirely from volunteers to the Baker Lake trap. Adults from the entire run are trapped, and incorporated proportionately into the brood to spawn in the beaches and, if there are sufficient fish, to spawn naturally in Baker Lake tributaries. Fish are not sexed or sorted prior to placement into the beaches. No fish are currently spawned artificially. **Note:** Plans are being formulated to incubate and hatch up to 1 million 2002 brood sockeye eggs in vertical-style incubators. The details are not yet worked out.

b. N.A.

c. N.A.

d. N.A.

e. Scale, otolith and other samples are collected after fish spawn out.

f. N.A.

g. All carcasses, pre-sawn mortality and spawned-out carcasses are removed from the spawning beaches to remove possible IHN-V reservoirs. They are used for nutrient enhancement and placed in tributaries throughout Baker Lake basin.

h. See “g” above.
Incubation

Green Eggs

Please describe your method for putting down green eggs:

a. Do you have adequate “clean” and “dirty” areas for handling eggs?
b. Describe your water hardening procedure.
c. Describe your green egg enumeration process.
d. Where are these eggs incubated (What type of incubator, water supply used)?
e. Do you incubate in single-family units? If you had the capacity, would that be desirable?
f. How many eggs per incubation unit?
g. What is the typical flow used?

a. N.A. at this time. Note: Plans are being formulated to incubate and hatch up to 1 million 2002 brood sockeye eggs in vertical-style incubators. The details are not yet worked out.
b. N.A. at this time.
c. N.A.
d. The eggs are deposited naturally in washed river rock in the beaches. After the eggs are deposited, the beaches are covered with floating hypolon sheets (5 @ 4’ x 150’ per section) to afford shade to the incubation units.
e. N.A.
f. Unknown.
g. Approximately 2.5 cfs per section (x 4) at beach #4 and 1.5 to 2 cfs at beach #3.

Eyed Eggs

Please describe your methods for handling and putting down eyed eggs:

a. How do you monitor egg development? (Temperature units, visual check, fish pathologist check, etc.)
b. Have you had any chronic (or difficult to control) losses of eggs to the eyed stage? If so, please explain.
c. How do you dispose of dead eggs?
d. Do you disinfect eyed eggs prior to putting down to hatch?
e. What type of container do you use for hatching?
f. Do you use any type of substrate?
g. What is your loading density? (eggs per unit)

a. N.A. at this time. Note: Plans are being formulated to incubate and hatch up to 1 million 2002 brood sockeye eggs in vertical-style incubators. The details are not yet worked out.
b. Unknown.
c. N.A.
d. N.A.
e. Spawning beach.
f. Washed river rock appropriately sized for sockeye salmon.
g. N.A.
Other Issues

Other incubation questions:

a. Is your water temperature regime similar to that in the natural environment?

b. Are eggs incubated under environmental conditions that tend to maximize individual fitness of fry? (e.g. allow volitional ponding of fry, incubate under environmental conditions that simulate the natural rearing environment)

c. Do you heat or cool your water during incubation? If so, please explain what you do and the purpose of the temperature manipulation.

d. Do you cull eggs during incubation for any purpose? (ELISA results, spawn timing, etc.)

e. Are excess eggs/fry culled randomly when necessary?

f. How do you deal with eggs in excess of your egg take needs?

g. Do fry have the ability to emerge volitionally?

h. If you have to remove fry from rearing units, how do you determine appropriate stage of development (Temperature units, visual check, pathologist check, etc.)?

a. The eggs are deposited naturally into the spawning medium and, except for providing clean spring water, very little control can be exerted over the incubation environment. The spring water temperature is stable at beach #4 and is unlike natural conditions. The temperatures are not as stable at #3 but not predictably so. After the adults finish spawning, each spawning unit is covered by five 4’ x 150’ floating hypolon sheets (e.g., 20 sheets at beach #4) to provide shade to the incubation gravel.

b. Unknown.

c. No

d. No

e. No

f. None.

g. The fry are able to emigrate volitionally from each section and are electronically counted as they do. It is unclear of how the emergence timing from the beach gravel compares with historic emergence from the original spawning areas in the system.

h. N.A.

Rearing Conditions

a. Explain what type of container this stock is rearing in from first ponding to release (size and types of each kind of rearing unit).

b. What water supply is used for rearing this stock (from first ponding to release)?

c. Are the rearing units covered?

d. Do you attempt to provide any type of “natural rearing” for this stock (cover, substrate, food, etc.)? Please describe.

e. How do you decide which fish to combine in a rearing unit (individual families, results of ELISA, size of fish, etc.)?

f. What do you use for keeping fish within recommended density and/or poundage targets (Flow Index, Density Index, pounds/gallon/minute, etc.)?

g. Are you typically able to stay at or below this guideline? If not, what are your limiting factors?

h. Are fish produced similar to natural fish in size, growth rate, morphology, behavior physiological status, health, etc.?
N. A. There is no rearing at this site. Out-migrant fry are unfed but range from 3,400 fish/pound in the beginning of the season and increase in size to about 2,500 fish/pound at the end of the out-migration season.

**Fish Health**

a. Do you use any prophylactic treatments? If so, describe drug/chemical used, targeted pathogen, life stage treated, and method of delivery.
b. Do you vaccinate this stock? If so, for what pathogen and with what vaccine?
c. Are you able to remove and enumerate mortalities easily? If not, what are your limitations?
d. Is this stock sampled for pathogens at spawning?
e. Do you or your fish health specialist perform any fish health assessments on this stock? If so, what sort and at what frequency?
f. What is your most challenging fish health problem with this stock? If you could, what would you do to resolve the problem?

a. Not in the classic sense of the term although the ponds are sterilized between brood years and adult carcasses are removed to eliminate a possible reservoir of IHN-V. For additional info. see section 5 above.
b. The area Fish Health Specialist is exploring the use of an IHN-V vaccine for adults, to minimize the levels of this virus.
c. No. The pond is too deep and wide to access and the gravel limits the ability to pick loss from the bottom.
d. N.A.
e. Yes, when fry begin to emerge from the gravel, 60 fish samples (12 five fish pools) are collected weekly from each beach sub-section. If the samples show 4 or more positive pools per 60 fish sample, the entire beach section may be destroyed.
f. IHN-V is our biggest problem. We need to take additional steps to control the disease. We believe that the proposed incubation of up to 1 million eggs in vertical incubators may alleviate this problem.

**Marking**

a. Is this stock marked or tagged in any way prior to release? Please describe (numbers, replications, quality control).
b. What is the purpose of this mark or tag?
c. How many years has it been identified in this way?
d. Are there historic marks or tags we should know about?

a. Fish are not actively marked at this time. A mark for sub-units of this program would facilitate monitoring and evaluation of this program. A controlled incubation system as proposed earlier will facilitate this ability.
b. N.A.
c. N.A.
d. N.A.

**Release/Transfer**
a. How is time of release decided?

b. How do you measure the size of fish at release (fish per pound, average length, other)?

c. What is the typical size range in millimeters of these fish at release? If you do not know the size range, what is average weight?

d. What other smolt quality monitoring do you perform, if any (fish pathologist checks, on-going research projects, smoltification indicators, etc.)?

e. Are fish released with adequate imprinting to facility or desired stream reach?

f. Describe your on-station release procedure for this stock (volitional vs. forced, time of day, typical date, length of time of release, etc.).

g. If you truck this stock off station, where do they go (acclimation pond, stream plant, transfer to another facility, etc.)?

h. Are you or others able to monitor the fish after they enter the river (snorkeling, smolt trapping downstream, etc.)?

i. Do you have any idea if these fish have interactions with other salmonids in the receiving environment? If so, what do you know?

---

a. The fry volitionally exit the beaches.

b. They are measured in fish per pound.

c. The fry range from 3,400 to 2,500 fish per pound. The first migrants are generally smaller. Samples are collected every-other week.

d. When fry begin to emerge from the gravel, 60 fish samples (12 five fish pools) are collected weekly from each beach sub-section. If the samples show 4 or more positive pools per 60 fish sample, the entire beach section may be destroyed.

e. The fry are volitionally counted out of the spawning beaches using Smith-Root electric counters as the fry are placed into Baker Lake where they rear.

f. The fry are volitionally counted out of the spawning beaches using Smith-Root electric counters as the fry are placed into Baker Lake where they rear. They are trucked to Baker Lake from beach #4 and migrate directly, through counters, into Baker Lake from Beach #3.

g. The beach out-migrants are collected in outlet traps at the outlet of each beach section. The fry are hauled every three days or when 30,000 fry are collected. They are hauled in a 1,000 gallon tank truck to 4 release sites on Baker Lake. The sites may vary depending upon lake levels.

h. The program at Baker is evaluated using several methods: the first is hand counting the adults at the trap in Concrete and placing the adults in either the spawning beaches, or the lake. The smolts are collected at a gulper trap one placed in front of each dam and sampled and hand counted before being trucked to the Skagit River.

i. When the fry are planted into Baker Lake the hatchery crew notices chinook fingerlings feeding upon the sockeye fry. Hook and line sampling of the fish in the vicinity of the release confirm the presence and predation by chinook.

**Adult Migration**

**Migration of returning adults**

a. Is the straying of hatchery fish into the wild controlled?

b. Is the attraction of wild fish into the hatchery minimized?

---

a. Yes, 100% of the sockeye in the Baker system, above the lower dam, are placed there by hand.
b. There is no mechanism to limit the straying into other watersheds within the Skagit River basin. All fish entering the Baker Trap, with the exception of chinook and hatchery steelhead, are moved into Baker Lake.
Skagit Riverine-Type Sockeye

HABITAT STATUS

Habitat Rating

Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hatchery</td>
<td>Hatchery</td>
<td>Hatchery</td>
<td>Hatchery</td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>H</td>
<td>Unknown</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>Wild</td>
<td>Wild</td>
<td>L</td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:

1. **High (H)** = Healthy: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.
2. **Medium (M)** = Limiting: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.
3. **Low (L)** = Inadequate: The target stock is unproductive and the population will go extinct, even without terminal harvest.

Habitat Condition/Habitat Improvement/Future Expectations/Additional Information

(Please refer to the Introduction section)
**STOCK STATUS**

**TRENDS**

*Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.*

No data available.

---

37. Information supplied by Don Hendrick (WDFW), Pete Castle (WDFW), and Bob Hayman (SSC)
**AGE CLASS STRUCTURE**

*What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.*

The Skagit Riverine sockeye return from three to five years of age. No trend analysis has been done for this stock.

**PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION**

*Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.*

Unknown

**PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY**

*For hatchery stocks- what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?*

Not applicable.

**INDEX STOCK**

*Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.*

Sockeye are not coded wire tagged.

**Biological Significance**

**STOCK ORIGIN**

*Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?*

a. *Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed?* or

b. *Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been?)?* or

c. *Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish?* or

d. *Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed?* or

e. *Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?*

The Skagit Riverine sockeye are a naturally spawning population considered native.
**BIOLOGICAL ATTRIBUTES**

Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.? ) Use the following questions to guide your answer:

a. Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or

b. Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or

c. Are all known biological attributes shared with other GDUs?

Skagit Riverine sockeye are genetically distinct from Baker Lake sockeye but indistinct from British Columbia populations. Chris Wood theorizes that this stock colonizes rivers and eventually evolves into lake populations. The Skagit Riverine Sockeye spawn in the extreme upper Skagit River by Newhalem and County Line Pond. They have also been observed in the Sauk River for the last twenty years.

**POPULATION SUBDIVISIONS**

How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:

a. How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?

b. What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.

c. What is the total number of stocks within the same GDU as the stock under consideration?

d. What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?

The Skagit Riverine sockeye have three spawning aggregates: the upper Skagit by Newhalem, the upper Sauk at the mouth of Falls Creek, and various other locations used periodically. Genetic information on this stock can be found in the paper, “Distribution and population genetic structure of river- and sea-type sockeye salmon in western North America” by R.G. Gustafson and G.A. Winans. Knowledge of this stock is recent. There is no GDU information on this stock.
MANAGEMENT GOALS

Harvest and Conservation

For each hatchery stock program, is the program goal conservation, harvest or both?

The program goals for Baker River sockeye are conservation and harvest.

Harvest

Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:
- High – harvest opportunity each year, spread over seasons
- Medium – opportunity most years, for some seasons
- Low – occasional opportunity, single run
- 0 – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Opportunity</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

Conservation

What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.

The goal is to maintain healthy stocks and to develop a mitigation program for sockeye now that they are in the Baker River.

Production

For hatchery programs, please summarize the production goals:
a. How many fish at what size are planned for release? Transferred off-station?

No hatchery program

b. Where are eggs taken and incubated? Where are fish reared and released?

Not Applicable

c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

Not Applicable

38. Information supplied by Don Hendrick (WDFW), Pete Castle (WDFW), and Bob Hayman (SSC)
d. Is the duration of this program clearly defined?

Not Applicable

Other Goals

Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.

Mitigation is an important goal for the co-managers.

Monitoring and Evaluation

Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.

Monitoring and evaluation methods include: fish tickets for monitoring catch; spawning surveys; smolt trapping; counting fish at Baker River trap; and estuarine surveys.

Goal Achievement

Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?

Nothing mentioned.

Conflicts

Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?

Habitat condition prevents goals from being met; recommend removing dikes and adding trees to the upper watershed. Flood control measures hinder creek and estuarine conditions. Forest conservation goals are in conflict with salmon conservation goals.

Incorporating Adaptive Management

Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?

We cannot easily change our goals when we receive new information. Inertia exists. Further, supporting data in a timely fashion does not drive management.
Habitat Rating

Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hatchery</td>
<td>Wild</td>
<td>Hatchery</td>
<td>Wild</td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>M—½ H and ½ L</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:
1. **High (H)** = Healthy: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.
2. **Medium (M)** = Limiting: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.
3. **Low (L)** = Inadequate: The target stock is unproductive and the population will go extinct, even without terminal harvest.

