

ANNUAL CODED WIRE TAG PROGRAM

OREGON

MISSING PRODUCTION GROUPS

1999 Annual Report

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## SUMMARY

This annual report is in fulfillment of contract obligations with Bonneville Power Administration which is the funding source for the Oregon Department of Fish and Wildlife's Annual Coded Wire Tag Program - Oregon Missing Production Groups Project.

Tule stock fall chinook were caught primarily in British Columbia and Washington ocean, and Columbia Basin fisheries. Up-river bright stock fall chinook contributed primarily to Alaska and British Columbia ocean commercial, Columbia Basin gillnet and other freshwater fisheries. Contribution of Rogue stock fall chinook released in the lower Columbia River occurred primarily in Oregon ocean commercial, Columbia Basin gillnet and other freshwater fisheries.

Willamette stock spring chinook contributed primarily to Alaska and British Columbia ocean, and Columbia Basin non-gillnet fisheries. Willamette stock spring chinook released by CEDC contributed to similar ocean fisheries, but had much higher catch in Columbia Basin gillnet fisheries than the same stocks released in the Willamette Basin. Up-river stocks of spring chinook contributed almost exclusively to Columbia Basin fisheries.

The up-river stocks of Columbia River summer steelhead contributed almost exclusively to the Columbia Basin gillnet and other freshwater fisheries.

Coho ocean fisheries from Washington to California were closed or very limited from 1994 through 1999 (1991 through 1996 broods). This has resulted in a lower percent of catch in Washington, Oregon and California ocean fisheries, and a higher percent of catch in Alaska and British Columbia ocean and Columbia Basin freshwater fisheries. Coho stocks released by ODFW below Bonneville Dam were caught mainly in Oregon, Washington, and British Columbia ocean, Columbia Gillnet and other freshwater fisheries. Coho stocks released in the Klaskanine River and Youngs Bay area had similar ocean catch distributions, but a much higher percent catch in gillnet fisheries than the other coho releases. Ocean catch distribution of coho stocks released above Bonneville Dam was similar to the other coho groups. However, they had a higher percent catch in gillnet fisheries above Bonneville Dam than coho released below the dam.

Survival rates of salmon and steelhead are influenced, not only by factors in the hatchery (disease, density, diet, size and time of release) but also by environmental factors in the river and ocean. These environmental factors are influenced by large scale oceanic and weather patterns such as El Nino. Changes in rearing conditions in the hatchery do impact survival, however, these can be offset by impacts caused by environmental factors.

Coho salmon released in the Columbia River generally experience better survival rates when released later in the spring. However, for the 1990 brood year June releases of Columbia River coho had much lower survival than May releases, for all ODFW hatcheries. In general survival of ODFW Columbia River hatchery coho has declined to low levels in recent years.

Preliminary results from the evaluation of Visual Implant Elastomer (VIE) tagging showed an improvement in tagging rate and pre-release tag retention from the first (1998) to second (1999) year of tagging. For fish tagged in 1999 pre-release VIE tag retention was 99.4%. The first adult hatchery returns of VIE tagged coho for this study will be in 2000. Of 17 jacks recovered at Sandy hatchery in 1999 12 (70.6%) had retained there VIE tag.

## INTRODUCTION

The Columbia Basin Fish and Wildlife Program Section 203 (a) proposes an interim goal of doubling runs of salmon and steelhead in the Columbia Basin. As part of this effort Section 206 (c) states an objective of exploring methods for substantially increasing and improving hatchery production at existing hatcheries. Section 206 (e)(1) states Bonneville shall fund collection of Columbia Basin hatchery data for anadromous fish. These data will include at a minimum: number of returning adults; disposition of returning adults; source and description of brood stock; actions to maintain genetic diversity; and size, location and time of release of juvenile fish. A system of monitoring and evaluation is necessary to measure present and future levels of fish production by various hatchery and natural fish production components if we are going to be able to evaluate the success of this program in attaining the goal of doubling fish runs.

In September 1989 the Oregon Department of Fish and Wildlife received a grant from the Bonneville Power Administration to begin a project of annually coded-wire tagging production groups of anadromous salmonids not currently tagged. Some groups of hatchery production fish were already being tagged by other programs. The Bonneville Power Administration contract consisted of coded-wire tagging the remaining untagged "missing" production groups for the future data base. This project began in 1990 to coded-wire tag groups of juvenile anadromous salmon produced at Oregon hatcheries.

Tagging will enable evaluation of survival and contribution rates. As the fish mature and are captured in various fisheries or return to release/recapture facilities, they are sampled to recover coded-wire tags. All recoveries of coded-wire tagged fish are reported to the Pacific States Marine Fisheries Commission (PSMFC). Release and recovery information is stored along with sampling and mark/unmarked release ratios. This information is then used to estimate survival rates and catch contribution rates for each production lot of fish reared and released at each hatchery. This data is used to evaluate effectiveness of each hatchery as well as various rearing and release practices. Evaluation of the various hatchery and natural production projects will be needed to measure the effectiveness of any mitigation program and to help direct future efforts in maintaining or enhancing fish runs in the Columbia Basin. This information is also used by salmon harvest managers in developing scenarios that will allow harvest of excess hatchery fish while protecting threatened and endangered natural stocks.

## METHODS AND MATERIALS

The adipose fin clip + coded-wire tag (Jefferts et.al. 1963) was chosen as the method of marking because its use is well established in the region, there is a regional data reporting, storing, and access system. In 1989 a committee of agency and tribal scientists recommended the number of fish tagged per group for this project be based on producing a minimum of 30 actual tag recoveries per group. Based on historic levels of survival, harvest, and sampling, the following levels of tagging should meet that goal; tag 25,000 for groups with expected survivals of 0.5% or higher, and tag 50,000 for groups with expected survivals of 0.5% or lower. Some groups of 30,000 are used for Willamette Basin spring chinook to maintain equal sample size with ongoing ODFW research projects funding other tagging at those hatcheries. These levels generally agree with Reisenbichler and Hartmann (1978) who recommended tagging 25,000 fish per group for estimation of fish contribution. However, the increasing complexity of fisheries management regimes requires much higher levels of tagging (Hankin and Mohr 1990).

Objective 1. Insure all ODFW Columbia Basin hatchery coho and chinook production releases have a representative CWT group included in the release. Specific tasks and methods follow:

- a) Determine groups to be tagged and number of fish to tag. This is a three step process. First, all production releases are identified, based on program intent (ongoing regular smolt production), number of fish released (50,000 or more), and fish of an acceptable size (at least 2.0 gm/fish). Second, groups with adequate tagging funded by other sources are eliminated from the list. Finally, the number of fish to tag is determined based on the expected survival, generally 25,000 to 50,000 fish per group.
- b) The identified groups of fish are tagged based on the manufactures recommendations and standard techniques for coded-wire tagging (Jenkinson and Bilton 1981).
- c) Pre-release checks of 500 fish per group (PSC 1995) are made at least 4 weeks after tagging (Blankenship 1981).
- d) All release information is reported to the Pacific States Marine Fisheries Commission and is available on their on-line computer database.

Objective 2. Recover coded-wire tags from snouts of fish tagged under Objective 1. Specific tasks and methods follow:

- a) Snouts collected from marked fish sampled in fisheries, hatcheries, and other recovery areas are frozen and transported to the ODFW Fish Identification head lab in Clackamas, Oregon.
- b) Tags are recovered, read and stored using standard techniques. Tags recovered by other agencies are sent to the Clackams lab for verification.
- c) All recovery information is reported to the Pacific States Marine Fisheries Commission and is available on their on-line computer database.

