SELECT AREA FISHERY ENHANCEMENT PROJECT

FY 2007- 08 ANNUAL REPORT

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GLOSSARY OF ACRONYMS

AD	Adipose
ATPase	Adenosine Triphosphatase
BHS	Bacterial Hemorrhagic Septicemia
BKD	Bacterial Kidney Disease
BO	Biological Opinion
BPA	Bonneville Power Administration
CCF	Clatsop County Fisheries
CEDC	Clatsop Economic Development Committee
CREST	Columbia River Estuary Study Taskforce
CWT	Coded-Wire Tag
DEQ	Oregon Department of Environmental Quality
DO	Dissolved oxygen
ESA	Endangered Species Act
EMAP	Environmental Monitoring and Assessment Program
ESU	Evolutionarily Significant Unit
FIFO	Fish In Fish Out
FONSI	Finding Of No Significant Impact
FTE	Full Time Employee
HSRG	Hatchery Scientific Review Group
IEAB	Independent Economic Analysis Board
IFG	Idaho Fish and Game
IMW	Intensively Monitored Watershed
ISRP	Independent Scientific Review Panel
KK	Klaskanine Hatchery
LCR	Lower Columbia River
LHO	Low Head Oxygen
LV	Left Ventral
MERTS	Marine and Environmental Research and Training Station
NEV	Net Economic Value
NF	North Fork
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPCC	Northwest Power and Conservation Council
NPDES	National Pollutant Discharge Elimination Systems
NRCS	Natural Resource Conservation Service
NSD	No Survey Done
OASIS	Oregon Adult Salmonid Inventory and Sampling
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
OFWC	Oregon Fish and Wildlife Commission
OSU	Oregon State University
PPM	Parts per million
PIT	Passive Integrated Transponder
PSMFC	Pacific States Marine Fisheries Commission
R&E	Restoration and Enhancement
RMPC	Regional Mark Processing Center
SAB	Select Area Bright fall Chinook
SAFE	Select Area Fisheries Enhancement
SARs	Smolt-to-Adult Survival Rates
SF	South Fork
STEP	Salmon and Trout Enhancement Program
TAC	Technical Advisory Committee
TOC	Total Organic Carbon
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
VSI	Visual Stock Identification
WDFW	Washington Department of Fish and Wildlife
WFWC	Washington Fish and Wildlife Commission

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ACKNOWLEDGEMENTS

The accomplishments of this project have only been possible through the hard work and dedication of many individuals and agency representatives of local, state, and federal governments working together collaboratively.

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The use of trade names throughout this report does not imply endorsement by the SAFE project.

EXECUTIVE SUMMARY

The Select Area Fisheries project is a well-established cooperative program that strives to deliver quality commercial and recreational salmon fishing opportunities in a setting which maximizes the return of hatchery production into fisheries. Funding support of the project is shared by the Bonneville Power Administration, the State of Oregon, Mitchell Act, fisher/processor voluntary contributions, and occasionally, ODFW's Restoration and Enhancement program. The longevity of the partnership between the various entities involved in the SAFE project is a testament to the effectiveness of cost sharing and cooperation of multiple government agencies.

In 2007 the SAFE project was retitled Select Area Fisheries *Enhancement* to reflect the progression from project implementation and research toward a goal of maximizing fisheries potential. This report summarizes activities and findings of the SAFE project during fall 2006 through summer 2008, but includes some earlier information for context and to identify trends.

Key findings and results are:

- Since 1993, Select Area commercial fisheries have contributed an average of 55% of spring Chinook, 45% of coho, and 20% of fall Chinook to the total non-Treaty Columbia River commercial harvest.
- Average harvest rates of 91% for spring Chinook, 99% for coho, and 97% for SAB fall Chinook produced by the SAFE project far exceed rates for production from other regional hatcheries which typically have high escapement rates due to complexities associated with harvest in mixed-stock fisheries of the mainstem Columbia River.
- On average, 19% of spring Chinook, 58% of SAB fall Chinook, and 32% of coho production from the SAFE project is harvested in other regional recreational and commercial fisheries.
- Due to spatial separation, Select Area fisheries have far less impact on non-target stocks per harvested fish than do mixed-stock commercial and recreational fisheries occurring in the mainstem Columbia River, even when these fisheries utilize mark-selective harvest methods.
- Stock composition in Select Area winter, spring, and summer commercial fisheries averages 91% local stock. Fall fisheries average 87% local Chinook stocks and 80% local coho stocks.

Several goals and objectives of the project are being realized with continued funding support from BPA; one being to maximize Select Area production and fisheries. Approximately 2.6 million coho, 1.1 million spring Chinook, and 1.2 million fall Chinook hatchery smolts are currently reared and released from SAFE net pens and associated hatcheries annually. Commercial and recreational fisheries have expanded substantially due to improved rearing strategies, modest release increases when possible, and adaptive management of the fisheries.

The goal of minimizing impact of Select Area fisheries on ESA listed and non-local stocks is also being met through extensive sampling and active in-season management of the commercial fisheries. Fishing periods, gear restrictions, and area boundaries have been refined over time to minimize impacts to listed species.

The third goal, minimize impact of Select Area production, is being met through the development of successful net-pen rearing strategies that facilitate rapid out-migration, reduced

incidence of disease, and maintaining water quality through monitoring efforts. All associated hatcheries operate under the required permits and are monitored extensively. Additional sampling of local hatchery returns, recreational fisheries in the Select Areas, and spawning grounds in local tributaries provides additional coded-wire tag recovery data that is used to monitor survival, straying, and fishery contributions.

Recent reviews of the Select Area Fisheries project by the Independent Scientific Review Panel (ISRP), the Independent Economic Analysis Board (IEAB), the Hatchery Scientific Review Group (HSRG), and the Select Area Fishery Evaluation Project Economic Analysis Study conducted by The Research Group (TRG) have been very positive while providing guidance for the future of the project. Some key points from these reviews are:

- ISRP: The project demonstrates "high and relatively stable harvest rates with minimal impacts on non-target and listed stocks, especially those above Bonneville Dam", and it is "consistent with the NPCC Fish and Wildlife Program, as well as the Bi-State lower Columbia River and Columbia River Estuary Subbasin Plan".
- ISRP: The "fishery has been carefully monitored to assess catch and effects on non-target stocks and regulations have been adjusted when deleterious impacts have been observed or anticipated".
- IEAB: a "benefit of the project is the positive demonstration effect that terminal fisheries can provide harvest opportunities with minimum impact on protected stocks".
- IEAB: the SAFE project "allows for more harvest than would the release of equivalent numbers of smolts from upriver hatcheries".
- IEAB: "it seems likely that the cost-effectiveness analysis, comparing the costs of alternative means of achieving SAFE project objectives, would be likely to favor the current SAFE approach to catch enhancement."
- TRG: "fishing on the SAFE hatchery-origin stocks allows significantly higher harvest rates, since adult returns not needed for broodstock can be 100% harvested."
- TRG: "the value of the hatchery fish caught in Select Area sites is higher because of better fish condition and ready markets compared to public hatchery surpluses."
- TRG: "If there must be augmentation hatchery production, then Study results suggest the SAFE process is a cost-effective method for allowing greater fishery access to the production."
- HSRG: "selective commercial harvest is necessary to ensure more effective removal of hatchery-origin fish".
- HSRG: "while outplanting and net-pen releases can pose significant genetic and ecological risks to naturally spawning populations, many of these programs support important tribal, commercial and/or recreational fisheries."

1. INTRODUCTION

BACKGROUND

In April 2006, the Final Project Completion Report was submitted for the Select Area Fishery Evaluation Project (North et al. 2006). That report covered the period from October 1993 through October 2005 and identified general requirements for developing sites (e.g. construction of acclimation/release facilities for hatchery smolts so that adult salmon would return to the area for harvest), the potential number of harvesters that might be accommodated, type of gear to be used, and other relevant information needed to determine the feasibility and magnitude of the program as recommended in the Northwest Power Planning Council's (currently Northwest Power and Conservation Council, NPCC) 1993 Strategy for Salmon which called on the Bonneville Power Administration (BPA) to "fund a study to evaluate potential terminal fishery sites and opportunities". An annual report covering October 2005 through September 2006 was submitted as a continuation of the SAFE Evaluation project (Whisler et al. 2006). In the FY 2007-09 funding proposal a shift in focus was proposed to move the project from a research/feasibility study to one of production and fisheries management. This new focus was approved for funding and, to acknowledge the shift, the project name was modified to Select Area Fisheries *Enhancement*. This report, covering the period of October 2006 through September 2008, will highlight that progression and how it will direct the future of this program. The sponsors are Clatsop County Fisheries (CCF, formerly CEDC Fisheries, http://www.co.clatsop.or.us/index.asp), the Oregon Department of Fish and Wildlife (ODFW), and the Washington Department of Fish and Wildlife (WDFW).

HISTORY

Terminal fisheries in the Columbia River estuary are characterized by a history of innovation and cooperation between government agencies and the fishing industry. Commercial salmon fishing on Youngs Bay existed from the early 1900s until 1931. When the salmon fishing closed, the only commercial fishery remaining in the bay was for American shad (*Alosa sapidissima)*. ODFW's Klaskanine Hatchery, in operation since 1911, was remodeled and expanded to its present size in 1952-53. Improved production techniques resulted in much higher returns to the hatchery, prompting ODFW to research a terminal commercial fishery. Youngs Bay was reopened to commercial salmon fishing in 1962 to maximize the harvest of coho salmon destined for Klaskanine Hatchery (Weiss 1966). By the early 1970s, production at the hatchery was at capacity. In 1975 the citizens of Clatsop County formed the Clatsop Economic Development Committee (CEDC) in an effort to improve the depressed local economy. The fisheries enhancement subcommittee of CEDC, acknowledging that the salmon segment of the fishing industry was seriously depressed, entered into a partnership with ODFW for the purpose of increasing hatchery salmon production in Youngs Bay through the development of new rearing sites. With ODFW support, CEDC offered to take surplus eggs from other hatcheries to hatch and rear as a way to supplement releases from the Klaskanine Hatchery. A search by CEDC for funds to implement their own salmon rearing program resulted in a Governor's Grant in 1977. With the receipt of this grant, CEDC was able to join efforts to help at the Klaskanine Hatchery and construct rearing ponds to further increase production of hatchery salmon for Youngs Bay.

Thirty-one years later, the partnership between Clatsop County and ODFW continues to benefit the salmon fishery and its significance to the regional economy. The Clatsop County Fisheries program has been receiving biennial appropriations from ODFW since 1978 to operate salmon

propagation facilities in the Youngs Bay watershed. The first earthen rearing pond was a 1.5-acre lake on Tucker Creek drainage donated by the family of the late Ted Vanderveldt for rearing salmon. A prefabricated overflow-drain system was built and contributed by Bumble Bee Seafoods, with many other local businesses and fishermen contributing resources toward construction of the pond. The first release from that site was 50,000 coho in 1977. A second pond site (also donated by the Vanderveldt family) was identified, and the welding class at Clatsop Community College built an overflow-drain system for it. In 1979, 1.4 million tule fall Chinook were released from these two earthen ponds. Since ODFW had allocated space at other Columbia River hatcheries for incubation and early rearing of the salmon to be released in Youngs Bay or from Klaskanine Hatchery, the adult returns from these releases were not needed for egg-take, thus introducing the concept of a 100% harvest terminal fishery in Youngs Bay.

In 1980 negotiations began between Clatsop County and Crown Zellerbach (a private timber company) to lease a third rearing site on the South Fork Klaskanine River. The earthen pond, intake, and dam structure were built with funding from Pacific Northwest Regional Commission (PNRC), donated labor from the Job Corps Center (currently Tongue Point Job Corps), and heavy equipment time donated by Crown Zellerbach. Many local businesses and individuals also contributed toward the completion of this facility. The first release of 1,800,900 tule fall Chinook occurred from the South Fork site in 1981.

In 1983, BPA agreed to fund the five-year Evaluation of a Low-Cost Salmon Production Facility project. By 1987, CEDC's rearing sites were at capacity and the project began investigating ways to expand rearing, augment production, improve local imprinting, and enhance adult returns to Youngs Bay. In 1987, the first net pens were purchased for placement in Youngs Bay and releases of 1,293,000 tule fall Chinook occurred from the pens that year. The first coho releases from the pens were scheduled for 1989. By 1992, the success of the net-pen returns prompted a proposal for funding the Youngs Bay Terminal Fishery program that resulted in an agreement between BPA and ODFW which included a sub-contract with CEDC Fisheries. Funding increased substantially that year, allowing for further research into the net-pen concept and doubling the net-pen rearing capacity with the purchase of more pens in Youngs Bay. That year's releases from the net pens were a combined total of 2.8 million spring Chinook, fall Chinook, and coho.

In 1993, BPA expanded its investment into and scope of the program with a long-term contract to ODFW and Clatsop County (CEDC Fisheries). With this newly formed Columbia River Terminal Fisheries Research project WDFW came aboard as a project cooperator. Over the next several years, eight potential sites were identified, surveyed, and classified with respect to rearing potential, access, capacity for fishers, and potential for impacts on stocks listed under the Endangered Species Act (ESA). As a result of the findings, four locations were selected in Oregon and three in Washington as viable Select Area production/fishery sites. Limited by available funds, Tongue Point and Blind Slough in Oregon, and Deep River and Steamboat Slough in Washington were the final choices; additionally, the established Youngs Bay site was expanded. Experimental releases of 1993 brood coho were conducted to determine each site's capability to successfully acclimate and imprint smolts. In 1995 and again in 1998, BPA issued a Finding of No Significant Impact (FONSI) for the project and in 2002, in consultation with the National Oceanic and Atmospheric Administration (NOAA), it was determined these FONSIs would remain valid as long as project activities remain unchanged. In 1998 the project was renamed the Select Area Fishery Evaluation (SAFE) project and maintained that title through 2006. The first coho releases from the new Select Area sites occurred in 1995 from Blind Slough, Tongue Point, and Deep River, with the first subsequent fall commercial fisheries at those sites in 1996. Coho releases and the initial fall commercial fishery at the Steamboat

Slough site occurred in 1999 and 2000, respectively. Spring Chinook releases from the SAFE sites also began in 1995, with the first commercial spring Chinook seasons occurring in 1998. Research to reduce interactions between naturally-produced chum and SAFE spring Chinook production resulted in towing the fish from the Deep River site for release in the Columbia River in 2003. To improve survival of Oregon spring Chinook, research into an oxygen supplementation system was initiated at Gnat Creek Hatchery in 2005. 2006 saw the transfer of the Select Area Bright (SAB) fall Chinook program from ODFW's Klaskanine Hatchery to CCF. In 2007, the focus of the project evolved from research and evaluation, having determined successful sites and rearing strategies, into a third phase intended to make best use of production and fisheries, and was therefore renamed Select Area Fisheries Enhancement (still utilizing the acronym SAFE) for the FY 2007-09 funding proposal to BPA. This proposal included efficiency measures implemented in 2008 that resulted in production increases with the resumption of coho production at ODFW's Klaskanine Hatchery (Figure 1.1).

Since the expansion of the project in the early 1990s to include additional stocks, areas, and fishing seasons, harvest in the Select Areas has increased. Although interannual variation is the norm in fisheries, the trend in harvest of each of the three stocks individually has been positive, starting with the seasons which harvested adults returning from the 1995 releases to the present. As fish production programs have stabilized and grown, the fisheries have as well. The Select Area fisheries have developed into a relatively stable and dependable source of income for the commercial industry and a reliable source of hatchery fish to enhance recreational fisheries. To illustrate the commercial industry's dependence on the fisheries in the Select Areas, refer to Figures 3.4 – 3.6 in Chapter 3 Harvest: Fisheries and Seasons. Between the years 1995 – 2001, Select Area spring Chinook harvest was the majority component of all non-Treaty catch; in five of those years it made up more than 90% of the total. The coho fishery showed a similar reliance on Select Area fisheries during the restricted mainstem fisheries in the mid-1990s. From 1994 – 1998 Select Area landings made up the majority of the coho harvest, at or above 80% of total harvest in those years. Mainstem Columbia River fall Chinook fisheries are usually much larger than fall Chinook catch in the Select Areas but in 1995 the majority of non-Treaty landings did come from Youngs Bay. These situations highlight the importance of the Select Area fisheries project; at times when mainstem fisheries are curtailed out of concern for at-risk stocks, the Select Areas still provide significant harvest opportunity with minimal impacts to non-local stocks.

1911	ODFW's Klaskanine Hatchery (KK) opens
1931	Commercial fishing for salmon in Youngs Bay closes
1952-53	Klaskanine Hatchery remodel and expansion to current size, innovations in fish culture result in increased returns
1962	Youngs Bay reopened for commercial harvest of coho destined for Klaskanine Hatchery
1975	Formation of Clatsop Economic Development Council (CEDC)
1976	ODFW provides funding for rearing of 4 million tule fall Chinook at KK
1977	KK releases 1 million chum, 1 million coho, 7 million tule fall Chinook
1978	ODFW begins biennial appropriations to CEDC to operate salmon propagation facilities in Youngs Bay area, these have continued to present day First coho releases from Vandervelt ponds
1979	1.4 million tule fall Chinook release from CEDC's Vanderveldt ponds
1980	Construction of rearing pond at CEDC's SF Klaskanine site (SF)
1981	1.8 million release of tule fall Chinook from SF site
1983	Introduction of SAB fall Chinook releases from SF site and broodstock maintenance at ODFW's Big Creek Hatchery (BC)
1983-88	BPA awards 5-year agreement for Evaluation of Low-Cost Salmon Production Facility
1986-87	First net-pen releases of tule fall Chinook at Youngs Bay Rearing sites at capacity, first net pens purchased with BPA funds
1989	First spring Chinook releases from SF, Youngs Bay pens; first coho release from YB net pens
1992	Proposal to BPA for funding Youngs Bay Terminal Fishery program
1993	BPA awards 10-year contract for Columbia River Terminal Fisheries Research to ODFW, WDFW, CEDC as co-sponsors, eight possible sites identified
1994-96	Select Area site evaluation occurs, resulting in the establishment of production and fishing sites at Blind Slough and Tongue Point in Oregon, and Deep River and Steamboat Slough in Washington
1995	First coho releases from Deep River in Washington and Blind Slough and Tongue Point in Oregon
1996	First fall commercial fisheries in Blind Slough, Tongue Point, Deep River
1998	BPA-funded project renamed Select Area Fishery Evaluation (SAFE) First spring Chinook commercial fishery in Blind Slough and Tongue Point
1999	First coho releases from Steamboat Slough
2000	First fall commercial fishery in Steamboat Slough
2003	Record coho harvest in Select Area commercial fisheries Towing of spring Chinook in Deep River net pens initiated
2005	Oxygen supplementation trials at Gnat Creek using 2003 brood spring Chinook
2006	SAB fall Chinook broodstock program transfers to CCF Steamboat Slough site discontinued and pens moved to Deep River
2007	SAFE evolves from Select Area Fisheries *Evaluation* to Select Area Fisheries *Enhancement*. FY 2007-2009 BPA funding proposal reflecting new goals and objectives is approved
2008	Efficiency measures result in reduction of project manager time funded by BPA, re-alignment of fish production duties between CCF, Gnat Creek, and Klaskanine hatcheries, and resumption of coho production at KK Record harvests for summer season Chinook, total SAB, and Deep River coho Oxygen supplementation system fully installed at Gnat Creek Hatchery; funding provided by ODFW's R&E program

Figure 1.1. Select Area Fisheries history timeline.

FISHING SITES AND FACILITIES

The four current SAFE net-pen rearing and fishing sites are located in the lower Columbia River (LCR) between river miles 10 and 28 (Figure 1.2). Each site provides commercial and recreational fishing opportunities, although season structure and target species differ depending on current production goals and management objectives.

Hatcheries providing production for these sites are South Fork Klaskanine (CCF); Big Creek, Cascade, Gnat Creek, Klaskanine, Oxbow, Sandy, and Willamette (ODFW); Cowlitz, Elochoman, Grays River, and Lewis River (WDFW), and Eagle Creek National Fish Hatchery (United States Fish and Wildlife Service (USFWS)). The SAFE project fully funds Gnat Creek, Grays River, and Klaskanine hatcheries; other hatcheries are funded by a blend of state, Mitchell Act (NOAA), and other funds.

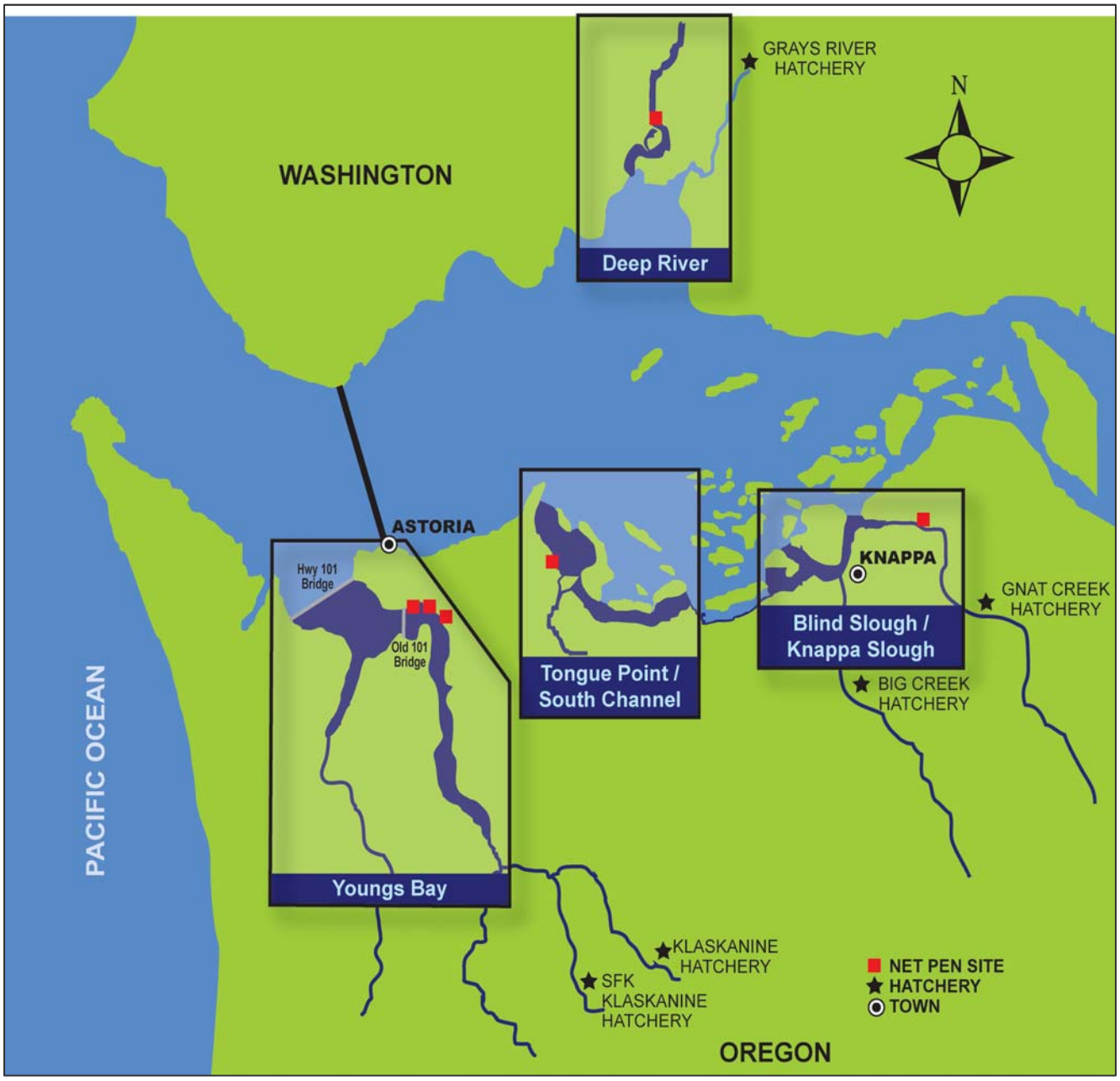


Figure 1.2. Select Area fishing locations and production facilities in the lower Columbia River.

GOALS AND OBJECTIVES

As stated in the FY 2007-09 funding proposal request for the SAFE project, and consistent with the Bi-State lower Columbia River and Columbia River Estuary Subbasin Plan, Strategy 15, the biological objectives and goals are threefold.

- Maximize Select Area production and fisheries. This will be achieved through implementing full-scale hatchery and net-pen releases in Select Areas so the commercial and recreational harvest opportunities can be maximized. This includes a goal for stable and reliable fisheries.
- Minimize impact of Select Area fisheries on ESA listed and non-local stocks. The goal continues to be provision of year-round recreational fisheries and commercial harvest opportunity in winter, spring, summer, and fall seasons. By sampling the fisheries to document impact rates and incorporating gear, area, and time restrictions as needed, harvest opportunity is maximized and impacts to listed Evolutionarily Significant Units (ESUs) are minimized.
- Minimize impact of Select Area production. The Select Area hatchery and net-pen production will be managed to minimize effects on the environment and other local juvenile salmon. Net-pen rearing strategies are implemented to keep the impact to a minimum, such as releasing full-term smolts during maximum tidal influence to facilitate rapid out-migration, vaccinating smolts to decrease incidence of potential disease transfer, and maintaining water quality sampling to verify no negative environmental impact. Local stream surveys will continue with basin-wide coded-wire tag (CWT) analyses to document straying of returning adults.

Evaluation criteria that will be used to measure progress toward project objectives include:

1. Progress toward project release goals (not necessarily hard numbers but general strategies for what is appropriate at each site)
2. Progress toward increasing harvest in Select Area fisheries
3. Progress toward improving smolt-to-adult survival rates (SARs)
4. Maintain low impact rates on adult ESA-listed salmonids from incidental harvest in Select Area fisheries
5. Minimize straying of adult fish produced by the SAFE Project
6. Monitor the contribution of Select Area commercial harvest to total non-Indian commercial harvest in the Columbia River Basin
7. Minimize the potential for competitive interaction of SAFE juveniles with wild salmonids migrating through the Columbia River Estuary
8. Minimize negative effects of Select Area production on the environment

Short-term plans include improving the value of Select Area fisheries by maximizing the value of the fish harvested and increasing production. Maximizing value of harvested adults includes releasing fish with a high market value, stabilizing harvest opportunities, and expanding time and area of fisheries in a prudent manner. Other methods of increasing the value of fish caught in Select Area commercial fisheries are generally outside the scope of this project and therefore require that the commercial fishing industry implement those changes (e.g. value-added marketing) but the project can work with industry to ensure decisions do not hinder their ability to pursue these avenues.

Increasing production can be accomplished by either increasing smolt releases or by improving SARs. In the short-term, the SAFE project intends to focus on increasing SARs. Modest

increases in juvenile production may be possible through cost efficiencies; however, these opportunities will likely be limited for the foreseeable future. Recently, policy changes have recommended the reprogramming of hatchery production from other areas of the Columbia River basin to the Select Area facilities. The SAFE project is receptive to these changes as another way to increase production and enhance fisheries. Production-related goals for this reporting period were to implement an oxygen supplementation system at Gnat Creek Hatchery to improve capacity and quality of our spring Chinook, to initiate production of coho at Klaskanine Hatchery to replace lost production from Eagle Creek National Fish Hatchery, and to successfully transfer the SAB program from Klaskanine Hatchery to CCF's SF Klaskanine facility.

INDEPENDENT REVIEWS OF THE SELECT AREA FISHERIES PROJECT

Independent Scientific Review Panel (ISRP) and the Independent Economic Analysis Board (IEAB)

As part of the NPCC's lower Columbia River and Estuary provincial funding review process in 2005, the ISRP and the IEAB issued a review of the draft SAFE Final Completion Report - October 1993 to October 2003. Funding was conditional on SAFE completing submission of information to the ISRP and IEAB to address biological and economic issues raised in the review, and on a favorable economic review of that information by the IEAB within one year (ISRP & IEAB 2005). The SAFE response to the biological issues was submitted with the FY 2007-09 funding proposal document to BPA in 2006 and to address the economic issue SAFE contracted two economists, Hans Radtke and Shannon Davis of The Research Group (TRG), to conduct a thorough economic analysis of the SAFE project. The study was completed in November 2006 and submitted to the IEAB for review (Radtke et al. 2006).

In April of 2007, a joint review was conducted of the revised SAFE Final Completion Report - October 1993 to October 2005 and the Economic Analysis Study - November 2006, by the ISRP and the IEAB. The ISRP recommended funding the project and found that the SAFE project provides "high and relatively stable harvest rates with minimal impacts on non-target and listed stocks, especially those above Bonneville Dam", and that it is "consistent with the NPCC Fish and Wildlife Program, as well as the Bi-State lower Columbia River and Columbia River Estuary Subbasin Plan" (ISRP & IEAB 2007). The review also found that the "fishery has been carefully monitored to assess catch and effects on non-target stocks and regulations have been adjusted when deleterious impacts have been observed or anticipated" (ISRP & IEAB 2007). Some concerns about the project and the report remained and the ISRP made recommendations which addressed expanding production, estimating stray rates, fish marking options, and contributing to furthering the understanding of effects of ocean conditions on salmon.

The IEAB concluded that the economic analysis was generally responsive to the economic issues raised in the 2005 review, while maintaining that the report by TRG presented some problems with regard to documentation, detail, and clarity of analysis that made it difficult to review. Ultimately, the IEAB did conclude that the conditions had been met and recommended funding of the project. The two general questions addressed by the analysis were whether changes to the SAFE project would generate net economic benefits and whether the SAFE project is a cost-effective approach to a mitigation fishery in the lower Columbia River.

Addressing the first question, the IEAB's conclusions were:

- The SAFE project generates economic benefits by providing relatively inexpensive fish for harvest, but the analysis does not provide all the information needed to determine if the SAFE investment provides a net economic benefit.
- Total project costs appear to exceed benefits with or without BPA funding, resulting in a negative net economic value (NEV) for the project overall.
- The Economic Study estimates that a loss of BPA funding would cause a net economic loss by reducing SAFE project NEV to levels below current levels.
- The estimate of economic impacts is based on assumed constant SARs, but SARs vary from year to year. Therefore, actual annual project benefits could be less or greater than those reported.
- The net benefit of expanding SAFE project recreational and commercial fisheries beyond present levels is not estimated.
- An additional benefit of the SAFE project is the positive demonstration effect that terminal fisheries can provide harvest opportunities with minimum impact on protected stocks.

On the second question the IEAB concluded that:

- The SAFE project allows for more harvest than would the release of equivalent numbers of smolts from upriver hatcheries.
- The increase in catch through the SAFE project could be achieved through expansion of upriver hatchery releases, but that would cost more per fish caught and would increase the risk of incidental catch of ESA protected species.
- The assessment of SAFE project cost-effectiveness is impeded by the current absence of alternative means to enhance catch without increasing risk to ESA protected stocks.
- The impacts of SAFE on catch of ESA stocks are not quantified. Consequently the analysis could not provide a complete cost-effectiveness analysis.
- It seems likely that the cost-effectiveness analysis, comparing the costs of alternative means of achieving SAFE project objectives, would be likely to favor the current SAFE approach to catch enhancement.
- The question of the cost-effective level for the SAFE mitigation fishery is not assessed.

Select Area Fishery Evaluation Project Economic Analysis Study by The Research Group

The Research Group was contracted to provide an economic review of the current and proposed changes to the SAFE project response to the 2005 review by the ISRP and IEAB that requested information addressing SAFE economic issues (see above). The Research Group's analysis was completed in November 2006; primary authors of the report were Hans Radtke, Shannon Davis, and Christopher Carter. The following excerpt from Radke et al. 2006 summarizes the conclusions of their study.

> The report discussed economic analysis results in terms of cost-effectiveness because business feasibility ratios are not always applicable when applied to public investments. For example, government intervention was necessary to build the Columbia River Basin hydropower system that led to development of habitat and fish mitigation programs. This federal intervention is a transfer of wealth through subsidies to the private sector accomplished in ways that complicate accounting of benefits and costs. The result for the narrow case of reviewing the SAFE is that a $2.4 million project helps inject $12.0 million personal income into local area households. It depends on perspective for whether the project is judged economically feasible. For harvesters that pay 10 percent of their ex-vessel value for the privilege

of harvesting SAFE production, the five-year average annual return has been about $680 thousand harvest revenue. From the perspective of the electric rate-payer, it is costing them $1.6 million out of a $2.4 million project to provide the $680 thousand harvest revenue. The harvesters' perspective is that dams were built for society and society needs to mitigate for their adverse effects. Society's perspectives are not so clearly defined, but there are many studies that show continued support for salmon recovery. How much of the recovery benefits should accrue to commercial or other user groups is a matter of policy concern.

The SAFE appears to be a winning solution to several problems. The SAFE system adult salmon return rates are at least similar and sometimes higher due to lower estuary predation and other factors affecting out-going smolt migration mortality. Adult returns to the off-channel net-pen locations means commercial and recreational fishing at the release sites will have lower harvest impacts on upriver destined depressed stocks than when fishing at mainstem locations. Fishing on these hatchery origin stocks allows significantly higher harvest rates, since adult returns not needed for broodstock can be 100 percent harvested rather than subject to harvest curtailments due to impacts on depressed stocks in mainstem fishing locations. The higher harvest rates on the returning adults also solves some problems that accompany the usual practice of releasing smolts at upriver hatchery location sites. Too many hatchery-produced fish return to these release sites and surpluses (those in excess of what is needed for future generation broods) must be handled and disposed. The value of the hatchery fish caught at the net-pen sites is higher because of better fish condition and ready markets compared to public hatchery surpluses. Moreover, a higher value accrues to the fishing industry rather than a lower value to the hatchery sponsors. If there must be augmentation hatchery production, then Study results suggest the SAFE process is a cost-effective method for allowing greater fishery access to the production.

Hatchery Scientific Review Group

The Hatchery Scientific Review Group (HSRG) was created and funded by the US Congress in 2000 as part of the Puget Sound and Coastal Washington Hatchery Reform Project. The HSRG was tasked with reviewing all hatchery programs in the Puget Sound and Coastal Washington. The intent of the reform project was to “conserve indigenous salmonid genetic resources, assist with the recovery of naturally spawning salmonid populations, provide sustainable fisheries, and improve the quality and cost-effectiveness of hatchery programs” (HSRG 2009).

In 2005, Congress directed the National Oceanic and Atmospheric Administration (NOAA) Fisheries to replicate the Puget Sound and Coastal Washington Hatchery Reform Project in the Columbia River Basin. The HSRG’s objective was to change the focus of the Columbia River hatchery system from one aimed at supplying fish for harvest as mitigation for hydropower development to an ecosystem-based approach based on the idea that harvest goals are sustainable only if they are compatible with conservation goals. “The challenge before the HSRG was to determine whether or not conservation *and* harvest goals could be met by fishery managers and, if so, how. The HSRG determined that in order to address these twin goals, both hatchery and harvest reforms are necessary” (HSRG 2009).

By July 2007, the HSRG completed its review of hatchery programs in the lower Columbia River. SAFE project staff assisted the HSRG in this process through a series of meetings and field visits. In February of 2009, the HSRG completed their Columbia River Hatchery Reform System-Wide Report. As stated in this report, the HSRG reached several critical, overarching

conclusions regarding areas where current hatchery and harvest practices need to be reformed. Fisheries managers should:

- Manage hatchery broodstocks to achieve proper genetic integration with, or segregation from, natural populations;
- Promote local adaptation of natural and hatchery populations;
- Minimize adverse ecological interactions between hatchery-and natural-origin fish;
- Minimize effects of hatchery facilities on the ecosystem in which they operate; and
- Maximize the survival of hatchery fish and make the primary performance measure total adults produced per spawner rather than number of smolts released.

It is interesting to note that the last three conclusions they drew closely mirror the SAFE project's stated goals and objectives. The HSRG made seventeen specific system-wide recommendations as well as specific recommendations for each population. They were supportive of the Select Area fisheries concept as a means to utilize hatchery production in an efficient manner by concentrating adult returns in terminal areas where they can be subject to high harvest rates thereby maximizing fishery benefits and minimizing escapement to spawning areas. In fact they single out the SAFE project as a solution to their system-wide recommendation 9 (manage the harvest to achieve full use of hatchery-origin fish). They also recommend that the Select Area fisheries be an exception to their recommendation 10 (ensure all hatchery programs have self-sustaining broodstocks) since the project intent is to harvest all returning adults. In the population-specific recommendations, the HSRG concluded that all SAFE hatchery/net-pen programs should at least continue as currently operated while stating that the spring Chinook program could be increased with minimal biological risk and specifically recommending that early-stock coho production be reprogrammed from facilities upriver for release in the Select Areas.

Several white papers were prepared by the HSRG and included as an appendix to address topics relevant to hatchery reform and provide background, documentation, and explanations not included in the body of the HSRG's report. White Paper No. 1, *Selective Fishing*, authored by Stephen H. Smith uses the Select Area fisheries as an example of an effective selective commercial fishery. Later in this same document he recommends considering additional or expanded terminal fisheries to increase both harvest and conservation benefits.

Another white paper included in the appendix (White Paper No. 8, authored by Dr. Donald Campton) titled *Outplanting and Net-Pen Release of Hatchery-Origin Fish* recognizes that while "outplanting and net-pen releases can pose significant genetic and ecological risks to naturally spawning populations, many of these programs support important tribal, commercial, and/or recreational fisheries. As a result, significant tradeoffs may be needed between the fishery benefits of such programs and the risks they pose to naturally spawning populations. Comprehensive assessments of the benefits and risks of each program, on a case-by-case basis, are necessary to understand the potential tradeoffs and make informed decisions."