Habitat Condition/Habitat Improvement/Future Expectations/Additional Information

(Please refer to the Introduction section)
**Stock Status**

**Trends**

*Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.*

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1968</td>
<td></td>
<td>44049</td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td></td>
<td>22393</td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td></td>
<td>127588</td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td></td>
<td>48827</td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td></td>
<td>144732</td>
<td></td>
</tr>
<tr>
<td>1973</td>
<td></td>
<td>83497</td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td></td>
<td>160248</td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td></td>
<td>15762</td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td></td>
<td>93000</td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td></td>
<td>36000</td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td></td>
<td>132895</td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td></td>
<td>23513</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td>19425</td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td></td>
<td>16939</td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td></td>
<td>142541</td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td></td>
<td>3193</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td></td>
<td>46817</td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td></td>
<td>45190</td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td></td>
<td>81869</td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td></td>
<td>42853</td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td></td>
<td>119791</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td></td>
<td>13904</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td></td>
<td>110567</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td></td>
<td>22364</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td></td>
<td>95940</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td></td>
<td>16673</td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td></td>
<td>121775</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
<td>38666</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td></td>
<td>74474</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td>14392</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td></td>
<td>120875</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td>34311</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td>22321</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td>62262</td>
<td></td>
</tr>
</tbody>
</table>

---

40. Information supplied by Pete Castle (WDFW), Don Hendrick (WDFW), and Bob Hayman (SSC)
AGE CLASS STRUCTURE
What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

Chum range from three to five years old.

PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION
Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

There are not hatchery chum programs on the Skagit River.

PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY
For hatchery stocks- what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?

Not applicable.

INDEX STOCK
Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.

No. There is no similar index stock.

Biological Significance

STOCK ORIGIN
Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?

a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or
b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been?)? or

c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or
d. Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? or

e. Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?

In the 1980’s, Hood Canal fall chum were brought in and released from Skagit Hatchery (Marblemount Hatchery ). This stock is derived from Nooksack, Samish, Skagit, and Snohomish.
hatcheries). However when the fish returned they were killed and the program cancelled. Naturally spawning populations are considered native. Of interest is Finney Creek stock that is genetically similar to the British Columbia and Pysht River stocks.

**BIOLOGICAL ATTRIBUTES**

*Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.?) Use the following questions to guide your answer:*

a. *Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or*
b. *Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or*
c. *Are all known biological attributes shared with other GDUs?*

Skagit River chum belong to the Inner Puget Sound fall-run and central/southern Puget Sound summer-run MAL. They are part of the North Puget Sound fall-run GDU. Eleven other stocks belong to the North Puget Sound fall-run GDU. Of their GDU, Skagit River chum fall within the group of stocks that prefer braided mainstem spawning habitat. The most significant genetic difference within this GDU is the Finney Creek stock. The GDU Technical report notes that “Chum salmon returning to any northern Puget Sound river or stream would find themselves in close proximity to other streams which host chum spawning populations so the opportunity for straying and mixing is great” (Phelps et al., 1995)

**POPULATION SUBDIVISIONS**

*How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:*

a. *How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?*
b. *What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.*
c. *What is the total number of stocks within the same GDU as the stock under consideration?*
d. *What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?*

There are three stocks within the Skagit River Chum: the Skagit mainstem; the Sauk; and the Finney Creek or lower Skagit tributary stocks. Of the three, Finney Creek is genetically quite different from Skagit mainstem or the Sauk. Both Skagit mainstem and Sauk stocks fall within the Stillaguamish and Snohomish Chum GDU. Finney Creek is genetically similar to British Columbia and Pysht River stocks.

All stocks are healthy.
MANAGEMENT GOALS

Harvest and Conservation

For each hatchery stock program, is the program goal conservation, harvest or both?

The Red Creek chum program goal is education and harvest.

HARVEST

Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:

- High – harvest opportunity each year, spread over seasons
- Medium – opportunity most years, for some seasons
- Low – occasional opportunity, single run
- 0 – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Opportunity</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

CONSERVATION

What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.

The goal is to maintain healthy stocks.

Production

For hatchery programs, please summarize the production goals:

a. How many fish at what size are planned for release? Transferred off-station?

No information provided

b. Where are eggs taken and incubated? Where are fish reared and released?

No information provided

c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

No information provided

---

41. Information supplied by Pete Castle (WDFW), Don Hendrick (WDFW), and Bob Hayman (SSC)

42. Scott Skylar (Hatchery manager for Red Creek) can supply this information in further detail.
d. Is the duration of this program clearly defined?

No information provided

Other Goals

Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.

Education

Monitoring and Evaluation

Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.

None mentioned

Goal Achievement

Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?

We can do better at achieving our goals but we are currently doing all right.

Conflicts

Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?

Habitat condition prevents goals from being met; recommend removing dikes and adding trees to the upper watershed. Flood control measures hinder creek and estuarine conditions. Forest conservation goals are in conflict with salmon conservation goals.

Incorporating Adaptive Management

Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?

We cannot easily change our goals when we receive new information. Inertia exists. Further, supporting data in a timely fashion does not drive management.
Skagit River Winter Steelhead

Habitat Status

Habitat Rating

Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hatchery</td>
<td>Wild</td>
<td>Hatchery</td>
<td>Wild</td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:

1. **High (H) = Healthy**: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.
2. **Medium (M) = Limiting**: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.
3. **Low (L) = Inadequate**: The target stock is unproductive and the population will go extinct, even without terminal harvest.

Habitat Condition/Habitat Improvement/Future Expectations/Additional Information

(Please refer to the Introduction section)
**TRENDS**

*Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.*

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td></td>
<td>5757</td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td></td>
<td>2982</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td>5288</td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td></td>
<td>4308</td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td></td>
<td>9609</td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td></td>
<td>7732</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td></td>
<td>8963</td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td></td>
<td>8603</td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td></td>
<td>11098</td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td></td>
<td>8305</td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td></td>
<td>13194</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td></td>
<td>11854</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td></td>
<td>10017</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td></td>
<td>5818</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td></td>
<td>7514</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td></td>
<td>6412</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
<td>7656</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td></td>
<td>7448</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td>7870</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td>3780</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td>4584</td>
<td></td>
</tr>
</tbody>
</table>

---

44. Information obtained from Pete Castle (WDFW), Bob Hayman (SSC), and Curt Kraemer (WDFW)
**AGE CLASS STRUCTURE**

What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

Wild steelhead have a broad age class structure. Generally adult returns are 50% 2-salt and 50% 3-salt.

**PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION**

Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

Management is based on hatchery fish not being a portion of naturally spawning fish. Kraemer and Hayman believe that hatchery origin fish comprise a portion of the natural spawning fish. Kraemer commented that genetic analysis was done to compare introgression of hatchery fish with wild fish in the Skagit River and no introgression was observed (Allendorf). Kraemer believes the Skagit River system has good compliance with the Wild Salmonid Policy for steelhead.

**PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY**

For hatchery stocks- what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?

Not applicable.

**INDEX STOCK**

Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.

No.

**Biological Significance**

**STOCK ORIGIN**

Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?

a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or

b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been?)? or

c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or
Wild winter steelhead are native. No stock transfers of wild fish have occurred. There have been hatchery winter stock transfers into the Skagit watershed; these fish are managed to have a different run time.

**BIOLOGICAL ATTRIBUTES**

*Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.)?* Use the following questions to guide your answer:

a. Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or
b. Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or

c. Are all known biological attributes shared with other GDUs?

Skagit River wild winter steelhead belong to the North Puget Sound GDU. The Skagit River is a snowmelt-dominated hydrograph (most river basins in Washington are rain or rain and snow driven). This results in significant spring run-off such that daily discharge is higher in June than November. Run-off indirectly influences spawning because it effects the optimum time for young salmon emerging from the gravel. Peak spawning occurs the second to third week in May. Young salmon emerge from the gravel in August when the flows are favorable. Kraemer has observed adults spawning as late as the last week in July. The Skagit wild winter steelhead penetrate more than 115 miles inland (typical steelhead penetration is less than 100 miles) and they spawn at elevations as high as 3,000 feet.

**POPULATION SUBDIVISIONS**

*How diverse is the metapopulation structure within the watershed?* Use the following questions to guide your answer:

a. How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?

b. What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.

c. What is the total number of stocks within the same GDU as the stock under consideration?

d. What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?

The SASSI reports three stocks for the Skagit River wild winter steelhead: mainstem Skagit and tributaries; Sauk; and Cascade.
MANAGEMENT GOALS

Harvest and Conservation

For each hatchery stock program, is the program goal conservation, harvest or both?

The program goal for wild winter steelhead is conservation.

Harvest

Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:

- High – harvest opportunity each year, spread over seasons
- Medium – opportunity most years, for some seasons
- Low – occasional opportunity, single run
- 0 – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Opportunity</td>
<td>0</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

Conservation

What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.

The goal is to attain and maintain a healthy stock. Currently, the goal for wild winter steelhead is 0 harvest but the tribes would like to harvest this stock in the future.

Production

For hatchery programs, please summarize the production goals:

a. How many fish at what size are planned for release? Transferred off-station?

Not applicable.

b. Where are eggs taken and incubated? Where are fish reared and released?

Not applicable.

c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

---

45. Information provided by Pete Castle (WDFW), Curt Kraemer (WDFW), and Bob Hayman (SSC). The GDU Technical Report, and the SASSI report were also used.
Not applicable.

d. Is the duration of this program clearly defined?

Not applicable.

Other Goals

Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.

None mentioned

Monitoring and Evaluation

Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.

Monitoring and evaluation methods include: fish tickets for monitoring catch; spawning surveys; smolt trapping; counting fish at Baker River trap; and estuarine surveys.

Goal Achievement

Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?

We are doing better at achieving our management goals. In the past the tribal and non-tribal escapement goal was in the range of 8,500 to 12,000. Last year for the first time the co-managers agreed on an escapement goal of 6,000 fish. Because the agreed-to escapement goal is now lower, we are closer to achieving our goals. Once there is an escapement of 6,000 fish, the tribes’ goal is to harvest 1,000 to 2,000 wild steelhead and the non-tribal goals are to have a catch and release season and a 1,000 to 2,000 harvest fishery annually.

Conflicts

Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?

Habitat condition prevents goals from being met; recommend removing dikes and adding trees to the upper watershed. Flood control measures hinder creek and estuarine conditions. Forest conservation goals are in conflict with salmon conservation goals.
Incorporating Adaptive Management

*Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?*

We cannot easily change our goals when we receive new information. Inertia exists. Further, supporting data in a timely fashion does not drive management.
Skagit River Hatchery Winter Steelhead

HABITAT STATUS

Habitat Rating

Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th></th>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hatchery</td>
<td>Wild</td>
<td>Hatchery</td>
<td>Wild</td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>N/A</td>
<td>N/A</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:

1. **High (H) = Healthy**: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.
2. **Medium (M) = Limiting**: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.
3. **Low (L) = Inadequate**: The target stock is unproductive and the population will go extinct, even without terminal harvest.

Habitat Condition/Habitat Improvement/Future Expectations/Additional Information

(Please refer to the Introduction section)
STOCK STATUS

TRENDS

Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.

No Information Provided

---

47. Information provided by Pete Castle (WDFW), Curt Kraemer (WDFW), Bob Hayman (SSC), and Charmane Ashbrook (WDFW). The GDU Technical Report, and the SASSI report were also used.
AGE CLASS STRUCTURE

What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

Hatchery steelhead adult returns generally have a higher 2-salt than 3-salt percentage.

PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION

Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

Biologists believe that hatchery origin fish comprise a portion of the natural spawning fish. However, management is based on hatchery fish not being a portion of naturally spawning fish.

PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY

For hatchery stocks- what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?

100% hatchery origin (Chambers stock) caught via Marblemount and Barnaby Slough Traps.

INDEX STOCK

Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.

The Winter-run steelhead are not coded wire tagged. They are 100% adipose clipped to allow identification as hatchery-origin fish. This stock is the generic Puget Sound hatchery winter steelhead planted throughout western Washington. Fish management changed the growth rate and return timing to provide sport opportunity.

Biological Significance

STOCK ORIGIN

Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?

a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or

b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been)? or

c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or

d. Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? or
e. Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?

Hatchery stock is the generic Puget Sound hatchery wild steelhead stock.

**BIOLOGICAL ATTRIBUTES**

*Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.?) Use the following questions to guide your answer:

a. Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or
b. Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or
c. Are all known biological attributes shared with other GDUs?

All hatchery steelhead are ad clipped.

**POPULATION SUBDIVISIONS**

*How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:

a. How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?
b. What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.
c. What is the total number of stocks within the same GDU as the stock under consideration?
d. What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?

The metapopulation structure for the hatchery winter steelhead is not diverse within the watershed.
MANAGEMENT GOALS

Harvest and Conservation

For each hatchery stock program, is the program goal conservation, harvest or both?

The program goal for steelhead is harvest.

Harvest

Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:

High – harvest opportunity each year, spread over seasons
Medium – opportunity most years, for some seasons
Low – occasional opportunity, single run
0 – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Opportunity</td>
<td>L</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

Conservation

What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.

The goal is to attain and then maintain a healthy hatchery stock.

Production

For hatchery programs, please summarize the production goals:

a. How many fish at what size are planned for release? Transferred off-station?

Plants: 273,000 @ 6 fpp from Marblemount/Barnaby into upper Skagit (above RM 68) in May
Plants: 172,000 @ 6 fpp below Skagit RM 68 in May at Grandy Creek and Fabors Ferry
Plant: 60,000 @ 6 fpp into Baker River in May (acclimation pond)
Plant: 30,000 @ 6 fpp from Davis Slough in lower Skagit in May (acclimation pond)
Total: 535,000 smolts

b. Where are eggs taken and incubated? Where are fish reared and released?

