HATCHERY AND GENETIC MANAGEMENT PLAN

(HGMP)

Hatchery Program:	**SAFE Coho**
Species or Hatchery Stock:	**Coho Stocks 14 (Bonneville) and 11 (Sandy)**
Agency/Operator:	**Oregon Department of Fish and Wildlife (ODFW) and Clatsop Economic Development Council (CEDC)**
Watershed and Region:	**Columbia River Estuary and Youngs Bay**
Date Submitted:	**September 28, 2005**
Date Last Updated:	**September 26, 2005**

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

SAFE Coho Salmon

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

The Select Area Fisheries Enhancement (SAFE) Project utilizes lower Columbia River coho salmon, *Oncorhynchus kisutch*. Currently, coho salmon stocks 14 (Bonneville) and 11 (Sandy) are used in this propagation program. USFWS Eagle Creek Hatchery coho were used in this program since 1992 but were recently discontinued (final release 2004) due to funding constraints; however, data is included herein for completeness. The wild population of coho salmon in the Lower Columbia River is part of the lower Columbia River Coho Evolutionarily Significant Unit (ESU). This ESU was listed by NOAA Fisheries as threatened on June 28, 2005 with a final determination expected soon. The Bonneville and Sandy hatchery populations were proposed for inclusion as part of the Lower Columbia River Coho ESU, but the USFWS Eagle Creek hatchery population was not (Federal Register Notice 2004). Oregon populations of wild coho in the Lower Columbia River were listed as an endangered species by the Oregon Fish and Wildlife Commission in July 1999.

1.3) Responsible organization and individuals.

Indicate lead contact and on-site operations staff lead.

Name (and Title):	John Thorpe, Chief of Fish Propagation
Organization:	Oregon Department of Fish and Wildlife
Address:	3406 Cherry Avenue, NE, Salem, OR 97303-4924
Telephone:	(503) 947-6000
Fax:	(503) 947-6202
Email:	John.Thorpe@state.or.us

Name (and title):	Tod Jones, CEDC Fisheries Project Leader
Agency or Tribe:	Clatsop Economic Development Council (CEDC)
Address:	2001 Marine Drive, RM 253, Astoria, OR 97103
Telephone:	503-325-6452
Fax:	503-325-2753
Email:	TJones@co.clatsop.or.us

Name (and title):	John North, ODFW Ocean Salmon/Col. River Asst. Fisheries Manager
Agency or Tribe:	Oregon Department of Fish and Wildlife
Address:	17330 SE Evelyn St, Clackamas, OR 97015
Telephone:	(503) 657-2000 ext 251
Fax:	(503) 657-2095
Email:	John.A.North@state.or.us

Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent

of involvement in the program:

NOAA: Partial funding of Bonneville, Cascade, Oxbow, Sandy, and Eagle Creek National fish hatcheries through Mitchell Act.
USACE: Partial funding of Bonneville Fish Hatchery.
PGE: Partial funding of Sandy Fish Hatchery.
USFWS: Operates Eagle Creek National Fish Hatchery (not associated after 2004).
CEDC: Rearing and/or acclimation of coho released in this program.
Fishermen and Processors: Provide funds through Voluntary Assessment Program.

Note: (*Production of coho at ECNFH for the SAFE Project was discontinued after 2002 brood releases in 2004. Information for ECNFH is included herein, but it is unlikely production of SAFE coho will be reinstated at this facility in the near future. Other options to replace this production are being considered.)*

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

Funding Sources:

State of Oregon/ODFW: Partial funding through Restoration and Enhancement Program (terminated in 2004); portion of CEDC operational costs currently funded at $246,700 per biennium.
NOAA: Partial funding of Bonneville, Cascade, Oxbow, Sandy and Eagle Creek National fish hatcheries through Mitchell Act.
USACE: Partial funding of Bonneville Fish Hatchery.
PGE: Partial funding of Sandy Fish Hatchery.
BPA: Funds over-winter rearing costs associated with 600,000 smolt production. Also funds some coded wire tagging.
Fishermen and Processors: Provide funds through Voluntary Assessment Program.

Operational Information:

Full time equivalent staff:
- Bonneville/Cascade/Oxbow: 30 FTE combined
- Sandy: 4 FTE
- Eagle Creek: 7 FTE
- CEDC: 7 FTE

Annual operating cost:
- Bonneville/Cascade/Oxbow: $2,800,000 combined
- Sandy: $470,000
- Eagle Creek: $524,000 (Discontinued after 2002 brood releases)
- CEDC: $743,800

Comments: Funding and staff levels for fish hatcheries and CEDC are for the entire facility and/or project and are not specific to the SAFE coho program.

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

1) Bonneville Hatchery is located at RM 0.25 on Tanner Creek in the lower Columbia River watershed, Multnomah County, Oregon. Tanner Creek is a tributary of the Columbia River less than one mile downstream of Bonneville Dam (RM 145.5).

SAFE Program Functions include:
- Primary broodstock source
- Broodstock collection
- Adult holding
- Spawning
- Juvenile rearing

2) Sandy Hatchery is located at RM 0.5 on Cedar Creek in the Sandy River watershed, Clackamas County, Oregon. Cedar Creek is a tributary of the Sandy River at about RM 22.

SAFE Program Functions include:
- Primary broodstock source
- Broodstock collection
- Adult holding
- Spawning
- Incubation
- Juvenile rearing

3) Eagle Creek National Fish Hatchery (ECNFH) is located at RM 16.0 on Eagle Creek in the Clackamas River watershed, Clackamas County, Oregon. Eagle Creek is a tributary of the Clackamas River at about RM 17.

SAFE Program Functions include:
- Primary broodstock source
- Broodstock collection
- Adult holding
- Spawning
- Incubation
- Juvenile rearing

(*Production of coho at ECNFH for the SAFE Project was discontinued after 2002 brood releases in 2004. Information for ECNFH is included herein, but it is unlikely production of SAFE coho will be reinstated at this facility in the near future. Other options to replace this production are also being considered.)*

4) Cascade Hatchery is located at RM 0.5 on Eagle Creek in the lower Columbia River watershed, Multnomah County, Oregon. Eagle Creek is a tributary of the Columbia River just above Bonneville Dam at about RM 148.

SAFE Program Functions include:
- Incubation
- Juvenile Rearing

5) Oxbow Hatchery is located at RM 0.75 on Little Herman Creek in the lower Columbia River watershed, Multnomah County, Oregon. Little Herman Creek is a tributary of the Columbia River just above Bonneville Dam at about RM 151.

SAFE Program Functions include:
Incubation
Juvenile Rearing

6) Youngs Bay, Tongue Point, and Blind Slough net pens are placed at RM 1.7-2.0 in Youngs Bay and in the Columbia River Estuary, Clatsop County, Oregon. Youngs Bay is located at about RM 11, Tongue Point at about RM 18, and Blind Slough at about RM 27 in the Columbia River Estuary.

SAFE Program Functions include:
Juvenile Rearing (over-winter and two-week acclimation)
Release Locations

1.6) Type of program.

Isolated harvest

1.7) Purpose (Goal) of program.

The primary goal of the program is to mitigate for reduced coho salmon catch in sport and commercial fisheries due to habitat and passage loss or degradation in the Columbia River Basin. Specifically, this program aims to provide a high quality coho salmon for harvest in Lower Columbia River (LCR) Select Area commercial and recreational fisheries. Select Area fisheries provide harvest of hatchery-produced salmon released from, and returning to Select Areas with minimal interception of non-local salmon stocks. A secondary goal is to supplement harvest in Oregon commercial troll, Oregon ocean recreational, and Columbia River mainstem commercial and recreational fisheries.

1.8) Justification for the program.

This program mitigates for the loss of coho salmon catch in Oregon commercial troll, Oregon ocean recreational, and Columbia River mainstem commercial and recreational fisheries due to habitat and passage loss and/or degradation in the Columbia River Basin. Select Area fisheries provide harvest of hatchery-produced salmon released in and returning to Select Areas with minimal interception of non-local salmon stocks. All (100%) hatchery coho smolts released are mass-marked with an adipose fin clip, and a portion are marked with a coded-wire tag (CWT) to facilitate identification and provide for monitoring in harvest and escapement areas. Mass marking allows for selective harvest of hatchery fish in mark-only fisheries (e.g. ocean commercial troll and recreational fisheries) while minimizing impacts on wild populations.

Select Area fisheries occur in off-channel locations of the Columbia River and in Youngs Bay. They are terminal area fisheries targeting specific hatchery stocks and offer increased fishing opportunity, compared to the mainstem Columbia River fisheries, because of minimal interception of wild salmon that are migrating through the mainstem Columbia River. The

Select Area coho fisheries are focused in September and October, with fishing effort concentrated prior to the presence of most wild chum and late stock wild coho that may return to the local tributary streams. The SAFE coho are harvested at a very high rate (98% for 1993-1997 broods), minimizing the number of hatchery-produced coho that escape to potentially spawn in Youngs Bay tributaries.

Release strategies are implemented to minimize potential biological effects to wild juveniles including; size of smolts, location, and timing of releases. Research is underway to gain further understanding of additional strategies that may minimize any ecological effects associated with SAFE coho smolt releases.

1.9) List of program "Performance Standards".

See Section 1.10

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

1.10.1) "Performance Indicators" addressing benefits.

Benefits Performance Standards	Performance Indicators	Monitoring & Evaluation
Contribution of SAFE coho to target fisheries.	Commercial and recreational harvest of Select Area coho in Youngs Bay, Blind Slough/Knappa Slough, and Tongue Pt./South Channel (2% smolt-adult survival goal; 75% harvest of adult return in SAFE fisheries)	Monitor adult returns, smolt to adult survival, and annual harvest of SAFE coho in LCR Select Area fisheries.
Contribution of SAFE coho to non-SAFE area fisheries.	Harvest of SAFE coho in commercial and recreational fisheries in the Pacific Ocean and mainstem Columbia River (25% harvest of adult return in non-SAFE fisheries)	Monitor ocean, Buoy 10, and mainstem Columbia River commercial fisheries for SAFE coho CWT recoveries and estimate contribution to fisheries.
Annual releases meet production goals.	Combined coho smolt releases at Youngs Bay, Tongue Pt., and Blind Slough net pens accomplish release goal (goal is 1.8 million to 2.8 million depending on funding).	Monitor numbers of fry received from Columbia basin facilities, fry to smolt survival and releases of smolts reared at the SAFE facilities.
Adaptive management through design and implementation of projects to improve the quality of SAFE coho.	Projects are identified, reviewed, and implemented that aim to increase survival of program fish while minimizing impacts on wild fish.	Research and monitoring programs will be incorporated into project designs. Examples of projects include: rearing/release, avian predation avoidance, and feeding studies.

Release groups are marked and tagged for identification.	All smolts released are marked to identify adults as hatchery origin fish, and pre-release checks indicate at least 95% marking success. All production releases include a CWT group to identify the program the fish came from.	Mark quality and tag retention checks are performed daily during marking, on each pond immediately post-marking, and for each mark type prior to release (at least one month post-marking).
Program hatcheries will be operated in compliance with ODFW's Fish Health Management Policy and Fish Hatchery Management Policy, and the Integrated Hatchery Operations Team (IHOT) fish health guidelines.	Rearing survival rates, egg to fry, and fry to smolt. Number of juveniles sampled and pathogens observed during rearing and immediately prior to release.	Juvenile fish health is monitored on at least a monthly basis at the rearing hatchery. A fish health specialist will examine affected fish and recommend remedial or preventative measures. Disposal of affected eggs or fish follows IHOT policy.

1.10.2) "Performance Indicators" addressing risks.

Risks Performance Standards	Performance Indicators	Monitoring & Evaluation
Harvest of hatchery produced fish minimizes impacts to wild fish populations.	Number of non-target or wild fish caught in commercial and sport fisheries	Impact rates on listed stocks are estimated annually based on sampling of the landed catch (sport and commercial) for CWTs and adipose fin-clips.
Juvenile hatchery releases minimize interactions (competition and predation) with wild fish species.	Release numbers, timing, location, condition, and emigration patterns of wild and hatchery smolts.	Hatchery fish are monitored through standard fish health and production monitoring and reporting. Wild fish data is obtained from ODFW monitoring projects such as juvenile freshwater surveys and life-cycle monitoring sites.
Minimize disease risk to wild fish.	Program complies with all state and federal health monitoring, transfer, and release guidelines (e.g. USFWS Fish Health Policy and Implementation Guidelines; IHOT fish policy).	Juvenile fish health is monitored on at least a monthly basis at the rearing hatchery. A fish health specialist will examine affected fish and recommend remedial or preventative measures. Disposal of affected eggs or fish follows IHOT policy.
Natural spawning of program fish is minimized.	Escapement of hatchery fish to natural spawning areas (through straying) complies with goals set in ODFW's Lower Columbia River Coho Recovery Plan and Native Fish Conservation Policy (<10% hatchery strays).	Local area streams are monitored for natural and hatchery-origin coho escapement based on adipose fin clip mark identification. CWTs are recovered from local and regional streams and hatcheries to identify origin of tagged hatchery fish.

1.11) Expected size of program.

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

Coho broodstock for the SAFE program are collected at the following locations:
Bonneville Hatchery, Tanner Creek, 0.25 RM, Lower Columbia;
Sandy Hatchery, Cedar Creek, 0.5 RM, Sandy;
Eagle Creek National Hatchery, Eagle Creek, 10 RM, Clackamas (discontinued in 2003);

The annual brood collection level and the stock ID for each hatchery are as follows:
Bonneville Hatchery: 5,953 adults and 10 jacks (stock 14).
Sandy Hatchery: 1,000 adults (stock 11).
Eagle Creek National Hatchery: 4,000 adults (Eagle Creek stock).

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

Life Stage	Release Location	Annual Release Level
Eyed Eggs	N/A	N/A
Unfed Fry	N/A	N/A
Fry	N/A	N/A
Fingerling	N/A	N/A
Yearling	Tongue Point, Youngs Bay, & Blind Slough	200,000 (Tongue Point), 1,225,000 (Youngs Bay), 300,000 (Blind Slough)

This program includes an annual release of 200,000 yearling coho smolts at Tongue Point, 1,225,000 yearling coho smolts into Youngs Bay, and 300,000 yearling coho smolts into Blind Slough. This annual release level reflects a recent reduction of 1 million yearling coho (500,000 from Tongue Point and 500,000 from Youngs Bay) as a result of federal funding cuts which resulted in discontinuation of the coho production at ECNFH for the SAFE Project. Coho release numbers may be increased, from the current 1.7-1.8 million back up to 2.8 million, in future years if new funding and alternative rearing strategies can be identified.

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 purpose of this hatchery program is to provide fish for harvest in regional fisheries. Performance is measured by catch and survival. The total catch of this stock is provided in Table 1.12a. Smolt-to-adult survival rates are provided in Table 1.12b.

Table 1.12a. Harvest of coho salmon in lower Columbia River mainstem and Select Area fisheries, 1993-2004 (North et al. 2004).

Run Year	Select Area Commercial	Select Area Recreational	Columbia River Commercial /1	Columbia River Recreational /2	Total
1993	15,500		20,700	21,500	57,700
1994	57,800		6,000	2,700	66,500
1995	22,300		200	5,200	27,700
1996	22,300		5,600	5,300	33,200
1997	16,900		2,800	21,200	40,900
1998	24,100	118	300	6,900	31,418
1999	23,000	159	57,600	10,300	91,059
2000	61,700	202	112,400	23,100	197,402
2001	33,800	261	219,800	135,100	388,961
2002	69,300	344	94,900	9,200	173,744
2003	114,400	772	149,800	55,500	320,472
2004	52,700	nya	nya	nya	nya

/1 Non-Indian lower Columbia River mainstem fisheries.
/2 Buoy 10 and lower Columbia River.
Not yet available (nya)

Table 1.12b. Smolt to adult survival rates of CWT marked coho salmon released from all net pen sites, 1993-1999 brood years (updated from North et al. 2004).

Brood Year	Smolt-Adult Survival					Average
	Youngs Bay	Tongue Pt.	Blind Sl.	Deep R.	Steamboat Sl.	
1993	1.25%	3.18%	1.99%			2.14%
1994	0.61%	0.82%	1.22%	0.67%		0.83%
1995	1.05%	0.54%	0.07%			0.55%
1996	0.93%	4.08%	1.60%	1.42%		2.01%
1997	1.67%	1.46%	0.75%	5.50%	2.14%	2.30%
1998	1.73%	3.34%	2.27%	0.62%	3.79%	2.35%
1999	2.00%	1.83%	0.00%	0.08%	5.64%	1.91%

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

Releases of early-stock coho by CEDC have occurred in Youngs Bay since 1977 and were continued by the SAFE project since its inception in 1993. Releases were initiated in the new SAFE sites at Tongue Point, Youngs Bay, and Blind Slough beginning with the 1993 brood.

1.14) Expected duration of program.

The program is on-going with no planned termination.

1.15) Watersheds targeted by program.

Youngs Bay and Columbia River Estuary.

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

1.16.1) Brief Overview of Key Issues.

Issue 1. Maintain/expand releases or increase survival of SAFE coho to reach production goals and provide adult returns sufficient to maintain fisheries.

Releases of early-stock coho by CEDC have occurred in Youngs Bay since 1977 and were continued by the SAFE project since its inception in 1993. Releases were initiated in the new SAFE sites at Tongue Point and Blind Slough beginning with the 1993 brood. Juveniles are received from Bonneville, Oxbow, Cascade, Sandy, and Eagle Creek (through 2002 brood) hatcheries. Coho are reared at all SAFE sites by either full-term production (South Fork Hatchery), over-wintering or two-week acclimation. Over-winter fish are generally received in mid-October at 25-30 fish/pound while acclimation fish are received about two weeks prior to release at 14-15 fish/pound. Combined releases during 1993-2005 for all Oregon sites has ranged from 1.6-4.2 million smolts annually, with a recent five-year average release of 2.75 million smolts.

Select Area coho production has recently been reduced due to a voluntary switch of production at the South Fork Hatchery from coho to spring chinook (2002 brood) and discontinuation of Eagle Creek Hatchery acclimation smolts (2003 brood) due to Mitchell Act funding constraints. These changes will reduce SAFE coho releases in Oregon to about 1.6-1.7 million smolts annually beginning in 2005. The South Fork Klaskanine Hatchery production change will likely reduce adult coho returns beginning in 2005. Adult returns in 2006 and beyond will be compromised by the combined effects of these two production changes.

Overall, the SAFE coho program has been very successful. Adult survival has generally been good with 1993-1999 brood survival rates for Youngs Bay, Tongue Point, and Blind Slough releases averaging 2.3%, 2.3%, and 1.3%, respectively. For the brood years 1993-1999, the contribution to regional fisheries from these releases is widespread with 61% of the adult returns harvested in SAFE fisheries, 9% harvested in ocean sport and commercial fisheries, 24% harvested in Columbia River sport and commercial fisheries, and only 6% escaping harvest (North et al. 2004). During 1993-2003, coho released from the SAFE project have accounted for 12.2-99.1% of the total lower Columbia River commercial coho harvest, with an average contribution of 40.7%. The ex-vessel value of these fish in SAFE fisheries ranged from $80,000 to $524,000 per year (2001 inflation adjusted dollars) during 1996-2003, although annual fluctuations in market value have been common. The total regional income impact from harvest of these fish has ranged from $464,000 to $3,490,000 annually (North et al. 2004).

The SAFE project was initially developed to include three phases: research, expansion, and implementation. For coho in Oregon Select Areas, the project has progressed through the expansion phase but has not yet achieved full production at all sites. Due to the recent changes discussed above, the goal of full production at all sites has been significantly delayed and adult returns will decrease unless survival rates can be increased, or additional funding secured to restore lost production. Considering the value of this stock and the fisheries it helps sustain, any action that would maintain or improve returns without jeopardizing listed stocks would be

warranted.

Issue 2. Increased returns of SAFE coho could result in increased stray rates for SAFE coho.

Improved ocean rearing conditions or increased juvenile production would result in increased adult returns, which may in turn increase straying of coho released from SAFE net pen sites. Current Ad+CWT marking rates and recovery rates are adequate for fishery management, run reconstruction and stock status monitoring purposes; however, they may not provide adequate precision for determining stray rates and freshwater distribution for SAFE coho. Increased precision in estimating stray rates is especially important in areas with low straying levels, such as natural spawning locations and would require investments in two areas: 1) increased Ad+CWT mark rate; and 2) increased sampling rates.