Objective 3. Prepare annual report. Specific tasks and methods follow:

- a) Compile release and recovery information from all CWT groups released in the Columbia Basin by ODFW.
- b) Calculate survival (total estimated recoveries/number of tagged fish released) and catch distribution (percent of total recoveries by location) for each CWT group. Calculate 5 year averages of the above information by hatchery program (species/stock/release location) and display graphically.
- c) Compile and submit report to BPA by 90 days after end of contract. Report published by BPA.

In 1997 a fourth objective was added to evaluate methods of marking large numbers of hatchery fish.

Objective 4. Evaluate the technical, logistic, and biological feasibility of using alternative marking techniques to mark large numbers of juvenile coho salmon.

- a) Mark one group of 75,000 juvenile coho salmon at Sandy hatchery. Each fish will receive a code-wire tag (in the snout), adipose fin clip, and visual implant tag (in the jaw).
- b) Collect and record data during hatchery rearing (from tagging through release) including daily mortality, daily amounts fed, monthly fish size, and monthly disease checks.
- c) Pre-release checks of 500 fish per group (PSC 1995) are made at least 4 weeks after tagging (Blankenship 1981).
- d) Coho salmon jacks and adults collected at Sandy hatchery will be checked for fin clips and visual implant tags. Marked fish will be sampled for gender, length, and have their snouts removed for CWT recovery.

## RESULTS

Objective 1. We completed coded-wire tagging and ad-clipping a total of about 0.9 million juvenile 1998 brood spring and fall chinook and coho salmon (Table 1). The total represents 25 different tag groups. Estimated total operational costs for this tagging (without administrative overhead) averaged \$95 per thousand fish tagged, and ranged from \$65/1,000 to \$145/1,000.

Table 1. Fish Tagged and Respective Estimated Operational Costs. (January 1, 1999 to December 31, 1999)

Obj.	Act.	Period	Location	Brood	Species	CWT'd	Grps	\$/K	Total \$
1	1	April, 99	Big Creek	1998	CHF	57,815	1	\$105	\$6,048
1	2	May, 99	Bonneville	1998	CHF	110,245	2	\$91	\$10,041
1	3	Mar., 99	Oxbow	1998	CHS	33,368	1	\$65	\$2,178
1	4	June, 99	Willamette	1998	CHS	26,782	1	\$89	\$2,373
1	5	July, 99	South Santiam	1998	CHS	55,642	1	\$113	\$6,290
1	6	Aug., 99	Marion Forks	1998	CHS	27,192	1	\$92	\$2,497
1	7	July, 99	McKenzie	1998	CHS	64,939	2	\$95	\$6,140
1	8	July, 99	Big Creek	1998	Coho	54,062	2	\$114	\$6,187
1	9	Oct., 99	Bonneville	1998	Coho	26,781	1	\$88	\$2,369
1	10	Sept., 99	Cascade	1998	Coho	134,511	5	\$91	\$12,225
1	11	Aug., 99	Oxbow	1998	Coho	55,273	2	\$107	\$5,902
1	12	Nov., 99	S Fk Klaskanine	1998	Coho	27,153	1	\$145	\$3,932
1	13	Nov., 99	Sandy	1998	Coho	27,355	1	\$87	\$2,379
1	14	Nov., 99	Sandy	1998	Coho	54,426	2	\$85	\$4,644
4	2	July, 99	Sandy (VIE tag)	1998	Coho	78,181	1	\$79	\$6,151
4	3	Dec., 99	Sandy	1998	Coho	74,771	1	\$96	\$7,157
			TOTALS			908,496	25	\$95	\$86,511

Objective 2. During 1999 we completed processing a total of 16,069 tags at the laboratory in Clackamas. The total consisted of fish from sport, commercial, tribal, hatchery, spawning ground surveys, and miscellaneous other fisheries (Table 2). During 1999 we verified 1,268 ODFW tags recovered and returned to ODFW by other agencies.

Objective 3. Summaries of available coded-wire tag recovery information for all groups of tagged fish released from Oregon Department of Fish and Wildlife hatcheries in the Columbia basin are presented in Appendix A. Charts depicting the latest five year average distribution of catch and estimated survival rate for each stock and hatchery are presented in Figures 1 to 43.

Objective 4. Results are reported in Appendix B.

Table 2. CWT's Recovered at Clackamas. (Jan. 99 to Dec. 99)

Fishery	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	1999 Total
River Sport	240	0	13	38	0	227	23	29	205	101	21	11	908
Hatchery	3,129	1,702	1,356	15	0	394	304	892	218	222	375	1,211	9,818

Spawning Ground	113	384	530	0	0	1	0	0	0	1	34	4	1,067
Treaty Gillnet	0	0	0	0	0	6	0	14	928	73	0	5	1,026
Non-Treaty Gillnet	0	0	0	0	0	0	0	45	123	80	188	2	438
Youngs Bay Gillnet	0	0	0	1	0	196	19	81	104	14	7	0	422
Terminal Gillnet	0	0	0	0	0	115	6	0	0	0	64	0	185
Ocean Sport/Com.	0	0	0	0	0	0	503	652	38	104	0	433	1,730
Estuary Sport	2	0	0	0	0	0	8	0	143	34	0	89	276
Whiting Fishery	19	0	0	0	0	0	0	0	9	0	0	110	138
Ceremonial/Subsist	19	0	0	0	0	0	0	0	34	0	0	0	53
Columbia R Test	2	0	0	1	0	2	0	0	0	0	3	0	8
Total	3,524	2,086	1,899	55	0	941	863	1,713	1,802	629	692	1,865	16,069
Verifications	0	0	68	0	0	0	833	367	0	0	0	0	1,268

## DISCUSSION

The average percent recovery (by fishery) for the last 5 completed brood years (chinook 1989 to 1993 broods; coho 1991 to 1995 broods; steelhead 1990 to 1994 broods) is presented in Appendix A.

### Big Creek Hatchery

Big Creek Hatchery is located 2 miles south of Knappa off Highway 30 near the mouth of the Columbia River. The hatchery, originally built in 1939-41, rears and releases tule and Rogue fall chinook, coho salmon, and winter steelhead.

Tule stock fall chinook 1989 to 1993 brood survival rate averaged 0.15%. They were caught primarily in British Columbia and Washington ocean fisheries, and Oregon freshwater fisheries (Figure 1).

Experimental releases of Rogue River stock fall chinook releases at Big Creek began in 1983. Good survival and contribution rates to Oregon fisheries resulted in expansion of the program. The 1989 to 1993 broods survived at an averaged rate of 0.83%, and were caught mainly in Oregon freshwater and ocean fisheries (Figure 2).

The 1991 to 1995 brood Big Creek stock coho released in Big Creek survived at an average rate of 0.78%. They were caught mainly in Oregon freshwater as well as British Columbia, and Washington ocean fisheries (Figure 3).

The 1991 to 1995 brood Big Creek stock coho released in Tualatin River survived at a average rate of 0.03% and were caught mainly in Washington and Oregon ocean and freshwater fisheries (Figure 4).

Winter steelhead are reared at Big Creek but none have been marked with coded-wire tags for evaluation.