Skagit River winter steelhead are spawned at Marblemount and Barnaby Slough. Green eggs are shipped to Marblemount from fish spawned at Barnaby Slough. If needed, eggs or adults, from

48. Information supplied by Bob Hayman (SSC) and Pete Castle (WDFW)
hatchery fish trapped at the Baker River Trap, are shipped to Marblemount. Fingerlings are started at Marblemount and full-term reared at both Marblemount and Barnaby. Some smolts are released on station at both sites and some are trucked. The management goal is to plant 49% below river mile 68 and 51% above, in the upper river. This management scheme is designed to concentrate recreational fishing efforts in the lower and upper river reaches to minimize potential harassment of Bald Eagles which winter along the middle reaches of the Skagit River.

c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

The program is stable at this time. If the Grandy Creek facility is built a larger share of the lower river releases will be acclimated and imprinted at Grandy Creek at RM 45.5.

d. Is the duration of this program clearly defined?

The program duration is defined as ongoing.

Other Goals

Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.

Winter Steelhead support a valuable riverine recreational fishery.

Monitoring and Evaluation

Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.

Monitoring and evaluation methods include: fish tickets for monitoring catch; spawning surveys; smolt trapping; counting fish at Baker River trap; and estuarine surveys.

Goal Achievement

Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?

The tribal goal for hatchery winter steelhead is to harvest 5,000 adults commercially. This goal is not being achieved. However, because of the low price paid for steelhead, achieving this goal is not the priority it might otherwise be. The non-tribal goals are to have a self-sustaining hatchery run (400 adults return to a facility) and to harvest 5,000 adults annually. This equates to a 1% return on smolt releases.

Conflicts

Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?
Habitat condition prevents goals from being met; recommend removing dikes and adding trees to the upper watershed. Flood control measures hinder creek and estuarine conditions. Forest conservation goals are in conflict with salmon conservation goals.

**Incorporating Adaptive Management**

*Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?*

We cannot easily change our goals when we receive new information. Inertia exists. Further, supporting data in a timely fashion does not drive management.
CURRENT HATCHERY PROGRAMS

Skagit River Winter Steelhead – Marblemount Hatchery and Barnaby Slough

**FACILITY – MARBLEMOUNT HATCHERY**

*Description*

Describe the property location and ownership. Give the funding and operating organization names, approximate size of the property (acres), number of buildings, any unique attributes of the site worth noting.

Marblemount Hatchery handles winter steelhead. This facility has already been discussed in the hatchery spring chinook section. (See “Skagit Hatchery Spring Chinook – Marblemount Hatchery” Section of Skagit Region Spring Chinook, Current Hatchery Programs page 17)

**FACILITY – BARNABY SLOUGH**

*Description*

Describe the property location and ownership. Give the funding and operating organization names, approximate size of the property (acres), number of buildings, any unique attributes of the site worth noting.

Barnaby Slough rearing pond is located on Martin Ranch road about 3 miles from the town of Rockport. The land is owned by Seattle City Light and leased to WDFW. The outflow from the ponds enters the Skagit River about 1 mile above the bridge at the town of Rockport. Barnaby has one large rearing pond with a gravity water supply, two adult traps, and two small raceways used for steelhead production and five wells (three work). There is also a small egg incubation building not currently used. There is one residence on site. The State Wildlife Fund supports this facility.

*Primary Goal*

What is the primary goal of the facility? (Examples: conservation of Shirley creek summer chum because of degraded habitat, harvest augmentation of Michael River coho salmon primarily for north Puget Sound commercial fisheries, community education)

These fish support an intensive recreational fishery along the entire length of the Skagit River, below the system dams and a tribal net fishery in the lower river.

*Associated Stocks*

What stocks of fish are handled and/or reared at this facility?

Barnaby Slough rears Chambers stock, hatchery origin winter steelhead.

---

49. Information provided by Darrell Mills, Steve Stout, and Kevin Karris, WDFW
**Water Supply**

Describe the water supply, including the following components:


b. If surface water, is it fish- or specific-pathogen free? Do you experience problems with “dirty water” that limits your ability to reach your goals?

c. Surface water intake structures on station – are they screened or sited in a way that excludes fish or other animals from entering the water supply?

d. If you use surface water, is there adequate water in the by-pass reach throughout the year?

e. Are there unique physical characteristics of the water supply on site or nearby that you feel should be noted?

The water flow for Barnaby is taken from a surface water gravity intake at the head of the pond and from three working wells. (Two additional wells are sanded in and not used.) The combined flows are as much as 9 cfs. The surface water supply is a combination of spring and surface water run-off and is not pathogen or fish free. The available surface flows range from 6 to 9 cfs seasonally and are stable. The temperature ranges from the mid 30’s to low 50’s depending upon the season and weather. A water chemistry profile has not been done. The wells are used only to supplement the surface water and have not been used in over a year. Each may supply between 200 and 300 gpm and the water supply appears stable from the three working wells. We allow sufficient surface water to bypass the rearing pond intake to allow natural coho (adults and smolts, etc.) to freely pass the rearing pond.

**Pathogen Combatant Methods and History**

Describe the fish health/pathogen history, including the following components:

a. How often does a fish health professional visit your site?

b. What is the most significant fish health problem at your facility (this could be a fish pathogen, inability to correct a situation, poor water, etc.)?

c. Have you had any significant epizootics on your facility? Please explain. Were you able to isolate the affected containers? Sanitize the effluent?

d. Do you have a history of viral isolations at your facility in the past five years? This excludes epizootics as described above.

e. Do you disinfect equipment between rearing units or banks of ponds? What method do you use?

f. Are you able to keep distinct lots or stocks of fish physically separated? Please answer for each of these life stages – adults, eggs, and juveniles.

a. The area Fish Health Specialist is on-site at least once per month, and generally, every two to three weeks, and is available anytime a need is identified.

b. Fish are started at Marblemount are reared in a common pond and generally have no serious fish health problems.

c. There have not been any significant epizootics.

d. There have been no viral isolations in the past 5 years.

e. Equipment is disinfected by use of iodophor.
f. We are unable to keep fish separated as they are in one large pond. Adults are trapped below juveniles in pond outlet water.

Pollution Abatement

Describe the waste removal/pollution abatement system including the following components:

a. What is the general frequency of pond cleaning?
b. How is pond waste disposed of (vacuum, brush, dry and remove, etc.)?
c. Describe pollution abatement pond or settling pond, if one exists.
d. Status of permits for discharging pollutants?
e. Any particular challenges you would like to share on this subject?

a. Barnaby Slough is a semi-natural earthen rearing pond and cannot be materially cleaned between brood years.
b. Not Applicable
c. None.
d. Barnaby has a permit and is currently in compliance with NPDES discharge requirements.
e. None.

Education

Please give details regarding the following:

a. Is your facility open to the public?
b. Do you have signs, pamphlets, or other materials for the public to self-tour?
c. Do hatchery staff or others schedule and conduct tours of the facility?
d. Are there citizen involvement opportunities such as volunteer programs, student interns, etc?
e. Are hatchery operations visible to facility visitors?
f. Do other fish and wildlife programs use the facility?
g. Do you have regular involvement with community or school groups?
h. Do you give fish or eggs to educational groups? If so, please estimate the amount of time this activity takes.

a. Barnaby Slough is open to the public but has no interpretive center.
b. The site is not set up for self-guided tours.
c. Staff will conduct tours as time allows. Contact with the public is primarily staff interaction with local salmon and steelhead fishers.
d. Ditto Marblemount
e. Yes.
f. No
g. Marblemount Hatchery is the primary contact point.
h. No

General Administration

a. Does key staff have a good understanding of the facility goals, budget, and expenditures? If not, what tools do you need for correcting this?
b. Is new relevant information from research and other sources made available to hatchery staff and used for attaining goals?
c. As fish culture and other related scientific understanding evolves, are you able to make changes to your programs? If not, what ideas do you have for changing this?
d. Are there state or federal laws that constrain the program, such as numbers and size of smolts produced?

- The staff has a good understanding of the facility and goals but not the budget. New developments and research are shared with the crew primarily through Olympia, the Regional office staff or the Complex Manager.
- We believe we are kept abreast of specific and relevant information that we use to attain our goals.
- Believe so.
- Program size is set by WDFW biologists in agreement with the Skagit System Coop.

**Other Facility Issues**

a. What are your predator control methods/facilities (nets, wires, etc)? Do you have unresolved predator problems?
b. Describe how you inventory your fish (frequency, size of weight sample, etc.).
c. How do you keep your inventory and other data? (Hatpro, spreadsheets of your own, agency forms, etc.)
d. How do you decide which food to use (mandatory contract, fish health recommendations, etc.)?
e. How do you store your feed?
f. Does your facility have any habitat improvements on site (wetlands, riparian improvements, etc.)?

- The rearing pond is covered with netting to exclude avian predators. River Otters are a problem at times but we have no control mechanisms.
- Fingerlings are inventoried, by weight, when they are delivered from Marblemount. Fish are sub-sampled, by cast net, to determine weight samples and recalculate feed rates. Automatic counters are used to count out-migrants from the pond.
- Data is recorded on standardized WDFW forms as well as spreadsheets and forms created at Marblemount.
- Choices of feed fed are largely based upon past performance of program fish to test lots of feed.
- Feed is stored according to the manufacturers specific recommendation. It may be frozen or kept in a cool-dry place as required for best storage life.
- None.

**Facility Wish List and Other Comments**

a. What is the most-needed piece or pieces of equipment for your facility and why?
b. What capital improvements are most needed at your facility and why?
c. What do you think would be the most valuable use of your facility?
d. Is there anything else that we have not covered that you would like to add?

The facility and program need include:
1. New pond intake for rearing pond.
2. New otter-proof fence and better security fence.
3. Upgrade trap to facilitate sorting and wild coho passage (adults and fry)
4. Upgraded bird covers.

**STOCK INFORMATION**

**Broodstock**

**Broodstock Description**

*Describe the broodstock as follows: (These may be a repeat of some questions asked under stock status - you may refer to those answers or cut and paste.)*

a. How was the broodstock chosen?
b. Do you consider it an integrated (goal is to maintain a single gene pool and prevent divergence) or segregated (isolated in the hatchery, managed to restrict gene flow) population?
c. Does this broodstock have a history of reportable pathogens?
d. Are you able to collect representative samples each year of the population, with respect to size, age, sex ratio, and run and spawn timing? If not, please explain the limitation.

---

a. The broodstock is entirely of hatchery origin from adults returning to the Marblemount, Barnaby and occasionally Baker River.
b. The stock is of locally adapted Chambers Creek stock and is segregated from the wild population genetically and temporally.
c. There have been no reportable pathogens in this stock at this facility.
d. We are able to collect adults from the entire run and incorporate them into the program egg take.

**Broodstock Collection Process**

*Describe the broodstock collection process, including the following components. Differentiate by Natural Origin Recruit (NOR) and Hatchery Origin Recruit (HOR) if they are collected in a different manner:*

a. Describe/give the location of adult collection relative to the physical plant where fish are held or spawned?
b. Describe how fish are collected (ladder, sorter, trap, in river, etc.)
c. Do you have the ability to handle or sort individual fish? If so, please describe your process.
d. If you transport adults from one site to another, describe method of transport. Have you had problems with mortality from handling because of this?
e. If the fish enter the adult holding structure on their own, describe the process for handling and counting. Include details on how and when you pass fish upstream, and about your ability to do so.
f. In what type of container do you hold these adults? Is it covered? Do you use overhead sprinklers? Do you have a problem with predation?
g. Which water supply is used for this purpose?
h. Are you able to hold these fish within recommended guidelines for temperature, water flow, and density?
Skagit River Hatchery Winter Steelhead

Adult Handling

Please describe how you handle adults:

a. What is the method for choosing and mating your broodstock (include how many adults of each sex are used per mating)?
   i. What are the spawner selection protocols (e.g. random, size, ripeness, wild or hatchery origin)?
      ii. Record how the gametes are handled (pooling of milt and/or eggs? If so, how?). What is the mating scheme (e.g. 1:1, factorial, multiple pooling?)

b. Do you use anesthesia?

c. Describe the pathogen-sampling regime.

d. Describe mark sampling program, if any.

e. Is there any other biological sampling done on adults?

f. How do you dispose of spawning waste?

g. How do you dispose of pre-spawning mortalities?

h. How do you dispose of spawned adults?
a. Spawners are selected at random from the general population as they ripen and it is not possible to segregate fish by return timing. Only HORs are used. Gametes are pooled in 5 fish pools prior to mating. At Barnaby, eggs are spawned in 5 fish pools and shipped, in bags on ice, to Marblemount for fertilization.
b. All fish are clubbed prior to spawning.
c. If eggs remain within the basin then 60 fish are viral sampled in accordance with the fish health policy. If eggs are required for out of basin programs (seldom) they are 100% sampled.
d. All fish are checked for adipose marks and only clipped fish are spawned.
e. Not usually.
f. Down the drain.
g. Nutrient enhancement sites.
h. Spawned carcasses are used for nutrient enhancement if in poor condition or are distributed to local food banks. Surplus adults may be “recycled” into the lower Skagit River to re-enter the recreational fishery.

Incubation

Green Eggs
Please describe your method for putting down green eggs:
   a. Do you have adequate “clean” and “dirty” areas for handling eggs?
   b. Describe your water hardening procedure.
   c. Describe your green egg enumeration process.
   d. Where are these eggs incubated (What type of incubator, water supply used)?
   e. Do you incubate in single-family units? If you had the capacity, would that be desirable?
   f. How many eggs per incubation unit?
   g. What is the typical flow used?

At Marblemount the procedures are the same as for chinook and coho except eggs are incubated in pooled lots at about 8,000 eggs per tray. There would be no particular benefit to incubation in single-family units. Eggs are not incubated elsewhere in the basin.