Currently a total of 6.4% of the SAFE coho production is marked with an Ad+CWT mark. Recovery efforts are part of ODFW's standard spawning ground survey program. Prior to 2003, recovery efforts were limited with surveys occurring two to three times a year. Additional surveys were conducted by SAFE project staff as workload allows. Beginning in 2003, the spawning ground survey program for lower Columbia River tributaries was expanded using the standard random survey methodology that has been used for coho populations in Oregon coastal streams for over a decade. Implementation of the coastal coho spawning ground survey methodology resulted in increased sampling level and improved precision for both escapement estimates and stock compositions, including hatchery/wild ratios, beginning in 2003.

Issue 3. Potential for ecological impacts of rearing and release of SAFE coho.

Releases of SAFE coho could impact juvenile wild coho and other salmonids through competition for food in Select Area tributaries and the Columbia River Estuary. Rearing of SAFE coho in net pens could also indirectly impact wild coho and other salmonids by degrading the water quality and/or changing the potential prey base in the vicinity of the net pens.

Issue 4. High harvest rates in SAFE areas could hinder recovery/re-colonization by wild coho populations in the SAFE areas.

Wild adult coho returning to tributary streams of Youngs Bay or Blind Slough could be exposed to high harvest rate fisheries as they transit through SAFE areas. Harvest of these fish in SAFE fisheries would reduce the number of wild coho available to re-colonize or rebuild local populations, thereby slowing or preventing recovery of these populations.

1.16.2) Potential Alternatives to the Current Program.

Issue 1. Maintain/expand releases or increase survival of SAFE coho to reach production goals and provide adult returns sufficient to maintain fisheries.

Alternative 1: Maintain/Increase the number of coho smolts released in Oregon Select Areas.

Currently, the status and potential for expansion of coho production in Oregon Select Areas varies by site. Given existing facilities and the loss of Eagle Creek NFH production, up to 700,000 acclimation smolts could be reared in Youngs Bay (500,000 replacement for Eagle Creek Hatchery and 200,000 new production). With additional funds for new net pens and feed

required for full-term rearing, production could be expanded significantly, although initial production changes will only offset recent losses. In Blind Slough, current coho and spring chinook production utilizes all available rearing space. An additional site and waste discharge permits would be needed to expand coho releases at this location. At Tongue Point, the new MERTS site can accommodate up to 80 net pens under the existing water discharge permit. Due to the loss of Eagle Creek Hatchery acclimation smolts, additional funds are needed to maintain current production levels. Without additional funds, coho production at Tongue Point will drop by 71%. Because this site is considered concurrent state waters, commercial fishers from both Oregon and Washington would benefit from expansion of coho production. The SAFE project is currently experimenting with artificial imprinting of spring chinook using morpholine at the MERTS site. If results of this experiment show promise, this technology could be applied to any expanded coho production in Tongue Point to minimize straying. Maintaining or moderately increasing historic coho production levels at each of the Oregon SAFE sites is a high priority for ODFW.

Alternative 2: Maximize the survival of current releases.

Salmon smolts released from net pens in Youngs Bay have likely been subjected to substantial avian predation based on visual observations at time of release. To address this problem, the SAFE project conducted experimental releases of coho smolts during 2001-2004 to evaluate differences in adult survival and straying rates for fish reared and released from net pens within Youngs Bay (control) with fish reared in Youngs Bay but released in the mainstem Columbia River. Experimental release groups were drifted out of Youngs Bay during an ebb tide with navigation provided by three to four contracted commercial fishing vessels. Based on recovery of 3,656 coded-wire tags from 1999-2001 brood coho adults (2001-2003 release groups), the average survival of fish towed out of Youngs Bay prior to release (3.7%) was higher than for the control group (3.27%), although other release groups exhibited survival higher than the towed groups. Straying of towed fish (0.34%) was lower than all other release strategies including the control groups released from Youngs Bay (1.1%). Although towing results compared favorably to control releases, it is unclear if the difference is due to benefits of towing or because the control fish faired poorer than other rearing and release strategies. Because towed fish survived well and did not stray excessively, this release option warrants further investigation. It may serve as a useful tool to circumvent avian predation in certain years or as a means of minimizing interaction and competition with wild salmonids in the Columbia River Estuary based on rapid outmigration rates observed for sonic-tagged spring chinook towed and released (see results for telemetry study in Section 12). Mainstem releases of SAFE Project coho via towing is an alternative supported by ODFW especially in years of high potential avian predation. Until additional information regarding the contribution of towed SAFE coho to regional fisheries is documented, only a portion of each years annual production from each SAFE site should be released via towing to ensure SAFE commercial coho fisheries are not reduced substantially.

Alternative 3: Increase SAFE fishery value by replacing coho production with spring chinook production.

Due to poor ex-vessel prices paid for coho salmon in 2001 and 2002 ($0.27 and $0.33 per pound), species-specific production goals for the SAFE Project were evaluated to determine how to maximize the economic value of the project. The Clatsop Economic Development Council's Fisheries Project (CEDC) proposed that coho production at their South Fork Hatchery be

replaced with spring chinook to increase the value of the harvest in Youngs Bay. Based on this suggestion, releases of coho from the South Fork Hatchery were discontinued following the 2003 release and replaced with spring chinook. Due to this production shift, average annual releases of spring chinook in Youngs Bay during 2004-2005 (~1.0 million) have increased 206% compared to 2001-2003 while coho releases have decreased to 62% (1.4 million) of 2001-2003 average releases (2.2 million).

Based on the larger size and higher value (1999-2003 average of $2.33/pound) of SAFE spring chinook, this production exchange should increase the overall value of SAFE commercial harvest. However, further reductions in coho production should be carefully evaluated so that fall fisheries are not jeopardized. Given the 2003 SAFE coho return of 117,133 fish and an ex-vessel value of ~$0.50/pound, the SAFE coho fishery is of considerable importance to the economy in lower Columbia River fishing communities. Due to recent Mitchell Act funding constraints, approximately 1,000,000 coho smolts from Eagle Creek Hatchery that had historically been acclimated in Youngs Bay and Tongue Point net pens prior to release are no longer available, further reducing future coho returns to Select Areas. In light of recent limitations on dedicated upriver spring chinook impacts for Select Area fisheries and increasing coho value (~$1.00-$1.25/lb), emphasis should be placed on re-establishing Select Area coho releases rather than further replacing coho with spring chinook. Consequently, this alternative is not supported in any form by ODFW until some of the lost coho production can be replaced in order to maintain a balance between maximizing economic return and maintaining a variety of viable harvest opportunities, including fall fisheries.

Alternative 4: Discontinue releases of coho in Oregon Select Areas.
The SAFE project was initiated to provide and expand commercial and recreational fishing opportunities in off-channel areas of the lower Columbia River without negatively affecting listed stocks. Due to high survival and harvest rates, early-stock coho released from the SAFE project contribute substantially to regional fisheries and are particularly important to SAFE commercial fisheries. Elimination of SAFE coho releases is unacceptable since it would jeopardize lower Columbia River commercial fisheries without significantly increasing the likelihood of recovery of listed stocks. This alternative is not supported by ODFW or industry.

Issue 2. Increased returns of SAFE coho could result in increased stray rates for SAFE coho.

Alternative 1: Maintain current Ad+CWT mark/recovery program.
Current mark/recovery program is adequate for fishery management, run reconstruction, stock status, and general freshwater distribution purposes. Straying is documented based on current sampling levels, but precision of the estimates could be improved through increased mark rates and recovery efforts. Beginning in 2003, sampling levels for coho in lower Columbia River tributaries increased significantly with implementation of OCN coho spawning ground survey methodology.

Alternative 2: Increase current Ad+CWT marking and recovery rates.
Although the current Ad+CWT marking and recovery program is adequate for fishery management, run reconstruction, stock status monitoring and general freshwater distribution

purposes; the precision of estimated stray rates could be improved by increased marking and recovery efforts. Beginning in 2003 survey efforts were increased considerably throughout Oregon tributaries of the lower Columbia River. Survey efforts could be further intensified in areas where SAFE coho are expected to stray, such as Youngs Bay tributaries. Increased recovery efforts in SAFE area tributaries would increase the number of CWTs recovered in SAFE basins which would result in increased precision of estimated stray rates for SAFE coho. Additionally, increased mark rates would also result in increased recoveries and increased precision of stray rates.

Issue 3. **Potential for ecological impacts of rearing and release of SAFE coho.**

Alternative 1: Maintain current rearing and release levels for SAFE coho.
Water quality monitoring in net pen areas indicates that changes in water quality are temporary (primarily limited to the rearing period and areas adjacent to the net pen sites) and that current rearing levels of SAFE coho do not appear to seriously degrade water quality or substantially change the potential prey base for wild juvenile salmonids (North et al. 2004). Hatchery spring chinook released from SAFE areas migrate out of the Columbia River estuary relatively quickly (usually on the first ebb tide based on telemetry data); therefore, the potential for interactions of SAFE production with wild juvenile salmonids in the estuary may be minimal due to limited exposure of the two stocks but additional telemetry work with coho is needed to confirm this assumption.

Alternative 2: Decrease or discontinue releases of SAFE coho.
Water quality monitoring shows that net pen rearing of SAFE coho has limited effects on factors that might impact wild juvenile salmonids in the Columbia River Estuary. In addition, once released, SAFE coho likely emigrate quickly from the estuary, leaving little time for potential interactions with other salmonids. Because the ecological effects of the current SAFE coho program on wild salmonids may be minimal, this alternative is not necessary.

Issue 4. High harvest rates in SAFE areas could hinder recovery/re-colonization by wild coho populations in the SAFE areas.

Alternative 1: Monitor local wild coho populations and manage SAFE fisheries to minimize impacts on wild fish.
Until 1999, ODFW believed that lower Columbia wild coho had become extinct outside the Sandy and Clackamas basins. However, results of spawning surveys in 2000 revealed that some natural production was still occurring in other tributaries of the lower Columbia, including Astoria area streams (Chilcote 2003). Surveys in the Astoria area are conducted annually and continue to show some naturally-produced coho returning to local streams (Brown et al. 2003). Spawn timing of unmarked fish in the Astoria area is bimodal with peaks occurring in mid- to late November and mid-December, presumably representing naturally-producing hatchery fish and "wild" coho. Continued monitoring should help further refine whether these peaks are representative of each of these groups; however, Select Area fisheries likely have limited impact on the late-spawning wild component since the vast majority of fishing effort concludes by the end of September even though seasons run through October.

Alternative 2: Manage SAFE fisheries without attempting to limit harvest of local wild coho. As stated above, for many years wild coho were thought to be extinct in Astoria area streams. However, recent data suggests that naturally-produced coho may have persisted at levels too low to be detected by spawning surveys at the time (Chilcote 2003). Although wild spawners have been documented in Astoria area streams since 2000, results from 2002 spawning surveys indicated that only about 4% of the spawning adults were believed to be wild fish (Brown et al. 2003). As stated above, only limited commercial fishing occurs in Select Areas during October, thereby reducing the likelihood of impacts on the "wild" component of unmarked coho spawning in Select Area tributaries.

1.16.3) Potential Reforms and Investments.

Reform/Investment 1: Identify a source for coho pre-smolts and secure funding to maintain current coho production in Select Areas. This option would maintain existing fall harvest opportunities in Select Areas with no additional risks to listed species (either juvenile or adult) since production and harvest effort would be maintained at recent levels. Current release strategies should minimize impacts to listed stocks (juveniles) since all fish are released on an ebb tide from net pens in the lower Columbia River. Costs have not been determined but would be dependent on the life stage of fish upon delivery to CEDC.

Reform/Investment 2: Identify a source for additional coho pre-smolts and secure funding for additional net pens, feed and labor to increase coho production in Select Areas. This option would increase fall harvest opportunities in Select Areas. Risks to listed stocks (juveniles) should be minimal if smolts are released when physiologically prepared to emigrate to the ocean based on ongoing ATPase studies. Harvest risks to listed stocks (adults) would not be any greater than exist with smaller SAFE releases since current harvest strategies yield high harvest rates and would not require fishing periods to be extended. Costs have not been determined but would be significant.

Reform/Investment 3: Secure funds to pay for towing of net pens out of Select Areas. Based on preliminary 2002-04 return data, this option could maintain survival rates and economic value for several regional fisheries while minimizing impacts to listed species migrating through the Columbia River estuary. Additional analysis of coded-wire tag recoveries is still needed to verify the potential benefit of this release strategy. The cost would be approximately $12,000-$18,000, annually.

Reform/Investment 4: Secure funds to pay for continued collection and analysis of ATPase samples to ensure coho smolts are physiologically ready to emigrate to the ocean. This action would likely increase survival since coho smolts could be released at an optimum time thereby minimizing avian predation within SAFE sites and the lower Columbia River estuary. Risks to listed stocks would be reduced since the potential for interaction between SAFE coho and wild stocks during juvenile out-migration would be lessened. Costs are very low, possibly less than $5,000 annually.

Reform/Investment 5: Increase Ad+CWT marking and recovery rates for SAFE coho. In 2003 recovery efforts were increased significantly for Oregon tributaries of the lower Columbia River;

however, these increased efforts did not focus on tributaries in SAFE areas. Recovery rates could be improved by increased recovery efforts in tributaries near SAFE release sites. Additionally, increased tagging rates would also increase CWT recoveries and precision of SAFE stray rates. Cost of this investment would be low and primary costs would be associated with increased tagging and lesser costs associated with increased recovery sampling effort.

SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS (USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

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

Fish production activities conducted by the Select Area Fisheries Enhancement Project are covered by a Biological Opinion from NMFS (NMFS 1999). Re-initiation of consultation regarding SAFE production was planned to begin in spring 2004 with a new production Biological Assessment. This and other species-specific HGMPs for the SAFE Project may serve as the basis for a new BA or may serve to replace it (Personal communication with Rich Turner; NOAA).

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

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

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

The lower Columbia River coho salmon ESU is federally-listed as threatened under the ESA, effective June 28, 2005.

Lower Columbia River coho salmon are present in the Youngs Bay tributaries and Big Creek areas. Spawning survey data suggests that most coho observed in these subbasins are Type S hatchery stocks and few wild fish are present. Recent survey data indicates a bi-modal spawn timing with naturally-produced fish spawning in mid- to late November and "wild" fish spawning in December. Lower Columbia River coho are categorized as either Type S or Type N, based on their general ocean distribution either south or north of the Columbia River. Managers also refer to Type S as early stock coho and Type N as late stock. Early stock coho salmon in the lower Columbia generally enter the Columbia River beginning in August, with peak spawn timing generally in late October. Late stock coho salmon in the lower Columbia generally enter the Columbia River beginning in September, with peak spawn timing generally in late November to January. Depending on spawn timing and water temperature, coho fry begin emerging in the spring and rear for a year in freshwater; emigration begins the following spring.

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

The lower Columbia River chinook salmon (*Oncorhynchus tshawytscha*) ESU is federally listed as threatened under the ESA, effective May 24, 1999.

The Columbia River chum salmon (*Oncorhynchus keta*) ESU is federally listed as threatened, effective May 24, 1999.

The fall component of the lower Columbia River Chinook ESU is comprised of two groups: 'tules' and 'brights'. Native fall chinook in Oregon tributaries of the lower Columbia River are almost all tule fall chinook, with the exception of bright stock fall chinook produced in the Sandy River. Small scattered naturally spawning fall chinook populations are observed in small Oregon tributaries, with the largest numbers in Big Creek and Plympton Creek, where a significant portion of the natural spawning is comprised of hatchery produced tule fall chinook. Small numbers of tule fall chinook spawn in Youngs Bay tributaries in some years. Tule fall chinook generally arrive at the mouth of the Columbia River beginning in August, with peak migration generally in September; bright fall chinook return timing generally is later than Tule chinook. Tule fall chinook are sexually mature upon river entry and spawn soon after arrival to the spawning grounds, while bright fall chinook are sexually immature and may hold in freshwater for months prior to spawning. Populations in the lower Columbia have short migrations, which are more characteristic of coastal populations than upper Columbia populations. Depending on spawn timing and water temperature, tule fall chinook juveniles in the lower Columbia River generally emerge beginning in March-April and follow an ocean-type life history, emigrating in late spring/early summer of their first year as sub-yearlings. Meanwhile, bright fall chinook juveniles in the lower Columbia River generally emerge from March-June and emigrate in early/late summer. Ocean distribution of lower Columbia fall chinook extends from the coast of Washington to Southeast Alaska; bright fall chinook salmon are generally more northerly distributed.

Lower Columbia River chum salmon are occasionally observed in the South Fork of the Klaskanine River and in Big Creek. Chum salmon in the lower Columbia generally arrive at the mouth of the Columbia River beginning in late October, with peak migration generally in November. Chum salmon are sexually mature upon river entry and spawn soon after arrival to the spawning grounds. Depending on spawn timing and water temperature, chum fry begin emerging in early spring (March) and emigrate shortly after emergence; peak emigration is usually late April. Current chum salmon ocean distribution is not well documented but is expected to extend along the coast from Washington to Alaska.

Listed populations that may be incidentally affected by the release of juvenile SAFE coho salmon include species utilizing habitat in the Columbia River and the Columbia River estuary downstream of Youngs Bay. Listed populations that may be incidentally affected by stray adult SAFE coho salmon include species utilizing habitat in the North and South Forks of the Klaskanine River, Youngs River, Lewis and Clark River, and Big Creek. All Columbia basin ESA-listed salmonids use the lower Columbia River as a migratory route, although effects of the SAFE coho salmon program are expected to be minimal. Potential impacts associated with the SAFE coho program are more likely to occur in populations of threatened chinook and chum, as

well as ESA candidate coho salmon that may occur in the Youngs Bay or Columbia estuary tributaries. Lower Columbia tule fall chinook abundance is generally low and other Columbia River chinook stocks (e.g. Lower River Bright, Upriver Brights, etc.) have not been observed spawning in the Youngs Bay tributaries. The Rogue River Bright stock, which are produced in the SAB fall chinook program, are currently the most abundant fall chinook stock spawning in the Youngs Bay tributaries (Table 2.2.1a). Big Creek naturally spawning fall chinook are predominately lower river tule stock, however, it is assumed that a large proportion of the natural spawners are hatchery produced fish (Table 2.2.1a).

Estimates of total escapement have not been quantified for coho salmon in the Youngs Bay and estuary tributaries. However, fish per mile estimates have been made for the Youngs River and for Big Creek. The 2000-2003 fish per mile data represents only wild coho as marked hatchery fish could be accounted for and removed from the data (Table 2.2.1b). Chum salmon are periodically observed in South Fork Klaskanine River and are trapped at Big Creek Hatchery, although abundance is quite low (Table 2.2.1b).

Table 2.2.1a. Fall Chinook aggregate natural spawning escapement estimates for select lower Columbia River subbasins 1990-2003, Youngs Bay tributaries and Big Creek 1998-2003.

	Aggregate	Youngs Bay Tributaries								Big Creek	
Run Year	Lower Columbia Tribs [a]	North Fork Klaskanine		South Fork Klaskanine		Lewis and Clark		Youngs			
		LRH [b]	RRB [c]	LRH [b]	RRB [c]	LRH [b]	RRB [c]	LRH [b]	RRB [c]	LRH [b]	RRB [c]
1990	2,545	na	na	na	na	na	na	na	na	na	na
1991	1,712	na	na	na	na	na	na	na	na	na	na
1992	2,230	na	na	na	na	na	na	na	na	na	na
1993	2,225	na	na	na	na	na	na	na	na	na	na
1994	5,189	na	na	na	na	na	na	na	na	na	na
1995	3,906	na	na	na	na	na	na	na	na	na	na
1996	2,307	na	na	na	na	na	na	na	na	na	na
1997	2,175	na	na	na	na	na	na	na	na	na	na
1998	1,206	7	0	7	0	10	0	9	0	461	8
1999	2,057	0	80	0	0	7	0	15	0	725	6
2000	2,843	0	347	2	0	0	0	25	46	1,197	61
2001	11,651	0	173	0	14	5	0	0	90	7,227	7
2002	22,685	0	0	0	685	14	0	0	0	11,677	0
2003	30,036	0	505	0	224	160	46	0	56	19,308	0

a Expanded spawning ground surveys for nine Oregon lower Columbia River tributaries; South Fork Klaskanine, North Fork Klaskanine, Lewis and Clark River, Youngs River, Bear Creek, Big Creek, Plympton Creek, Gnat Creek, and Clatskanie River.

b LRH = Lower River Hatchery stock.

c RRB = Rogue River Bright stock.

Table 2.2.1b. Chum and coho salmon escapement estimates in select lower Columbia River subbasins, 1990-2003.