Previously small groups of chum salmon and searun cutthroat trout were reared and released at Big Creek hatchery, but none of these fish were coded-wire tagged for evaluation.

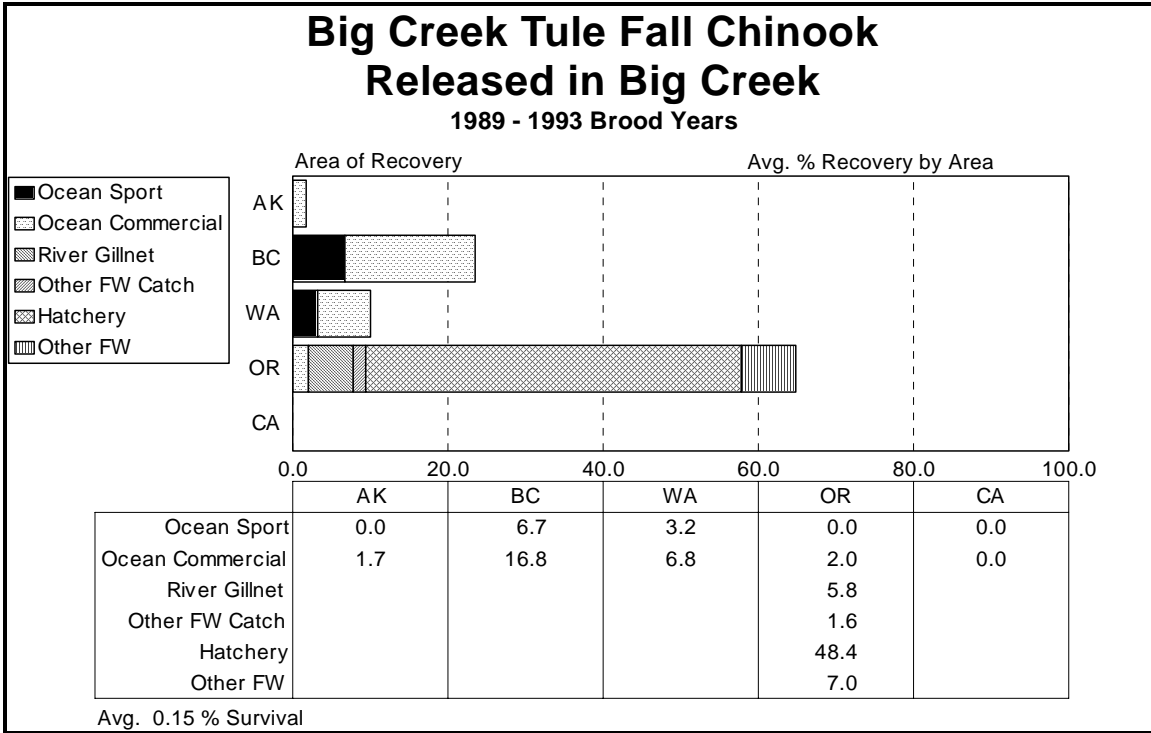


Figure 1. Average survival and catch distribution of Big Creek hatchery tule stock fall chinook, released in Big Creek (1989 to 1993 broods).

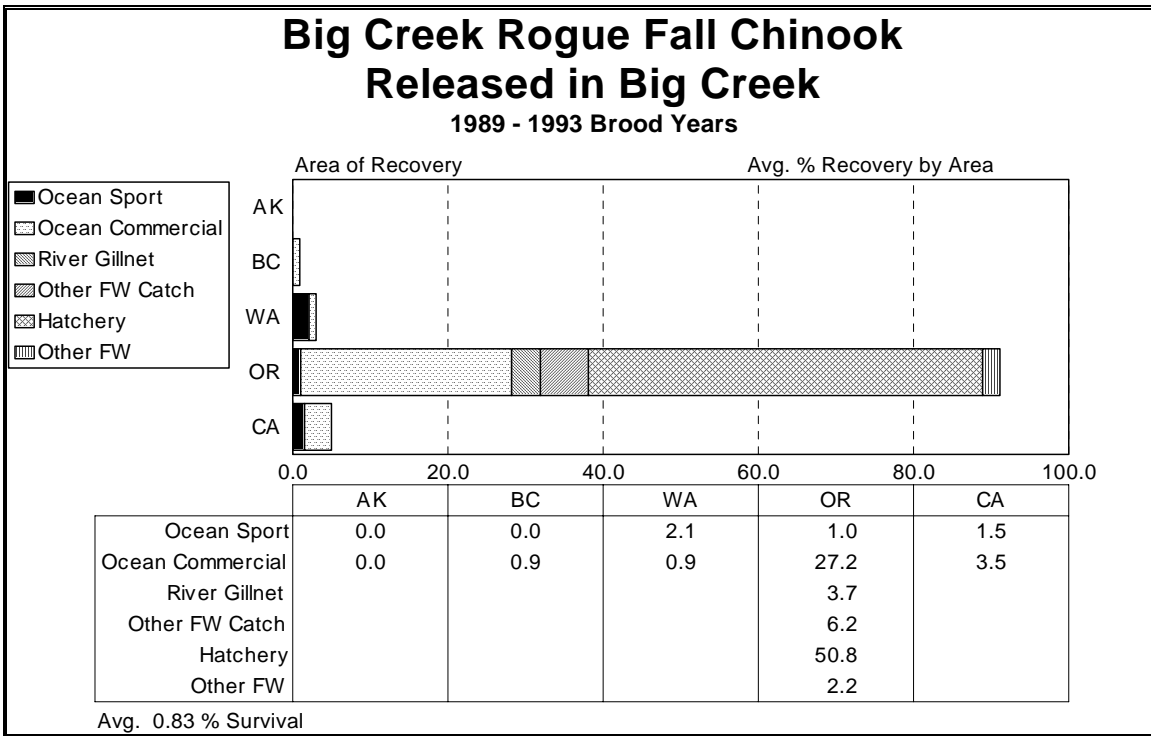


Figure 2. Average survival and catch distribution of Big Creek hatchery Rogue River stock fall chinook, released in Big Creek (1989 to 1993 broods).



