<table>
<thead>
<tr>
<th>Hatchery Program</th>
<th>Tokul Creek Winter Steelhead Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species or Hatchery Stock</td>
<td>Tokul Creek Winter Steelhead (<em>Oncorhynchus mykiss</em>) (Chambers Creek stock)</td>
</tr>
<tr>
<td>Agency/Operator</td>
<td>Washington Department of Fish and Wildlife</td>
</tr>
<tr>
<td>Watershed and Region</td>
<td>Snohomish River, Puget Sound</td>
</tr>
<tr>
<td>Date Submitted</td>
<td>August 04, 2005</td>
</tr>
<tr>
<td>Date Last Updated</td>
<td>July 25, 2005</td>
</tr>
</tbody>
</table>
SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Tokul Creek Winter Steelhead Program

1.2) Species and population (or stock) under propagation, and ESA status.

Tokul Creek (Chambers Creek stock) Winter Steelhead (*Oncorhynchus mykiss*) - not listed

1.3) Responsible organization and individuals

Name (and title): Chuck Phillips, Region 4 Fish Program Manager
Doug Hatfield, Cascade Complex Manager
Agency or Tribe: Washington Department of Fish and Wildlife
Address: 600 Capitol Way North, Olympia, WA 98501-1091
Telephone: (425) 775-1311 Ext 120 (360) 793-1382
Fax: (425) 338-1066 (360) 793-9558
Email: phillcep@dfw.wa.gov hatfidgh@dfw.wa.gov

Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

1.4) Funding source, staffing level, and annual hatchery program operational costs.

<table>
<thead>
<tr>
<th>Operational Information</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual operating cost (dollars)</td>
<td>$180,032</td>
</tr>
</tbody>
</table>

The above information for annual operating cost applies cumulatively to the Tokul Creek Hatchery Fish Programs. Funding source is Wildlife Fund – State.

1.5) Location(s) of hatchery and associated facilities.

**Broodstock, Incubation, Rearing & Release:**
Tokul Creek Hatchery: Located on Tokul Creek (07.0440) at RM 0.5. Tokul Creek is a tributary of the Snoqualmie River (07.0219) at RM 39. The Snoqualmie River is a tributary to the Snohomish River (07) at RM 20.5.

1.6) Type of program.

Isolated harvest
1.7) **Purpose (Goal) of program.**

The goal of this program is release 185,000-winter steelhead to provide for sport and tribal harvest opportunity in the Snohomish River basin (WRIA 07.0000).

1.8) **Justification for the program.**

This hatchery program will be operated to provide fish for harvest while minimizing adverse effects on listed fish. This will be accomplished in the following manner:

1. Hatchery fish will be released as smolts at a time to minimize or eliminate adverse interactions with listed fish.

2. Fish will be acclimated before release when possible.

3. Hatchery fish will be propagated using appropriate fish culture methods and consistent with the Co-Managers' Disease Policy, spawning and genetic guidelines and state and federal water quality standards.

4. Juvenile fish produced in excess to production goals will be dealt with appropriately, such as by being planted in a lake with no outlet.

To minimize impacts on listed fish by WDFW facilities operation and the Tokul Creek winter steelhead program, the following Risk Aversions are included in this HGMP:
Table 1. Summary of risk aversion measures for the Tokul Creek winter steelhead program.

<table>
<thead>
<tr>
<th>Potential Hazard</th>
<th>HGMP Reference</th>
<th>Risk Aversion Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Withdrawal</td>
<td>4.2</td>
<td>Usage of spring and surface waters from Tokul Creek are formalized through trust water right # S1-08944.</td>
</tr>
<tr>
<td>Intake Screening</td>
<td>4.2</td>
<td>Screens at Tokul Creek are compliant with WDFW and NOAA fish screening standards.</td>
</tr>
<tr>
<td>Effluent Discharge</td>
<td>4.2</td>
<td>Effluent from Tokul Creek Hatchery is regulated through NPDES permit # WAG 13 – 3004.</td>
</tr>
<tr>
<td>Broodstock Collection &amp; Adult</td>
<td>2.2.3, 7.9</td>
<td>The intake at Tokul Creek poses a barrier to upstream migration of listed adult chinook (in the fall). Beginning in the fall of 2000, non-adipose fin clipped adults were passed upstream around the barrier manually. The Army Corps of Engineers budget and the Washington 03-05 biennial budget included funding for removal of the hatchery intake dam.</td>
</tr>
<tr>
<td>Passage</td>
<td></td>
<td>The program is operated consistent with the Co-Manager’s Fish Health Policy.</td>
</tr>
<tr>
<td>Competition &amp; Predation</td>
<td>2.2.3, 10.11</td>
<td>Fish are released at a time, size, and life-history stage (smolts) to foster rapid migration to marine waters. Trucking of smolts from an out-of-basin rearing location (Whitehorse Ponds) for release into the Snohomish River basin was eliminated. Smolts are released in May to allow chinook salmon to grow to a size that reduces the potential for predation. Studies are/will be conducted in riverine, estuarine, and nearshore areas to evaluate the ecological risks posed by the release of steelhead smolts.</td>
</tr>
</tbody>
</table>

1.9) List of program “Performance Standards”.

See below.
1.10) List of program “Performance Indicators”, designated by "benefits" and "risks."

**Benefits:**

<table>
<thead>
<tr>
<th>Performance Standard</th>
<th>Performance Indicator</th>
<th>Monitoring &amp; Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assure that hatchery operations support Puget Sound Salmon Management Plan (US v Washington), the Shared Strategy for Salmon Recovery, production and harvest objectives.</td>
<td>Contribute to a meaningful harvest for sport, tribal and commercial fisheries. Achieve a 10-year average smolt-to-adult survival rate of 1.0% that includes harvest and escapement (see section 3.3.1).</td>
<td>Survival and contribution to fisheries will be estimated for each brood year released. Work with co-managers to manage adult fish returning in excess of broodstock needs.</td>
</tr>
<tr>
<td>Maintain outreach to enhance public understanding, participation and support of WDFW hatchery programs.</td>
<td>Provide information about agency programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off station efforts may include festivals, classroom participation, stream adoptions and fairs.</td>
<td>Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program. Record on-station organized education and outreach events.</td>
</tr>
<tr>
<td>Program contributes to fulfilling tribal trust responsibility mandates and treaty rights.</td>
<td>Follow pertinent laws, agreements, policies and executive and judicial orders on consultation and coordination with Native American tribal governments.</td>
<td>Participate in annual coordination meetings between the co-managers to identify and report on issues of interest, coordinate management, and review programs (FBD process).</td>
</tr>
<tr>
<td>Implement measures for broodstock management to maintain integrity and genetic diversity. Maintain effective population size</td>
<td>A minimum of 900 adults is collected throughout the spawning run in proportion to timing, age, and sex composition of return.</td>
<td>Annual run timing, age, and sex composition and return timing data are collected. Adhere to HSRG (2004) and WDFW spawning guidelines (WDFW 1983)</td>
</tr>
<tr>
<td>Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery-origin fish.</td>
<td>Use mass mark for maintaining a segregated population and for selective fisheries.</td>
<td>Returning fish are sampled throughout their return for length, sex, mass marks and, if available, coded-wire tags.</td>
</tr>
<tr>
<td>Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-Managers Fish Disease Policy (1998).</td>
<td>Necropsies of fish to assess health, nutritional status and culture conditions.</td>
<td>WDFW Fish Health Section inspect adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary. A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.</td>
</tr>
</tbody>
</table>
Release and/or transfer exams for pathogens and parasites. 1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-Managers Fish Health Policy.

Inspection of adult broodstock for pathogens and parasites. At spawning, lots of 60 adult broodstock are examined for pathogens.

Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites. Control of specific fish pathogens through eggs/fish movements is conducted in accordance to Co-Managers Fish Health Disease Policy.

