

# HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

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**Hatchery Program:**

Crisp Creek Ponds – On-Station

**Species or  
Hatchery Stock:**

Green River Coho - Yearlings

**Agency/Operator:**

Muckleshoot Indian Tribe

**Watershed and Region:**

09.0001 – Green River (Puget Sound)

**Date Submitted:**

October 29, 2004

**Date Last Updated:**

October 2004

## **SECTION 1. GENERAL PROGRAM DESCRIPTION**

**1.1) Name of hatchery or program.**

Crisp Creek Coho / On-Station

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

Coho Salmon – Oncorhynchus kisutch

**1.3) Responsible organization and individuals**

Name (and title): Dennis Moore – Fish Enhancement Manager

Agency or Tribe: Muckleshoot

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

WDF&W

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

Funding Source : Tribal and funds from other government sources are available to Implement this program.

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

Crisp Creek Ponds : RM 1.1 on Crisp Creek (09.0013), a right bank tributary of Green River ( 09.0001) entering at RM 40.1

**1.6) Type of program.**

Integrated Harvest

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

Produce fish to meet harvest needs

-2-

**1.8) Justification for the program.**

Artificially propagated fish will provide fishing opportunities.

**1.9) List of program "Performance Standards".**

( see table below)

**1.10) List of program "Performance Indicators", designated by "benefits" and "risks."**

**1.10.1) "Performance Indicators" addressing benefits.**

(see table below)

**1.10.2) "Performance Indicators" addressing risks.**

Goal – Section 1.7	Justification –Section 1.8	Performance Standard- Section 1.9	Performance Indicator- Section 1.10
Produce fish to meet harvest needs	Artificially propagated fish will provide fishing opportunities, .	Hatchery production contributes to harvest and maintains Tribal Treaty harvest rights by providing surplus coho for in-river and bay fisheries	Estimate total harvest and effort for target fishery.  Estimate the contribution of Crisp Creek production to harvest in terminal target fisheries.  Estimate survival of Crisp Creek hatchery production

**1.11) Expected size of program.**

600,000

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

( WDF&W – Soos Creek Hatchery HGMP)

**1.11.2) Proposed annual fish release levels (maximum number) by life stage and**

location.

Life Stage	Release Location	Annual Release Level
Yearling	Crisp Creek (River Mile 1.1)	600k

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

see Attachment 1

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

First Brood 1975 by WDF&W  
Program taken over by Muckleshoot Tribe in 1992

**1.14) Expected duration of program.**

Indefinite

**1.15) Watersheds targeted by program.**

Green River ( 09.0001)

**1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.**

Expansion of the program at WDF&W's Soos Creek Hatchery. This option has not materialized due to an increase risk of loss "within" a hatchery with only one facility in production.

## **SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.**

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

None to date

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

Unknown impacts at this time

**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.

Green River Fall Chinook

**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
- Critical/Viable population thresholds under ESA have not been determined, however the SASSI report (WDF&W) determined this population ( Green-Duwamish Summer/Fall Chinook) to be “healthy”.
- 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.
- On average ( return years 1987-98) , each Green River natural spawner produces 2.33 adults returning to Washington waters - WDF&W Run-reconstruction Tables)
- 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.
- The 12 year average escapement is 7,598 based on the WDF&W Chinook run-reconstruction tables. The escapement goal of 5,800 Chinook has been exceeded in 9 of the last 12 years ( 1988-1999)

- 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.**

- Washington Department of Fish and Wildlife reports the ratio of hatchery-origin adults on the spawning grounds averaged 33.4% between 1989 and 1997, based on WDF&D coded-wire tag data( see WDF&W's Soos Creek Hatchery HGMP). This data is based on a small sample size ( <4%) in five of these years and was sampled from a limited area ( RM 33.8 to 41.4 only(; therefore, it is not appropriate to apply this data river-wide.
- The ratio of Soos Creek hatchery-origin Chinook adults to Newakum Creek natural spawners averaged 23.3% in 9 years between 1989 and 1997 ( WDF&W CWT data) . Sample rates averaged 30% per year.