2. PRODUCTION

Salmonid species and stocks that are reared in the Select Areas were chosen because of their flesh quality, availability of gametes, timing of return, homing ability, and overall value to the economy. Species currently being reared and released from SAFE sites include spring Chinook (Willamette and Cowlitz/Lewis stock), fall Chinook (SAB stock), and coho (early stock). The SAB fall Chinook stock originated from Rogue River stock egg transfers in 1982 and 1983 but since then has been maintained by a local broodstock program which has progressed from Big Creek Hatchery to Klaskanine Hatchery and now to South Fork (SF) Klaskanine Hatchery (beginning with 2005 brood). Early stock coho currently released from Oregon Select Areas originate from Big Creek, Bonneville, and Sandy hatcheries, while Washington coho releases now originate from Grays River Hatchery. Annual releases of Select Area salmonids from 1993 – 2008 have ranged from 3.46 to 6.48 million fish (Figure 2.1). These releases represent <4% of total Columbia River basin hatchery releases.

HATCHERIES

The role of hatcheries within the SAFE project is two-fold: they rear fish for net-pen releases and also release fish directly into Select Area sites. The bulk of the salmon smolts produced in the SAFE net pens require initial rearing of almost a year in a hatchery setting (more than a year in the case of acclimation smolts). The SAFE project provides nearly full funding for operation of three hatcheries: Gnat Creek and Klaskanine hatcheries on the Oregon side, and Grays River Hatchery in Washington. Because of federal and state budget reductions in past years, these facilities may not be operational today if it weren't for BPA SAFE project funding. Gnat Creek Hatchery rears all of the spring Chinook fingerlings for the Oregon net pens and Klaskanine Hatchery is currently rearing and direct releasing coho. Grays River Hatchery provides both spring Chinook and coho for the Deep River net pens. ODFW's Cascade Hatchery receives some SAFE project funds to produce coho fingerlings for the Tongue Point Marine and Environmental Research and Training Station (MERTS) net pens. Several other hatcheries that provide fish for the net pens are either state or Mitchell Act-funded; ODFW's Oxbow Hatchery provides coho fingerlings for the Youngs Bay net pens, Sandy Hatchery provides acclimation coho smolts for the Blind Sough net pens, and Salmon River Hatchery and Eagle Creek NFH provide coho fingerlings for rearing at CCF's SF Klaskanine Hatchery, which also produces SAB fall Chinook for the Youngs Bay net pens.

NET PENS

A variety of fish rearing strategies are utilized in the SAFE net pens. Known numbers of fry, fingerlings, or smolts are transferred from hatcheries by truck and piped directly into the pens. The fish are then dipped into the appropriate number of pens to achieve target densities. Fish are fed recommended levels of pelletized feed throughout the rearing period and released according to schedules developed during the research phase of this project. During the time the fish are in the pens, growth is monitored bi-weekly and mortalities are removed and recorded daily. If significant loss to disease occurs, ODFW or WDFW pathology staff are usually called in to diagnose the cause and recommend treatment – typically medicated feed. In the case of large losses, mortalities are removed, counted, and disposed of in a facility dumpster. Other losses during net-pen rearing (e.g. predation or holes in nets) have been estimated according to feed conversions and feeding response, as fish are not typically inventoried at release. Several inventory methods have been discussed, such as electronic fish counters, mark/recapture

population estimates, and sample by weight (where all the fish in representative pens are dipped and weighed). Each of these methods has either cost/benefit, biological, or logistical drawbacks so it has proven difficult to determine a reasonable method to apply to net-pen production. Detailed descriptions of rearing strategies by species and brood year are provided in the following sections.

SPRING CHINOOK

Willamette River stock spring Chinook were first released from Youngs Bay in 1989 (1988 brood). Releases have continued annually at this site with the exception of 1993 when rearing strategies shifted from sub-yearling (0+) to yearling (1+) release patterns. Net-pen rearing of spring Chinook is generally limited to over-wintering and two-week acclimation strategies due to elevated summer water temperatures. Experimental direct releases from SF Klaskanine facility ended with the 1995 brood due to generally poor returns, most likely due to high levels of bacterial kidney disease (BKD). Initiation of the SAFE project provided opportunities to expand the program and releases from Youngs Bay net pens were increased in 1995. Releases for site evaluation at Tongue Point and Blind Slough began in 1996 (1994 brood). Beginning with the 1996 brood, WDFW started releasing Cowlitz River stock spring Chinook from the Deep River site, adding Lewis River stock beginning with the 2001 brood.

Spring Chinook production has been relatively stable at one million with the exception of a brief increase due to experimental releases of brood years 2002 – 2004 from the SF site, which were discontinued because of disease and water rights issues. Modest increases have occurred with the towing strategy at Deep River net pens and oxygen supplementation at Gnat Creek Hatchery (Figure 2.2).

Spring Chinook Production Modifications

Deep River Net Pens

Two major changes in the Deep River spring Chinook program were initiated with the 2003 brood year (releases beginning in 2005). These changes include increases in the number of smolts released and changes in the timing and location of release.

Prior to 2003, spring Chinook smolts were released directly from the Deep River net-pen site. In order to avoid potential detrimental interactions with ESA-listed chum fry that emigrate out of Grays River and Grays Bay throughout April, the Deep River spring Chinook were generally not released prior to May 1. This was considerably later than typical late-March to mid-April release dates for the other spring Chinook programs (Table 2.1). Under that protocol, heavy losses from BKD plagued the Deep River Chinook, presumably as a result of warming water temperatures and perhaps physiological stresses associated with the smoltification process and extended holding. In 2003 and 2004, spring Chinook net pens were towed out of Deep River and the smolts were released into Grays Bay near the first day in May. While this might have reduced the potential for interactions with chum fry, it did not appreciably reduce the issue of extended holding of the smolts. Beginning in 2005, the release strategy included release dates that were a month or more earlier than previous years, coupled with towing the net pens and releasing the smolts near the outer downstream corner of Grays Bay at Rocky Point. This approach was intended to maintain a low potential for interaction with chum fry while also improving the survival of Chinook up to and following their release.

Concurrent with the change in release strategy in 2005 was an increase in the production goal from 150,000 in prior years to 250,000 smolts released. The goal was further increased to

350,000 smolts beginning in 2006. Figure 2.3 shows the actual production levels and release timing for each year of Deep River spring Chinook releases. Three key periods with differing production levels and release timing are evident. First are the two initial years of small (average 48,000) and relatively late (average May 2) direct releases into the Deep River site. Next, are four years of moderate (average 124,000) releases, two years of which were direct releases into the Deep River site and two towed releases, but all late (average May 6). Finally, there are the four most recent years, with generally higher (average 244,000) releases that were all towed and released much earlier (average March 24). Those latter four years of increased production levels, in combination with the towing and earlier release timing, would be expected to result in increased survival, return, and harvest of spring Chinook released from the Deep River pens. Because harvest data through the 2008 spring fishery provide only portions of the returns from the first two release years (2005 and 2006), it is not yet possible to assess the potential harvest benefits of the increased production and early towing release strategy. A preliminary assessment may be possible after analysis of 2009 season harvest data.

Gnat Creek Hatchery

Since the inception of SAFE, Gnat Creek Hatchery has reared the majority of the spring Chinook pre-smolts for the SAFE project in Oregon. Gnat Creek is an ideal stream for rearing spring Chinook because it originates from springs that flow to the surface high up on Nicolai Mountain in the northern Oregon Coast Range. When the spring water reaches the hatchery, it rarely exceeds 60 degrees Fahrenheit during the heat of summer. Like all Pacific Northwest coastal streams, Gnat Creek experiences its lowest flow period during the late summer/early fall. The low flow period that occurs during the months of August, September, and the first part of October has created a significant challenge for rearing fish there.

In eight of the eleven spring Chinook production years at Gnat Creek, at least 50% of these fish have been transferred to the net pens from two to eight weeks ahead of schedule. These fish had to be transferred out because of the low dissolved oxygen levels that resulted from the low flows in Gnat Creek, in combination with the high poundage of fish at the hatchery during this time.

Transferring these fish to the net pens early is a less than ideal situation for fish health and optimizing smolt-to-adult survival. Water quality again becomes an issue because the net pens are located in the lower Columbia estuary where water temperatures routinely reach the low 70s (˚F) during this period of time. These high water temperatures, in combination with the natural pathogens in the system, significantly increase the stress level of the fish making them more susceptible to disease. When the spring Chinook have been transferred to the net pens early, they have routinely required treatment for diseases.

In 2005, in an effort to alleviate this problem, staff at Gnat Creek Hatchery worked closely with staff at CCF to conduct a literature review into methods that may allow Gnat Creek to keep the spring Chinook at that facility during the annual low-water conditions. Oxygen supplementation appeared to show some promise. As Clark (2003) noted, “Oxygen injection is an effective means of increasing dissolved oxygen concentrations, reducing effluent solids loading, and increasing raceway carrying capacity.”

During the initial trial phase in the summer of 2006, one low head oxygen unit (LHO) was installed in one raceway. Oxygen was provided to the unit from liquid oxygen tanks at 6 liters per minute. Dissolved oxygen levels were monitored at the inflow and outflow ends of the raceway. Fish loading was at standard levels typical of maximum production at this facility.

Metabolic activities removed from three to five parts per million (ppm) of oxygen therefore oxygen supplementation was metered to replace that same amount.

As a result of the success of the initial trial, a grant for $108,000 was secured from ODFW's Restoration and Enhancement Program (R&E) for full implementation of LHOs combined with OG20® oxygen concentrators in all fifteen raceways (Figures 2.4, 2.5, 2.6).

Gnat Creek ponds are configured in such a way that allows water from one pond to overflow into two other ponds in a series of three ponds. LHOs were installed at the points where the ponds overflow into the next. The LHO is the location where the oxygen that is concentrated in the OG20® is infused into the water. The oxygen concentrating system gives the hatchery the ability to regulate oxygen levels throughout the series of ponds; allowing it to rear 2/3 more pounds of fish per gallon of inflow than could be reared without the oxygen system. Optimal oxygen concentrations for salmonids are between 8 and 10 ppm throughout the rearing pond. With oxygen supplementation the hatchery is able to maintain concentrations of 10 ppm throughout the entire pond. Not only will oxygen supplementation allow Gnat Creek to keep the fish at the hatchery during the lowest flow period of the year rather than forcing an early transfer to the net pens, it will also afford the opportunity to explore the option of increasing production.

During the summer/fall of 2007 subsequent installation of additional LHOs driven by OG20® oxygen concentrators demonstrated that spring Chinook pre-smolts can be held through the low-water periods. The 2006 brood pre-smolts were not transported to the estuary net pens during the low-water period and fish health was excellent.

The oxygen supplementation system was completed in the fall of 2008. The system is now fully operational for all fifteen raceways at Gnat Creek. The 2007 brood pre-smolts were again held at the hatchery through the low-water period. The expectation is for increased overall adult spring Chinook returns at all SAFE locations because the fish will no longer be transported to the net pens before the receiving water quality is optimal. This will significantly reduce the risk for disease-related mortality.

The implementation of the oxygen supplementation system at Gnat Creek is an example of how fish culturists can use research and innovation and a variety of funding sources to overcome physical limitations to produce a larger number of a higher quality product.

2005 Brood Spring Chinook

The 2005 brood spring Chinook for the Oregon net pens originated from Willamette Hatchery, and approximately 917,000 eyed eggs were shipped to Gnat Creek Hatchery in the fall of 2005. Early rearing, mass marking, and coded-wire tagging occurred while the fish were at Gnat Creek in the spring and summer of 2006 and the fry were also vaccinated for enteric redmouth disease and vibriosis. Because of low-flow concerns during late summer, the Youngs Bay portion (450,000 fish) of the production was transferred to the net pens in late September, while the Blind Slough production was put in the pens as scheduled at the end of October. The Youngs Bay fish suffered moderate losses to chronic furunculosis through December despite being treated with 0.835% Romet® 30 for ten days following transfer to the pens. Mortality decreased in January but began increasing again in February, this time the fish were treated with 6% Terramycin 100 for Fish® (TM-100) for ten days which curbed losses. The fish at Blind Slough had very low mortality throughout the net-pen rearing period.

In mid-March, 27,000 acclimation fish were transferred to net pens in the John Day River, and 77,000 to net pens at the MERTS site. All groups of spring Chinook from SAFE Oregon sites were released near the end of March 2007.

On the Washington side, Grays River Hatchery received 405,000 eyed eggs from Cowlitz and Speelyai hatcheries in late September and early October of 2005. After completion of incubation, fry were ponded and early rearing, mass marking, and coded-wire tagging occurred during the spring and summer of 2006. Due to multiple disease outbreaks (ichthyophthiriosis or ich, bacterial gill disease, and furunculosis) and resultant mortality, only 270,000 fingerlings were transferred to the Deep River net pens in November of 2006. Losses while in the net pens were minimal and in mid-March the pens were towed out to the mainstem Columbia River to release the fish.

2006 Brood Spring Chinook

Oregon's 2006 brood spring Chinook production was again provided by Willamette Hatchery with approximately 960,000 eyed eggs transferred to Gnat Creek Hatchery for completion of incubation in October of 2006. Early rearing, mass marking, and coded-wire tagging occurred in the spring and summer of 2007, and the fry were vaccinated for enteric redmouth and vibriosis. Oxygen supplementation enabled all spring Chinook fingerlings to be held until scheduled transfer to the net pens in November 2007. Approximately 545,000 fish were trucked to Youngs Bay and 310,000 fish went to Blind Slough for over-winter rearing. The Youngs Bay fish suffered a mild outbreak of bacterial hemorrhagic septicemia (BHS), but after a ten-day treatment with 4% TM-100 losses were minimal and both groups of over-winter fish were healthy until release in late March.

In mid-March, 79,000 acclimation fish were transferred to the Tongue Point MERTS pens where they were held for two weeks and released. The John Day River trial acclimation program was ended after the 2005 brood with no plans to continue.

Grays River Hatchery again received eyed eggs from Cowlitz and Speelyai hatcheries (410,000) for the Washington spring Chinook production. After final incubation, fry were ponded and early rearing, mass marking, and coded-wire tagging occurred at Grays River Hatchery. As with the 2005 brood, the fry experienced high mortality due to multiple disease outbreaks (ich, bacterial gill disease, and furunculosis). In addition, a screening failure allowed several hundred large smolts to enter into the raceways and a large number of the fry were consumed. As a result, only 136,000 fingerlings were transferred to the Deep River net pens where they were over-wintered and towed to the mainstem Columbia for release in early April of 2008.

Actual release numbers, fish sizes, and release dates for all groups are provided in Table 2.1.

SAB FALL CHINOOK

The SAB fall Chinook stock used in the Select Areas originated from Rogue River stock egg transfers to Big Creek Hatchery in 1982 and to SF Klaskanine Hatchery in 1983. This stock was utilized because of its high quality/red flesh color and south-turning migration pattern which makes it available for harvest to all Oregon coast commercial and sport fisheries as well as in lower Columbia River and Youngs Bay fisheries. An additional benefit of this stock is the protracted timing of return which provides harvest opportunity from late spring through summer, when no other fall Chinook are present in Youngs Bay.

Broodstock releases were maintained at Big Creek Hatchery through 1995, when concerns of insufficient homing by returning adults prompted shifting the release location to Klaskanine Hatchery in an attempt to confine straying to within the Youngs Bay system. Broodstock collection transitioned to Klaskanine Hatchery as adults began returning to that facility. However, incubation, early rearing, mass marking, and coded-wire tagging continued to be conducted by Big Creek staff, and smolts were trucked to Klaskanine for acclimation and release through 2005. The broodstock program was moved to SF Klaskanine Hatchery in 2006.

The fishery enhancement efforts with SAB fall Chinook in Youngs Bay began with releases from the SF Klaskanine Hatchery from 1983 – 1988 and expanded with net-pen releases beginning in 1989. Following some poor survival years during the late 1990s that resulted in lower smolt release numbers, the SAB fall Chinook program has stabilized at smolt releases between 1.0 – 1.5 million annually, for brood years 2001 – 2007 (Figure 2.7).

2006 Brood SAB Fall Chinook

The 2006 broodstock for the SAB fall Chinook program were collected at Klaskanine Hatchery and at the confluence of Youngs and Klaskanine rivers. Approximately 1.17 million eggs were taken at Klaskanine Hatchery and another 300,000 at the confluence for a total take of 1.47 million eggs, which were then incubated at SF Klaskanine Hatchery. In December of 2006, 20,000 eyed eggs were provided to Astoria High School through the Salmon and Trout Enhancement program (STEP) and later 20,000 fry were made available to Warrenton High School for their fisheries program[†]. During the course of ponding fry in February and March, 725,000 fry were kept at the SF Klaskanine for the ODFW-funded broodstock release, leaving 650,000 fry for the SAFE-funded net-pen production. At the net pens, mass marking and coded-wire tagging took place in April of 2007. These fish were vaccinated for vibriosis during early April, but also required treatment with 4% TM-100 while being handled during marking and tagging, which kept losses to disease negligible. The broodstock fish at the SF Klaskanine were mass marked and coded-wire tagged during May and there was no significant loss to disease. Both groups of fish were released in good health near the end of June when warm water temperatures began to be a threat.

2007 Brood SAB Fall Chinook

Broodstock for the 2007 SAB fall Chinook were collected at Klaskanine Hatchery only, with the temporary adult holding site at the confluence of Klaskanine and Youngs rivers no longer available due to a winter storm in late 2006 that caused two anchor piles to fail. A total of approximately 1.5 million eggs were taken at Klaskanine Hatchery and incubated at SF Klaskanine Hatchery, but poor fertilization rates resulted in the ponding of only 1.3 million fry. Astoria High School was given 26,000 green eggs, but also had poor fertilization rates and ended up with only 5,000 fry. Warrenton High School received a total of 5,000 fry for their program. Approximately 706,000 fry were retained at the SF Klaskanine for the ODFW-funded broodstock program which left 590,000 fry for the SAFE-funded net-pen production. The net-pen fish were started on feed for at least one week before transfer to Youngs Bay, which appeared to reduce the number of pinheads in the net pens. Vaccination for vibriosis, mass marking, and coded-wire tagging began in April with no significant losses to disease. Mass marking and coded-wire tagging at the SF Klaskanine began in mid-May and was completed in June. Actual release numbers, fish size and release dates for all groups are provided in Table 2.2.

[†] The Warrenton High School program normally receives tule stock fall Chinook from Big Creek Hatchery but in 2006 (and again in 2007) extremely low returns to Big Creek meant that no surplus tule eggs were available. During these years the SAFE project supplied a limited number of SAB fry to the high school project.

COHO

Early run hatchery coho have been released in the Youngs Bay system for decades, with Klaskanine Hatchery providing up to 1.6 million smolts annually by 1962. In 1977, CCF began an effort to enhance the commercial fishery by developing other freshwater rearing ponds, gradually adding from 50,000 (1977) to 400,000 (1986) coho smolts to the hatchery releases into Youngs Bay. The first experimental net-pen releases of coho occurred in 1989 in Youngs Bay, with increased BPA funding and expansion of the net-pen sites releases climbed to just over 4 million smolts by 2000 (Figure 2.8). Similar to spring Chinook, net-pen rearing of coho is generally limited to over-wintering and two-week acclimation strategies due to elevated summer water temperatures. With the loss of federally-funded acclimation coho from Eagle Creek NFH and SF Klaskanine production changing to SAB fall Chinook, coho production in the Select Areas dropped to around 2 million smolts in 2005 – 2007 prompting project personnel and ODFW propagation managers to seek alternative sources of coho production. Included in the FY07-09 proposal was funding to re-initiate coho production at Klaskanine Hatchery to restore stability to the SAFE coho program. Releases are now rebuilding with new production at Klaskanine and SF Klaskanine facilities beginning with brood year 2006 as described in further detail below.

Beginning with the 2006 brood, limited SAFE-funded coho production was initiated at Klaskanine Hatchery. In order to implement this new production, several facility maintenance projects were completed such as screen replacements, valve repair on intake structures, headbox silt removal, and replacement of aluminum inflow spouts at the raceways. As outlined in the FY07-09 SAFE proposal, this was made possible by reducing two manager positions to half time, hiring only one permanent staff at Klaskanine Hatchery, and re-aligning existing ODFW and CCF staff to provide eight months of assistance during the time that fish are at the hatchery. Due to low summer flow concerns at Klaskanine Hatchery and space and staff availability at Clackamas Hatchery, the fingerlings are trucked to Clackamas Hatchery and held there from June through September before being transferred back to Klaskanine Hatchery for final over-winter rearing and release in the spring. The goal of this production is 750,000 smolts, with broodstock and eggs collected at Big Creek Hatchery.

As a result of the Oregon Coast Coho Conservation Plan for the State of Oregon (ODFW 2007), rearing space at Salmon River Hatchery became available to produce approximately 200,000 coho fingerlings beginning with the 2006 brood. These ODFW propagation funded fish are transferred to SF Klaskanine Hatchery in October for final rearing and release. Big Creek Hatchery provides the eggs for this program. For more information on the rationale for this program refer to the Conservation Plan, specifically Appendix 3.

Also beginning with the 2006 brood, Eagle Creek NFH's participation with SAFE coho production resumed at a limited level. The extent of this production is dependent on federal funding and policy decisions.

Prior to 2005, releases of SAFE coho on the Washington side occurred at Steamboat Slough and at two Deep River net-pen sites. The Steamboat Slough site was discontinued after the 2004 release year because the returning coho failed to congregate at the release site. This resulted in poor harvest rates despite adequate survival as evidenced by returns to Elochoman Hatchery (North et al. 2006). The upper Deep River site (one mile above the current site shown in Figure 1.2) was also discontinued after the 2004 release due to irreparable winter storm damage to net pens and pilings. Thus, all Deep River production after the 2004 release year was consolidated to the current pen site one-half mile below the state highway bridge. This consolidation, coupled with increased numbers of spring Chinook reared in available net pens,

resulted in temporary reductions in releases of coho from Deep River in 2005 and 2006. Upon completion of the repair and addition of net pens at the consolidated site, production goals of 400,000 coho were resumed beginning with the 2005 brood year, released in 2007.

2005 Brood Coho

The coho fingerlings for the Oregon net-pen sites were initially reared at ODFW's Cascade Hatchery where they were mass marked and coded-wire tagged prior to transfer to the net pens in late October 2006. Production of these fish is funded by both Mitchell Act and SAFE. Approximately 410,000 fingerlings were trucked to Youngs Bay and 205,000 fingerlings were received at Tongue Point MERTS for over-winter rearing. In addition, approximately 817,000 Mitchell Act-funded fingerlings were transferred to the Youngs Bay net pens from ODFW's Oxbow Hatchery in mid-October for over-winter rearing. All net-pen fingerlings were given a 10-day treatment for BHS with 0.835% Romet® 30. Losses to disease in these over-winter fish were minimal after treatment and all groups were released in late April. At the Blind Slough net pens coho production was provided with 305,000 acclimation smolts trucked from ODFW's Sandy Hatchery in early April. These Mitchell Act-funded fish were held in the net pens for about two weeks and released.

Coho fingerlings for the Deep River net pens on the Washington side originated from WDFW's Grays River Hatchery where approximately 700,000 eggs were collected and incubated. Early rearing, mass marking, and coded-wire tagging occurred in the spring and summer of 2006 and 444,000 fingerlings were transferred to the net pens in December. Also, 250,000 fingerlings were kept at Grays River Hatchery for broodstock release purposes. Some losses to coldwater disease occurred while at the hatchery, so numbers released were somewhat lower than anticipated.

2006 Brood Coho

The SAFE-funded coho fingerlings for the Oregon net pens originated from Cascade Hatchery where early rearing, mass marking, and coded-wire tagging occurred. Due to program additions at Klaskanine and SF Klaskanine hatcheries, which resulted in additional coho production in Youngs Bay, all 600,000 fingerlings were transferred to Tongue Point MERTS in mid-October for over-winter rearing. After the loss of the Eagle Creek NFH production, this was an important step toward returning coho releases to levels necessary to maintain a viable fishery in the Tongue Point/South Channel site. Oxbow Hatchery provided 813,000 Mitchell Act-funded fingerlings for the Youngs Bay net pens. All net-pen fish were treated for BHS with 0.835% Romet® 30 for ten days shortly after transfer to the net pens, after which losses to disease were minimal. The Tongue Point MERTS fish were released in mid-April and the Youngs Bay fish in early May. Approximately 300,000 Mitchell Act-funded acclimation smolts were trucked to the Blind Slough net pens from Sandy Hatchery in mid-April and released at the end of April.

In addition to the net-pen coho, SAFE-funded production of coho was initiated at Klaskanine Hatchery beginning with the 2006 brood. Big Creek Hatchery collected and incubated 500,000 eggs, and after buttoning-up they were ponded as fry at Big Creek and transferred to Klaskanine Hatchery in March of 2007. Mass marking and coded-wire tagging were conducted at Klaskanine and in mid-June the fingerlings were transferred to Clackamas Hatchery for rearing through the summer. While at Clackamas, the fingerlings suffered an outbreak of *Ceratomyxa shasta* and nearly half of the production was lost before transfer back to Klaskanine Hatchery in mid-October for over-winter rearing. Approximately 232,000 fish were trucked back to Klaskanine in mid-October and released in May of 2008. An additional 50,000 fish were transferred to the SF Klaskanine for over-winter rearing there (CCF had agreed to take up to half of the production if water flows were a concern at Klaskanine). Also, in December of 2007,

Eagle Creek NFH transferred 17,625 surplus adipose-fin clipped fingerlings that were added to the South Fork rearing pond.

As mentioned earlier, a coho rearing program utilizing ODFW's Salmon River Hatchery was initiated with the 2006 brood. Approximately 250,000 eyed eggs were delivered to Salmon River Hatchery in December of 2006 where incubation was completed. Fry were ponded in February of 2007 and mass marking and coded-wire tagging occurred in the spring. In October, 232,000 fingerlings were transferred to SF Klaskanine Hatchery where they were reared until release in April of 2008.

On the Washington side Grays River Hatchery supplied the coho fingerlings for the Deep River net pens. Early rearing, mass marking, and coded-wire tagging occurred at the hatchery and in late fall 388,000 fingerlings were transferred to the pens. A screen failure at the hatchery that contributed to a significant loss of fry limited the broodstock portion of the coho production to 120,000 fish. Both the hatchery and net-pen groups were released in May of 2008.

Actual release numbers, fish size and release dates for all groups are provided in Table 2.3.

The total combined production of coho, and spring and fall Chinook at all Oregon and Washington Select Area sites in 2008 was 4.864 million (2.559 coho, 1.057 spring Chinook, 1.248 fall Chinook) compared to the goal (within 1-9 years from 2007) of 6.175 million (3.075 coho, 1.6 spring Chinook, 1.5 fall Chinook). Several limiting factors are at work with regard to expanding production by increasing smolt releases. With flat funding from all current funding sources, SAFE and non-SAFE, no significant increase in rearing programs has been possible aside from additional coho production at Klaskanine Hatchery (which was possible by primarily restructuring existing funding) and innovative methods such as the oxygen supplementation at Gnat Creek Hatchery that may allow for modest increases of spring Chinook. Without increased or new sources of funding support, production is limited to current levels. Another limiting factor is the 2007 recommendation from the ISRP that called for extreme caution in expanding production in future years and noting that continuous monitoring is essential to determine harvest and survival rates, impacts on non-target fish stocks, and stray rates of SAFE fish as production increases (ISRP & IEAB 2007). Until and unless fish management policy decisions dictate production increases for the Select Areas and funding infrastructure for all hatchery production stabilizes (e.g. Mitchell Act cuts resulting in hatchery closures and major program changes) future expanded production will continue to focus on increasing SARs rather than increasing smolt production.

Table 2.1. Releases of spring Chinook from lower Columbia River Select Area facilities, 1993 - 2006 brood years.

Brood Year	Release Date	Release Site[a]	Number Released	Number of CWTs	Tag Code[b]	Release Size #/lb	Funding Agency[c] and Study
1993	2/7/95	SFK	86,978	52,251	07-03-51	14.4	BPA
	2/9/95	YB	79,336	39,840	07-03-45	12.1	BPA / Feb release
	3/7/95	YB	156,519	52,872	07-03-43	8.1	BPA / Mar release
	3/30/95	YB	127,367	53,498	07-03-44	7.4	BPA / Apr release
			450,200	**198,461**			
1994	1/31/96	SFK	76,618	52,431	07-11-19	14.7	BPA
	2/5/96	TG	100,138	52,563	07-12-38	10.1	BPA / Feb release
	2/29/96	TG	142,181	48,635	07-12-36	10.8	BPA / Mar release
	2/29/96	BS	199,389	53,257	07-12-37	9.9	BPA / Mar release
	2/5/96	YB	142,976	53,896	07-11-21	11.9	BPA / Feb release
	2/29/96	YB	133,517	51,737	07-11-22	10.7	BPA / Mar release
	3/21/96	YB	97,945	41,085	07-11-20	10.0	BPA / Apr release
			892,764	**353,604**			
1995	2/1/97	YB	100,680	50,127	09-17-37	18.1	BPA / Feb release
	3/5/97	YB	96,540	49,341	09-17-38	15.2	BPA / Mar release
	4/4/97	YB	95,396	50,562	09-17-39	14.6	BPA / normal
	4/4/97	YB	94,612	50,339	09-17-40	12.7	BPA / dormancy
	3/4/97	SFK	76,821	25,149	07-13-37	15.9	BPA
	3/5/97	BS	171,229	58,220	09-17-16	15.2	BPA / Mar release
	3/5/97	TG	151,905	51,667	09-17-17	16.6	BPA / Mar release
	4/4/97	TG	149,889	50,309	09-17-18	14.6	BPA / Apr release
			937,072	**385,714**			
1996	3/3/98	YB	149,878	50,865	09-22-16	11.6	BPA / Mar release
	4/1/98	YB	153,265	47,495	09-22-14	12.0	BPA / dormancy
	4/1/98	YB	153,139	49,392	09-22-15	9.6	BPA / normal
	3/3/98	TG	128,314	46,710	09-22-18	13.8	BPA / Mar release
	4/1/98	TG	125,456	43,987	09-22-19	13.6	BPA / dormancy
	3/3/98	BS	198,034	45,510	09-22-17	12.6	BPA / Mar release
	4/1/98	BS	25,284	24,203	09-20-35	9.6	BPA /acc/normal
	4/1/98	BS	25,396	23,602	09-20-36	11.6	BPA / acc/dorm.
	4/22/98	DR	56,414	56,414	63-61-15	5.1	BPA
			1,015,180	**388,178**			
1997	3/4/99	YB	165,298	24,415	09-25-34	13.2	BPA / Mar release
	4/1/99	YB	158,574	24,437	09-25-33	11.9	BPA / dormancy
	4/1/99	YB	102,546	23,611	09-25-36	8.2	BPA / normal
	3/3/99	TG	118,291	23,969	09-25-32	10.0	BPA / Mar release
	4/1/99	TG	105,986	21,637	09-25-35	8.9	BPA / dormancy
	3/3/99	BS	148,881	24,742	09-25-30	14.0	BPA / Mar release
	4/1/99	BS	25,553	25,544	09-25-31	11.0	BPA / acc/dorm.

continued

Table 2.1. (continued) Releases of spring Chinook from lower Columbia River Select Area facilities, 1993 - 2006 brood years.

Brood Year	Release Date	Release Site[a]	Number Released	Number of CWTs	Tag Code[b]	Release Size #/lb	Funding Agency[c] and Study
1997	4/1/99	BS	25,573	25,560	09-25-37	10.0	BPA /acc/normal
	5/13/99	DR	25,205	24,856	63-05-11	6.8	BPA
	5/13/99	DR	14,473	14,106	63-06-52	6.4	BPA
			890,380	**232,877**			
1998	3/1/00	YB	128,656	27,420	09-28-47	15.9	BPA / Mar release
	4/4/00	YB	180,695	24,873	09-28-46	18.7	BPA / dormancy
	4/4/00	YB	155,299	26,740	09-28-48	14.4	BPA / normal
	3/1/00	TG	132,484	29,028	09-28-50	12.6	BPA / Mar release
	4/4/00	TG	117,525	23,515	09-28-49	9.8	BPA / dormancy
	3/1/00	BS	143,507	25,703	09-28-45	17.7	BPA / Mar release
	4/4/00	BS	26,393	25,442	09-28-43	13.8	BPA / acc/dorm.
	4/4/00	BS	26,501	25,397	09-28-44	11.9	BPA /acc/normal
			911,060	**208,118**			
1999	3/2/01	YB	101,516	24,520	09-31-23	15.1	BPA / Mar release
	3/29/01	YB	27,310	25,950	09-31-33	13.8	BPA / 2-wk acc.
	3/29/01	YB	96,839	17,226	09-31-27	14.2	BPA / Mar release
	4/3/01	YB	146,346	25,883	09-31-26	16.2	BPA / dormancy
	4/3/01	YB	138,491	24,519	09-31-24	15.8	BPA / normal
	4/12/01	YB	27,396	23,849	09-31-29	12.3	BPA / 4-wk acc.
	3/2/01	BS	139,319	25,501	09-31-28	16.4	BPA / Mar release
	3/29/01	BS	25,384	24,707	09-31-25	12.8	BPA /acc/normal
	3/29/01	BS	27,467	23,705	09-31-32	14.4	BPA / acc/dorm.
	4/3/01	BS	27,897	13,470	09-31-31	13.4	BPA / normal
	4/3/01	BS	30,329	14,728	09-31-30	16.3	BPA / dormancy
	5/9/01	DR	119,533	25,109	63-13-10	12.0	BPA / normal
	5/9/01	DR	40,032	25,485	63-13-11	11.0	BPA / dormancy
			947,859	**294,652**			
2000	3/29/02	YB	212,214	24,593	09-33-30	10.4	BPA / normal
	3/29/02	YB	213,069	24,924	09-33-31	12.6	BPA / dormancy
	3/29/02	YB	26,973	25,516	09-33-32	13.4	BPA / 2-wk acc.
	4/12/02	YB	25,806	24,595	09-33-29	9.9	BPA / 4-wk acc.
	3/28/02	BS	67,981	20,790	09-33-33	12.3	BPA / subsurface
	3/28/02	BS	177,625	20,175	09-33-34	11.7	BPA / normal fed
	4/10/02	BS	24,887	21,174	09-01-20	14.8	NOAA / acclim.
	4/19/02	BS	23,871	20,090	09-01-19	13.6	NOAA / acclim.
	4/30/02	BS	24,164	20,002	09-01-21	13.7	NOAA / acclim.
	5/10/02	BS	24,441	20,992	09-01-22	13.0	NOAA / acclim.
	5/20/02	BS	23,536	19,646	09-01-23	15.7	NOAA / acclim.
	5/30/02	BS	24,403	20,798	09-01-24	13.0	NOAA / acclim.
	5/16/02	DR	83,563	12,361	63-10-87	9.0	BPA / normal
	5/16/02	DR	12,377	12,377	63-12-88	10.0	BPA / dormancy
			964,910	**288,033**			

continued

Table 2.1. (continued) Releases of spring Chinook from lower Columbia River Select Area facilities, 1993 - 2006 brood years.

Brood Year	Release Date	Release Site[a]	Number Released	Number of CWTs	Tag Code[b]	Release Size #/lb	Funding Agency[c] and Study
2001	3/27/03	BS	302,934	25,097	09-36-01	11.5	BPA
	3/27/03	TGM	30,385	25,514	09-35-61	11.9	BPA/morpholine
	3/27/03	TGJ	27,412	26,601	09-36-02	11.4	BPA/JD acclim.
	3/28/03	YB	188,956	26,219	09-35-62	9.0	BPA / normal
	3/28/03	YB	187,097	26,342	09-35-63	12.7	BPA / dormancy
	3/28/03	YB	75,570	25,513	09-35-60	11.4	BPA / subsurface
	4/9/03	BS	18,508	17,941	09-36-19	16.6	NOAA / acclim.
	4/18/03	BS	22,353	21,958	09-36-22	15.5	NOAA / acclim.
	4/28/03	BS	21,236	20,982	09-36-20	15.6	NOAA / acclim.
	4/30/03	DR	33,113	20,052	63-15-72	10.0	BPA/Lewis/towed
	4/30/03	DR	108,791	20,455	63-15-73	11.4	BPA/Cowlitz/towed
	5/7/03	BS	20,801	20,395	09-36-23	16.5	NOAA / acclim.
	5/16/03	BS	20,158	19,922	09-36-21	16.6	NOAA / acclim.
	5/27/03	BS	20,319	19,925	09-36-24	14.7	NOAA / acclim.
			1,077,633	**316,916**			
2002	3/31/04	SFK	639,446	22,382	09-37-23	13.7	SFK production
	4/5/04	BS	261,840	26,763	09-39-01	12.1	BPA
	4/6/04	TGM	20,913	20,407	09-36-61	11.1	BPA/morpholine
	4/6/04	TGJ	27,143	26,794	09-36-63	10.4	BPA/JD acclim.
	4/8/04	BS	16,185	15,195	09-39-06	12.8	NOAA / acclim.
	4/8/04	YB	455,825	25,934	09-36-62	12.8	BPA
	4/16/04	BS	27,359	26,498	09-39-03	12.5	NOAA / acclim.
	4/26/04	BS	27,644	26,658	09-39-07	11.7	NOAA / acclim.
	5/6/04	BS	27,471	26,795	09-39-04	13.1	NOAA / acclim.
	5/17/04	BS	24,488	24,123	09-39-08	11.4	NOAA / acclim.
	5/20/04	BS	23,508	22,942	09-39-05	12.5	NOAA / acclim.
	5/1/04	DR	31,095	24,088	63-21-76	12.0	BPA/Cowlitz/towed
	5/1/04	DR	66,223	9,867	63-21-77	11.0	BPA/Lewis/towed
			1,649,140	**398,446**			

continued

Table 2.1. (continued) Releases of spring Chinook from lower Columbia River Select Area facilities, 1993 - 2006 brood years.