<table>
<thead>
<tr>
<th>Risks:</th>
<th>Performance Standard</th>
<th>Performance Indicator</th>
<th>Monitoring &amp; Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimize impacts and/or interactions to ESA listed fish</td>
<td>Hatchery operations comply with all state and federal regulations. Hatchery juveniles are raised to smolt-size (6.0 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream. Mass mark production fish to identify them from naturally produced fish (except CWT only groups)</td>
<td>As identified in the HGMP: Monitor size, number, date of release and mass mark quality. Additional WDFW projects: straying (if coded-wire tagged), NOR/HOR ratio on the spawning grounds, fish health documented.</td>
<td></td>
</tr>
<tr>
<td>Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including IHOT, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration</td>
<td>Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.</td>
<td>Pathologists from WDFW’s Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed</td>
<td></td>
</tr>
<tr>
<td>Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring</td>
<td>NPDES permit compliance WDFW water right permit compliance</td>
<td>Flow and discharge reported in monthly NPDES reports.</td>
<td></td>
</tr>
<tr>
<td>Water withdrawals and in stream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.</td>
<td>Hatchery intake structures meet state and federal guidelines where located in fish bearing streams.</td>
<td>Barrier and intake structure compliance assessed and needed fixes are prioritized.</td>
<td></td>
</tr>
<tr>
<td>Hatchery operations comply with ESA responsibilities</td>
<td>WDFW completes an HGMP and is issued a federal and state permit when applicable.</td>
<td>Identified in HGMP and Biological Opinion for hatchery operations.</td>
<td></td>
</tr>
<tr>
<td>Harvest of hatchery-produced fish minimizes impact to wild populations</td>
<td>Harvest is regulated to meet appropriate biological assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.</td>
<td>Agencies and tribes to provide up to date information monitor harvests.</td>
<td></td>
</tr>
</tbody>
</table>
1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

900 adults.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location. *(Use standardized life stage definitions by species presented in Attachment 2).*

<table>
<thead>
<tr>
<th>Life Stage</th>
<th>Release Location</th>
<th>Annual Release Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyed Eggs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unfed Fry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fingerling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yearling</td>
<td>Snoqualmie R. watershed</td>
<td>185,000*</td>
</tr>
</tbody>
</table>

* A total of 185,000 are released from the hatchery directly and at acclimation/plant sites within the Snoqualmie River watershed.

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

The escapement levels back to the hatchery from 1995 through 2004 have been 960, 1,129, 684, 309, 816, 403, 483, 1,148, 330, and 1,169, respectively. No releases have been coded-wire tagged for estimating smolt-to-adult survivals.

1.13) Date program started (years in operation), or is expected to start.

1960

1.14) Expected duration of program.

Ongoing

1.15) Watersheds targeted by program.

Snohomish River watershed (07).
-Snoqualmie River watershed (07.0219)
1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

Program goals supporting tribal and sport fisheries cannot be attained without hatchery augmentation. The Tokul Creek winter steelhead program produces smolts for planting in the Snohomish River watershed. The majority of the smolts are released in the upper watershed that is at the upper end of the sport fishery so that they are highly susceptible to harvest.

Steelhead management and hatchery production are currently undergoing extensive co-manager review through the development of a science “white” paper. Expectation is that effort will address many of the issues and recommendations raised by the Hatchery Scientific Review Group (HSRG 2003).
SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

During 2004-05, WDFW is writing HGMP's to cover all stock/programs produced at the Tokul Creek complex for authorization under the 4(d) rule of the ESA.

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

- Identify the ESA-listed population(s) that will be directly affected by the program.

None.

- Identify the ESA-listed population(s) that may be incidentally affected by the program.

Threatened populations of chinook salmon within the Puget Sound ESU, including north and south fork Stilliguamish, upper Snohomish and Skykomish chinook, may potentially be incidentally affected by this program.

Other Snohomish Basin Chinook populations:
1) Snoqualmie chinook stock that spawns in the Snoqualmie basin as well as the Pilchuck River, Sultan River, Woods Creek and Elwell Creek. It is considered to be a native stock and has been classified as depressed due to low escapement trends (draft SaSI, WDFW unpublished 2002)
3) Skykomish chinook stock spawns in the south fork Skykomish River, including Bridal Veil Creek, as well as the North Fork Skykomish up to Bear Creek (RM 13.1). It is considered to be native and its stock status is classified as unknown (draft SaSI, WDFW unpublished 2002).

Skykomish Bull Trout:
1) A single stock that spawns in the south fork Skykomish River including West Cady Creek, Goblin Creek, Troublesome Creek, Salmon Creek and the east fork Foss Creek, tributaries to the south fork Skykomish River. This stock is considered to be a native stock that has been classified as healthy based on increasing escapement trends (1998 SASSI bull trout and Dolly Varden appendix).
2.2.2) **Status of ESA-listed salmonid population(s) affected by the program.**

- **Describe the status of the listed natural population(s) relative to “critical” and “viable” population thresholds**

  Preliminary critical and viable population thresholds under ESA have been determined by the Co-manager’s (Puget Sound) Technical Review Team (PSTRT) to be at 1,745 and unknown, respectively for the Skykomish chinook stock (PSTRT 2003). For the Snoqualmie chinook stock, the critical population threshold as determined by the PSTRT is 521 (2003). NOAA Fisheries critical and viable thresholds are 1,650 and 3,500, respectively. SaSI designations are stated in 2.2.1 above.

- **Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.**

  1.358: 1 for 1990 to 1999

- **Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.**

  **Natural spawning chinook escapements in the Snohomish basin:**

<table>
<thead>
<tr>
<th>Year</th>
<th>Skykomish</th>
<th>Snoqualmie</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>2,192</td>
<td>628</td>
<td>2,820</td>
</tr>
<tr>
<td>1992</td>
<td>2,002</td>
<td>706</td>
<td>2,708</td>
</tr>
<tr>
<td>1993</td>
<td>1,653</td>
<td>2,366</td>
<td>4,019</td>
</tr>
<tr>
<td>1994</td>
<td>2,898</td>
<td>728</td>
<td>3,626</td>
</tr>
<tr>
<td>1995</td>
<td>2,791</td>
<td>385</td>
<td>3,176</td>
</tr>
<tr>
<td>1996</td>
<td>3,819</td>
<td>1,032</td>
<td>4,851</td>
</tr>
<tr>
<td>1997</td>
<td>2,355</td>
<td>1,937</td>
<td>4,292</td>
</tr>
<tr>
<td>1998</td>
<td>4,412</td>
<td>1,892</td>
<td>6,304</td>
</tr>
<tr>
<td>1999</td>
<td>3,455</td>
<td>1,344</td>
<td>4,799</td>
</tr>
<tr>
<td>2000</td>
<td>4,665</td>
<td>1,427</td>
<td>6,092</td>
</tr>
<tr>
<td>2001</td>
<td>4,575</td>
<td>3,589</td>
<td>8,164</td>
</tr>
<tr>
<td>2002</td>
<td>4,327</td>
<td>2,896</td>
<td>7,223</td>
</tr>
<tr>
<td>2003</td>
<td>3,474</td>
<td>1,977</td>
<td>5,451</td>
</tr>
</tbody>
</table>

  Source: WDFW (Region 4, Chad Jackson)
Snoqualmie/Tokul chinook escapement:

<table>
<thead>
<tr>
<th>Year</th>
<th>Snoqualmie</th>
<th>Tokul</th>
<th>Returned to Rack</th>
<th>*Passed Upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>628</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>706</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>2,366</td>
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<td></td>
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<tr>
<td>1994</td>
<td>728</td>
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<tr>
<td>1995</td>
<td>385</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1996</td>
<td>1,032</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1997</td>
<td>1,937</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>1,892</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>1,344</td>
<td>347</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>1,427</td>
<td>128</td>
<td>100</td>
<td>98</td>
</tr>
<tr>
<td>2001</td>
<td>3,589</td>
<td>215</td>
<td>149</td>
<td>147</td>
</tr>
<tr>
<td>2002</td>
<td>2,896</td>
<td>133</td>
<td></td>
<td>97</td>
</tr>
<tr>
<td>2003</td>
<td>3,474</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Passed upstream of dam at hatchery.

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

In the table above for return years 2000-02, 98, 147 and 97 chinook were passed upstream of Tokul Creek Hatchery, respectively. For those three years no marked fish were passed upstream above the hatchery rack. They were killed and used for nutrient enhancement. The proportion of hatchery-origin and natural-origin fish on the spawning grounds (not above the rack) is assumed to be the same as at the rack.

<table>
<thead>
<tr>
<th>Percent HORs estimate straying into natural spawning areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Source: K. Rawson Tulalip Tribe in B. Sanford, WDFW draft update for 2004 escapement)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Snoqualmie</th>
<th>Skykomish</th>
<th>Basin Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>6.3</td>
<td>28.8</td>
<td>18.2</td>
</tr>
<tr>
<td>1998</td>
<td>28.0</td>
<td>66.1</td>
<td>54.7</td>
</tr>
<tr>
<td>1999</td>
<td>22.6</td>
<td>59.4</td>
<td>49.1</td>
</tr>
<tr>
<td>2000</td>
<td>12.5</td>
<td>62.0</td>
<td>50.4</td>
</tr>
<tr>
<td>2001</td>
<td>8.5</td>
<td>33.3</td>
<td>22.4</td>
</tr>
<tr>
<td>2002</td>
<td>14.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>17.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average (97-03)</td>
<td>14.7</td>
<td>52.9</td>
<td>39.9</td>
</tr>
</tbody>
</table>

HORs – Hatchery-origin chinook returns
2.2.3) Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

**Broodstock Collection:**
Steelhead adult broodstock collection takes place between late November through February while chinook are trapped and hauled (unmarked) from September through mid-November.