Eyed Eggs
Please describe your methods for handling and putting down eyed eggs:
   a. How do you monitor egg development? (Temperature units, visual check, fish pathologist check, etc.)
   b. Have you had any chronic (or difficult to control) losses of eggs to the eyed stage? If so, please explain.
   c. How do you dispose of dead eggs?
   d. Do you disinfect eyed eggs prior to putting down to hatch?
   e. What type of container do you use for hatching?
   f. Do you use any type of substrate?
   g. What is your loading density? (eggs per unit)
At Marblemount the procedures are the same as for chinook and coho except there is no culling. Eggs are incubated at 9,000 per vertical tray section to hatch. Eggs are not incubated elsewhere in the basin.

**Other Issues**

**Other incubation questions:**

a. Is your water temperature regime similar to that in the natural environment?
b. Are eggs incubated under environmental conditions that tend to maximize individual fitness of fry? (e.g. allow volitional ponding of fry, incubate under environmental conditions that simulate the natural rearing environment)
c. Do you heat or cool your water during incubation? If so, please explain what you do and the purpose of the temperature manipulation.
d. Do you cull eggs during incubation for any purpose? (ELISA results, spawn timing, etc.)
e. Are excess eggs/fry culled randomly when necessary?
f. How do you deal with eggs in excess of your egg take needs?
g. Do fry have the ability to emerge volitionally?
h. If you have to remove fry from rearing units, how do you determine appropriate stage of development (Temperature units, visual check, pathologist check, etc.)?

---

a. The eggs are incubated and hatched on well water, which does not reflect the varying temperatures and conditions of local surface water.
b. Unknown.
c. In the future we hope to install heaters to allow acceleration of later egg takes to allow merging of egg takes which span wide egg take date differences.
d. No.
e. Rarely.
f. Surplus eggs are culled at the eyed egg stage by freezing. Surplus eggs may be buried on site.
g. No, they are forced ponded.
h. Fry are ponded when the yolk slit has closed.

**Rearing Conditions**

a. Explain what type of container this stock is rearing in from first ponding to release (size and types of each kind of rearing unit).
b. What water supply is used for rearing this stock (from first ponding to release)?
c. Are the rearing units covered?
d. Do you attempt to provide any type of “natural rearing” for this stock (cover, substrate, food, etc.)? Please describe.
e. How do you decide which fish to combine in a rearing unit (individual families, results of ELISA, size of fish, etc.)?
f. What do you use for keeping fish within recommended density and/or poundage targets (Flow Index, Density Index, pounds/gallon/minute, etc.)?
g. Are you typically able to stay at or below this guideline? If not, what are your limiting factors?
h. Are fish produced similar to natural fish in size, growth rate, morphology, behavior physiological status, health, etc.?
a. They are ponded by age group into either starter tanks in the hatchery building or into 10 x 100’ raceways outside. The Barnaby pond is an earthen pond (~ 1 acre) and provides a semi-natural rearing environment.
b. At Marblemount the fish are started on well water. Outside they are reared on Clark Creek water. The Barnaby Rearing Pond is supplied by a mix of spring and surface.
c. All outside ponds are covered.
d. There is no “natures” style structures in the ponds. The Barnaby rearing pond is an earthen pond. There is an earthen pond at Marblemount which may be used but the outlet structure needs work to make it secure.
e. Feed rates are adjusted somewhat to allow the merger of fish from the full range of egg takes to allow eventual rearing in common lots to assure that, as much as possible, both Marblemount and Barnaby Slough are rearing fish representative of the entire run. The fish shipped to Barnaby Slough in December are normally the smaller fish of the entire population. They are able to gain the needed growth because their water is warmer, on average, than Marblemount.
f. Due to the abundance of water and space available at both sites, program fish are reared at conservative loadings and densities, as compared to Piper, et. al. At both rearing sites flows and density are not limiting factors.
g. Yes. At both sites.
h. The yearling steelhead are larger and do not mimic the size or age of natural steelhead seen at the WDFW screw traps in place at RM 17 in the lower Skagit River.

Fish Health

a. Do you use any prophylactic treatments? If so, describe drug/chemical used, targeted pathogen, life stage treated, and method of delivery.
b. Do you vaccinate this stock? If so, for what pathogen and with what vaccine?
c. Are you able to remove and enumerate mortalities easily? If not, what are your limitations?
d. Is this stock sampled for pathogens at spawning?
e. Do you or your fish health specialist perform any fish health assessments on this stock? If so, what sort and at what frequency?
f. What is your most challenging fish health problem with this stock? If you could, what would you do to resolve the problem?

a. No.
b. No.
c. At Marblemount, yes, as long as the fish are in 10 x 100’ raceways. In larger ponds it is difficult. At Barnaby it is very difficult due to the size and depth of the pond.
d. Yes, routinely.
e. Yes, on a routine basis several times per month.
f. This stock can experience cold-temp disease particularly during early rearing.

Marking

a. Is this stock marked or tagged in any way prior to release? Please describe (numbers, replications, quality control).
b. What is the purpose of this mark or tag?
c. How many years has it been identified in this way?
d. Are there historic marks or tags we should know about?
a. All fish are adipose clipped in the summer of their first year.
b. They are marked to facilitate identification between hatchery and wild fish caught in recreational and other fisheries.
c. Over 20 years.
d. Unknown.

Release/Transfer

a. How is time of release decided?
b. How do you measure the size of fish at release (fish per pound, average length, other)?
c. What is the typical size range in millimeters of these fish at release? If you do not know the size range, what is average weight?
d. What other smolt quality monitoring do you perform, if any (fish pathologist checks, on-going research projects, smoltification indicators, etc.)?
e. Are fish released with adequate imprinting to facility or desired stream reach?
f. Describe your on-station release procedure for this stock (volitional vs. forced, time of day, typical date, length of time of release, etc.).
g. If you truck this stock off station, where do they go (acclimation pond, stream plant, transfer to another facility, etc.)?
h. Are you or others able to monitor the fish after they enter the river (snorkeling, smolt trapping downstream, etc.)?
i. Do you have any idea if these fish have interactions with other salmonids in the receiving environment? If so, what do you know?

Steelhead are generally planted between May 1 and May 15 in accordance with agency direction. Physical and behavioral cues are used to confirm smoltification.

All fish are weighed in fish/pound.

Fish average about 6 fish per pound at release.

See “a” above.

Fish are imprinted at 4 sites: two in the upper river and two in the lower. The rest are direct released at several lower river sites. The overall steelhead management for the Skagit River is for 51% of the fish to be released above RM 68 directly from Barnaby and Marblemount rearing ponds and the remaining 49% to be released below RM 68 from Davis Slough, the Baker Trap, Fabors' Ferry and into Grandy Creek or other sites. At the Davis Slough acclimation site (RM 40) approximately 30,000 fish are held for one month prior to release in May. An additional 60,000 or more steelhead are acclimated for about 3 weeks at the Baker River Trap site prior to release.

At Barnaby and Marblemount, steelhead are planted volitionally on station or are trucked, via fish tankers, to lower river release and/or acclimation sites. A majority of the hauled fish come from Barnaby because it is easier to load migrants into trucks there than at Marblemount. Most hauled fish are trapped as they volitionally exit the rearing ponds and are loaded onto tank trucks via boom net (at Barnaby) and by screen buckets (at Marblemount). All volitional releases are made on site at night.

See questions “e” and “f” above.

They exit the area quickly and are not monitored closely at the site.

The passage of these and other fish is monitored at a WDFW screw trap in the lower Skagit River.
Adult Migration

Migration of returning adults

a. Is the straying of hatchery fish into the wild controlled?
b. Is the attraction of wild fish into the hatchery minimized?

---

a. The only mechanism to limit hatchery fish from straying into the wild is imprinting and acclimating a portion of the releases at specific trap sites, and harvest that removes fish from the river.
b. The trap is normally shut down when a majority of wild steelhead are in the river.
Habitat Status^50

Habitat Rating

Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hatchery</td>
<td>Wild</td>
<td>Hatchery</td>
<td>Wild</td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>H</td>
<td>H</td>
<td>M</td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:

1. **High (H) = Healthy**: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.
2. **Medium (M) = Limiting**: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.
3. **Low (L) = Inadequate**: The target stock is unproductive and the population will go extinct, even without terminal harvest.

Habitat Condition/Habitat Improvement/Future Expectations/Additional Information

(Please refer to the Introduction section)

---

50. Provided by Brett Barkdull, WDFW
STOCK STATUS

TRENDS

Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.

No information exists for the Skagit River wild summer steelhead.

---

51. Information supplied by Pete Castle (WDFW), Bob Hayman (SSC), and Curt Kraemer (WDFW)
**AGE CLASS STRUCTURE**

What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

Wild steelhead have a broad age class structure. Generally adult returns are 50% 2-salt and 50% 3-salt.

**PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION**

Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

Management is based on hatchery fish not being a portion of naturally spawning fish. Biologists believe that hatchery origin fish comprise a portion of the natural spawning fish. There are stray summer chinook observed in the Skagit River.

**PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY**

For hatchery stocks- what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?

Not applicable.

**INDEX STOCK**

Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.

No.

**Biological Significance**

**STOCK ORIGIN**

Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?

a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or

b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been?)? or

c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or

d. Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? or

e. Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?
Wild summer steelhead are native. No stock transfers of wild fish have occurred. There has been hatchery summer stock straying into the Skagit watershed; these fish are managed to have a different run time. The fish managers suspect the strays are from the Stillaguamish and Snohomish systems.

**BIOLOGICAL ATTRIBUTES**

*Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.?) Use the following questions to guide your answer:*

- a. Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or
- b. Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or
- c. Are all known biological attributes shared with other GDUs?

The Skagit River wild summer steelhead belong to the North Puget Sound GDU. This is a small population and not much is known about it.

**POPULATION SUBDIVISIONS**

*How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:*

- a. How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?
- b. What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.
- c. What is the total number of stocks within the same GDU as the stock under consideration?
- d. What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?

The SASSI report lists three stocks of Skagit River wild summer steelhead: Finney Creek; Sauk; and Cascade.
MANAGEMENT GOALS\textsuperscript{52}

Harvest and Conservation

For each hatchery stock program, is the program goal conservation, harvest or both?

Not applicable.

**Harvest**

Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:

- **High** – harvest opportunity each year, spread over seasons
- **Medium** – opportunity most years, for some seasons
- **Low** – occasional opportunity, single run
- **0** – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Opportunity</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Conservation**

What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.

The goal is to attain and maintain a healthy stock.

**Production**

For hatchery programs, please summarize the production goals:

a. How many fish at what size are planned for release? Transferred off-station?

Not applicable.

b. Where are eggs taken and incubated? Where are fish reared and released?

Not applicable.

c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

Not applicable.

\textsuperscript{52} Information supplied by Bob Hayman (SSC), Pete Castle (WDFW), and Curt Kraemer (WDFW)
d. Is the duration of this program clearly defined?

Not applicable.

Other Goals

Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.

None mentioned

Monitoring and Evaluation

Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.

The only monitoring method for the Skagit River wild summer steelhead is the punch card that anglers fill out and return to WDFW.

Goal Achievement

Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?

Fish managers do not have a goal because they do not know how many of these fish are in the Skagit basin. Where these fish spawn is unknown. There is no assessment. Fish managers know the number is low because hardly any catch is reported on the punch cards for June (fishing season for wild summer steelhead).

Conflicts

Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?

Habitat condition prevents goals from being met; recommend removing dikes and adding trees to the upper watershed. Flood control measures hinder creek and estuarine conditions. Forest conservation goals are in conflict with salmon conservation goals.

Incorporating Adaptive Management

Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?

We cannot easily change our goals when we receive new information. Inertia exists. Further, supporting data in a timely fashion does not drive management.
Skagit River Sea-Run Cutthroat Trout

Habitat Status\textsuperscript{53}

Habitat Rating

Please fill out the table below for each stock using the general definitions provided:

<table>
<thead>
<tr>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hatchery</td>
<td>Wild</td>
<td>Hatchery</td>
<td>Wild</td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.\n
Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:

1. **High (H) = Healthy**: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.
2. **Medium (M) = Limiting**: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.
3. **Low (L) = Inadequate**: The target stock is unproductive and the population will go extinct, even without terminal harvest.

Habitat Condition/Habitat Improvement/Future Expectations/Additional Information

(Please refer to the Introduction section)

---

\textsuperscript{53} Provided by Brett Barkdoll, WDFW
**STOCK STATUS**

---

**TRENDS**

*Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.*

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival (%)</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>24.7</td>
<td></td>
<td>180</td>
</tr>
<tr>
<td>1995</td>
<td>46.5</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>1996</td>
<td>32.9</td>
<td></td>
<td>238</td>
</tr>
<tr>
<td>1997</td>
<td>24.9</td>
<td></td>
<td>57</td>
</tr>
<tr>
<td>1998</td>
<td>23.6</td>
<td></td>
<td>173</td>
</tr>
<tr>
<td>1999</td>
<td>27.6</td>
<td></td>
<td>150</td>
</tr>
<tr>
<td>2000</td>
<td>32</td>
<td></td>
<td>127</td>
</tr>
</tbody>
</table>

*Other than Kraemers sampling efforts (see above) there are no monitoring efforts for adult escapement. Steve Newhauser has cutthroat smolt counts from the Skagit screw trap.*

---

54. Information supplied by Pete Castle, Curt Kraemer, Mark Downen, and the Cutthroat SaSI.
**AGE CLASS STRUCTURE**

What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

All life-history forms of cutthroat are found within the Skagit Region.

**PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION**

Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

Hatchery origin fish do not comprise a portion of naturally spawning cutthroat trout. There are no hatchery cutthroat trout programs in the Skagit Region.

**PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY**

For hatchery stocks—what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?