Brood Year	Release Date	Release Site[a]	Number Released	Number of CWTs	Tag Code[b]	Release Size #/lb	Funding Agency[c] and Study
2003	3/22/05	YB	29,495	AD only		5.3	BPA/over-summer
	4/4/05	TGJ	26,955	26,226	09-39-29	12.0	BPA/JD acclim.
	3/22/05	DR	101,344	22,500	63-21-74	10.0	BPA/Cowlitz/towed
	3/23/05	DR	153,127	22,300	63-21-73	10.0	BPA/Lewis/towed
	4/4/05	TGM	26,344	25,632	09-39-30	13.0	BPA/morpholine
	4/4/05	BS	285,959	26,396	09-39-32	13.2	BPA
	4/5/05	YB	428,499	26,069	09-39-31	14.2	BPA
	4/5/05	SFK	458,659	24,264	09-37-36	12.1	SFK production
	4/6/05	BS	25,646	23,807	09-40-55	15.8	NOAA / acclim.
	4/15/05	BS	25,344	23,964	09-40-56	14.2	NOAA / acclim.
	4/25/05	BS	25,182	23,786	09-40-57	16.0	NOAA / acclim.
	5/4/05	BS	24,747	24,259	09-40-58	14.0	NOAA / acclim.
	5/13/05	BS	23,051	22,898	09-40-60	13.6	NOAA / acclim.
	5/23/05	BS	23,115	22,516	09-40-59	13.7	NOAA / acclim.
			1,657,467	**314,617**			
2004	9/26/05	SFK	566,030	27,373	09-37-22	24.5	SFK production[d]
	3/27/06	DR	159,300	23,841	63-22-97	13.0	BPA/Cowlitz/towed
	3/27/06	DR	177,000	23,203	63-31-81	14.0	BPA/Lewis/towed
	3/27/06	TGJ	25,451	24,117	09-37-06	10.8	BPA
	3/27/06	TGM	57,114	24,191	09-37-08	12.5	BPA/morpholine
	3/27/06	BS	287,215	22,839	09-39-33	15.7	BPA
	3/28/06	YB	391,843	21,876	09-37-07	11.6	BPA
	4/6/06	BS	28,099	27,117	09-42-54	17.2	NOAA
	4/17/06	BS	27,440	26,952	09-42-53	17.5	NOAA
	4/27/06	BS	27,459	26,256	09-42-58	15.5	NOAA
	5/5/06	BS	27,831	27,107	09-42-55	14.3	NOAA
	5/16/06	BS	27,493	26,857	09-42-56	16.9	NOAA
	5/24/06	BS	25,851	24,657	09-42-57	16.0	NOAA
			1,828,126	**326,386**			
2005	3/15/07	DR	263,600	55,000	63-29-85	14.0	BPA/towed
	3/28/07	BS	272,226	26,944	09-44-32	11.0	BPA
	3/29/07	TGM	76,877	25,295	09-44-33	10.4	BPA
	3/29/07	TGJ	27,272	26,650	09-44-35	10.1	BPA
	3/30/07	YB	417,662	26,292	09-44-34	11.2	BPA
			1,057,637	**132,681**			
2006	3/25/08	BS	312,612	23,043	09-46-06	11.7	BPA
	3/25/08	TGM	79,343	26,137	09-46-07	14.2	BPA
	3/27/08	YB	543,803	25,990	09-46-08	9.4	BPA
	4/3/08	DR	121,500	47,900	63-41-90	11.8	BPA/towed
			1,057,258	**99,120**			

[a] *BS=Blind Slough, DR=Deep River, SFK=South Fork Klaskanine, SS=Steamboat Slough, TG=Tongue Pt., TGM=Tongue Point MERTS, TGJ=Tongue Point John Day, YB=Youngs Bay*

[b] *Tag codes funded by BPA representing production releases for each site that were used for year/site survival and straying analyses*

[c] *BPA-Bonneville Power Administration; NOAA-National Oceanic & Atmospheric Administration (10-day acclimation study)*

[d] *Early release due to high incidence of BKD and lack of funds to treat effectively*

Table 2.2. Releases of Select Area Bright fall Chinook from lower Columbia River Select Area facilities, 1994 - 2007 brood years.

Brood Year	Study Group	Site	Release Date	Number Released	Number of CWTs	Tag Code	Release Size (#/lb)	Funding Agency[a]
1994	July 15 or 65º	YB	6/27/95	107,892	50,068	07-07-42	18.2	BPA
	Aug 1 or 70º	YB	7/17/95	77,100	49,898	07-09-28	13.6	BPA
	0.25 #/ft^3 density	YB	7/17/95	116,030	43,729	07-09-29	10.9	BPA
	0.56 #/ft^3 density	YB	7/17/95	127,936	44,337	07-09-30	11.8	BPA
	0.66 #/ft^3 density	YB	7/17/95	115,702	43,062	07-09-31	13.8	BPA
	R&E	YB	7/17/95	707,127	19,954	07-14-21	36.5	R&E
	SFK Raceways	SF	8/15/95	15,758	LV only		37.0	OR/FPC
	BC Broodstock	BC	8/11/95	83,386	13,392	07-05-41	20.2	R&E
	BC Broodstock	BC	8/11/95	83,302	13,281	07-05-40	20.4	R&E
	BC Broodstock	BC	8/11/95	83,201	13,264	07-05-40	20.6	R&E
	BC Broodstock	BC	8/11/95	83,321	13,376	07-05-41	20.7	R&E
	BC Broodstock	BC	8/29/95	175,032	27,446	07-05-42	15.4	R&E
	BC Broodstock	BC	8/30/95	500,356	26,916	07-05-43	15.6	R&E
				2,276,143	**358,723**			
1995	0.25 #/ft^3 density	YB	7/16/96	64,679	58,060	07-13-42	13.1	BPA
	0.67 #/ft^3 density	YB	7/16/96	154,593	46,336	07-13-41	14.5	BPA
	R&E	TG	7/15/96	26,792	26,500	07-13-50	22.0	R&E
	PSMFC	YB	7/17/96	329,976	27,243	07-13-54	31.8	PSMFC
	R&E	BS	7/15/96	27,380	27,330	07-13-51	19.9	R&E
	R&E	YB	7/16/96	389,320	LV only		16.3	R&E
	PSMFC	YB	7/17/96	428,405	LV only		37.5	PSMFC
	KK Broodstock	KK	7/31/96	26,178	25,988	07-13-53	22.2	R&E
	BC Broodstock	BC	8/26/96	521,952	27,041	07-13-52	14.2	R&E
				1,969,275	**238,498**			
1996	July 15 or 65º	YB	6/17/97	53,442	52,956	07-13-39	38.0	BPA
	Aug 1 or 70º	YB	7/17/97	50,868	50,371	07-13-38	18.1	BPA
	0.14 #/ft^3 density	YB	7/17/97	116,680	52,468	09-21-36	21.4	BPA
	0.33 #/ft^3 density	YB	7/17/97	188,948	51,392	09-21-35	17.9	BPA
	0.46 #/ft^3 density	YB	7/17/97	53,765	52,618	07-13-40	18.4	BPA
	R&E	TG	7/17/97	27,482	27,482	09-21-46	24.1	R&E
	R&E	BS	7/17/97	27,413	27,413	09-21-45	31.6	R&E
	KK Broodstock	KK	10/31/97	195,247	9,593	09-21-43	13.8	R&E
	KK Broodstock	KK	10/31/97	408,713	27,327	09-21-44	13.8	R&E
				1,122,558	**351,620**			

continued

Table 2.2. (continued) Releases of Select Area Bright fall Chinook from lower Columbia River Select Area facilities, 1994 - 2007 brood years.

Brood Year	Study Group	Site	Release Date	Number Released	Number of CWTs	Tag Code	Release Size (#/lb)	Funding Agency[a]
1997	July 15 or 65º	YB	7/1/98	25,201	24,853	09-24-54	19.8	BPA
	Aug 1 or 70º	YB	7/20/98	25,019	24,958	09-24-53	16.0	BPA
	0.27 #/ft^3 density	YB	7/20/98	25,035	24,803	09-24-56	14.5	BPA
	0.34 #/ft^3 density	YB	7/20/98	17,303	16,891	09-24-57	15.8	BPA
	0.47 #/ft^3 density	YB	7/20/98	25,024	24,962	09-24-55	16.5	BPA
	KK Broodstock	KK	9/23/98	52,677	LV only		19.4	R&E
	KK Broodstock	KK	9/25/98	54,752	13,405	09-25-17	17.0	R&E
	KK Broodstock	KK	9/28/98	54,472	LV only		17.2	R&E
	KK Broodstock	KK	9/30/98	54,734	13,402	09-25-17	16.9	R&E
	KK Broodstock	KK	11/4/98	445,342	26,862	09-25-18	16.1	R&E
				779,559	**170,136**			
1998	July 15 or 65º	YB	7/12/99	25,811	25,467	09-27-54	17.1	BPA
	Aug 1 or 70º	YB	8/2/99	26,000	25,446	09-27-53	12.5	BPA
	0.24 #/ft^3 density	YB	7/12/99	25,992	25,746	09-27-57	16.6	BPA
	0.45 #/ft^3 density	YB	7/12/99	25,921	25,106	09-27-56	18.1	BPA
	0.57 #/ft^3 density	YB	7/12/99	32,410	25,570	09-27-55	17.8	BPA
	R&E	YB	7/12/99	85,837	26,794	09-27-58	30.6	R&E
	KK Broodstock	KK	9/27/99	52,546	6,676	09-27-60	16.4	R&E
	KK Broodstock	KK	9/27/99	52,547	6,676	09-27-60	16.6	R&E
	KK Broodstock	KK	9/28/99	51,659	6,563	09-27-60	16.6	R&E
	KK Broodstock	KK	9/28/99	51,480	6,541	09-27-60	16.5	R&E
	KK Broodstock	KK	11/3/99	494,968	26,402	09-27-59	13.9	R&E
				925,171	**206,987**			
1999	0.46#/ft^3, surface	YB	7/5/00	24,944	24,559	09-30-39	17.1	BPA
	0.46#/ft^3, subsurf.	YB	7/5/00	25,079	23,825	09-30-40	17.0	BPA
	0.23#/ft^3, subsurf.	YB	7/5/00	24,909	24,332	09-30-41	16.7	BPA
	0.27#/ft^3, surface	YB	7/5/00	24,983	24,442	09-30-42	14.3	BPA
	R&E	YB	7/5/00	54,013	22,269	09-30-43	15.7	R&E
	KK Broodstock	KK	8/21/00	50,409	13,787	09-30-48	20.4	R&E
	KK Broodstock	KK	8/21/00	50,650	13,853	09-30-48	17.2	R&E
	KK Broodstock	KK	8/24/00	51,600	LV only		21.2	R&E
	KK Broodstock	KK	8/24/00	50,124	LV only		18.8	R&E
	KK Broodstock	KK	9/25/00	51,040	LV only		15.7	R&E
	KK Broodstock	KK	9/25/00	51,274	LV only		15.7	R&E
	KK Broodstock	KK	9/26/00	51,832	LV only		15.7	R&E
	KK Broodstock	KK	9/26/00	51,563	27,277	09-30-49	15.7	R&E
				562,420	**174,344**			

continued

Table 2.2. (continued) Releases of Select Area Bright fall Chinook from lower Columbia River Select Area facilities, 1994 - 2007 brood years.

Brood Year	Study Group	Site	Release Date	Number Released	Number of CWTs	Tag Code	Release Size (#/lb)	Funding Agency[a]
2000	0.50#/ft^3, surface	YB	7/4/01	25,263	25,263	09-32-58	26.9	BPA
	0.50#/ft^3, subsurf.	YB	7/4/01	24,658	24,466	09-32-59	26.5	BPA
	0.25#/ft^3, subsurf.	YB	7/4/01	25,235	24,922	09-32-60	22.2	BPA
	0.25#/ft^3, surface	YB	7/4/01	25,221	24,809	09-32-61	20.2	BPA
	0.50#/ft^3, density	YB	7/4/01	104,768	23,987	09-32-62	24.4	R&E
	KK Broodstock	KK	8/23/01	49,309	26,898	09-33-12	19.3	R&E
	KK Broodstock	KK	8/23/01	49,259	LV only		18.3	R&E
	KK Broodstock	KK	8/24/01	49,890	LV only		18.7	R&E
	KK Broodstock	KK	8/24/01	49,850	LV only		19.3	R&E
	KK Broodstock	KK	9/20/01	471,605	27,000	09-33-13	16.9	R&E
				875,058	**177,345**			
2001	0.50#/ft^3, surface	YB	7/2/02	125,607	24,211	09-35-09	22.1	BPA
	0.50#/ft^3, subsurf.	YB	7/2/02	25,065	24,577	09-35-10	26.2	BPA
	0.25#/ft^3, subsurf.	YB	7/2/02	24,775	24,225	09-35-11	22.9	BPA
	0.25#/ft^3, surface	YB	7/2/02	126,448	24,853	09-35-12	22.8	BPA
	R&E	YB	7/2/02	165,161	24,602	09-35-13	27.0	R&E
	KK Broodstock	KK	8/1/02	203,853	26,608	09-35-33	36.8	R&E
	KK Broodstock	KK	8/22/02	416,674	21,587	09-35-32	23.1	R&E
				1,087,583	**170,663**			
2002	SAFE	YB	7/24/03	370,942	23,832	09-38-09	17.4	BPA
	R&E	YB	8/7/03	409,372	27,833	09-38-19	22.3	R&E
	KK Broodstock	KK	7/19/03	199,640	26,938	09-38-17	42.7	R&E
	KK Broodstock	KK	8/20/03	167,486	LV only		19.3	R&E
	KK Broodstock	KK	8/27/03	167,288	LV only		17.5	R&E
	KK Broodstock	KK	8/30/03	167,804	27,348	09-38-18	16.0	R&E
				1,482,532	**105,951**			
2003	Broodstock	SF	7/6/04	53,963		LV only	91.3	R&E[b]
	R&E	YB	7/15/04	147,467	25,327	09-39-55	16.5	R&E
	Production	YB	7/15/04	372,209	25,041	09-39-54	15.5	BPA
	KK Broodstock	KK	7/23/04	50,465	LV only		33.7	R&E
	KK Broodstock	KK	7/26/04	151,316	27,075	09-39-59	33.7	R&E
	KK Broodstock	KK	8/14/04	166,900	27,523	09-39-60	20.0	R&E
	KK Broodstock	KK	8/21/04	167,179	LV only		18.9	R&E
	KK Broodstock	KK	8/28/04	143,293	LV only		14.8	R&E
				1,252,792	**104,966**			

continued

Table 2.2. (continued) Releases of Select Area Bright fall Chinook from lower Columbia River Select Area facilities, 1994 - 2007 brood years.

Brood Year	Study Group	Site	Release Date	Number Released	Number of CWTs	Tag Code	Release Size (#/lb)	Funding Agency[a]
2004	Broodstock, AHS	SF	7/14/05	45,247	27,822	62-02-27	31.6	R&E
	Production	YB	7/18/05	101,987	24,971	09-39-48	15.4	BPA
	R&E	YB	7/18/05	59,250	24,909	09-39-49	13.4	R&E
	KK Broodstock	KK	8/5/05	202,285	29,012	07-05-46	31.5	R&E
	KK Broodstock	KK	8/20/05	177,836	29,420	09-21-01	21.2	R&E
	KK Broodstock	KK	8/27/05	174,838	LV only		17.6	R&E
	KK Broodstock	KK	9/6/05	180,107	LV only		16.6	R&E
				941,550	**136,134**			
2005	Production	YB	7/6/06	383,723	24,942	09-43-29	15.2	BPA
	R&E	YB	7/19/06	92,774	22,017	09-44-24	10.7	R&E
	Broodstock	SF	7/22/06	628,888	50,153	09-44-29	25.0	R&E/ODFW
				1,105,385	**97,112**			
2006	Production	YB	6/27/07	564,641	23,163	09-45-50	16.8	BPA
	Broodstock	SF	6/28/07	708,412	28,562	09-46-04	33.5	OR/FPC
				1,273,053	**51,725**			
2007	Production	YB	7/1/08	574,020	23,120	09-01-26	18.6	BPA
	Broodstock	SF	7/27/08	674,181	30,019	09-01-42	31.5	OR/FPC
				1,248,201	**53,139**			

[a] *BPA-Bonneville Power Administration; OR/FPC-Oregon Department of Fish and Wildlife (ODFW) and Fishermen Poundage Contributions; R&E-ODFW; PSMFC-Pacific States Marine Fisheries Commission; AHS-Astoria High School cooperative marking*

[b] *Early release due to disease*

Table 2.3. Releases of lower Columbia River early stock coho from Select Area facilities, 1993 - 2006 brood years.

Brood Year	Release Date	Release Site[a]	Number Released	Number of CWTs	Tag Code[b]	Release Size (#/lb)	Funding Agency[c] and Study
1993	5/11/95	YB	138,371	29,172	07-15-44	7.8	BPA / site comparison
	5/12/95	BS	140,267	26,258	07-15-45	8.9	BPA / site comparison
	5/12/95	TG	130,623	26,426	07-53-29	8.7	BPA / site comparison
	5/12/95	DR	201,200	30,751	63-54-44	8.1	BPA / site comparison
	4/10/95	SFK	433,674	23,160	07-03-56	10.5	OR/FPC
	4/17-18/95	YB	822,185	25,886	07-07-58	9.7	Mitchell
	5/1-8/95	YB	467,531	22,545	07-07-43	12.6	R&E / acclimation
	5/15/95	YB	280,412	22,057	07-07-44	12.6	R&E / acclimation
			2,614,263	**206,255**			
1994	5/7/96	YB	216,187	26,274	07-12-22	9.5	BPA / site comparison
	5/6/96	BS	209,761	24,942	07-59-01	9.0	BPA / site comparison
	5/6/96	TG	190,032	23,942	07-12-41	8.4	BPA / site comparison
	5/7/96	DR	200,100	28,406	63-57-39	9.7	BPA / site comparison
	4/14/96	SFK	443,183	25,979	07-09-25	10.7	OR/FPC
	4/15/96	YB	808,263	28,299	07-12-42	11.7	Mitchell
	4/26/96	YB	829,600	26,933	07-09-61	9.6	Mitchell
	5/20/96	YB	341,339	22,104	07-12-23	11.3	R&E / acclimation
	5/28/96	YB	295,512	26,418	07-11-36	11.2	Mitchell
			3,533,977	**233,297**			
1995	5/5/97	YB	146,818	27,360	07-09-42	13.2	BPA / site comparison
	5/5/97	BS	196,963	25,195	09-18-18	14.4	BPA / site comparison
	5/5/97	TG	430,221	26,223	07-13-36	13.9	BPA / site comparison
	5/12/97	YB	633,310	26,703	07-13-35	14.5	Mitchell
	5/12/97	SFK	621,932	28,284	09-18-24	12.7	OR/FPC
			2,029,244	**133,765**			
1996	5/1/98	YB	133,373	26,677	09-23-02	10.4	BPA / site comparison
	5/1/98	BS	144,958	25,570	09-23-05	11.4	BPA / site comparison
	5/1/98	TG	119,611	18,641	09-23-06	11.2	BPA / site comparison
	4/23/98	DR	208,350	29,717	63-62-47	10.6	BPA / site comparison
	4/29/98	SFK	550,427	27,321	09-23-21	16.8	OR/FPC
	5/1/98	YB	268,870	52,510	05-37-32	12.2	R&E / acclimation
	5/1/98	YB	261,654	50,604	05-37-33	12.2	R&E / acclimation
	5/26/98	YB	425,634	29,525	09-23-36	13.3	Mitchell / acclimation
	5/26/98	YB	30,101	29,990	09-23-38	13.3	Mitchell /acclim/d.index
			2,142,978	**290,555**			

continued

Table 2.3. (continued) Releases of lower Columbia River early stock coho from Select Area facilities, 1993 - 2006 brood years.

Brood Year	Release Date	Release Site[a]	Number Released	Number of CWTs	Tag Code[b]	Release Size (#/lb)	Funding Agency[c] and Study
1997	4/12/99	YB	663,012	27,123	09-24-22	13.9	Mitchell
	4/28/99	YB	158,203	28,809	09-23-34	11.9	BPA / site comparison
	4/28/99	BS	197,089	26,256	09-25-28	11.3	BPA / site comparison
	4/28/99	TG	204,143	26,431	09-25-29	11.4	BPA / site comparison
	5/13/99	DR	203,284	25,003	63-05-30	11.4	BPA / site comparison
	5/13/99	DR	210,824	24,563	63-05-31	13.0	BPA / site comparison
	5/5/99	SS	210,530	24,248	63-05-32	10.4	BPA / site comparison
	4/21/99	SFK	429,652	19,730	09-24-28	13.3	OR/FPC
	5/5/99	YB	502,146	24,963	05-39-47	12.5	R&E / acclimation
	5/19/99	YB	479,662	24,974	05-39-46	11.8	R&E / acclim/d.index
	6/1/99	YB	272,656	26,215	09-26-43	13.4	Mitchell / acclimation
	6/1/99	YB	26,894	26,841	09-26-56	13.4	Mitchell /acclim/d.index
			3,558,095	**305,156**			
1998	5/4/00	YB	206,377	24,490	09-29-14	11.9	BPA / site comparison
	5/4/00	BS	195,645	24,624	09-29-12	11.5	BPA / site comparison
	5/4/00	TG	228,290	24,774	09-29-13	10.8	BPA / site comparison
	5/3/00	DR	217,732	25,774	63-12-01	11.8	BPA / site comparison
	5/4/00	DR	213,411	29,697	63-12-02	11.3	BPA / site comparison
	4/24/00	SS	191,543	29,937	63-11-17	11.2	BPA / site comparison
	4/12/00	YB	836,845	26,244	09-27-16	15.7	Mitchell
	5/1-8/00	SFK	610,658	25,514	09-27-30	12.8	OR/FPC
	5/11/00	TG	525,833	26,176	09-27-49	13.5	Mitchell
	5/25/00	YB	27,138	27,086	09-25-40	13.6	Mitchell /acclim/d.index
	5/25/00	YB	272,992	26,806	09-27-29	13.6	Mitchell / acclimation
	5/31/00	YB	476,148	21,731	05-39-48	15.9	R&E / acclimation
			4,002,612	**312,853**			
1999	5/14/01	YB	502,077	22,577	05-01-91	14.2	R&E / acclimation
	4/10/01	YB	808,735	26,482	09-30-06	15.6	Mitchell
	4/16/01	YB	234,032	26,011	09-31-61	14.0	BPA / control
	4/17/01	YB	179,187	26,592	09-31-59	14.7	BPA / towed
	5/07/01	SFK	344,738	26,276	09-30-13	12.5	OR/FPC
	5/24/01	BS	274,257	26,969	09-32-20	15.5	Mitchell / acclimation
	5/24/01	BS	25,154	25,104	09-32-22	15.5	Mitchell /acclim/d.index
	5/31/01	TG	482,414	25,055	05-49-08	15.3	R&E / acclimation
	4/16/01	TG	173,199	21,854	09-31-60	13.2	BPA / site comparison
	5/09/01	DR	166,087	22,468	63-03-75	12.0	BPA / site comparison
	5/09/01	DR	229,250	24,062	63-03-76	12.0	BPA / site comparison
	5/01/01	SS	208,966	29,800	63-03-69	12.0	BPA / site comparison
			3,628,096	**303,250**			

continued

Table 2.3. (continued) Releases of lower Columbia River early stock coho from Select Area facilities, 1993 - 2006 brood years.

Brood Year	Release Date	Release Site[a]	Number Released	Number of CWTs	Tag Code[b]	Release Size (#/lb)	Funding Agency[c] and Study
2000	5/06/02	YB	482,657	24,632	05-42-50	14.1	R&E / acclimation
	4/12/02	YB	837,201	26,545	09-30-15	13.0	Mitchell
	5/05/02	YB	177,730	24,555	09-33-39	11.9	BPA / towed
	5/03/02	YB	191,108	22,937	09-33-40	12.0	BPA / control
	5/07/02	BS	315,988	26,896	09-33-52	13.8	Mitchell / acclimation
	5/07/02	BS	27,854	27,798	09-33-56	13.8	Mitchell /acclim/d.index
	5/07/02	SFK	583,248	24,285	09-33-57	11.4	OR/FPC
	5/16/02	TG	488,866	28,068	05-42-54	14.4	R&E / acclimation
	4/25/02	TG	178,892	23,726	09-33-41	14.6	BPA / site comparison
	5/16/02	DR	229,501	24,940	63-06-64	12.0	BPA / site comparison
	5/16/02	DR	125,056	25,359	63-10-82	9.4	BPA / site comparison
	5/01/02	SS	158,598	20,585	63-07-64	12.0	BPA / site comparison
			3,796,699	**300,326**			
2001	5/08/03	YB	512,549	23,482	05-47-60	12.6	R&E / acclimation
	4/10/03	YB	844,653	27,009	09-19-32	11.7	Mitchell
	5/09/03	YB	158,476	25,201	09-36-10	10.4	BPA / control
	5/10/03	YB	171,033	27,004	09-36-11	10.3	BPA / towed
	5/07/03	BS	161,222	26,940	09-34-61	13.0	Mitchell / acclimation
	5/07/03	BS	155,582	26,452	09-36-38	13.0	Mitchell /acclim/d.index
	4/28/03	SFK	641,555	26,035	09-34-60	12.0	OR/FPC
	5/22/03	TG	477,918	23,396	05-47-59	12.8	R&E / acclimation
	4/24/03	TG	197,794	25,439	09-36-12	10.0	BPA / site comparison
	4/30/03	DR	129,545	24,506	63-15-19	12.0	BPA / site comparison
	4/30/03	DR	236,890	25,652	63-15-20	12.0	BPA / site comparison
	5/05/03	SS	239,635	29,747	63-11-74	12.0	BPA / site comparison
			3,926,852	**310,863**			

continued

Table 2.3. (continued) Releases of lower Columbia River early stock coho from Select Area facilities, 1993 - 2006 brood years.

Brood Year	Release Date	Release Site[a]	Number Released	Number of CWTs	Tag Code[b]	Release Size (#/lb)	Funding Agency[c] and Study
2002	4/6/04	TGM	186,520	24,770	09-38-62	13.0	BPA / site comparison
	4/9/04	YB	758,997	24,155	09-37-27	11.6	Mitchell
	4/28/04	YB	361,078	23,546	09-38-63	11.4	BPA / towed
	4/28/04	BS	298,748	26,809	09-37-32	14.4	Sandy acclimation
	4/28/04	TGM	511,002	24,747	05-37-25	13.7	R&E / acclimation
	4/29/04	YB	350,839	22,364	05-37-24	12.4	R&E / acclimation
	5/1/04	DR	152,780	24,900	63-20-72	14.0	BPA / site comparison
	5/1/04	DR	204,420	25,100	63-20-77	13.0	BPA / site comparison
	4/26/04	SS	204,600	30,000	63-20-67	13.0	BPA / site comparison
			3,028,984	**226,391**			
2003	4/6/05	YB	723,793	28,007	09-39-44	15.4	Mitchell
	5/1/05	DR	144,900	20,200	63-22-94	11.0	BPA / site comparison
	5/2/05	YB	422,275	26,855	09-39-46	15.2	BPA / towed
	5/3/05	BS	309,527	26,390	09-41-14	14.5	Sandy acclimation
	5/4/05	TGM	202,727	25,179	09-39-45	15.9	BPA / site comparison
			1,803,222	**125,632**			
2004	4/10/06	YB	744,274	25,212	09-20-44	12.7	Mitchell
	4/21/06	TG	194,442	28,948	09-42-41	9.10	BPA
	4/24/06	YB	381,335	28,092	09-42-42	10.5	BPA
	5/1/06	DR	201,300	28,534	63-26-97	12.3	BPA
	5/3/06	BS	305,573	24,189	09-43-06	13.8	Mitchell
			1,826,924	**134,975**			
2005	4/19/07	TG	174,547	28,031	09-43-30	12.6	BPA
	4/23/07	YB	385,825	28,566	09-43-31	12.0	BPA
	4/25/07	YB	771,921	25,960	09-44-55	12.0	Mitchell
	4/26/07	BS	304,558	26,069	09-45-01	15.1	Sandy acclimation
	5/1/07	DR	420,000	29,500	63-37-64	13.0	BPA
			2,056,851	**138,126**			
2006	4/15/08	TG	597,754	28,574	09-46-23	12.0	BPA
	4/28/08	SFK	115,763	27,615	09-39-34	10.6	Salmon River
	4/28/08	SFK	115,763	30,185	09-45-14	10.6	Salmon River
	4/28/08	SFK	50,675	3,264	09-36-26	10.6	BPA (part of KK group)
	5/1/08	DR	368,000	33,684	63-41-78	15.5	BPA
	5/1/08	BS	310,133	27,851	09-46-35	13.9	Sandy acclimation
	5/7/08	YB	768,960	27,365	09-46-31	13.0	Mitchell
	5/10/08	KK	232,455	19,742	09-36-26	12.0	BPA
			2,559,503	**198,280**			

[a] *BS=Blind Slough, DR=Deep River, KK=North Fork Klaskanine, SFK=South Fork Klaskanine, SS=Steamboat Slough,TG=Tongue Point, TGM=Tongue Point MERTS, YB=Youngs Bay*

[b] *Tag codes funded by Bonneville Power Administration representing production releases for each site that were used for year/site survival and straying analyses*

[c] *BPA-Bonneville Power Administration; OR/FPC-Oregon Department of Fish and Wildlife (ODFW) and Fishermen Poundage Contributions; R&E-ODFW Restoration and Enhancement Program; Mitchell-Mitchell Act Funds. Double index (d.index)*

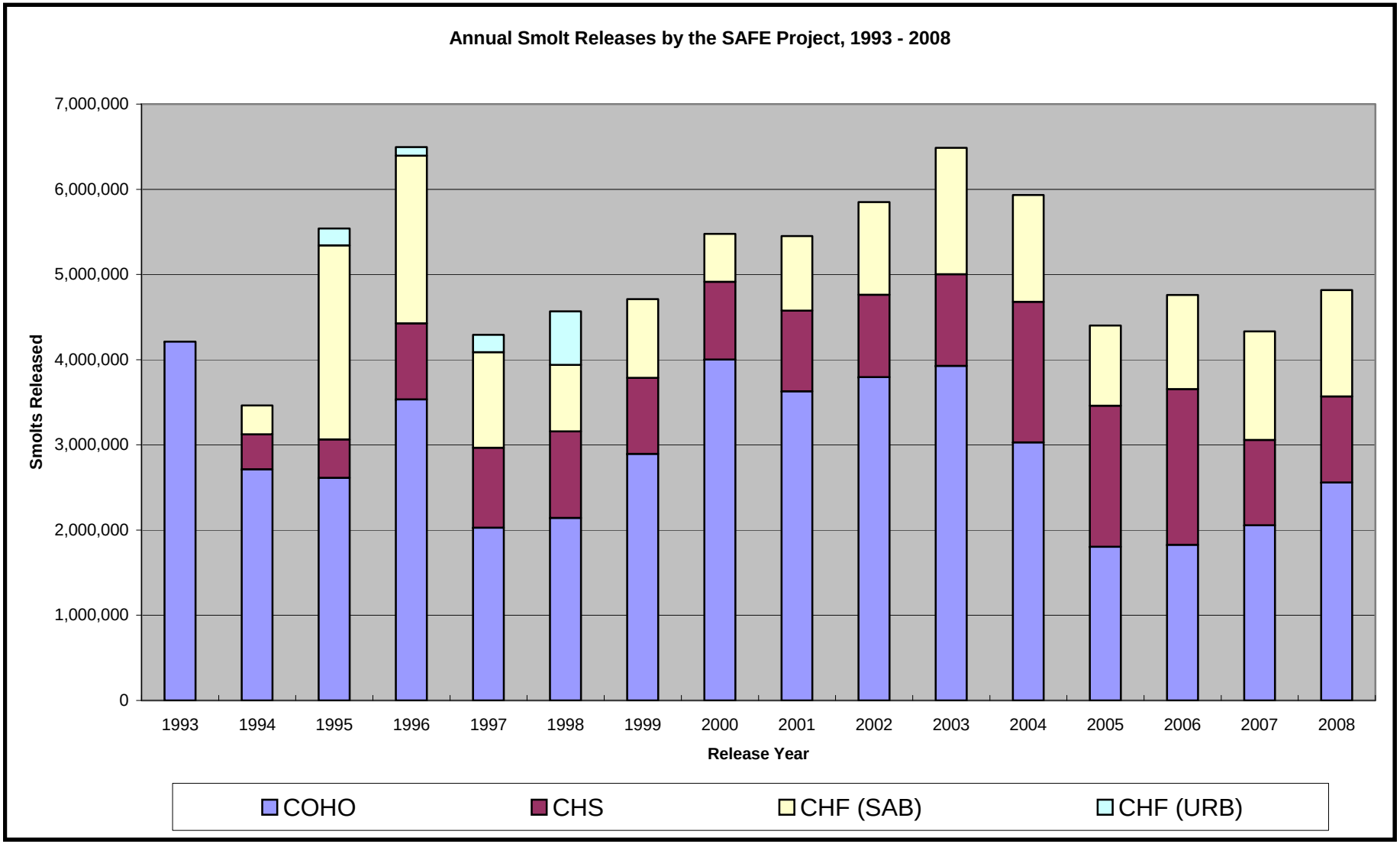


Figure 2.1. SAFE annual smolt releases, 1993 - 2008.

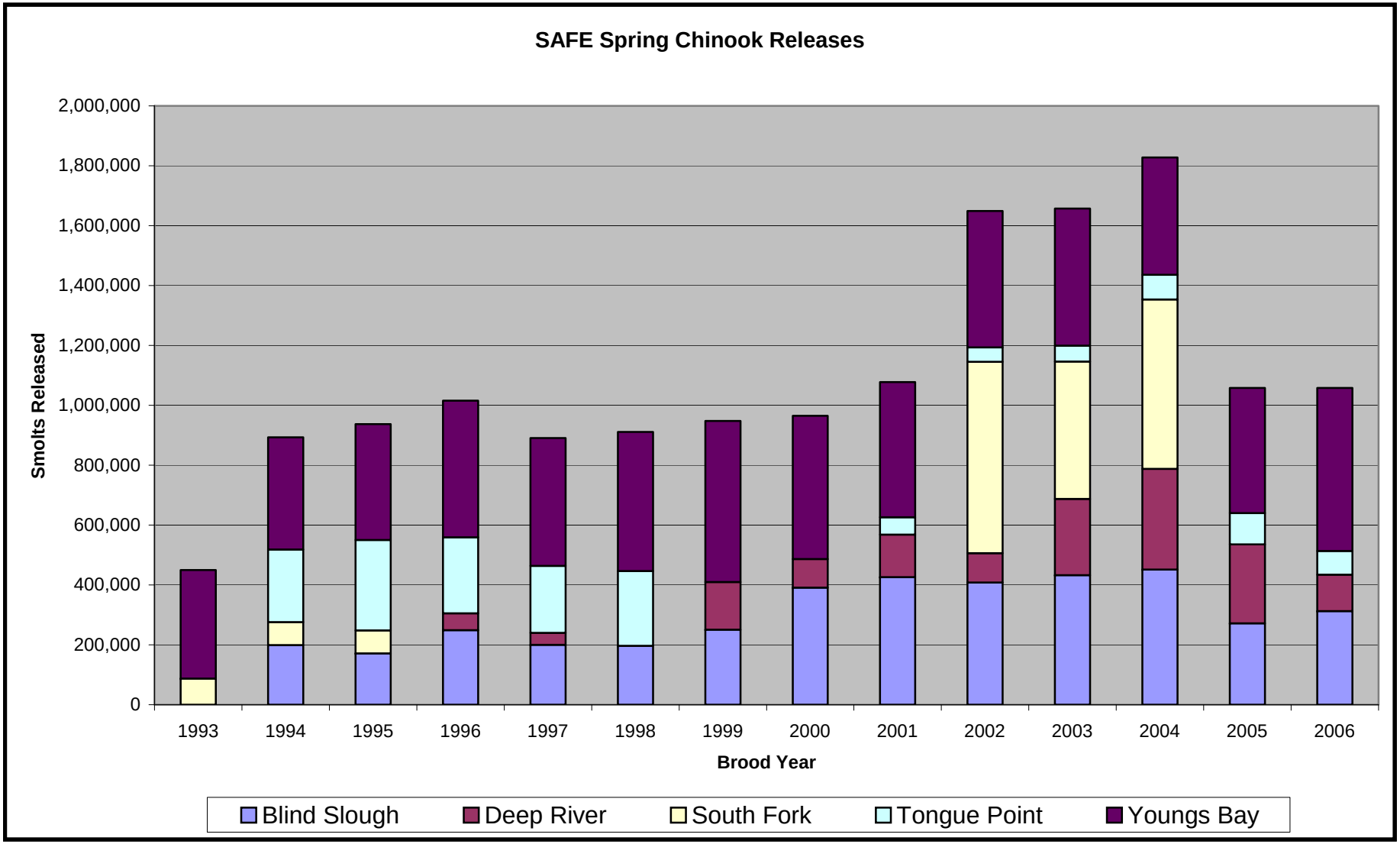


Figure 2.2. SAFE spring Chinook releases, brood years 1993 - 2006.