**Entrainment Effects:**
The intake dam poses a barrier to upstream migration of wild adult chinook (in the fall). Beginning in the fall of 2000, non-adipose fin clipped adults were passed upstream around the barrier manually. Intake screening complies with WDFW and NOAA Fisheries fish screening criteria. The Army Corps of Engineers has approved funding for removal of the hatchery intake dam. Based upon ACOE funding and support, WDFW anticipates completion of removal of the barrier by approximately June of 2005.

**Disease Effects**
Pathogens are not unique to hatcheries. Hatchery-origin fish may have an increased risk of carrying fish disease pathogens because higher rearing densities of fish in the hatchery may stress fish and lower immune responses. Under certain conditions, hatchery effluent has the potential to transport fish pathogens out of the hatchery, where natural fish may be exposed. These impacts are addressed by rearing the steelhead at lower densities, within widely recognized guidelines (Piper et al 1982), continuing well-developed monitoring, diagnostic, and treatment programs already in place (Co-manager’s Fish Health Policy 1998).

**Predation/Competition:**
The program described in this HGMP interacts with the biotic and abiotic components of the freshwater, estuarine, and marine salmonid ecosystem through a complex web of short and long-term processes. The complexity of this web means that secondary or tertiary interactions (both positive and negative) with listed species could occur in multiple time periods, and that evaluation of the net effect can be difficult. WDFW is not aware of any studies that have directly evaluated the ecological effects of this program. Alternatively, we provide in this section a brief summary of empirical information and theoretical analyses of two types of ecological interactions, predation, and competition that may be relevant to this program. Recent reviews by Fresh (1997) and Flagg et al. (2000) can be consulted for additional information; NMFS (2002) provides an extensive review and application to ESA permitting of artificial production programs.
Predation – Freshwater Environment
Coho and steelhead released from hatchery programs may prey upon listed species of salmonids, but the magnitude of predation will depend upon the characteristic of the listed population of salmonids, the habitat in which the population occurs, and the characteristics of the hatchery program (e.g., release time, release location, number released, and size of fish released). The site-specific nature of predation, and the limited number of empirical studies that have been conducted, make it difficult to predict the predation effects of any specific hatchery program. WDFW is unaware of any studies that have empirically estimated the predation risks to listed species posed by the program described in this HGMP.

In the absence of site-specific empirical information, the identification of risk factors can be a useful tool for reviewing hatchery programs while monitoring and research programs are developed and implemented. Risk factors for evaluating the potential for significant predation include the following:

**Environmental Characteristics.** Water clarity and temperature, channel size and configuration, and river flow are among the environmental characteristics that can influence the likelihood that predation will occur (see SWIG (1984) for a review). The SIWG (1984) concluded that the potential for predation is greatest in small streams with flow and turbidity conditions conducive to high visibility.

**Relative Body Size.** The potential for predation is limited by the relative body size of fish released from the program and the size of prey. Generally, salmonid predators are thought to prey on fish approximately 1/3 or less their length (USFWS 1994), although coho salmon have been observed to consume juvenile chinook salmon of up to 46% of their total length (Pearsons et al. 1998). The lengths of juvenile migrant chinook salmon originating from natural production have been monitored in numerous watersheds throughout Puget Sound, including the Skagit River, Stillaguamish River, Bear Creek, Cedar River, Green River, Puyallup River, and Dungeness River. The average size of migrant chinook salmon is typically 40mm or less in February and March, but increases in the period from April through June as emergence is completed and growth commences (Table 2.2.3.1). Assuming that the prey item can be no greater than 1/3 the length of the predator, Table 2.2.3.1 can be used to determine the length of predator required to consume a chinook salmon of average length in each time period. The increasing length of natural origin juvenile chinook salmon from March through June indicates that delaying the release hatchery smolts of a fixed size will reduce the risks associated with predation.
Table 2.2.3.1. Average length by statistical week of natural origin juvenile chinook salmon migrants captured in traps in Puget Sound watersheds. The minimum predator length corresponding to the average length of chinook salmon migrants, assuming that the prey can be no greater than 1/3 the length of the predator, are provided in the final row of the table. (NS: not sampled.)

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Statistical Week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Skagit</td>
<td>43.2</td>
</tr>
<tr>
<td>1997-2001</td>
<td></td>
</tr>
<tr>
<td>Stilliguiamish</td>
<td>51.4</td>
</tr>
<tr>
<td>2001-2002</td>
<td></td>
</tr>
<tr>
<td>Cedar</td>
<td>54.9</td>
</tr>
<tr>
<td>1998-2000</td>
<td></td>
</tr>
<tr>
<td>Green</td>
<td>52.1</td>
</tr>
<tr>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>Puyallup</td>
<td>NS</td>
</tr>
<tr>
<td>2002</td>
<td></td>
</tr>
<tr>
<td>Dungeness</td>
<td>NS</td>
</tr>
<tr>
<td>1996-1997</td>
<td></td>
</tr>
<tr>
<td>All Systems</td>
<td>50.4</td>
</tr>
<tr>
<td>Average Length</td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>153</td>
</tr>
<tr>
<td>Predator Length</td>
<td></td>
</tr>
</tbody>
</table>

Sources:  
1 Data are from Seiler et al. (1998); Seiler et al. (1999); Seiler et al. (2000); Seiler et al. (2001), and Seiler et al. (2002).  
2 Data are from regression models presented in Griffith et al. (2001) and Griffith et al. (2003).  
3 Data are from Seiler et al. (2003).  
4 Data are from Seiler et al. (2002).  
5 Data are from Samarin and Sebastian (2002).  
6 Data are from Marlowe et al. (2001).

**Date of Release.** The release date of juvenile fish for the program can influence the likelihood that listed species are encountered or are of a size that is small enough to be consumed. The most extensive studies of the migration timing of naturally produced juvenile chinook salmon in the Puget Sound ESU have been conducted in the Skagit River, Bear Creek, Cedar River, and the Green River. Although distinct differences are evident in the timing of migration between watersheds, several general patterns are beginning to emerge:

1) Emigration occurs over a prolonged period, beginning soon after emergence (typically January) and continuing at least until July;
2) Two broad peaks in migration are often present during the January through July time period; an early season peak (typically in March) comprised of relatively small chinook salmon (40-45mm), and a second peak in mid-May to June comprised of larger chinook salmon;
3) On average, over 80% of the juvenile chinook have migrated past the trapping locations after statistical week 23 (usually occurring in the first week of June).
Table 2.2.3.2. Average cumulative proportion of the total number of natural origin juvenile chinook salmon migrants estimated to have migrated past traps in Puget Sound watersheds.

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Statistical Week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Skagit 1</td>
<td>0.61</td>
</tr>
<tr>
<td>1997-2001</td>
<td></td>
</tr>
<tr>
<td>Bear 2</td>
<td>0.26</td>
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<td>1999-2000</td>
<td></td>
</tr>
<tr>
<td>Cedar 2</td>
<td>0.76</td>
</tr>
<tr>
<td>1999-2000</td>
<td></td>
</tr>
<tr>
<td>Green 3</td>
<td>0.63</td>
</tr>
<tr>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>All Systems</td>
<td>0.56</td>
</tr>
<tr>
<td>Average</td>
<td></td>
</tr>
</tbody>
</table>

Sources: 1 Data are from Seiler et al. (1998); Seiler et al. (1999); Seiler et al. (2000); Seiler et al. (2001), and Seiler et al. (2002).
2 Data are from Seiler et al. (2003).
3 Data are from Seiler et al. (2002).

Release Location and Release Type. The likelihood of predation may also be affected by the location and type of release. Other factors being equal, the risk of predation may increase with the length of time the fish released from the artificial production program are commingled with the listed species. In the freshwater environment, this is likely to be affected by distribution of the listed species in the watershed, the location of the release, and the speed at which fish released from the program migrate from the watershed.