**2.2.3 Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take**

N/A

- **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.**

N/A

- **Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.**

N/A

- **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).**

N/A

- **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.**

N/A

**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.  
None

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

N/A

3.3) Relationship to harvest objectives

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

See Attachment 1 – Coded-wire tag data

3.4) Relationship to habitat protection and recovery strategies

N/A

3.5) Ecological interactions.

Hatchery fish can interact with listed fish species through competition and predation (Fresh 1997). Program fish can negatively impact listed fish populations through reduced growth, survival and abundance. Several methods have been developed to assess potential negative ecological interactions and risks associated with hatchery programs (Pearsons and Hopley 1999; Ham and Pearsons 2001). The degree to which fish interact depends upon fish life-history characteristics which include: 1) size and morphology, 2) behavior, 3) habitat use and 4) movements (Flagg et al. 2000). Important considerations associated with hatchery practices include the type of species reared, fish size at time of release, number of fish released and location(s) of program releases. Interaction potential between hatchery origin fish and natural origin fish can certainly depend on habitat structure and system productivity. For example, habitat structure can influence predator-prey encounter rates (visibility), the amount of preferred spawning habitat and fish susceptibility to flushing flows. System productivity determines the degree to which fish populations may be food-limited, and thus negatively impacted by density-dependent effects. The type and degree of risk associated with releases of program fish typically involve complex mechanisms. Actual identification and magnitude of causal mechanisms negatively impacting listed fish is not always definitive due to confounding factors such as human-induced environmental changes, indirect pathway effects and the diversity of environments salmon occupy throughout their life-cycle (Li et al. 1987; Fausch 1988; Fresh 1997; Flagg et al. 2000).

Given these complex mechanisms and site-specific considerations it is not surprising that for most hatchery programs, the extent of possible adverse competition and predation effects of hatchery releases

on listed fish populations throughout Puget Sound have not been explicitly documented or quantified.

Given the perceived risks associated with hatchery programs, hatchery coho salmon are reared and released in a manner to minimize potential negative impacts on listed chinook salmon and bull trout populations (see Section 10.11).

Releases of yearling coho salmon certainly pose a predation risk on juvenile fall chinook and chum salmon, both in the freshwater and marine environment (Hargreaves and LeBrasseur 1985; Hawkins and Tipping 1999; Pearsons and Fritts 1999). Actual rates of predation by program releases of yearling coho salmon on juvenile chinook and chum salmon are unknown at this time.

#### **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.**

Crisp Creek is fed by groundwater recharge and springs that discharge to the creek. Groundwater and surface water is in hydraulic continuity throughout the watershed; therefore a loss of recharge in the watershed could reduce Crisp Creek's base flows.

Water quality in Crisp Creek above the Tribe's hatchery operations facilities meets most of Washington State's Class A standards, which are the current standards that apply to the creek. The existing water quality data collected in 1993 and 1994 indicate that Crisp Creek meets State water quality standards for temperature, turbidity, dissolved oxygen, and pH.

**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.**

Anadromous fish are not present up-stream of the rearing ponds and no Chinook are present in Crisp Creek below the ponds outflow.

#### **SECTION 5. FACILITIES**

Note: All brood collection is at Soos Creek Hatchery. Fingerling are shipped to Crisp Creek Ponds ( See WDF&W – Soos Creek HGMP)

**5.1) Broodstock collection facilities (or methods).**

N/A

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

N/A

**5.3) Broodstock holding and spawning facilities.**

N/A

**5.4) Incubation facilities.**

N/A

**5.5) Rearing facilities.**

Early rearing is conducted Soos Creek Hatchery. Fingerling to Yearling release is conducted at the Crisp Creek Ponds. ( see Section 9.2)

**5.6) Acclimation/release facilities.**

Release directly from Crisp Creek Ponds

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

N/A

**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.**

N/A

**SECTION 6. BROODSTOCK ORIGIN AND IDENTITY**

(see WDF&W – Soos Creek HGMP)