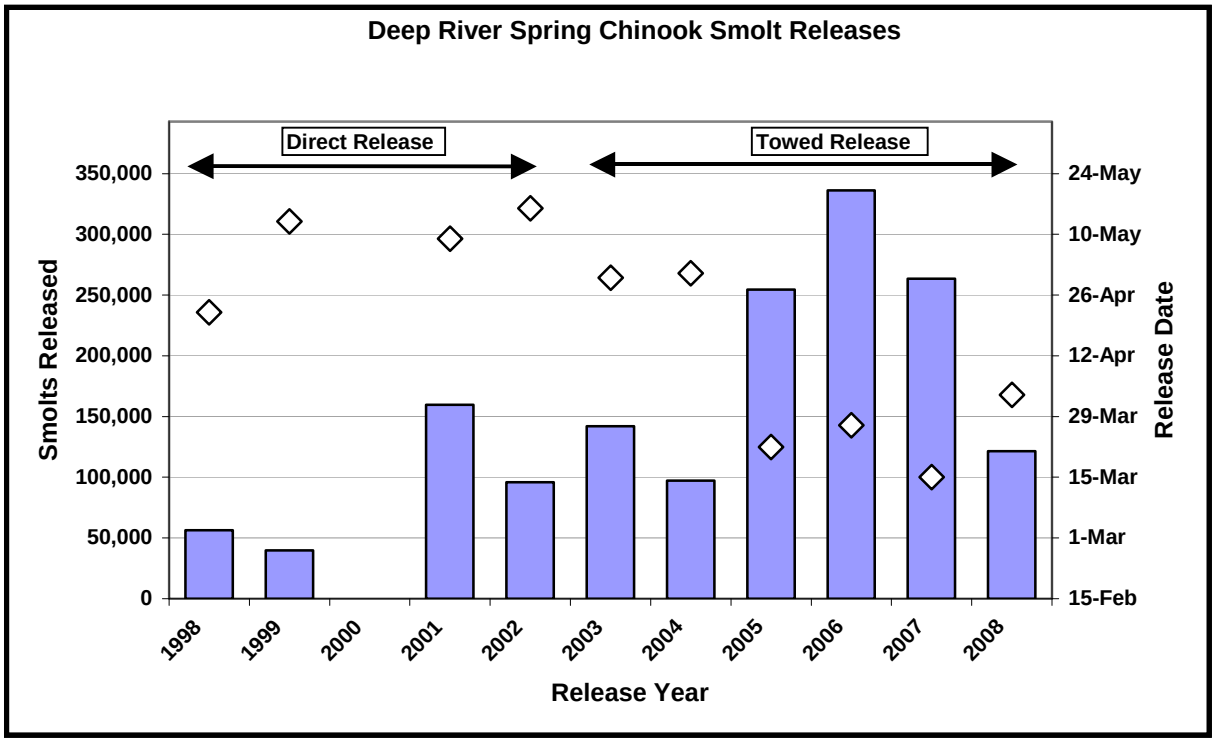


Figure 2.3. Numbers (bars) and date of release (diamonds) of spring Chinook smolts released from Deep River SAFE net pens from 1998 through 2008 (1996-2006 brood years).

Figure 2.4. Hatchery manager adjusting OG20® concentrator.

Figure 2.5. Low head oxygen (LHO) system at Gnat Creek Hatchery.

Figure 2.6. LHO in place with perforation plate for diffusing incoming water.

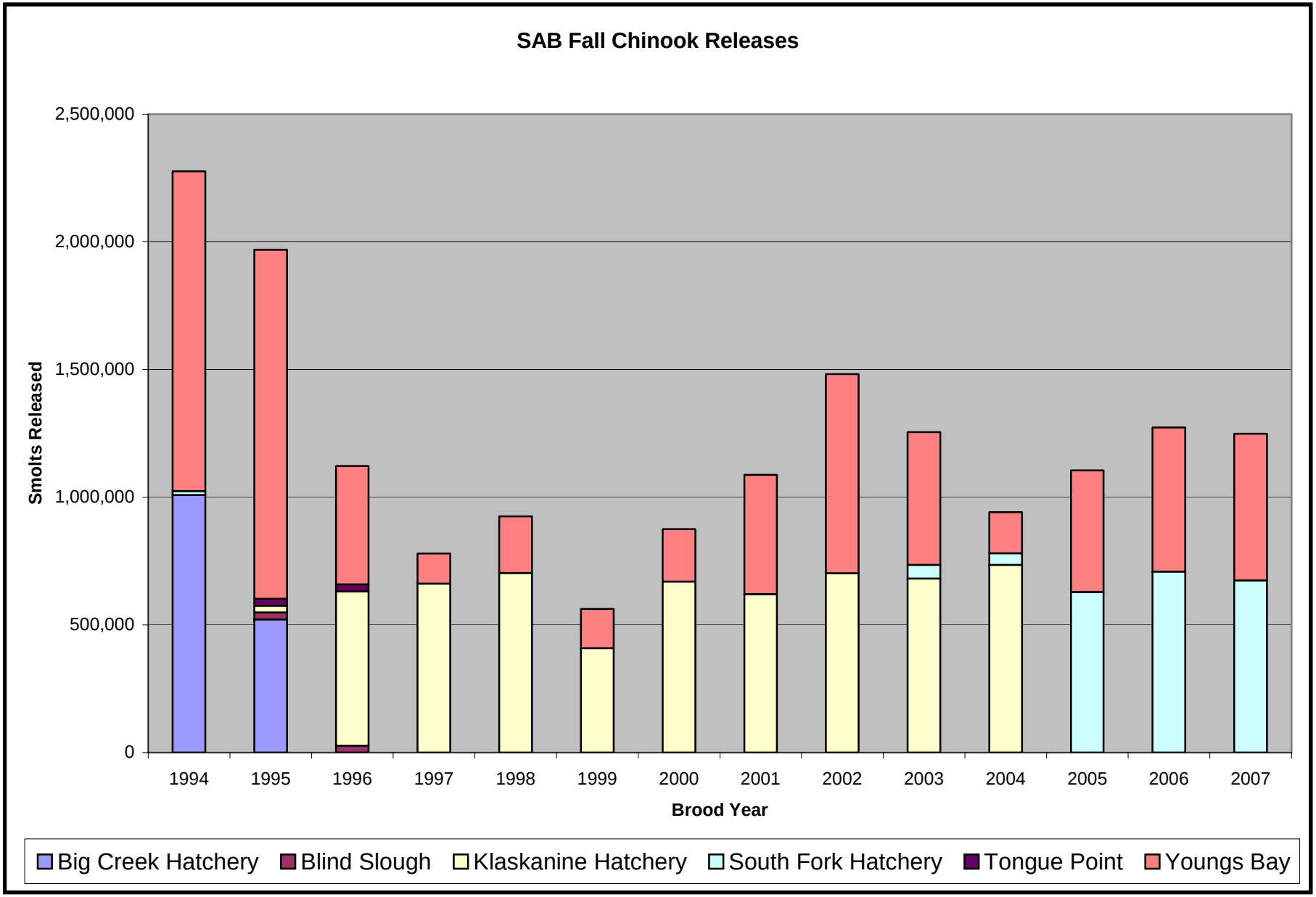


Figure 2.7. SAFE SAB fall Chinook releases, brood years 1994 - 2007.

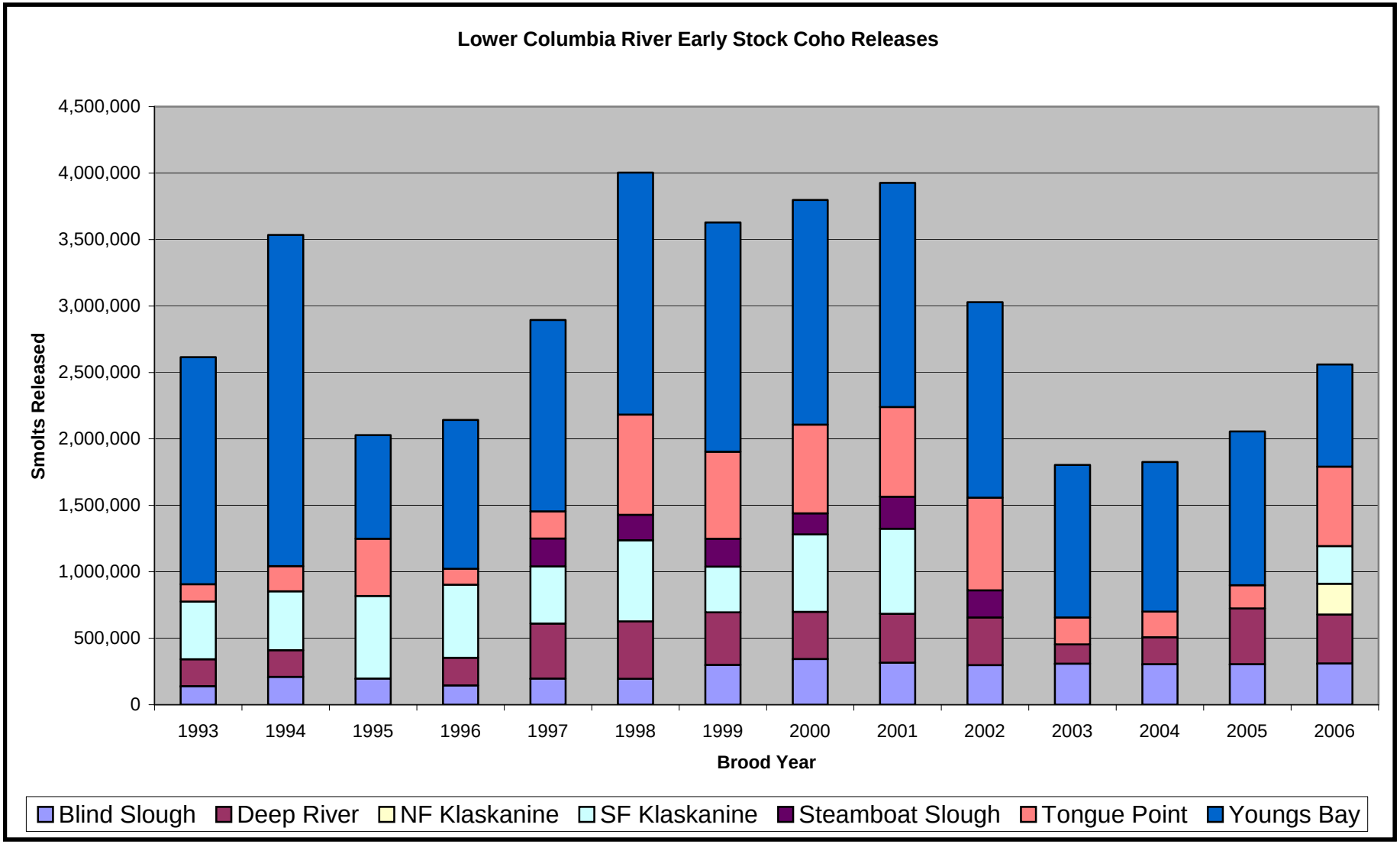


Figure 2.8. SAFE releases of lower Columbia River early stock coho, brood years 1993 - 2006.

3. HARVEST: FISHERIES AND SEASONS

RUN-SIZE FORCASTS

During December through February each year, ODFW, WDFW, and the Technical Advisory Committee (TAC) collaborate to produce formal forecasts for the expected return of salmonid stocks to the Columbia River. These run-size predictions are incorporated into regional pre-season fishery planning processes and used to estimate in-season fishery impacts to ESA-listed stocks based on catch estimates for each stock. Return forecasts of SAFE-produced salmon are developed independently by project staff and then incorporated into the Columbia River estimate. TAC will update Columbia River run sizes in-season to ensure proper management of ESA listed stocks, but returns to Select Areas are not formally updated in-season.

Methodology used to forecast adult returns of SAFE-project salmon has been refined as the dataset of smolt-to-adult survival, cohort reconstruction, and fishery contribution increases. This report describes methods used since 2007 to predict the adult abundance of SAFE-produced salmon. For run-size forecasting methods used prior to 2007, refer to North et al. (2006). See Figures 3.1 - 3.3 for a comparison of forecasted and actual returns for Select Area and mainstem Columbia River salmonid returns.

Spring Chinook

Two estimates relating to spring Chinook are produced in January of each year; the number of SAFE-origin spring Chinook returning to Select Area fishing sites and total expected harvest of Chinook in Select Area winter/spring/summer commercial fisheries. The latter estimate includes harvest of non-local stocks. The harvest estimate and a range is provided to fishery managers for use in Columbia River fisheries planning.

For each release site, the number of 4-year old and 5-year old returning adults is estimated based on the smolt release for the appropriate brood year multiplied by a recruitment rate. The recruitment rate is an average of the specific release site cohort reconstruction return/harvest rate by age; brood years 1996 – 2003 were used to develop the rate used for the 2007 and 2008 forecasts. The age-4 and -5 harvest prediction is summed by Select Area location to produce fishery specific estimates and summed further for a total SAFE-stock Select Area harvest prediction. Prior to 2008, the recruitment rate described above was used to predict both age-4s and -5s. Due to an unexpected failure of the 2003 brood, manifested as a lower than expected number of age-4s in 2007, a linear regression model (using brood years 1996 – 2002 SAFE data: $y=0.8224x$, $r^2=0.4032$) was used to estimate the 2008 age-5 component of this brood. This technique led to further analysis of the spring Chinook forecasting method. A new model for forecasting the age-5 component has been developed and will be reported on in the FY09 annual report.

The second estimate made annually, the site-specific Select Area commercial fishery harvest estimate, is based on the return prediction described above, expanded to account for expected harvest of non-local stocks using the 2004 – 2007 average (Youngs Bay – 13.8%, Blind Slough – 3.6%). These years were selected because there appears to be a significant change in the proportion of non-local stocks (likely due to adaptive management and increased knowledge of the fisheries) since 2003 (e.g. 2000-03 Youngs Bay harvest averaged 25.7% non-local stocks). The same shift has been observed in the Blind Slough/Knappa Slough commercial fishery (2000-03 averaged 10.5% non-local). The harvest estimate is presented as a point estimate and range. The point estimate is the harvest estimate as described above, the lower bound of

the range is the SAFE-stock only forecast and the upper bound is an estimation of the maximum number of non-local stocks expected (Willamette and upriver spring Chinook based on allowable impact rates, others based on historical averages).

Select Area Bright Fall Chinook

Since SABs and coho from SAFE releases are subject to ocean fisheries, the ocean abundance of returning adults from these stocks is estimated and provided to fishery managers for use in regional fisheries management processes (e.g. PFMC Ocean Salmon Management Process, North of Falcon public meetings). Essentially three estimates are made annually; ocean abundance, Columbia River mouth return, and return to Select Area commercial fisheries. Ocean abundance for three adult age classes (3,4,5) of returning SABs is estimated, since these three age classes make up nearly 90% of the SAB return (based on 1995-03 returns, WDFW unpublished data).

Release-site-specific (net-pen and broodstock hatchery) estimates for each of the three major adult age classes are made by multiplying the number of smolts released by stratified average smolt-to-adult survival rates (using brood years 1995-00). This estimate is then multiplied by the average percent contribution of that age class to the total return based on return years 1995-03 (WDFW unpublished data). Estimates for each age class are summed by release site, then summed to obtain total ocean abundance of returning adults for the given return year. To estimate Columbia River mouth return, site-specific estimates are apportioned to categories of final destination (harvest and escapement) based on 1998-00 CWT recoveries (see Run Reconstruction chapter for detail). Expected ocean harvest is subtracted out to develop the Columbia River mouth estimate. The same apportioning process used to estimate ocean contribution is used to estimate the total return to Select Area commercial fisheries.

Coho

The adult return forecast of SAFE-origin coho is estimated much like the SAB forecast. Three estimates are produced; ocean abundance and Columbia River mouth estimates are provided for regional fisheries management purposes. Coho estimation is simpler than SAB since only one age class of returning adults is predominant. Release-site-specific smolt releases are multiplied by the average SARs (1993-02 brood years) then the estimate is apportioned to fisheries based on CWT recoveries from the 1998-02 return years. The fishery and escapement specific estimates are used to estimate Columbia River mouth return (by subtracting estimated ocean harvest) and Select Area commercial harvest (by subtracting mainstem Columbia River harvest and escapement).

FISHERY MANAGEMENT: SEASON SETTING AND IN-SEASON MANAGEMENT

All fisheries in the Columbia River are established within the guidelines and constraints of the current *U.S. v Oregon* Management Agreement, the ESA, and other management agreements or accords negotiated between the parties to *U.S. v. Oregon* or management entities. Initial season design and management guidelines for Columbia River non-Treaty fisheries, including Select Areas, are established through the Biological Assessment/Opinion and Compact/Joint State hearing processes in accordance with the aforementioned agreements and ESA requirements.

Biological Assessments are prepared by the TAC in advance of intended fisheries and submitted to NOAA Fisheries for review. These documents outline predicted harvest impacts on federally-listed species and measures that will be taken to minimize these impacts. A

Biological Opinion (BO) is then issued by NOAA with a determination regarding the likelihood that the proposed fisheries will jeopardize recovery of listed stocks. The BO outlines management guidelines for the proposed fisheries including "take" limitations and other management concerns the states should address while executing the fisheries. Fisheries reported on in this document (fall 2006 – summer 2008) were covered by the interim Management Agreement and the 2008 – 2017 U.S. v Oregon Management Agreement. Consultation with NOAA Fisheries regarding the 2008 – 2017 U.S. v Oregon Management Agreement resulted in a BO dated May 5, 2008 (NMFS 2008) with a finding of no significant impact (FONSI) for all activities described in the Management Agreement (including Select Area fisheries and test fishing research).

The Columbia River Compact is an agreement ratified by the U.S. Congress in 1918 covering concurrent jurisdiction of Columbia River commercial fisheries. The Compact is comprised of the Washington Fish and Wildlife Commission (WFWC) of WDFW and the Oregon Fish and Wildlife Commission (OFWC) of ODFW. In recent years, the two commissions have delegated Compact decision-making authority to the agency's director or the director's designee. Seasons for concurrent waters, of which some Select Area fisheries are included, are established by the Compact. Select Area commercial seasons occurring in state waters and all recreational seasons and regulations are established by the regulating state.

When addressing commercial seasons for Columbia River fisheries, the Compact must consider the effect of the commercial fishery on escapement, treaty rights, and the impact on species listed under the ESA. Working together under the Compact, the states have the responsibility to address the allocation of limited resources between recreational, commercial, and treaty Indian fishers. This responsibility has become increasingly demanding in recent years. The states maintain a conservative management approach when considering Columbia River fisheries that will affect species listed under the ESA.

Each year, pertinent management constraints and information on historic and predicted run sizes and past and projected fisheries are summarized by agency staff and distributed to management agencies, TAC, tribes, and the public. These Joint Staff Reports are distributed three times each year in advance of anticipated seasons. One report is dedicated to sturgeon and smelt, one to spring and summer runs and fisheries, and one for fall runs and fisheries. For Select Area fisheries, annual public meetings to solicit community input regarding commercial and recreational season recommendations are held in Astoria, Oregon in January of each year for spring fisheries and in June for fall fisheries. Subsequent Fact Sheets are then prepared and distributed by staff in advance of all Compact/Joint State Hearings whereby mainstem Columbia River and Select Area fisheries are set. In recent years, these major Compact hearings have occurred in December, January/February, and July; however, hearings are held multiple times throughout the year to make in-season modifications to various Columbia River fisheries. The Fact Sheets detail specific season recommendations and regulations based on fishery objectives, management guidelines and agreements, and public and industry input. Agency staff present the information from the Fact Sheets at the Compact/Joint State hearings. Public testimony (often including Treaty, recreational, and commercial fishers) regarding the recommended seasons is taken along with input from treaty and non-treaty tribes, NOAA, USFWS, Idaho Fish and Game (IFG), and the TAC. The Compact representatives use this testimony and information from the Fact Sheets to weigh the risks and benefits of the proposed seasons and make final rulings based on their joint decision. Adopted seasons and regulations are announced in a Compact, Joint State, or State Action notice following each hearing and distributed via the Agency websites, email and fax distribution lists, and telephone hotlines. Joint Staff Reports, Compact Fact Sheets, and Compact Action Notices are available on both agencies' websites:

(ODFW: http://www.dfw.state.or.us/fish/OSCRP/CRM/index.asp,
WDFW: http://wdfw.wa.gov/fish/crc/crcindex.htm). ODFW also maintains a telephone hotline with current fishing seasons and fishery actions: (971) 673-6000.

To ensure impacts to ESA-listed stocks resulting from Select Area fisheries remain within management guidelines, fish run sizes and stock specific harvest are tracked in-season and regulations and fishing periods are adjusted, if necessary. Run-size estimates for mainstem Columbia River stocks are updated by the TAC regularly throughout the adult run based on passage updates at Bonneville Dam and other data. In-season landings for Select Area fisheries are estimated immediately following each fishing period through phone surveys (see Fishery Monitoring, In-Season section for details). Impact rates are tracked continuously by staff as new information becomes available. Whenever additional fishing opportunity is considered or in-season management action is required to reduce impacts to listed stocks, a Compact or Joint State hearing is scheduled and an associated Fact Sheet is prepared summarizing any new information and suggested management actions. The entire process is extremely intensive and responsive with over 50 Compact/Joint State hearings occurring annually in recent years, and multiple hearings weekly are not uncommon during winter/spring and fall seasons. This level of management is not necessarily needed for Select Area fisheries due to relatively minor impacts to ESA-listed stocks. However, since Select Area fisheries are managed in concert with mainstem fisheries and utilize some of the non-Treaty allowable impacts, they have been subject to frequent review and management action as needed to account for results of mainstem fisheries.

Project staff and fishery managers try to be flexible in-season about taking advantage of opportunity to add additional time or area (within existing Select Area boundaries) when possible and requested by fishers. Staff weigh the risks associated with any modification, present recommendations, if appropriate, at a scheduled Compact hearing, and a decision is made based on the risk and public testimony.

FISHERY MONITORING: ESTIMATION OF HARVEST AND STOCK & AGE COMPOSITION

In-Season Monitoring

Select Area fisheries are monitored extensively to ensure adequate representation of the catch and to determine impacts to non-local stocks based on in-season updates of mainstem salmon and steelhead returns. The ODFW and the WDFW are responsible for both sampling to collect biological data and for analyzing data to estimate harvest in their respective Select Area fisheries. The catch from all Select Area fisheries is sampled for the recovery of CWTs using electronic detection and for additional biological information. Each Select Area fishing site is monitored independently to account for variability in total catch, species, stock, and age composition within each fishery. Funding for fishery sampling is provided by BPA through the SAFE project (BPA #1993-06000) in Oregon and Washington and also by the coded-wire tag recovery project (BPA Project #1982-01301) in Oregon and Washington.

Commercial Fisheries

Sampling of catch from Select Area commercial fisheries is conducted by ODFW and WDFW field staff at the various buying stations at the time of landing. A two-part sampling strategy is employed to collect the data necessary for managing the fisheries in-season and analyzing the fisheries post-season. A subset of the catch is sampled for presence of fin marks and CWTs (mark sampling); a subset of the mark sampled population is randomly sampled for biological data (bio-sampling). Data collected from mark sampled fish exhibiting a fin mark or CWT

includes species, stock, sex, length, and fin mark. The CWT and scale samples are collected at this time also. The same data are collected on bio-sampled fish with the addition of the individual fish's weight in pounds. All snouts potentially containing CWTs are delivered to the tag recovery lab in Clackamas, Oregon where the CWT is extracted and decoded. The resulting tag code is entered and verified on a mainframe computer where it is accessible to fisheries management staff.

Minimum target mark sampling rates are 20% of the landed catch by species, area, and season; however, sampling rates are usually significantly higher. Twenty percent is the minimum needed to determine stock composition in fisheries (PSC 2005). During 2001 – 2007, over 146,000 (31%) of all salmon harvested in Select Area fisheries were examined for fin marks (see Table 3.1 for season and year specific mark sampling rates). Coded-wire tag data is used primarily to determine survival rates and stock composition of the landed catch and not to estimate numbers of harvested fish. Average bio-sampling rates during 2003 – 2007 exceeded 25% for Select Area winter, spring, and summer fisheries but tend to be lower for fall fisheries due to higher volume of fish landed (TAC 2008). It is important to note that biological sampling rates associated with Select Area fisheries are generally higher than mainstem Columbia fisheries.

Stratified harvest estimates of all commercial catch in Washington and Oregon are calculated using data from fish tickets[†] completed at the time of sale and data from the biological sampling described above. All licensed fish buyers report total landings in pounds (round weight) stratified by species, fishing period, and fishing zone. For purposes of in-season management, ODFW staff conduct phone surveys of key buyers within hours of the close of a fishing period (or weekly for extended seasons such as fall); WDFW relies on reporting by buyers via their "Quick Report" system. Average weights from bio-sampling are applied to the total landings poundage to estimate total number of fish landed. This method of harvest estimation is used in mainstem Columbia River commercial fisheries as well as Select Area fisheries therefore we are confident that the method is appropriate.

Preliminary landings are summarized in-season by statistical week based on phone surveys of buyers and processors and made available to the public via ODFW's website at http://www.dfw.state.or.us/fish/OSCRP/CRM/comm_fishery_updates.asp. Landings are confirmed and refined as necessary when copies of fish tickets are available. For purposes of in-season management, coded-wire tag and visual stock identification (VSI; spring Chinook) data is analyzed to determine stock compositions of fish landed in each Select Area fishery. Stock compositions are then applied to total landing estimates to produce stock-specific catch estimates. Stock-specific catch estimates for fisheries are monitored in conjunction with in-season run size updates to maintain fisheries within ESA guidelines.

Recreational Fisheries

Prior to 2006, a creel census program was used to estimate sport catch in the Select Areas in response to increased sport fishing effort. Refer to North et al. (2006) for further information.

[†] Fish tickets are legal documents required by the States to document the landing and sale of fish. Every landing must be recorded on a fish ticket; information required to be recorded on the fish ticket includes fisher name, commercial license number, a unique ticket number, gear type, the catch area, and the number and pounds landed by species. For further information on fish tickets, landing, and transportation refer to Oregon Administrative Rules 635-006-0210/0212 (fish tickets), 635-006-0165 (transportation). Oregon Revised Statue 509.070 addresses fish quality. Washington Administrative Code 220-69-240 details fish ticket reporting (section 1) and Quick Reporting requirements (section 12, d).

Since 2006, due to minimal recreational effort and reduction in available resources very limited creel sampling has occurred. Participation in Select Area recreational fisheries has dropped off recently with increased opportunity available in the mainstem Columbia River. When possible, the recreational catch is sampled to collect biological information, recover CWTs, and determine stock composition. Scales are collected to determine age structure of the kept catch. SAFE staff monitor the fishery by sampling occasionally and obtaining anecdotal information from local fishers and hatcheries. The fall fishery in Youngs Bay watershed tidewater has been more consistent and has received more sampling effort.

ESA COMPLIANCE

Winter and Spring Fisheries

As mentioned, winter and spring Select Area fisheries are managed intensely in-season to ensure the allowable impact rate (currently 0.1 – 0.2 percent of the upriver spring Chinook run) is not exceeded. For these fisheries, VSI from the sampled catch is used to estimate the rough-scale stock composition (upriver vs. lower river origin) of the total catch for each statistical week. Total upriver spring Chinook harvest rate is used as a surrogate to track impacts to listed upriver spring Chinook, since few of those fish are coded-wire tagged. Physical characteristics used to classify stock are readily discernable on dead fish and samplers can be easily trained to determine the stock visually with a high degree of accuracy. Coded-wire tags recovered during sampling of the landed catch are decoded periodically in-season and used to verify and, if needed, correct VSI calls to calculate the frequency of upriver spring Chinook in the sample by week. In most cases, the correction factor is minor since the samplers are highly proficient at classifying stock based on visual cues. The adjusted rate is then applied to the total weekly landed catch to calculate weekly impacts to upriver spring Chinook. Weekly and cumulative season totals are divided by the current estimated run size to determine the impact rate. If the data suggests that impacts will exceed management guidelines, adopted seasons are modified through the Compact hearing process. Beginning in 2008, the number of upriver fish impacted is calculated weekly. Prior to 2008, the season to-date rate was applied to total season landings to calculate the number of upriver spring Chinook harvested in Select Area commercial fisheries.

It is important to note that even though final upriver spring Chinook impact percentages are generally at or below the pre-season allotment and average 0.113% for 2002 – 2008 (Table 3.2), final numbers reflect the effects of in-season uncertainty in upriver spring Chinook run size, the interrelated nature of LCR fisheries management, and any management actions enacted to stay under the guidelines. Since all LCR non-Treaty fisheries operate under the same BO from NOAA, if one fishery accrues (or is projected to accrue) a higher than planned impact, any on-going fisheries must be modified so the combined allowable impact rate is not exceeded. Because Select Area fisheries harvest few upriver spring Chinook, they accrue impacts at a much slower rate than mainstem fisheries, providing the ability to run for much longer periods of time. When mainstem fisheries are at or near allowable impact limits, the Select Area fisheries may be closed for significant periods of time. For example, in 2008 the final impact of Select Area winter and spring commercial fisheries was 0.132% of the upriver spring Chinook final run size, well under the guideline of 0.15%. However, due to the upriver run tracking below pre-season forecast and mainstem fisheries projected to exceed allowable impacts, all Select Area commercial fisheries were closed for a full week in mid-May. Therefore the final impact rate observed does not represent a full season. To meet the project goal of providing stable and meaningful fisheries, it is imperative that Select Area fisheries be allotted sufficient upriver impacts to run with minimal disruption.

Fall Fisheries

The following excerpt from TAC's Biological Assessment for 2008-2017 fisheries (TAC 2008) describes how fall fisheries are monitored for ESA compliance:

> CWTs are utilized for in-season management of fall Chinook fisheries to a much greater extent than for any other in-river fishery. In contrast with some other Chinook stocks, high CWT rates for hatchery fall Chinook allow for sufficient recoveries of CWTs for these purposes. Recovered CWTs are delivered to tag recovery labs in Clackamas, Oregon or Olympia, Washington, where the CWT is extracted and decoded. The resulting tag code is entered and verified on a mainframe computer. Associated fishery/recovery and biological data, collected when snouts are recovered, are uploaded to the mainframe computer and merged with previously entered CWT recovery data. Based on fishery-specific sampling rates, individual tag recoveries are increased by an expansion factor to estimate the total number of that particular tag present in a given fishery. CWT recovery data are summarized to estimate the number of CWTs recovered for each tag code for each sampling program. Throughout this process, the data are diligently checked and corrected to ensure data quality.
>
> Summarized CWT data recoveries, fishery catch estimates, and estimated escapements for most Columbia River salmonid stocks are provided by several state and federal agencies for additional data analysis. Data analysis includes run reconstruction of all major salmonid stocks. Each stock group is represented by summing the CWTs for that group. Total returns are categorized by age and stock. Included in total returns are fishery catches, escapement estimates for hatchery and natural-spawn fish, and dam counts.

Reporting

Impacts to listed stocks are summarized and reported via technical reports, Joint Staff Reports, and Fact Sheets. Additionally, TAC develops annual summary reports to serve as a reporting mechanism to assess compliance with limits established under the ESA (TAC 2008).

POST-SEASON ANALYSES

Age and stock composition of the commercial harvest for Select Area fisheries is developed separately for winter, spring, summer, and fall seasons. Methodology for determining the age and stock composition is identical for winter, spring, and summer fisheries. First, a season-specific expansion factor (may be further subdivided if appropriate) is calculated based on the number of fish mark sampled divided by the total landings (mark sample rate). SAB fall Chinook stock is removed from the catch total based on their positive identification via the LV fin mark to determine the total number of spring Chinook in the estimate. This number is split into upriver or lower river stock (winter and spring season only) based on CWT-corrected VSI calls. Season- and stock-specific age data is derived from analysis of scale samples collected during field sampling. This age data is applied directly to the upriver spring Chinook and SAB fall Chinook catch estimates. Lower river origin (including SAFE-produced) spring Chinook are further partitioned by watershed of origin (or SAFE release site) using CWT recoveries which have been expanded once for mark sample rate, expanded again for tag rate, and forced to fit the age-at-return matrix derived from scale aging.

Age and stock composition of fall Select Area fisheries is completed by WDFW as part of the larger analysis of all Columbia River fall fisheries. The methodology for determining the age and stock composition for fall fisheries is slightly different from that of the winter, spring, and summer fisheries. First a season-specific expansion factor (may be further subdivided if appropriate) is calculated based on the number of fish mark sampled, divided by the total landings (mark sample rate). Season- and stock-specific age data is derived from analysis of scale samples collected during field sampling. This age data is applied to fall Chinook catch estimates. Fall Chinook are further partitioned by watershed of origin (or SAFE release site) using CWT recoveries that have been expanded once for mark sample rate, expanded again for tag rate, and forced to fit the age-at-return matrix derived from scale aging.

In-season harvest estimates are finalized post-season once final fish ticket data is available from each agency. ODFW is responsible for finalizing Select Area landings from each state. To finalize fish ticket data a final check occurs post-season and ODFW staff works with WDFW staff to take care of any unresolved issues from in-season estimates. Once the final run size is determined and final harvest numbers (including final stock composition) are complete, the final impact rates can be determined (Table 3.2).

FISHERIES (FALL 2006 – WINTER/SPRING/SUMMER 2008 SEASONS)

Commercial harvest in the Select Areas contributes significantly to the overall non-Treaty Columbia River commercial salmon fishery (Figures 3.4 - 3.6). On average, spring Chinook catch makes up 55%, coho is 45%, and fall Chinook is 20% of 1993 – 2008 total harvest. The importance of the SAFE project is evident when one considers that Select Area fisheries carried the commercial industry through the mid to late 1990s when little mainstem fishing opportunity was available.

Winter/Spring/Summer Season Select Area Commercial Fisheries

Spring Chinook commercial fisheries in Select Areas were initiated in Youngs Bay in 1992. Through 1996, fishing time was limited to less than 15 days annually with landings ranging from 155 – 851 spring Chinook. Commercial landings of spring Chinook in Youngs Bay have increased significantly from 1,821 Chinook in 1997 to a range of 4,100 – 5,700 Chinook landed in 2000 – 2007 (excluding 2005). Initial seasons in Youngs Bay were restricted to the spring fishing period with open periods occurring primarily from late April through early June. As production increased, winter and summer seasons were added in an attempt to harvest all returning hatchery adults. Winter seasons during late February through early/mid-March were initiated in 1998 to harvest early returning 5-year old spring Chinook. Beginning in 1999, summer seasons during mid-June through July were adopted to increase harvest of late returning 4-year old spring Chinook and early returning SAB fall Chinook. Winter, spring, and summer season commercial catch in all Select Areas since 1993 can be found in Table 3.3.

Prior to 2006, Select Area fisheries were consistently closed during mid-March through mid-April to minimize the handle of non-local spring Chinook stocks, which tend to be more abundant during this period. During 2006 through 2008, fisheries in Youngs Bay have been opened during this time period, but have been constrained to specific locations in upstream areas of Youngs Bay to reduce harvest of non-local Chinook that are known to “dip in” to lower portions of Youngs Bay in response to tidal fluctuations and river height/flow during this timeframe. Opportunity, measured in open hours, during this winter/spring interim timeframe has been expanded incrementally each year with very low impacts to non-local stocks.

Commercial fisheries for spring Chinook in Blind Slough began in 1998 with spring seasons only until 2000, when the first winter season was established. Weeknight fishing periods have been consistently adopted to minimize interactions with recreational boaters. Annual spring season landings have ranged from 60 – 3,200 Chinook. In most years, fishing periods have opened concurrent with Youngs Bay and other Select Area sites to minimize congestion. The spring season fishing area was initially limited to Blind Slough but was expanded downstream to include the waters of Knappa Slough in 1999 as returns increased. A one-year trial summer season was adopted in Blind and Knappa sloughs in 1999, but resulted in a harvest of only three spring Chinook and no summer seasons have been adopted since.

Spring commercial fisheries in Tongue Point were initiated in 1998 and continued through 2003, with experimental winter seasons occurring in 2000 and 2001. In most years, seasons and open hours were concurrent with Blind/Knappa Slough and Youngs Bay. The spring season fishing area was expanded to include the South Channel in 1999 to reduce congestion during peak fishing periods. Annual Chinook harvest increased dramatically with landings peaking in 2002, when 3,003 fish were landed. High abundance of upriver spring Chinook in this area during the 2003 spring fishery resulted in the cancellation of the season after one period. Production-level releases of spring Chinook at Tongue Point were discontinued in 2000 due to higher than anticipated straying of returning adults. In response to the straying issues, a new net-pen rearing site was established in late 2002 at the MERTS dock approximately 1.2 miles upstream of the former site. Since then, experimental groups of 20,900 – 79,300 spring Chinook smolts have been released from this site each year, and between 2003 and 2007 an additional 25,500 – 27,400 were released annually from net pens in the nearby John Day River. By relocating the rearing site higher into Cathlamet Bay, further from the mainstem Columbia River and closer to a unique water source, the propensity for straying is expected to be reduced. In 2008, volunteer test fishing and a full-fleet test fishery occurred in Tongue Point/South Channel and results appear promising.