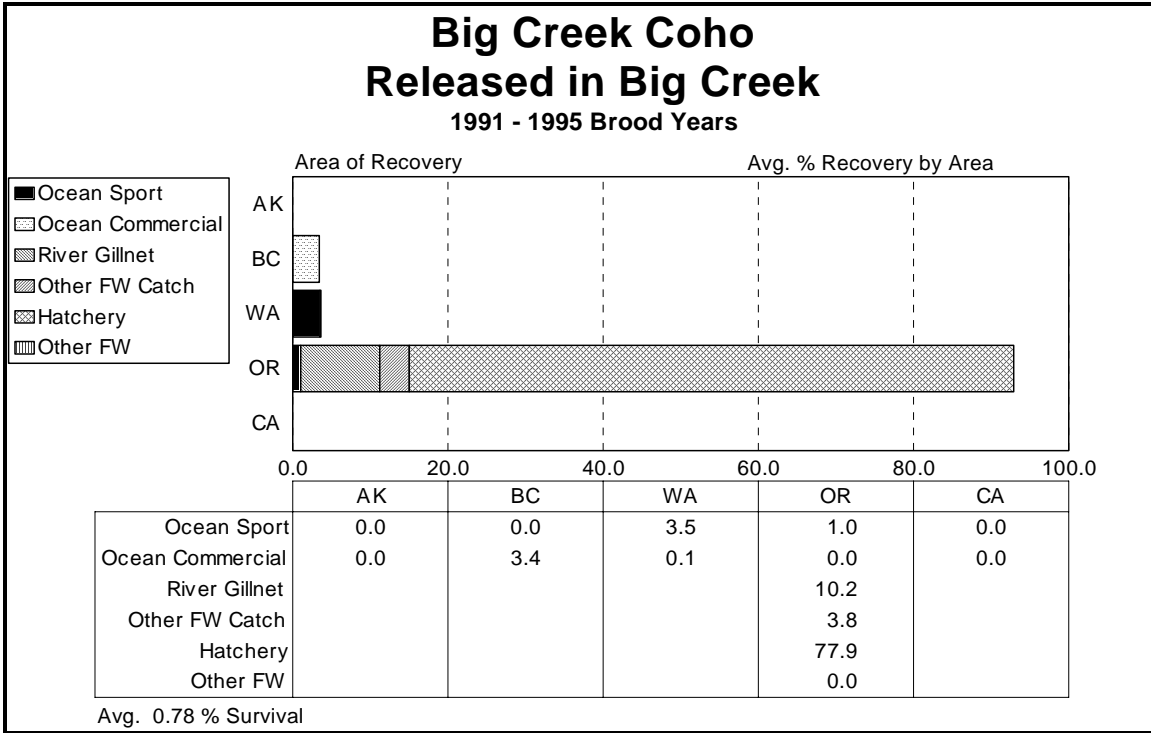


Figure 3. Average survival and catch distribution of Big Creek hatchery Big Creek stock coho, released in Big Creek (1991 to 1995 broods).

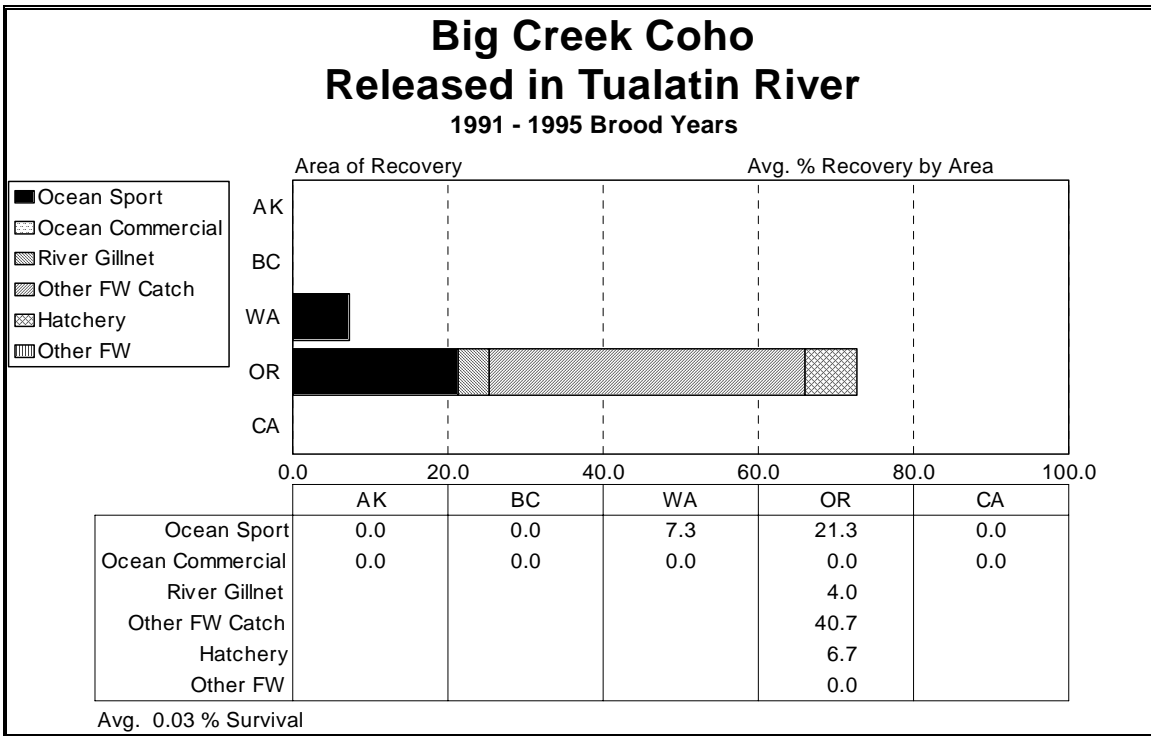


Figure 4. Average survival and catch distribution of Big Creek hatchery Big Creek stock coho, released in Tualatin River (1991 to 1995 broods).

**Klaskanine Hatchery**

Klaskanine Hatchery is located 21 miles southeast of Astoria, Oregon on Highway 202 adjacent to the Klaskanine River. The hatchery, originally built in 1913, was expanded and remodeled in 1953. Budget cuts have reduced hatchery staffing to 1 person and eliminated all rearing programs. The hatchery does serve as an acclimation and adult recapture facility for Rogue stock fall chinook and Big Creek stock winter steelhead.

Rogue Stock fall chinook releases began in 1997 (1996 brood). The tule fall chinook program was discontinued after the 1988 brood year. For information on the survival and catch distribution of these releases refer to prior annual reports.

The coho program was discontinued after the 1995 brood year. The 1991 to 1994 brood Klaskanine coho produced an average survival rate of 0.42%. They were caught primarily in Columbia Basin gillnet and other freshwater fisheries, with ocean catch mainly from British Columbia to Oregon (Figure 5).

Winter steelhead are acclimated at Klaskanine Hatchery but none have been marked with coded-wire tags for evaluation.