Not applicable.

**INDEX STOCK**

Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.

No. There is not a similar index stock.

**Biological Significance**

**STOCK ORIGIN**

Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?

a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or

b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been)? or

c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or

d. Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? or

e. Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?
All Skagit Region cutthroat forms are considered native in origin, and production is wild. However, some stocking of west slope cutthroat did occur in alpine lakes within the Skagit watershed in past years and persistent populations of this exotic stock may still be found there.

**Biological Attributes**

*Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g., age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.?) Use the following questions to guide your answer:*

  a. Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or
  b. Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or
  c. Are all known biological attributes shared with other GDUs?

Skagit coastal cutthroat are identified as a separate stock complex based on the geographic distribution of their spawning grounds. The anadromous form is found in most mainstem and some tributary waters where passage to salt water is accessible. Stream population work done by Washington Department of Game (now WDFW) in 1977 and 1978 showed that anadromous cutthroat fry were most numerous in the lower tributaries of the Sauk River and the north bank tributaries below the Sauk. This distribution is consistent with angler data, where most cutthroat were caught below the mouth of the Sauk River. The anadromous form is an early-entry type, entering the mouth of Skagit River from July through November. Spawning occurs from January through April. The adfluvial cutthroat spawn from June to mid-August. Little is known about the saltwater movements of the anadromous form, but they are thought to distribute in Skagit Bay, along the shores of Camano and Hope islands and in Swinomish Slough.

**Population Subdivisions**

*How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:*

  a. How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?
  b. What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.
  c. What is the total number of stocks within the same GDU as the stock under consideration?
  d. What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?

Skagit cutthroat are represented by collections from a number of tributaries, including Alder, Red Cabin, Walker, Wiseman, Bulson, Lake and Parker creeks. Each of these collections is genetically distinct from the others and from all other Washington cutthroat collections.
MANAGEMENT GOALS

Harvest and Conservation

For each hatchery stock program, is the program goal conservation, harvest or both?

Not applicable. There is no hatchery cutthroat program in the Skagit Region.

Harvest

Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:

- High – harvest opportunity each year, spread over seasons
- Medium – opportunity most years, for some seasons
- Low – occasional opportunity, single run
- 0 – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Opportunity</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

Conservation

What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.

The goal is to maintain stable populations with diverse life histories and a component of multiple spawning fish.

Production

For hatchery programs, please summarize the production goals:

a. How many fish at what size are planned for release? Transferred off-station?

Not applicable

b. Where are eggs taken and incubated? Where are fish reared and released?

Not applicable

c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?

Not applicable

55. Information supplied by Mark Downen (WDFW), Bob Hayman (SSC) and Pete Castle (WDFW)
d. Is the duration of this program clearly defined?

Not applicable

Other Goals

Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.

Our primary goal is to sustain an annual fishery spread over seasons based entirely on natural production.

Monitoring and Evaluation

Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.

Monitoring and evaluation methods include: spawning surveys; smolt trapping; counting fish at Baker River trap; and estuarine surveys. Currently, we have only one limited index reach for spawning surveys. Incidental smolt trapping at the mainstem Skagit screw trap also provides limited information. However, no valid expansion factors currently exist to allow estimates of total anadromous production.

Goal Achievement

Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?

Current goals cannot be assessed based on available information.

Conflicts

Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?

Current management practices conflict with present goals due to lack on stock assessment information necessary for making informed management decisions. Habitat conditions create conflicts; recommend removing dikes and adding trees to the upper watershed. Flood control measures hinder creek and estuarine conditions. Forest conservation goals are in conflict with salmon conservation goals.

Incorporating Adaptive Management

Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?

We cannot easily change our goals when we receive new information.
Skagit River Dolly Varden/Bull Trout

Habitat Status

Habitat Rating

Please fill out the table below for each stock using the general definitions provided:

Upper Skagit Basin Dolly Varden/Bull Trout

<table>
<thead>
<tr>
<th></th>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat</td>
<td>Hatchery</td>
<td>Wild</td>
<td>Hatchery</td>
<td>Hatchery</td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Lower Skagit Basin Dolly Varden/Bull Trout

<table>
<thead>
<tr>
<th></th>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat</td>
<td>Hatchery</td>
<td>Wild</td>
<td>Hatchery</td>
<td>Wild</td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td>H</td>
<td>M</td>
<td>M</td>
<td>L</td>
</tr>
</tbody>
</table>

*The habitat ratings definitions below were NOT used. Many Skagit Region stocks have significant harvest but this does not mean that the habitat is in good shape.

Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assuming that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:

1. **High (H) = Healthy**: Productivity of the target stock is high and the population is capable of growth and supporting significant terminal harvest.
2. **Medium (M) = Limiting**: The target stock is productive enough for the population to sustain itself at a low level terminal harvest.
3. **Low (L) = Inadequate**: The target stock is unproductive and the population will go extinct, even without terminal harvest.

Habitat Condition/Habitat Improvement/Future Expectations/Additional Information

(Please refer to the Introduction section)
# Stock Status

## Trends

Fill out a table as completely as possible that resembles the template below. We will generate a general trend for this stock with this information.

<table>
<thead>
<tr>
<th>Year</th>
<th>Survival</th>
<th>Catch</th>
<th>Escapement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>145</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Dolly Varden Bull Trout**

![Graph showing survival, catch, and escapement trends over the years](graph.png)

---

57. Information provided by Pete Castle, Mark Downen and Bull Trout SaSl

---

Skagit River Dolly Varden/Bull Trout  Skagit Briefing Book, 5/20/02  181
**AGE CLASS STRUCTURE**

What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

Native char have a broad age class structure. Anadromous, fluvial, adfluvial, and resident char exist in the Skagit watershed and, in many cases, overlap geographically.

**PROPORTION OF HATCHERY ORIGIN FISH IN NATURAL POPULATION**

Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

Hatchery origin fish do not comprise a portion of natural spawning char. There are no hatchery char programs in the Skagit Region. However, hatchery fish of other salmonid species may occur on the spawning grounds during the same period as spawning char.

**PROPORTION OF POPULATION FROM WILD FISH OR ANOTHER HATCHERY**

For hatchery stocks- what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?

Not applicable.

**INDEX STOCK**

Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.

No. There is not a similar index stock.

**Biological Significance**

**STOCK ORIGIN**

Within each watershed, what is the history of introductions (e.g. stock transfers) hatchery fish releases, and hatchery fish strays from other watersheds?

a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? or
b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been?)? or
c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? or
d. Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? or
e. Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?
All native char stock and populations are native and are maintained by wild production. Eastern brook have been introduced in the past into a number of lakes as streams in the upper watershed but the potential for hybridization and associated impact of this practice is unknown. Hatchery rainbow trout were released into Baker Lake until this year, and kokanee stocking occurs in Shannon Reservoir. However, no evidence exists the interactions between these species occurs.

**BIOLOGICAL ATTRIBUTES**

*Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.)?* Use the following questions to guide your answer:

- **a.** Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or
- **b.** Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or
- **c.** Are all known biological attributes shared with other GDUs?

The Skagit River supports the largest natural population of Dolly Varden/bull trout in Puget Sound. These fish spawn in most, if not all, of the accessible upriver areas in the drainage.

Life histories of the Skagit stocks in areas accessible to anadromous and non-anadromous fish are complex. Spawning occurs in the upriver areas as water temperatures decrease to around 8°C (from September through mid-November). In many cases, fluvial, anadromous, and resident adults spawn in the same areas. After spawning, anadromous adults begin the downriver migration from late fall through winter. Anadromous individuals enter the estuary area in the spring. They remain in the estuary until early to mid-summer to begin the upriver spawning run again. Fluvial adults migrate similarly to mainstem river habitats. Anadromous char migrate as smolts in the spring, return to the lower river in the fall, overwinter in the lower river, then move to the estuary and Puget Sound in late winter and early spring (Curt Kraemer).

Many of the upper Skagit areas used for spawning by adults lie within either the North Cascades National Park boundary or within U.S. Forest Service boundaries designated as wilderness areas. These areas contain excellent habitat for spawning, incubation, and juvenile rearing.

**POPULATION SUBDIVISIONS**

*How diverse is the metapopulation structure within the watershed?* Use the following questions to guide your answer:

- **a.** How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?
- **b.** What genetic data exist for this stock? Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.
- **c.** What is the total number of stocks within the same GDU as the stock under consideration?
- **d.** What is the mean and range of viabilities (i.e. status) of the other stocks within the same GDU?
Field surveys combined with tagging individual fish identified three Skagit stocks: Baker Lake (now a reservoir), upper Skagit River (above Gorge Dam), and lower Skagit River and tributaries. This stock identification will undoubtedly change as more life history and genetic information becomes available. The status of the Baker Lake and Upper Skagit stocks is Unknown. The status of the lower Skagit stock is Healthy based upon historical escapement, spawning surveys, smolt trap counts, and tagging studies.
**Management Goals**

**Harvest and Conservation**

*For each hatchery stock program, is the program goal conservation, harvest or both?*

Not applicable

**Harvest**

*Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:*

- **High** – harvest opportunity each year, spread over seasons
- **Medium** – opportunity most years, for some seasons
- **Low** – occasional opportunity, single run
- **0** – no harvest opportunity

<table>
<thead>
<tr>
<th>Goals</th>
<th>Present</th>
<th>Short-Term</th>
<th>Long-Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest Opportunity</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

**Conservation**

*What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.*

Our goal is to maintain stable or increasing populations with diverse life histories.

**Production**

*For hatchery programs, please summarize the production goals:*

a. **How many fish at what size are planned for release? Transferred off-station?**

Not applicable

b. **Where are eggs taken and incubated? Where are fish reared and released?**

Not applicable

c. **Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?**

Not applicable

58. Information supplied by Mark Downen (WDFW), Bob Hayman (SSC), Pete Castle (WDFW) and Curt Kraemer (WDFW)
d. Is the duration of this program clearly defined?

Not applicable

Other Goals

Are there other goals for this stock that are important to the co-managers? Some examples include: use of a stock as an indicator for survival or fishery contribution, cultural importance to tribal members, educational programs, mitigation for lost habitat or access to spawning area, scientific research, etc.

Char is an ESA listed species. Skagit has a robust stock and one of the objectives could be to allow the Skagit to be a source for colonization in other systems. Char may also as an indicator species due to their trophic level, variable life history, longevity, and requirement for cold water spawning habitat.

Monitoring and Evaluation

Do you have a monitoring and evaluation program that is adequate to determine if the goals are being met? If so, please describe.

Monitoring and evaluation methods include: spawning surveys; smolt trapping; counting fish at Baker River trap; and estuarine surveys. We currently have one 4 mile index reach on the south fork of the Sauk River. While expansion of index reaches is underway, we cannot currently extrapolate trends in the Sauk to the Skagit Basin as a whole. Smolt trapping currently consists of incidental interception of juvenile char at the mainstem Skagit screw trap. However, we currently have no valid expansion factors over the range of environmental conditions with which to make estimates of total production of this life history form.

Goal Achievement

Are the current goals being achieved? What are the levels of achievements being realized for each of these goals?

Strong positive trends in the number of south fork Sauk spawners and smolts intercepted at the Skagit screw trap suggest goals are currently being met. However, confidence in this conclusion is questionable.

Conflicts

Is there a conflict between the present goals based upon current management practices or habitat conditions? If so, what adjustments or suggestions do you recommend (example: hatchery coho production vs. natural chum production)?

Habitat conditions create conflicts; recommend removing dikes and adding trees to the upper watershed. Flood control measures hinder creek and estuarine conditions. Forest conservation goals are in conflict with salmon conservation goals.
Incorporating Adaptive Management

*Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?*

We cannot easily change our goals when we receive new information. Inertia exists. Further, supporting data in a timely fashion does not drive management.
## Appendix – Additional Information on Baker Basin Stocks

### Baker Basin HSRG Questionnaire

By Gary Sprague  
24 February 2002

#### B. Status of the Habitat by Stock

Appropriate habitat or other agency policy staff should answer the following questions for each hatchery and naturally spawning stock:

1. **Please fill out the table below for each stock using the general definitions provided:**

<table>
<thead>
<tr>
<th>Stock Name</th>
<th>Spawning Habitat</th>
<th>Freshwater Rearing Habitat</th>
<th>Migration Habitat</th>
<th>Estuarine Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hatchery</td>
<td>Wild</td>
<td>Hatchery</td>
<td>Wild</td>
</tr>
<tr>
<td>Rating (H/M/L)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Baker River Sockeye</strong></td>
<td>M</td>
<td>L</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td><strong>Skagit coho in the Baker Basin (former Baker stock likely extinct)</strong></td>
<td>L</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td><strong>Skagit Chinook in the Baker Basin</strong></td>
<td>none</td>
<td>L</td>
<td>Hatchery</td>
<td>L</td>
</tr>
</tbody>
</table>

Appendix
Three categories of habitat are defined in terms of conditions that support the target stocks, with the assumption that these conditions would also provide for the needs of other native stocks of salmonids (assume that pre-terminal harvest is part of the environment during the fish’s whole life cycle).

These habitat ratings are:

a. High (H) = Healthy: Productivity of the target stocks is high and the population is capable of growth and supporting significant terminal harvest.

b. Medium (M) = Limiting: The target stocks is productive enough for the population to sustain itself at a low level terminal harvest.

c. Low (L) = Inadequate: The target stocks is unproductive and the population will go extinct, even without terminal harvest.

2. Are there exceptions or “islands” of habitat that are in better or worse condition and do not correspond with the rating given in question?

Yes. In the Baker Basin the primary problem for coho and sockeye is downstream migration. Current, evaluations of Baker coho indicate that 55 percent migrate downstream from Baker Lake and only 25 percent migrate from Lake Shannon. These numbers are probably somewhat lower than what actually migrates out, due to differential mortality from handling, and possibly from the “trout” fishery. Sockeye are also limited by spawning habitat. Sockeye are affected by the dropping of the reservoir after spawning. All species are probably impacted by the high level of wandering of the Baker River, in the area above Baker Lake.