Spring fisheries have been conducted in Deep River since 2003 with harvest ranging between 28 –117 fish annually. Experimental winter seasons have been adopted annually since 2006 but have resulted in little effort and no salmonid catch. Fishing periods in Deep River have generally been non-concurrent with the other Select Areas to encourage participation.

Fall Season Select Area Commercial Fisheries

Select Area commercial fisheries during the fall season target coho and Chinook returning from net-pen and hatchery releases at these sites. These fisheries were initiated in 1962 with the adoption of coho salmon seasons in Youngs Bay (Weiss 1966). Initially, Youngs Bay fall fisheries were concurrent with the late fall mainstem gillnet season. Since 1977, the Youngs Bay season has been separated from mainstem seasons and has increased in importance with the involvement of the Clatsop County Fisheries Project that pioneered the successful net-pen acclimation program, which is now a cornerstone of the SAFE project.

Fall Select Area fisheries primarily target hatchery coho returning to these release sites; however, SAB fall Chinook are also produced and harvested in Youngs Bay. Fisheries targeting coho are typically initiated in late August or early September and continue through the end of October. In Youngs Bay, limited Chinook target fishing periods occur weekly from mid-June (summer season) through August to target late returning SAFE-produced spring Chinook and early returning SAB fall Chinook. A target Chinook fishery has occurred intermittently in Knappa Slough when surplus tule fall Chinook were expected to return to Big Creek Hatchery. Fall season commercial catch in all Select Areas since 1993 can be found in Table 3.4.

Fall fisheries have occurred in Youngs Bay since 1962; Tongue Point/South Channel, Blind Slough/Knappa Slough, and Deep River since 1996; and Steamboat Slough during 2000-2005. All non-Indian fisheries are managed in accordance with predetermined harvest impact rates or catch guidelines; however, Select Area fall fishery impacts on listed fish are negligible and in-season modifications are seldom necessary.

2006 Fall Season Commercial Fisheries

Select Area commercial fisheries occurring during the fall of 2006 were managed to harvest hatchery and net-pen reared coho and SAB fall Chinook salmon with minimal impacts to listed species. Catch totals in the four Select Area fisheries during the fall of 2006 were average with landings of 4,557 Chinook (similar to recent years' catches even though fisheries were managed to ensure tule escapement to Big Creek Hatchery), 37,653 coho (below recent average), and 109 white sturgeon (Table 3.4).

Youngs Bay

Similar to the pattern in recent years, the fall Youngs Bay Select Area fishery began in early August with weekly fishing periods through late August followed by a 72-hour period from August 29 – September 1 and then continuous fishing beginning the week of Labor Day through the end of October. A total of five fishing periods, two 36-hour, two 30-hour, and one 72-hour, during August and early September were intended to harvest net-pen produced SAB fall Chinook and early returning coho without jeopardizing SAB fall Chinook broodstock needs at Klaskanine Hatchery. To ensure adequate escapement, the upper fishing boundary was moved downstream from the confluence of Youngs and Klaskanine rivers to Battle Creek Slough beginning in August. The season included 57 consecutive days of fishing from September 5 through October 31 with the intent of harvesting late returning SAB fall Chinook and 100% of the surplus hatchery-origin coho whose abundance peaks in mid-September. The combined August – October season consisted of 64 fishing days and resulted in a catch of 3,878 Chinook, 20,967 coho, and 77 white sturgeon. Both the SAB Chinook and coho catches were less than pre-season expectations (4,600 and 28,000, respectively).

Tongue Point/South Channel

The Tongue Point/South Channel fishery opened on September 5 and included the South Channel fishing area from the outset of the season in an effort to maximize harvest of coho released from the Tongue Point net pens. The fishery was initiated with three nightly 12-hour fishing periods weekly during September 5 – September 15, increased to four nightly 12-hour periods during the week of September 18, then increased again to four nightly 16-hour periods each week from September 25 – October 27. The 30-night season resulted in landings of approximately 305 Chinook, 11,567 coho, and 21 white sturgeon. The coho catch was over twice the pre-season expectation of 5,000 fish. Landings from the Tongue Point/South Channel area are included in mainstem Columbia River landings when the mainstem is open so catch attributed to Tongue Point/South Channel should be considered a minimum.

Blind Slough/Knappa Slough

The season structure of the Blind Slough/Knappa Slough fishery was similar to the Tongue Point/South Channel fishery. The fishery began with three 12-hour nightly fishing periods each week during September 5 – September 15, followed by four 12-hour nightly periods during the week of September 18. Beginning September 25, nightly fishing hours were expanded to 14 hours in an effort to maximize harvest of the net-pen reared coho. Due to anticipated low returns of tule fall Chinook to Big Creek Hatchery, no late August season was set to target this

stock. Additionally, the Compact decided in-season (August 31 and September 11) to restrict fishing to Blind Slough until the week of September 18 to provide additional escapement of Big Creek fall Chinook. The 30-night season ended October 27 and resulted in landings of 190 Chinook, 2,884 coho, and 3 white sturgeon. The coho catch was greater than the pre-season expectation of 2,500 fish.

Deep River

The structure of the Deep River fishery was similar to that used in the other Select Area fishing sites with multiple nightly fishing periods occurring each week from September 4 through October 27. The fishery consisted of four 12-hour nightly periods per week during September 4 – September 22. The four weekly fishing periods were lengthened to 16 hours beginning September 25 in response to shorter daylight hours. The 32-night season resulted in landings of 184 Chinook, 2,235 coho, and 8 white sturgeon. The coho catch was slightly less than the pre-season expectation of 2,500 fish.

2007 Winter/Spring/Summer Season Commercial Fisheries

Youngs Bay

A winter commercial fishery was adopted for 2007 in Youngs Bay to target early arriving 5-year old local-stock spring Chinook prior to the time when significant numbers of non-local Chinook stocks are present in the lower Columbia River area. In accordance with the goal of adaptive management for Select Area fisheries, the winter season structure used since 2004 was expanded in 2006 and expanded further in 2007. A progressive fishery schedule was developed to allow the fishery to bridge the gap between the typical end of the winter season and the start of the spring season and to access returning adults from South Fork Klaskanine Hatchery releases. To accomplish this, the fishery was constricted in time and area to avoid encounters of non-local stocks. The standard winter season was expanded slightly and consisted of eight fishing periods (18-hour) between February 14 and March 12. In addition, one 4-hour period (March 14) was set for the entire bay followed by eleven 12- to 18-hour periods between March 18 and April 10 held in upper Youngs Bay, above the power lines located immediately downstream of the Walluski River mouth. Gear regulations were modified for this upper Youngs Bay fishery to allow the use of heavy nets above the mouth of the Walluski River. This strategy of constricting the fishery into the upper bay when non-local stocks could be present in the lower reach appears to have been an effective alternative to closing the fishery during this timeframe. The minimum mesh size for all winter fishing periods was restricted to seven inches, since steelhead handle is minimal in this fishery. As is the case for all commercial fisheries in Youngs Bay, maximum net length was restricted to 250 fathoms, with no more than two pounds of leadline per fathom of net (with the exception noted above). The 20 fishing periods resulted in landings of 883 spring Chinook and 13 white sturgeon, the second highest Chinook catch since winter seasons began in 1998. Weekly white sturgeon landing limits were in place for winter, spring, and summer seasons.

The 2007 spring season in Youngs Bay began in late April and consisted of progressively longer fishing periods through mid-June. The scheduled opening period of April 19 (12-hours) was rescinded due to concerns about impacts to upriver spring Chinook. Ten 12-hour to 4-day periods occurred between April 23 and June 15. The shorter, staggered fishing periods during the early portion of the fishery were intended to allow fishery managers time to summarize harvest sampling data between openings and adjust future proposed seasons to minimize impacts on non-local spring Chinook. The 2007 Youngs Bay spring fishery landed 4,070 Chinook, which is greater than the ten-year average Chinook harvest (3,557), and 161 white

sturgeon. Throughout the spring season, an 8-inch maximum mesh size restriction was in effect to target Chinook instead of sturgeon.

To provide harvest opportunity on early returning SAB-stock fall Chinook and any remaining local spring Chinook, a six-week summer gillnet season was set in Youngs Bay from June 20 - July 27. The 2007 summer season was open 6 AM Wednesday through 6 AM Friday each week for the entire season, which was an expansion in open hours over previous summer seasons. An 8-inch maximum mesh size restriction was adopted to target Chinook instead of sturgeon. The Youngs Bay summer fishery yielded landings of 256 Chinook and 10 white sturgeon, less than the 1999 - 2006 average Chinook harvest (369).

The combined Youngs Bay winter/spring/summer fishery stock composition was based on VSI and CWT analysis with a total of 2,865 Chinook (55% of the combined catch of 5,209 Chinook) examined for fin marks and CWTs and 183 CWTs being collected. Based on scale readings, verified with CWTs, the age composition of the catch was <1% age-2 (SAB jacks), 1% age-3, 13% age-4, 84% age-5, and <1% age-6 fish. The 2007 combined winter/spring/summer catch was comprised of 91.0% spring Chinook and 1.8% SAB fall Chinook destined for Select Area sites, 0.7% spring Chinook and 0.1% summer (upper Columbia) Chinook destined for locations above Bonneville Dam, 5.3% Willamette River spring Chinook, and 1.1% spring Chinook destined for the Cowlitz, Kalama, Lewis, or Sandy rivers.

Blind Slough/Knappa Slough

Similar to 2000 – 2006, a winter gillnet season with a 7-inch minimum mesh restriction was adopted for Blind Slough (excluding Knappa Slough) in 2007 to harvest early arriving, larger 5-year old hatchery Chinook. The season adopted at the January 25, 2007 Compact hearing consisted of eight 12-hour periods (7 PM-7 AM) on Wednesday and Sunday nights during February 21 – March 26, (except Wednesday March 14 and 21). During the winter fishing periods in 2007 a total of 85 spring Chinook and 1 white sturgeon were landed, which is the third highest winter season Chinook harvest. Weekly white sturgeon landing limits were in place for winter and spring seasons.

During the spring fishery, the Blind Slough Select Area site was expanded to include Knappa Slough down to the east end of Minaker Island, to increase fishing area and maximize the opportunity to harvest local SAFE stock spring Chinook. After the first three periods, the lower deadline in Knappa Slough was extended further downstream to the western end of Minaker Island for the remaining 13 periods of the spring season. An 8-inch maximum mesh size restriction was enacted to target Chinook and limit sturgeon catch. For both the winter and spring fisheries in Blind/Knappa sloughs, net length was limited to 100-fathoms with no weight restrictions on the leadline, including allowed use of additional weights and anchors. As was the case with the other Select Areas, the scheduled opening period (April 19, 12-hours) was rescinded due to concerns about impacts to upriver spring Chinook. The 2007 spring fishery consisted of sixteen 12-hour (7 PM-7 AM) fishing periods occurring one or two weeknights each week between April 23 and June 15. The 2007 Blind/Knappa Slough spring fishery landed 1,451 spring Chinook and 49 white sturgeon. This Chinook harvest was slightly lower than average (1,503) but was an increase over the last two years.

The combined Blind Slough/Knappa Slough winter and spring fishery stock composition was based on VSI and CWT analysis with a total of 1,386 Chinook (90% of the combined catch) examined for fin marks and CWTs and 216 CWTs being collected. Based on scale readings, verified with CWTs, the age composition of the catch was 3% age-3, 19% age-4, 78% age-5, and <1% age-6 fish. The 2007 Blind Slough/Knappa Slough catch was comprised of 96.4%

spring Chinook destined for Select Area sites, 0.4% upriver spring Chinook, 2.8% Willamette River spring Chinook, and 0.5% spring Chinook destined for the Cowlitz, Kalama, Lewis, or Sandy rivers.

Deep River

For the second consecutive year, a winter season of four weekly 14-hour periods from February 18 to March 12 was adopted for the Deep River site. The scheduled spring season opening period (April 19, 12-hours) was rescinded along with the other Select Areas due to concerns about impacts to upriver spring Chinook. An expanded spring fishery consisting of 30 fishing periods occurring two or four nights (7 PM-7 AM) weekly between April 23 and June 15 was adopted at the January 25 and April 25, 2007 Compact hearings. The fishing area during all periods was restricted to the area from markers at navigation marker #16 upstream to the Highway 4 Bridge. Gear regulations included a 100-fathom maximum net length, a 7-inch minimum mesh size for the winter season, an 8-inch maximum mesh size for the spring season, and no weight restrictions. As in Blind Slough and Knappa Slough, the use of additional weights or anchors was allowed. Since spring seasons have only occurred in Deep River since 2003, the seasons have been considered experimental with 100% sampling of the landed catch required before harvested fish could be transported out of the fishing area. No catch was reported in the winter season and a total of 29 Chinook and 23 white sturgeon were harvested in the spring season. The 2007 spring Chinook catch continued the trend of extremely low harvest at this site. Weekly white sturgeon landing limits were in place for winter and spring seasons.

The combined Deep River winter/spring fishery stock composition is based on VSI and CWT analysis with a total of 27 Chinook (100% of the combined catch) examined for fin marks and CWTs and 2 CWTs being collected. The 2007 combined winter/spring catch was comprised of 100% spring Chinook destined for Select Area sites. Based on ages estimated from fork lengths, which were verified with CWTs, the age composition of the catch was 11% age-4, 78% age-5, and 11% age-6 fish. Fork lengths were used as a surrogate for scale readings to determine ages due to the lack of scale readings in 2007. The fork lengths of 579 coded-wire tagged spring Chinook released from Deep River from brood years 1996 – 2001 indicated that 100% of fish less than 380 mm were age-2, 90% of fish 380-620 mm were age-3, 86% of fish 621-750 mm or less were age-4, and 89% of fish greater than 750 mm were age-5 or 6. Fish greater than 750 mm were apportioned into ages based on the 108 CWT recoveries from age-5 and 6 fish. Those data indicated that of the fish greater than 750 mm 89% were age-5 and 11% were age-6. There were no fish in age-2 or 3 fork-length range in the 2007 sample.

2007 Fall Season Commercial Fisheries

Select Area fisheries occurring during the fall of 2007 were managed to harvest hatchery and net-pen reared coho and SAB fall Chinook salmon with minimal impacts to listed species. A sales/possession limit of five white sturgeon per vessel per calendar week was also adopted for fall commercial fisheries in 2007. Sale of white sturgeon was prohibited effective October 14, 2007 when the annual catch guideline (400 fish) for the Select Areas was met. Total coho harvest in the four Select Area fisheries during the fall of 2007 was a record low (10,516 fish), driven primarily by unexpectedly low returns of Youngs Bay coho. However, Chinook landings were average with a total of 4,533 Chinook, similar to recent years' catches, even though fisheries in Blind Slough/Knappa Slough were restricted to increase tule escapement to Big Creek Hatchery, as they were in 2006. Additionally, 148 white sturgeon were harvested incidentally in SAFE fall fisheries.

Youngs Bay

Similar to the pattern in recent years, the fall Youngs Bay Select Area fishery began in early August with weekly 30-36 hour fishing periods through late August, followed by a 72-hour period from August 28 – August 31, and continuous fishing from the week of Labor Day through the end of October. August fishing periods were intended to harvest net-pen produced SAB fall Chinook and early returning coho without jeopardizing SAB fall Chinook broodstock needs at the Klaskanine and South Fork Klaskanine hatcheries. To ensure adequate SAB escapement, the upper Youngs Bay fishing boundary was moved downstream from the confluence of Youngs and Klaskanine rivers to Battle Creek Slough beginning in August. The season included 57 consecutive days of fishing from September 4 through October 31 with the intent of harvesting late-returning SAB fall Chinook and hatchery-origin coho whose abundance typically peaks in mid-September. The complete season consisted of 64 fishing days and resulted in a catch of 4,002 Chinook, 3,301 coho, and 64 white sturgeon. The SAB Chinook catch was slightly greater than pre-season expectations (3,300 fish) while coho harvest was much lower than pre-season expectations (23,300 fish).

Tongue Point/South Channel

The Tongue Point/South Channel fishery opened on September 4 and included the South Channel fishing area from the outset of the season in an effort to maximize harvest of coho released from the Tongue Point net pens. The fishery was initiated with three nightly 12-hour fishing periods per week during September 4 – September 14, increased to four nightly 12-hour periods during the week of September 17, then increased again to four nightly 16-hour periods each week from September 24 – October 26. The 30-night season resulted in landings of approximately 269 Chinook, 2,043 coho, and 66 white sturgeon. The coho catch was less than half the pre-season expectation of 5,000 fish.

Blind Slough/Knappa Slough

The season structure of the Blind Slough/Knappa Slough fishery was similar to the Tongue Point/South Channel fishery. The fishery began with three 12-hour nightly fishing periods each week during September 4 – September 14 followed by four 12-hour nightly periods during the week of September 17. Beginning September 24, nightly fishing hours were expanded to 14 hours in an effort to maximize harvest of the net-pen reared coho. Due to low anticipated returns of tule fall Chinook to Big Creek Hatchery the late August season was closed to protect this stock. For the second year in a row, the fishing area was restricted to Blind Slough until the week of September 17 to provide additional protection to Big Creek Chinook. The 30-night season ended October 26 and resulted in landings of 87 Chinook, 2,498 coho, and 13 white sturgeon. The coho catch was slightly less than the pre-season expectation of 3,000 fish.

Deep River

The structure of the Deep River fishery was similar to that used in the other Select Area fishing areas with multiple nightly fishing periods occurring each week from September 3 – October 26. The fishery consisted of four 12-hour nightly periods per week during September 3 – 21. The nightly fishing periods were lengthened to 16 hours beginning September 24 in response to decreasing daylight hours. The 32-night season resulted in landings of 175 Chinook, 2,674 coho, and 5 white sturgeon. The coho catch was slightly less than the pre-season expectation of 3,300 fish.

2008 Winter/Spring/Summer Season Commercial Fisheries

At the January 24, 2008 Columbia River Compact hearing the state of Oregon announced a modification to existing commercial fishing and boat license requirements specific to the Youngs Bay Select Area fishery. As of February 13, 2008, non-resident licenses are not required of Washington fishers holding valid licenses issued by the state of Washington. Since Youngs Bay is located entirely in Oregon state waters, Washington fishers previously had to purchase Oregon non-resident licenses to participate in Youngs Bay Select Area commercial fisheries. Tongue Point, South Channel, Knappa Slough, and the majority of Blind Slough are under concurrent jurisdiction therefore licenses from either state were already acceptable.

Youngs Bay

As in all years since 1998, a winter commercial fishery was adopted for 2008 in Youngs Bay to target early arriving 5-year old local-stock spring Chinook prior to the time when significant numbers of non-local Chinook stocks are present in the lower Columbia River area. In accordance with the goal of adaptive management for Select Area fisheries, the winter season structure used since 2004 has been expanded annually since 2006 as additional fishery data are collected. A progressive fishery schedule has been developed to bridge the gap between the typical end of the winter season and the start of the spring season, allowing access to returning SAFE spring Chinook earlier in the season when prices are higher. To accomplish this, the fishery is constricted in time and area to minimize encounters with non-local stocks. Primarily due to limited commercial fishing in the mainstem Columbia River, pre-season plans placed a high priority on significant and stable opportunity in the Select Areas in 2008 and 0.15% impacts on upriver spring Chinook were allocated to Select Area fisheries from the total commercial share in 2008 to accomplish this goal. The standard winter season consisted of eight 18-hour fishing periods between February 13 and March 10. In addition, one 4-hour period (March 12) was set for the entire bay followed by six 12-18 hour periods between March 16 and March 27 upstream of the old Youngs Bay Bridge. From March 30 through April 8, five more 12 to18-hour periods were scheduled for upper Youngs Bay (above the power lines located immediately downstream of the Walluski River mouth). In season, the lower boundary was extended downstream to the Old Youngs Bay Bridge for the first three periods, based on the minimal catch of upriver stocks in the prior week. This strategy of constricting the fishery (with in-season flexibility) when non-local stocks may be most abundant, appears to be an effective alternative to closing the fishery entirely during this timeframe. The 7-inch minimum mesh size regulation was in effect for all winter fishing periods since steelhead handle is minimal in this fishery. As is the case for all commercial fisheries in Youngs Bay, maximum net length was restricted to 250 fathoms with no more than two pounds of leadline per fathom of net, except in the Walluski area as noted above. The 20 fishing periods resulted in landings of 241 spring Chinook, which is less than the average catch of 349 Chinook observed since winter seasons began in 1998. Additionally, 21 white sturgeon were landed in the Youngs Bay winter season. The three white sturgeon (per vessel per week) landing limit used in recent years was in place for the February portion of the winter season that began in March based on a request from industry.

The 2008 spring season in Youngs Bay began on April 17 and consisted of progressively longer fishing periods through mid-June. Emergency action was necessary in-season to rescind fishing periods in all Select Area sites during the week of May 11 due to the downgrade of the upriver spring Chinook run size and resultant ESA concerns. The closure resulted in the loss of four days of fishing opportunity in Youngs Bay. Ten 12-hour to 4-day periods occurred between April 17 and June 13. The shorter, staggered fishing periods during the early portion of the fishery were intended to allow fishery managers time to summarize harvest sampling data between openings and adjust future proposed seasons to minimize impacts on non-local spring

Chinook. Later in the season, as the risk of encountering upriver spring Chinook diminished, longer 4-day openers were possible. The 2008 Youngs Bay spring fishery landed 1,937 Chinook, just over one half of the ten-year average Chinook harvest (3,800). Thirty-five white sturgeon were landed prior to June 4, after which retention and sale of white sturgeon was prohibited for the remainder of the spring and summer season. Throughout the spring season, an 8-inch maximum mesh size restriction was in effect to target Chinook instead of sturgeon.

To provide harvest opportunity on early returning SAB-stock fall Chinook and any remaining local-stock spring Chinook, a seven-week summer gillnet season was set in Youngs Bay from June 18 – July 31. The 2008 summer season was open 6 AM Wednesday through 6 AM Friday each week for the entire season, except for the last week, which was open for 36-hours to be consistent with the fall season periods that started August 6. As in the spring fishery, an 8-inch maximum mesh size restriction was adopted to target Chinook instead of sturgeon. The Youngs Bay summer fishery yielded record landings of 1,017 Chinook, nearly three times the 1999 – 2007 average Chinook harvest of 360 fish. The high landings were driven by an increased abundance of SABs (862 landed) returning to Youngs Bay, which was almost certainly due to the coast-wide closure of ocean commercial and recreational Chinook fisheries.

The combined Youngs Bay winter/spring/summer fishery stock composition is based on VSI and CWT analysis with a total of 1,281 Chinook (40% of the combined catch of 3,195 Chinook) examined for fin marks and CWTs and 158 CWTs being collected. The 2008 combined winter/spring/summer catch was comprised of 61.4% spring Chinook and 27.0% SAB fall Chinook destined for Select Area sites, 6.5% upriver spring Chinook, 0.9% upper Columbia summer Chinook, 1.5% Willamette River spring Chinook, and 2.8% spring Chinook destined for the Cowlitz, Kalama, Lewis, or Sandy rivers. Based on scale readings, which were verified with CWTs, the age composition of the catch was <1% age-2 (all SAB jacks), 14% age-3 (primarily SABs), 64% age-4, 22% age-5, and <1% age-6 fish.

Blind Slough/Knappa Slough

Similar to 2000 – 2007, a winter gillnet season with a 7-inch minimum mesh restriction was adopted for Blind Slough (excluding Knappa Slough) in 2008. The adopted season consisted of thirteen 12-hour periods (7 PM–7 AM) on Wednesday and Sunday nights during February 20 – April 7 (except Wednesday April 2). The six periods (March 16 – April 7) held after the normal end of the winter season represent ongoing efforts to apply adaptive management techniques and also to meet the goal of significant and stable opportunity in 2008. During the winter fishing periods, a total of 51 spring Chinook and one white sturgeon were landed, which is less than the 2000 – 2007 average Chinook harvest (80). As described for Youngs Bay, a three white sturgeon landing limit was in place for the February portion of the winter season only.

During the spring fishery, the Blind Slough Select Area site expanded to include Knappa Slough down to the east end of Minaker Island to increase fishing area and maximize the opportunity to harvest local SAFE stock spring Chinook. On May 1, the lower deadline in Knappa Slough was extended further downstream to the western end of Minaker Island for the remainder of the spring season. An 8-inch maximum mesh size restriction was adopted to target Chinook and limit sturgeon catch. For both the winter and spring fisheries in Blind/Knappa sloughs, net length was limited to 100-fathoms with no weight restrictions on the leadline, including allowed use of additional weights and anchors. The 2008 spring fishery consisted of fifteen 12-hour (7 PM–7 AM) fishing periods on Thursday and Monday nights between April 17 and June 13. As was the case with the other Select Areas, all fishing periods during the week of May 11 were rescinded by Compact and Oregon state action due to the reduced upriver spring Chinook run size. This closure resulted in the loss of two previously set fishing periods. The 2008

Blind/Knappa Slough spring fishery landed 953 spring Chinook and 47 white sturgeon prior to the white sturgeon retention/sales prohibition that began June 4. The Chinook harvest was less than the ten-year average (1,470) and was the lowest since 2000.

The combined Blind Slough/Knappa Slough winter and spring fishery stock composition is based on VSI and CWT analysis. A total of 797 Chinook (79% of the combined catch) were examined for fin marks and CWTs and 350 CWTs were collected. The 2008 Blind Slough/Knappa Slough catch was comprised of 96.2% spring Chinook destined for Select Area sites, 1.1% upriver spring Chinook, 1.2% Willamette River spring Chinook, and 1.3% spring Chinook destined for the Cowlitz, Kalama, Lewis, or Sandy rivers. Based on scale readings, which were verified with CWTs, the age composition of the catch was 74% age-4, 24% age-5, and 2% age-6 fish.

Tongue Point/South Channel

As previously mentioned, no winter or spring seasons had been conducted in the Tongue Point/South Channel Select Area fishing site since the abbreviated season in 2003. However, low-level spring Chinook releases have been maintained at the new MERTS net-pen location. A test fishery was held from April 26 – May 25, 2005 with one contracted test-fisher for the purpose of gathering data to test the effectiveness of the new site; however, only two spring Chinook were captured in 30 drifts. Coded-wire tags from fish released at the MERTS site and the trial John Day River net pens have been routinely collected from commercial fisheries in Blind/Knappa Slough, providing evidence that adults are returning from releases at both sites.

One of the goals of the 2008 Select Area winter/spring/summer season was to have some test fishing in the Tongue Point/South Channel site; the increased upriver spring Chinook impact rate allocated to the Select Area fisheries was intended for this purpose, as well as to allow stability in the remainder of the Select Area fishing seasons. In late April, two commercial fishers volunteered to test fish in the Tongue Point site. Ten drifts were conducted with an ODFW biologist on-board during all test-fishing efforts. Four adipose-fin clipped spring Chinook of lower river origin (VSI) were captured (and released) in the test fishing activities.

Because the limited sampling by test fishers provided little data, the staff recommended, and the Compact adopted, a full-fleet commercial test fishery in the Tongue Point/South Channel site at the April 24, 2008 hearing. Open periods started April 28 and were concurrent with those previously adopted for Blind Slough/Knappa Slough; 7 PM–7 AM Monday and Thursday nights. An 8-inch maximum mesh restriction was in place for both sites; in Tongue Point nets were restricted to a maximum length of 250 fathoms with standard weight restrictions, while nets in South Channel were limited to a maximum length of 100 fathoms and no weight restrictions were in place. Abundance of non-local stocks was expected to be minimal based on the volunteer test fishing results and observed run timing but as an additional precautionary measure a new lower deadline was recommended and adopted. This new Tongue Point deadline is described as “a line extended from the upstream (southern most) pier (#1) at the Tongue Point Job Corps facility through navigation marker #6 to Mott Island”. The deadline is approximately 1 mile upstream from the deadline used in 2003 and prior. Additionally, for the first two weeks (April 28 – May 9) all catch was required to be sampled by ODFW staff before being transported out of the fishing area. Beginning May 12 and continuing through the end of the spring season, fishers were required to call ODFW’s Astoria Field Office with details on catch and time/location of sale to facilitate sampling efforts.

The 2008 spring full-fleet test fishery in Tongue Point/South Channel consisted of 12 fishing periods between April 28 and June 13 (except the week of May 11) and landed 259 spring

Chinook. Additionally, 204 white sturgeon were caught and sold prior to the retention/sales prohibition that began June 4.

The combined Tongue Point/South Channel spring fishery stock composition was based on VSI and CWT analysis with a total of 199 Chinook (77% of the combined catch) examined for fin marks and CWTs, and 73 CWTs being collected. The 2008 Tongue Point/South Channel catch was comprised of 56.8% spring Chinook destined for Select Area sites, 7.0% upriver spring Chinook, 14.7% summer (upper Columbia) Chinook destined for locations above Bonneville Dam, 15.8% Willamette River spring Chinook, and 5.8% spring Chinook destined for the Cowlitz, Kalama, or Lewis rivers. Based on scale readings and verified with CWTs, the age composition of the catch was <1% age-3, 72% age-4, 25% age-5, and 3% age-6 fish.

Deep River

For the third consecutive year, an experimental winter season of four weekly 14-hour periods from February 18 to March 11 was adopted for the Deep River site. Special regulations were in place requiring biological sampling of all of the catch. A spring fishery consisting of 17 fishing periods occurring on Thursday and Monday nights (7 PM – 7 AM) weekly between April 17 and June 13 was adopted at the February 15, 2008 Compact hearing. As was the case with the other Select Areas, all fishing periods during the week of May 11 were later rescinded. This closure resulted in the loss of two of the 17 periods. The fishing area during all periods was restricted to the area from markers at navigation marker #16 upstream to the Highway 4 Bridge. Gear regulations included a 100-fathom maximum net length, a 7-inch minimum mesh size for the winter season, and an 8-inch maximum mesh size for the spring season. As in Blind Slough and Knappa Slough, the use of additional weights or anchors was allowed. Since spring seasons have only occurred in Deep River since 2003, they are considered experimental with biological sampling of all the landed catch required before harvested fish may be transported out of the fishing area. A WDFW sampling station was set up in the area for this purpose. No catch was reported in the winter season and a total of 28 Chinook and 39 white sturgeon were harvested in the spring season. The 2008 spring Chinook catch continued the trend of extremely low harvest at this site. Concurrent with the other Select Areas, weekly white sturgeon landing limits were in place for the February portion of the winter season only, with retention and sale of white sturgeon prohibited starting June 4.

The combined Deep River winter/spring fishery stock composition is based on VSI and CWT analysis with a total of 28 Chinook (100% of the combined catch) examined for fin marks and CWTs and 9 CWTs being collected. The 2008 combined winter/spring catch was comprised of 89.3% spring Chinook destined for Select Area sites, 3.6% upriver spring Chinook, and 7.1% destined for the Cowlitz, Kalama, Lewis or Sandy Rivers. Based on scale readings (n = 27), which were verified with CWTs, the age composition of the catch was 79% age-4 and 21% age-5 fish.

Commercial Harvest Ex-Vessel Value

Table 3.5. shows the overall ex-vessel value of Chinook harvested in the Select Area fisheries ranging from $346,000 to $634,000 over the three years indicated in the tables (2006-2008). The overall ex-vessel value of coho harvested in the Select Area fisheries decreased between 2006 and 2007 from $510,000 to $132,000; however, preliminary numbers from 2008 show a significant increase and 2009 is forecasted to be a record return year for coho (Table 3.6). With total ex-vessel value for the Select Areas ranging from $766,000 to $1.03 million in 2006 and 2007 (2008 coho numbers not yet available) the impact on the local economy is significant, especially considering that ex-vessel value is a minimum economic value prior to the expansion that occurs as the money is expended throughout the community. Environmental variables

such as ocean conditions and estuary smolt predation, as well as regional fisheries management greatly affect the realized economic returns from the Select Area fisheries.

Select Area Recreational Fisheries

In 1998, year-round recreational seasons opened for Chinook and adipose fin-clipped coho in Youngs Bay, Tongue Point, and Blind Slough. Similar regulations were adopted for South Channel and Knappa Slough in 1999 and for Deep River in 2000. In 2003, regulations to allow year-round angling for adipose fin-clipped steelhead were adopted in all Oregon Select Areas. To maintain consistency with mainstem fisheries, mark-selective regulations were permanently adopted for Select Area spring Chinook recreational fisheries effective January 1, 2004. Also in 2004, classification of Tongue Point and South Channel as Select Area recreational fishing sites was rescinded due to discontinuation of production-level spring Chinook releases and because these areas are already open to angling concurrent with the mainstem Columbia River. Brief springtime recreational fishing closures were enacted in the Select Areas during 2004 and 2005, when the potential for additional impacts to upriver spring Chinook also forced closure of Select Area commercial fisheries.

As per permanent regulations, Youngs Bay, Blind Slough/Knappa Slough, and Deep River Select Areas are open the entire year for retention of Chinook and adipose fin-clipped coho with a daily bag limit of either two adult salmonids in any combination. Chinook retained during January 1 – July 31 must be fin-clipped (either adipose or ventral clips) in Youngs Bay and associated tributaries, and adipose fin-clipped in other Select Areas and tributaries.

Spring Fisheries

Despite the fact that most Select Area sites have been open year-round for recreational fishing, participation has expanded slowly, at least partially due to limited adult returns early in the program's history. In the early 2000s, both effort and harvest in Select Area recreational fisheries increased, likely due to increasing adult returns resulting in higher quality fishing opportunities. The estimated recreational harvest of 1,081 spring Chinook in 2004 Select Area fisheries was the highest observed. Among the Select Areas, the most popular and productive spring Chinook fisheries occur in Blind Slough/Knappa Slough and Youngs Bay during March–May. Based on limited creel survey data, the estimated average annual recreational spring Chinook harvest in Youngs Bay from 1998 – 2007 was 52 fish per year (range 9–121) with success usually dictated by water conditions. In Blind Slough/Knappa Slough, an average of 248 spring Chinook have been landed annually since 2000. During the same period, recreational harvest in nearby Gnat and Big creeks has ranged from 0–700 fish annually. Due to limited resources to carry out a statistical creel program, estimates of recreational catch are not possible for 2008 SAFE spring Chinook fisheries. Based on anecdotal information, the recreational harvest in SAFE areas is believed to have been less than 100 spring Chinook in 2008. This information will be compared with catch record card data once it is available.

Fall Fisheries

The most popular areas for fall season recreational fisheries in the Select Areas are Youngs Bay tidewater and Deep River. These fisheries have a five-year average (2002 – 2006) catch of approximately 340 Chinook and 275 coho per fall season. The 2006 recreational fisheries in Select Areas occurred without any in-season adjustments. Catch estimates for 2006 were less than the recent 5-year average, with 113 Chinook and 19 coho kept.

The 2007 fall recreational fisheries in Select Areas also occurred as per permanent regulations. Catch estimates for 2007 were much less than the recent 5-year average, with an estimated 40 Chinook and 0 coho kept.

Table 3.1. Number and percent of total salmonid catch mark-sampled in Oregon Select Area commercial fisheries during each management season, 2001 - 2007 [1].

Year	Winter	Spring	Summer	Fall	Total
2001	341 (50%)	2,896 (36%)	316 (54%)	11,644 (34%)	15,197 (35%)
2002	117 (54%)	5,468 (51%)	366 (53%)	29,886 (39%)	35,837 (40%)
2003	56 (65%)	3,667 (50%)	49 (18%)	20,314 (17%)	24,086 (19%)
2004	619 (46%)	3,913 (44%)	60 (24%)	17,020 (29%)	21,612 (31%)
2005	167 (88%)	1,520 (74%)	38 (40%)	19,765 (28%)	21,490 (29%)
2006	424 (56%)	3,980 (67%)	178 (37%)	13,602 (34%)	18,184 (39%)
2007	656 (68%)	3,501 (63%)	94 (37%)	5,431 (45%)	9,682 (51%)
2001 – 2007 Totals	2,380 (56%)	24,945 (51%)	1,101 (42%)	117,662 (29%)	146,088 (31%)

[1] No information available from Washington sampling efforts

Table 3.2. Final impact rates on ESA-listed upriver spring Chinook from winter and spring season Select Area commercial fisheries, 2002 – 2008.

Year	Actual Impact Rate	Management Guideline
2002	0.191%	0.20%
2003	0.210%	0.20%
2004	0.100%	0.20%
2005	0.012%	0.10%
2006	0.090%	0.10%
2007	0.054%	0.10%
2008	0.132%	0.15%

Table 3.3. Select Area winter, spring, and summer commercial seasons and harvest, 1992 – 2008.