	Chum		Coho	
Run Year	Big Creek Hatchery Trap	S. Fork Klaskanine Hatchery	Youngs River [a] (fish/mile)	Big Creek[a] (fish/mile)
1990	10	n.a.	0.0	0.0
1991	3	n.a.	0.0	0.0
1992	2	n.a.	0.0	0.7
1993	1	n.a.	0.0	0.7
1994	6	n.a.	0.0	1.4
1995	0	n.a.	3.3	0.0
1996	0	n.a.	0.0	0.0
1997	3	n.a.	0.0	0.0
1998	3	n.a.	0.0	0.0
1999	0	n.a.	0.0	0.0
2000	0	6	71.4	0.0
2001	4	4	0.2	0.0
2002	0	0	15.6	1.0
2003	27	2	23.3	2.2

[a] Escapement estimates represent fish per mile counts; estimates from 2000-2003 represent wild fish only while pre-2000 estimates include both hatchery and wild fish, of which, many are hatchery fish.

2.2.2) Status of NMFS 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 (see definitions in "Attachment 1").

The Willamette/Lower Columbia Technical Review Team (WLC-TRT) have not calculated critical and viable population thresholds for the Oregon lower Columbia fall chinook, chum, or coho populations in the vicinity of the SAFE coho program. However, the WLC-TRT has established "default value" minimum population viability criteria of 1,400 for chinook and 1,100 for chum for use as a general value for lower Columbia fall chinook and chum populations. A default minimum viable population criterion has not been identified by the WLC-TRT for coho, although the Lower Columbia Recovery Board (LCFRB) has assumed a value of 600 for Washington lower Columbia coho populations, which is the same default criterion identified by the WLC-TRT for lower Columbia steelhead.

The WLC-TRT has completed a draft assessment of the current viability status of salmon and steelhead populations in the lower Columbia and Willamette ESUs. This assessment used a probability criterion to estimate extinction risk for each population. To estimate the extinction risk, four key attributes were evaluated: 1) abundance and productivity, 2) diversity, 3) spatial structure, and 4) habitat. The populations were ranked from 0-4, with category 0 representing a 0-40% chance of persistence in the next 100 years and category 4 representing a 99 percent chance of persistence in the next 100 years. A population was considered viable with a category 3 or higher score. The status assessment includes fall chinook, coho, and chum populations in Youngs Bay tributaries, Big Creek, Scappoose Creek, and the Clatskanie River. The persistence

probability scores are reflected as a range (Figure 1). The scores for fall chinook are generally low ranging from 1-2, for chum very low at less than 1, and for coho low from 1 to 2. However, it should be noted that ODFW, working in cooperation with the WLC-TRT, has not yet finalized this assessment and subsequent refinement of the methods and analyses may yield different results.

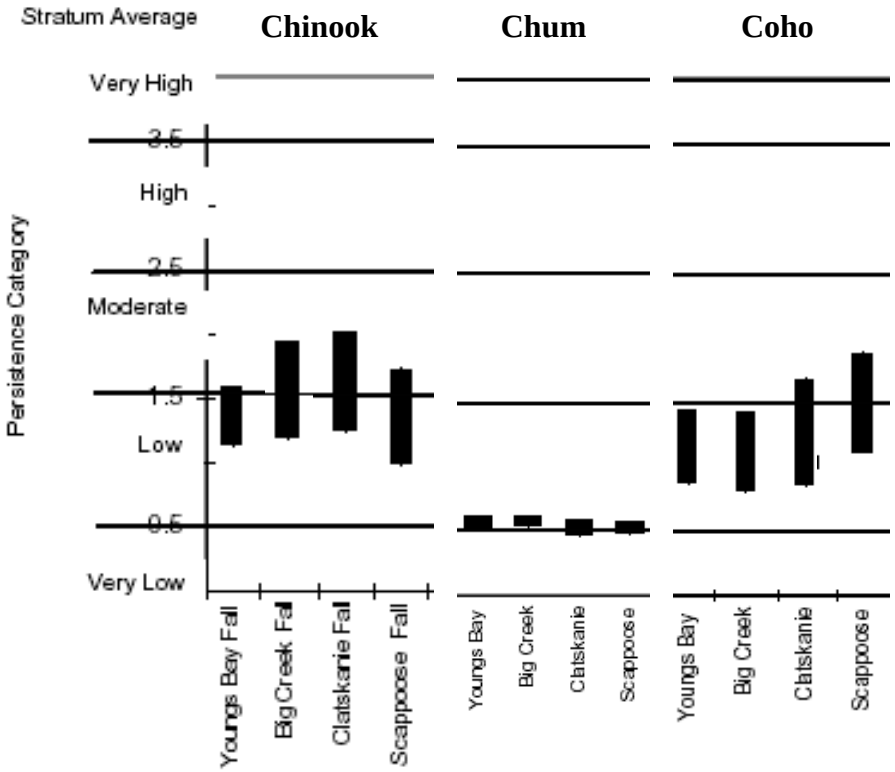

Figure 1. Current viability status of fall chinook, chum and coho salmon populations in Youngs Bay, Big Creek, Clatskanie River, and Scappoose Creek. Figure adapted from McElhany et al. (2004).

- 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.

These data are not available.

- 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. (Include estimates of juvenile habitat seeding relative to capacity or natural fish densities, if available).

Most recent available spawning escapement estimates are shown in Tables 2.2.1a and 2.2.1b.

- 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.

Hatchery proportions in coho natural spawning escapement in lower Columbia tributaries are summarized in Table 2.2.2a. It is likely that the coho naturally-produced in the Youngs River and Big Creek are very similar to the hatchery-produced fish due to many years of coho hatchery production in the area. These data are not available for chum, although few hatchery chum salmon are expected to be present in Oregon tributaries of the lower Columbia because of a lack of chum salmon hatchery programs in the region.

Natural Chinook spawning escapements in Oregon tributaries of the lower Columbia River have been separated by stock components since 1998 (Table 2.2.2a). No wild lower river bright (LRW) fall chinook have been observed during that time; the primary stock components are LRH (includes hatchery and wild produced tule stock fall chinook) and RRB. Although the proportions of hatchery and wild produced LRH stock are unknown, it is assumed that these tributaries are similar to other lower Columbia tributary fall chinook populations with the majority of LRH spawning returns including a mixture of first generation hatchery-produced fish and domesticated naturally-produced fish.

Table 2.2.2a. Estimated percent of hatchery coho in the natural spawning escapement for select Oregon lower Columbia tributaries.

Year	Youngs River	Big Creek	Clatskanie River	Scappoose Creek
1999				7%
2000	49%	49%		9%
2001	99%	92%	17%	20%
2002	91%	91%	60%	0%
2003	65%	65%	0%	1%

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take (see "Attachment 1" for definition of "take").

- 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.

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

There is no collection of SAFE coho for broodstock purposes. SAFE coho juveniles are derived from pre-existing broodstock programs at either Bonneville Hatchery (stock 014), Sandy Hatchery (stock 011), or Eagle Creek National Fish Hatchery. Incidental take as a result of broodstock collection for these stocks is addressed in the respective HGMPs for the Bonneville, Sandy, and Eagle Creek National Fish Hatchery coho salmon programs.

- 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).

Incidental take of juvenile lower Columbia River chinook, Columbia River chum, or Columbia River coho could occur through activities associated with rearing and acclimation of coho at Select Area net pens sites; however, any potential take would be indirect and difficult to estimate (i.e. disease transfer). Few listed juvenile salmonids are expected to be present in the vicinity of the net pens for extended periods. All fish transferred to the net pens are vaccinated to minimize disease outbreaks. Further, nets are checked for holes during regular cleaning schedules to prevent early, accidental releases that could possibly prey on juvenile chum. Quantifiable take of listed Lower Columbia juvenile salmonids is expected to be zero (Table 2.2.3). No adult take of listed salmonids occurs related to the SAFE coho program propagation activities since coho broodstock are not collected at the South Fork Klaskanine Hatchery anymore. Take resulting from Select Area fisheries is discussed in Section 3.3.1.

- 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.

Contingency plans for coho broodstock collection are addressed in Bonneville Hatchery, Sandy Hatchery, and Eagle Creek NFH HGMPs where SAFE coho broodstock is attained.

If take levels were to exceed the described levels in this HGMP as a result of coho smolt releases from the net pens, the SAFE program would respond by implementing alternative release strategies, including timing, location and release size alternatives.

Table 2.2.3. Estimated annual take of lower Columbia River listed salmonids based on typical hatchery operations.

Action	Lower Columbia Chinook		Columbia Chum		Lower Columbia Coho	
	Life stage[b]	Estimated Annual take	Life stage[b]	Estimated Annual take	Life stage[b]	Estimated Annual take
Observe or harass	A, J	0	A, J	0	A, J	0
Collect for transport	A, J	0	A, J	0	A, J	0
Capture, handle, and release	A, J	0	A, J	0	A, J	0
Capture, handle, tag mark / tissue sample, and release	A, J	0	A, J	0	A, J	0
Capture and remove (e.g., broodstock)	A, J	0	A, J	0	A, J	0
Intentional lethal take	A, J	0	A, J	0	A, J	0
Unintentional lethal take	A, J	0	A, J	0	A, J	0
Other take (specify)	A, J	0	J	0	A, J	0

a Data includes combined values for net pen rearing/acclimation.

b A = Adult, J = Juvenile.

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 SAFE coho salmon program operates in accordance with the ODFW Hatchery Management Policy (OAR 635-007-0542 through 635-007-0548), the Northwest Power and Conservation Council Annual Production Review Report (NPPC document 99-15), the Lower Columbia Salmon and Steelhead Recovery and Subbasin Plan (LCFRB 2004), and the Lower Columbia River and Estuary Bi-State Subbasin Plan (LCREP 2004).

The Oregon Fish and Wildlife Commission (OFWC) adopted the Native Fish Conservation Policy (NFCP) in 2002. Conservation plans will provide guidance for hatchery programs for species within the associated Species Management Unit (SMU). Once the conservation plans for native species are developed for the Lower Columbia and Estuarine areas, this HGMP will be reviewed and possibly revised and re-submitted (in necessary).

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates. Indicate whether this HGMP is consistent with these plans and commitments, and explain any discrepancies.

Mitchell Act
US v. Oregon - 2005-2007 Interim Management Agreement for upriver Chinook, sockeye, steelhead, coho, and white sturgeon
Weyerhauser agreement with CEDC for site access
Oregon Division of State Lands submerged land lease(s)
Bonneville Power Administration Project 1993-06000 Statement of Work
Biological Assessments/Opinions
Oregon Department of Fish and Wildlife's Endangered Species Management Plan for Lower Columbia Coho Salmon

This HGMP is consistent with these plans and commitments.

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. Also provide estimated future harvest rates on fish propagated by the program, and on listed fish that may be taken while harvesting program fish.

This program is managed to provide coho salmon production to supplement harvest in ocean, Columbia River, and Select Area commercial fisheries and ocean, Columbia River and Select

Area sport fisheries (Table 3.3.1a). Two of the primary goals of the Select Area Fisheries project were to develop fisheries that provided greater protection for depressed and listed stocks and to maximize harvest of returning adults while minimizing catch of non-SAFE stocks. Incidental take of listed stocks in select area fisheries is included in biological assessments and opinions adopted for mainstem Columbia River fisheries. Impact rates on ESA-listed fish in SAFE fisheries adopted during 1993-2000 were negligible. SAFE fall commercial fisheries impacts to listed stocks are summarized in Table 3.3.1b for chinook and Table 3.3.1c for chum and sockeye.

Lower Columbia coho were listed as a threatened species by NOAA Fisheries on June 28th, 2005 and a final determination is expected in August. The State of Oregon listed wild coho destined for Oregon tributaries of the lower Columbia River as an endangered species under Oregon state law in July 1999. The ODFW has completed a management plan for state-listed wild coho (Chilcote 2003). The management plan includes separate abundance-based harvest matrices for ocean and freshwater fisheries and was adopted at the July 20, 2001 OFWC meeting. The harvest matrices provide separate maximum allowable fishery mortality rates for ocean and freshwater fisheries based on parental escapement relative to full seeding and marine survival as indexed by the return rate of jacks per hatchery smolts released. For 2005, the combined ocean and freshwater fishery mortality rate should not exceed 21.4% of the pre-fishery ocean abundance and the freshwater fishing mortality rate should not exceed 6.5% of the run entering the Columbia River. Fisheries will be managed to limit impacts to state-listed coho through the use of area closures or mesh size restrictions as described in the ”Coho Protection Measures” section of this document.

In order to facilitate consultations with the National Oceanographic and Atmospheric Administration (NOAA) Fisheries for past mainstem treaty Indian and non-Indian fisheries, the *U.S. v Oregon* TAC has prepared biological assessments for combined fisheries based on relevant *U.S. v Oregon* management plans and agreements. The TAC has completed Biological Assessments (BAs) of impacts to all ESA-listed salmonid stocks (including steelhead) for all mainstem Columbia River fisheries including Select Area fisheries since January 1992 and for Snake River Basin fisheries since January 1993. A Biological Assessment concerning Columbia River treaty Indian and non-Indian fisheries as described in the recently adopted “2005-2007 Interim Management Agreement for upriver Chinook, sockeye, steelhead, coho, and white sturgeon” was submitted to the NOAA Fisheries during the spring of 2005 (TAC 2005), and a Biological Opinion was issued on May 9th, 2005.

To ensure impacts (lethal take) of listed stocks resulting from SAFE commercial fisheries remain within management guidelines, fish run sizes and harvest of individual stocks is tracked in-season based on visual stock identification (winter-spring seasons only) and CWT recoveries, with regulations and fishing periods adjusted in-season if necessary. In-season catch estimates are produced immediately following each fishing period. Stock-specific catch estimates for fisheries are monitored in conjunction with in-season run size updates to track stock-specific impact rates. If the data suggests that impacts will exceed management guidelines, adopted seasons are modified through the Compact Hearing process. Joint staff reports are prepared in advance and distributed for public review prior to each hearing. Adopted seasons and regulations are presented in a Compact Action Notice following each Compact Hearing.

Coded-wire tag recoveries document extremely high harvest rates for SAFE coho salmon. As intended, the majority of the fish harvested in SAFE fisheries were of local origin. Coho salmon harvest and stock composition varied among SAFE release sites, although the highest landings consistently occur in Youngs Bay. During 1996-2002, Youngs Bay annual harvest ranged from 13,647 to 51,859 coho salmon, with 87.1 percent originating from SAFE sites based on non-expanded CWT recoveries and less than 1 percent originated from locations above Bonneville Dam (Table 3.3.1d).

Fisheries adopted as a result of the Select Area fisheries program have resulted in significant increase in interest by both commercial and recreational user groups. The number of participating commercial vessels increased from 96 to 192 in fall fisheries. Since recreational surveys were initiated in 1998, sport harvest has increased significantly. The economic value of the fishery, as measured in ex-vessel dollars for commercial fisheries, and the non-market user value per fish landed in sport fisheries, increased from approximately $492,000 in 1996 to $3.3 million in 2003. The economic impact of SAFE salmonid production on personal incomes of families in lower Columbia River communities increased from $987,000 in 1996 to $4.6 million in 2003. The annual contribution of the SAFE coho salmon program to the overall SAFE fisheries economic impacts are summarized in Table 3.3.1e.

Some harvest of non-target species has occurred during fall Select Area fisheries. For example, white sturgeon are incidentally harvested during SAFE fisheries, primarily in Youngs Bay and Tongue Point; however, these fish are accounted for in the annual commercial allocation. Inseason management is used to maintain annual harvest to less than 400 sturgeon annually with no more than 300 allowed in winter-summer fisheries. The 400 sturgeon harvest guideline for SAFE fisheries represents 5.0% of the current 8,000 white sturgeon commercial harvest allocation.

Table 3.3.1a. Contribution to fisheries of coded wire tagged SAFE coho salmon from various Select Area release sites, 1993-1999 brood years (North et al. 2004).

	Release Site				
	Youngs Bay (OR)	**Tongue Point (OR)**	**Blind Slough (OR)**	**Deep River (OR)**	**Steamboat Slough (WA)**
Brood Years	1993-1999	1993-1999	1993-1999	1993-1999	1997-1999
Number of CWT groups	8	7	8	9	3
Fishery Contributions (% of total adult return)					
Commercial					
SAFE	79.9%	45.5%	83.0%	74.7%	10.8%
Ocean	1.0%	0.8%	0.7%	2.0%	0.9%
Columbia River	8.0%	35.4%	5.1%	6.8%	31.1%
Total	88.9%	81.7%	88.8%	83.5%	42.8%
Recreational					
Ocean	5.4%	7.4%	4.7%	8.9%	12.8%
Freshwater	5.5%	9.2%	5.7%	4.6%	11.3%
Total	10.9%	16.6%	10.4%	13.5%	24.1%
Escapement /a	0.4%	1.8%	0.8%	2.9%	33.1%

a Escapement includes unharvested fish recovered in streams and hatcheries (natal and out-of-system).

Table 3.3.1b. Summary of harvest impacts on upriver Chinook during fall Select Area commercial fisheries, 1993-2003 (North et al. 2004).

Year	Site	Upriver Bright Harvest	Upriver Bright Run Size	Snake River Wild (SRW) Run Size	SAFE SRW Harvest	% SRW Impacts	Lower River Hatchery (LRH) Run Size	SAFE LRH Harvest	% LRH Impacts	Lower River Wild (LRW) Run Size	SAFE LRW Harvest	% LRW Impacts
1993												
	Youngs Bay	46	102,908	1,620	1	0.045%	-	-	-	-	-	-
	Tongue Point	0	102,908	1,620	0	0.000%	-	-	-	-	-	-
	Blind Slough	0	102,908	1,620	0	0.000%	-	-	-	-	-	-
	All SAFE	**46**			**1**	**0.045%**	**52,300**	**0**	**0.000%**	**13,300**	**0**	**0.000%**
1994												
	Youngs Bay	0	132,839	1,055	0	0.000%	-	-	-	-	-	-
	Tongue Point	0	132,839	1,055	0	0.000%	-	-	-	-	-	-
	Blind Slough	0	132,839	1,055	0	0.000%	-	-	-	-	-	-
	All SAFE	**0**			**0**	**0.000%**	**53,600**	**0**	**0.000%**	**12,200**	**0**	**0.000%**
1995												
	Youngs Bay	44	106,459	1,223	1	0.041%	-	-	-	-	-	-
	Tongue Point	0	106,459	1,223	0	0.000%	-	-	-	-	-	-
	Blind Slough	0	106,459	1,223	0	0.000%	-	-	-	-	-	-
	All SAFE	**44**			**1**	**0.041%**	**46,400**	**0**	**0.000%**	**16,000**	**0**	**0.000%**
1996												
	Youngs Bay	0	143,193	1,957	0	0.000%	-	-	-	-	-	-
	Tongue Point	16	143,193	1,957	0	0.011%	-	-	-	-	-	-
	Blind Slough	0	143,193	1,957	0	0.000%	-	-	-	-	-	-
	Deep River	0	143,193	1,957	0	0.000%	-	-	-	-	-	-
	All SAFE	**16**			**0**	**0.011%**	**75,500**	**2,938**	**3.891%**	**14,600**	**0**	**0.000%**
1997												
	Youngs Bay	4	161,727	2,048	0	0.002%		-		-	-	-
	Tongue Point	0	161,727	2,048	0	0.000%		-		-	-	-
	Blind Slough	0	161,727	2,048	0	0.000%		-		-	-	-
	Deep River	0	161,727	2,048	0	0.000%		-		-	-	-
	All SAFE	**4**			**0**	**0.002%**	**57,400**	**2,220**	**3.868%**	**12,300**	**0**	**0.000%**
1998												
	Youngs Bay	22	142,301	864	0	0.015%	-	-	-	-	-	-
	Tongue Point	42	142,301	864	0	0.030%	-	-	-	-	-	-
	Blind Slough	0	142,301	864	0	0.000%	-	-	-	-	-	-
	Deep River	0	142,301	864	0	0.000%	-	-	-	-	-	-
	All SAFE	**64**			**0**	**0.045%**	**45,300**	**498**	**1.099%**	**7,300**	**0**	**0.000%**
1999												
	Youngs Bay	17	166,066	2,739	0	0.010%	-	-	-	-	-	-
	Tongue Point	80	166,066	2,739	1	0.048%	-	-	-	-	-	-
	Blind Slough	12	166,066	2,739	0	0.007%	-	-	-	-	-	-
	Deep River	0	166,066	2,739	0	0.000%	-	-	-	-	-	-
	All SAFE	**109**			**2**	**0.066%**	**40,000**	**380**	**0.950%**	**3,300**	**0**	**0.000%**
2000												
	Youngs Bay	86	155,744	1,977	1	0.055%	-	-	-	-	-	-
	Tongue Point	140	155,744	1,977	2	0.090%	-	-	-	-	-	-
	Blind Slough	0	155,744	1,977	0	0.000%	-	-	-	-	-	-
	Deep River[a]	1	155,744	1,977	0	0.001%	-	-	-	-	-	-
	All SAFE	**227**			**3**	**0.145%**	**27,000**	**135**	**0.500%**	**10,200**	**0**	**0.000%**
2001												
	Youngs Bay	22	232,446	nya	nya	nya	-	-	-	-	-	-
	Tongue Point	414	232,446	nya	nya	nya	-	-	-	-	-	-
	Blind Slough	387	232,446	nya	nya	nya	-	-	-	-	-	-
	Deep River[a]	0	232,446	nya	nya	nya	-	-	-	-	-	-
	All SAFE	**823**			nya	nya	**94,300**	**1,193**	**1.265%**	**15,700**	**0**	**0.000%**
2002												
	Youngs Bay	381	276,872	nya	nya	nya	-	-	-	-	-	-
	Tongue Point	350	276,872	nya	nya	nya	-	-	-	-	-	-
	Blind Slough	51	276,872	nya	nya	nya	-	-	-	-	-	-
	Deep River[a]	2	276,872	nya	nya	nya	-	-	-	-	-	-
	All SAFE	**784**			nya	nya	**156,400**	**3,887**	**2.485%**	**24,900**	**0**	**0.000%**
2003[b]												
	Youngs Bay		380,000	nya			-	-	-	-	-	-
	Tongue Point		380,000	nya	510	0.130%	-	-	-	-	-	-
	Blind Slough		380,000	nya			-	-	-	-	-	-
	Deep River[a]		380,000	nya			-	-	-	-	-	-
	All SAFE	**0**			**510**	**0.130%**	**nya**	**nya**	**nya**	**nya**	**nya**	**nya**

[a] *Includes landings for Steamboat Slough*
[b] *Upriver bright run size is estimate*

Table 3.3.1c. Summary of harvest impacts on lower Columbia River chum and sockeye salmon during Select Area commercial fisheries, 1993-2002 (North et al. 2004).