**6.1) Source.**

N/A

**6.2) Supporting information.**

**6.2.1) History.**

N/A

**6.2.2) Annual size.**

N/A

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

N/A

**6.2.4) Genetic or ecological differences.**

N/A

**6.2.5) Reasons for choosing.**

N/A

**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.**

N/A

**SECTION 7. BROODSTOCK COLLECTION**

( see WDF&W Soos Creek Hatchery HGMP)

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

N/A

**7.2) Collection or sampling design.**

N/A

**7.3) Identity.**

N/A

**7.4) Proposed number to be collected:**

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

N/A

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

N/A

**7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.**

N/A

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

N/A

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

N/A

**7.8) Disposition of carcasses.**

N/A

**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.**

N/A

## **SECTION 8. MATING**

( see WDF&W – Soos Creek Hatchery HGMP)

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

### **8.1) Selection method.**

N/A

### **8.2) Males.**

N/A

### **8.3) Fertilization.**

N/A

### **8.4) Cryopreserved gametes.**

N/A

### **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.**

N/A

## **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:**

( WDF&W – Soos Creek Hatchery HGMP)

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

N/A

-12-

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

N/A

**9.1.3) Loading densities applied during incubation.**

N/A

**9.1.4) Incubation conditions.**

N/A

**9.1.5) Ponding.**

N/A

**9.1.6) Fish health maintenance and monitoring.**

N/A

**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.**

N/A

**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..**

Fingerling size fish are transferred to the Muckleshoot operated Crisp Creek Ponds about August 1 each year at about 80 per pound. The earthen ponds do not lend themselves to accurate mortality counting but is believed to range from 10 percent to 30percent, mainly from mammal predators.

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

Pond Size = 62,500 Cubic Feet  
Fish Number= 200,000 ( currently )  
Fish Number = 600,000 ( goal )  
Maximum pounds = 16,666 @ 12 per pound  
Pounds of Fish/ Cubic Feet = 0.26

-13-

**9.2.3) Fish rearing conditions**

Between May and August the earthen ponds sit empty , aside from Crisp Creek flowing through . This allows natural plants to grow to provide habitat when the pond is filled again. Fish are transferred in and feeding begins the first week of August. The near constant "base " flow from springs provides about 5 cfs and an "average" flow during rearing conditions ranges from 5 cfs to 10 cfs ( for both ponds). Based on that range the oxygen levels never dip below 7.5 ppm and the turnover rate is 5.8 hours to 2.9 hours at 2.5 cfs and 5.0 cfs respectfully) Fish size and health monitoring sampling is by grab sample near the feed "blower". Fish are not disturbed until CWT tagging in late February when fish are seined to one end. Fish are volitionally released in mid-May.

**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.**

Not Available

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

Fish are placed in the ponds in August at about 80 fish per pound and left relatively undisturbed until marking in February of the following year when they average 20 fish per pound.

**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*).**

Fish are fed a semi-dry diet through-out the rearing period. A specialized diet( Freshwater Transfer) is fed for the last 6 weeks of rearing before release. Although we have not conducted a formal study as to the benefits of the Transfer diet, we have found that the yearling coho migrates out of Crisp Creek sooner on their way to Puget Sound. It is thought that this condition minimizes predation in Crisp Creek and the Green River.

**9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.**

Fish are monitored on a daily basis for health concerns and inspected monthly By The Olympia Fish Health Center ( NWIFC) Once in the pond this stock has never required chemical or otherwise treatment. Low level of parasites and BKD is in the stock/ pond history.

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

Not available

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

Fish are reared in an earthen pond with aquatic plant habitat and patchy gravel bottom. Approximately 10 to 15 percent of the pond population stay away from the artificial diet fed via "blower" and by hand, and opt for natural bugs available throughout the rearing period.