Coho salmon and steelhead released from western Washington artificial production programs as smolts have typically been found to migrate rapidly downstream. Data from Seiler et al. (1997; 2000) indicate that coho smolts released from the Marblemount Hatchery on the Skagit River migrate approximately 11.2 river miles per day. Steelhead smolts released on-station may travel even more rapidly – migration rates of approximately 20 river miles per day have been observed in the Cowlitz River (Harza 1998). However, trucking fish to off-station release sites, particularly release sites located outside of the watershed in which the fish have been reared may slow migrations speeds (Table 2.2.3.3).
Table 2.2.3.3. Summary of travel speeds for steelhead smolts for several types of release strategies.

<table>
<thead>
<tr>
<th>Location</th>
<th>Release Type</th>
<th>Migration Speed (River miles per day)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowlitz River</td>
<td>Smolts, on-station</td>
<td>21.3</td>
<td>Harza (1998)</td>
</tr>
<tr>
<td>Kalama River</td>
<td>Trucked from facility located within watershed</td>
<td>4.4</td>
<td>Hulett (pers. comm.)</td>
</tr>
<tr>
<td></td>
<td>in which fish were released.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bingham Creek</td>
<td>Trucked from facility located outside of watershed</td>
<td>0.6</td>
<td>Seiler et al. (1997)</td>
</tr>
<tr>
<td></td>
<td>in which fish were released.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stevens Creek</td>
<td>Trucked from facility located outside of watershed</td>
<td>0.5</td>
<td>Seiler et al. (1997)</td>
</tr>
<tr>
<td></td>
<td>in which fish were released.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snow Creek</td>
<td>Trucked from facility located outside of watershed</td>
<td>0.4</td>
<td>Seiler et al. (1997)</td>
</tr>
<tr>
<td></td>
<td>in which fish were released.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number Released. Increasing the number of fish released from an artificial production program may increase the risk of predation, although competition between predators for prey may eventually limit the total consumption (Peterman and Gatto 1978).

Predation – Marine Environment
WDFW is unaware of any studies that have empirically estimated the predation risks to listed species posed by the program described in this HGMP. NMFS (2002) reviewed existing information on the risks of predation in the marine environment posed by artificial production programs and concluded:

“1) Predation by hatchery fish on natural-origin smolts or sub-adults is less likely to occur than predation on fry. Coho and chinook salmon, after entering the marine environment, generally prey upon fish one-half their length or less and consume, on average, fish prey that is less than one-fifth of their length (Brodeur 1991). During early marine life, predation on natural origin chinook, coho, and steelhead will likely be highest in situations where large, yearling-sized hatchery fish encounter sub-yearling fish or fry (SIWG 1984).”

“2) However, extensive stomach content analysis of coho salmon smolts collected through several studies in marine waters of Puget Sound, Washington does not substantiate any indication of significant predation upon juvenile salmonids (Simenstad and Kinney 1978).”
“3) Likely reasons for apparent low predation rates on salmon juveniles, including chinook, by larger chinook and other marine predators are described by Cardwell and Fresh (1979). These reasons included: 1) due to rapid growth, fry are better able to elude predators and are accessible to a smaller proportion of predators due to size alone; 2) because fry have dispersed, they are present in low densities relative to other fish and invertebrate prey; and 3) there has either been learning or selection for some predator avoidance.”

Competition

WDFW is unaware of any studies that have empirically estimated the competition risks to listed species posed by the program described in this HGMP. Studies conducted in other areas indicate that this program is likely to pose a minimal risk of competition:

1) As discussed above, coho salmon and steelhead released from hatchery programs as smolts typically migrate rapidly downstream. The SIWG (1984) concluded “migrant fish will likely be present for too short a period to compete with resident salmonids.”

2) NMFS (2002) noted that “.where inter-specific populations have evolved sympatrically, chinook salmon and steelhead have evolved slight differences in habitat use patterns that minimize their interactions with coho salmon (Nilsson 1967; Lister and Genoe 1970; Taylor 1991; Murdoch and Kamphaus 2002). Along with the habitat differences exhibited by coho and steelhead, they also show differences in foraging behavior. Peterson (1966) and Johnston (1967) reported that juvenile coho are surface oriented and feed primarily on drifting and flying insects, while steelhead are bottom oriented and feed largely on benthic invertebrates.”

3) Flagg et al. (2000) concluded, “By definition, hatchery and wild salmonids will not compete unless they require the same limiting resource. Thus, the modern enhancement strategy of releasing salmon and steelhead trout as smolts markedly reduces the potential for hatchery and wild fish to compete for resources in the freshwater rearing environment. Miller (1953), Hochachka (1961), and Reimers (1963), among others, have noted that this potential for competition is further reduced by the fact that many hatchery salmonids have developed different habitat and dietary behavior than wild salmonids.” Flagg et al (2000) also stated “It is unclear whether or not hatchery and wild chinook salmon utilize similar or different resources in the estuarine environment.”

4) Fresh (1997) noted “Few studies have clearly established the role of competition and predation in anadromous population declines, especially in marine habitats. A major reason for the uncertainty in the available data is the complexity and dynamic nature of competition and predation; a small change in one variable (e.g., prey size) significantly changes outcomes of competition and predation. In addition, large data gaps exist in our understanding of these interactions. For instance, evaluating the impact of introduced fishes is impossible because we do not know which nonnative fishes occur in many salmon-producing watersheds. Most available information is circumstantial. While such information can identify where inter- or intra specific relationships may occur, it does not test mechanisms explaining why observed relations exist. Thus, competition and predation are usually one of several plausible hypotheses explaining observed results.”
Potential Tokul Creek Winter Steelhead HGMP Predation and Competition Effects on Listed Salmon

*Environmental Characteristics:* The Snohomish River watershed, that includes the Tokul Creek Hatchery, is a large river system that tends to carry sufficient flows and to be turbid (snow melt) during the late spring hatchery winter steelhead release (May) and at the end of the juvenile chinook emigration.

*Relative Body Size:* Winter steelhead smolts released through the Tokul Creek program average 194 mm fl. or approximately 6 fish per pound (fpp). Trapping studies on the Skagit River (data from Seiler et al., 1998-2002 (Table 2.2.3.1) showed that juvenile chinook salmon emigrating during the first two weeks of May averaged 54 mm fl. while the last two weeks in May averaged close to 59 mm fl. Food resource competition risks to listed chinook juveniles are not likely to be substantial since the larger steelhead are likely to select different food sources. Assuming the "1/3 size rule", chinook salmon smaller than 65 mm fl may be susceptible to predation by the average size hatchery steelhead released through the program. Comparing sizes of chinook the first two weeks of May to the last two weeks indicates it would be advantages to release the steelhead close to the end of May to reduce potential predation of listed chinook by the hatchery steelhead.

*Date of Release:* Hatchery winter steelhead smolts are released through the program in May. Data is incomplete on how much of the emigrating chinook have passed out of the system prior to the release of the steelhead.

*Release Location and Release Type:* Winter steelhead released through the Tokul Creek Hatchery program in May might encounter rearing and emigrating juvenile chinook salmon in the mainstem river from the release point (RM 60) to the river mouth. The duration of interaction between the two species may be limited. The steelhead are released as actively migrating smolts, which are likely to disperse seaward after release. WDFW data indicates that steelhead smolts released from the Palmer Pond (Green River) program emigrated quite rapidly downstream; reaching a trapping location located 23 miles downstream at RM 34.5 within days of release (data from Seiler et al. 2004).

*Release Number:* The release of up to 185,000 winter steelhead smolts (194 mm fl) into the Snoqualmie River (Snohomish river watershed) via Tokul Creek foster rapid downstream migration and; therefore; they are unlikely to pose significant predation and competition risks to juvenile chinook.

Based on a review of general information applied to the proposed program, the steelhead are unlikely to pose significant predation and competition risks to listed chinook juveniles. Monitoring and evaluation actions, and potential adaptive management measures that will be implemented to determine, and then (as appropriate) respond to, ecological effects of the program on listed chinook salmon are described in HGMP section 11.0.
- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

Chinook juveniles lost due to newly improved intake screens not known at this time.

Actual injury or mortality levels of chinook adult’s passing/passed upstream prior to spawning are not known (trapping and passage upstream of adults since 2000 are documented in section 2.2.2). The operational/monitoring guidelines established for the Tokul Creek weir and fish trap include: 1) count, sex and record all chinook that are collected in the fish trap, 2) chinook that are unmarked are to be transported 1/4 of a mile above the hatchery intake, 3) marked hatchery chinook are to be killed and appropriate sample information taken with carcasses used for nutrient enhancement, and 4) chinook carcasses that float down onto the weir will be retrieved and sampling will be coordinated with the Region 4 biologist.