		Chum Impacts			Sockeye Impacts		
Year	Site	SAFE Chum Harvest	Chum Run Size[a]	% Chum Impacts	SAFE Sockeye Harvest	Sockeye Run Size	% Sockeye Impacts
1996							
	Youngs Bay	3	3,300	0.091%	0	30,300	0.000%
	Tongue Point	0	3,300	0.000%	0	30,300	0.000%
	Blind Slough	2	3,300	0.061%	0	30,300	0.000%
	Deep River	0	3,300	0.000%	0	30,300	0.000%
	Steamboat Slough		3,300	0.000%		30,300	0.000%
	All SAFE Areas	**5**		**0.152%**	**0**		**0.000%**
1997							
	Youngs Bay	2	1,700	0.118%	0	46,900	0.000%
	Tongue Point	1	1,700	0.059%	0	46,900	0.000%
	Blind Slough	0	1,700	0.000%	0	46,900	0.000%
	Deep River	1	1,700	0.059%	0	46,900	0.000%
	Steamboat Slough		1,700	0.000%		46,900	0.000%
	All SAFE Areas	**4**		**0.235%**	**0**		**0.000%**
1998							
	Youngs Bay	2	1,900	0.105%	0	13,220	0.000%
	Tongue Point	2	1,900	0.105%	0	13,220	0.000%
	Blind Slough	0	1,900	0.000%	0	13,220	0.000%
	Deep River		1,900	0.000%	0	13,220	0.000%
	Steamboat Slough		1,900	0.000%		13,220	0.000%
	All SAFE Areas	**4**		**0.211%**	**0**		**0.000%**
1999							
	Youngs Bay	1	2,400	0.042%	0	17,878	0.000%
	Tongue Point	0	2,400	0.000%	0	17,878	0.000%
	Blind Slough	0	2,400	0.000%	0	17,878	0.000%
	Deep River	2	2,400	0.083%	0	17,878	0.000%
	Steamboat Slough		2,400	0.000%		17,878	0.000%
	All SAFE Areas	**3**		**0.125%**	**0**		**0.000%**
2000							
	Youngs Bay	1	2,500	0.040%	0	93,757	0.000%
	Tongue Point	0	2,500	0.000%	0	93,757	0.000%
	Blind Slough	0	2,500	0.000%	0	93,757	0.000%
	Deep River	1	2,500	0.040%	0	93,757	0.000%
	Steamboat Slough	0	2,500	0.000%	0	93,757	0.000%
	All SAFE Areas	**2**		**0.080%**	**0**		**0.000%**
2001							
	Youngs Bay	1	5,500	0.018%	1	116,623	0.001%
	Tongue Point	0	5,500	0.000%	0	116,623	0.000%
	Blind Slough	0	5,500	0.000%	0	116,623	0.000%
	Deep River	0	5,500	0.000%	0	116,623	0.000%
	Steamboat Slough	0	5,500	0.000%	0	116,623	0.000%
	All SAFE Areas	**1**		**0.018%**	**1**		**0.001%**
2002							
	Youngs Bay	0	11,900	0.000%	0	49,629	0.000%
	Tongue Point	0	11,900	0.000%	0	49,629	0.000%
	Blind Slough	0	11,900	0.000%	0	49,629	0.000%
	Deep River	1	11,900	0.008%	0	49,629	0.000%
	Steamboat Slough	0	11,900	0.000%	0	49,629	0.000%
	All SAFE Areas	**1**		**0.008%**	**0**		**0.000%**
2003							
	Youngs Bay	0	nya	nya	0	39,296	0.000%
	Tongue Point	0	nya	nya	0	39,296	0.000%
	Blind Slough	0	nya	nya	0	39,296	0.000%
	Deep River	0	nya	nya	0	39,296	0.000%
	Steamboat Slough	0	nya	nya	0	39,296	0.000%
	All SAFE Areas	**0**		**nya**	**0**		**0.000%**

[a] *Estimated run size rounded to nearest hundred fish*

Table 3.3.1d. Stock composition of coho salmon harvested in Select Area fall[a] commercial fisheries based on coded-wire tag recoveries, 1996-2002 (North et al 2004).

Fishery	Year	Harvest	Total Recoveries	Above Bonneville	Below Bonneville			Origins of above Bonneville Dam recoveries
						SAFE		
					Non-SAFE	Local	Non-Local	
Youngs Bay	1996	15,783	1,594	0	220	1,207	167	
	1997	13,647	891	0	52	760	79	23-L. White Salmon Hat., 2-Ringold Pond, 4-Rosa Accl.
	1998	19,523	1,197	34	210	878	75	Pond, 5-Umatilla R.
	1999	15,911	1,614	4	51	1,467	92	2-L. Yakima R., 1-Umatilla R., 1-Wenatchee R.
	2000	33,214	2,857	3	348	2,309	197	3-Cascade Hatchery (Yakima R)
	2001	25,469	1,307	6	182	1,043	76	5-Umatilla R., 1-Little White Salmon
	2002	51,859	3,048	9	607	2,137	295	6-Willard NFH, 3-Cascade Hatchery
				0.6%	12.3%	79.4%	7.7%	
Tongue	1996	1,955	350	0	15	260	75	
	1997	861	62	0	3	37	22	
	1998	3,374	204	3	35	46	120	2-L. White Salmon, 1-Umatilla R.
	1999	3,659	459	1	33	255	170	1-Umatilla R.
	2000	10,731	589	0	155	199	235	
	2001	2,021	181	0	48	61	72	
	2002	15,560	1,057	7	555	309	188	4-Willard NFH, 3-Cascade Hatchery
				0.3%	19.8%	44.1%	35.7%	
Deep River	1996	2,240	393	0	6	374	13	
	1997	515	139	0	5	133	1	
	1998	0						
	1999	1,430	268	0	7	257	4	
	2000	13,392	2,120	0	83	2,027	10	
	2001	2,491	202	0	23	124	55	
	2002	303	73	3	42	23	5	3-Keta Creek Hatchery
				0.7%	13.4%	79.2%	6.7%	

Continued

Table 3.3.1d. (continued) Stock composition of coho salmon harvested in Select Area fall commercial fisheries based on coded-wire tag recoveries, 1996-2002.								
Blind	1996	2,301	470	0	24	431	15	
Slough	1997	1,605	215	0	3	209	3	
	1998	615	52	0	6	22	24	
	1999	1,958	390	0	17	344	29	
	2000	3,398	436	0	47	381	8	
	2001	3,764	653	0	89	400	164	
	2002	1,449	192	2	155	2	33	2-Cascade Hatchery
				0.1%	18.2%	67.0%	14.6%	
Steamboat	2000	362	32	1	8	19	4	1-Dworshak NFH
Slough	2001	26	9	0	1	5	3	
	2002	105	16	0	14	2	0	
				1.0%	41.2%	42.5%	15.3%	

a Fall commercial fisheries include those conducted from August to October.

Table 3.3.1e. Total SAFE coho salmon program contribution to regional commercial and recreational fisheries by landings and total personal income impacts, 1996-2003 (North et al. 2004).

	Commercial Harvest						Recreational Harvest						Total Contribution	
	SAFE		Columbia River		Ocean		SAFE		Columbia River		Ocean			
Year	Harvest	Total Personal Income /a	Harvest	Total Personal Income /a	Harvest	Total Personal Income /a	Harvest	Total Personal Income /a	Harvest	Total Personal Income /a	Harvest	Total Personal Income /a	Harvest	Total Personal Income /a
1996	22,422	$391,462	2,318	$27,260	361	$3,411	69	$4,198	1,482	$136,611	1,478	$95,612	28,130	$658,554
1997	16,991	$222,019	231	$2,994	0	$0	48	$2,920	4,253	$215,627	309	$19,989	21,832	$463,549
1998	24,134	$372,428	0	$0	0	$0	118	$7,179	389	$31,139	1,026	$66,372	25,667	$477,118
1999	22,954	$303,154	5,922	$72,485	108	$1,004	159	$14,657	1,210	$96,861	2,415	$156,226	32,768	$644,387
2000	61,745	$779,323	6,076	$68,537	1,241	$13,217	202	$18,620	2,544	$203,647	5,915	$382,641	77,723	$1,465,985
2001	33,771	$307,314	38,617	$321,293	679	$5,262	263	$24,243	17,848	$480,468	13,346	$863,353	104,524	$2,001,933
2002	69,281	$820,214	11,321	$99,625	111	$916	344	$31,710	1,171	$104,769	6,000	$388,140	88,228	$1,445,374
2003	117,133	$1,244,264	23,427	$206,158	1,171	$9,661	772	$71,163	21,084	$1,051,459	14,056	$909,283	177,643	$3,491,988

/a Total impact on state level personal income (direct, indirect, and induced based on Oregon Fisheries Economic Assessment Model) and prices in 2001 dollars.

3.4) Relationship to habitat protection and recovery strategies.

Natural coho production in Oregon tributaries to the lower Columbia River is likely limited by one or more the following habitat issues: water quantity, water quality, sedimentation, stream substrate, cover, and barriers to fish passage. No single entity is responsible for habitat protection and recovery strategies in the Columbia Estuary region; Oregon Department of Fish and Wildlife, Oregon Department of Forestry, the Lower Columbia River Estuary Partnership, and numerous regional, state, and local organizations have interest in habitat protection in the region.

Habitat protection and recovery strategies were recently developed in the draft Lower Columbia River and Estuary Bi-State Subbasin Plan (LCREP 2004). The SAFE coho salmon program does not directly contribute to the plan, but is consistent with these habitat strategies.

3.5) Ecological interactions.

(1) Species that could negatively impact the program include:

- Avian predators, such as great blue herons, Caspian terns, cormorants, and gulls,
- Mammalian predators such as river otters, harbor seals, or sea lions,
- Introduced fish species such as American shad, walleye, smallmouth bass, and channel catfish,
- Northern pikeminnow,
- Out-of-basin hatchery salmonid releases,
- Known or unknown aquatic non-indigenous animals and plants.

The majority of the preceding species list can be characterized as predators of juvenile salmonids, which will negatively affect SAFE coho salmon juvenile survival after release and may attract predators to the various Select Area net pens. Attention to limiting or eliminating losses in the net pens from avian and mammalian predation is an ongoing concern. Typically the net pens, regardless of location, are visited by several species of piscivorous birds. Sewing bird covers to the nets has been tried with some success. Current net-pen covers need to be replaced with finer-mesh netting to prevent chronic predation by blue herons. In recent years, Caspian terns (*Sterna caspia*) have colonized the Columbia River estuary; the colony currently represents the largest in North America. Recent estimates of annual Caspian tern predation on salmonid smolts have been as high as about 25 million (Roby et al. 1998). Caspian tern predation is highest on large smolts, such as steelhead or coho that spend 1-2 years rearing in freshwater; predation is lower on ocean-type salmonids such as fall chinook and chum salmon that emigrate as sub-yearlings. Northern pikeminnow (*Ptychocheilus oregonensis*) have been estimated to annually consume millions of juvenile salmonids in the lower Columbia River. Most Northern pikeminnow predation is thought to occur downstream of dams. Pikeminnow abundance in the Columbia River estuary is likely low; therefore, pikeminnow effects are expected to be minimal. Walleye (*Stizostedium vitreum*), smallmouth bass (*Micropterus dolomeiui*), and channel catfish (*Ictalurus punctatus*) have been estimated to consume substantial numbers of emigrating juvenile salmonids; effects of these species is thought to be highest around dams and throughout impounded reaches of the Columbia River. Like pikeminnow, their abundance in the Columbia River estuary is thought to be low; thus, their predation effects on SAFE juvenile coho in the

estuary should be minimal.

The net pens attract families of river otters (*Lutra canadensis*) as well; legal trapping has been tried with some success. Incidences of otter predation continue to plague the project and new treatments are underway to address the problem. A solar-powered electric deterrent device similar to the kind used in agriculture to contain bovines has been evaluated at some sites. The Deep River pen complex has been successful in reducing otter predation using this technique, yet it was only marginally successful when tested at Youngs Bay net pens. Harbor seals (*Phoca vitulina*), Steller sea lions (*Eumetopias jubatus*), and California sea lions (*Zalophus californianus*) are commonly observed in the Columbia River estuary. Seals and sea lions reportedly prey on adult salmonids, although diet studies indicate that other fish species generally comprise the majority of their food. These mammals are often attracted to concentrated fishing effort and can be troublesome to both sport and commercial fishers by taking hooked or net-caught fish before they can be landed. Additionally, seals and sea lions may be attracted to the Youngs Bay net pens and could potentially cause equipment damage.

American shad (*Alosa sapidissima*) and large out-of-basin hatchery salmonid releases represent potential competitors of juvenile SAFE coho salmon and may decrease juvenile survival through density dependent competition effects. In the Columbia River estuary, juvenile American shad were described as year-round residents in all areas of the estuary (Bottom et al. 1984). Multiple studies have found overlap in both habitat use and diet items in juvenile American shad and both sub-yearling and yearling salmonids (McCabe et al. 1983, Bottom et al. 1984), suggesting competition for food and space. Additionally, other hatchery fish may be a source of competition for SAFE coho salmon. The potential exists for large-scale hatchery releases of fry and fingerling ocean-type chinook salmon to overwhelm the production capacity of estuaries (Lichatowich and McIntyre 1987). Estuaries may be “overgrazed” when large numbers of ocean-type juveniles enter the estuary en masse (Reimers 1973, Healey 1991). Food availability may be negatively affected by the temporal and spatial overlap of juvenile salmonids from different locations; competition for prey may develop when large releases of hatchery salmonids enter the estuary (Bisbal and McConnaha 1998), although this issue remains unresolved (Lichatowich 1993 as cited in Williams et al. 1998.

Aquatic non-indigenous species introductions in the lower Columbia River represent permanent alterations of the biological integrity of the ecosystem for numerous reasons: impacts of introduced species are unpredictable, introduced species alter food web dynamics, and introduced species are a conduit for diseases and parasites (Waldeck et al. 2003). Significant changes in estuary faunal and floral communities have occurred through species introductions, but, for the most part, the effects of these species introductions have not been assessed. Several non-native invertebrate species have expanded their populations dramatically since introduction, particularly the Asian bivalve, *Corbicula fluminea*. Additionally, ecosystem effects of non-indigenous aquatic plants are a concern for many resource managers. Of particular interest in the Columbia River estuary and lower mainstem are four plants considered noxious weeds: purple loosestrife (*Lythrum salicaria*), Eurasian water milfoil (*Myriophyllum spicatum*), parrot feather (*Myriophyllum aquaticum*), and Brazilian elodea (*Egeria densa*). Effects of these non-indigenous species on SAFE coho salmon are unknown.

(2) Species that could be negatively impacted by the program include:

- Lower Columbia River chinook,
- Lower Columbia River chum,
- Lower Columbia River coho,
- Out-of-basin wild salmonids using Youngs Bay or the Columbia River estuary,

Wild juvenile salmonids using Youngs Bay, Tongue Point, Blind Slough, or the Columbia River estuary may be affected by releases of SAFE spring chinook. However, Select Area coho are released as full-term yearling smolts so they are expected to promptly emigrate through SAFE fishing sites and the lower Columbia River estuary with a minimum of ecological interaction with other species. Ledgerwood (1997) found radio-tagged spring chinook smolts released from Youngs Bay net pens out-migrated from Youngs Bay within one full tidal series and moved through the Columbia River estuary rapidly. Preliminary results from recent acoustic tracking studies corroborate the rapid emigration rates documented by Ledgerwood (1997), with average travel times of 11.5 and 48.7 hours from Youngs Bay net pens to the mouth of the Columbia River in 2004 and 2005, respectively (personal communication; Robert Warren; Sea Resources and Columbia River Estuary Study Taskforce (CREST)). The influence of these hatchery juveniles on predator behavior in the lower Columbia is unknown. Some researchers purport that releases of hatchery juveniles in general attract predators, thereby increasing predation on wild juvenile salmonids (Bayer 1986, Collis et al. 1995). However, other researchers maintain that releases of hatchery fish may overwhelm predators, thereby providing a competitive advantage to wild juvenile salmonids that have better predator avoidance capability than hatchery fish (Petersen and De Angelis 1992).

As adults, SAFE coho return at a time of year when adult chum are not usually present, but overlap the run timing of other lower Columbia River coho and fall chinook salmon. As discussed in Section 2, the abundance of wild fall chinook and coho in Youngs Bay and the Klaskanine River is thought to be low (Tables 2.2.1a and 2.2.1b); therefore, the probability of SAFE coho interacting ecologically with wild adult salmonids in these areas should also be low. Although the likelihood of interactions may be low, the impact of these interactions on small wild populations is largely unknown. To help identify potential program effects on wild salmonids, research has been ongoing throughout the history of the SAFE program (North et al. 2004). Although not all SAFE research projects involve coho, studies on migration characteristics of released smolts and adult homing can often be applied across species or stock lines. Results can then be used to assess potential effects on wild salmonids and modify the program, as necessary, to minimize negative effects.

(3) Species that could positively impact the program include any hatchery or wild fish that die or are deposited within the subbasin for the purposes of stream enrichment. Decaying carcasses of salmonid species may contribute nutrients that increase productivity in the subbasin.

(4) Species that may be positively impacted through the program include any freshwater or marine species that depend on salmonids as a nutrient or food base. Pacific salmon carcasses are important for nutrient input back to freshwater streams (Cederholm et al. 1999). Many species are known to utilize juvenile and adult salmon as a nutrient food base (Groot and Margolis 1991; McNeil and Himsworth 1980). Declines in wild salmonid populations during the last few

decades could reduce overall ecosystem productivity. Hatchery production, passage of unmarked fish above hatcheries, and carcass placement in the upper watershed areas of other regional area streams without hatcheries has the potential for maintaining the population dynamics of predator-prey relationships and community ecology during low productivity and shifting climatic cycles when natural returns are reduced. This program likely provides a moderate net gain in nutrient load to Select Area streams due to fishery escapement.

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.

Multiple hatcheries are involved in this program including: Bonneville Hatchery, Sandy Hatchery, Eagle Creek NFH(discontinued after 2002 brood releases in 2004), Cascade Hatchery, and Oxbow Hatchery. The Tongue Point, Blind Slough, and Youngs Bay net pens are also included in this program.

Bonneville Hatchery:

Bonneville Hatchery operates on a combination of well water supply and Tanner Creek surface water. Water flow for production averages 19,680 gpm for the year. The well water meets or exceeds IHOT guidelines for temperature, ammonia, carbon dioxide, chlorine, pH, copper, dissolved oxygen, hydrogen sulfide, dissolved nitrogen, iron, and zinc. The water supply is protected by flow alarms at the head box. The hatchery meets the terms of its NPDES permit. The water supply does not impose any production limitations.