**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.**

N/A

**SECTION 10. RELEASE Describe fish release levels, and release practices applied through the hatchery program.**

**10.1) Proposed fish release levels.**

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Yearling	600,000	12	May 1-15	Crisp Creek Rearing Ponds , Crisp Creek (RM 1.1)

**10.2) Specific location(s) of proposed release(s).**

**Stream, river, or watercourse:** Crisp Creek ( 09.0113)

**Release point:** RM 1.1

**Major watershed:** Green River

**Basin or Region:** Puget Sound

10.3) Actual numbers and sizes of fish released by age class through the program.

Release year	Brood Year	Yearling	Avg size	Release Dates	Tag Code
1988	1986	588,900	15		WDF&W
1989	1987	560,000	15		WDF&W
1990	1988	596,250	17		WDF&W
1991	1989	526,800	23		WDF&W
1992	1990	599,100	16		WDF&W
1993	1991	529,000	18		WDF&W
1994	1992	333,995	18	Apr.29 to May 4	053538
1995	1993	240,135	18.5	May 1-7	053540 053541 053542 053543
1996	1994	495,606	25 (flood waters release)	Feb.9	No CWT
1997	1995	58,000	15.6	May 1	No CWT
1998	1996	312,885	13.7	Apr.29 to May 6	213163
1999	1997	291,000	15	May 11	210138
2000	1998	194,180	17	May 2	210224
2001	1999	195,000	12.1	May 7-10	210197
2002	2000	345,085	9.7	May 6-10	210335
Average					

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

Fish are typically released the first or second week of May if behavior indicates an out-migration pattern, ie. Crowding the screens, circling the pond, silvery coloration, etc. To allow for volitional release the screens are pulled but dam boards are kept in place. Over the course of a week the dam boards are pulled to lower the pond 5 inches a day. Stragglers are left to migrate out on their own but all fish are typically gone by this time.

**10.5) Fish transportation procedures, if applicable.**

N/A

**10.6) Acclimation procedures**

N/A

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

Currently 50,000 smolts are CWT tagged each year regardless of actual number in the pond.

**10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.**

N/A

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

Fish are inspected and certified as dictated by the Pacific Northwest Fish Health Protection Committee / Agreement

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

Fish are released directly into Crisp Creek, a tributary of Green River.

**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.**

Given the perceived risks associated with hatchery programs ( see Section 3.5), hatchery coho yearling salmon are reared and released in a manner to minimize potential negative impacts on listed Chinook salmon and bull trout populations.

These measures include feeding a "transfer" diet the last six weeks prior to release to

improve physical and biological processes relating to smolting and the desire to migrate quickly to saltwater reducing any freshwater predation.

**SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS**

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

<b>Performance Indicator- Section 1.10</b>	<b>Monitoring / Methods / Comments Section 11.1</b>
Estimate total harvest and effort for target fishery.	Through Fish Tickets
Estimate the contribution of hatchery fish to harvest in terminal target fisheries.	CWT tagged fish are sampled in the fisheries
Estimate exploitation rates of hatchery fish  Estimate survival of hatchery production to target fisheries and escapement	CWT tagged fish are sampled in the fisheries, escapement to hatchery rack

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

Currently, CWT tagging is used to calculate contribution rates.

**11.1.2) Indicate whether funding, staffing, and other support logistics are available**

**or committed to allow implementation of the monitoring and evaluation program.**

Tribal, and funds from other governmental sources are available to implement this Program

**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.**

N/A

## **SECTION 12. RESEARCH**

No research is being conducted at this time

**12.1) Objective or purpose.**

**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**

### Attachment 1- Program Performance – CWT Data

#### Literature Cited

Fausch KD. 1988. Tests of competition between native and introduced salmonids in streams: what have we learned? *Canadian Journal of Fisheries and Aquatic Sciences* 45:2238-2246.

Flagg TA, Berejikian BA, Colt JE, Dickhoff WW, Harrell LW, Maynard DJ, Nash CE, Strom MS, Iwamoto RN, Mahnken CVW. 2000. Ecological and behavioral impacts of artificial production strategies on the abundance of wild salmonid populations; a review of practices in the Pacific Northwest. NOAA Technical Memorandum NMFS-NWFSC-41.