Year	Fishery	Season		Days	Chinook	White Sturgeon
1992	Youngs Bay	Apr. 27 - May 26		9	296	10
			Total	**9**	**296**	**10**
1993	Youngs Bay	Apr. 26 – May 26		9	851	32
			Total	**9**	**851**	**32**
1994	Youngs Bay	Apr. 25 - May 25		9	155	31
			Total	**9**	**155**	**31**
1995	Youngs Bay	May 1 – Jun. 7		11	201	108
			Total	**11**	**201**	**108**
1996	Youngs Bay	Apr. 29 – Jun. 14		15	789	581
			Total	**15**	**789**	**581**
1997	Youngs Bay	Apr. 28 – Jun. 13		22	1,821	351
			Total	**22**	**1,821**	**351**
1998	Youngs Bay	Feb. 25 – Mar. 11		3	74	6
	Youngs Bay	Apr. 23 – Jun. 12		23	2,093	251
	Tongue Point	Apr. 29 – May 27		9	31	79
	Blind Slough	Apr. 29 – Jun. 12		13	60	19
			Total	**48**	**2,258**	**355**
1999	Youngs Bay	Feb. 24 – Mar. 11		3	4	1
	Youngs Bay	Apr. 22 – Jun. 11		26	936	84
	Youngs Bay	Jun. 14 – Jul. 28		10	358	85
	Tongue Point/S. Channel	Apr. 28 – Jun. 9		13	199	260
	Blind/Knappa Sloughs	Apr. 28 – Jun. 11		13	450	94
	Blind/Knappa Sloughs	Jun. 24 – Jul. 2		3	8	0
			Total	**68**	**1,955**	**524**
2000	Youngs Bay	Feb. 23 – Mar. 9		3	33	6
	Youngs Bay	Apr. 19 – Jun. 9		23	4,494	182
	Youngs Bay	Jun. 12 – Jul. 26		11	204	78
	Tongue Point	Feb. 29 – Mar. 14		3	10	5
	Tongue Point/S. Channel	Apr. 24 – Jun. 15		15	937	220
	Blind Slough	Feb. 27 – Mar. 13		3	8	0
	Blind/Knappa Sloughs	Apr. 23 – Jun. 14		15	810	44
			Total	**73**	**6,496**	**535**
2001	Youngs Bay	Feb. 21 – Mar. 9		3	544	14
	Youngs Bay	Apr. 18 – Jun. 14		32	4,462	122
	Youngs Bay	Jun. 18 – Jul. 31		9	587	181
	Tongue Point	Feb. 20 – Mar. 7		3	124	2
	Tongue Point/S. Channel	Apr. 17 – Jun. 13		15	1,507	145
	Blind Slough	Feb. 19 – Mar. 6		3	14	0
	Blind Slough	Apr. 2 – Apr. 10		2	238	0
	Blind/Knappa Sloughs	Apr. 16 – Jun. 14		16	1,793	27
			Total	**83**	**9,269**	**491**

Table 3.3. (continued) Select Area winter, spring, and summer commercial seasons and harvest, 1992 –2008.

Year	Fishery	Season	Days	Chinook	White Sturgeon
2002	Youngs Bay	Feb. 20 – Mar. 8	6	199	3
	Youngs Bay	Apr. 17 – Jun. 13	30	5,749	135
	Youngs Bay	Jun. 19 – Aug. 1	9	695	103
	Tongue Point/S. Channel	Apr. 18 – Jun. 12	15	3,003	354
	Blind Slough	Feb. 18 – Mar. 5	3	19	1
	Blind/Knappa Sloughs	Apr. 18 – Jun. 12	15	2,034	48
		Total	**78**	**11,699**	**644**
2003[a,b]	Youngs Bay	Feb. 18 – Feb. 25	3	74	1
	Youngs Bay	Apr. 16 – Jun. 12	22	4,947	81
	Youngs Bay	Jun. 18 – Jul. 31	9	279	102
	Tongue Point	Apr. 17 - Apr. 18	1	348	11
	Blind Slough	Feb. 15 – Mar. 2	3	12	0
	Blind/Knappa Sloughs	Apr. 17 – Jun. 13	13	2,029	32
	Deep River	Apr. 17 – Jun. 13	20	117	24
		Total	**71**	**7,806**	**251**
2004[a,b]	Youngs Bay	Feb. 14 – Mar. 21; Apr. 12	10	1,050	8
	Youngs Bay	Apr. 22 – Jun. 18	18	5,611	92
	Youngs Bay	Jun. 23 – Jul. 29	8	255	19
	Blind Slough	Feb. 14 – Mar. 21; Apr. 12	7	291	1
	Blind/Knappa Sloughs	Apr. 22 – Jun. 18	12	3,240	59
	Deep River	Apr. 22 – Jun. 18	12	115	5
		Total	**67**	**10,562**	**184**
2005[a,b]	Youngs Bay	Feb. 16 – Mar. 17	9	144	6
	Youngs Bay	May 5 – Jun. 17	21	730	137
	Youngs Bay	Jun. 22 – July 28	8	95	67
	Blind Slough	Feb. 16 – Mar. 17	9	46	3
	Blind/Knappa Sloughs	May 5 – Jun. 17	13	1,331	57
	Deep River	May 5 – Jun. 17	13	60	8
		Total	**73**	**2,406**	**278**
2006[a]	Youngs Bay	Feb. 15 – Mar. 23	10	82	5
	Youngs Bay	Mar. 27 – Apr. 13	6	510	3
	Youngs Bay	Apr. 17 – Jun. 16	29	4,730	242
	Youngs Bay	Jun. 21 – July 27	8	476	32
	Blind Slough	Feb. 22 – Apr. 13	14	167	1
	Blind/Knappa Sloughs	Apr. 20 – Jun. 16	17	1,252	25
	Deep River	Feb. 20 – Mar. 14	4	0	0
	Deep River	Apr. 20 – Jun. 16	17	28	9
		Total	**105**	**7,245**	**317**

Continued

Table 3.3. (continued) Select Area winter, spring, and summer commercial seasons and harvest, 1992 – 2008.

Year	Fishery	Season	Days	Chinook	White Sturgeon
2007[a]	Youngs Bay	Feb. 14 – Mar. 14	7	209	10
	Youngs Bay	Mar. 18 – Apr. 10	11	674	3
	Youngs Bay	Apr. 23[c] – June 15	27	4,070	161
	Youngs Bay	June 20 – July 27	12	256	10
	Blind Slough	Feb. 21 – Mar. 26	8	85	1
	Blind/Knappa Sloughs	Apr. 23[c] – June 15	16	1,451	49
	Deep River	Feb. 18 – Mar. 12	4	0	0
	Deep River	Apr. 23[c] – Jun. 15	30	29	23
		Total	**115**	**6,774**	**257**
2008[a]	Youngs Bay	Feb. 13 – Mar. 12	9	61	14
	Youngs Bay	Mar. 16 – Apr. 8	11	180	7
	Youngs Bay	Apr. 17 – June 13[d]	24	1,937	35
	Youngs Bay	June 18 – July 31	14	1,017	0
	Tongue Point/S. Channel	Apr. 28 – June 13	12	259	204
	Blind Slough	Feb. 20 – Apr. 7	13	51	1
	Blind/Knappa Sloughs	Apr. 17 – June 13[d]	15	953	47
	Deep River	Feb. 18 – Mar. 11	4	0	17
	Deep River	Apr. 17 – June 13[d]	15	28	22
		Total	**117**	**4,486**	**347**

[a] *Landings are preliminary*

[b] *Spring seasons in 2003 – 2005 were reduced significantly due to high abundance of non-local stocks (2003) and lower than anticipated upriver returns that increased mainstem commercial impacts (2004-2005)*

[c] *Spring season openers for all sites were rescinded via in-season action due to lower than anticipated upriver returns which increased mainstem commercial impacts*

[d] *All periods set for week 20 were rescinded via in-season action due to lower than anticipated upriver returns which increased mainstem commercial impacts*

Table 3.4. Select Area fall commercial seasons and harvest, 1996 – 2007.

Year	Fishery	Season	Days	Chinook	Coho	Chum	White Sturgeon
1996	Youngs Bay	Aug. 12 - Sept. 6	10	806	1,456	0	85
		Sept. 9 - Oct. 31	52	633	14,327	3	0
	Tongue Point	Sept 17 - Oct. 31	14	50	1,955	0	0
	Blind Slough[b]	Sept. 16 - Oct. 29	13	82	2,301	2	0
	Deep River	Sept. 16 - Oct. 29	13	35	2,240	0	0
		Total	**102**	**1,606**	**22,279**	**5**	**85**
1997	Youngs Bay	Aug. 11 – Aug. 28	7	737	167	0	65
		Sept. 2 - Oct. 31	59	989	13,482	2	11
	Tongue Point	Sept. 3 - Oct. 24	16	180	861	1	0
	Blind Slough[c]	Sept. 8 - Oct. 22	18	32	1,605	0	0
	Deep River	Sept. 8 - Oct. 22	18	149	821	1	0
		Total	**118**	**2,087**	**16,936**	**4**	**76**
1998	Youngs Bay	Aug. 10 – Sept. 4	11	453	10	0	50
		Sept. 8 – Oct. 31	53	772	20,111	2	55
	Tongue Point	Sept. 10 - Oct. 29	14	421	3,398	1	67
	Blind Slough	Sept. 8 - Oct. 30	19	103	615	0	2
		Total	**97**	**1,749**	**24,134**	**3**	**174**
1999	Youngs Bay	Aug. 3 – Sept. 1	5	878	721	0	41
		Sept. 7 – Oct. 31	54	711	15,190	1	58
	Tongue Point	Sept. 7 – Sept. 15	3	214	1,347	0	72
	Tongue Point/S. Channel	Sept. 20 – Oct. 28	16	125	2,312	0	50
	Blind Slough	Sept. 9 – Sept. 17	3	98	683	0	4
	Blind/Knappa Sloughs	Sept. 22 – Oct. 28	16	69	1,275	0	0
	Deep River	Sept. 9 - Oct. 28	19	48	1,426	2	0
		Total	**116**	**2,143**	**22,954**	**4**	**225**
2000	Youngs Bay	Aug. 1 – Aug. 30	5	1,160	1,461	0	64
		Sept. 5 – Oct. 31	56	584	31,753	1	24
	Tongue Point	Sept. 5 – Sept. 15	6	214	7,451	0	38
	Tongue Point/S. Channel	Sept. 17 – Oct. 31	26	38	3,280	0	21
	Blind Slough	Sept. 7 – Sept. 16	6	56	995	0	1
	Blind/Knappa Sloughs	Sept. 18 – Oct. 31	26	76	2,403	0	8
	Deep River	Sept. 5 - Oct. 31	32	109	14,039	1	0
	Steamboat Slough	Sept. 7 - Oct. 28	30	78	363	0	1
		Total	**187**	**2,315**	**61,745**	**2**	**157**

continued

Table 3.4. (continued) Select Area fall commercial seasons and harvest, 1996 – 2007.

Year	Fishery	Season	Days	Chinook	Coho	Chum	White Sturgeon
2001	Youngs Bay	Aug. 6 – Aug. 30	5	1,458	170	1	21
		Sept. 4 – Oct. 31	57	582	25,299	0	0
	Tongue Point	Sept. 4 – Sept. 14	7	49	774	0	0
	Tongue Point/S. Channel	Sept. 17 – Oct. 31	26	67	1,247	0	0
	Blind/Knappa Sloughs	Sept. 4 – Oct. 31	33	793	3,764	0	0
	Deep River	Sept. 4 – Oct. 31	33	149	2,491	0	0
	Steamboat Slough	Sept. 4 – Oct. 31	33	0	26	0	0
		Total	**194**	**3,098**	**33,771**	**1**	**21**
2002	Youngs Bay	Aug. 7 – Aug. 29	4	2,039	139	0	51
		Sept. 3 – Oct. 31	58	1,735	51,720	0	45
	Tongue Point	Sept. 3 – Sept. 13	7	1,472	9,290	0	65
	Tongue Point/S. Channel	Sept. 16 – Oct. 31	27	236	6,270	0	137
	Blind/Knappa Sloughs	Aug. 26 – Aug. 29	3	2,331	5	0	27
		Sept. 3 – Oct. 31	34	429	1,444	0	6
	Deep River	Sept. 3 – Oct. 31	34	145	303	1	3
	Steamboat Slough	Sept. 3 – Oct. 31	34	183	105	0	0
		Total	**201**	**8,570**	**69,276**	**1**	**334**
2003[a]	Youngs Bay	Aug. 6 – Aug. 30	5	1,703	1,576	0	13
		Sept. 2 – Oct. 31	59	2,904	88,254	0	8
	Tongue Point	Sept. 2 – Sept. 12	7	2,421	13,748	0	97
	Tongue Point/S. Channel	Sept. 15 – Oct. 31	28	30	1,850	0	0
	Blind/Knappa Sloughs	Aug. 25 – Aug. 28	3	63	0	0	9
		Sept. 2 – Oct. 31	35	1,840	3,816	0	19
	Deep River	Sept. 2 – Oct. 31	35	168	3,333	0	3
	Steamboat Slough	Sept. 2 – Oct. 31	35	44	107	0	0
		Total	**207**	**8,837**	**114,352**	**0**	**173**
2004[a]	Youngs Bay	Aug. 4 – Aug. 26	4	1,530	283	0	3
		Aug. 31 – Sept. 3	3	801	3,175	0	1
		Sept. 7 – Oct. 31	55	1,559	31,155	1	19
	Tongue Point/S. Channel	Aug. 31 – Oct. 29	34	2,124	10,196	0	33
	Blind/Knappa Sloughs	Aug. 24 – Aug. 27	3	1,461	63	0	28
		Aug. 31 – Oct. 29	34	4,774	1,292	0	31
	Deep River	Aug. 23 – Oct. 29	40	393	5,780	0	2
	Steamboat Slough	Aug. 31 – Oct. 29	34	0	0	0	0
		Total	**207**	**12,642**	**51,944**	**1**	**117**

continued

Table 3.4. (continued) Select Area fall commercial seasons and harvest, 1996 – 2007.

Year	Fishery	Season	Days	Chinook	Coho	Chum	White Sturgeon
2005[a]	Youngs Bay	Aug. 3 – Aug. 25	4	703	63	0	25
		Aug. 30 – Sept. 2	3	1,447	3,030	0	0
		Sept. 6 – Oct. 31	56	2,139	39,268	1	12
	Tongue Point/S. Channel	Aug. 30 – Oct. 28	34	1,919	19,083	0	29
	Blind/Knappa Sloughs	Aug. 30 – Oct. 28	34	2,124	1,777	0	0
	Deep River	Aug. 30 – Oct. 28	34	364	2,586	0	8
	Steamboat Slough	Aug. 30 – Oct. 28	34	0	0	0	0
		Total	**199**	**8,696**	**65,807**	**1**	**74**
2006[a]	Youngs Bay	Aug. 2 – Aug. 24	4	1,334	287	0	49
		Aug. 29 – Sept. 1	3	744	1,175	0	2
		Sept. 5 – Oct. 31	56	1,800	19,505	0	26
	Tongue Point/S. Channel	Sept. 5 – Oct. 27	30	305	11,567	0	21
	Blind Slough	Sept. 5 – Sept. 15	6	40	328	0	0
	Blind/Knappa Sloughs	Sept. 18 – Oct. 27	24	150	2,556	0	3
	Deep River	Sept. 4 – Oct. 27	32	184	2,235	0	8
		Total	**155**	**4,557**	**37,653**	**0**	**109**
2007[a]	Youngs Bay	Aug. 1 – Aug. 23	4	381	1	0	26
		Aug. 28 – Aug. 31	3	1,593	133	0	12
		Sept. 4 – Oct. 31	57	2,028	3,167	0	26
	Tongue Point/S. Channel	Sept. 4 – Oct. 26	30	269	2,043	0	66
	Blind Slough	Sept. 4 – Sept. 14	6	39	374	0	1
	Blind/Knappa Sloughs	Sept. 17 – Oct. 26	24	48	2,124	0	12
	Deep River	Sept. 3 – Oct. 26	32	175	2,674	0	5
		Total	**156**	**4,533**	**10,516**	**0**	**148**

[a] *Preliminary landings*

[b] *Does not include Big Creek terminal CHF fishery Aug. 26-28, Sept. 3-5, and Sept. 9-11*

[c] *Does not include Big Creek terminal CHF fishery Sept. 2-4 and 9-11*

Table 3.5. Ex-vessel values of Chinook harvest landed in Select Area commercial fisheries by season and site, 2006 - summer 2008.

		2006 Chinook			2007 Chinook			2008 Chinook		
Season	Site	Landings (pounds)	Average price per pound	Ex-vessel value	Landings (pounds)	Average price per pound	Ex-vessel value	Landings (pounds)	Average price per pound	Ex-vessel value
Winter	Youngs Bay	6,920	$5.88	$40,690	13,582	$7.97	$108,249	3,425	$10.63	$36,408
	Blind Slough	2,276	$5.94	$13,519	1,386	$6.94	$9,619	779	$10.09	$7,860
	Deep River	0	--	$0	0	--	$0	0	--	$0
Spring	Youngs Bay	53,411	$4.91	$262,248	59,079	$4.59	$271,173	23,460	$6.45	$151,317
	Blind Slough/ Knappa Slough	13,964	$4.90	$68,424	20,832	$4.65	$96,869	11,290	$6.06	$68,417
	Tongue Point/ South Channel	--	--	--	--	--	--	3,323	$6.14	$20,403
	Deep River	362	*$4.90*	$1,774	439	*$4.65*	$2,041	328	*$6.06*	$1,988
Summer	Youngs Bay	6,265	$2.73	$17,103	3,975	$3.55	$14,111	16,484	$3.59	$59,178
Fall	Youngs Bay	52,370	$2.10	$109,977	41,640	$2.90	$120,756			
	Blind Slough/ Knappa Slough	3,543	$0.61	$2,161	1,143	$0.80	$914			
	Tongue Point/ South Channel	4,470	$1.62	$7,241	2,520	$2.10	$5,292			
	Deep River	2,490	$2.32	$5,777	1,834	$2.50	$4,585			

Table 3.6. Ex-vessel values of fall season coho harvest landed in Select Area commercial fisheries by site, 2006 – 2007.

Season	Site	2006 coho Landings (pounds)	2006 coho Average price per pound	2006 coho Ex-vessel value	2007 coho Landings (pounds)	2007 coho Average price per pound	2007 coho Ex-vessel value
Fall	Youngs Bay	218,567	1.31	$286,323	28,020	$1.45	$40,629
	Blind Slough/ Knappa Slough	29,603	1.31	$38,780	20,042	$1.50	$30,063
	Tongue Point/ South Channel	118,130	1.31	$154,750	18,034	$1.46	$26,330
	Deep River	23,466	1.29	$30,271	22,710	$1.54	$34,973

Figure 3.1. Comparison of pre-season forecast precision for SAFE and Willamette River spring Chinook returning adults; return years 2002 – 2008.

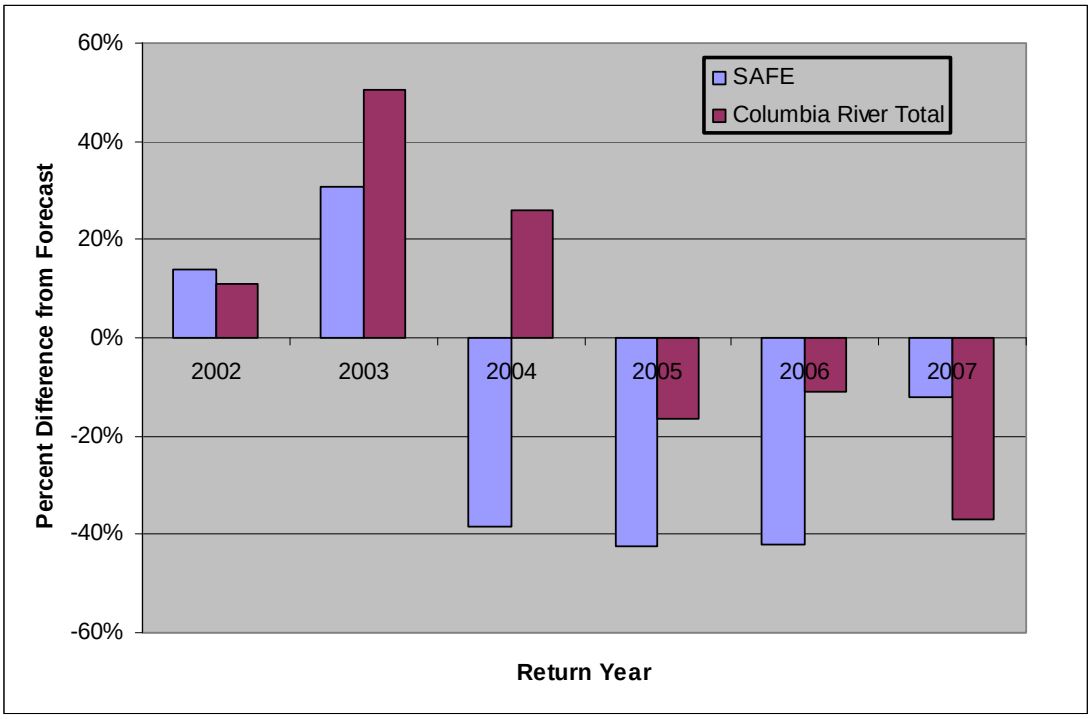


Figure 3.2. Comparison of pre-season forecast precision for Select Area Bright and Columbia River fall Chinook returning adults; return years 2002 – 2007.

Figure 3.3. Comparison of pre-season forecast precision for SAFE and Columbia River early stock coho returning adults; return years 2002 – 2007.

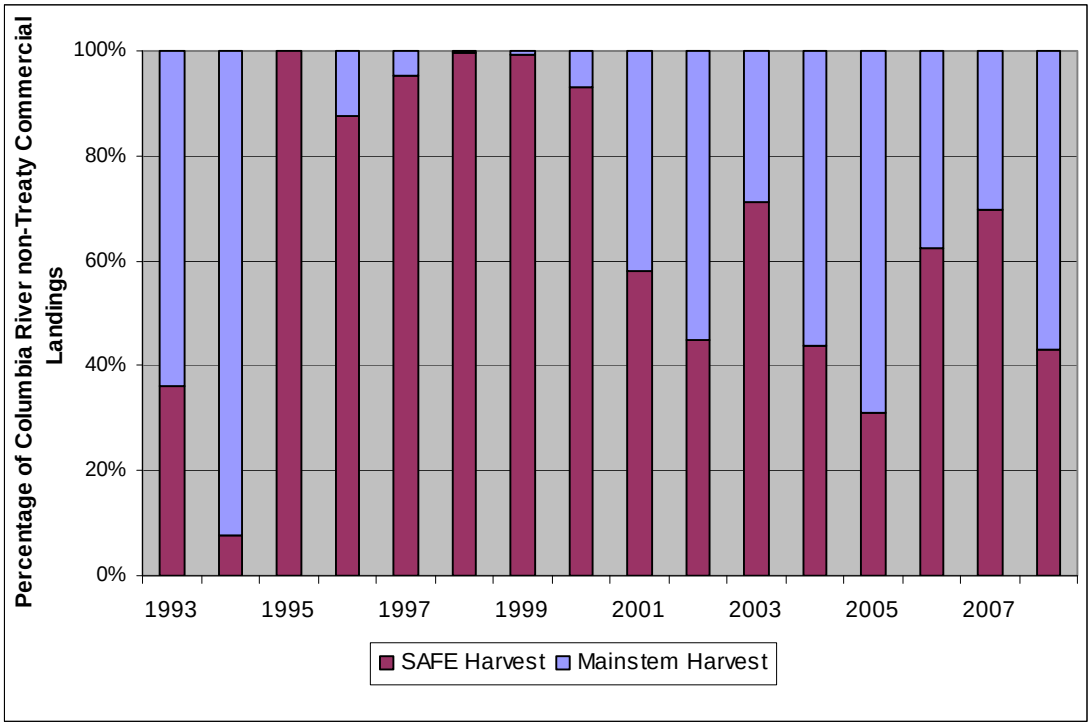


Figure 3.4. Contribution of Select Area commercial spring Chinook harvest to total non-treaty commercial spring Chinook harvest, 1993 – 2008.

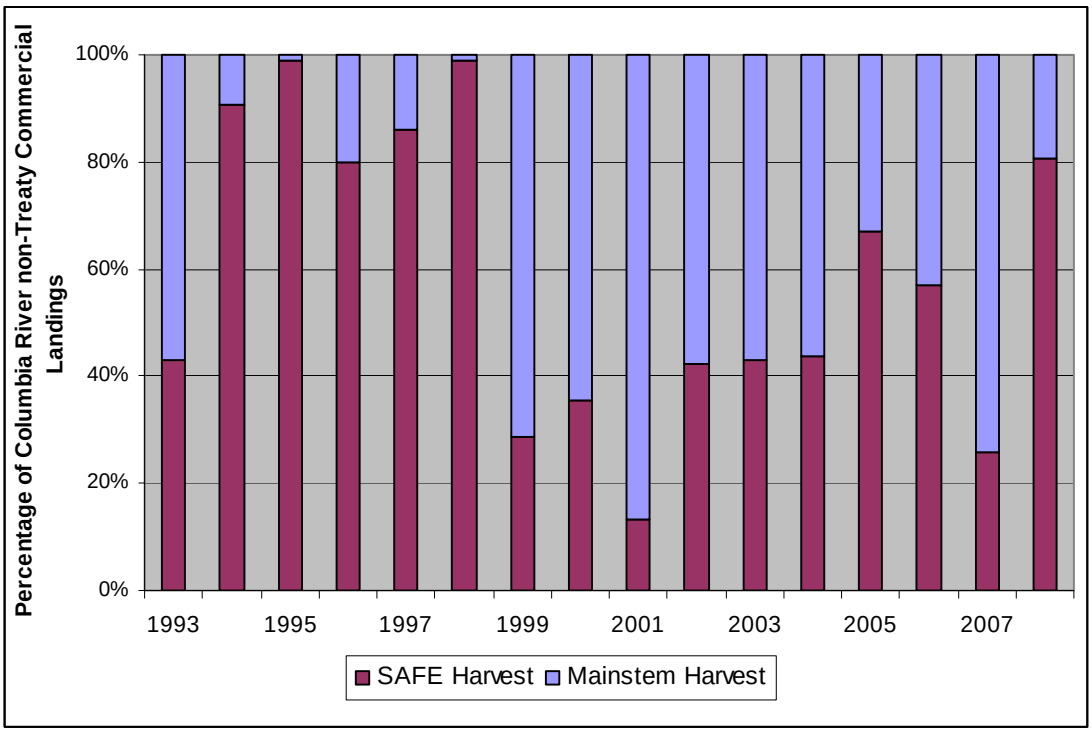


Figure 3.5. Contribution of Select Area commercial coho harvest to total non-treaty commercial coho harvest, 1993 – 2008.

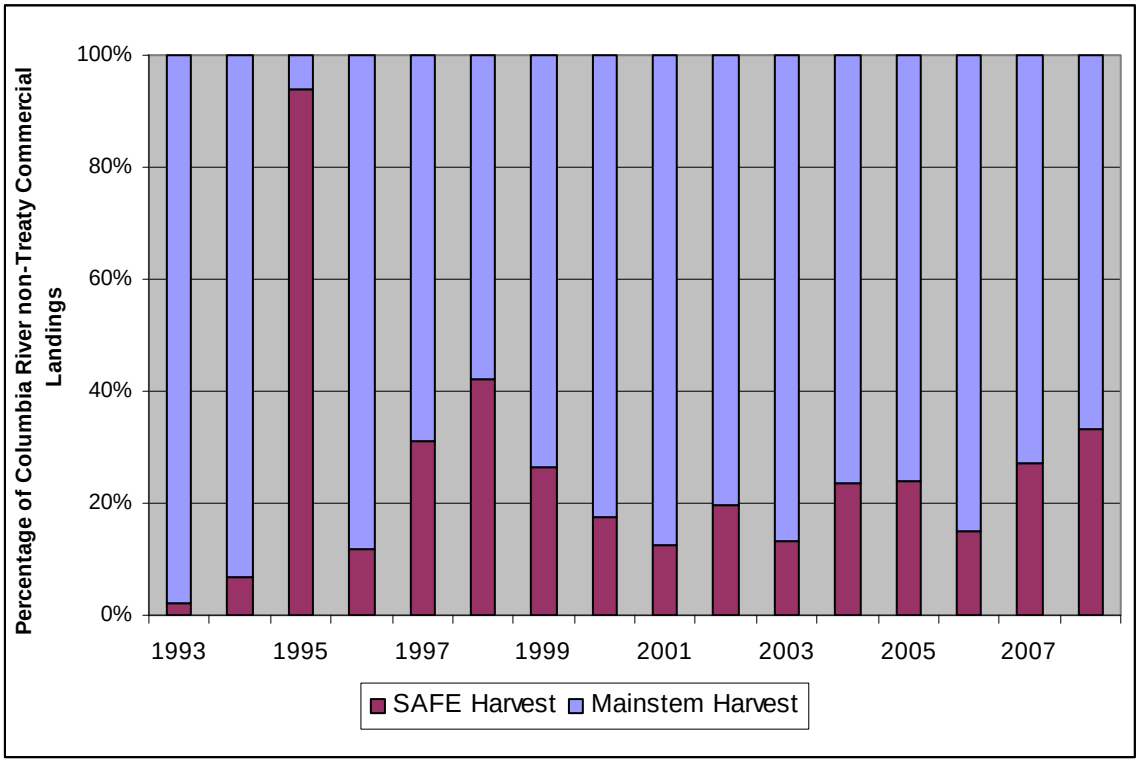


Figure 3.6. Contribution of Select Area commercial fall Chinook harvest to total non-treaty commercial fall Chinook harvest, 1993 – 2008.

4. RUN RECONSTRUCTION and SMOLT-TO-ADULT SURVIVAL

Cohort reconstruction and SARs were calculated using data retrieved from the RMPC coded-wire tag database (www.rmpc.org) managed by the PSMFC. For each relevant tag group, all CWT recoveries reported by all agencies as of August 2008 were used to calculate SARs and to determine the ultimate fate of SAFE project releases (using CWT'd fish as the proxy for the entire release group). Adult returns were categorized by type of recovery (e.g. ocean or freshwater fishery, commercial or recreational fishery, hatchery or stream escapement) to determine contribution to the various regional fisheries and escapement values. Survival rates of Chinook were calculated separately for sub-adults (jacks) and adults based on age-specific CWT recoveries. Unless otherwise noted, survival rates in this report represent smolt-to-adult rates and do not include jack survival.

The following is excerpted from the Regional Overview of Coded-Wire Tagging of Anadromous Salmonid and Steelhead in Northwest America (Johnson, update from 1989 to 2004) to provide detail regarding methods used for expansion of CWT recoveries.

Recovery Estimation Equations

The total number of fish from a particular release group that are caught in a particular area (or landed at a particular port) during a particular time period can be estimated in a two-step process. The first step is to estimate the number of tagged fish in the fishery sample for that area (or port) and time:

$$R_T = aR_O;$$

R_T = the estimated total recoveries of tags bearing the release group's code;
R_O = the observed number of tags of the appropriate code;
a = a sampling expansion factor: (total catch)/(sampled catch).

The second step is to account for the fraction of the release group that was tagged:

$$C = bR_T;$$

C = the total estimated contribution of the release group to the fishery in that area at that time;
b = a marking expansion factor: (total fish released)/(total fish marked).

These are the simplest forms of the recovery expansion equations. Typically, the sampling expansion factor is adjusted to account for biases introduced by snouts with no tags, snouts sampled but not taken, lost snouts, and lost tags

Reporting

Upon completion of this process, the recovery agency forwards the observed and estimated tag recovery data and associated catch and sample data on magnetic tape to the Mark Center. The Mark Center checks the data for errors and works with the recovery agency to resolve discrepancies. Once validated, the CWT data (preliminary or final) are combined with those of other recovery agencies in the online CWT database.

It is important to acknowledge that determining survival and straying is a lengthy process for various reasons. The life history patterns of salmon introduce inherent delays into the process; it takes six years for a complete spring Chinook cohort to return. Preliminary tag recovery, catch sampling, and fishery effort data should be reported to the RMPC by January 31 of the year following the run year (PSC 2008). In practice however, reporting agencies require a substantial amount of time to process and report finalized CWT recovery data to the RMPC. Therefore the RMPC database is continually updated as new information becomes available from the individual reporting agencies. As a result, final recoveries of all age classes of a study group may not be accessible for up to eight years post-release.

As described in Johnson (2004), each sampling agency employs slightly different sampling programs, yet strives for a mark-sample rate of 20% of landed catch. In some instances (e.g. Prince William Sound, Alaska) no sampling for CWTs is conducted. Because of the variation in sampling programs, stratification, and expansion methodology, the use of CWT recoveries to estimate SARs will provide a minimum estimate. As long as the myriad methodologies remain static, interannual comparisons of fishery contributions and SARs should be informative.

SPRING CHINOOK

Results for spring Chinook included in this report are based on recoveries of 13,835 coded-wire tags recovered from 61 CWT study groups released between 1996 and 2002 (1994 – 2000 brood years) from SAFE production facilities; including 26 tag groups released from net pens in Youngs Bay, 18 tag groups from Blind Slough, 10 tag groups from Tongue Point, and 7 groups from Deep River. These same data are used for survival comparisons between SAFE sites; however, analysis is confounded somewhat since fish were not released from all sites in all years. To identify differences or similarities in survival and fishery contribution between SAFE project releases and production from other basin hatchery programs, data are compared with 49,855 tag recoveries from 163 spring Chinook CWT groups (1994 – 2000 brood years) released from four ODFW Willamette Basin hatcheries (Marion Forks, McKenzie, South Santiam, and Willamette), and WDFW's Cowlitz Hatchery.

Smolt-to-Adult Survival Rates

Average annual survival rates of SAFE spring Chinook fluctuated widely within and between release locations (Table 4.1), but overall averaged 0.72% for the brood years 1994 – 2000 (Equation 1). The annual average brood-specific survival rates ranged between 0.11 – 1.32 percent. Spring Chinook released from Blind Slough and Youngs Bay net pens had the highest overall survival at 0.82% and 0.78%, respectively. Survival of Deep River and Tongue Point net-pen fish were lower at 0.59% and 0.52%, respectively. On average, survival rates increased for the 1997 – 1999 broods, likely a result of the improved ocean conditions these fish encountered after outmigration.

Equation 1. Overall survival rate = $\sum CWTrec \Big/ \sum CWTrel$

Analysis of SARs of spring Chinook releases from the comparative other basin hatcheries also showed similar fluctuation within and between release locations (Table 4.1). Overall, survival averaged 0.63% – slightly less than but still similar to the SAFE-produced spring Chinook of the same broods. The annual average brood-specific survival rates ranged between 0.21 – 1.29 percent. This range is slightly smaller than the SAFE broods but is remarkably similar.

Willamette basin and Cowlitz hatcheries both showed similar overall survival rates at 0.64% and 0.61%, respectively.

Run Reconstruction

As intended, the vast majority (90.8%) of SAFE-produced spring Chinook were harvested in fisheries (brood years 1992 – 2000; Table 4.2, Figure 4.1). Most of these (72.1%) were landed in Select Area commercial fisheries, but they also contributed to ocean and Columbia River mainstem commercial and recreational fisheries. The high fishery contribution rates observed for SAFE-produced spring Chinook indicate that the project is meeting one of its primary goals, i.e. to maximize harvest of local stocks in order to achieve the greatest economic value of the project, while minimizing adverse impacts of the program. Only 9.0% of returning SAFE-produced spring Chinook escaped past fisheries and of these the majority returned to hatcheries. In comparison, spring Chinook released from Willamette basin and Cowlitz hatcheries were more likely to escape fisheries; the majority of returning adults (59.86%) either ended up at a hatchery or onto spawning grounds (Table 4.3; Figure 4.2). While the majority of the Willamette/Cowlitz escapement did return to hatcheries[†] they were four times more likely than SAFE fish to be recovered on spawning grounds. Production from SAFE facilities contributed much less (3.0%) to inland recreational fisheries (including mainstem Columbia and tributaries) than did Willamette or Cowlitz hatchery releases (17.0%), certainly due to the fact that returning SAFE adults leave the mainstem Columbia River prior to being exposed to significant recreational fisheries. The Willamette and Cowlitz fish were more likely to contribute to ocean commercial and recreational fisheries, suggesting they may be exposed to different fishing pressure in the ocean, perhaps due to slightly differential migration timing. A higher percentage of SAFE spring Chinook were caught in mainstem Columbia River commercial fisheries than fish from the comparison hatcheries.

Analysis of CWT recoveries indicates that homing of the 1992 – 2000 brood SAFE spring Chinook was generally good. The overall stray rate averaged 7.7%. Very few fish (0.23%) strayed to areas above Bonneville Dam. Strictly speaking, since all SAFE project spring Chinook are released from net pens, any recovery at a hatchery or stream could be considered "straying", but for our purposes we define straying as a recovery at a hatchery or stream other than one in the immediate vicinity of the net-pen release site (plus all recoveries above Bonneville Dam) since, by design, the fish have imprinted on the proximate water source and it would be reasonable to expect them to go somewhere if not harvested in a fishery. Also, since spring Chinook are not endemic to the lower Columbia River estuary, and return timing is separated temporally from fall Chinook, it is thought that risk of introgression with wild stocks is not an issue.