Sandy Hatchery:

Sandy Hatchery operates on a both a well water supply and from Cedar Creek. Water flow for production ranges from 4,100 gpm to 8,800 gpm through the year. The water sources meet or exceed IHOT guidelines for temperature, ammonia, carbon dioxide, chlorine, pH, copper, dissolved oxygen, hydrogen sulfide, dissolved nitrogen, iron, and zinc. The water supply is protected by flow alarms at the head box and at the intake(s). The hatchery meets the terms of its NPDES permit. The water supply does not impose any production limitations.

Eagle Creek NFH:

Water rights for the Eagle Creek NFH total 110.02 cfs. This includes 0.02 cfs from one spring for incubating eggs for winter steelhead, two fish ladder passage ways at 27 cfs each located downstream of the hatchery in Eagle Creek, and 56 cfs for fish culture use derived from the hatchery intake structure located one quarter mile upstream of the hatchery in Eagle Creek. The water for raceway fish production is serial use. There are three upper banks of 12 raceways and three lower banks of 13 raceways. During low creek flows water is serially used through all six banks of raceways. In 2001, the water line to the upper raceways was replaced with a larger size that increased the potential for 25% more water flow. Water use for production ranges from 5,785 gpm to 12,380 gpm. The hatchery monitors water discharges and is in compliance with the current NPDES permit. The water source meets or exceeds IHOT guidelines for temperature,

ammonia, carbon dioxide, chlorine, pH, copper, dissolved oxygen, hydrogen sulfide, dissolved nitrogen, iron, and zinc.

Cascade Hatchery:
The water source for Cascade Hatchery is a mixture of untreated water from Eagle Creek (600 gpm) and spring water (15-20 gpm). The water source is gravity fed. The water source meets or exceeds IHOT guidelines for temperature, ammonia, carbon dioxide, chlorine, pH, copper, dissolved oxygen, hydrogen sulfide, dissolved nitrogen, iron, and zinc. The water supply is protected by flow alarms at the head box. The water supply does not impose any production limitations.

Oxbow Hatchery:
The water source at Oxbow Hatchery is a mixture of water from Upper Herman Creek and Lower Herman Creek, and Oxbow Springs. The water source meets or exceeds IHOT guidelines for temperature, ammonia, carbon dioxide, chlorine, pH, copper, dissolved oxygen, hydrogen sulfide, dissolved nitrogen, iron, and zinc. The water supply does not impose any production limitations.

Tongue Point, Blind Slough, and Youngs Bay Net Pens:
The water source at the net pens is tidal (flow-through exchange). Alarms are not needed and the water supply is not a limiting factor. The water meets or exceeds the recommended IHOT water quality guidelines for temperature, ammonia, carbon dioxide, chlorine, pH, copper, dissolved oxygen, hydrogen sulfide, dissolved nitrogen, iron, and zinc. The water source is accessible to anadromous fish. Limitations include: 1) the availability of leasable space for securing pens, and 2) summer water temperatures.

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.

Each of the hatcheries involved in the program (with the exception of those listed below) are in compliance with their NPDES permits, and intake screens are in compliance with NOAA Fisheries screening criteria.

Intake screens at Cascade Hatchery do not meet NOAA Fisheries screening criteria. Screens will be replaced when funding becomes available.
Intake screens at Oxbow Hatchery are in the process of being replaced to meet NOAA Fisheries screening criteria.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock collection for this program is carried out in Tanner Creek (Bonneville Hatchery), Cedar Creek (Sandy Hatchery), and Eagle Creek (Eagle Creek NFH).

Bonneville Hatchery:
Broodstock at Bonneville Hatchery is collected by volitional returns to an adult capture pond. The collection ponds at Bonneville and Cascade hatcheries are described in Table 5.1. A limited number of the broodstock incorporated at Bonneville are collected at Cascade Hatchery.

Sandy Hatchery:
All returning adult coho are diverted by a picket weir from Cedar Creek into the fish ladder and into the adult holding pond. There is one broodstock holding pond, which is separated into five pens by use of aluminum tubing, so males / females, ripe fish / green fish can be sorted and held.

Eagle Creek NFH:
Fish enter the spawning facility volitionally via a fish ladder below an electric weir. Fish are trapped in the collection pond, which is 80 ft. x 120 ft. x 5 ft. with sloping sides.

Table 5.1. Description of broodstock facilities at hatcheries involved in broodstock collection for the SAFE coho program.

Hatchery	No. of Ponds	Pond type	Volume (ft3)	Length (ft)	Width (ft)	Depth (ft)	Flow (gpm)
Bonneville	2	Concrete	32,785	123.23	38	6.0	5,000
Bonneville	1	Concrete	14,502	83	27.3	6.5	3,500
Bonneville	1	Concrete	11,288	61.5-82	13.5-27.3	6.5	3,500
Cascade	30	Concrete	3,200	80	16	2.5	250-400
Sandy	1	Concrete	10,412	85	35	3.5	2,700
Eagle Cr	1	Concrete	48,000	120	80	5	--

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

The fish transportation equipment used at Bonneville, Sandy, and Eagle Creek hatcheries are described in Table 5.2. IHOT guidelines for transportation are followed.

Table 5.2. Fish transportation equipment used at Bonneville, Sandy and Eagle Creek hatcheries.

Equipment type	Capacity (gallons)	Supplemental Oxygen (y/n)	Normal transit time	Chemicals used
Tanker truck	1,000	Y	Varied	None
Tanker truck	200	Y	Varied	None
Tanker truck	2,400	Y	180 minutes	None

5.3) Broodstock holding and spawning facilities.

Bonneville Hatchery
Broodstock holding facilities are the same as those described in association with the adult trap in Section 5.1. Spawning takes place in a covered facility. IHOT adult holding guidelines are followed for adult holding, density, water quality, alarm systems and predator control measures to provide the necessary security for the broodstock.

Sandy Hatchery
Broodstock holding facilities are the same as those described in association with the adult trap in Section 5.1. Spawning takes place in a covered facility. IHOT adult holding guidelines are followed for adult holding, density, water quality, alarm systems and predator control measures to provide the necessary security for the broodstock.

Eagle Creek NFH
Broodstock holding facilities include the collection pond and a 10 ft. x 120 ft. x 3 ft. holding channel. Fish are moved from the collection pond using a mechanical crowder, crowding fish into a water lift. Then fish slide down a tube into the holding channel. A mechanical crowder moves fish into a brail lift that transfers fish into the carbon dioxide anesthetic tank where fish are sorted. Ripe fish are handled on aluminum spawning racks.

5.4) Incubation facilities.

Incubation for this program takes place at the Sandy Hatchery, Eagle Creek NFH, and Cascade Hatchery.

Sandy Hatchery
All coho eggs are placed in bulk incubation after spawning, and held there until eye-up. The incubation trough measures 1' long x 1.5' wide x 1' deep. A perforated plate lies in the bottom, and eggs are gently poured into each section. The perforated plate allows upwelling of the incoming water supply to oxygenate eggs in that section.

There are 10 sections per trough, with two troughs used. A water flow of 12 gpm runs through each trough. The water source is spring fed and runs year round between 50° - 52°F.

Once eggs are eyed, they are cleaned, dead eggs removed and good eggs counted into open baskets at 8,000 eggs per basket. There are 10 baskets per trough, and 15 troughs are used to hatch 1,200,000 fry. The water source used throughout the eyed egg to fry stage is Cedar Creek. Flow rate through the troughs is 12 gpm. The water temperature of Cedar Creek during incubation varies greatly from as low as 32.5° to 50° F. Daily water temperatures are monitored and recorded by using a digital thermograph.

Eagle Creek NFH
Incubation is done in the nursery building. There are 38 vertical 16-tray incubators with flow set initially to 3 gpm and raised to 4 gpm after hatching. Water use is primarily from Eagle Creek. The water supply is screened and filtered by a gravel bed before incubation. Eggs are treated daily with 1,667 ppm formalin for fifteen minutes to control fungus. Eggs are dispensed using a delivery system ensuring proper dilution and timing. The installation of egg isolation units has been proposed to prevent potential disease transmission from eggs transported from outside the facility to Eagle Creek stocks.

Cascade Hatchery
Incubation is done in vertical stacks of incubation trays. The hatchery uses 44 stacks with 15

trays per stack. Water is supplied primarily from Eagle Creek with some supplementation from springs. Flows through the trays are maintained at 5 gpm. Temperatures during incubation range from 34° to 45° F. Egg densities are 8,250 green eggs/tray and 6,000 eyed eggs/tray. Capacity is reached at about 5 million eggs.

5.5) Rearing facilities.

SAFE coho are reared at Bonneville Hatchery (to produce future broods), Cascade Hatchery, Oxbow Hatchery, Sandy Hatchery, Eagle Creek NFH, and the Tongue Point, Blind Slough, and Youngs Bay net pens (Table 5.5). Blind Slough contains all acclimation fish while Tongue Point and Young's Bay have both over-winter and acclimation rearing strategies.

Table 5.5. Rearing facilities associated with the SAFE coho program.

Hatchery	No. of Ponds	Pond Type	Volume (ft^3)	Length (ft)	Width (ft)	Depth (ft)	Flow (gpm)
Bonneville	28	Concrete	3,780	75	16.8	3	650
Bonneville	32	Concrete	4,800	80	20	3	700
Bonneville	4	F.G. Circular	64	--	9	3	100
ECNFH		Concrete	1,280	80	8	2	300-500
Youngs Bay	Various	Net pens	3,200	20	20	8	NA
Tongue Point	Various	Net pens	3,200	20	20	8	NA
Blind Slough	Various	Net pens	3,200	20	20	8	NA
Oxbow	3	Concrete	11,100	110	37	3	2,400
Oxbow	3	Concrete	4,000	80	20	2.5	300
Sandy	20	Concrete	4,800	80	20	3	--

5.6) Acclimation/release facilities.

There are currently 76 net-pens at Youngs Bay, 37 at Tongue Point, 15 at Blind Slough, 36 in Deep River, and 16 at Steamboat Slough. Fish are grown and released from these pens under varying management and grow-out regimes including two-week acclimation, over-winter, and full-term net-pen rearing. Blind Slough contains all acclimation fish while Tongue Point and Youngs Bay have both over-winter and acclimation rearing strategies.

The net-pen rearing complex at each site consists of 2-4 individual 6.1-m^2 inside dimension frames of high-density polyethylene pipe (33 cm o.d.) filled with styrofoam. A wooden walkway of 2" x 12" lumber is bolted to the plastic frame for access. A 3.1-m deep net hung within each frame confines the fish during rearing and acclimation. Mesh sizes of 3.2-19.0 mm (0.125-0.750") are utilized and adjusted depending on fish size. Vertical plastic standpipes are submerged around the perimeter of each pen to maintain the shape of the net. Actual rearing area of each net is approximately 91 m^3 (3,200 ft^3).

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

No major catastrophic disasters related to net-pen rearing or related operational activities have occurred over the twenty-some years the program has existed. Several minor incidences, such as floating debris, have torn holes in nets allowing early escapement, however, the maximum event

has not exceeded the contents of one net pen. Of the three Oregon net-pen sites, Youngs Bay is the most dynamic with tidal changes providing superior flushing and greater opportunity for debris problems. The only ongoing operational challenge for high survivals in the net-pens is predator avoidance. Bird covers of various designs have been used with increasing success. River otter predation is a chronic problem with various passive methods employed in the past. Each method seems to work for a season before the otters learn to outsmart these systems. In 2001 a local trapper (under permit from ODFW) focused on one of our sites and has significantly reduced the population, reducing problems for us. He will be expanding his efforts to include our other two sites.

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.

No ESA-listed population/stock is currently used in this propagation program. However to prevent any catastrophic fish loss, all associated hatcheries are staffed full-time and equipped with alarms for all critical operations. Also, net pens are checked for holes during regular washing schedules to prevent accidental releases. Net pen complexes are sufficiently constructed to avoid accidents due to adverse weather, etc. Clatsop County coordinates with the municipal government, the Port Authority and the US Coast Guard for general disaster and event preparedness. As a part of that system, the CEDC (SAFE) net pens are identified as "critical water dependent programs". In the event of any potential hazard or harm the above agencies all have the list of telephone numbers (home and cell) for CEDC staff. Internally, we deploy a minimum of one staff member on duty 365 days a year, and that staff member, who may be alone (usually weekend duty), carries a portable phone for instant communications. Should contact be made the staff are trained to:

- Inform the field supervisor as soon as possible;
- Take corrective action on the site as his/her judgment informs; and
- Contact the project manager if the event involves policy issues or inter-governmental relations.

The project has sustained several significant flood events, including the 1996 one-hundred-year flood without loss of fish or infrastructure. The pilings to which the pens are moored, are of significant height to withstand such occurrences.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

6.1) Source.

Three different broodstocks are used in this program, including coho stock 14 from the Bonneville Hatchery, coho stock 11 from the Sandy Hatchery, and Eagle Creek NFH coho. Each of the hatcheries derive their broodstock from hatchery fish returning to the hatchery.

6.2) Supporting information.

6.2.1) History.

Bonneville Stock 14
This hatchery program dates back to 1938. Historically, coho were collected at Eagle Creek, Herman Creek and Tanner Creek on the Lower Columbia. At one time these were maintained as three broodstocks, although with a high rate of transfers among hatcheries. They were eventually combined into a single broodstock. In addition to local coho, fish were transferred into this broodstock from several other locations, including Big Creek and Sandy hatcheries.

Sandy Stock 11
The Coho Stock 11 originated from wild coho trapped and spawned from Cedar Creek in 1952. This was the first year of operation of the Sandy Hatchery at Cedar Creek.

Eagle Creek NFH coho
The original stock of coho salmon used at Eagle Creek NFH was a combination of Sandy, Toutle, and Big Creek stocks.

6.2.2) Annual size.

Bonneville Stock 14
The annual broodstock collection goal at Bonneville Hatchery is 3,000 females, 3,000 males and 10 jacks. Actual collection levels of the past are displayed in Section 7.4.2. No natural fish are taken for broodstock.

Sandy Stock 11
The annual broodstock collection goal at Sandy Hatchery is 400 males and 600 females. Fish are spawned at 1 male:3 females so not all collected fish are spawned. Actual collection levels are in Section 7.4.2. No natural fish are taken for broodstock.

Eagle Creek NFH coho
The current broodstock take goal at Eagle Creek NFH is 4,000 fish, averaging 50% female. Actual collection levels are in Section 7.4.2. No natural fish are taken for broodstock.

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

Bonneville Stock 14
No wild coho salmon are currently used for production in this program at Bonneville Hatchery.

Sandy Stock 11
No wild coho salmon are currently used for production in this program at Sandy Hatchery.

Eagle Creek NFH coho
There are no wild coho salmon currently used for Eagle Creek NFH production. Documentation of later returning coho salmon at the hatchery is rare. Because late run wild coho are currently

proposed for listing under the ESA, the disposition of any late run coho which now return to Eagle Creek NFH will be determined by the ODFW District Biologist (Eagle Creek NFH Coho HGMP, 2002).

6.2.4) Genetic or ecological differences.

Bonneville Stock 14
The Bonneville coho stock is an early run, mixed, domesticated stock. It is assumed to have genotypic, phenotypic and behavioral differences from the ancestral and current wild coho stocks in this area. If present, these differences in the Bonneville Hatchery coho stock are assumed to be the result of domestication, artificial selection, and stock transfer.

Sandy Stock 11
The Sandy Stock is a locally-adapted broodstock, increasing the likelihood of long term survival, maintaining among population diversity, and reducing the likelihood of unexpected ecological interactions. Genetic diversity of the stock is maintained by randomly mating a representative sample of the entire run.

Eagle Creek NFH coho
The hatchery stock at Eagle Creek is an early-run, mixed, domesticated stock. The wild indigenous stock is considered late-run. There are no known late-run coho regularly returning to Eagle Creek. It is assumed the hatchery stock has genotypic, phenotypic and behavioral differences from the ancestral and current wild coho stocks in this area. If present, these differences are assumed to be the result of domestication, artificial selection, and stock transfer.

6.2.5) Reasons for choosing.

These broodstock were selected because of availability, generally good survival, and because they have characteristics that are desirable for Columbia River fisheries, such as early return timing which allows fisheries to avoid late returning wild coho.

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.

Bonneville Hatchery
Broodstock selection targets only hatchery-produced coho(stock 14), which are not currently listed in the lower Columbia. Any listed salmonids that are incidentally captured in the adult trap are released above Bonneville Dam with minimum stress.

Sandy Hatchery
No listed fish are currently used for Sandy Hatchery production. The current broodstock is spatially segregated from the wild indigenous Sandy River coho which spawn upstream of Cedar Creek (location of Sandy Hatchery).

Eagle Creek NFH
No listed fish are currently used for Eagle Creek NFH production. The current broodstock is spatially and temporally segregated from the wild indigenous late-run Clackamas coho.

SECTION 7. BROODSTOCK COLLECTION

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

Only adults and a limited number of jacks are collected for this program.

7.2) Collection or sampling design

Bonneville Hatchery
Broodstock are collected through volitional returns to the adult capture pond at Bonneville Hatchery. A small portion of the broodstock spawned at Bonneville Hatchery is collected at the trap at Cascade Hatchery. Representative samples of the population are collected with respect to age, size, sex ratio, run timing, and other traits important to long-term fitness. The program follows a "spread-the-risk" strategy that attempts to improve the probability of survival for the entire population. The program collects sufficient broodstock to maintain full production of the smolt goal.

Sandy Hatchery
Broodstock are collected through volitional returns to the adult capture pond at the Sandy Hatchery. Representative samples of the population are collected with respect to age, size, sex ratio, run timing and other traits important to long-term fitness. The program follows a "spread-the-risk" strategy that attempts to improve the probability of survival for the entire population. The program collects sufficient broodstock to maintain full production of the smolt goal.

Eagle Creek NFH
Adults return to Eagle Creek from September through November. Fish returning directly to the hatchery holding pond are spawned in October and November.

Fish are randomly selected and spawned at a 2:2 male to female ratio. Coho jacks are spawned at 1% of the spawning population. Excess eggs are either destroyed or transferred for use in other programs where acceptable. Fish are randomly spawned throughout the run.

7.3) Identity.

100% of the fish produced by the program are externally marked with an adipose fin clip. Some are also marked with an internal coded-wire tag, and only marked fish are used for broodstock.

7.4) Proposed number to be collected.

7.4.1) Program goal.

The broodstock collection goal at Bonneville Hatchery is approximately 3,000 females, 3,000 males, and 10 jacks. The program goal for Sandy hatchery is 600 males and 400 females. The goal for the Eagle Creek NFH is to collect 4,000 adults at a 1:1 sex ratio. Actual collections can be found in Table 7.4.2

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1990-2001), or for most recent years available.

Bonneville and Cascade

Year	Adults Collected		
	Females	Males	Jacks
1992	1,431	2,258*	NA
1993	511	802	94
1994	428	665	29
1995	610	693	57
1996	194	228	136
1997	4,203	1,844	169
1998	3,966	1,437	144
1999	2,491	1,635	129
2000	2,094	1,498	137
2001	2,322	1,409	134
2002	2,522	1,561	156
2003	15,911	19,741	470

*includes jacks.

Sandy

Year	Adults Collected		
	Females	Males	Jacks
1992	5,048	8,229	652
1993	80	151	242
1994	2,771	5,176	125
1995	1,422	1,842	38
1996	148	180	314
1997	616	660	140
1998	2,618	2,795	93
1999	464	549	504
2000	5,184	7,322	975
2001	8,101	12,268	623
2002	1,797	5,073	1,204
2003	2,046	6,700	1,447

Eagle Creek NFH

Year	Adults Collected		
	Females	Males	Jacks
1992	1,539	1,461	
1993	190	209	
1994	937	886	161
1995	1,396	1,191	
1996	717	665	
1997	585	621	
1998	2,315	2,260	
1999	2,795	2,782	
2000	1,728	1,707	
2001	1,715	1,696	31
2002	2,881	3,404	1,085
2003	2,131	2,667	879

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

Adults in excess of program goals are randomly selected from throughout the run and removed. See Section 7.8 for disposition of carcasses.

7.6) Fish transportation and holding methods.

The fish transportation equipment used at Bonneville, Sandy, and Eagle Creek National hatcheries are described in Table 5.5. IHOT guidelines for transport are followed for this program. Broodstock are both collected and spawned at these hatcheries, so transportation of broodstock is minimized. Adults return to holding ponds volitionally and are utilized throughout the spawning run as needed.

7.7) Describe fish health maintenance and sanitation procedures applied.

At both the Bonneville Hatchery and Sandy Hatchery IHOT guidelines are followed for broodstock fish health inspection, transfer of eggs or adults, broodstock holding, and disposal of carcasses.