Fresh KL. 1997. The role of competition and predation in the decline of Pacific salmon and steelhead. In: Stouder DJ, Bisson PA, Naiman RJ, Duke MG, editors. *Pacific salmon and their ecosystems*. New York, NY: Chapman and Hall. p 245-275.

Ham KD, Pearsons TN. 2001. A practical approach for containing ecological risks associated with fish stocking programs. *Fisheries* 26(4):15-23.

Hargreaves NB, LeBrasseur RJ. 1985. Species selective predation on juvenile pink (*Oncorhynchus gorbuscha*) and chum salmon (*O. keta*) by coho salmon (*O. kisutch*). *Canadian Journal of Fisheries and Aquatic Sciences* 42:659-668.

Hawkins SW, Tipping JM. 1999. Predation by juvenile hatchery salmonids on wild fall chinook salmon fry in the Lewis River, Washington. *California Fish and Game* 85(3):124-129.

Li HW, Schreck CB, Bond CE, Rexstad E. 1987. Factors influencing changes in fish assemblages of Pacific Northwest streams. In: Matthews WJ, Heins DC, editors. *Community and Evolutionary Ecology of North American Fishes*: University of Oklahoma Press, Norman and London. p 193-202.

Pearsons TN, Fritts AL. 1999. Maximum size of chinook salmon consumed by juvenile coho salmon. *North American Journal of Fisheries Management* 19:165-170.

Pearsons TN, Hopley CW. 1999. A practical approach for assessing ecological risks associated with fish

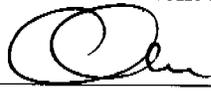
stocking programs. Fisheries 24(9):16-27.

**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.” By submitting this material, the Muckleshoot Tribe is not conceding the application of ESA to its hatchery operations. This information is primarily submitted to facilitate the ability of NOAA Fisheries to carry out its duties under the ESA consistent with the government to government relationship between the Muckleshoot Tribe and the United States.”

Name, Title, and Signature of Applicant:

Dennis Moore, Fish Enhancement Manager

Certified by  Date: 10/29/04

**Crisp Creek Coho HGMP**

**Attachment 1 – Coded - Wire-Tag- Retrieval and Analysis**

Northwest Indian Fisheries Commission  
**CRAS - Coded-Wire-Tag Retrieval and Analysis System**

Prepared On: 1/16/02

**CWT RECOVERY DISTRIBUTION REPORT**

Page 1 of 5

CWT LIST: crisp crk by 92-96

<b>Tag Code: 053538</b>		<b>Run:</b>	
Brood Year: 1992		Release Site: GREEN R 09.0001	
Age: 3		Stock: BIG SOOS CR 09.0072	
Species: Coho		Avg Weight (g): 18.4	
Hatchery Name: CRISP CR REARING PON		Type of Tag: Standard (1 mm)	
Releasing Agency: Washington Dept. Fish and Wildlife		Total # of Expanded Recoveries: 5.9	
Release Stage: Smolt		Total # of Expanded Fishery Recoveries: 5.9	
First Release Date: 5/10/94			
Last Release Date: 5/10/94			
# Tagged: 19,937			
# Ad Onlys: 407			
# Unmarked: 0			

Recovery Location	Number of Obs. Recoveries	Number of Est. Recoveries	% of Total Recoveries
SW Vancouver Island Troll	1	5.9	100.0%

<b>Tag Code: 053540</b>		<b>Run:</b>	
Brood Year: 1993		Release Site: GREEN R 09.0001	
Age: 3		Stock: BIG SOOS CR 09.0072	
Species: Coho		Avg Weight (g): 20	
Hatchery Name: CRISP CR REARING PON		Type of Tag: 1.5 length	
Releasing Agency: Washington Dept. Fish and Wildlife		Total # of Expanded Recoveries: 220.4	
Release Stage: Smolt		Total # of Expanded Fishery Recoveries: 160.4	
First Release Date: 4/24/95			
Last Release Date: 4/24/95			
# Tagged: 20,210			
# Ad Onlys: 202			
# Unmarked: 0			