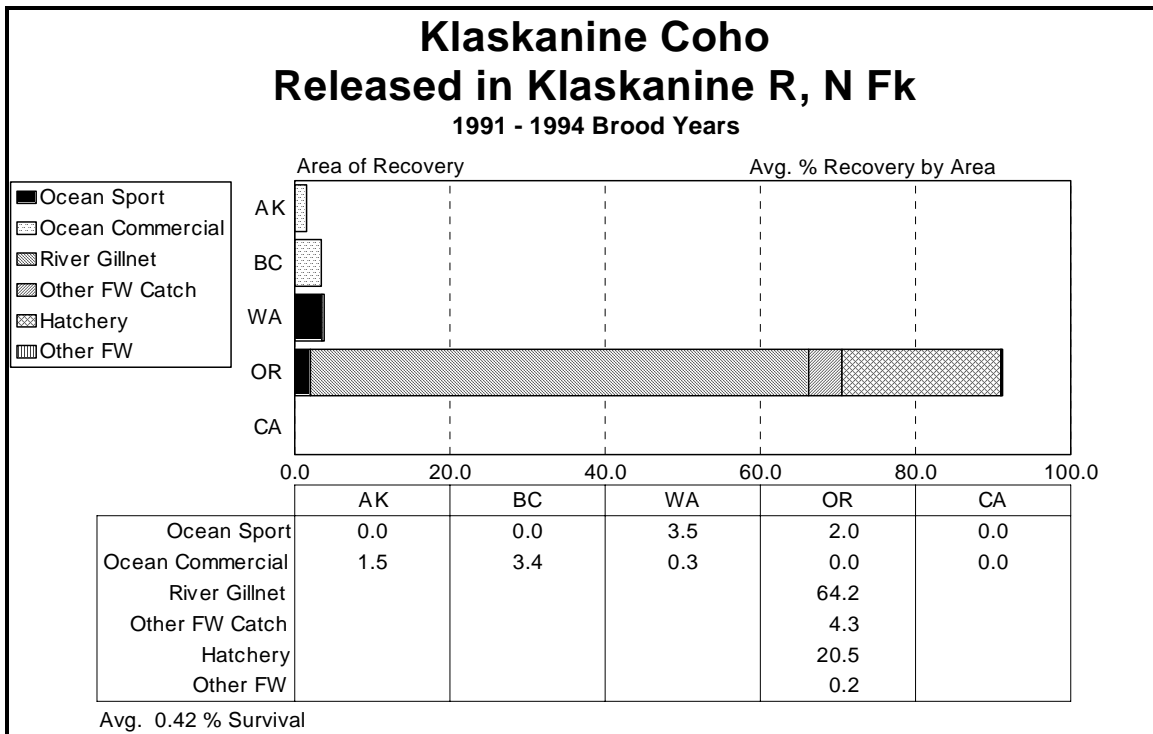


Figure 5. Average survival and catch distribution of Klaskanine hatchery Klaskanine River stock coho, released in North Fork Klaskanine River (1991 to 1994 broods).

**Clatsop Economic Development Commission (CEDC)**

CEDC operates freshwater ponds and estuary net pens in Youngs Bay and adjacent areas near Astoria, Oregon. CEDC releases coho and chinook salmon in cooperation with ODFW hatcheries.

Tule fall chinook production was discontinued after the 1987 brood year. For information on the survival and catch distribution of these releases refer to prior annual reports.

The Rogue River stock fall chinook released by CEDC (1989, 1991 and 1993 broods) survived at an average rate of 0.90%. They were caught primarily in Oregon ocean, gillnet, and other freshwater fisheries (Figure 6).

The 1991 to 1995 brood Klaskanine River stock coho released in South Fork Klaskanine River survived at an average rate of 0.89%. They were caught mainly in Washington and Oregon ocean, gillnet and other freshwater fisheries (Figure 7).

The 1991 to 1994 broods of Clackamas River stock coho, reared at Eagle Creek NFH and acclimated for release in the Youngs Bay net pens, survived at a rate of 0.75% (Figure 8). Catch was primarily in gillnet and other freshwater fisheries, with ocean catch from British Columbia to Oregon (Figure 8).

The 1991 to 1995 brood Tanner Creek coho stock acclimated and released from the Youngs Bay net pens survived at a rate of 1.36% (Figure 9). Catch was primarily in gillnet and other freshwater fisheries, with ocean catch from British Columbia to Oregon (Figure 9).

The 1994 to 1995 brood Sandy River coho stock acclimated and released from the Youngs Bay net pens survived at a rate of 0.42% (Figure 10). Catch was primarily in gillnet and other freshwater fisheries, with ocean catch from Washington to Oregon (Figure 10).

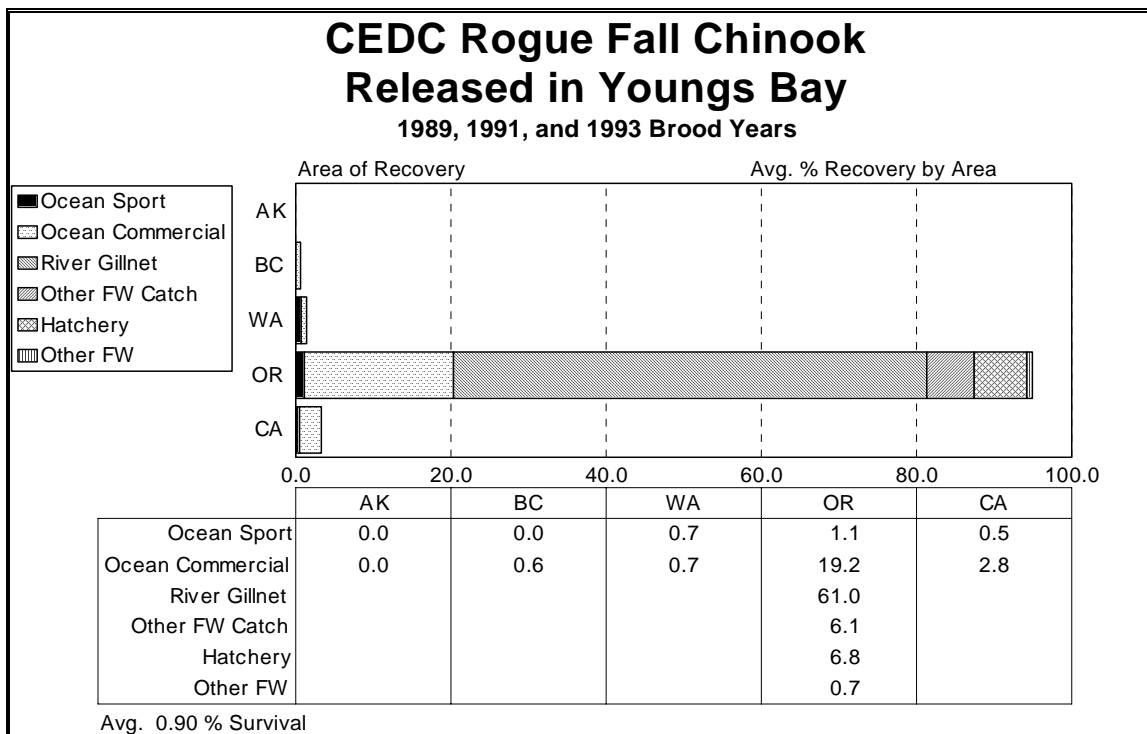


Figure 6. Average survival and catch distribution of CEDC hatchery Rogue stock fall chinook, released in South Fork Klaskanine River and Youngs River (1989, 1991 and 1993 broods).