At Eagle Creek NFH personnel from the Lower Columbia River Fish Health Center test for the listed pathogens defined by USFWS Fish Health Policy and Implementation Guidelines. Samples are taken from 150 female and 60 male adults throughout the spawning period to ascertain the health profile. As defined by the USFWS Fish Health Policy, Eagle Creek NFH is classified as a virus-free facility so adult fish from facilities with a history of virus are not allowed on station.

7.8) Disposition of carcasses.

Bonneville Hatchery
High quality carcasses are donated to food banks, allocated to tribes, or sold to seafood buyers. Poor quality carcasses are treated as per IHOT guidelines and disposed of at a landfill.

Sandy Hatchery
Excess carcasses are used for stream nutrient enrichment projects, donated to the Oregon Food Bank or local food banks, given to a local composting unit, or are sold to a fish buyer.

Eagle Creek NFH
Carcasses have been utilized by the Warm Springs and Yakama Indian tribes. If available, fish are also distributed to suppliers for food at federal prisons.

Adult coho salmon carcasses have been distributed by the state of Oregon and U.S. Forest Service for stream enrichment. There is minimal concern for disease transmission as the fish are historically negative for virus and *Myxobolis cerebralis* and have a low incidence and level of bacterial kidney disease.

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.

No listed fish are collected or propagated at these hatcheries. IHOT guidelines are followed for broodstock fish health inspection, transfer of eggs or adults, broodstock holding, and disposal of carcasses.

Bonneville Hatchery
At Bonneville Hatchery, any listed fish incidentally captured are transported upstream daily. Safeguards are in place, including separate facilities, sanitation procedures and treated water supplies, to protect any other listed species that may occur on the hatchery site.

Sandy Hatchery
Risks to wild coho at Cedar Creek Hatchery are minimal. In 2002, 8,074 fish were trapped returning to the hatchery while only 57 were wild. In 2003, 10,193 fish were trapped and only 184 were wild. All fish identified as wild are transported above Marmot Dam and released. Safeguards are in place, including separate facilities, sanitation procedures and treated water supplies, to protect any other listed species that may occur on the hatchery site.

Eagle Creek NFH
At Eagle Creek NFH, the early-run hatchery coho population is spatially and temporally segregated from the listed late-run coho population. Safeguards are in place, including separate facilities, sanitation procedures and treated water supplies, to protect any other listed species that may occur on the hatchery site.

SECTION 8. MATING

8.1) Selection method.

Bonneville Hatchery
Only hatchery-origin fish are intentionally used for the broodstock. Males and females available on a given day are mated randomly.

Sandy Hatchery
Only hatchery-origin fish are intentionally used as broodstock. Ripe males and females available on a given day are randomly selected for mating.

Eagle Creek NFH
Eagle Creek NFH coho are spawned randomly over the entire run, from ripe fish on selected days over a 3-4 week period.

8.2) Males.

Bonneville Hatchery
The target sex ratio for this program is about 1 male for every 2 females (see Table 7.4.2). Some jacks are used in the broodstock.

Sandy Hatchery
The target sex ratio for this program is 1 male for every 3 females. Jacks are used as a set percentage or in proportion to their contribution to the adult run. Back-up males are used in the spawning protocol.

Eagle Creek NFH
The target sex ratio for this program is about 1 male for every 1 female. If short of males, the hatchery will use males more than once as needed.

8.3) Fertilization.

Bonneville Hatchery
Current protocols are to spawn two females with a single male for fertilization. Males may be used more than once.

Sandy Hatchery
Current fertilization protocols call for a spawning ratio of three females per male.

Eagle Creek NFH
Coho are spawned in 2:2 (M:F) individual matings, 1% saline solution is used to enhance fertilization, and ovarian fluid is drained.

8.4) Cryopreserved gametes.

Cryopreserved gametes are not used as part of this program.

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.

These hatchery coho are currently not listed under the Federal ESA. Safeguards are in place, including separate facilities, sanitation procedures, and treated water supplies, to protect any other listed species that may occur on the hatchery site.

This is an isolated harvest program of hatchery stock, and therefore, it is unlikely that the mating scheme will have any adverse genetic or ecological impacts on listed natural fish. However, to maintain within hatchery-population genetic diversity, adults used for brood are mixed and randomly selected (throughout the entire run). Pairs of males and females are mated randomly with conscious effort made to avoid bias due to size or other external characteristics. Since broodstock is collected throughout the temporal duration of the run, it is believed that this method is sufficiently random to minimize the potential for genetic bias within the hatchery program.

SECTION 9. INCUBATION AND REARING

9.1) Incubation.

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

Table 9.1.1a. Coho egg take at hatcheries involved in the SAFE coho program. Broodstock for eggs incubated at Cascade and Oxbow hatcheries is collected and spawned at Bonneville Hatchery.

Brood Year	Bonneville Hatchery	Eagle Creek NFH	Sandy Hatchery
1992	4,368,000	2,684,220	8,122,394
1993	5,270,000	486,992	151,871
1994	9,901,000	2,664,780	4,988,535
1995	5,448,000	3,796,721	3,137,884
1996	10,711,000	2,075,656	361,917
1997	9,596,000	1,768,593	1,538,168
1998	7,099,730	6,501,558	1,803,404
1999	2,021,152	9,191,106	1,084,800
2000	6,313,210	5,580,332	1,724,912
2001	6,946,000	5,240,386	1,912,800
2002	7,259,000	6,368,631	1,551,230
2003	8,319,280	4,135,979	1,379,252

Table 9.1.1b. Coho egg-to-ponding survival at hatcheries involved in the SAFE coho program. Broodstock for eggs incubated at Cascade and Oxbow hatcheries is collected and spawned at Bonneville Hatchery.

Brood Year	Cascade Hatchery*	Oxbow Hatchery	Eagle Creek NFH	Sandy Hatchery
1990	91%			95%
1991	76%	96%		88%
1992	85%	92%	93%	96%
1993	90%	98%	95%	85%
1994	93%	98%	79%	57%
1995	89%	84%	92%	92%
1996	78%	97%	95%	92%
1997	85%	84%	95%	91%
1998	78%	91%	88%	66%
1999	84%	80%	87%	94%
2000	75%	88%	88%	87%
2001	71%	72%	99%	61%
2002	67%	62%	93%	67%
2003	58%	71%	99%	87%

* Data is combined for Cascade and Bonneville hatcheries. Prior to 1996, broodstock was collected and spawned at Cascade Hatchery. Broodstock was collected and eggs taken at each hatchery 1996, 1998, 1999, and 2000. In 1997 and 2001, broodstock collection and egg take only occurred at Bonneville. Survival rates are weighted averages from the two hatcheries.

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

Bonneville Hatchery

If eggs are found to be in excess of production goals, it is first determined if any other hatcheries have egg deficits. If not, eggs are destroyed, frozen and disposed of or given to the Oregon Coast Aquarium or local zoos to feed the animals. Eggs may be non-randomly culled for BKD.

Sandy Hatchery

Extra eggs may be taken to safeguard against potential incubation losses. If found to be in excess of production goals, eggs are frozen and then buried.

Eagle Creek NFH

Extra eggs may be taken to safeguard against potential incubation losses and short falls at other facilities. Excess eggs are fed to trout or saved for "kids fishing day".

9.1.3) Loading densities applied during incubation.

Bonneville Hatchery

Eggs produced for the SAFE program at Bonneville hatchery are transferred to Cascade hatchery for incubation.

Cascade Hatchery

Rearing densities are 10,000 eggs per tray to the green egg stage, and then 8,250 to the eyed egg stage. Average egg sizes are 111 eggs/oz. as green and 90 eggs/oz. at the eyed stage. Flow in

the trays is maintained at 5 gpm.

Sandy Hatchery
All coho eggs are placed in bulk incubation after spawning, until eye-up. There are approx. 75,000 green eggs that are placed in a section of trough that measures 1' long x 1.5' wide x 1' deep. Once eggs are eyed, they are cleaned, dead eggs removed and good eggs counted into open baskets at 8,000 eggs per basket. There are 10 baskets per trough, and 15 troughs are used to hatch 1,200,000 fry. A water flow of 12 gpm runs through each trough.

Eagle Creek NFH
Eggs are placed into incubation trays at four females (approximately 10,000-12,000 eggs) per tray. At eye-up bad eggs are removed, the remaining eggs are enumerated and then placed back into trays at a rate of 7,000-9,000 eggs per tray. Initial water flows are set at 3 gpm and increased to 4 gpm at hatch. These loading densities have been found to be the best management practice at Eagle Creek NFH to control abrasion to the yolk sac and subsequently control disease.

9.1.4) Incubation conditions.

Cascade Hatchery
IHOT species-specific incubation recommendations are followed for water quality, flows, and temperatures. Eggs are monitored when needed to determine fertilization efficiency and embryonic development. Eggs are incubated under conditions to allow for equal survival of all segments of the population to ponding. Families are not incubated individually, but rather may be mixed with other families from the same spawn group. Families among spawning groups are mixed randomly at ponding so that unintentional rearing differences affect families equally.

Rearing densities are 10,000 eggs per tray to the green egg stage, and then 8,250 to the eyed egg stage. Average egg sizes are 111 eggs/oz. as green and 90 eggs/oz. at the eyed stage. Flow through the incubators is 5 gpm. Temperatures range from 32-52°F.

Sandy Hatchery
Until eye-up, eggs are incubated in well water that ranges between 50-52°F. Once eggs are eyed, they are cleaned, dead eggs removed, and good eggs counted into open baskets at 8,000 eggs per basket. 10 baskets per trough, and 15 troughs are used to hatch 1,200,000 fry. The water source used throughout the eyed egg to fry stage is Cedar Creek. Flow through each trough is 12 gpms. The water temperature of Cedar Creek during incubation varies greatly from as low as 32.5 degrees F to a high of 50 degrees F. Daily water temperatures are monitored and recorded by using a digital thermograph.

IHOT species-specific incubation recommendations are followed for water quality, flows, and temperatures. Eggs are monitored when needed to determine fertilization efficiency and embryonic development. Eggs are incubated under conditions to allow for equal survival of all segments of the population to ponding. Families are not incubated individually, but rather may be mixed with other families from the same spawn group. Families among spawning groups are mixed randomly at ponding so that unintentional rearing differences affect families equally.

Eagle Creek NFH
Water temperature is monitored using thermograph probes and recorded. Temperature during incubation ranges from 34 ^{o}F to 53 ^{o}F, with typical temperatures around 42 ^{o}F. Dissolved oxygen levels are not regularly monitored, but have been tested and found to be at saturation. All water for incubation is filtered through a gravel bed to remove sediment. Flows range from 3 to 4 gpm.

9.1.5) Ponding.

Cascade Hatchery
The fry are ponded at 1,200 fish/lb into six raceways, with 753,000 fish in each raceway. Flows through the raceways are 100 gpm. Raceway dimensions are 80 ft long by 16 ft wide and 2.5 ft deep. The fish are split for the first time into 12 raceways at 700 fish/lb and 375,000 fish per raceway. Flows through the raceways after the first split are 200 gpm. The second split typically occurs in May at 200 fish/lb. Flows at this time are usually increased to about 350 gpm.

Sandy Hatchery
Coho fry are ponded at approximately 1,200 fish/lb in late February. The fry are ponded into four raceways, at approximately 300,000 fry per raceway. The raceways are 80' long x 20' wide x 3.5' deep or 5,600 cu. ft. The fry are reared in these four raceways until additional space becomes available, which occurs in May. At this time, the fry average approx. 200 fish/lb or 1,500 lbs of fish/pond. Flow rates in the ponds are 400 gpm of Cedar Creek water.

Eagle Creek NFH
Fish are transferred to the raceways from egg trays when most have absorbed their yolk sac (at around 1,600 Temperature Units). At this time fry are poured into a 30 gallon plastic container with 12 gallons of water, moved to the appropriate raceway and poured directly into the raceway in late February through March. Average length at ponding is 3.3 cm.

Oxbow Hatchery (Upper Herman Creek Pond)
Oxbow hatchery receives swim-up fry from Cascade hatchery in June for ponding. The size of fry are 150 fish/lb.

9.1.6) Fish health maintenance and monitoring.

Cascade Hatchery
Disinfection procedures are implemented during incubation, preventing pathogen transmission between stocks of fish. Eggs are monitored to determine fertilization efficiency and embryonic development. Following eyed-up stage, eggs are inventoried, and dead or undeveloped eggs are removed and disposed of as described in the disease control guidelines. Dead or culled eggs are discarded in a manner that prevents transmission to the receiving watershed.

Oxbow Hatchery
Disinfection procedures are implemented during incubation that prevent pathogen transmission between stocks of fish on site. Eggs are monitored when needed to determine fertilization

efficiency and embryonic development. Following eyed-up stage, eggs are inventoried, and dead or undeveloped eggs are removed and disposed of as described in the disease control guidelines. Dead or culled eggs are discarded in a manner that prevents transmission to the receiving watershed.

Sandy Hatchery

Disinfection procedures are implemented during incubation that prevent pathogen transmission between stocks of fish on site. Eggs are monitored when needed to determine fertilization efficiency and embryonic development. Following eyed-up stage, eggs are inventoried, and dead or undeveloped eggs are removed and disposed of as described in the disease control guidelines. Dead or culled eggs are discarded in a manner that prevents transmission to the receiving watershed. Ponds are cleaned weekly throughout the year. Dead fish are removed from ponds on a daily basis and recorded.

Eagle Creek NFH

Minimal health concerns exist for progeny originating from Eagle Creek broodstock which are free from virus and have minimal incidence of vertically-transmitted pathogens. However, eggs received from other stations must be from adults individually tested and certified free of virus. The eggs are to be water-hardened in 50 ppm iodine for 30 minutes at the spawning site prior to transport to Eagle Creek NFH. Upon receipt, eggs received at Eagle Creek are disinfected with iodine to prevent virus transfer. The current treatment to control fungus on the eggs is a 1,667 ppm formalin drip for 15 minutes six times a week. The first health exam of newly hatched fish occurs when approximately 50% are beyond the yolk sac stage and begin feeding. Sixty fish are sampled and tested for virus. Regular fish health checks are done on a monthly basis by the fish health specialist from the USFWS Lower Columbia River Fish Health Center.

Youngs Bay, Tongue Point, and Blind Slough Net Pens

Fish health is monitored daily; any mortalities are examined for signs of disease. If an outbreak occurs, CEDC staff biologist will take fish back to the lab for necropsy and gram stains. Usually ODFW pathologist will receive samples to confirm the diagnosis. Treatment for diseases in the net pens is with medicated fish food produced at Bio-Oregon; usually TM-100 or Romet-30, depending on recommendation from ODFW pathology. Potential diseases in the net pens include vibriosis, furunculosis and columnaris.

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. (e.g. "Eggs will be incubated using well water only to minimize the risk of catastrophic loss due to siltation.")

No ESA listed fish are involved in the incubation process of this program. Disinfection procedures are implemented to ensure prevention of disease transfer between stocks. Dead or culled eggs are discarded in a manner that prevents transmission of disease to the receiving watershed.

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 (1990-2001), or for years dependable data are available.

Table 9.2.1a. Fry-to-fingerling survival rate at rearing locations within the SAFE coho program.

Year	Bonneville*	Cascade*	Oxbow	Sandy	Eagle Cr.*
1992	84.6%	90.2%	93%	95%	81%
1993	97.1%	95.9%	96%	96%	89%
1994	97.3%	93.9%	99%	92%	84%
1995	97.1%	73.2%	95%	89%	55%
1996	74.9%	85.3%	100%	94%	94%
1997	97.9%	80.9%	99%	98%	93%
1998	99.5%	89.6%	99%	99%	93%
1999	99.6%	99.2%	99%	99%	90%
2000	98.0%	98.3%	99%	97%	90%
2001	85.2%	93.7%	98%	96%	90%
2002	99.2%	91.7%		96%	94%
2003	94.6%	96.2%		96%	

* Hatchery was only able to provide fry to smolt survival which are presented here

Table 9.2.1b. Fingerling-to-smolt survival rate at rearing locations within the SAFE coho program.

Year	Bonneville	Cascade	Oxbow	Sandy	Eagle Cr.	Net Pens
1992	84.6%	90.2%	97.3%	87%	81%	Na
1993	97.1%	95.9%	99.5%	90%	89%	Na
1994	97.3%	93.9%	93.7%	98%	84%	Na
1995	97.1%	73.2%	82.4%	96%	55%	88.0%
1996	74.9%	85.3%	94.2%	91%	94%	97.0%
1997	97.9%	80.9%	98.8%	92%	93%	99.3%
1998	99.5%	89.6%	97.7%	98%	93%	97.1%
1999	99.6%	99.2%	96.8%	96%	90%	95.6%
2000	98.0%	98.3%	96.9%	97%	90%	98.0%
2001	85.2%	93.7%	98.3%	94%	90%	88.1%
2002	99.2%	91.7%	96.7%	99%	94%	88.2%
2003	94.6%	96.2%		99%		

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

Bonneville Hatchery

Actual densities are 0.80 lbs/ft^3. The goal is to remain under 1.1 lbs/ft^3.

Cascade Hatchery

Actual densities are 1.09 lbs/ft^3. The goal is to remain under 1.1 lbs/ft^3.

Oxbow Hatchery

Actual loading levels are 7 lbs/gpm. The goal is to remain under 8 lbs/gpm.

Sandy Hatchery
Loading density goals and levels are as follows:

At Ponding:	0.625 pounds/gpm or 0.045 pounds/ft^3
May split:	3.750 pounds/gpm or 0.267 pounds/ft^3
Fall (prior to transfer):	9.100 pounds/gpm or 0.89 pounds/ft^3

Eagle Creek NFH
Current production goals are to have a final density index of below 0.54 and a flow index of no higher than 1.5. Maximum density and loading criteria are for maximum loadings of 8 lbs/gpm or 3.25 lbs/cu. ft.

Net Pens
Actual densities are 0.28 lbs/ft^3 (fingerlings) and 0.61 lbs/ft^3 (smolts). The goal for fingerlings is 0.25 lbs/ft^3, and for smolts is 0.65 lbs/ft^3.

9.2.3) Fish rearing conditions.

In all the hatcheries, IHOT standards are followed for: water quality, alarm systems, and predator control measures to provide the necessary security for the cultured stock. The program uses a diet regime that maintains and improves growth through the winter. Settleable solids, unused feed, and waste are removed periodically to ensure proper cleanliness of rearing containers. The juvenile rearing density and loading guidelines used at the facilities are based on standardized agency guidelines, life stage specific survival studies conducted at other facilities, staff experience, and other criteria.

Bonneville Hatchery
Temperature in rearing ponds can be adjusted by mixing water from the two water sources (well and Tanner Creek). For early rearing, well water is used exclusively. Temperature is monitored daily via thermographs. Rearing ponds are cleaned weekly, and mortalities are picked daily.

Cascade Hatchery
The water source for Cascade Hatchery is a mixture of untreated water from Eagle Creek (600 gpm) and spring water (15-20 gpm). Temperatures are dictated by natural fluctuations in the waters source and can not be altered by the hatchery. The hatchery has not typically encountered problems with excessively low or high temperatures. Rearing ponds are cleaned weekly, and mortalities are picked daily.

Oxbow Hatchery
The water source at Oxbow Hatchery is a mixture of water from Upper Herman Creek and Lower Herman Creek, and Oxbow Springs. Temperatures are dictated by natural fluctuations in the water sources and can not be altered by the hatchery. The hatchery has not typically encountered problems with excessively low or high temperatures. Rearing ponds are cleaned weekly, and mortalities are picked daily.

Sandy Hatchery

The water temperature range during the full rearing period varies from month to month. Extremes have been below 32°F in the winter where ponds freeze over to a 1 foot depth and above 77°F in late July/August. A 10 year average is 42°F in winter to 60°F in summer. Water temperatures are recorded three times per day using a digital thermograph. Ponds are cleaned weekly and mortalities removed daily. Low dissolved oxygen levels have not been a concern.

Eagle Creek NFH

Temperatures are taken using thermograph probes which take readings continuously. Temperatures in the raceways range from 32°F to 65°F for the containment of coho salmon. Mortalities are removed daily, recorded, and deducted from raceway inventory. Raceways are cleaned with a broom while effluent water is drained to a pollution abatement pond. Cleaning is performed as needed, but no less than once a week. Dissolved oxygen, carbon dioxide, and total gas pressure have not been regularly monitored, but is not considered a problem and is measured periodically, as necessary. Fish are reared on creek gravity flow water.