Recovery Location	Number of Obs. Recoveries	Number of Est. Recoveries	% of Total Recoveries
NW Vancouver Island Troll	3	11.5	5.2%
SW Vancouver Island Troll	16	59.2	26.9%
Georgia/Juan de Fuca/Johnstone Str. Sport	2	20.7	9.4%
Juan de Fuca Net (Canadian Area 20)	1	2.4	1.1%
WA Area 4 Sport (Neah Bay)	1	1.6	0.7%
WA Area 5 Sport	1	18.2	8.3%
WA Area 6 Sport	3	11.0	5.0%
WA Area 10 Sport (Seattle-Bainbridge)	1	7.8	3.5%
WA Area 11 Sport (Tacoma-Vashon)	1	7.5	3.4%
WA Area 10 Net	2	2.0	0.9%
WA Area 13 Sport (South Sound)	1	3.4	1.5%
Freshwater Net	12	15.1	6.9%
Freshwater Escapement	49	60.0	27.2%

# Northwest Indian Fisheries Commission

## CRAS - Coded-Wire-Tag Retrieval and Analysis System

Prepared On: 1/16/02

### CWT RECOVERY DISTRIBUTION REPORT

Page 2 of 5

CWT LIST: crisp crk by 92-96

**Tag Code: 053541**

Brood Year: 1993

Age: 2

Species: Coho

Hatchery Name: CRISP CR REARING PON

Releasing Agency: Washington Dept. Fish and Wildlife

Release Stage: Smolt

First Release Date: 4/25/95

Last Release Date: 4/25/95

# Tagged: 20,318

# Ad Onlys: 203

# Unmarked: 0

Run:

Release Site: GREEN R 09.0001

Stock: BIG SOOS CR 09.0072

Avg Weight (g): 20

Type of Tag: 1.5 length

Total # of Expanded Recoveries: 4.0

Total # of Expanded Fishery Recoveries: 4.0

Recovery Location	Number of Obs. Recoveries	Number of Est. Recoveries	% of Total Recoveries
WA Area 13 Sport (South Sound)	1	4.0	100.0%

**Tag Code: 053541**

Brood Year: 1993

Age: 3

Species: Coho

Hatchery Name: CRISP CR REARING PON

Releasing Agency: Washington Dept. Fish and Wildlife

Release Stage: Smolt

First Release Date: 4/25/95

Last Release Date: 4/25/95

# Tagged: 20,318

# Ad Onlys: 203

# Unmarked: 0

Run:

Release Site: GREEN R 09.0001

Stock: BIG SOOS CR 09.0072

Avg Weight (g): 20

Type of Tag: 1.5 length

Total # of Expanded Recoveries: 561.4

Total # of Expanded Fishery Recoveries: 359.4

Recovery Location	Number of Obs. Recoveries	Number of Est. Recoveries	% of Total Recoveries
NW Vancouver Island Troll	2	7.0	1.2%
SW Vancouver Island Troll	37	139.4	24.8%
West Coast Vancouver Island Sport	1	16.1	2.9%
Georgia/Juan de Fuca/Johnstone Str. Sport	5	48.4	8.6%
WA Areas 4 and 4B Troll (Cape Flattery)	1	15.7	2.8%
WA Area 4 Sport (Neah Bay)	3	5.6	1.0%
WA Area 2 Sport (Westport)	2	3.0	0.5%
WA Area 1 Sport (Illwaco)	4	6.9	1.2%
WA Area 5 Sport	3	15.0	2.7%
WA Area 6 Sport	5	21.9	3.9%
WA Area 8-2 Sport (Stillaguamish-Snohomish)	1	3.4	0.6%
WA Area 10 Sport (Seattle-Bainbridge)	3	12.2	2.2%
WA Area 10 Net	4	4.0	0.7%
Freshwater Net	39	60.8	10.8%
Freshwater Escapement	165	202.0	36.0%

Northwest Indian Fisheries Commission  
**CRAS - Coded-Wire-Tag Retrieval and Analysis System**