Non-natal straying of Youngs Bay and Blind Slough net-pen releases occurred at relatively low levels (4.7% and 3.4% of adult returns, respectively). Releases from the original Tongue Point net-pen site exhibited high stray rates (averaging 22.1%); the overall SAFE stray rate reported above is likely higher than the current rate since these releases are included. We have not yet been able to evaluate the effect that moving the net pens to the MERTS site has made on the propensity for these fish to stray. Non-natal straying of spring Chinook releases from the Deep River net pens appears to be unacceptably high (19.5%). This finding will be further investigated to determine if the actual magnitude of strays is too high, or if the percentage is high because natal recoveries have been quite low at the Deep River site. Management and biological implications of the resultant findings will be considered, as will methods to reduce any unacceptable straying impacts.

[†] Some minimum level of hatchery return is necessary for broodstock purposes but is presumably less than the levels observed.

COHO

As is the case with all SAFE project releases, each year a representative CWT group (usually 25,000-30,000) is included at each coho release site. Additional tag groups may have been applied to study groups at various times, but the fish reared utilizing a standard set of practices agreed to by all parties were monitored through the representative CWT groups. For 1993 – 2003 brood year coho, 41,046 CWTs representing 86 tag groups were analyzed from releases at SF Klaskanine Hatchery, and Youngs Bay, Blind Slough, Tongue Point, and Deep River net pens. Releases of early run coho (16,075 tag recoveries from 33 tag groups) during the same years (1995 – 2005) from Bonneville Hatchery in Oregon and Fallert Hatchery in Washington were used to compare survival and fishery contribution.

Smolt-to-Adult Survival Rates

Average annual smolt-to-adult survival of the CWT'd release groups provides a reference for relative success between years. For brood years 1993 – 2003 annual survival was highly variable, ranging from 0.71% – 4.37% (Table 4.4). A protracted range of SARs is typical of coho and is presumably influenced heavily by ocean conditions. Tongue Point net-pen and SF Klaskanine Hatchery releases exhibited the highest average survival rates (2.79% and 2.19%, respectively). Youngs Bay and Deep River net-pen groups were next with 1.72% and 1.62%, respectively. Blind Slough net-pen releases consistently have the lowest survival (averaging 1.00%), even during periods of relatively high survival in other groups. Overall, SAFE-project coho had an average SAR of 1.83%.

Coho from the other basin comparative groups demonstrated a relatively similar overall survival rate of 1.85%. As shown in Table 4.4, interannual survival also ranged broadly (0.56% – 4.41%). Average survival of Bonneville Hatchery coho was double that of Fallert Hatchery fish (2.36% vs. 1.07%).

Run Reconstruction

The contribution of 1993 – 2003 brood SAFE and representative hatchery coho to fisheries and escapement is presented in Tables 4.2 and 4.3 and also in Figures 4.3 and 4.4. SAFE-produced coho exhibit the highest rate of contribution to fisheries of all SAFE stocks and likely of any salmonid hatchery program in the region. Nearly all returning adults, 98.8%, are harvested in fisheries. Releases from Youngs Bay, Blind Slough, and Deep River performed similarly. For these sites, the vast majority of CWTs were recovered from a Select Area commercial fishery, range 73.5 – 73.9%. For Tongue Point releases, only 44.9% of adult returns were harvested in Select Area commercial fisheries; however, this statistic is a bit misleading. When mainstem Columbia River commercial fisheries are open, all landings from the Tongue Point/South Channel Select Area site are included in the mainstem harvest. Combining Select Area and Columbia River mainstem landings of Tongue Point fish shows a total commercial fishery contribution similar to the other sites. Very few SAFE-produced fish escape harvest (1.1%) while the majority of the comparison basin hatchery adult return does (68.8%). In both cases, the majority of escapement is comprised of returns to hatcheries as opposed to escapement to streams. Both SAFE and other basin production contribute similarly to ocean fisheries and to Columbia River recreational fisheries.

Homing of SAFE-produced coho appears to be very good. Very few (0.01%) stray above Bonneville Dam, and only 0.9% stray to non-natal areas. The comparison basin production exhibited higher stray rates (0.5% above Bonneville and 2.8% non-natal).

SELECT AREA BRIGHT FALL CHINOOK (SAB)

Results for SAB fall Chinook included here are based on recoveries from 40 CWT groups released between 1995 and 2002 (1994 – 2001 brood years) from Select Area net pens in Youngs Bay, and 18 CWT groups released from broodstock hatchery facilities. CWT recoveries from fisheries and escapement areas totaled 9,807 net-pen tags and 3,977 broodstock tags. Results are not contrasted with another basin stock because we do not believe that a comparable stock (i.e. early fall returning, south-migrating) exists in the Lower Columbia River.

Smolt-to-Adult Survival Rates

Survival rates of 1994 – 2001 brood SAB fall Chinook varied substantially between release sites and year (range 0.22% - 2.29%) but overall averaged 0.79% (Table 4.5). Survival increased dramatically for the 1998 – 2000 broods but appears to have dropped back to average levels with the 2001 brood. Many factors likely affect survival including avian predation, river and ocean conditions, size at release, release timing and location, and health of released smolts. It is unclear which variable expresses the greatest influence on survival rates of SAB fall Chinook; although it appears ocean conditions may be significant. Survival rates are similar for both the net-pen reared fish and the hatchery broodstock group (0.77% and 0.86%, respectively).

Run Reconstruction

SAB fall Chinook contribute substantially to a variety of regional fisheries (Table 4.2; Figures 4.5 and 4.6). As with the other SAFE-produced salmon, the vast majority of adult SABs are harvested (96.4% of net-pen releases and 85.3% of hatchery releases) Results are presented separately for the net-pen (production) releases and hatchery (broodstock) releases since management actions are in place to escape a percentage of the broodstock release past fisheries in Youngs Bay. As a result, returning adults from the hatchery releases contribute less to harvest and more escape to the hatchery. Significant harvest occurs in the Select Area commercial fishery, but a large component of both net-pen and hatchery releases are harvested in ocean commercial fisheries (27.7% and 28.7%, respectively). The balance is harvested in ocean and Columbia River recreational (majority in the Buoy 10 fishery) and mainstem commercial fisheries. Some returning SAB adults do escape fisheries and end up in streams (1.1% of net-pen fish and 1.4% of broodstock fish) and some return to hatcheries (1.6% of net-pen fish and 11.2% of broodstock fish).

As reported in North et al. (2006), straying of SAB fall Chinook into Oregon-side tributaries of the Columbia River estuary has been an issue in the past. Transferring the broodstock program from Big Creek Hatchery to Klaskanine Hatchery in Youngs Bay[†] in 1995 reduced straying to minimal levels, averaging 1.0% for the brood years analyzed. No CWTs from broodstock releases have been reported from areas above Bonneville Dam. SABs from the net-pen releases are observed in non-natal areas at a slightly higher rate (2.3%); of these very few (0.4%) have strayed to areas above Bonneville.

[†] As reported earlier in this report, the broodstock program was transferred from Klaskanine Hatchery to CCF's SFk Klaskanine Hatchery in 2006. It is expected that stray rates will remain at low levels with this production change.

Table 4.1. Smolt-to-Adult survival of SAFE project and comparative in-basin hatchery spring Chinook, brood years 1994 - 2000. Survival rates are based on CWTs collected in fisheries and escapement monitoring. SAFE releases do not include experimental release groups.

	SAFE Project Releases					Other In-Basin Releases		
Brood Year	Youngs Bay Net Pens	Blind Slough Net Pens	Tongue Point Net Pens[1]	Deep River Net Pens	Annual Average	Cowlitz Hatchery (WA)	Willamette Hatcheries[2] (OR)	Annual Average
1994	0.16%	0.11%	0.07%	--	0.11%	0.09%	0.39%	0.24%
1995	0.10%	0.26%	0.22%	--	0.19%	0.13%	0.30%	0.21%
1996	1.48%	0.33%	0.74%	0.02%	0.64%	0.30%	0.69%	0.49%
1997	1.20%	0.78%	0.94%	1.25%	1.04%	0.04%	0.59%	0.32%
1998	0.92%	1.83%	1.20%	--	1.32%	0.72%	1.85%	1.29%
1999	1.53%	1.62%	--	0.36%	1.17%	1.79%	0.54%	1.16%
2000	0.54%	0.41%	--	1.27%	0.74%	1.50%	0.75%	1.12%

[1] Tongue Point net-pen site relocated to current MERTS location in 2002. No releases of 1999 or 2000 brood spring Chinook occurred in Tongue Point during the transition.

[2] Includes Marion Forks, McKenzie, South Santiam, and Willamette hatcheries

Table 4.2. Distribution of returning adult salmon from SAFE project releases; brood years for each stock indicated in parentheses.

		Spring Chinook	Coho	Select Area Bright Fall Chinook (net pens)	Select Area Bright Fall Chinook (Klaskanine Hatchery)
		(BY 1992-2000)	(BY 1993-2003)	(BY 1994-2001)	(BY 1995-2001)
Commercial Fisheries	Select Area	72.11%	66.82%	40.19%	29.65%
	Columbia River Mainstem	6.82%	14.62%	16.66%	10.71%
	Ocean	8.49%	0.58%	27.74%	28.67%
	subtotal	87.42%	82.02%	84.59%	69.03%
Recreational Fisheries	Ocean	0.35%	10.25%	4.19%	7.44%
	Freshwater (including Columbia River Mainstem)	3.03%	6.51%	7.58%	8.86%
	subtotal	3.38%	16.75%	11.77%	16.30%
Escapement	Hatcheries	7.54%	0.95%	1.55%	11.19%
	Streams	1.49%	0.14%	1.12%	1.35%
	subtotal	9.03%	1.09%	2.67%	12.54%
Miscellaneous	Ocean by-catch	0.17%	0.13%	0.98%	2.13%

Table 4.3. Distribution of returning adult salmon from representative basin hatchery releases; brood years for each stock indicated in parentheses. No appropriate comparative stock to contrast with SABs exists.

		Spring Chinook (BY 1992-2000)	Coho (BY 1993-2003)
Commercial Fisheries	Select Area	1.45%	1.43%
	Columbia River Mainstem	4.50%	3.88%
	Ocean	14.62%	0.76%
	subtotal	20.56%	6.08%
Recreational Fisheries	Ocean	2.30%	13.78%
	Freshwater (including Columbia River Mainstem)	16.99%	11.29%
	subtotal	19.29%	25.07%
Escapement	Hatcheries	54.07%	67.80%
	Streams	5.79%	0.96%
	subtotal	59.86%	68.77%
Miscellaneous	Ocean by-catch	0.26%	0.06%
	Columbia River Test Fisheries	0.03%	0.00%

Table 4.4. Smolt-to-Adult survival of SAFE project and comparative in-basin hatchery coho, brood years 1993 – 2003. Survival rates are based on CWTs collected in fisheries and escapement monitoring. SAFE releases do not include experimental release groups.

	SAFE Project Releases						Other In-Basin Releases		
Brood Year	SFk Klaskanine	Youngs Bay Net Pens	Blind Slough Net Pens	Tongue Point Net Pens[1]	Deep River Net Pens	Annual Average	Fallert Hatchery (WA)	Bonneville Hatchery (OR)	Annual Average
1993	0.65%	1.05%	1.95%	3.08%	1.57%	1.66%	0.25%	0.88%	0.56%
1994	0.32%	0.52%	1.21%	0.82%	0.67%	0.71%	0.42%	1.02%	0.72%
1995	1.67%	1.05%	0.07%	0.53%	--	0.83%	0.97%	0.70%	0.83%
1996	0.93%	0.92%	1.55%	3.87%	1.42%	1.74%	1.12%	0.79%	0.95%
1997	0.50%	1.65%	0.73%	1.43%	5.48%	1.96%	0.86%	1.72%	1.29%
1998	3.88%	2.09%	2.21%	3.29%	0.60%	2.41%	3.58%	5.25%	4.41%
1999	2.90%	1.57%	0.01%	1.80%	0.05%	1.27%	1.71%	2.79%	2.25%
2000	7.59%	5.93%	2.34%	3.93%	2.03%	4.37%	1.29%	5.62%	3.45%
2001	1.21%	1.95%	0.04%	2.68%	1.71%	1.52%	0.35%	3.95%	2.15%
2002	--	2.89%	0.01%	4.07%	0.37%	1.84%	1.06%	1.45%	1.26%
2003	--	1.27%	0.58%	3.46%	2.01%	1.83%	0.63%	--	0.63%

[1] Tongue Point net-pen site relocated to current MERTS location in 2002.

Table 4.5. Smolt-to-Adult survival of SAFE project Select Area Bright fall Chinook, brood years 1994 - 2000. Survival rates are based on CWTs collected in fisheries and escapement monitoring.

Brood Year	SAFE Project Releases		
	Youngs Bay Net Pens	Hatchery Broodstock[1]	Annual Average
1994	0.31%	0.31%	0.31%
1995	0.41%	0.18%	0.29%
1996	0.09%	0.35%	0.22%
1997	0.27%	0.58%	0.43%
1998	2.29%	1.15%	1.72%
1999	1.43%	3.14%	2.29%
2000	1.28%	1.22%	1.25%
2001	0.91%	0.24%	0.57%

[1] Big Creek Hatchery for brood year 1994, Big Creek and Klaskanine Hatcheries in 1995, Klaskanine Hatchery from 1996 - 2001.

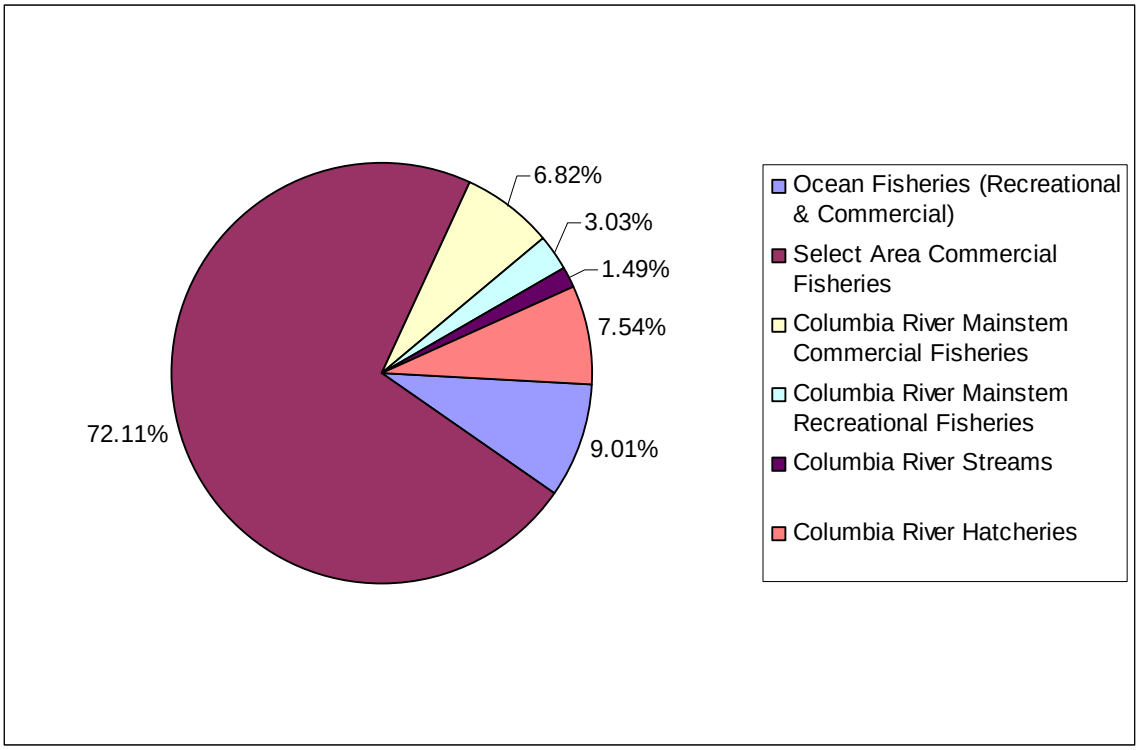


Figure 4.1. Distribution of returning adult spring Chinook from SAFE project releases; brood years 1992 – 2000.

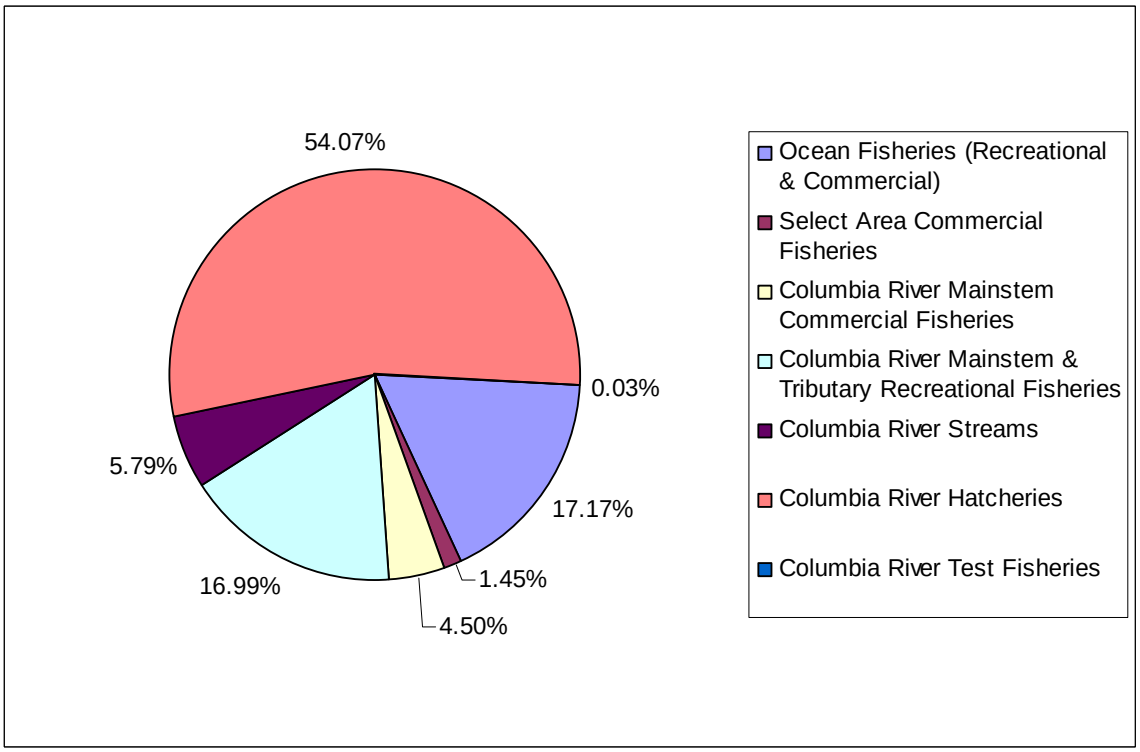


Figure 4.2. Distribution of returning adult spring Chinook from representative basin releases (Willamette basin and Cowlitz hatcheries); brood years 1992 – 2000.

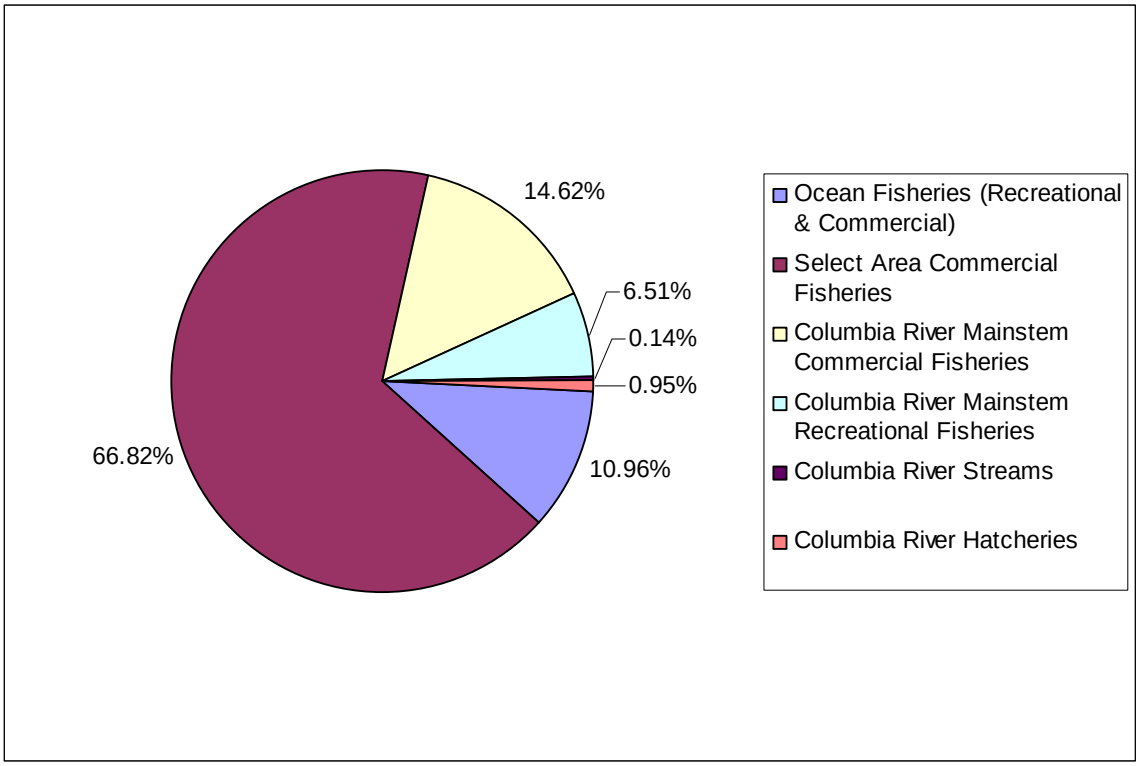


Figure 4.3. Distribution of returning adult coho from SAFE project releases; brood years 1993 – 2003.

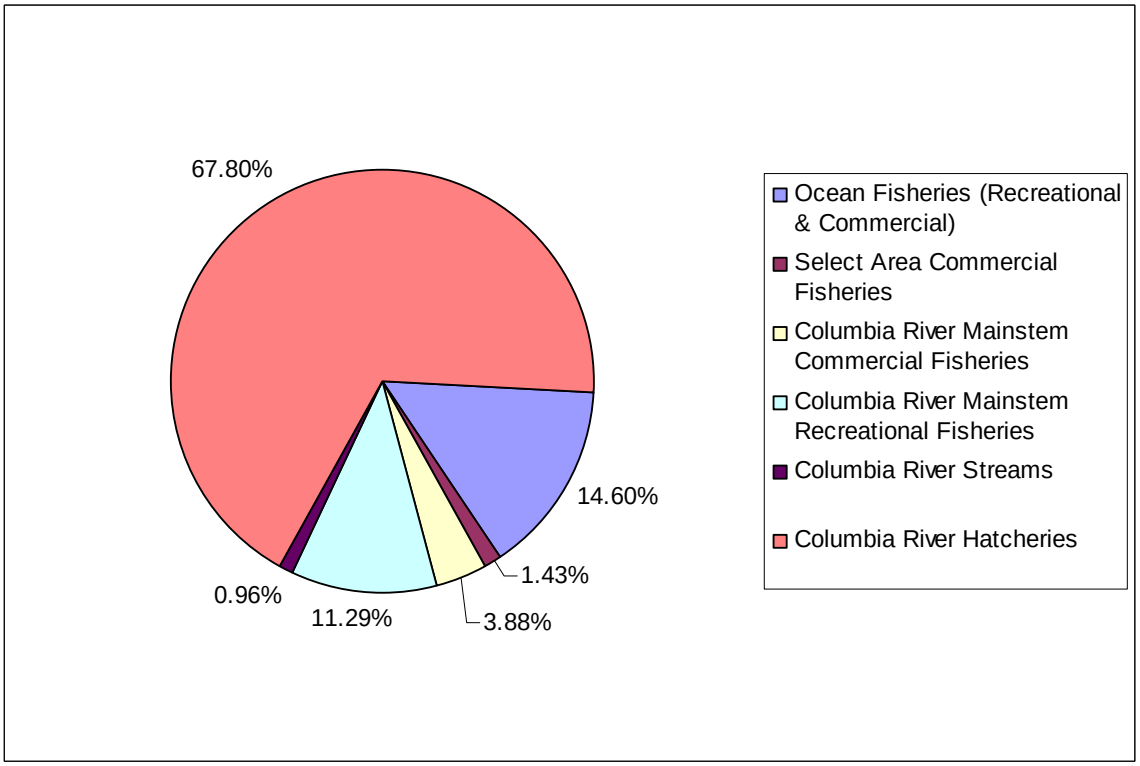


Figure 4.4. Distribution of returning adult coho from representative basin releases (Bonneville and Fallert hatcheries); brood years 1993 – 2003.

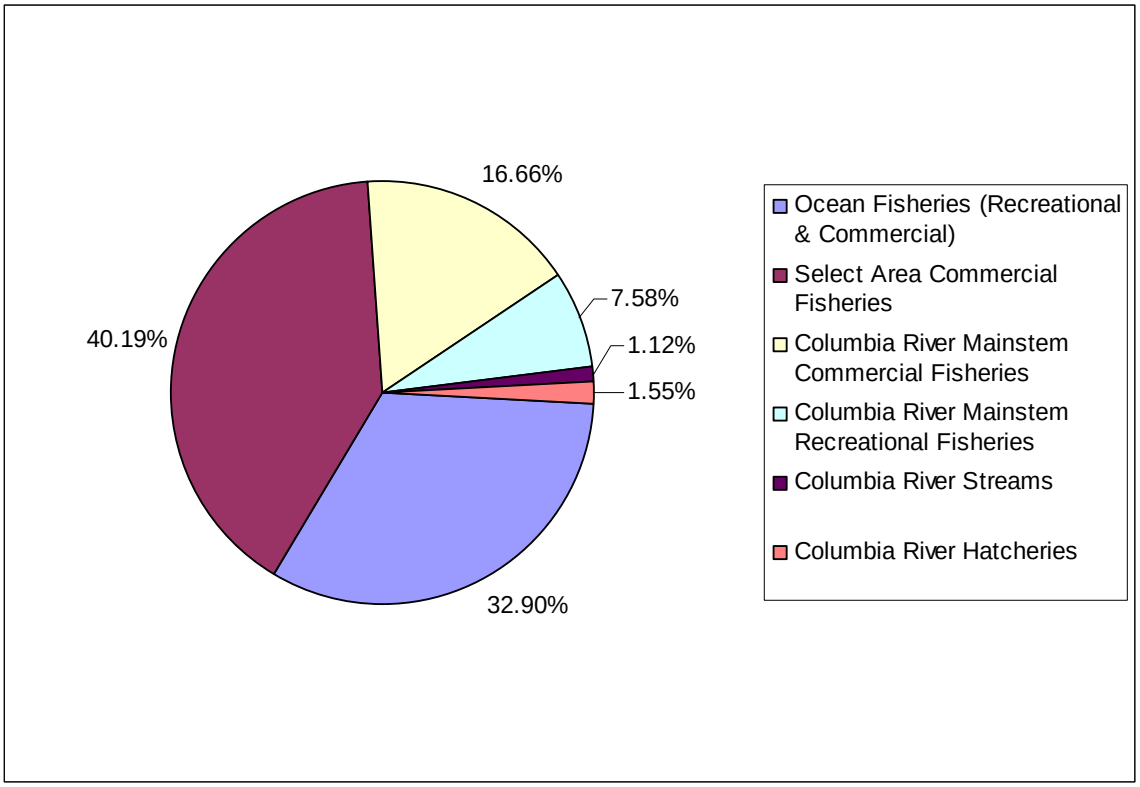


Figure 4.5. Return distribution of net-pen reared Select Area Bright fall Chinook; brood years 1994 – 2001.

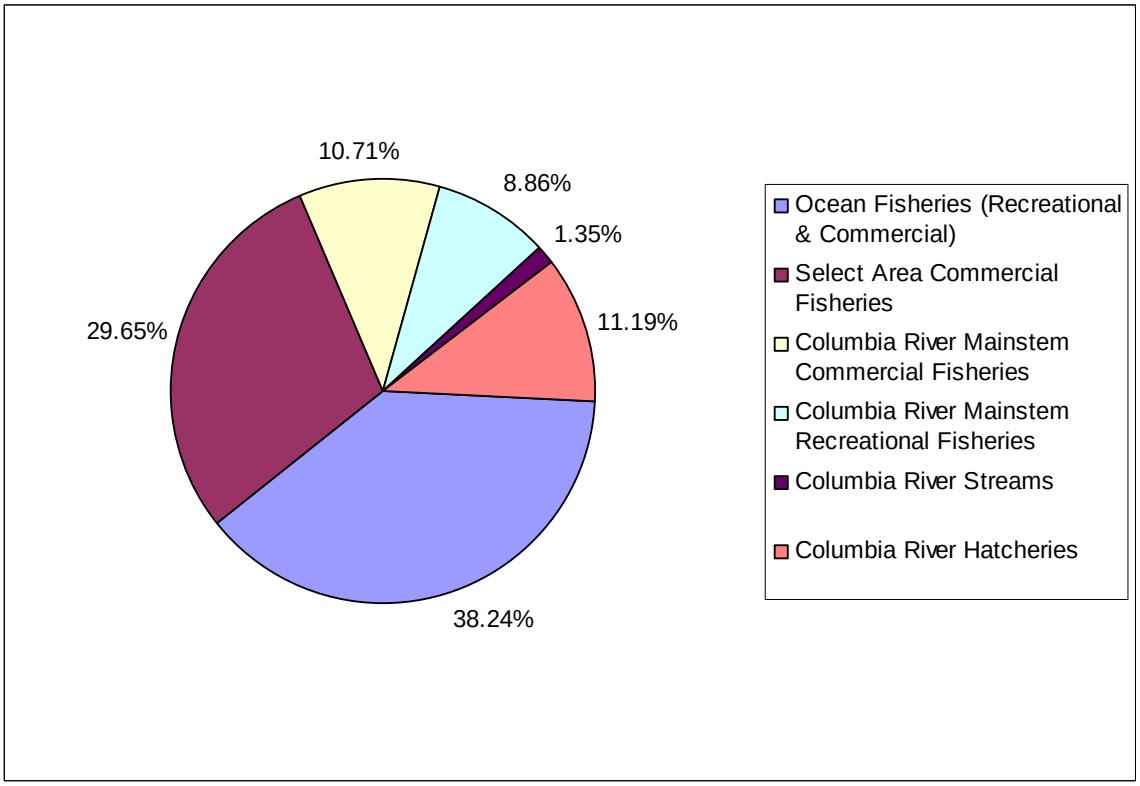


Figure 4.6. Return distribution of broodstock (Klaskanine Hatchery) Select Area Bright fall Chinook; brood years 1995 – 2001.

5. ESCAPEMENT

SPAWNING GROUND SURVEYS

Spawning ground surveys for fall Chinook and coho are conducted annually on many LCR tributaries by ODFW and WDFW staff. Surveys are conducted by SAFE project staff, as well as staff from other programs including: BPA-funded CWT Recovery project (project #198201301), WDFW's Intensively Monitored Watershed (IMW) program, WDFW's Fish In Fish Out (FIFO) monitoring program, and ODFW's Oregon Adult Salmonid Inventory and Sampling project (OASIS). Each of these programs has unique project goals and survey protocols; however, all available carcasses are examined for the presence of fin marks and CWTs. Taken together, these projects provide a wide range of spawning ground survey coverage on LCR tributaries that may be susceptible to straying of SAFE-produced fish. Data from these surveys, along with SAFE-project surveys, are used to assess escapement of SAFE-produced fish into streams.

In general, surveys are conducted throughout the spawning period, which is typically mid-September through early November, depending on the species and stock. A minimum of three surveys are conducted on each stream. These surveys are done by jet boat, cataraft, and/or on foot. Typical data collected consists of counts of live (adults and jacks) and dead fish by species, redd counts, and biological data collected from carcasses. The biological data collected from salmon carcasses consists of fork length, scales (occasionally, no scales are collected from adipose-clipped coho), the presence of any fin marks and/or tags, and spawn success. Tails are removed from all carcasses after sampling to prevent duplicate sampling. Water conditions (visibility and stream flow) are recorded during each survey. Spawning ground survey data is used to estimate spawning escapement, stock composition, and age composition to assist with run reconstruction and run forecasting and to estimate stray rates.

ODFW Surveys

Fall Chinook

Surveys targeting naturally-spawning fall Chinook are conducted in tributaries of the LCR from Youngs Bay to the Sandy River during September and October. Results from these surveys are reported via an annual ODFW whitepaper series (see Takata 2006 and Takata 2007); refer to these documents for specific survey and analytical methodology. Only results pertinent to the evaluation of the SAFE project are discussed here. A total of 9.8 miles of stream are surveyed in the Youngs Bay watershed and another 13.2 miles are surveyed in tributaries between Astoria and Clatskanie (Table 5.1). Additionally, 10.0 miles are surveyed on the mainstem Sandy River from the mouth of Gordon Creek to the Lewis and Clark boat ramp near the confluence with the Columbia River. SAFE project funded staff primarily conduct surveys in Youngs Bay but occasionally will assist in the other surveys.

In 2006, fall Chinook surveys in the Youngs Bay watershed observed a combined peak count of 344 fish, of these 123 (35.8%) were examined for fin marks and CWTs. The vast majority of the mark sampled fish (97.6%) had a LV fin-clip indicating that they were SAB stock (SAB releases are 100% fin-marked with an LV clip). The observed number of fish per mile (35.1) was less than the recent five-year average (2001-05) of 43.8 fish/mile. The surveys from Astoria to Clatskanie recorded a fall Chinook peak count of 326 fish; surveyors were able to examine 201 (61.7%) of these for fin marks and CWTs. Based on fin marks, none of these fish were SABs. No SABs were observed in the Sandy River surveys either.

The 2007 Youngs Bay watershed fall Chinook surveys observed a combined peak count of 345 fish. Because of adverse weather and streamflow conditions, only 30 (8.7%) were examined for fin marks and CWTs. Based on observed fin clips 56.7% of the fish were SABs. As the only two CWTs recovered were both SABs, the stock of origin of the remaining fish cannot be conclusively identified. Based on run timing, however, it can be assumed that they were most likely tule stock. The observed number of fish per mile (35.2) was less than the recent five-year average (2002-06) of 47.4 fish/mile and was similar to that observed in 2006. The surveys from Astoria to Clatskanie recorded a fall Chinook peak count of 444 fall Chinook; surveyors were able to mark sample 221 (49.8%). Based on observed fin marks, none of these fish were SABs. Again, no SABs were observed in the Sandy River surveys in 2007.

Because the water diversion dam, which at times impeded fish passage on the South Fork Klaskanine was removed in 2007 (see Chapter 7 for details), ODFW surveyed a section of the stream above the dam site that year. Six fall Chinook were observed in this area, all were identified as SABs via the LV fin clip. This indicates that, as a result of the dam removal, some natural spawning may have occurred above the CCF hatchery facility in an area which previously had marginal accessibility for these fish. Since then, CCF has constructed a weir near the site to prevent SABs from escaping above the hatchery.

Coho

Since 2002, ODFW has conducted an intensive monitoring program focused on the Oregon portion of the LCR coho ESU. This project, known as OASIS, is administered from the Corvallis Research Lab and is not affiliated with the SAFE project. We have been working with OASIS project staff to obtain survey data to assist with the evaluation of SAFE project goals; also, their CWT recoveries are reported to RMIS and can be used for these purposes. Details on the OASIS project survey methodology and analyses can be found in Suring et al. (2006). The population estimation technique relies on a random sample of available coho spawning habitat and is supplemented with standard surveys.

The Oregon portion of the Lower Columbia River ESU extends from the mouth of the Columbia River to Hood River. Analysis is conducted at the population complex level, six subsets of the ESU defined during the ODFW status review (Chilcote 1999). Two of those subsets, the Astoria and Clatskanie drainages, are most likely to be affected by SAFE project fish and are the focus of discussion in this report. Astoria is defined as all Columbia tributaries from the mouth upstream to, and including, the Gnat Creek basin (this area is further subdivided into the Youngs Bay and Big Creek area watersheds for reporting and analysis). Clatskanie is defined as all Columbia tributaries upstream of Gnat Creek to, and including, the Clatskanie River basin. Table 5.2 provides data on survey effort and estimated coho spawner abundance. Big Creek area tributaries were sampled in 2006 but sample sizes too low to produce an accurate estimate.

The OASIS project summaries indicate that all of the coho observed in the tributaries of Youngs Bay and Big Creek area were of hatchery origin in 2006 and 2007. While some of the hatchery-origin spawners are undoubtedly adults returning from Select Area releases, coded-wire tag recoveries show that SAFE project fish are not the sole contributor. Of the three CWTs recovered in 2006, one was from Big Creek Hatchery, one from the Tongue Point net pens, and one from the Deep River net pens. In 2007 both of the CWTs recovered were from Big Creek Hatchery.

WDFW Surveys

WDFW staff surveyed a total of 33 streams in 2006 and 2007 (Table 5.3). Of these, 19 surveys were supported by SAFE funding (denoted by an asterisk in Table 5.3). Spawner escapement is estimated by a variety of methodologies including peak count expansion, mark-recapture, and area under the curve. Spawner escapement estimates, methodologies, and mark sample summaries by stream can be found in Jenkins (2007; 2008) and Wilson (in prep).

In 2006, 10,208 Chinook and 908 coho carcasses were mark sampled yielding 263 and 84 CWT recoveries, respectively. Out of these 347 CWT recoveries, 2 were SAFE origin CWTs (1 Chinook and 1 coho). In 2007, 4,971 Chinook and 414 coho carcasses were mark sampled yielding 149 and 45 CWT recoveries, respectively. Of these 194 CWT recoveries, 3 were SAFE origin CWTs (2 coho and one Chinook). All SAFE-origin CWTs were recovered in the Grays River watershed.