Provide projected annual take levels for listed fish by life stage (juvenile and adult), quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

See "take" table.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

For listed chinook, if significant numbers are observed impacted by this program operation, then staff would inform the WDFW District Biologist who along with the Hatchery Complex Manager would determine an appropriate plan and consult with NOAA fisheries, if needed.

The intake dam at Tokul Creek poses a barrier to upstream migration of wild adult chinook (in the fall). Beginning in the fall of 2000, non-adipose fin clipped adults were passed upstream around the barrier manually. Intake screening complies with WDFW and NOAA Fisheries fish screening criteria. The Army Corps of Engineers has approved funding for removal of the hatchery intake dam. Based upon ACOE funding and support, WDFW anticipates completion of removal of the barrier by approximately June of 2005.
SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. **Hood Canal Summer Chum Conservation Initiative**) or other regionally accepted policies (e.g. the **NPPC Annual Production Review Report and Recommendations - NPPC document 99-15**). Explain any proposed deviations from the plan or policies.

The Tokul Creek winter steelhead program HGMP is included as one of 46 WDFW-managed plans under the co-managers' non-chinook Resource Management Plan (RMP) for Puget Sound region non-chinook salmon hatcheries. This HGMP is in alignment with the RMP, which serves as the overarching comprehensive plan for state and tribal non-chinook salmon hatchery operations in the region.

As affirmed in the co-manager’s non-chinook RMP, WDFW hatchery programs in Puget Sound must adhere to a number of guidelines, policies and permit requirements in order to operate. These constraints are designed to limit adverse effects on cultured fish, wild fish and the environment that might result from hatchery practices. Following is a list of guidelines, policies and permit requirements that govern WDFW hatchery operations:

- **Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington.** These guidelines define practices that promote maintenance of genetic variability in propagated salmon (Hershberger and Iwamoto 1981).

- **Hatchery Reform: Principles and Recommendations of the Hatchery Scientific Review Group.** This report provides a detailed description of the HSRG’s scientific framework, tools and resources developed for evaluating hatchery programs, the processes used to apply these tools, and the resulting principles, system-wide recommendations, and program-specific recommendations to reform (2004).

- **Spawning Guidelines for Washington Department of Fisheries Hatcheries.** Assembled to complement the above genetics manual, these guidelines define spawning criteria to be use to maintain genetic variability within the hatchery populations (Seidel 1983).

- **Stock Transfer Guidelines.** This document provides guidance in determining allowable stocks for release for each hatchery. It is designed to foster development of locally adapted broodstock and to minimize changes in stock characteristics brought on by transfer of non-local salmonids (WDFW 1991).

- **WDFW Steelhead Rearing Guidelines.** Details rearing guidelines and parameters statewide (July 31, 2001).

- **Fish Health Policy of the Co-managers of Washington State.** This policy designates zones limiting the spread of fish pathogens between watersheds, thereby further limiting the transfer of eggs and fish in Puget Sound that are not indigenous to the regions (WDFW, NWIFC 1998).
**National pollutant Discharge Elimination System Permit Requirements** This permit sets forth allowable discharge criteria for hatchery effluent and defines acceptable practices for hatchery operations to ensure that the quality of receiving waters and ecosystems associated with those waters are not impaired.

In 1999, several PS and coastal stocks were listed as threatened under the federal Endangered Species Act (ESA). State, tribal and federal managers need to ensure that their hatcheries do not present a risk to listed species. Through this Hatchery Reform Project, the managers have sought to go beyond merely complying with ESA directives. The new approach is to reform hatchery programs to provide benefits to wild salmon recovery and sustainable fisheries. Hatchery management decisions will be based on system-wide, scientific recommendations, providing an important model that can be replicated in other areas.

In addition, the Legislature, in 1999, created the Salmon Recovery Funding Board (SRFB) and the Shared Strategy for Salmon Recovery. Both are collaborative efforts to protect and restore salmon runs across Puget Sound. They bring together the experience and viewpoints of citizens, major state and federal natural resource agencies, local governments, non-government organizations and Puget Sound Tribes. The SRFB provides grant funds to protect or restore salmon habitat and assist related activities that produce sustainable and measurable benefits for fish and their habitat. The Shared Strategy process helps identify what is needed in each watershed to recover salmon habitat through a watershed recovery plan (see section 3.4 for more details).

### 3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

This hatchery, as well as other WDFW hatcheries, operates under *U.S. v Washington* that provides the legal framework for coordinating these programs, defining artificial production objectives, and maintaining treaty-fishing rights through the court-ordered Puget Sound Salmon Management Plan (1985). This co-management process requires that both the State of Washington and the relevant Puget Sound Tribe(s) develop program goals and objectives and agree on the function, purpose and release strategies of all hatchery programs. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring and finalized in July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are collected.

### 3.3) Relationship to harvest objectives.

#### 3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

The program benefits the in-river recreational fishery and the Tulalip Tribal fishery. Harvest rates on hatchery steelhead in the Snohomish basin have approached 90% in some years.
### Table 3.

**Snohomish River System Winter-run Steelhead**  
WDFW District 13, 16018 Mill Creek Blvd, Mill Creek  
98012, (425) 775-1311

<table>
<thead>
<tr>
<th>Year</th>
<th>hatchery</th>
<th>Wild</th>
<th>H&amp;W Total</th>
<th>Hatchery</th>
<th>Wild</th>
<th>H&amp;W Total</th>
<th>Hatchery</th>
<th>Wild</th>
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<th>H&amp;W Total</th>
<th>hatchery</th>
<th>Wild</th>
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<td>839</td>
<td>5,498</td>
<td>873</td>
<td>225</td>
<td>1,098</td>
<td>5,936</td>
<td>7,000</td>
<td>350,200</td>
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<tr>
<td>1991/92</td>
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<td>11,457</td>
<td>1,913</td>
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<td>1,948</td>
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<tr>
<td>1992/93</td>
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<td>11,918</td>
<td>832</td>
<td>39</td>
<td>871</td>
<td>6,992</td>
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<td>1993/94</td>
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</tr>
<tr>
<td>1995/96</td>
<td>5,269</td>
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<td>5,647</td>
<td>252</td>
<td>328,600</td>
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<tr>
<td>1996/97</td>
<td>3,015</td>
<td>319</td>
<td>3,334</td>
<td>241</td>
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<td></td>
<td></td>
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<tr>
<td>1997/98</td>
<td>2,067</td>
<td>105</td>
<td>2,172</td>
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<tr>
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<tr>
<td>1999/00</td>
<td>3,959</td>
<td>184</td>
<td>4,143</td>
<td>377</td>
<td>2,822</td>
<td>451,800</td>
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<tr>
<td>2000/01</td>
<td>4,349</td>
<td>118</td>
<td>4,467</td>
<td>66</td>
<td>3,122</td>
<td>412,300</td>
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<tr>
<td>2001/02</td>
<td>8,629</td>
<td>114</td>
<td>8,743</td>
<td>545</td>
<td>2,234</td>
<td>418,000</td>
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<tr>
<td>2002/03</td>
<td>2,281</td>
<td>75</td>
<td>2,356</td>
<td>3,188</td>
<td>423,250</td>
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<tr>
<td>2003/04</td>
<td>6,584</td>
<td>62+</td>
<td>6,646+</td>
<td>5,604</td>
<td>288,593</td>
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</tr>
</tbody>
</table>

#### 3.4) Relationship to habitat protection and recovery strategies.

The Legislature, in 1999, created the Salmon Recovery Funding Board (SRFB) and, as indicated earlier, the Shared Strategy for Salmon Recovery. Both are collaborative efforts to protect and restore salmon runs across Puget Sound. They bring together the experience and viewpoints of citizens, major state and federal natural resource agencies, local governments, non-government organizations and Puget Sound Tribes. The SRFB provides grant funds to protect or restore salmon habitat and assist related activities that produce sustainable and measurable benefits for fish and their habitat. The Shared Strategy process helps identify what is needed in each watershed to recover salmon habitat through a watershed recovery plan.

**Shared Strategy**

The Shared Strategy is based on the conviction that:

1) People in Puget Sound have the creativity, knowledge, and motivation to find lasting solutions to complex ecological, economic, and cultural challenges;
2) Watershed groups that represent diverse communities are essential to the success of salmon recovery;
3) Effective stewardship occurs only when all levels of government coordinate their efforts;
4) The health and vitality of Puget Sound depends on timely planning for ecosystem health and strong local and regional economies; and
5) The health of salmon are an indicator of the health of our region salmon recovery will benefit both human and natural communities.