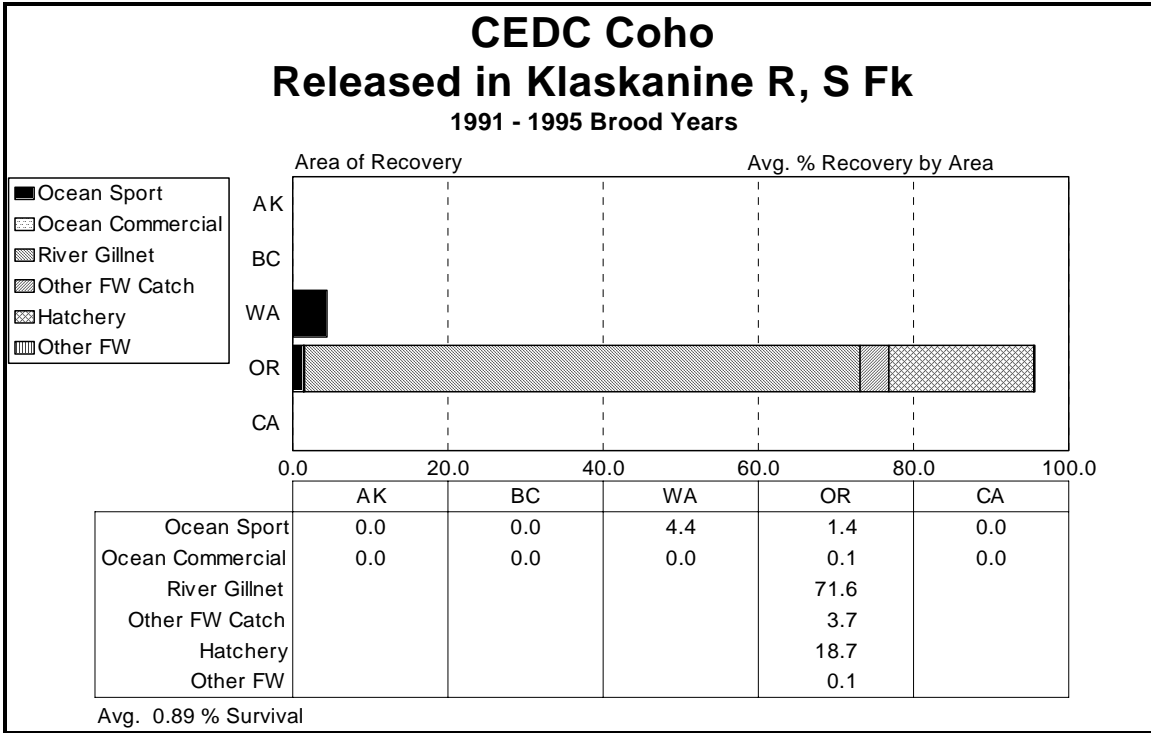


Figure 7. Average survival and catch distribution of CEDC hatchery coho, released in South Fork Klaskanine River (1991 to 1995 broods).

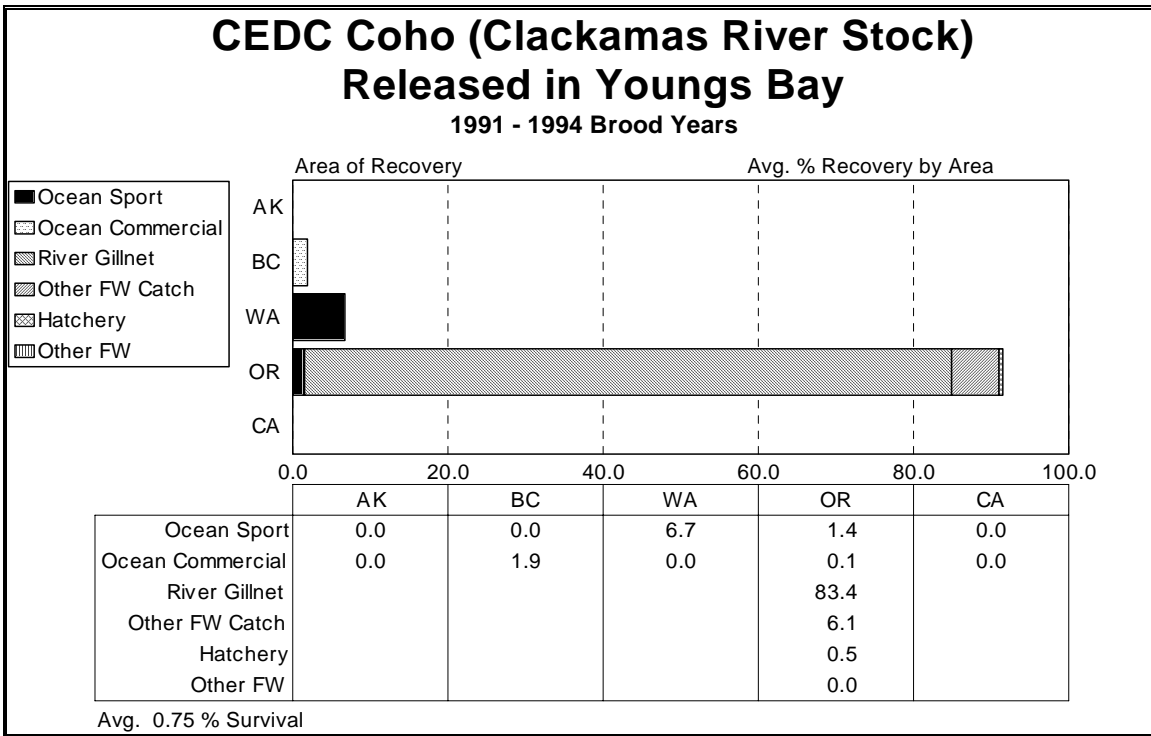


Figure 8. Average survival and catch distribution of CEDC hatchery Clackamas River stock coho, released in Youngs Bay (1991 to 1994 broods).

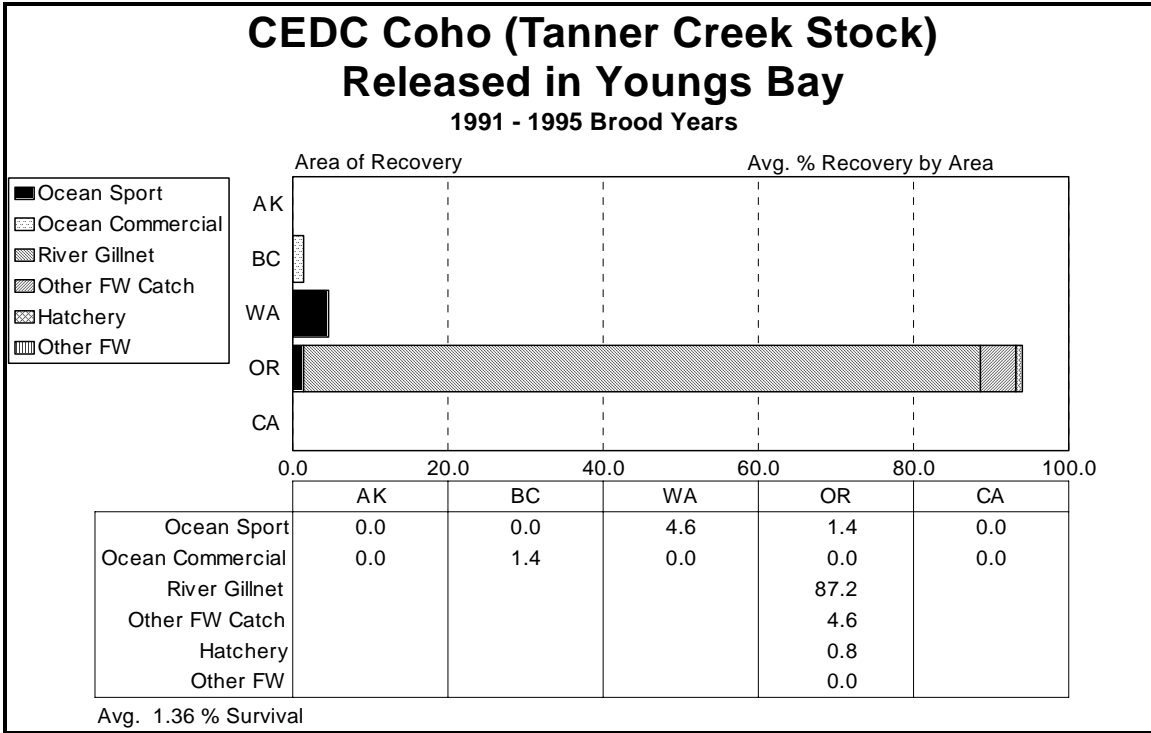


Figure 9. Average survival and catch distribution of CEDC hatchery Tanner Creek stock coho, released in Youngs Bay (1991 to 1995 broods).