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Prepared On: 1/16/02

**CWT RECOVERY DISTRIBUTION REPORT**  
**CWT LIST: crisp crk by 92-96**

Page 3 of 5

**Tag Code: 053542**

Brood Year: 1993  
 Age: 2  
 Species: Coho  
 Hatchery Name: CRISP CR REARING PON  
 Releasing Agency: Washington Dept. Fish and Wildlife  
 Release Stage: Smolt  
 First Release Date: 5/9/95  
 Last Release Date: 5/9/95  
 # Tagged: 20,098  
 # Ad Onlys: 81  
 # Unmarked: 40

Run:  
 Release Site: GREEN R 09.0001  
 Stock: BIG SOOS CR 09.0072  
 Avg Weight (g): 24.3  
 Type of Tag: 1.5 length  
 Total # of Expanded Recoveries: 1.0  
 Total # of Expanded Fishery Recoveries:

Recovery Location	Number of Obs. Recoveries	Number of Est. Recoveries	% of Total Recoveries
Freshwater Escapement	1	1.0	100.0%

**Tag Code: 053542**

Brood Year: 1993  
 Age: 3  
 Species: Coho  
 Hatchery Name: CRISP CR REARING PON  
 Releasing Agency: Washington Dept. Fish and Wildlife  
 Release Stage: Smolt  
 First Release Date: 5/9/95  
 Last Release Date: 5/9/95  
 # Tagged: 20,098  
 # Ad Onlys: 81  
 # Unmarked: 40

Run:  
 Release Site: GREEN R 09.0001  
 Stock: BIG SOOS CR 09.0072  
 Avg Weight (g): 24.3  
 Type of Tag: 1.5 length  
 Total # of Expanded Recoveries: 28.4  
 Total # of Expanded Fishery Recoveries: 16.4

Recovery Location	Number of Obs. Recoveries	Number of Est. Recoveries	% of Total Recoveries
NW Vancouver Island Troll	1	3.1	10.9%
SW Vancouver Island Troll	3	12.2	43.0%
Freshwater Net	1	1.1	3.9%
Freshwater Escapement	10	12.0	42.3%

Northwest Indian Fisheries Commission  
**CRAS - Coded-Wire-Tag Retrieval and Analysis System**

Prepared On: 1/16/02

**CWT RECOVERY DISTRIBUTION REPORT**

Page 4 of 5

CWT LIST: crisp crk by 92-96

**Tag Code: 053543**

Brood Year: 1993  
 Age: 2  
 Species: Coho  
 Hatchery Name: CRISP CR REARING PON  
 Releasing Agency: Washington Dept. Fish and Wildlife  
 Release Stage: Smolt  
 First Release Date: 5/10/95  
 Last Release Date: 5/10/95  
 # Tagged: 20,038  
 # Ad Onlys: 447  
 # Unmarked: 0

Run:  
 Release Site: GREEN R 09.0001  
 Stock: BIG SOOS CR 09.0072  
 Avg Weight (g): 23.4  
 Type of Tag: 1.5 length  
 Total # of Expanded Recoveries: 3.7  
 Total # of Expanded Fishery Recoveries: 3.7

Recovery Location	Number of Obs. Recoveries	Number of Est. Recoveries	% of Total Recoveries
WA Area 10 Net	2	2.0	54.1%
Freshwater Net	1	1.7	45.9%

**Tag Code: 053543**

Brood Year: 1993  
 Age: 3  
 Species: Coho  
 Hatchery Name: CRISP CR REARING PON  
 Releasing Agency: Washington Dept. Fish and Wildlife  
 Release Stage: Smolt  
 First Release Date: 5/10/95  
 Last Release Date: 5/10/95  
 # Tagged: 20,038  
 # Ad Onlys: 447  
 # Unmarked: 0

Run:  
 Release Site: GREEN R 09.0001  
 Stock: BIG SOOS CR 09.0072  
 Avg Weight (g): 23.4  
 Type of Tag: 1.5 length  
 Total # of Expanded Recoveries: 518.1  
 Total # of Expanded Fishery Recoveries: 359.0