The 5-Step Shared Strategy
1) Identify what should be in a recovery plan and assess how current efforts can support the plan.
2) Set recovery targets and ranges for each watershed.
3) Identify actions needed at the watershed level to meet targets.
4) Determine if identified actions add up to recovery. If not, identify needed adjustments.
5) Finalize the plan and actions and commitment necessary for successful implementation.

Salmon Recovery Funding Board
Composed of five citizens appointed by the Governor and five state agency directors, the Board provides grant funds to protect or restore salmon habitat and assist related activities. It works closely with local watershed groups known as lead entities (see below). SRFB has helped finance over 500 projects. The Board supports salmon recovery by funding habitat protection and restoration projects. It also supports related programs and activities that produce sustainable and measurable benefits for fish and their habitat.

Lead Entities
Lead entities are voluntary organizations under contract with the Washington State Department of Fish and Wildlife (WDFW). Lead entities define their geographic scope and are encouraged to largely match watershed boundaries. Lead entities are essential in ensuring the best projects are proposed to the Board for funding in its annual grant process.

All lead entities have a set of technical experts that assist in development of strategies, and identification and prioritization of projects. The lead entity citizen committee is responsible under state law for developing the final prioritized project list and submitting it to the SRFB for funding consideration. Lead entity technical experts and citizen committees perform important unique and complementary roles. Local technical experts are often the most knowledgeable about watershed, habitat and fish conditions. Their expertise is invaluable to ensure priorities and projects are based on ecological conditions and processes. They also can be the best judges of the technical merits and certainty of project technical success. Citizen committees are critical to ensure that priorities and projects have the necessary community support for success. They are often the best judges of current levels of community interests in salmon recovery and how to increase community support over time with the implementation of habitat projects. The complementary roles of both lead entity technical experts and citizen committees is essential to ensure the best projects are proposed for salmon recovery and that the projects will increase the technical and community support for an expanded and ever increasing effectiveness of lead entities at the local and regional level. (http://www.iac.wa.gov/srfb/leadentities.htm).
Work groups, including the Snohomish County Lead Entity, are currently in the process of assessing the major factors limiting (Limiting Factors Analysis) natural salmon production and are developing habitat management plans to facilitate salmon recovery. Initial recommendations for the Snohomish basin are described in the Initial Snohomish River Basin Chinook Salmon Conservation/Recovery Technical Work Plan (1999).

3.5) **Ecological interactions.**

(1) *Salmonid and non-salmonid fishes or other species that could negatively impact the program.*

Negative impacts by fishes and other species on the Tokul Creek winter steelhead program could occur directly through predation on program fish, or indirectly through food resource competition, genetic effects, or other ecological interactions. In particular, fishes and other species could negatively impact Tokul Creek winter steelhead survival rates through predation on newly released, emigrating juvenile fish in the freshwater and marine areas. Certain avian and mammalian species may also prey on juvenile steelhead while the fish are rearing at the hatchery sites, if these species are not excluded from the rearing areas. Species that could negatively impact juvenile steelhead through predation include the following:

- Northern pikeminnow
- Avian predators, including mergansers, cormorants, belted kingfishers, great blue herons, and night herons
- Mammalian predators, including mink, river otters, harbor seals, and sea lions

Rearing and migrating adult steelhead originating through the program may also serve as prey for large, mammalian predators in marine areas, nearshore marine areas in Puget Sound and in the Snoqualmie River to the detriment of population abundance and the program's success in augmenting harvest. Species that may negatively impact program fish through predation may include:

- Orcas
- Sea lions
- Harbor seals
- River otters

(2) *Salmonid and non-salmonid fishes or other species that could be negatively impacted by the program (focus is on listed and candidate salmonid species).*

- Chinook salmon
- Bull trout
3) *Salmonid and non-salmonid fishes or other species that could positively impact the program*

Fish species that could positively impact the program may include chinook salmon and other salmonid species present in the Snoqualmie River watershed through natural and hatchery production. Juvenile fish of these species may serve as prey items for the steelhead during their downstream migration in freshwater. Decaying carcasses of spawned adult fish may contribute nutrients that increase productivity in the watershed, providing food resources for the emigrating steelhead.

4) *Salmonid and non-salmonid fishes or other species that could be positively impacted by the program.*

The steelhead program could positively impact freshwater and marine fish species that prey on juvenile fish. Nutrients provided by decaying hatchery steelhead carcasses may also benefit fish in freshwater. These species include:

- Northern pikeminnow
- Chinook salmon
- Coho salmon
- Steelhead
- Pacific staghorn sculpin
- Numerous marine pelagic fish species

WDFW is unaware of any studies in the watershed that have directly evaluated the beneficial effects of this program to listed salmon. Therefore, we provide in this section a summary of empirical information and theoretical analyses of one type of ecological interaction that may be relevant to this program: nutrient enhancement. Recent reviews by Stockner (2003) can be consulted for additional information. NOAA Fisheries also provides a general review of nutrient enhancement benefits that may result from hatchery programs. This general information is applied to the specific hatchery operational practices proposed in the Tokul Creek winter steelhead HGMP to describe the plan's potential nutrient enhancement effect on listed salmon in the Skykomish River watershed and within the northern Puget Sound nearshore marine areas.

**Nutrient Enhancement**

Steelhead adults originating from this program that return to natural spawning areas in the Snoqualmie River may provide a source of nutrients in the form of gametes and carcasses, stimulating stream productivity. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmon have been found to elevate stream productivity through several pathways, including:

1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have
been observed to feed directly on the carcasses (Bilby et al. 1996). Addition of nutrients has been observed to increase the production of salmonids (Slaney and Ward 1993; Slaney et al. 2003; Ward et al. 2003).

Assuming a steelhead smolt to adult survival rate of 1.0%, the Tokul Creek program may lead to the annual return of 1,850 adult steelhead. At an average size of 6 pounds and if half of these spawn and die in the watershed, it can be assumed that approximately 5,550 pounds of marine derived nutrients would be made available for use by other living organisms, including juvenile fish, in the Snoqualmie River watershed.
SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

The primary source of incubation and initial rearing water for Tokul Creek Hatchery is an underground spring. This source provides a relatively constant 200 gallons per minute (gpm) supply of water at a constant 48 degrees Fahrenheit. The rearing water for the hatchery comes directly from Tokul Creek. Temperatures range from 40 to 65 degrees Fahrenheit. The creek supply is capable of providing 5000 gpm of flow.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Water for raceway rearing comes directly from Tokul Creek while incubation and early rearing water is supplied from an underground spring and are formalized through water right # S1-08944 from the Department of Ecology. The facility operates under the “Upland Fish Hatching and Rearing” National Pollution Discharge Elimination System (NPDES) general permit which conducts effluent monitoring and reporting and operates within the limitations established in its permit administered by the Washington Department of Ecology (DOE). The facility is covered under NPDES permit # WAG 13- 3004. Intake screening complies with WDFW and NOAA Fisheries fish screening criteria. The Army Corps of Engineers approved funding for removal of the hatchery intake dam. Based upon ACOE funding and support, WDFW anticipates completion of removal of the barrier by approximately June of 2005.

The Hatchery Scientific Review Group (HSRG) has recommended obtaining an additional 1 cfs (cubic foot/second) of spring water for additional incubation and early rearing (engineers
SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

 Tokul Creek Hatchery has a concrete adult capture pond and fish ladder. The pond is supplied by water from Tokul Creek and once the water passes through the adult pond it is returned to the creek. The pond is approximately 100' X 10' X 3' and is divisible into numerous sections. The pond is operated from November 25th to February 10th.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

 No broodstock are transported on-station or between stations.

5.3) Broodstock holding and spawning facilities.

 Tokul Creek Hatchery has a concrete adult capture pond and fish ladder. The pond is supplied by water from Tokul Creek and once the water passes through the adult pond it is returned to the creek. The pond is approximately 100' X 10' X 3' and is divisible into numerous sections. The pond is operated from November 25th to February 10th.

5.4) Incubation facilities.

 96 shallow trough (1' x 15' x .5') incubators fed by pathogen free spring water at 8.9 degrees Centigrade (~49 degrees Fahrenheit).

5.5) Rearing facilities.

 Fish are hatched and initially reared in shallow troughs until they reach 500 fish per pound (fpp). They are then transferred to six 10' X 80' raceways where they continue to rear until they reach a size of 50 fpp. They are then transferred to a large semi-natural rearing pond in October and released from this pond in May of the following year at 6 fpp.