For Chinook there is the additional problem of migrating through the reservoirs and very limited spawning habitat.

Chum and Pink salmon are not currently passed into Baker Lake, due to observed low production.

3. What habitat improvement projects could elevate the rating for this sub-region or the “islands” of inferior production? If so, please list them and indicate if they are in the proposed or planning stages.

Improved fish passage (including for steelhead kelts). It is currently unclear where all of the problems for downstream migrating fish occur. Some studies are likely to occur in 2002. Full screening of the powerhouse intakes, with auxiliary facilities when the powerhouse isn’t in operation. Current construction cost estimates for full screening are: Lower Baker Dam $48,623,000 – 104,193,000, and at Upper Baker Dam $51,000,000 – 108,000,000. Puget Sound Energy has stated that expenses at this level are unacceptable. The have proposed less costly alternatives.

Reservoir level
Baker Lake is operated for flood control as well as power generation. Reduction of reservoir fluctuation would likely reduce impacts to fish. Uncertainty with this is based on the unknown frequency of spill and its impacts on fish. This is likely to be expensive because of revenue lost from power generation and flooding impacts.

Minimum Flows

Ramping Rates
Riparian impacts

4. Do you see the quality of the habitat in this region become better or worse in the next ten to twelve years? Fifty years? What are the long-term goals for habitat in this sub-region?

Some improvements are expected with relicensing of the Baker River Hydroelectric Project, but there are many unknowns associated with the relicensing. The habitat is likely to remain the same for 40 to 100 years.

5. What other habitat information should the Scientific Group consider (for example, salmonid or non-salmonid stocks not native to the watershed)? Please describe.

Baker Sockeye
Very little stocking of outside sockeye into the Baker has occurred in the last 100 years. The risks associated with sand entering the water supply for Sockeye Spawning Beach No. 4 should be considered. The risks associated with total reliance upon artificial measures for continued survival of the stock (e.g. problems that could impact a whole brood year, or all smolts in a year).

Skagit Steelhead in the Baker Basin
Downstream migration for Steelhead kelts is necessary. Currently, there is no method to collect kelts.
C. Status of the Salmonid Stocks

Appropriate management or other agency policy staff should answer the following questions for each hatchery and naturally spawning stock:

I. Trends

This information is available going back to 1896 for sockeye, and to 1926 for coho, chinook, chum, pink, and steelhead (there may be some problems with the steelhead data). The sockeye table below hasn’t been completed since 1997, and doesn’t include sport harvest of adult sockeye or harvest of smolts. I don’t currently have access to harvest numbers. It is not clear if your template is requesting brood year data, or return year data. Survival for species that return over multiple years must be calculated on a brood year basis, or smolt year basis, NOT on a return year basis. Also the survival should be calculated separately for hatchery groups and wild groups. For Baker sockeye data has been collected since 1991 to identify age at return, and some data was collected in 1939 – 1941. For coho there is survival information for the “wild” Baker Lake coho for a number of years, and there is some data for the net pen coho. This coho information is based on coded wire tags.

Sockeye
Data used for Runsize Histogram (Return not spawning population)
Gary Sprague - WDFW
February 13, 1997 (w/ March 2001, Feb. 2002 updates)

<table>
<thead>
<tr>
<th>Year</th>
<th>Hatchery Trap No.</th>
<th>Hatchery Trap Estimated Number</th>
<th>Dam Trap Number</th>
<th>Harvest (Commercial and C&amp;S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>4,942</td>
<td></td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>10,384</td>
<td></td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>4,628</td>
<td></td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>11,042</td>
<td></td>
<td>2,145</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>6,446</td>
<td></td>
<td>653</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>7,417</td>
<td></td>
<td>352</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>2,155</td>
<td></td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>15,991</td>
<td></td>
<td>311</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>3,811</td>
<td></td>
<td>318</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>2,423</td>
<td></td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>480</td>
<td></td>
<td>196</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Release</td>
<td>Returns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>---------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>1,976</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>536</td>
<td>229</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>818</td>
<td>61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>683</td>
<td>446</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>547</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>99</td>
<td>57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>358</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td>735</td>
<td>172</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>1,869</td>
<td>277</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>208</td>
<td>245</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>499</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td>865</td>
<td>528</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>2,716</td>
<td>656</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>1,707</td>
<td>385</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td>1,518</td>
<td>651</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td>1,303</td>
<td>626</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>3,611</td>
<td>1,065</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1973</td>
<td>3,656</td>
<td>1,107</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td>10,031</td>
<td>641</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>2,931</td>
<td>793</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>821</td>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td>1,295</td>
<td>306</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1968</td>
<td>3,022</td>
<td>448</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1967</td>
<td>4,121</td>
<td>745</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1966</td>
<td>468</td>
<td>61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1965</td>
<td>774</td>
<td>286</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1964</td>
<td>2,242</td>
<td>776</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1963</td>
<td>8,241</td>
<td>3,940</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Count 1</td>
<td>Count 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>---------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1962</td>
<td>3,449</td>
<td>1,281</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1961</td>
<td>450</td>
<td>299</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>1,258</td>
<td>577</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1959</td>
<td>1,911</td>
<td>602</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1958</td>
<td>2,692</td>
<td>902</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1957</td>
<td>1,177</td>
<td>444</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1956</td>
<td>1,070</td>
<td>544</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1955</td>
<td>1,076</td>
<td>1,768</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1954</td>
<td>2,046</td>
<td>2,403</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1953</td>
<td>3,091</td>
<td>2,019</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1952</td>
<td>3,401</td>
<td>1,255</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1951</td>
<td>3,705</td>
<td>764</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>2,416</td>
<td>813</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1949</td>
<td>3,494</td>
<td>2,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1948</td>
<td>4,610</td>
<td>700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1947</td>
<td>1,980</td>
<td>300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1946</td>
<td>4,892</td>
<td>1,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1945</td>
<td>2,737</td>
<td>900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1944</td>
<td>2,678</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1943</td>
<td>2,435</td>
<td>200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1942</td>
<td>6,894</td>
<td>800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1941</td>
<td>5,937</td>
<td>1,800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1940</td>
<td>5,266</td>
<td>2,700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1939</td>
<td>5,775</td>
<td>1,700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1938</td>
<td>2,857</td>
<td>1,100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1937</td>
<td>3,510</td>
<td>800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1936</td>
<td>3,990</td>
<td>1,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Quantity 1</td>
<td>Quantity 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
<td>------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1935</td>
<td>3,524</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1934</td>
<td>1,276</td>
<td>2,700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1933</td>
<td>660</td>
<td>1,700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1932</td>
<td>1,186</td>
<td>3,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1931</td>
<td>1,703</td>
<td>4,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>1,036</td>
<td>2,600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1929</td>
<td>1,379</td>
<td>3,900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1928</td>
<td>2,121</td>
<td>1,900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1927</td>
<td>4,149</td>
<td>1,600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1926</td>
<td>3,578</td>
<td>1,700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1925</td>
<td>40</td>
<td>9,000</td>
<td>6,300</td>
<td></td>
</tr>
<tr>
<td>1924</td>
<td>14,558</td>
<td>1,800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1923</td>
<td>5,408</td>
<td>3,200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1922</td>
<td>7,080</td>
<td>1,100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1921</td>
<td>7,075</td>
<td>6,200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1920</td>
<td>7,850</td>
<td>9,300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1919</td>
<td>7,800</td>
<td>8,200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1918</td>
<td>3,965</td>
<td>3,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1917</td>
<td>3,510</td>
<td>4,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1916</td>
<td>5,091</td>
<td>6,400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1915</td>
<td>2,334</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1914</td>
<td>6,163</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1913</td>
<td>1,289</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1912</td>
<td>6,440</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1911</td>
<td>4,828</td>
<td>1,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1910</td>
<td>4,452</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1909</td>
<td>3,519</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1908</td>
<td>6,048</td>
<td>2,500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Chapter One The Baker River System as Fish Habitat

Adult Salmonid Returns to the Baker River Trap between 1926 and 1999.