Youngs Bay, Tongue Point, and Blind Slough Net Pens

In the net pens, fish are fed daily-recommended rations based on water temperature and body weight. Pens are cleaned and/or changed as needed to ensure adequate flow. Excess feed and feces do not accumulate in the pens. Benthic monitoring is conducted seasonally under and adjacent to the net pens. Results to date indicate waste accumulation below the net pens is minimal and does not adversely affect invertebrate communities.

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.

Table 9.2.4. Monthly growth information in fish per pound for locations involved in rearing of SAFE program coho.

Month	Bonneville[1]	Cascade	Oxbow	Sandy	Eagle Creek[2]	Net Pens
February				860		
March				324	1,275	
April				156	472	
May				110	225	
June				84	116	
July	75	62	77	65	72	
August	48	38	52	51	45	
September	37	27	36	40	30	
October	28	23	30	32	23	32
November	26	21	25	27	18	29
December	23	21	23	24	18	25
January	21	19	21	20	18	22
February	17	18	20		18	20
March	15		17		15	17
April	15				13	14
May	13					12

1. 10 year average.
2. 2001 Brood year data. Representative of typical growth rate on an annual basis.

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

Energy reserve information is not available. Refer to section 9.2.4 for growth data.

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).

Bonneville Hatchery

From July through September fish are fed Grower at 3-4 feedings per day at a feeding rate of 2.0-1.0% body weight per day. Feeding rate is 5 lbs./gpm. Food conversion rates range from 0.7-1.0.

Oxbow Hatchery

From July through October fish are fed MCCF. Feeding rates were not available. Food conversion efficiency was 1.23.

Sandy Hatchery

Rearing Period	Food Type	No. Feedings per day	Feeding Rate (%B.W./day)	Lbs. fed per gpm of inflow	Food Conversion
Feb-Apr	M/C #0-#2	4-8	2.0-2.7	0.54	0.5-0.75
May-Jun	M/C 1.2mm	2-4	1.9-2.7	0.59	0.75-1.0
Jul-Aug	M/C 1.5mm	1-2	0.5-1.1	1.61	0.75-1.0
Sep-Oct	M/C 2.0mm	1-2	0.25-0.5	1.57	1.0-1.2
Nov-May	M/C 2.5mm	1-2	0.3-0.6	0.9	1.0-1.2

Eagle Creek NFH

Fish are fed Bio Diet Starter, 1.0 mm to 1.5 mm Grower, and Silver Cup Slow Sinking Salmon Diet, 2.0-3.0 mm, by hand until 45 fish per pound. After that, demand hoppers are used. The feeding ration follows manufacturer recommendations.

Net Pens

The fish are received at approximately 25 fish/pound, fed recommended levels of BioDry 1000TM three days per week, and released in April-May at about 10 fish/pound.

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

In the hatcheries, IHOT fish health guidelines are followed to prevent transmission between lots of fish on site or transmission or amplification to, or within, the watershed. The juvenile rearing density and loading guidelines used at the facilities are based on standardized agency guidelines, life-stage specific survival studies conducted at other facilities, staff experience, and other criteria.

In the net pens, fish health is monitored daily and any mortalities are examined for signs of disease. If an outbreak occurs, the CEDC staff biologist will take fish back to the lab for

necropsy and gram stains. Usually ODFW pathologist will receive samples to confirm the diagnosis. Treatment for diseases in the net pens is with medicated fish food produced at Bio-Oregon; usually TM-100 or Romet-30, depending on recommendation from ODFW pathology. Potential diseases in the net pens include vibriosis, furunculosis and columnaris. If significant losses occur in any of the three species in the net pens, mortalities are bagged, frozen and put in the facility dumpster. No exchange of dip nets, rearing nets, etc. is made between different rearing sites (Youngs Bay, Tongue Pt., Blind Slough) to minimize risk of disease transfer.

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

For fish released from the net pens, ATPase samples are collected periodically beginning several weeks prior to release to establish baseline information and for comparison with adult return rates. Actual release timing is based on smolt behavior, physical appearance, time of year, potential for avian predation, and tidal stage. The potential release window and target size is based on release trials conducted from 1993-2002.

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

The program utilizes net pens for rearing the majority of the production to achieve confirmed benefits of this rearing strategy. Conditions in the net pens may be more natural than can be found in a typical hatchery setting. Growth rates are rapid since natural feeds, including invertebrates and small fishes, are available as prey. These fish are exposed to natural salinity profiles and daily tidal exchange.

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.

Net pens are checked for holes during regular washing schedules to prevent accidental releases. Net pen complexes are sufficiently constructed to avoid accidents due to weather, etc. Coho are not vaccinated for disease before transfer to the net pens. Once in the net pens fish are vaccinated at approximately 100/lb for *Vibrio angularium* and Furunculosis to minimize disease outbreaks.

SECTION 10. RELEASE

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”).)

The proposed releases for 2005 are 200,000 yearling coho smolts at Tongue Point, 1,225,000 yearling coho smolts at Youngs Bay, and 300,000 yearling coho smolts at Blind Slough. All fish will be released on about 5/1/05 with the exception of 825,000 fish released in Youngs Bay on about 4/10/05. If lost Eagle Creek production can be re-established, production at Tongue Point and Youngs Bay would increase by 500,000 fish at each site (to a total of 700,000 and 1,725,000, respectively) with similar release dates.

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

The smolts are released into the Columbia River at Tongue Point and Blind Slough, and into Youngs Bay.

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

The actual numbers of coho released at Tongue Point, Blind Slough and Youngs Bay since 1995 are presented in Table 10.3, including release dates and sizes. Coho juveniles are released as smolts usually in two releases in April and May.

Table 10.3. Releases of coho salmon from the Tongue Point, Blind Slough, and Youngs Bay net pens since the 1995 release year.

Release year	Yearling	Avg size (fpp)
1995	2,614,263	10.1
1996	3,533,977	10.3
1997	2,029,244	13.7
1998	2,142,978	12.9
1999	2,895,083	12.1
2000	4,002,612	13.3
2001	3,628,096	14.1
2002	3,796,699	12.8
2003	3,926,852	11.9
2004	3,028,984	12.6
Average	3,159,879	12.0

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

Release timing is based on smolt behavior, physical appearance, time of year, potential for avian predation, tidal stage, and logistical needs (i.e. releasing in order to receive acclimation smolts). The potential release window and target size is based on release trials conducted from 1993-2002. Releases may also be initiated if rearing space needs to be made for incoming groups of fish. Releases are volitional. Release dates are provided in Table 10.4.

Table 10.4. Release timing from Youngs Bay, Tongue Pt., and Blind Slough net pens; 1995-2004.

Release Year	Release Date		Release Location
	From	To	
1995	17-Apr	15-May	Youngs Bay
	12-May	12-May	Tongue Pt.
	12-May	12-May	Blind Slough
1996	15-Apr	28-May	Youngs Bay
	6-May	6-May	Tongue Pt.
	6-May	6-May	Blind Slough
1997	5-May	12-May	Youngs Bay
	5-May	5-May	Tongue Pt.
	5-May	5-May	Blind Slough
1998	1-May	26-May	Youngs Bay
	1-May	1-May	Tongue Pt.
	1-May	1-May	Blind Slough
1999	28-Apr	1-Jun	Youngs Bay
	28-Apr	28-Apr	Tongue Pt.
	28-Apr	28-Apr	Blind Slough
2000	12-Apr	31-May	Youngs Bay
	4-May	11-May	Tongue Pt.
	4-May	4-May	Blind Slough
2001	10-Apr	14-May	Youngs Bay
	16-Apr	31-May	Tongue Pt.
	24-May	24-May	Blind Slough
2002	12-Apr	6-May	Youngs Bay
	25-Apr	16-May	Tongue Pt.
	7-May	7-May	Blind Slough
2003	10-Apr	10-May	Youngs Bay
	24-Apr	22-May	Tongue Pt.
	7-May	7-May	Blind Slough
2004	9-Apr	29-Apr	Youngs Bay
	6-Apr	28-Apr	Tongue Pt.
	28-Apr	28-Apr	Blind Slough

10.5) Fish transportation procedures, if applicable.

Juveniles for over-winter rearing are generally transferred from Oxbow and Cascade hatcheries to the Select Area sites in October or November. The two-week acclimation fish are transferred from ODFW's Sandy Hatchery to Blind Slough, and from Eagle Creek National Fish Hatchery to Youngs Bay and Tongue Point. The acclimation coho are usually received in April at approximately 15 fish/pound and held for a minimum of 14 days prior to release to allow for imprinting. Transportation equipment is described in section 5.2.

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

SAFE coho are reared in net pens by both over-winter and two-week acclimation strategies. Both strategies are used in Youngs Bay and Tongue Point, while only acclimation is used for Blind Slough releases. Over-winter fish are transferred to the net pens in October and released in April-May. Acclimation fish are transferred to the pens in April and released two-weeks later.

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

Net pen coho are 100% marked with adipose fin clips. Some are also marked with coded wire tags.

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

All fish transferred to the net pens are released.

10.9) Fish health certification procedures applied pre-release.

All fish are examined for the presence of "reportable pathogens" as defined in the PNFHPC disease control guidelines, within 3 weeks prior to transport or release.

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

Net pen complexes are sufficiently constructed to avoid accidents due to weather. Water system failure or flooding incidents are not possible since the pens and fish are immersed in large water bodies rather than supplied by an external source. In the event of net pen failure, fish would be capable of leaving the pens on their own and could not be recovered. Pen complexes are arranged to provide protection to the net pens and minimize the chances of early release. However, in the event of a weather-related emergency, procedures for the net pens are as follows: Clatsop County coordinates with the municipal government, the Port Authority and the US Coast Guard for general disaster and event preparedness. As a part of that system, the CEDC (SAFE) net pens are identified as "critical water dependent programs". In the event of any potential hazard or harm the above agencies all have the list of telephone numbers (home and cell) for CEDC staff. Internally, we deploy a minimum of one staff member on duty 365 days a year, and that staff member, who may be alone (usually weekend duty), carries a portable phone for instant communications. Should contact be made the staff are trained to:

- Inform the field supervisor as soon as possible.
- Take corrective action on the site as his/her judgment informs.
- Contact the Project Manager if the event involves policy issues or inter-governmental relations.

The project has sustained several significant flood events, including the 1996 one-hundred year flood without loss of fish or infrastructure. Pilings, to which the pens are moored, are of

significant height to withstand such occurrences.

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.

Coho salmon are not currently federally-listed in the lower Columbia (although they are proposed for mid-summer addition to the ESA list). Fish are released on strong ebb tides and are assumed to leave the system rapidly. Refer to section 3.5 for further information on effects to listed fall chinook and chum.

The SAFE program is also conducting studies to understand impacts related to this program on listed populations and their habitats. Appropriate measures will be taken to minimize any adverse genetic or ecological impacts identified by the research.

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.

Many policies within the hatchery program are already in place to minimize and avoid risks to ESA listed species. Thus, much of the monitoring and evaluation of the SAFE coho program are incorporated into routine ODFW operations within the Hatchery, Fish Pathology, and Fish Management programs. Ongoing research into additional issues relating to this hatchery program are discussed in Section 12. Refer to Section 1.10 for a listing of monitoring and evaluation efforts associated with each of the performance indicators for the SAFE coho program.

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Funding for monitoring and evaluation is provided entirely by the BPA through one of two projects; the SAFE project in Oregon and Washington, and in Oregon by the coded-wire tag recovery project (BPA Project # 82-01301). Routine ODFW monitoring is funded annually within the ODFW agency budget.

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.

No adverse effects to listed stocks are anticipated from monitoring of the landed catch and analysis of CWT data.

SECTION 12. RESEARCH

The SAFE project has conducted or been involved in several studies with a goal of maximizing smolt survival, improving smolt quality, and minimizing impacts of the project on endangered salmonids and their habitat. Current research activities include studies involving one of the three stocks (spring chinook, fall chinook, and coho) that are released as part of the SAFE program. Listed below are studies involving SAFE coho.

12.1) Objective or purpose.

Avian Avoidance and Predator Studies

Avian predation of juvenile salmonids in the LCR estuary by piscivorous birds has been well documented by the scientific community (Emmett and OSU 1997; Maynard et al. 2001). Artificial nesting areas created by channel dredging have dramatically increased the numbers of these predators. Their close proximity to the SAFE rearing sites creates opportunity for heavy losses of released smolts. Each year increasing numbers of cormorants (*Phalacrocorax* spp.), Caspian terns (*Sterna caspia*), great blue herons (*Ardea herodias*), and gulls (*Larus* spp.) are documented in Youngs Bay at times of chinook and coho releases. Predator control becomes ineffective when the numbers become overwhelming. To address this problem, the SAFE Project conducted release trials during 2001-2003 (1999-2001 broods) to evaluate differences in adult survival rates of coho smolts released from net pens within Youngs Bay (control) with experimental releases in the mainstem Columbia River (treatment). It is not expected that this research had/will have an effect on listed fish.

12.2) Cooperating and funding agencies.

Entities: CEDC and ODFW
Projects: Avian Avoidance and Predator Studies

12.3) Principle investigator or project supervisor and staff.

Lead Investigator(s): Tod Jones (CEDC) and John North (ODFW)

Projects: Avian Avoidance and Predator Studies

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

See Section 2

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

Avian Avoidance and Predator Studies

The SAFE project conducted release trials during 2001-2003 (1999-2001 broods) to evaluate differences in adult survival rates of coho smolts released from net pens within Youngs Bay (control), with experimental releases in the mainstem Columbia River (treatment). Each test group consisted of 200,000 smolts, of which approximately 25,000 were coded-wire tagged.

Each year, treatment group net pens were drifted out of Youngs Bay during an ebb tide with navigation provided by 2-3 contracted commercial fishing vessels. Treatment fish were released near Hammond, Oregon at river mile 8.0, approximately ten miles downriver from the rearing site in Youngs Bay. Control fish were released within 1-2 days of treatment group releases during a nighttime ebb tide. Coded-wire tagged fish are recovered through sampling of commercial and recreational fisheries, through returns to the hatchery, and through sampling of carcasses during spawning ground surveys. Additional towing was conducted in 2004-2005 but was not considered part of the earlier paired release trials since methods were modified slightly.

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

Avian Avoidance and Predator Studies

Experimental releases were made in the spring of 2001-2003, along with production releases. Sampling of harvested fish to recover CWT fish occurs in the fall recreational and commercial Select Area and Columbia River fisheries. Sampling of escapement areas, hatchery and spawning grounds, occurs from fall to early winter. Coded-wire tags were recovered from sampling conducted during the 2002-2004 return years.

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

No listed fish, or their eggs, will be held, maintained, or transported during research activities associated with this program.

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

Avian Avoidance and Predator Studies

These research projects are not expected to result in take of listed fish. They are largely based on the recovery of CWT tagged release groups. Tag recoveries are made through sampling of commercial and recreational fisheries, returns to hatcheries, and through sampling of carcasses during spawning ground surveys.

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

There has been no take of listed fish resulting from research activities associated with the SAFE coho program.

12.10) Alternative methods to achieve project objectives.

Avian Avoidance and Predator Studies

Incidental take of listed species is not expected to occur as a result of activities associated with these research projects. Alternative methods to achieve project objectives are unnecessary with respect to effects of the research on listed fish.

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

Avian Avoidance and Predator Studies

No other species are affected by these research projects.

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.

Avian Avoidance and Predator Studies

It is not expected that listed fish are affected by these research activities.

SECTION 13. ATTACHMENTS AND CITATIONS

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided 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 and Title of Applicant: Curtis Melcher, Ocean Salmon and Columbia River Program Manager

Signature: _____ Date: _____

Certified by: John Thorpe, Fish Propagation Program Manager

Signature: _____ Date:_____

Table 1. Estimated listed salmonid take levels by hatchery activity.

Listed species affected: ___ ESU/Population: _____ _____ Activity:_____				
Location of hatchery activity:_____ Dates of activity:__ __ Hatchery program operator:_____				
	Annual Take of Listed Fish By Life Stage (Number of Fish)			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

ATTACHMENT 1. DEFINITION OF TERMS REFERENCED IN THE HGMP TEMPLATE.

Augmentation - The use of artificial production to increase harvestable numbers of fish in areas where the natural freshwater production capacity is limited, but the capacity of other salmonid habitat areas will support increased production. Also referred to as "fishery enhancement".

Critical population threshold - An abundance level for an independent Pacific salmonid population below which: depensatory processes are likely to reduce it below replacement; short-term effects of inbreeding depression or loss of rare alleles cannot be avoided; and productivity variation due to demographic stochasticity becomes a substantial source of risk.

Direct take - The intentional take of a listed species. Direct takes may be authorized under the ESA for the purpose of propagation to enhance the species or research.

Evolutionarily Significant Unit (ESU) - NMFS definition of a distinct population segment (the smallest biological unit that will be considered to be a species under the Endangered Species Act). A population will be/is considered to be an ESU if 1) it is substantially reproductively isolated from other conspecific population units, and 2) it represents an important component in the evolutionary legacy of the species.

Harvest project - Projects designed for the production of fish that are primarily intended to be caught in fisheries.

Hatchery fish - A fish that has spent some part of its life-cycle in an artificial environment and whose parents were spawned in an artificial environment.

Hatchery population - A population that depends on spawning, incubation, hatching or rearing in a hatchery or other artificial propagation facility.

Hazard - Hazards are undesirable events that a hatchery program is attempting to avoid.

Incidental take - The unintentional take of a listed species as a result of the conduct of an otherwise lawful activity.

Integrated harvest program - Project in which artificially propagated fish produced primarily for harvest are intended to spawn in the wild and are fully reproductively integrated with a particular natural population.

Integrated recovery program - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), and fish produced are intended to spawn in the wild or be genetically integrated with the targeted natural population(s). Sometimes referred to as "supplementation".

Isolated harvest program - Project in which artificially propagated fish produced primarily for harvest are not intended to spawn in the wild or be genetically integrated with any specific

natural population.

Isolated recovery program - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), but the fish produced are not intended to spawn in the wild or be genetically integrated with any specific natural population.

Mitigation - The use of artificial propagation to produce fish to replace or compensate for loss of fish or fish production capacity resulting from the permanent blockage or alteration of habitat by human activities.

Natural fish - A fish that has spent essentially all of its life-cycle in the wild and whose parents spawned in the wild. Synonymous with natural origin recruit (NOR).

Natural origin recruit (NOR) - See natural fish .

Natural population - A population that is sustained by natural spawning and rearing in the natural habitat.

Population - A group of historically interbreeding salmonids of the same species of hatchery, natural, or unknown parentage that have developed a unique gene pool, that breed in approximately the same place and time, and whose progeny tend to return and breed in approximately the same place and time. They often, but not always, can be separated from another population by genotypic or demographic characteristics. This term is synonymous with stock.

Preservation (Conservation) - The use of artificial propagation to conserve genetic resources of a fish population at extremely low population abundance, and potential for extinction, using methods such as captive propagation and cryopreservation.

Research - The study of critical uncertainties regarding the application and effectiveness of artificial propagation for augmentation, mitigation, conservation, and restoration purposes, and identification of how to effectively use artificial propagation to address those purposes.

Restoration - The use of artificial propagation to hasten rebuilding or reintroduction of a fish population to harvestable levels in areas where there is low, or no natural production, but potential for increase or reintroduction exists because sufficient habitat for sustainable natural production exists or is being restored.

Stock - (see “Population”).

Take - To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

ATTACHMENT 2. AGE CLASS DESIGNATIONS BY FISH SIZE AND SPECIES FOR SALMONIDS RELEASED FROM HATCHERY FACILITIES.

(generally from Washington Department of Fish and Wildlife, November, 1999).

SPECIES/AGE CLASS	Number of fish/pound	SIZE CRITERIA Grams/fish
Chinook Yearling	<=20	>=23
Chinook (Zero) Fingerling	>20 to 150	3 to <23
Chinook Fry	>150 to 900	0.5 to <3
Chinook Unfed Fry	>900	<0.5
Coho Yearling 1/	<20	>=23
Coho Fingerling	>20 to 200	2.3 to <23
Coho Fry	>200 to 900	0.5 to <2.3
Coho Unfed Fry	>900	<0.5
Chum Fed Fry	<=1000	>=0.45
Chum Unfed Fry	>1000	<0.45
Sockeye Yearling 2/	<=20	>=23
Sockeye Fingerling	>20 to 800	0.6 to <23
Sockeye Fall Releases	<150	>2.9
Sockeye Fry	> 800 to 1500	0.3 to <0.6
Sockeye Unfed Fry	>1500	<0.3
Pink Fed Fry	<=1000	>=0.45
Pink Unfed Fry	>1000	<0.45
Steelhead Smolt	<=10	>=45
Steelhead Yearling	<=20	>=23
Steelhead Fingerling	>20 to 150	3 to <23
Steelhead Fry	>150	<3
Cutthroat Trout Yearling	<=20	>=23
Cutthroat Trout Fingerling	>20 to 150	3 to <23
Cutthroat Trout Fry	>150	<3
Trout Legals	<=10	>=45
Trout Fry	>10	<45

1/ Coho yearlings defined as meeting size criteria and 1 year old at release, and released prior to June 1st.