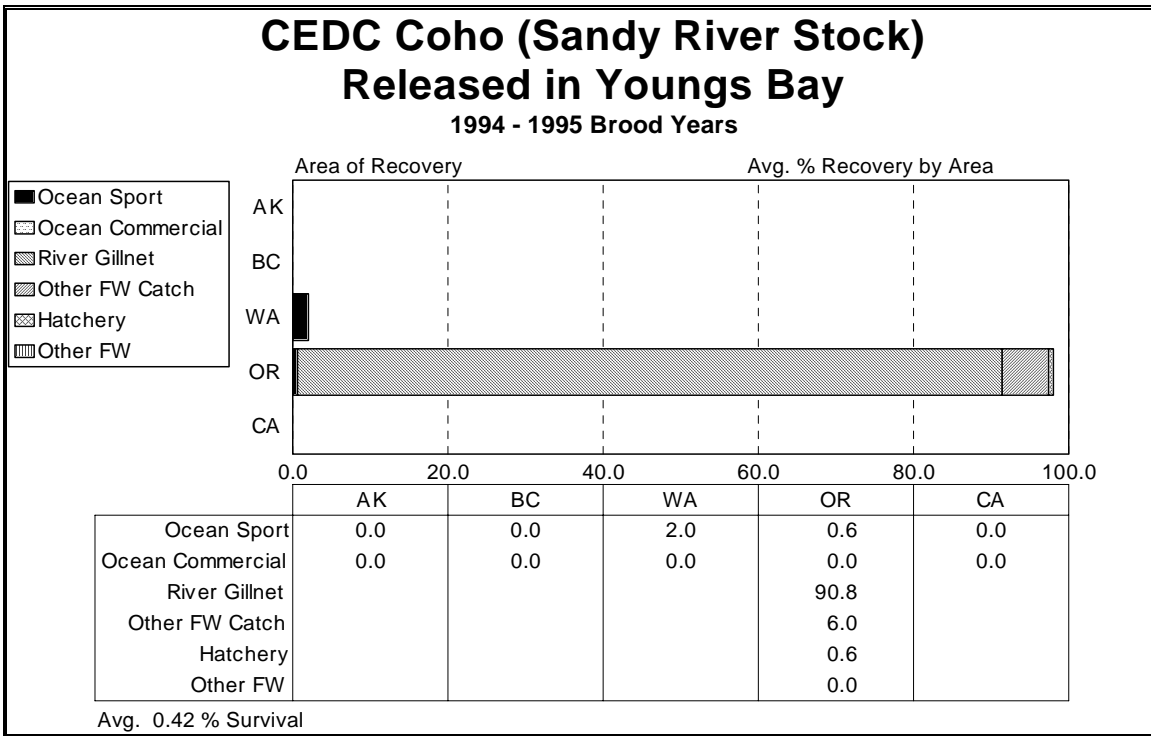


Figure 10. Average survival and catch distribution of CEDC hatchery Sandy River stock coho, released in Youngs Bay (1994 to 1995 broods).

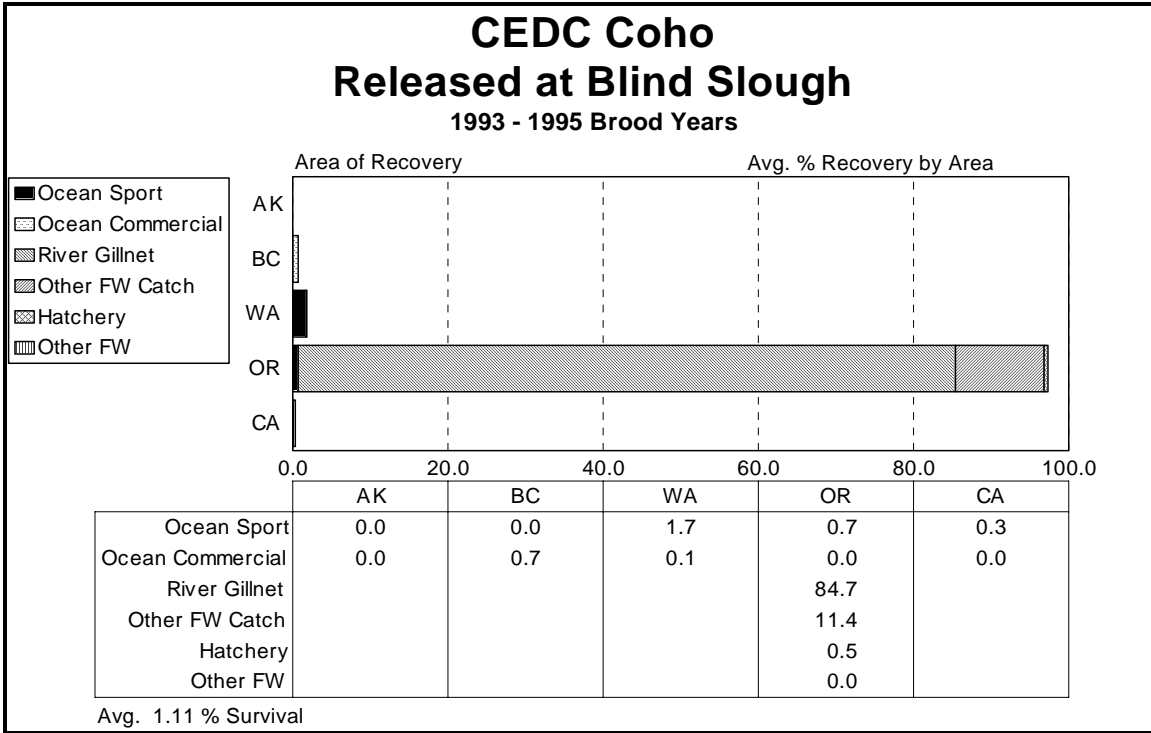


Figure 11. Average survival and catch distribution of CEDC hatchery coho, released at Blind Slough (1993 to 1995 broods).