5.6) Acclimation/release facilities.

 They are transferred to a large semi-natural rearing pond in October and released from this pond in May of the following year at 6 fpp.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

 Virus problems have led to egg/fish mortality.
5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Tokul Creek Hatchery is staffed with 3 full time employees. All staff are very familiar with the workings of the hatchery and have received training in fish cultural techniques and disease recognition and prevention issues. Additionally, the fish health staff makes frequent visits to the hatchery to check the health of fish stocks. They are available immediately in case of disease outbreaks. The hatchery is equipped with a sophisticated alarm system that monitors flow and other conditions critical to hatchery operations.
SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

Adult winter steelhead returning to the adult capture pond between November 25th and February 10th are used as broodstock.

6.2) Supporting information.

6.2.1) History.

Hatchery steelhead returns to Tokul Creek are originally Chambers Creek stock. Phelps et al. (1997) compared genetic samples collected from natural-origin winter steelhead in two time periods - 1975 and 1993-1996 with Chambers Creek Hatchery steelhead. Analysis of genetic distances indicated that gene flow from hatchery fish of Chambers Creek origin to naturally spawning populations in the Nooksack, Skagit, Stillaguamish and Skykomish rivers "has been minor and has not been widespread over the past twenty years."

6.2.2) Annual size.

900 adults.

6.2.3) Past and proposed level of natural fish in broodstock.

There is no known level of natural fish used in the broodstock in the past. All fish used now are of hatchery origin (adipose-fin clipped). Natural fish are not integrated within the broodstock at this time.

6.2.4) Genetic or ecological differences.

Chambers Creek origin hatchery fish typically return from late November through early February, while their wild counterparts return from late December through May. Peak hatchery spawning is in January, while peak wild spawning occurs in early May. Hatchery steelhead are released as age 1+ smolts whereas wild steelhead are predominately age 2+ smolts. Out-migration timing for both life history types is similar but is slightly earlier for hatchery component (Fuss et al. 1998). Genotypic differences have been noted through electrophoresis, but the stocks are similar, if not identical, in appearance and body shape.

6.2.5) Reasons for choosing.

Chambers Creek origin broodstock has been widely used at WDFW hatcheries because of its early arrival and spawn timing as compared to wild steelhead and availability.
6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

Steelhead adult broodstock selection takes place between late November through February while chinook are trapped and hauled (unmarked) from September through mid-November.
SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Adults

7.2) Collection or sampling design.

Hatchery fish are collected from mid-November through early February. Broodstock collected by volitional return to adult holding pond that is approximately 100' X 10' X 3' and is divisible into numerous sections. The intent of the adult collection procedure at Tokul Hatchery is to collect enough adults to maintain the hatchery production program.

7.3) Identity.

All hatchery-origin Tokul Creek winter steelhead are adipose-fin clipped. Only adipose-fin clipped adults are used for broodstock. Adult broodstock are randomly selected over the entire run entry pattern.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

900 adults.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

<table>
<thead>
<tr>
<th>Year</th>
<th>Females</th>
<th>Adults</th>
<th>Eggs</th>
<th>Juveniles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Males</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Jacks</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>464</td>
<td>464(live spawned)</td>
<td>1,689,139</td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td>451</td>
<td>451(ls)</td>
<td>1,398,100</td>
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<tr>
<td>1997</td>
<td>277</td>
<td>280 (ls)</td>
<td>831,000</td>
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<tr>
<td>1998</td>
<td>189</td>
<td>25 (172 ls)</td>
<td>607,000</td>
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<tr>
<td>1999</td>
<td>325</td>
<td>325(ls)</td>
<td>1,141,500</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>273</td>
<td>193 (ls)</td>
<td>955,500</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>254</td>
<td>255 (ls)</td>
<td>938,500</td>
<td></td>
</tr>
</tbody>
</table>
7.5) **Disposition of hatchery-origin fish collected in surplus of broodstock needs.**

Fish in excess of hatchery needs are returned to the river for recreational opportunity.

7.6) **Fish transportation and holding methods.**

NA

7.7) **Describe fish health maintenance and sanitation procedures applied.**

Adult broodstock are sampled for virus in accordance with the Co-managers Fish Health Policy (1998) and spawning procedures follow the guidelines set forth in WDFW’s Spawning Guidelines (Seidel 1983).

7.8) **Disposition of carcasses.**

Carcasses fit for human consumption are donated to local food banks or can be used for nutrient enhancement.

7.9) **Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.**

Steelhead adult broodstock collection takes place between late November through February while chinook are trapped and hauled (unmarked) from September through mid-November.
SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

Adult male and female steelhead are selected randomly over the entire run.

8.2) Males.

No backup males or repeat spawners are used.

8.3) Fertilization.

The intent is to utilize a spawning population of at least 900 adults and spawn fish at a 1:1 male-to-female ratio and gametes are pooled in lots of 5.

8.4) Cryopreserved gametes.

NA

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

NA
SECTION 9. INCUBATION AND REARING -

Specify any management goals (e.g., “egg to smolt survival”) that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

The hatchery survival goal for eyed egg-to-fry is 85%. The 5-year average is 97.6%. Typical survival from spawn to eyed egg is 95%.

9.1.2) Cause for, and disposition of surplus egg takes.

Current management approaches do not allow for the taking of eggs in surplus of program goals. If losses are too high, then goals are not met.

9.1.3) Loading densities applied during incubation.

25,000 eggs/trough.

9.1.4) Incubation conditions.

Temperature of pathogen free spring water that feeds 96 shallow troughs is a constant 49 degrees Fahrenheit. Water is saturated with oxygen at 12 ppm, but it is monitored infrequently. Disinfection procedures are implemented during incubation when appropriate.

9.1.5) Ponding.

Fish are hatched and initially reared in shallow troughs until they reach 500 fish per pound (fpp). They are then transferred to six 10’ X 80’ raceways where they continue to rear until they reach a size of 50 fpp. They are then transferred to a large semi-natural rearing pond in October and released from this pond in May of the following year at 6 fpp.

9.1.6) Fish health maintenance and monitoring.

The fish are cared for on a daily basis by trained hatchery specialists. As soon as potential problems are seen, these concerns are immediately communicated to the WDFW Fish Health Specialist. In addition, fish health specialists conduct inspections monthly. Potential problems are managed promptly to limit mortality and reduce possible disease transmission.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

NA
9.2) **Rearing:**

9.2.1) *Provide survival rate data (average program performance) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available.*

For broodyears 2000-04:
Average fry to fingerling survival was 87.4%
Average fingerling to smolt survival was 92.4%.

9.2.2) *Density and loading criteria (goals and actual levels).*

Numerous criteria are applied depending on the fish's size, the pond style they reside in, water quality, water temperature, relative health and water conditions. However, as a rule, the criteria limit loadings to a maximum of 3 pounds fish/gpm of flow until they have reached a size of 100 fpp.

9.2.3) *Fish rearing conditions*

Water temperatures are monitored on a daily basis. The rearing water for the hatchery comes directly from Tokul Creek. Temperatures range from 40 to 65 degrees Fahrenheit. The creek supply is capable of providing 5000 gpm of flow. Water flows are checked at least weekly.

9.2.4) *Indicate biweekly or monthly fish growth information (average program performance), including length, weight, and condition factor data collected during rearing, if available.*

No available.

9.2.5) *Indicate monthly fish growth rate and energy reserve data (average program performance), if available.*

No energy reserve data is available.

9.2.6) *Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (average program performance).*

Diets are supplied by Moore-Clark and BioOregon. The diets are typically "dry" or "semi-dry" in nature and included starter diets, crumbles and pellet type feeds. Daily percent of body weight fed varies depending on the size of the fish, temperature of the water and time of year. However, the range is usually from 1-3% B.W./day. Overall food conversion is typically 1.1 to1.2: 1.
9.2.7) **Fish health monitoring, disease treatment, and sanitation procedures.**

Fish are sampled during rearing for the incidence of disease in accordance with the Co-Managers Fish Health Policy. Monthly monitoring exams take place to detect pathogens of concern. In the event of disease epizootics or elevated mortality, fish pathologists are available to diagnose problems and provide treatment recommendations.

9.2.8) **Smolt development indices (e.g. gill ATPase activity), if applicable.**

No Gill ATPase activity is monitored. The migratory state of the release population is noticeable by fish behavior. Aggressive screen crowding, swarming against sloped pond sides, a silvery physical appearance and loose scales during feeding events are signs of smolt development. From past history, hatchery personnel will reduce feed regimes in early spring as fish show signs of smolting. Correspondingly, environmental cues including daylight increase, spike in the water temperature and spring freshets will also be part of the decision to release fish.