Based on CWT expansion, the number of SAB stock Chinook found annually on the spawning grounds of Washington LCR tributaries between 2001 and 2007 has ranged from 41 to 102 fish, with a mean of 64. In this same period, over 81% of the SAB Chinook strays in Washington tributaries have been found in the Grays River basin.

Grays River

Fall Chinook natural spawn escapement estimates in the Grays River basin prior to 2005 were strictly generated using a peak fish count (live and dead) expansion factor of 3.58. Since the development of this Grays River peak count expansion factor, spawn timing of Chinook has shifted and become more prolonged resulting in potential inaccuracies of the peak count expansion method. Beginning in 2005 and continuing to the present, more intensive surveys are being conducted in the Grays River utilizing mark-recapture methodology to more accurately estimate the number of spawning salmonids. The results of these new methods are still in development and will be reported on in the FY09 report. For the purpose of this report, peak count expansion methodology is used.

In 2006, spawning ground surveys began on September 21 and ended on December 27. A peak count of 109 Chinook was observed on September 21 resulting in a natural spawn escapement estimate of 390 Chinook. Almost 21% (81) of the Chinook were of SAB origin based on LV marks and CWT expansion. A total of 15.4% of the Chinook were mark sampled. In 2007, surveys began on September 21 and ended on December 17. A peak count of 29 Chinook was counted on October 11 resulting in a natural spawn escapement estimate of 104 Chinook. Over 39% were of SAB origin based on CWT expansion. A total of 56.7% of the Chinook were mark sampled.

HATCHERY SAMPLING

Hatchery sampling of returning Chinook and coho is conducted annually from September through November, concurrent with spawning activities at WDFW and ODFW hatchery facilities. Sampling goals are to collect CWTs and biological data, which are used for run reconstruction and future run forecasts. Sampling rates are determined based on the run size and number of scale samples needed for statistical validity of the age composition. Data collected consists of fork length, sex, scales, fin marks, and the presence of a CWT.

ODFW Hatchery Recoveries

Sampling of returning SAB fall Chinook is conducted annually during October through November, concurrent with spawning activities at ODFW's Klaskanine Hatchery and CCF's SF Klaskanine Hatchery. It is important to note that while every salmonid returning to these hatcheries is examined for the presence of a CWT, SAFE-funded staff may not always be present to sub-sample for biological data such as scale samples for age analysis (Table 5.4).

Based on coded-wire tags collected during broodstock collection and spawning activities, 92.5% of the Chinook returning to Klaskanine Hatchery in 2006 were SABs from the hatchery broodstock production groups, 6.3% were SABs from the Youngs Bay net-pen releases, and 1.3% were spring Chinook released from the SF Klaskanine facility. In return year 2007, nearly all (99.0%) of the Chinook were SABs from the hatchery broodstock production groups and the remaining 1.0% were SABs from the Youngs Bay net-pen releases.

WDFW Hatchery Recoveries

In 2006, 217 CWTs (171 Chinook and 46 coho) were recovered from the nine WDFW LCR hatcheries and fish collection facilities. These facilities include: Grays River, Elochoman, Toutle, Cowlitz, Fallert Creek, Kalama Falls, Lewis River, and Washougal hatcheries, and Merwin Dam Fish Collection Facility. Of these 217 CWTs, 21 (9.7%) were of SAFE origin, which included 17 spring Chinook, 1 fall Chinook (SAB), and 3 coho. All 17 of the spring Chinook CWTs were recovered at the Cowlitz Hatchery, as well as the 1 SAB fall Chinook CWT. The 3 coho CWTs were recovered at Grays River Hatchery.

In 2007, 186 CWTs (130 Chinook and 56 coho) were recovered from the nine WDFW LCR hatcheries and fish collection facilities. Of these, 14 (7.5%) were of SAFE origin, which included 4 spring Chinook and 10 coho. Of the 4 spring Chinook CWT recoveries, 3 were recovered at Cowlitz Hatchery and 1 was recovered at Elochoman Hatchery. Of the 10 coho CWT recoveries, 7 were recovered at Grays River Hatchery, 2 at Elochoman Hatchery, and 1 at Cowlitz Hatchery.

HOMING AND STRAYING

Results of the ODFW fall Chinook surveys provide evidence that the transfer of the SAB program from Big Creek Hatchery to facilities in Youngs Bays has successfully decreased the propensity of these fish to stray into other Oregon-side tributaries.

There was a consistent tendency for Washington recoveries of CWTs from SAFE-origin fish to be more prevalent from the hatchery sampling than from the spawner survey sampling. For example, in 2006 SAFE Chinook CWTs comprised 10% (18/171) of the hatchery CWTs recovered from Chinook. That compared to only 0.4% (1/263) of the CWTs recovered from Chinook in the streams that year. Likewise in 2007, SAFE CWTs comprised 3.1% (4/130) of the Chinook CWTs recovered at hatcheries and 0.7% (1/149) of those collected from stream surveys. The pattern was similar for coho. In 2006, the percentages of the total CWT recoveries from coho were 6.5% (3/46) from hatcheries vs. 1.2% (1/84) from streams. In 2007, SAFE origin CWTs were 17.9% (10/56) of the hatchery recoveries but only 4.4% (2/45) of the recoveries from stream surveys.

This could be reflective of two different movement behaviors of the fish. Some of the fish captured and held at the hatcheries might have been exhibiting wandering or searching behavior but were not given the opportunity to exit and eventually home to the stream of

release. On the other hand, the CWTs recovered from spawner carcasses in the streams were fish that had either chosen to spawn in the “non-natal” stream or at least died there before leaving. The latter would be of greater biological concern regarding the genetic introgression of strays into the local population. In any case, it would appear from these results that CWT recoveries from hatcheries did not reliably reflect stray rates to spawning areas, overestimating the latter by a 4- to 27-fold margin (though sample sizes are small).

There was also a tendency for the vast majority of the SAFE-origin CWT recoveries to be recovered primarily from a single hatchery facility in Washington. For Chinook, 21 of the 22 SAFE-origin CWTs were recovered from the Cowlitz Hatchery (the other being from Elochoman Hatchery). For coho, 10 of the 13 SAFE-origin CWTs were collected at the Grays River Hatchery (plus 2 from Elochoman and 1 from the Cowlitz).

Table 5.1. Lower Columbia River tributary fall Chinook spawner survey areas in 2006 and 2007. Adapted from Takata 2007.

Stream	Survey Description	Miles Surveyed
NF Klaskanine River	Fish hatchery to confluence with SFK	1.5
SF Klaskanine River	Clatsop County fish hatchery to confluence with NFK	3.5
Youngs River	Falls to tidewater	0.3
Lewis and Clark River	400 line bridge (aka Crown Zellerbach bridge) to tidewater	4.5
Subtotal		*9.8*
Clatskanie River	Mouth of Keystone Cr. To tidewater	2.0
Gnat Creek	Falls to tidewater	3.5
Bear Creek	Falls to tidewater	3.0
Big Creek	Hatchery to tidewater	3.0
Plympton Creek	Falls to tidewater	1.7
Subtotal		*13.2*

Table 5.2. Lower Columbia ESU, Oregon portion estimated coho spawner abundance, 2006 - 2007. (Table constructed using summaries available on ODFW website; http://oregonstate.edu/dept/ODFW/spawn/cohoabund.htm)

	Survey Effort		Total		Wild	
Run Year	Number Surveys	Miles	Estimate	95% Confidence Interval	Estimate	95% Confidence Interval
2006						
Youngs Bay	2	1.3	457	895	0	0
Clatskanie	14	13.8	467	242	421	218
2007						
Youngs Bay	20	17.9	16	11	n/a	n/a
Big Creek	4	3.7	216	141	0	0
Clatskanie	14	14.4	1,126	412	583	213

Estimates derived using EMAP protocol. Estimates are adjusted for visual observation bias.

Estimates of wild spawners derived through application of carcass fin-mark observations.

Table 5.3. WDFW spawning ground areas surveyed in 2006 and 2007. Asterisks denote streams for which surveys were supported in whole or part by SAFE project funding.

Drainage	Stream	Index Area Description	River Mile – River Mile	Miles Surveyed
Columbia River	Megler Bridge Creek*	Log jam to Hwy 101 culvert	0.4-0.0	0.4
Columbia River	Coon Canyon*	Hwy 4 culvert upstream 1 mile	1.0-0.0	1.0
Columbia River	Sisson Creek*	Spur Rd 290 washout to Spur Rd 200 bridge	2.5-1.1	1.4
Columbia River	Deep River*	3rd culvert to 1st culvert	3.5-2.2	1.3
Deep River	Person Creek*	Kin Road intersection upstream 0.4 miles	0.4-0	0.4
Columbia River	Grays River	Mouth of West Fork to covered bridge	12.4-10.5	1.9
Grays River	Hull Creek*	Mouth of Fall Creek to Hwy 4	2.6-1.0	1.6
Grays River	Fossil Creek*	Fossil Cr Rd bridge upstream 0.8 miles	1.3-0.5	0.8
Grays River	West Fork Grays River*	Intake to mouth	3.6-0	3.6
WF Grays River	Crazy Johnson Creek	Source to Mouth	0.4-0	0.4
Columbia River	Crooked Creek*	Bridge at NF upstream 1.3 miles	6.0-4.7	1.3
Crooked Creek	NF Crooked Creek*	Eden Valley Rd bridge upstream 1.1 miles	8.7-7.6	1.1
Columbia River	Jim Crow Creek *	2nd bridge to Spur Road 503 bridge	4.0-2.4	1.6
Columbia River	Skamokawa Creek*	Standard/McDonald Cr. confl. to Wilson Cr.	6.8-1.9	4.9
Skamokawa Creek	Wilson Creek*	End of Middle Valley Road to white church	1.5-0.0	1.5
Skamokawa Creek	Falk Creek*	2nd bridge to 0.25 miles below 1st bridge	4.8-4.0	0.8
Skamokawa Creek	LF Skamokawa Creek*	Mouth upstream 1 mile	1.0-0.0	1.0
Columbia River	Alger Creek*	Falls to 0.25 miles upstream of Hwy 4	1.9-1.0	0.9
Columbia River	Elochoman River*	Salmon Hatchery to Foster (Risk) Rd. bridge	9.5-2.7	6.8
Elochoman River	Beaver Creek*	Flagging at RM 1.4 to mouth	1.4-0	1.4
Elochoman River	Duck Creek*	Elochoman mainline road bridge to mouth	0.6-0.0	0.6
Columbia River	Mill Creek	Mill Creek Road bridge to mouth	2.0-0	2.0
Columbia River	Abernathy Creek	Salmon hatchery to mouth	3.0-0	3.0
Columbia River	Germany Creek	Mouth to 3.5 miles upstream	3.6-0	3.6
Columbia River	Coal Creek	Mouth of Mosquito Creek to falls (pipeline)	3.5-.5	3.0
Columbia River	Cowlitz River	Barrier dam to Kelso bridge	50.4-5.1	45.3
Cowlitz River	Coweeman River	Mulholland Cr. to Jeep club bridge (Libby Rd)	18.4-13.1	5.3
Toutle River	South Fork Toutle River	4700 Road bridge to county road bridge	12.7-7.2	5.5
Toutle River	Green River	Weir to mouth	0.37-0	0.4
Columbia River	Kalama River	Italian Creek to I-5 bridge	9.4-1.2	8.2
Lewis River	East Fork Lewis River	Lewisville Park (ramp) to Daybreak Park	14.3-10.1	4.2
Lewis River	North Fork Lewis River	Merwin Dam to salmon hatchery	19.2-15.7	3.5
Columbia River	Washougal River	Salmon Falls to wildlife access	15.4-11.9	3.5

Table 5.4. Klaskanine Hatchery fall Chinook CWT sampling summary, 2006 and 2007.

Year	Hatchery Escapement	CWTs Collected	Percent Biological Sampled
2006	1243	80	77%
2007	1322	103	87%

6. ENVIRONMENTAL COMPLIANCE

PRODUCTION

All SAFE production facilities are currently operating under the 1998 NMFS/NOAA Biological Opinion (NMFS 1998). This BO was a formal ESA consultation completed in November 1998. The final ESA response was that the proposed actions were not likely to jeopardize the continued existence of listed Chinook or sockeye salmon or steelhead, nor result in the destruction or adverse modification of their critical habitat. In addition, species proposed for listing were also considered in this evaluation.

The Oregon hatcheries also operate under 300-J National Pollutant Discharge Elimination Systems (NPDES) permits issued by the Oregon Department of Environmental Quality (DEQ). This permit requires quarterly reporting of water sample analysis for settleable solids, suspended solids, and pH. Water samples from the rearing areas (raceways and/or ponds) are taken each week during the month of highest production of each quarter at intake and outlet. Parameters are established in each permit with maximum/minimum limitations between intake and outlet and if those limits are ever exceeded then a letter of justification is required by the agency that may involve further action. Such a situation occurred in December 2007 when the north coast of Oregon experienced a major storm event that caused high turbidity and silt build-up in the system, resulting in permit limits being exceeded. A letter was submitted to DEQ documenting the problem and no actions were required.

The SAFE net-pen facilities also operate under a NPDES permit from DEQ that requires bi-annual sampling and reporting as discussed below under Benthic and Sediment Monitoring.

BENTHIC AND SEDIMENT MONITORING

Currently, only one of the SAFE net-pen facilities in Oregon has a production level that requires an NPDES permit (No. 101767) issued by the Oregon DEQ, and that is the Youngs Bay net-pen complex. This permit allows a 15-meter mixing zone extending in all directions from the net-pen structure. No environmental impact is permitted outside of the mixing zone as compared with reference conditions and no impact that adversely affects aquatic life or any beneficial use is permitted within the mixing zone. Samples are collected at the perimeter of the mixing zone at these facilities to ensure that any environmental impact is confined to the mixing zone. The environmental impact is monitored by collecting macroinvertebrate samples under the net pens and from reference sites at the end of the growing season (summer) every other year, as directed by the permit. These are compared with macroinvertebrate population parameters of the impact and reference sites. The primary impact from net-pen fish rearing activities is organic enrichment of the area under the pens. The impact on the macroinvertebrate population varies from site to site; for example, a site with a saltwater influence will have a different invertebrate population structure than a fresh water environment, and the influence of an input of organic material on the population structures will differ. Samples are delivered to a laboratory for enumeration and identification of benthic organisms, with the raw data delivered to the SAFE biologist for analysis and reporting the year following the collection of samples.

Sediment samples are also collected for chemistry analysis. These samples are analyzed for total organic carbon (TOC) as a measure of organic enrichment and grain size as a reference of the sediment structure. These samples are also sent to a laboratory for analysis and those

results are included with the benthic reporting the year following collection (the link to the latest report is included as an appendix to this document).

Increases in net-pen loading at the single Deep River site prompted a review in 2008 by Washington Department of Ecology of sediment and water quality sampling protocols. Once established, the monitoring protocols will provide a means to assess the effects of increased net-pen rearing on the local environment.

ADENOSINE TRIPHOSPHATASE SAMPLING

One of the comments in the 2007 SAFE review conducted by a joint ISRP and IEAB panel (ISRP & IEAB 2007) was regarding release timing and smolt-size experiments, stating that further studies were needed to unravel the importance of these variables. To address the concern about release timing, adenosine triphosphatase (ATPase) sampling was conducted to quantify the degree of smoltification and potentially identify a method for determining optimal release time for smolts in the Select Areas. The goal is to release the smolts at the optimum time for quick outmigration from the estuary in order to minimize the possibility of interaction between SAFE smolts and listed stocks in those areas. The ATPase sampling began in 2003 and continued in 2006 and 2007 with the collection of 60 gill samples each from the SAFE coho, spring Chinook, and SAB fall Chinook release groups in Oregon. The samples were prepared and sent to a laboratory in Corvallis, Oregon for analysis. The results showed a tendency of increased specific activity (the chemical process that determines readiness for adaptation to salt water, or degree of smoltification) at the current time of release for the Youngs Bay spring Chinook and coho groups. The SAB fall Chinook results showed a decrease in specific activity at the current time of release. This information will become part of a database being developed for the SAFE program (Figures 6.1 - 6.3). Analysis of results and current release protocols are still in progress.

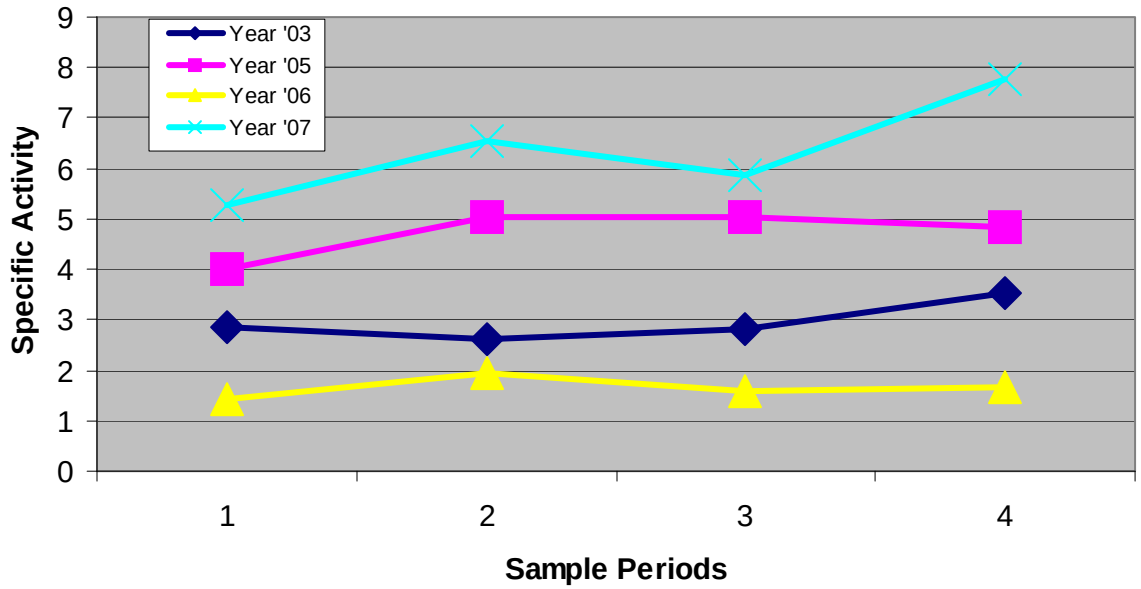


Figure 6.1. Results of gill ATPase for SAFE spring Chinook, 2003 - 2007.

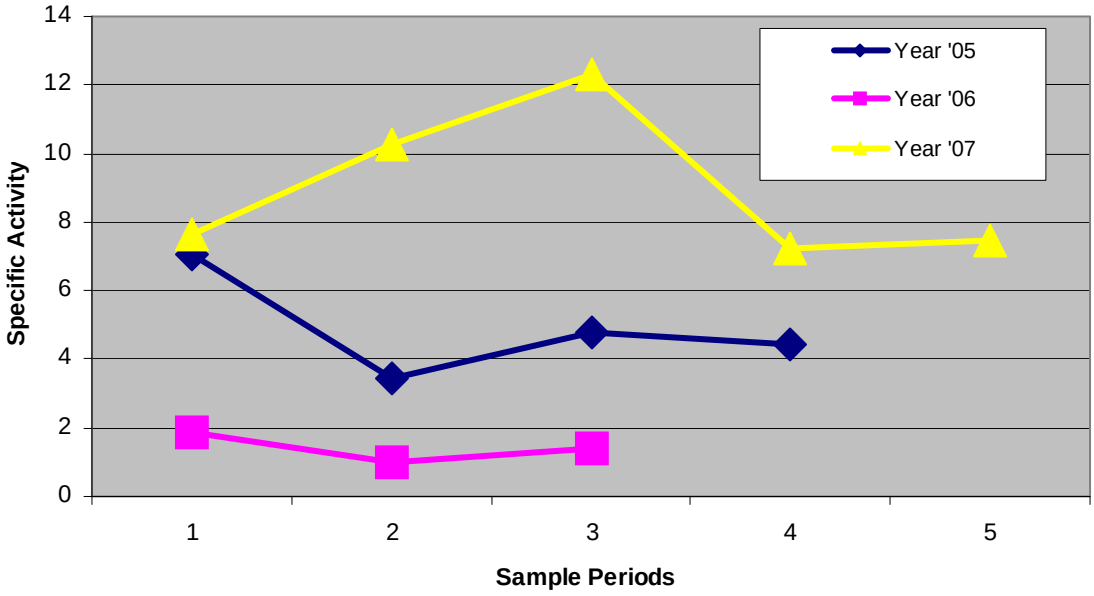


Figure 6.2. Results of gill ATPase for SAFE SAB fall Chinook, 2005 - 2007.

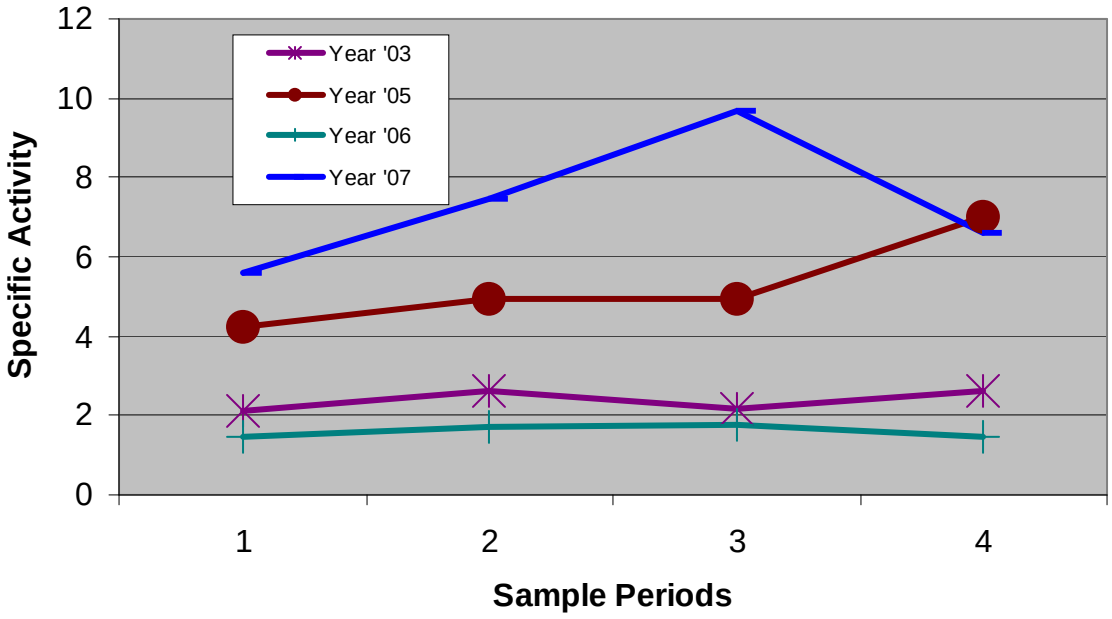


Figure 6.3. Results of gill ATPase for SAFE coho, 2003 - 2007.

7. COLLABORATIVE PROJECTS

SOUTH FORK DIVERSION REPLACEMENT PROJECT

A diversion structure on the South Fork of the Klaskanine River that provided water to an earthen pond used for grow out of juvenile salmon (which later developed into the CCF hatchery facility) was installed as a community project in 1980. The structure included a screening system that prevented debris and juvenile salmon and trout from getting into the pond. The structure was designed by ODFW engineering staff and, at the time, met state and federal requirements for screening and fish passage. Those standards have since changed dramatically. At times, the system blocked adult and juvenile migration upriver and impinged salmon and trout fry on the screens (Figure 7.1).

In an attempt to correct the passage problem and address issues of maintenance on the apron of the dam, CCF submitted a request to the Corps of Engineers and the State of Oregon to install a fish ladder and widen the structure. This triggered a review of the functionality of the entire structure and it was determined that any work on the structure would require addressing the improper screening, as well as fish passage. Through consultation with the local ODFW district biologist and the Natural Resource Conservation Service (NRCS) engineers, it was determined that another option existed, that of removing the dam entirely and replacing it with a "low head" diversion system and newly designed screening structure.

Figure 7.1. Old deteriorated South Fork diversion and screening structure.

By April 2007, all permits were secured and commitments from federal, state, and local partners were in place to begin site work. Funding and technical support came from USFWS, American Rivers (through NOAA Fisheries), NRCS, USACE, ODFW Screen Shop, and ODFW's Fish Passage Program. Local vendors supplied forty loads of large rock, several loads of pit run and

crushed rock, all forming material and labor, and the concrete to complete three structures. By September 1, 2007, the new system was functional with the dam removed and four hundred feet of stream reconstructed. Stream banks were stabilized with large root wads and riprap, then covered with soil lifts and re-vegetated with native plants (Figures 7.2 and 7.3). Total project cost was $475,000 with over a third contributed by the following local businesses and individuals: Astoria Builders Supply, Bergerson Construction, Big River Excavation, Ed Fisher Construction, Englund Marine, Hampton Affiliates, Longview Fibre Company, Natural Solutions, Nygaard Logging, and Weyerhaeuser Company.

Figure 7.2. SF Klaskanine after dam removal and installation of engineered riffle pool structures.

Figure 7.3. SF Klaskanine engineered stream with bank stabilization.

AVIAN PREDATION

The SAFE project continues to work with other agencies to further understanding of interactions of released smolts with the environment. Specifically, NOAA Fisheries is PIT tagging tule fall Chinook from Big Creek Hatchery and SAB fall Chinook from SF Klaskanine Hatchery. The purpose of the study is to measure avian predation on lower river fall Chinook in comparison to upriver stocks.

TIME OF OCEAN ENTRY

From 2002 through 2006, NOAA Fisheries conducted a USACE-funded project using the Blind Slough net pens to serially acclimate and release six groups of 25,000 spring Chinook smolts each year. The purpose of this study was to investigate the relationship between SARs and the time of ocean entry of the smolts with regard to the physical and biological characteristics of the estuary and plume environment. CCF staff were responsible for receiving, feeding, monitoring fish health, and releasing the differentially coded-wire tagged groups at ten-day intervals in April and May of each year.

Coded-wire tags from returning adults were recovered in sport and commercial fisheries (primarily the Blind Slough gillnet fishery) and from Big Creek Hatchery during routine sampling by ODFW staff. Results to date are summarized in the report of research by William Muir and Robert Emmett (Muir et al. 2008).

DELAYED MORTALITY STUDY

Beginning in 2007, James Lathe from the University of California-Davis began using some of CCF's unoccupied net pens for a study of delayed mortality of hatchery-reared Snake River spring/summer Chinook associated with barging and in-river life history strategies. CCF provided three net-pen frames at both the Tongue Point MERTS and Blind Slough sites in the spring and summer of 2007 and three at Tongue Point MERTS only in 2008 for the purpose of holding different treatment groups of smolts in cages to monitor for disease susceptibility and mortality. CCF also provided a pressure washer and storage area at Tongue Point MERTS so that UC Davis personnel could wash and store 72 holding cages. This USACE-funded study was scheduled for one more year of operation in 2009.

OUTMIGRATION TIMING

SAFE project staff worked closely with Salmon For All and the Columbia River Estuary Study Taskforce (CREST) to tag spring Chinook smolts released from the Youngs Bay net pens and the SF Klaskanine Hatchery with acoustic tags in 2004 and 2005. The fish were then tracked as they migrated to the ocean past the Columbia River bar. This study engaged other agencies and entities including Oregon State University (OSU) and Battel Northwest. Results from this two-year tagging and tracking program indicated that spring Chinook smolts released from the Select Areas migrate immediately to the ocean within the first set of tides with minimal delay (Warren et al. unpublished). This confirmed results from earlier research conducted by NOAA Fisheries (Ledgerwood et al. 1997).

IDENTIFICATION OF LATE RUN FALL CHINOOK

Another project that CCF and ODFW worked on and completed with the aid of the Northwest Fisheries Science Center, Genetics and Evolution Program at Manchester, Washington, was the identification of late-run fall Chinook that appear to have colonized the SF Klaskanine River. These fish enter Youngs Bay in late October near the end of the commercial fishery and appear at the hatchery reach by Thanksgiving. Since smolts from the Trask and Chetco Rivers were released into the Youngs Bay watershed during the early 1970s, it was hypothesized that these may have been the source. Cryogenically-preserved samples collected over a four-year period (1998 – 2001) were examined by NOAA Fisheries. Results from microsatellite analysis indicate that the fish are of upper Oregon coastal stocks, not lower Columbia or southern Oregon coast (Doornik et al. unpublished) meaning that these fish may in fact be derived from the past releases of Trask stock fall Chinook.

8. OUTREACH AND EDUCATION

The SAFE project has a history of outreach to the local community and actively supports educational programs at all levels. Project staff provide tours to elementary, high school, and college programs on a regular basis. Project staff are also active with local watershed councils. These activities provide constructive opportunities to educate and inform.

ASTORIA AND WARRENTON HIGH SCHOOLS

Clatsop County Fisheries, in coordination with ODFW's STEP program, provides salmon eggs, fry, and technical assistance with fish culture activities to aquatic science programs at Warrenton and Astoria high schools. Field trips to local hatcheries and net-pen sites are annual events; additionally, students visit periodically as part of their respective class assignments. Students are given new opportunities to experience hands-on learning while working with fisheries staff.

A project initiated by NOAA Fisheries to PIT tag several thousand fall Chinook from various release sites in the LCR involved Warrenton High School and CCF. Fall Chinook from CCF and coho from Big Creek Hatchery were PIT tagged by students under the supervision of NOAA staff and released into Skipanon Slough (Figure 8.1). This study evaluates the vulnerability of juvenile salmonids to avian predation while they migrate through the Columbia River estuary.

Figure 8.1. Warrenton High School students PIT tagging fall Chinook smolts with NOAA Fisheries supervision.

GNAT CREEK OUTREACH

Gnat Creek Hatchery is recognized within ODFW as a leader in community outreach and watershed education. The hatchery has a kiosk to display information about the SAFE program and a show pond where visitors can feed trophy trout and white sturgeon. Gnat Creek Hatchery staff host hundreds of students from Oregon and Washington each year.

OSU Extension held a youth education field day at Gnat Creek in May 2008. Sixty 6th-graders from Knappa and Astoria learned about native plants, aquatic invertebrates, salmonid external anatomy, and got the chance to work with OSU researchers on an experimental stand of Douglas fir trees on site. During the same month, over 100 3rd-graders from Astor School (Astoria) arrived at Gnat Creek to learn about the salmon life cycle, native plants, watersheds, and the operation of a fish hatchery. In June 2008, 75 students from Rainier School came to Gnat Creek to learn about the salmon life cycle, watersheds, PIT tags, fish hatcheries, and toured the ODFW mass-marking trailer (Figure 8.2).

There are nearly five miles of nature trails connected to the hatchery grounds, which have been constructed by staff from ODFW, Oregon Department of Forestry (ODF), local Boy Scout groups, and numerous volunteers. The extensive network of trails explores the Gnat Creek Watershed and has become a stand-alone tourist attraction. Signs along the lower trail system explain the local geology, Native American history of the area, watershed ecology, and native fish and plant species.

Recently, Wauna Mill (Georgia Pacific) acknowledged the forward thinking of this program with a $30,000 grant to help construct an outdoor classroom on the hatchery grounds. This classroom will greatly enhance the outdoor watershed education experience by providing a location where large groups of students can gather out of the often-inclement weather. This facility will also be open year-around for public use.

Figure 8.2. Local area students learning about hatcheries and salmon life cycle at Gnat Creek Hatchery.

9. PROJECT COORDINATION

During the FY07-09 proposal process for SAFE project funding, several efficiency measures were scheduled for implementation. Beginning in FY08, the project manager positions for WDFW and CCF were both reduced to one-half full-time employee (FTE).

Other efficiencies included the Gnat Creek Hatchery staff assuming duties at the Blind Slough net pens, which are located in close proximity to that facility, which freed up a CCF biological aide to share duties at Klaskanine Hatchery for six months from December 15 through June 15 each year. Also, duties were modified for the ODFW Technician position to assist at Klaskanine Hatchery for two months annually. The staff at Klaskanine and Big Creek hatcheries also assist CCF staff with the annual SAB fall Chinook broodstock collection and spawning activities.

STAFFING CHANGES

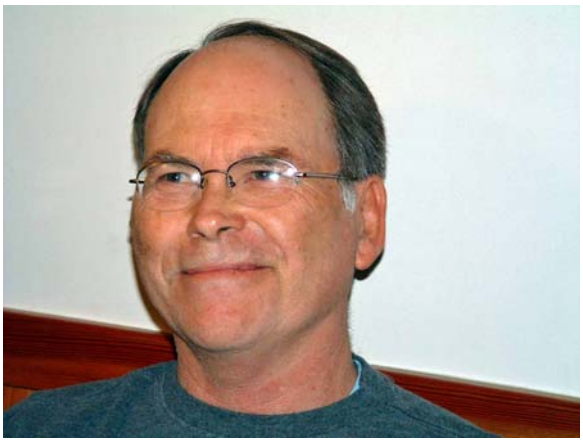
The end of June 2008 marked 'The Changing of the Guard' for three men who have played significant roles in the production and protection of salmon in the Pacific Northwest. We want to take time to recognize them for their contribution to the ongoing salmon saga, particularly their impact on the SAFE Program.

Tod Jones joined the CCF program in 2001 as project manager. Tod brought over 20 years of experience rearing salmon in Alaska, as well as a "no status quo" attitude. Tod immediately saw the need for program upgrades to the SF Klaskanine Hatchery. Major improvements were accomplished and the hatchery is still undergoing upgrades with more in the planning stages. The new water diversion system at the SF Klaskanine site was a feat in itself as Tod was able to bring several government agencies and private entities together through the lengthy and complicated process of in-water work and permitting to remove the outdated dam structure and improve fish passage on the SF Klaskanine River. Tod also worked tirelessly for salmon in the arena of advisory committees and boards. He will continue to work for the benefit of the salmon resource now as a private citizen and leaves the project in able hands as he passes the torch to Steve Meshke, who will be wearing two hats now as Natural Resources Manager for County Parks and CCF.

Steve, who came with high recommendations from his years of service with the county, was a natural fit for the position and was welcomed aboard July 2008. A native Oregonian born and raised in Portland, Steve is an avid fisherman and hunter and has lived in Astoria since 1997. He entered the US Coast Guard following high school graduation and completed a 20-year career where he served in Alaska, California, Minnesota, Oregon (three times), and Virginia. Following retirement from the Coast Guard, and prior to joining Clatsop County full time, Steve worked as a seasonal for County Parks, an engineering consultant for the Tongue Point Seamanship Program, and in construction. Since joining CCF he has been diving into the complex maze of lower Columbia River salmon issues and the challenges of sustaining CCF's hatchery and net-pen sites on limited funding. He brings a strong background of leadership, a

good understanding of local government processes, and an excellent reputation with state and federal agencies.

Alan Meyer of Big Creek Hatchery enters a much deserved retirement after a 31-year career with ODFW. He managed four hatcheries in Oregon; Klamath, Klaskanine, Cascade, and Big Creek. Alan's ten years at Big Creek were a time of partnership and teamwork with the SAFE project because of its SAB fall Chinook and coho production. Big Creek and Klaskanine hatcheries and CCF worked closely together to build the SAB broodstock program begun by Jim Hill in the mid-80s. In 2006, that program was transferred over entirely to CCF. Klaskanine Hatchery is under the management of Big Creek Hatchery, and the three facilities continue to cooperate closely with annual coho production in the SAFE areas.



And last, by alphabetical order only, we say goodbye to Marc Miller, SAFE program manager for WDFW. Marc logged in 30 years with WDFW and came on board SAFE in 1993 when it was the Columbia River Terminal Fisheries Research program. As one of the original three SAFE program managers that included Jim Hill of CCF, Paul Hirose of ODFW, and Marc of WDFW, he helped to pioneer a 'concept' into a successful and viable program that provides fishing opportunities for both sport and commercial fishermen at the same time that it protects threatened and endangered species returning to the Columbia River. Marc's torch passed on to Patrick Hulett in February of 2009.

Pat took over management of WDFW's portion of the SAFE project following a long stint as a research biologist in Southwest Washington. A native Oregonian, Pat was raised in the small-town setting of Sheridan at the northwest corner of the Willamette Valley, where hunting, fishing, and other outdoor pastimes led to his desire to become a biologist. He spent a number of years at Oregon State University in Corvallis, where he was an undergraduate student and then research worker, and finally came away with a Masters degree in Fisheries Science. From there he became a Washington transplant, taking a job with WDFW on a research project to assess the reproductive success of hatchery steelhead spawning naturally in the Kalama River. Though a Beaver in Husky territory, he was fortunate to have had another Beaver alum, Mark Chilcote (now with ODFW), precede him in that position. That project geneticist position led to a project leader role on the Kalama Research Team, which he held up to the point of joining the SAFE program. Apparently, after nearly 23 years on the same project, it was time for a change. Pat supervises Jeremy Wilson, who became the WDFW SAFE field biologist in the fall of 2008. Jeremy, along with the veteran Grays River Hatchery crew, provides valuable SAFE project knowledge and historical context for Pat in his new role.

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APPENDIX

See the link below for the 2007 Youngs Bay Benthic Invertebrate Study by Rod Litton to the Oregon Department of Environmental Quality.

http://pisces.bpa.gov/release/documents/DocumentViewer.aspx?doc=P108368&session=4a8e668a-743c-4b1f-9758-5209df0944d1