<table>
<thead>
<tr>
<th>Year</th>
<th>Sockeye</th>
<th>Coho</th>
<th>Chinook</th>
<th>Steelhead</th>
<th>Pink</th>
<th>Chum</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926</td>
<td>3,492</td>
<td>8,560</td>
<td>279</td>
<td>12,331</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1927</td>
<td>4,150</td>
<td>12,610</td>
<td>721</td>
<td>17,481</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1928</td>
<td>2,119</td>
<td>187</td>
<td>40</td>
<td>2,346</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1929</td>
<td>1,379</td>
<td>5,888</td>
<td>95</td>
<td>830</td>
<td>6</td>
<td>8,198</td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>1,032</td>
<td>16,267</td>
<td>56</td>
<td>335</td>
<td>17</td>
<td>6,790</td>
<td></td>
</tr>
<tr>
<td>1931</td>
<td>1,710</td>
<td>2,076</td>
<td>26</td>
<td>166</td>
<td>20</td>
<td>3,998</td>
<td></td>
</tr>
<tr>
<td>1932</td>
<td>1,180</td>
<td>7,076</td>
<td>17</td>
<td>8,273</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1933</td>
<td>666</td>
<td>2,062</td>
<td>23</td>
<td>10</td>
<td>13</td>
<td>2,774</td>
<td></td>
</tr>
<tr>
<td>1934</td>
<td>1,284</td>
<td>3,786</td>
<td>31</td>
<td>20</td>
<td>5</td>
<td>5,121</td>
<td></td>
</tr>
<tr>
<td>1935</td>
<td>3,522</td>
<td>19,637</td>
<td>32</td>
<td>133</td>
<td>54</td>
<td>23,378</td>
<td></td>
</tr>
<tr>
<td>1936</td>
<td>3,982</td>
<td>10,082</td>
<td>11</td>
<td>19</td>
<td>1</td>
<td>14,096</td>
<td></td>
</tr>
<tr>
<td>1937</td>
<td>3,510</td>
<td>3,888</td>
<td>13</td>
<td>9</td>
<td>7</td>
<td>7,420</td>
<td></td>
</tr>
<tr>
<td>1938</td>
<td>2,846</td>
<td>14,733</td>
<td>23</td>
<td>17</td>
<td>602</td>
<td>17,602</td>
<td></td>
</tr>
<tr>
<td>1939</td>
<td>5,775</td>
<td>7,885</td>
<td>17</td>
<td>49</td>
<td>180</td>
<td>13,906</td>
<td></td>
</tr>
<tr>
<td>1940</td>
<td>5,166</td>
<td>5,343</td>
<td>5</td>
<td>63</td>
<td>10</td>
<td>11,577</td>
<td></td>
</tr>
<tr>
<td>1941</td>
<td>5,937</td>
<td>5,501</td>
<td>20</td>
<td>45</td>
<td>164</td>
<td>11,667</td>
<td></td>
</tr>
<tr>
<td>1942</td>
<td>6,894</td>
<td>6,721</td>
<td>8</td>
<td>26</td>
<td>1</td>
<td>13,650</td>
<td></td>
</tr>
<tr>
<td>1943</td>
<td>2,435</td>
<td>4,723</td>
<td>12</td>
<td>10</td>
<td>309</td>
<td>7,489</td>
<td></td>
</tr>
<tr>
<td>1944</td>
<td>2,688</td>
<td>9,741</td>
<td>38</td>
<td>73</td>
<td>7</td>
<td>12,547</td>
<td></td>
</tr>
<tr>
<td>1945</td>
<td>2,737</td>
<td>14,372</td>
<td>83</td>
<td>27</td>
<td>900</td>
<td>18,119</td>
<td></td>
</tr>
<tr>
<td>1946</td>
<td>4,892</td>
<td>7,431</td>
<td>19</td>
<td>50</td>
<td>12</td>
<td>13,392</td>
<td></td>
</tr>
<tr>
<td>1947</td>
<td>1,980</td>
<td>8,255</td>
<td>91</td>
<td>97</td>
<td>2,945</td>
<td>13,368</td>
<td></td>
</tr>
<tr>
<td>1948</td>
<td>4,610</td>
<td>9,778</td>
<td>4</td>
<td>25</td>
<td>29</td>
<td>14,446</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>stocked</td>
<td>tags</td>
<td>fatality</td>
<td>egged</td>
<td>condition</td>
<td>total</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>------</td>
<td>----------</td>
<td>-------</td>
<td>-----------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>1949</td>
<td>3,494</td>
<td>6,774</td>
<td>13</td>
<td>32</td>
<td>71</td>
<td>10,384</td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td>2,416</td>
<td>14,209</td>
<td>16</td>
<td>29</td>
<td>5</td>
<td>16,675</td>
<td></td>
</tr>
<tr>
<td>1951</td>
<td>3,705</td>
<td>10,529</td>
<td>26</td>
<td>112</td>
<td>272</td>
<td>14,644</td>
<td></td>
</tr>
<tr>
<td>1952</td>
<td>3,401</td>
<td>11,542</td>
<td>7</td>
<td>30</td>
<td>14,980</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1953</td>
<td>3,091</td>
<td>5,638</td>
<td>7</td>
<td>10</td>
<td>38</td>
<td>8,784</td>
<td></td>
</tr>
<tr>
<td>1954</td>
<td>2,046</td>
<td>5,151</td>
<td>3</td>
<td>64</td>
<td>7,264</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1955</td>
<td>1,076</td>
<td>5,513</td>
<td>1</td>
<td>13</td>
<td>16</td>
<td>6,619</td>
<td></td>
</tr>
<tr>
<td>1956</td>
<td>1,707</td>
<td>4,473</td>
<td>4</td>
<td>28</td>
<td>5</td>
<td>5,575</td>
<td></td>
</tr>
<tr>
<td>1957</td>
<td>1,177</td>
<td>5,264</td>
<td>24</td>
<td>38</td>
<td>11</td>
<td>6,608</td>
<td></td>
</tr>
<tr>
<td>1958</td>
<td>2,692</td>
<td>12,854</td>
<td>130</td>
<td>9</td>
<td>7</td>
<td>15,692</td>
<td></td>
</tr>
<tr>
<td>1959</td>
<td>1,911</td>
<td>7,245</td>
<td>236</td>
<td>22</td>
<td>11</td>
<td>9,425</td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td>1,258</td>
<td>5,955</td>
<td>354</td>
<td>41</td>
<td>7</td>
<td>8,784</td>
<td></td>
</tr>
<tr>
<td>1961</td>
<td>3,449</td>
<td>26,549</td>
<td>150</td>
<td>120</td>
<td>1</td>
<td>30,269</td>
<td></td>
</tr>
<tr>
<td>1962</td>
<td>8,241</td>
<td>11,023</td>
<td>251</td>
<td>30</td>
<td>5</td>
<td>13,551</td>
<td></td>
</tr>
<tr>
<td>1963</td>
<td>774</td>
<td>4,106</td>
<td>863</td>
<td>93</td>
<td>1,701</td>
<td>7,537</td>
<td></td>
</tr>
<tr>
<td>1964</td>
<td>468</td>
<td>4,706</td>
<td>1,033</td>
<td>457</td>
<td>1</td>
<td>6,665</td>
<td></td>
</tr>
<tr>
<td>1965</td>
<td>1,070</td>
<td>4,473</td>
<td>4</td>
<td>28</td>
<td>5</td>
<td>5,575</td>
<td></td>
</tr>
<tr>
<td>1966</td>
<td>1,076</td>
<td>5,513</td>
<td>1</td>
<td>13</td>
<td>16</td>
<td>6,619</td>
<td></td>
</tr>
<tr>
<td>1967</td>
<td>1,177</td>
<td>5,264</td>
<td>24</td>
<td>38</td>
<td>11</td>
<td>6,608</td>
<td></td>
</tr>
<tr>
<td>1968</td>
<td>2,692</td>
<td>12,854</td>
<td>130</td>
<td>9</td>
<td>7</td>
<td>15,692</td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td>1,911</td>
<td>7,245</td>
<td>236</td>
<td>22</td>
<td>11</td>
<td>9,425</td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>1,258</td>
<td>5,955</td>
<td>354</td>
<td>41</td>
<td>7</td>
<td>8,784</td>
<td></td>
</tr>
<tr>
<td>1971</td>
<td>3,449</td>
<td>26,549</td>
<td>150</td>
<td>120</td>
<td>1</td>
<td>30,269</td>
<td></td>
</tr>
<tr>
<td>1972</td>
<td>8,241</td>
<td>11,023</td>
<td>251</td>
<td>30</td>
<td>5</td>
<td>13,551</td>
<td></td>
</tr>
<tr>
<td>1973</td>
<td>774</td>
<td>4,106</td>
<td>863</td>
<td>93</td>
<td>1,701</td>
<td>7,537</td>
<td></td>
</tr>
<tr>
<td>1974</td>
<td>468</td>
<td>4,706</td>
<td>1,033</td>
<td>457</td>
<td>1</td>
<td>6,665</td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td>1,070</td>
<td>4,473</td>
<td>4</td>
<td>28</td>
<td>5</td>
<td>5,575</td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td>1,177</td>
<td>5,264</td>
<td>24</td>
<td>38</td>
<td>11</td>
<td>6,608</td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>2,692</td>
<td>12,854</td>
<td>130</td>
<td>9</td>
<td>7</td>
<td>15,692</td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>1,911</td>
<td>7,245</td>
<td>236</td>
<td>22</td>
<td>11</td>
<td>9,425</td>
<td></td>
</tr>
<tr>
<td>1979</td>
<td>1,258</td>
<td>5,955</td>
<td>354</td>
<td>41</td>
<td>7</td>
<td>8,784</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>3,449</td>
<td>26,549</td>
<td>150</td>
<td>120</td>
<td>1</td>
<td>30,269</td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>8,241</td>
<td>11,023</td>
<td>251</td>
<td>30</td>
<td>5</td>
<td>13,551</td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>774</td>
<td>4,106</td>
<td>863</td>
<td>93</td>
<td>1,701</td>
<td>7,537</td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td>468</td>
<td>4,706</td>
<td>1,033</td>
<td>457</td>
<td>1</td>
<td>6,665</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>1,070</td>
<td>4,473</td>
<td>4</td>
<td>28</td>
<td>5</td>
<td>5,575</td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>1,177</td>
<td>5,264</td>
<td>24</td>
<td>38</td>
<td>11</td>
<td>6,608</td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>2,692</td>
<td>12,854</td>
<td>130</td>
<td>9</td>
<td>7</td>
<td>15,692</td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>1,911</td>
<td>7,245</td>
<td>236</td>
<td>22</td>
<td>11</td>
<td>9,425</td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>1,258</td>
<td>5,955</td>
<td>354</td>
<td>41</td>
<td>7</td>
<td>8,784</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>3,449</td>
<td>26,549</td>
<td>150</td>
<td>120</td>
<td>1</td>
<td>30,269</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>8,241</td>
<td>11,023</td>
<td>251</td>
<td>30</td>
<td>5</td>
<td>13,551</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>774</td>
<td>4,106</td>
<td>863</td>
<td>93</td>
<td>1,701</td>
<td>7,537</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>468</td>
<td>4,706</td>
<td>1,033</td>
<td>457</td>
<td>1</td>
<td>6,665</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>1,070</td>
<td>4,473</td>
<td>4</td>
<td>28</td>
<td>5</td>
<td>5,575</td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>1,177</td>
<td>5,264</td>
<td>24</td>
<td>38</td>
<td>11</td>
<td>6,608</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>2,692</td>
<td>12,854</td>
<td>130</td>
<td>9</td>
<td>7</td>
<td>15,692</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>1,911</td>
<td>7,245</td>
<td>236</td>
<td>22</td>
<td>11</td>
<td>9,425</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>1,258</td>
<td>5,955</td>
<td>354</td>
<td>41</td>
<td>7</td>
<td>8,784</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>3,449</td>
<td>26,549</td>
<td>150</td>
<td>120</td>
<td>1</td>
<td>30,269</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>8,241</td>
<td>11,023</td>
<td>251</td>
<td>30</td>
<td>5</td>
<td>13,551</td>
<td></td>
</tr>
</tbody>
</table>

**Average**

*(1926-99)*

2,979 6,064 219 166 344 28
Baker Lake Sockeye Annual Runs and Egg Collections.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Sockeye</th>
<th>Salmon Caught at Baker Lake</th>
<th>Number of Eggs Collected</th>
<th>Number of Eggs Shipped to Other Stations and Countries</th>
<th>Holding Loss of Fish</th>
<th>Enclosure to Spawning Time</th>
<th>Put Over Baker River Dam</th>
</tr>
</thead>
<tbody>
<tr>
<td>1896</td>
<td>No Record</td>
<td>6,500,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1897</td>
<td>No Record</td>
<td>7,500,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1898</td>
<td>No Record</td>
<td>No Record</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1899</td>
<td>No Record</td>
<td>No Record</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1900</td>
<td>No Record</td>
<td>No Record</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1901</td>
<td>No Record</td>
<td>No Record</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1902</td>
<td>No Record</td>
<td>No Record</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1903</td>
<td>No Record</td>
<td>4,226,500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1904</td>
<td>5,489</td>
<td>8,069,200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1905</td>
<td>3,241</td>
<td>3,569,220</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1906</td>
<td>No Record</td>
<td>4,444,035</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1907</td>
<td>No Record</td>
<td>9,079,955 150,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1908</td>
<td>6,048</td>
<td>6,565,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1909</td>
<td>No Record</td>
<td>4,692,020 100,300</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1910</td>
<td>No Record</td>
<td>5,935,030</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1911</td>
<td>4,828</td>
<td>5,562,000</td>
<td></td>
<td></td>
<td>50,000</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td>1912</td>
<td>No Record</td>
<td>8,585,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1913</td>
<td>No Record</td>
<td>1,719,000 100,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1914</td>
<td>No Record</td>
<td>8,215,900 237,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1915</td>
<td>No Record</td>
<td>3,111,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1916</td>
<td>5,091</td>
<td>5,445,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1917</td>
<td>3,510</td>
<td>5,250,000 50,000 132</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1918</td>
<td>3,965</td>
<td>6,900,000 100 females</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1919</td>
<td>7,800</td>
<td>11,150,000 170</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1920</td>
<td>7,850</td>
<td>11,750,000 100,000 50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1921</td>
<td>7,075</td>
<td>10,275,000 75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1922</td>
<td>7,080</td>
<td>11,040,000 25,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1923</td>
<td>5,408</td>
<td>8,135,000 200,000 54</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Unmarked</td>
<td>Marked</td>
<td>Unmarked</td>
<td>Marked</td>
<td>Chinook</td>
<td>Steelhead</td>
<td>Other</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>--------</td>
<td>----------</td>
<td>--------</td>
<td>---------</td>
<td>-----------</td>
<td>-------</td>
</tr>
<tr>
<td>1987</td>
<td>3,293</td>
<td>4,672</td>
<td>71</td>
<td>--</td>
<td>690</td>
<td>93</td>
<td>9</td>
</tr>
<tr>
<td>1988</td>
<td>26,511</td>
<td>19,630</td>
<td>9,618</td>
<td>--</td>
<td>3,266</td>
<td>809</td>
<td>21</td>
</tr>
<tr>
<td>1989</td>
<td>36,571</td>
<td>42,110</td>
<td>6,346</td>
<td>--</td>
<td>1,562</td>
<td>16</td>
<td>87</td>
</tr>
<tr>
<td>1990</td>
<td>19,261</td>
<td>22,426</td>
<td>24,102</td>
<td>--</td>
<td>277</td>
<td>15</td>
<td>66</td>
</tr>
<tr>
<td>1991</td>
<td>26,895</td>
<td>2,493</td>
<td>9,658</td>
<td>--</td>
<td>752</td>
<td>21</td>
<td>40</td>
</tr>
<tr>
<td>1992</td>
<td>37,177</td>
<td>2,493</td>
<td>9,658</td>
<td>--</td>
<td>752</td>
<td>21</td>
<td>40</td>
</tr>
<tr>
<td>1993</td>
<td>30,024</td>
<td>2,825</td>
<td>24,470</td>
<td>647</td>
<td>3,618</td>
<td>306</td>
<td>27</td>
</tr>
<tr>
<td>1994</td>
<td>52,684</td>
<td>7,923</td>
<td>146,080</td>
<td>981</td>
<td>693</td>
<td>95</td>
<td>211</td>
</tr>
<tr>
<td>1995</td>
<td>33,637</td>
<td>6,124</td>
<td>150,286</td>
<td>981</td>
<td>693</td>
<td>95</td>
<td>211</td>
</tr>
<tr>
<td>1996</td>
<td>44,267</td>
<td>4,341</td>
<td>167,370</td>
<td>429</td>
<td>538</td>
<td>38</td>
<td>216</td>
</tr>
<tr>
<td>1997</td>
<td>38,499</td>
<td>5,120</td>
<td>105,670</td>
<td>659</td>
<td>342</td>
<td>31</td>
<td>150</td>
</tr>
<tr>
<td>1998</td>
<td>51,997</td>
<td>11,429</td>
<td>48,789</td>
<td>716</td>
<td>346</td>
<td>44</td>
<td>113</td>
</tr>
<tr>
<td>1999</td>
<td>25,827</td>
<td>7,251</td>
<td>173,882</td>
<td>9,868</td>
<td>491</td>
<td>938</td>
<td>47</td>
</tr>
</tbody>
</table>

Source: Puget juvenile trap records


<table>
<thead>
<tr>
<th>Year</th>
<th>Unmarked</th>
<th>Marked</th>
<th>Unmarked</th>
<th>Marked</th>
<th>Chinook</th>
<th>Steelhead</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>8/1</td>
<td>214</td>
<td>48</td>
<td>3</td>
<td>7</td>
<td>9</td>
<td>2</td>
<td>283</td>
</tr>
<tr>
<td>1990</td>
<td>7/23</td>
<td>616</td>
<td>148</td>
<td>346</td>
<td>0</td>
<td>163</td>
<td>4</td>
<td>1,277</td>
</tr>
</tbody>
</table>