9.2.9) **Indicate the use of "natural" rearing methods as applied in the program.**

NA

9.2.10) **Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.**

Pathogens are not unique to hatcheries. Hatchery-origin fish may have an increased risk of carrying fish disease pathogens because higher rearing densities of fish in the hatchery may stress fish and lower immune responses. Under certain conditions, hatchery effluent has the potential to transport fish pathogens out of the hatchery, where natural fish may be exposed. These impacts are addressed by rearing the steelhead at lower densities, within widely recognized guidelines (Piper et al 1982), continuing well-developed monitoring, diagnostic, and treatment programs already in place (Co-manager’s Fish Health Policy 1998).
SECTION 10. RELEASE
Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels. (Use standardized life stage definitions by species presented in Attachment 2. "Location" is watershed planted (e.g. "Elwha River").)

<table>
<thead>
<tr>
<th>Age Class</th>
<th>Maximum Number</th>
<th>Size (fpp)</th>
<th>Release Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eggs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unfed Fry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fingerling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yearling</td>
<td>185,000</td>
<td>6</td>
<td>May</td>
<td>Snoqualmie R. Watershed</td>
</tr>
</tbody>
</table>

10.2) Specific location(s) of proposed release(s).
Stream, river, or watercourse: Snoqualmie River (07.0219)
Release point: Tokul Creek Hatchery @ RM 0.5 (07.0440), multiple acclimation/planting sites in Snoqualmie River watershed (Duvall, mouth and upriver of Tolt and the Raging rivers).
Major watershed: Snohomish River (07)
Basin or Region: Puget Sound
10.3) Actual numbers and sizes of fish released by age class through the program.

<table>
<thead>
<tr>
<th>Release year</th>
<th>Eggs/ Unfed Fry</th>
<th>Avg size Fry</th>
<th>Avg size</th>
<th>Fingerling Avg size</th>
<th>Yearling</th>
<th>Avg size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>74,000</td>
<td>6</td>
</tr>
<tr>
<td>1996</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>179,000</td>
<td>6</td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>137,000</td>
<td>6</td>
</tr>
<tr>
<td>1998</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>230,000</td>
<td>6</td>
</tr>
<tr>
<td>1999</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>186,700</td>
<td>6</td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>176,647</td>
<td>6</td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>198,171</td>
<td>6</td>
</tr>
<tr>
<td>2002</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>195,506</td>
<td>5.5</td>
</tr>
<tr>
<td>2003</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>193,474</td>
<td>5</td>
</tr>
<tr>
<td>2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>183,143</td>
<td>5</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>175,364</td>
<td>5.8</td>
</tr>
</tbody>
</table>

Data source: Tokul Cr. hatchery records

Note: Of the numbers above, approximately 100,000 are releases on-station (Tokul Creek) with the remainder being acclimated/planted at sites in the Snoqualmie River system.

10.4) Actual dates of release and description of release protocols.

Fish releases are made the first week of May. The release protocol is forced. The pond is drawn down and fish are weighed out for release. Fish to be planted at off-station sites are loaded into tankers for transport to the release sites. Fish to be released on-site are weighed into the creek.

10.5) Fish transportation procedures, if applicable.

Fish are weighed into tanker trucks equipped with oxygen and recirculation tanks.

10.6) Acclimation procedures (methods applied and length of time).

Incubated and reared on the same water source (river) prior to release.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

All hatchery steelhead are adipose-fin clipped.
10.8) **Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.**

Programmed levels will be controlled by limiting the number of broodstock collected.

10.9) **Fish health certification procedures applied pre-release.**

These winter steelhead are fish health certified in accordance with the Co-Managers Fish Health Policy within two weeks of their scheduled release.

10.10) **Emergency release procedures in response to flooding or water system failure.**

In the case of a catastrophic event conditions critical to the fishes health would be monitored and if deemed necessary the fish would be released prematurely to prevent their loss in the ponds.

10.11) **Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.**

Steelhead are released at a time, size, and life history stage (smolts) to foster rapid migration to marine waters. Smolts are released in May to allow chinook to grow to a size that reduces the potential for predation (see section 2.2.3 for more details).
SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of “Performance Indicators” presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each “Performance Indicator” identified for the program.

The co-managers conduct numerous ongoing monitor programs, including catch, escapement, marking, tagging, and fish health testing. The focus of enhanced monitoring and evaluation programs will be on the risks posed by ecological interactions with listed species. WDFW is proceeding on four tracks:

1) An ongoing research program conducted by Duffy et al. (2002) is assessing the nearshore distribution, size structure, and trophic interactions of juvenile salmon, and potential predators and competitors, in northern and southern Puget Sound. Funding is provided through the federal Hatchery Scientific Review Group. Preliminary results by Duffy et al. (2005, HSRG Research Workshop) indicated that the dominant predator of salmonids in the nearshore and estuary environments is cutthroat trout. Chinook were found to prey largely on herring and sand lance. The biggest prey item for coho was marine plankton and pink and chum salmon.

2) A three-year study of the estuarine and early marine use of Sinclair Inlet by juvenile salmonids is nearing completion. The project has four objectives:
   a) Assess the spatial and temporal use of littoral habitats by juvenile chinook throughout the time these fish are available in the inlet;
   b) Assess the use of offshore (i.e., non-littoral) habitats by juvenile chinook;
   c) Determine how long cohorts of juvenile chinook salmon are present in Sinclair Inlet;
   d) Examine the trophic ecology of juvenile chinook in Sinclair Inlet. This will consist of evaluating the diets of wild chinook salmon and some of their potential predators and competitors. Funding is provided by the USDD-Navy.

3) WDFW is developing the design for a research project to assess the risks of predation on listed species by coho salmon and steelhead released from artificial production programs. Questions that this project will address include:
   a) How do trucking and the source of fish (within watershed or out of watershed) affect the migration rate of juvenile steelhead?
   b) How many juvenile chinook salmon of natural origin do coho salmon and steelhead consume?
   c) What is the rate of residualism of steelhead in Puget Sound Rivers?
   Funding needs have not yet been quantified, but would likely be met through a combination of federal and state sources.

4) WDFW is assisting the Hatchery Scientific Review Group in the development of a template for a regional monitoring plan. The template will provide an integrated assessment of hatchery and wild populations.
11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

See Section 11.1.1.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Risk aversion measures will be developed in conjunction with the monitoring and evaluation plans.
SECTION 12. RESEARCH

12.1) Objective or purpose.

There is currently no research being conducted using Tokul Creek Winter Steelhead.

12.2) Cooperating and funding agencies.

12.3) Principle investigator or project supervisor and staff.

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

12.6) Dates or time period in which research activity occurs.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

12.8) Expected type and effects of take and potential for injury or mortality.

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached “take table” (Table 1).

12.10) Alternative methods to achieve project objectives.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.
SECTION 13. ATTACHMENTS AND CITATIONS


SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

“I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973.”

Name, Title, and Signature of Applicant:

Certified by_____________________________ Date:_____________
Table. Estimated listed salmonid take levels by hatchery activity.

**Chinook**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Tokul Creek Winter Steelhead Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location of hatchery activity</td>
<td>Tokul Creek Hatchery, RM 0.5 Tokul Creek (07.0440)</td>
</tr>
<tr>
<td>Dates of activity</td>
<td>September- May</td>
</tr>
<tr>
<td>Hatchery Program Operator</td>
<td>WDFW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Take</th>
<th>Annual Take of Listed Fish by life Stage (number of fish)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Egg/Fry</td>
</tr>
<tr>
<td>Observe or harass (a)</td>
<td>-</td>
</tr>
<tr>
<td>Collect for transport (b)</td>
<td>-</td>
</tr>
<tr>
<td>Capture, handle, and release (c)</td>
<td>-</td>
</tr>
<tr>
<td>Capture, handle, tag/mark/tissue sample, and release (d)</td>
<td>-</td>
</tr>
<tr>
<td>Removal (e.g., broodstock (e))</td>
<td>-</td>
</tr>
<tr>
<td>Intentional lethal take (f)</td>
<td>-</td>
</tr>
<tr>
<td>Unintentional lethal take (g)</td>
<td>-</td>
</tr>
<tr>
<td>Other take (indirect, unintentional) (h)</td>
<td>-</td>
</tr>
</tbody>
</table>

* Current policy is to pass all unmarked chinook adults above the rack. For the past 3 years that range has been 97-147. If we get more than 200 will consult with NMFS.

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.