Recovery Location	Number of Obs. Recoveries	Number of Est. Recoveries	% of Total Recoveries
NW Vancouver Island Troll	5	19.5	3.8%
SW Vancouver Island Troll	37	148.4	28.6%
Georgia/Juan de Fuca/Johnstone Str. Sport	2	14.4	2.8%
Juan de Fuca Net (Canadian Area 20)	1	2.4	0.5%
WA Areas 4 and 4B Troll (Cape Flattery)	3	7.6	1.5%
WA Area 4 Sport (Neah Bay)	2	4.5	0.9%
WA Area 2 Sport (Westport)	3	5.4	1.0%
WA Area 1 Sport (Illwaco)	1	1.5	0.3%
WA Area 5 Sport	7	34.7	6.7%
WA Area 6 Sport	2	9.4	1.8%
WA Area 8 or 8-1 Sport (Skagit)	1	4.0	0.8%
WA Area 8-2 Sport (Stillaguamish-Snohomish)	1	5.5	1.1%
WA Area 9 Sport (Discovery-Admiralty)	2	10.3	2.0%
WA Area 10 Sport (Seattle-Bainbridge)	5	22.8	4.4%
WA Area 11 Sport (Tacoma-Vashon)	1	6.6	1.3%
WA Area 10 Net	2	2.1	0.4%
Freshwater Net	41	59.9	11.6%
Freshwater Escapement	129	159.1	30.7%

Northwest Indian Fisheries Commission  
**CRAS - Coded-Wire-Tag Retrieval and Analysis System**

Prepared On: 1/16/02

**CWT RECOVERY DISTRIBUTION REPORT**  
**CWT LIST: crisp crk by 92-96**

Page 5 of 5

<p><b>Tag Code: 213163</b>  <b>Brood Year: 1996</b>  <b>Age: 3</b>  <b>Species: Coho</b>  <b>Hatchery Name: KETA CREEK HATCHERY</b>  <b>Releasing Agency: Muckleshoot Tribe (WA)</b>  <b>Release Stage: Smolt</b>  <b>First Release Date: 4/29/98</b>  <b>Last Release Date: 5/6/98</b>  <b># Tagged: 49,352</b>  <b># Ad Onlys: 599</b>  <b># Unmarked: 262,934</b></p>	<p><b>Run: Fall</b>  <b>Release Site: CRISP CR 09.0113</b>  <b>Stock: BIG SOOS CR 09.0072</b>  <b>Avg Weight (g): 32.9</b>  <b>Type of Tag: 1.5 length</b>  <b>Total # of Expanded Recoveries: 1,234.9</b>  <b>Total # of Expanded Fishery Recoveries: 575.9</b></p>
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Recovery Location	Number of Obs. Recoveries	Number of Est. Recoveries	% of Total Recoveries
WA Areas 4 and 4B Troll (Cape Flattery)	9	31.9	2.6%
WA Area 4 Sport (Neah Bay)	15	39.6	3.2%
WA Area 3 Troll (Quileute)	1	1.2	0.1%
WA Area 3 Sport (La Push)	5	9.9	0.8%
WA Area 2 Sport (Westport)	1	3.4	0.3%
WA Area 1 Sport (Illwaco)	1	2.1	0.2%
Tillamook Sport	1	1.5	0.1%
WA Area 5 Sport	9	45.2	3.7%
WA Area 8-2 Sport (Stillaguamish-Snohomish)	2	7.4	0.6%
Tulalip Bay Net (Area 8D)	1	2.2	0.2%
WA Area 9 Sport (Discovery-Admiralty)	2	21.3	1.7%
WA Area 10 Sport (Seattle-Bainbridge)	6	16.9	1.4%
WA Area 10 Net	2	5.6	0.5%
WA Area 11A Net	1	1.0	0.1%
Freshwater Net	298	385.7	31.2%
High Seas Catch	1	1.0	0.1%
Freshwater Escapement	422	659.0	53.4%