Source: Puget juvenile trap records

*To September 26, 1945*

Baker River Sockeye Spawning Beach Production, 1957 through 1998 Brood Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Number Spawned</th>
<th>Production</th>
<th>Survival</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1957</td>
<td>1</td>
<td>24,720,000</td>
<td>30.2%</td>
<td>21,742,000</td>
</tr>
<tr>
<td>1959</td>
<td>2</td>
<td>678,000</td>
<td>61%</td>
<td>1,235,130</td>
</tr>
<tr>
<td>1960</td>
<td>2</td>
<td>620,000</td>
<td>73%</td>
<td>1,358,355</td>
</tr>
<tr>
<td>1961</td>
<td>2</td>
<td>246,000</td>
<td>74%</td>
<td>545,357</td>
</tr>
<tr>
<td>1962</td>
<td>1</td>
<td>100,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1962</td>
<td>2</td>
<td>509,000</td>
<td>63%</td>
<td>960,608</td>
</tr>
<tr>
<td>1963</td>
<td>2</td>
<td>692,000</td>
<td>81%</td>
<td>1,169,065</td>
</tr>
<tr>
<td>1964</td>
<td>2</td>
<td>246,000</td>
<td>72%</td>
<td>1,105,177</td>
</tr>
<tr>
<td>1965</td>
<td>2</td>
<td>250,000</td>
<td>69%</td>
<td>519,951</td>
</tr>
<tr>
<td>1966</td>
<td>2</td>
<td>241,000</td>
<td>80%</td>
<td>575,670</td>
</tr>
<tr>
<td>1967</td>
<td>2</td>
<td>496,000</td>
<td>45%</td>
<td>671,225</td>
</tr>
<tr>
<td>1968</td>
<td>2</td>
<td>474,000</td>
<td>53%</td>
<td>757,443</td>
</tr>
<tr>
<td>1969</td>
<td>2</td>
<td>255,000</td>
<td>57%</td>
<td>1,289,120</td>
</tr>
<tr>
<td>1970</td>
<td>2</td>
<td>193,000</td>
<td>75%</td>
<td>1,105,177</td>
</tr>
<tr>
<td>1971</td>
<td>2</td>
<td>781,000</td>
<td>44%</td>
<td>1,039,421</td>
</tr>
<tr>
<td>1972</td>
<td>3</td>
<td>334,000</td>
<td>34%</td>
<td>1,036,409</td>
</tr>
<tr>
<td>1973</td>
<td>2</td>
<td>343,000</td>
<td>78%</td>
<td>807,000</td>
</tr>
<tr>
<td>1974</td>
<td>3</td>
<td>1,029,000</td>
<td>58%</td>
<td>594,000</td>
</tr>
<tr>
<td>1975</td>
<td>2</td>
<td>129,000</td>
<td>67%</td>
<td>258,000</td>
</tr>
<tr>
<td>1976</td>
<td>2</td>
<td>197,000</td>
<td>95%</td>
<td>561,550</td>
</tr>
<tr>
<td>1977</td>
<td>2</td>
<td>674,000</td>
<td>56%</td>
<td>1,129,930</td>
</tr>
<tr>
<td>1978</td>
<td>2</td>
<td>412,000</td>
<td>71%</td>
<td>883,120</td>
</tr>
<tr>
<td>1979</td>
<td>2</td>
<td>3,036,000</td>
<td>37%</td>
<td>1,105,177</td>
</tr>
</tbody>
</table>

Source: Puget juvenile trap records
1984 3 206 618,000 83 511,580
1985 2 48 144,000 70 100,200
1986 3 347 1,041,000 68 707,836
1987 2 307 921,000 67 614,024
1988 3 ? 455 1,365,000 51 702,727
1989 2 291 873,000 50 433,600
1990 2 598 1,794,000 25 451,804
1990 4 329 987,000 10 95,065
1991 3 172 516,000 93 479,964
1991 4 44 132,000 14 18,203
1992 2 572 1,716,000 24 410,995
1992 3 248 744,000 69 593,581
1992 4 488 1,464,000 68 997,432
1993 3 399 1,197,000 67 798,313
1993 4 1,473 4,419,000 65 2,860,030
1994 2 431 1,293,000 74 953,460
1994 3 414 1,242,000 91 1,127,593
1994 4 764 2,292,000 69 1,575,715
1995 3 350 1,050,000 no counts
1995 4 667 2,028,000 50 1,012,656
1996 3 409 1,227,000 no counts
1996 4 1,668 5,004,000 45 2,241,883
1997 3 363 1,089,000 no counts
1997 4 1,053 3,159,000 61 1,928,621
1998 4 1,156 3,468,000 40 1,383,578

Source: Puget fish rearing records
* Fecundity estimate of 3,000 eggs/female
* IHNV detection in 1996, 1997, 1998 and newly adopted agencies’ disease management criteria resulted in early termination of program and destruction of fry, which is reflected in lower survival numbers
    * 763 fish mortality in beach 3 after water source loss in extremely low-water-year

Sockeye survivals have ranged from 6 to 11 percent from smolt to adult, less than 10 percent to 130 percent from egg to fry (fecundity estimates didn’t account for large percentage of older fish), and fry to smolt survival can be calculated for some years. Net pen sockeye survivals from smolt to adult ranged from 0.6 to 1.1 percent. Net pen sockeye survivals from fry to smolt were better than in Baker Lake, if otter and IHNV losses are discounted.

Coho survival can be calculated based on coded wire tag information, or smolt and adult numbers. The tag information indicates low a very coho stray rate into the Baker Adult Fish Trap.

4. What is the age class structure of this stock (by sex) and do historical data exist on potential changes over time? For example, five year-old adults may have constituted 20% of returning adults 30 years ago, but those fish may now be rare.

Baker Sockeye return as 2 through 9 year olds. They stay 1 to 5 winters in freshwater, and 1 to 3 winters in marine waters. “Historically” they mostly migrated as 1+ smolts, and returned primarily as 4 year old fish. Age data is available since 1991, and some age data was collected 1939-1941. There may be some smolt age data from the 1960s.

Note: The question perpetuates the confusion associated with looking at the number or percent of fish of a given age returning in a given year. This number fluctuates based on brood/ smolt year strength. Analysis should be done on a brood year basis.
Coho age data is available. Coded wire tag studies have been conducted in the Skagit for over 10 years, though the Baker part of this was recently discontinued.

5. Do you know if hatchery origin fish comprise a portion of natural spawning fish? If so, please give your estimation of the number of hatchery spawners and a timeline. These numbers can be estimated through escapement or carcass counts.

Basically most (100%) of the sockeye spawning in the wild in the Baker system originated from hatchery parents.

Based on analysis of hatchery releases in the Baker Basin, it appears that all of the coho are from hatchery stock. In recent years there has been an effort to reestablish coho in the Baker Basin. In the last 5 years there have been no hatchery releases into Baker Lake, other than adults.

Chinook adults from the hatchery have been released into Baker Lake for three years. No other Chinook are placed into Baker Lake.

6. For hatchery stocks - what proportion of hatchery eggs, fry or adults are from wild fish or another hatchery?

Sockeye, none to a low percent is some years
Coho, all were from fish that reared in the wild, and in recent years from fish that spawned in the wild. With discontinuation of the marking program the fish taken to the hatchery program are selected at random.
Chinook, 100% come from returns to the hatchery

7. Is this stock a coded wire tag index stock? If not, which index stock is it most closely aligned with? Provide any additional relevant information from previous coded wire tag groups.

Sockeye are not sampled for CWTs, though we have used CWTs for evaluation of the sockeye net pen production.

Baker wild Coho have been used as an indicator group.

CWT have been collected from Chinook entering the adult fish trap. The results indicate a high level of strays, including up to half of the CWTs being from Canada.
II. Biological Significance

Please answer the following for each stock:

1. Within each watershed, what is the history of introductions (e.g. stock transfers), hatchery fish releases, and hatchery fish strays from other watersheds?
   a. Are naturally spawning populations considered “native” with little or no history of stock transfers, introductions, or artificial propagation within the watershed? Or

   **Baker Sockeye**
   Only about two introductions of sockeye have been made into the Baker Basin in the last 100+ years.

   **Coho in the Baker**
   Baker coho were taken from the Baker Basin and propagated at the Marblemount Hatchery and the Hoodsport Hatchery. Baker coho no longer exist at these facilities. Clarks Creek coho were released into Baker Lake for many years. Based on review of hatchery records, numbers of returning coho, and outmigrating coho smolt numbers, it is unlikely the original Baker coho still exist. Efforts are underway to reestablish a stock of coho in the Baker Basin. Coho from outside the Baker have not been released in the Baker for at least 5 years. All propagation of coho for release in the Baker was based on fish that had reared in the wild, with some proportion from wild spawning fish. For about three years all adult fish in the artificial propagation program were from wild spawning parents. In 2001 selection of adult coho for the hatchery is done randomly, due to discontinuation of the marking program.

   b. Have little or no stock transfers occurred, but the species has been artificially propagated within the watershed to some extent (how extensive has artificial propagation been?)? Or

   **Sockeye**
   Artificial propagation has been 100 percent for most years since 1959. From 1896 through 1933 it is unclear what percentage of production was artificial, but it was likely a high percentage in most years.

   **Coho**
   It is likely that most of the production was from hatchery fed fry releases for many years.

   c. Have significant stock transfers into the watershed occurred historically, with the potential for significant interbreeding between native and introduced fish? Or

   **Sockeye**
   No, but there have been large releases (300,000?) of Lake Whatcom kokanee fry into Lake Shannon for a number of years. At this time it isn’t probably an issue, but when there were only 99 returning sockeye, if 10 were from kokanee there was the potential for significant interbreeding.

   **Coho**
   Yes

   **Chinook**
   Yes
d. **Was the species extirpated from the watershed historically, but stock introductions reestablished the species within the watershed? Or**

Coho yes

*Chinook, we are trying*

Chum, Pink, Steelhead have been extirpated, and there have been some introductions, but they haven’t been reestablished.

e. **Is the species not native to the watershed, but currently exists as a naturalized population resulting from past stock transfers?**

No

2. **Biological Attributes - Does the stock exhibit any unique or distinctive biological attributes within the watershed with respect to life history characteristics (e.g. age/size at maturity, run timing, freshwater migration distance, morphology, physiology, disease resistance, genetics, etc.?) Use the following questions to guide your answer:**

a. **Are the distinctive traits potentially irreplaceable or not typical of other stocks within the same GDU? Or**

Sockeye, to the best of my knowledge Baker sockeye are unique.

Coho are likely to be very genetically similar to the Clarks Creek stock, but may show some phenotypic differences.

Chinook are adults from the Marblemount Hatchery

b. **Does the stock have no unique, biological attributes but share some unique attributes with other stocks in the same GDU? Or**

c. **Are all known biological attributes shared with other GDUs?**

3. **Population Subdivisions - How diverse is the metapopulation structure within the watershed? Use the following questions to guide your answer:**

a. **How many distinct spawning aggregations (e.g., tributary creeks) exist within the stock under consideration?**

While sockeye spawn in three general locations, due to the history and operations which mix the fish there is likely only one stock. The sockeye currently spawn in Spawning Beach No. 2, Spawning Beach No. 3, in Channel Creek, where the Baker River enters Baker Lake (delta area), in the Baker River above Baker Lake, and in 2002 an artificial spawning program is scheduled to begin.

For coho there are a number of spawning locations, plus the hatchery fish. Coho use many different rearing locations. Some in tributaries, some in Baker Lake.
b. **What genetic data exist for this stock?** Please provide agency reports or publication citations that contain these data, or provide summary tables of population allele frequencies if such reports or publications do not exist.

For sockeye some information is available in at least one thesis at the UW.
D. Co-Manager Goals for Salmonid Stocks

Appropriate management or other agency policy staff should answer the following questions for each hatchery and naturally spawning stock:

1. **For each hatchery stock program, is the program goal conservation, harvest or both?**

   For Baker sockeye the co-managers goals are to rebuild the stock to levels that allow harvest. For Puget Sound Energy it is to provide required mitigation measures. Puget Sound Energy goes beyond what is required in the licensee for the Baker River Hydroelectric Project.

   For Skagit coho in the Baker the goals are to reestablish coho in the basin, and provide harvest. Beyond what Puget Sound Energy is legally required to do, they have provided net pens, enumeration of fish, a hatchery program for coho, and marking of coho for gulper efficiency studies.

   For Skagit chinook in the Baker the co-managers would like to reestablish chinook in the Baker Basin. Currently, the program is aimed at conservation, with the hope that harvest will be possible in the future.

2. **Please list your harvest management goals for each of the following time frames: present day, short-term (10 years in the future) and long-term (50 years in the future.) Use the following definitions for harvest goals:**

   - **High** – harvest opportunity each year, spread over seasons
   - **Medium** – opportunity most years, for some seasons
   - **Low** – occasional opportunity, single run
   - **0** – no harvest opportunity

<table>
<thead>
<tr>
<th>Stock</th>
<th>present day</th>
<th>short-term</th>
<th>long-term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baker sockeye</td>
<td>L</td>
<td>M</td>
<td>M/H</td>
</tr>
<tr>
<td>Coho in the Baker</td>
<td>L</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>Chinook in the Baker</td>
<td>0</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>Chum in the Baker</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pink in the Baker</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Steelhead</td>
<td>0</td>
<td>L</td>
<td>H</td>
</tr>
</tbody>
</table>

3. **What are your conservation goals? The answer to this question is typically qualitative. The answer should include local as well as regional (i.e., ESU) and/or statewide goals for each stock.**

4. **For hatchery programs, please summarize the production goals:**
   a. **How many fish at what size are planned for release? Transferred off-station?**
For sockeye the production goal from Beach No. 4 is the production from 3,000 adults. For Beach No. 3 the goal is for the production from about 500 sockeye. The goals for Beaches No. 1 and 2 are zero. The production from the artificial spawning is production from 1,000,000 eggs.

b. Where are eggs taken and incubated? Where are fish reared and released?
Sockeye: In the gravel of Beaches 3 and 4. For the artificial spawning program, in the former adult sorter for Beach 4.

c. Does this program stay relatively constant or does it change regularly? If it changes, what is the process for this change?
The sockeye programs have evolved over time. Decisions are currently usually made by the Baker River Committee. The Baker River Committee has made changes to the program since its inception in 1985. The Committee has made changes in response to low returning numbers, natural risks, transportation problems, and disease problems.

d. Is the duration of this program clearly defined?
For parts of the programs yes, for other parts no. Parts of the programs are required by the FERC license, other parts are voluntary on the part of Puget. The license for the Baker River Hydroelectric Project expires in May 2006. Puget Sound Energy has begun the relicensing process. Based on past experience, it is uncertain how long the licensing process will take (5-30 years?).

5. Are regional decisions based upon adaptive management? How do you incorporate new information to adjust existing programs and goals?

Yes, if there are any cost consequences to Puget Sound Energy we argue a lot about what the new information means and what should be done.