2/ Sockeye yearlings defined as meeting size criteria and 1 year old.

ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (ANADROMOUS SALMONID EFFECTS ARE ADDRESSED IN SECTION 2)

A.1) List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.
Section 7 biological opinions, Section 10 permits, 4(d) rules, etc.

A.2) Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.
General species description and habitat requirements.
Local population status and habitat use.
Site-specific inventories, surveys, etc.

Columbian White-tailed Deer (*Odocoileus virginianus leucurus*, Endangered Species – Delisting Proposed)

Currently, there are 38 recognized subspecies on *O. virginianus*. The Columbian white-tailed deer (*Odocoileus virginianus leucurus*) is one of the largest terrestrial mammals associated with the Columbia River estuary. Preferred habitats on the mainland and on islands exist in the upper Columbia River estuary and within the river corridor (LCFRB 2004).

Status: Declines in the Columbia white-tailed deer populations led to its listing under the Endangered Species Act in 1967. These deer occupied floodplain and riparian habitat between the western slopes of the Cascade Mountains and the Pacific Ocean. They ranged as far north as Puget Sound and southward to the Umpqua River Basin. Habitat modification (farming, logging and commercial and residential development) and over hunting are thought to be the cause of the decline in white-tailed deer numbers (ODFW 2003). The few scattered populations now number 300-500 in the Lower Columbia and 5,000 in Douglas County (LCFRB 2004).

Recent reintroduction of Columbia white-tailed deer has taken place on Crims Island and Lord Island in the Columbia River. The Crims Island population has become established in the Willow Grove, Washington area. (LCFRB 2004).

Habitat: The Columbian white-tailed deer are linked closely with riparian habitats. Historically, deer were found throughout the woodlands and bottomlands of the lower Columbia, Cowlitz, Willamette, and Umpqua river basins in Oregon and Washington (LCFRB 2004). Tall shrubs and scattered spruce, alder cottonwood and willows dominated the densely forested habitats associated with white-tailed deer (ODFW 2003). Large numbers of lakes, sloughs, ponds, backwaters, overflow channels and wetlands scattered the habitat.

Columbian white-tailed deer are resident in suitable habitat and show little tendency to wander outside the home range. Preferred habitat in the lower Columbia Subbasin is limiting. Extensive losses of habitat have occurred in the lower Columbia and estuary provinces as a result of dredging, filling, diking, and channelization. The floodplain and lowlands likely were much more heavily forested and historically there were many more lakes, ponds, sloughs, overflow channels, backwaters and wetlands. Between 1850 and 1999, 20,000 acres of tidal swamps (with

woody vegetation, 10,000 acres of tidal marshes (with non woody vegetation), and 3,000 acres of tidal flats have been lost along the lower Columbia River (BPA unpub. data).

Conservation Measures: Population numbers have increased due to land acquisition, and protection and improvement of habitat. Protection under the Endangered Species Act has resulted in acquisition, protection, and improvement of habitat, which has allowed the two populations to increase in size. A Recovery Plan was developed for the two populations of Columbian white-tailed deer in 1983. Many of the tasks identified in the Recovery Plan have been implemented. In 1972, the Julia Butler Hansen Refuge for the Columbian White-tailed Deer was established in Wahkiakum County, Washington. In Douglas County, the Bureau of Land Management acquired a large parcel of habitat (the North Bank Habitat Management Area) through a land exchange specifically to benefit the Columbian white-tailed deer; this parcel alone provides over 6,000 acres of good habitat for the deer.

Fisher (*Martes pennanti*, Candidate Species)

Status: The west coast population of the fisher was accorded federal candidate status on April 8, 2004. Fishers, found only in North America, occur in the northern coniferous and the mixed forests of Canada and the northern United States. Their range extends from the mountainous areas in the southern Yukon and Labrador Provinces southward to central California and Wyoming, the Great Lakes and Appalachian regions, and New England.

In Oregon, fishers occurred historically throughout the Coastal and Cascade mountains. Currently, the range of the fisher is severely reduced. Despite extensive surveys conducted in forested regions of Oregon, records dating from 1954 to 2001 show that the remaining populations of fishers are restricted to two separate and genetically isolated populations in southwestern Oregon; one in the northern Siskiyou Mountains and one in the southern Cascade Range. The population in the southern Cascades descended from reintroduced fishers that were translocated to Oregon from British Columbia and Minnesota.

The west coast population of the fisher is endangered mainly due to the loss and fragmentation of habitat due to timber harvest, roads, urban development, recreation, and wildfires. Other threats include small population sizes and isolation, predation, and human-caused mortality from vehicle collisions, poaching, and incidental capture and injury.

Habitat: Fishers select forests with high canopy closure, large trees, and a high percentage of conifers. The physical structure of this type of forest provides the fisher with reduced vulnerability to predation and an abundance of prey. The distribution of the fisher is likely limited by elevation and snow depth.

Conservation Measures: In December 2000, the Fish and Wildlife Service (Service) received a petition to list the west coast population of the fisher as an endangered species in Washington, Oregon, and California. The Service concluded that the west coast fisher population was a distinct population segment and was warranted for listing, but precluded by other higher priority listing action, and subsequently placed the species on the federal list of candidates. Now the Service will begin conducting an annual review of the species status and may propose to list the species at a later date. The Service encourages state and federal agencies proposing activities

within the historic range of the fisher to give consideration to the fisher during the environmental planning process, especially activities which alter or destroy mature and old growth forests.

Bald Eagle (*Haliaeetus leucocephalus*, Threatened Species – Delisting Proposed)

Status: Bald Eagles were listed as endangered in the conterminous United States under the ESA on March 6, 1967 (32 FR 4001). The population in the Pacific Northwest was later down listed on February 14, 1978 to threatened. Eagles in the remaining states were subsequently down listed to threatened on July 12, 1995 (60 FR 36000). Bald eagle populations have rebounded considerably within the last few years, with nearly all recovery goals met for Oregon, Washington, and other regions of the country. On July 6, 1999 the USFWS proposed delisting bald eagles from the ESA. Bald eagles and golden eagles are, and will continue to, be protected under the Bald Eagle and Golden Eagle Protection Act of 1940 (as amended) and the Migratory Bird Treaty.

The northern bald eagle is closely associated with freshwater, estuarine, and marine ecosystems that provide abundant prey and suitable habitat for nesting and communal roosting (Watson et al. 1991). Breeding territories are typically located within one mile of permanent water in predominantly coniferous, uneven-aged stands with old-growth structural components (Anthony et al. 1982, Stalmaster 1987, Anthony and Isaac 1989). Bald eagles winter along ice-free lakes, streams, and rivers where food and perch sites are abundant and the level of human disturbance is low (USFS 1977, Steenhof 1978, Stalmaster 1980). Communal night roosts are used by bald eagles primarily during the winter months. In the Pacific Northwest, communal roosts generally occur in multi-layered mature or old-growth conifer stands that provide protection from weather and human disturbance (Stalmaster and Newman 1978).

Home range size varies greatly according to food abundance and the availability of suitable nest and perch trees (Stalmaster 1987). Favored nest trees are usually the largest tree or snag in a stand that provides an unobstructed view of the surrounding area and a clear flight to and from the nest (Stalmaster 1987). Nests are usually built on limbs just below the crown, with the canopy above providing cover (USFS 1977). Nesting behaviors typically begin in January, followed by egg laying and incubation in February and March (Isaac et al. 2001). Young are reared throughout April, May, and June. Fledging occurs in July and August. Bald eagles are primarily predators but also opportunistic scavengers that feed on a variety of prey including salmon, other fish, small mammals, waterfowl, seabirds, and carrion (Snow 1981). Bald eagles usually forage in large open areas with a wide visual field and suitable perch trees near the food source (USFS 1985).

The bald eagle occurs throughout the United States and Canada. It winters primarily along rivers south of the Canadian border. The historic decline of the bald eagle has been attributed to the loss of feeding and nesting habitat, organochloride pesticide residues, shooting, poisoning, and electrocution (Snow 1981, USFS 1985). Human interference has been shown to adversely affect the distribution and behavior of wintering bald eagles (Stalmaster and Newman 1978).

Critical Habitat: Critical habitat for bald eagles has not been formally designated by USFWS.

Northern Spotted Owl (*Strix occidentalis caurina*, Threatened Species)

Status: The northern spotted owl was listed as a threatened species throughout its entire range in June 1990 (55 FR 26114). It ranges from southern British Columbia south to Marion County, California and east to the shrub steppe of the Great Basin in Oregon and California. In the Western Cascades, the northern spotted owl can be found from approximately sea level to 4,000 feet in elevation (USFWS 1992). Most observations of spotted owl habitat use have been made in forests with a component of old-growth and mature forests consisting of western hemlock, Douglas-fir and western red cedar. However, the northern spotted owl has been observed to use a wide variety of habitat types and forest stand conditions, including managed stands, for nesting, feeding or roosting (USFWS 1992). In general, northern spotted owls preferentially use forests with greater complexity and structure. In the Western cascades, the home range of northern spotted owl pairs ranges in size from approximately 1,450 acres to 9,750 acres with a median home range size of 2,950 acres (USFWS 1992). Spotted owls do not build their own nests. They depend on suitable naturally occurring nest sites such as broken-top trees and cavities in older-age forests, abandoned raptor nests, squirrels nests and debris accumulations. Most northern spotted owl nest sites observed on public lands have been located in old-growth or mature forests (USFWS 1992). However, spotted owls are known to nest in managed stands, especially if residual old-growth characteristics are present. Owlets remain in the nest for three to five weeks and generally leave the nest before they can fly. They usually remain near the nest in nearby branches or on the ground where they are fed and tendered by both adults before dispersing in early fall (late September to early October) (USFWS 1992). Roosting habitat is typically areas of relatively dense vegetation (high canopy closure dominated by large-diameter trees). Spotted owls respond to variations in temperature and move within the canopy to find favorable microclimate conditions which are facilitated by multistoried stand structure of roost sites (USFWS 1992). Spotted owl foraging habitat is more varied but is generally characterized by high canopy closure and complex structure. Spotted owls are primarily nocturnal and eat small mammals, birds and insects. Both the woodrat (*Neotoma fuscipes* and *N. cinerea*) and the northern flying squirrel (*Glaucomys sabrinus*) compose the majority of the prey base of the spotted owl (USFWS 1992).

Habitat: Critical habitat is designated for the northern spotted owl solely on 6.9 million acres of federal lands (57 FR 1796). Areas managed by the U.S. Forest Service (USFS) in upper Eagle Creek watershed are part of the critical habitat designation for northern spotted owl. Northern spotted owls live in forests characterized by dense canopy closure of mature and old-growth trees, abundant logs, standing snags, and live trees with broken tops. Although they are known to nest, roost, and feed in a wide variety of habitat types, these owls prefer older forest stands with variety: multi-layered canopies of several tree species of varying size and age, both standing and fallen dead trees, and open space among the lower branches to allow flight under the canopy. Typically, forests do not attain these characteristics until they are at least 150 to 200 years old.

Conservation measures: The listing of the northern spotted owl as threatened and the designation of critical habitat are helping to reduce habitat loss on federal lands. Although the need for timber necessitates continued harvesting, new forest management practices now stress restricted harvesting in old-growth forests and suggest alternate areas for harvest which are less preferred by spotted owls. Careful planning of timber sales and wise use of forest resources is necessary to halt the decline of the northern spotted owl and other old growth-associated species. The Northwest Forest Plan, created in 1994, creates a system of late-successional reserves (LSR)

across the range of the species that are designed to provide suitable nesting habitat over the long term. The federal forest lands outside these reserves are managed to allow dispersal between the LSRs through riparian reserves and other land allocations.

Marbled Murrelet (*Brachyramphus marmoratus,* Threatened Species)

Status: The North American subspecies of marbled murrelet ranges from the Aleutian Islands and Southern Alaska south to central California, the largest portion of the population occurs in Alaska and British Columbia. Due to loss of older forests used for nesting sites, the species is declining. Current estimates indicate that the population has declined by 50% to 82%. Along the Oregon coast, recent surveys have shown a decline in murrelet numbers during the 1990's. Loss of viable nesting habitat is thought to be a primary factor responsible for an estimated annual 4% to 7% decline in marbled murrelet populations in Washington, Oregon, and California. It is unlikely that population numbers will increase rapidly due to the naturally low reproductive rate and the continued loss of nesting habitat. These factors also indicate that the recovery of the species is likely to take decades.

Habitat: The marbled murrelet is a small robin-sized diving seabird that feeds primarily of fish and invertebrates in near-shore marine waters. It spends the majority of its time on the ocean roosting and feeding, but comes inland up to 80 kilometers (50 miles) to nest in forest stands with old growth forest characteristics. These dense shady forests are generally characterized by large trees with large branches or deformities for use as nest platforms. The listed population nests in stands varying in size from several acres to thousands of acres. However, larger, unfragmented stands of old growth appear to be the highest quality habitat for marbled murrelet nesting. Nesting stands are dominated by Douglas fir in Oregon and Washington and by old growth redwoods in California.

Conservation measures: Although most murrelet nesting habitat on private lands has been decimated by logging, suitable habitat remains on Federal and State owned lands. Areas of critical habitat have been designated within the three-state area to protect habitat and promote the recovery of the species. Over the next 50 to 100 years, the protected areas on Federal lands should provide for an increase in suitable nesting habitat. Although timber continues to be harvested, timber sale programs on Federal lands require consultation with the U.S. Fish and Wildlife Service to review and assess the potential impacts of the timber harvests on the marbled murrelet. In 1997, the Fish and Wildlife Service approved a recovery plan for the marbled murrelet that specified actions necessary to halt the decline of the species in the three-state area.

Western Snowy Plover (*Charadrius alexandrinus nivosus*, Threatened Species)

The western snowy plover is a small shorebird distinguished from other plovers by its small size, pal brown upper parts, dark patches on either side of the upper breast, and dark gray to blackish legs. Snowy plovers weigh between 1.2 and 2 ounces and are about 5.9 to 6 inches long. The western snowy plover is listed as threatened. Critical habitat has been designated at 28 areas along the coasts of California, Oregon and Washington. A recovery plan is being prepared.

Status: The Pacific coast population of the western snowy plover is defined as those individuals that nest beside or near tidal waters, and includes all nesting colonies on the mainland coasts, peninsulas, offshore islands, adjacent bays and estuaries form southern Washington to southern

Baja California, Mexico. Historic records indicate that western snowy plovers nested at 29 locations on the Oregon coast. Currently, only nine locations in Oregon support nesting western snowy plovers, a 69 percent reduction in active breeding locations. As early as the 1970's, observers suspected a decline in plover numbers. The primary cause of decline is loss and degradation of habitat. The introduced European beachgrass (*Ammophila arenaria*) contributes to habitat loss by reducing the amount of open, sandy habitat and contributing to steepened beaches and increased habitat for predators. Urban development has reduced the available habitat for western snowy plovers while increasing the intensity of human use, resulting in increased disturbance to nesting plovers.

Habitat: The Pacific coast population of western snowy plovers breeds on coastal beaches from southern Washington to southern Baja California, Mexico. Plovers lay their eggs in shallow depressions in sandy or salty areas that generally do not have much vegetation. Because the sites they choose are in loose sand or soil, nesting habitat is constantly changing under the influence of wind, waves, storms and encroaching plants.

Conservation measures: In the nine areas of the Oregon coast that are currently used for nesting by the snowy plover, seasonal restrictions on beach use are implemented in an effort to reduce disturbance to breeding plovers. Activities that may adversely affect plovers include sand deposition, spreading or leveling; beach cleaning; construction of breakwaters and jetties; dune stabilization/restoration using native and nonnative vegetation or fencing; driving of off-road vehicles in nesting areas or at night. Recreational activities near western snowy plover nests, such as picnicking or dog walking, may also result in abandonment of the nest by adult plovers. Trash or food left on the beach may attract predators.

Brown Pelican (*Pelecanus occidenta,* Endangered species)

Status: There are two geographically and genetically distinct regional populations or subspecies of brown pelican that occur in North America. They are the California brown pelican (*P. o. californicus*), ranging from California to Chile, and the eastern brown pelican (*P. o. carolinensis*), which occurs along the Atlantic and Gulf coasts, the Caribbean, and the Central and South American coasts. Consumption of pesticide-laden fish, lack of food, and disturbances by humans were responsible for a marked decline in reproductive success, and consequently a decline in numbers of both brown pelican subspecies in the 1960s and 1970s. The eastern brown pelican remains endangered. Current information indicates that the California brown pelican has sufficiently recovered as a result of restrictions on the use of certain types of pesticides (organochlorines), and this news has prompted a proposal to delist this subspecies. A final ruling on this action is pending.

Habitat: The brown pelican is a warm weather species that thrives near coasts and on islands. The California brown pelican generally uses the rocky islands along the California coast for their group or "colonial" nest sites. These islands typically feature steep, rocky slopes and little vegetation, and they must be without terrestrial predators or human disturbances. Nearby high-quality marine habitat is also essential. Brown pelicans rely in part on the actions of marine predators such as sharks, salmon, and dolphins to force schools of fish to the surface where they can catch them. Pelicans will only breed in areas and at times with enough food to support the breeding colony. Roosting and resting or "loafing" sites where brown pelicans can dry their feathers and rest without disturbance are also important.

Conservation measures: In the early 1970s, the use of DDT was banned, and restrictions controlling the use of other pesticides were imposed in the United States. As a result, pelican reproduction improved. Sanctuaries, reserves, and natural areas have been established to protect nesting habitat and fledging areas from human disturbances and to preserve nearby marine resources. Reduction of contaminant levels, habitat protection, and conservation of food resources have led to the successful recovery of the California brown pelican population to self-sustaining levels, warranting the current proposal for delisting of this subspecies.

Oregon Silverspot Butterfly (*Speyeria zerene hippolyta*, Threatened Species)

The Oregon silverspot is a medium-sized, orange and brown butterfly with black veins and spots on the dorsal (upper) wing surface, and a yellowish sub-marginal band and bright metallic silver spots on the ventral (under-side) wing surface. This subspecies is distinguished from other subspecies of silverspot butterflies be a somewhat smaller size and darker coloration at the base of the wings. These are morphological adaptations for survival in a persistently wind and foggy environment.

Status: The historical range of this subspecies extends from the Long Beach Peninsula, Pacific County, Washington, south to Del Norte Count, California. All of these populations were restricted to the immediate coast, centered around salt-spray meadows, or within a few miles of the coastline in similar meadow-type habitat. At the time of listing the only viable population known was on the Siuslaw National Forest in Tillamook County, Oregon. Additional populations have since been discovered at Cascade Head, Bray Point and Clatsop Plains in Oregon, on the Long Beach Peninsula in Washington and in Del Norte County in California.

Habitat: The Oregon silverspot occupies three types of grassland habitat. One type consists of marine terrace and coastal headland salt-spray meadows (e.g., Cascade Head, Bray Point Rock Creek-Big Creek and portions of Del Norte sites). The second consists of stabilized dunes as found at the Long Beach Peninsula, Clatsop Plains, and the remainder of Del Norte. Both these habitats are strongly influenced by proximity to the ocean, mild temperatures, high rainfall, and persistent fog. The third habitat type consists on montane grasslands found on Mount Hebo and Fairview Mountains. Conditions at these sites include colder temperatures significant snow accumulations, less coastal fog, and no salt spray.

The most important feature of the habitat of the Oregon silverspot is the presence of the early blue violet. This plant is normally the only species on which the Oregon silverspot can successfully feed and develop as larva. This plant is apart of the salt-spray meadow vegetation and is an obligatory component of the butterfly's habitat. Other features of optimum habitat include moderate grass cover, and a mixture of herbaceous plants used for nectaring by adults. Adults generally move out of the meadows into the fringe of conifers or brush for shelter, courtship and mating.

A.3) Analyze effects.

No take of USFWS listed? species will occur or be adversely affected by operation of SAFE program hatcheries. (So why do we include this list and description of all these species???)

Bald eagles occasionally forage in the lower watershed during the winter months (USFS 1995). Adult hatchery fish in Klaskanine River at Big Creek could potentially serve as a forage base for bald eagles.

A.4) Actions taken to minimize potential effects.

No take of USFWS trust species will occur or be adversely affected by operation of SAFE program hatcheries.

A.5) References.

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