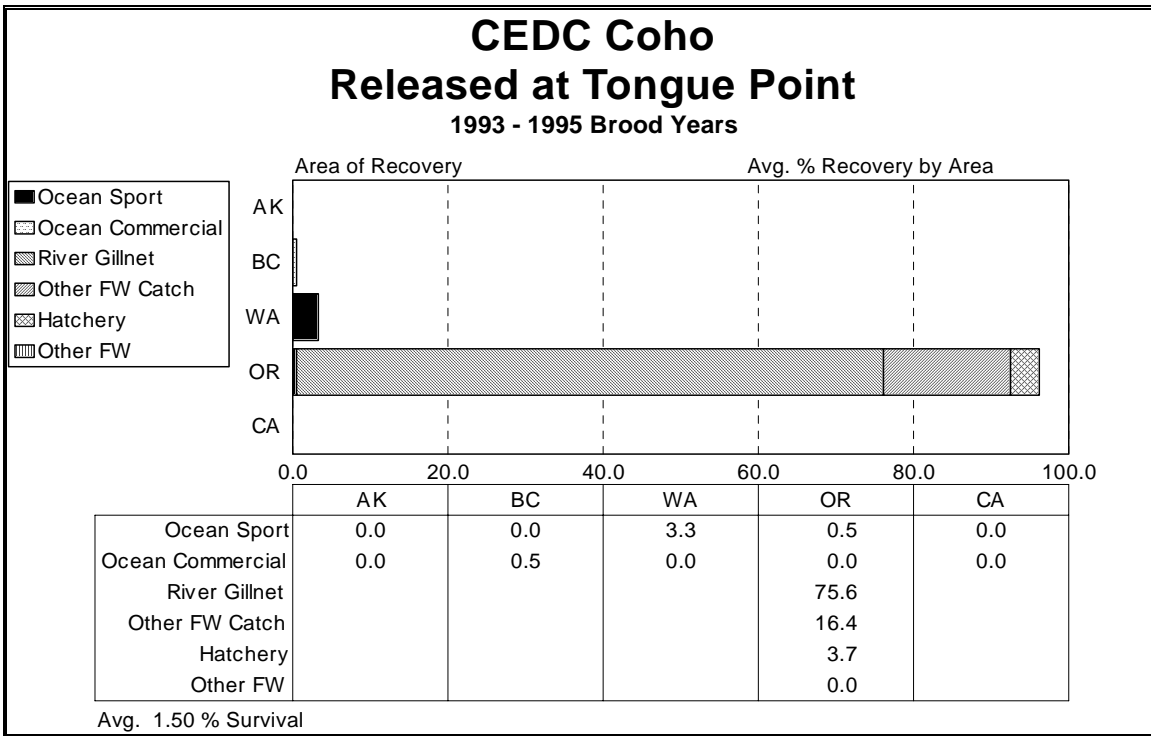


Figure 12. Average survival and catch distribution of CEDC hatchery coho, released at Tongue Point (1993 to 1995 broods).

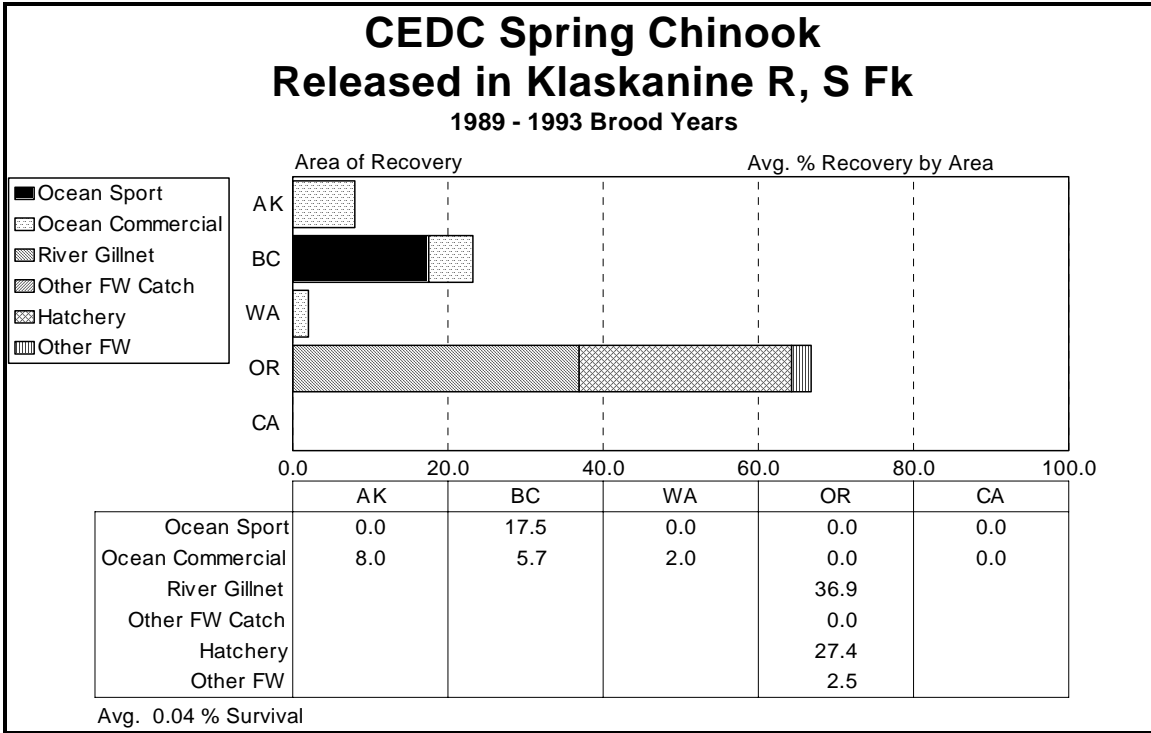


Figure 13. Average survival and catch distribution of CEDC hatchery Willamette Basin spring chinook, released in Klaskanine R., South Fork (1989 to 1993 broods).

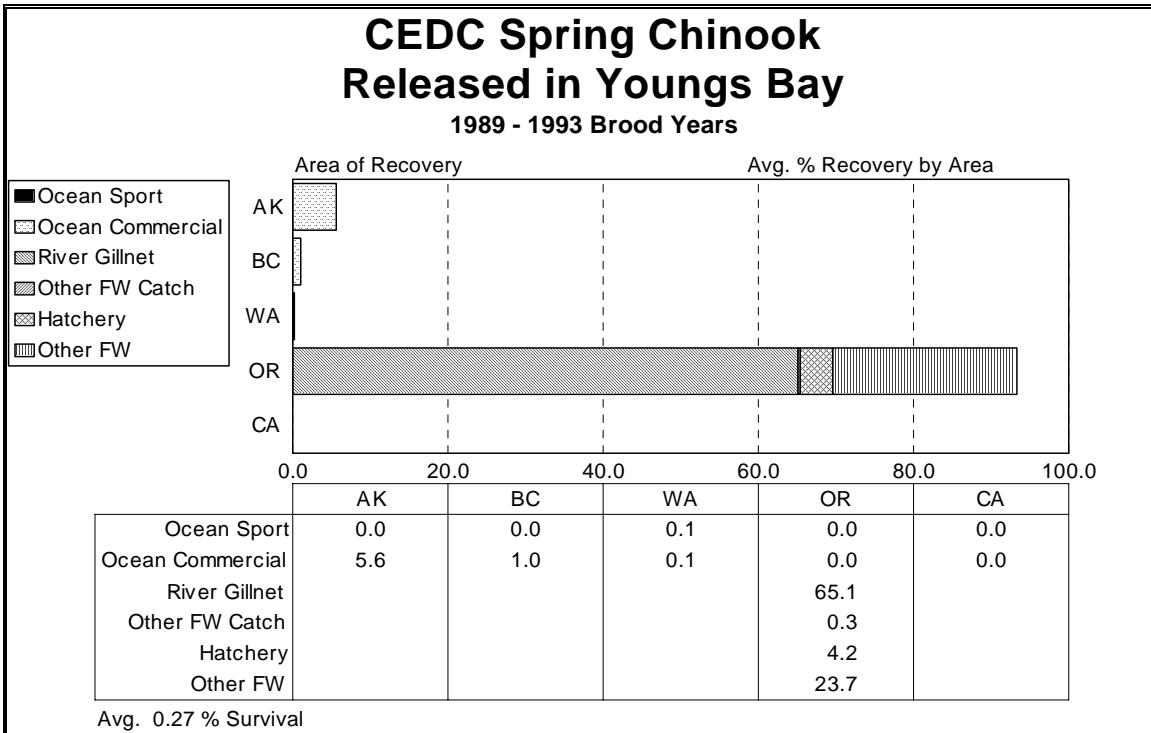


Figure 14. Average survival and catch distribution of CEDC hatchery Willamette Basin spring chinook, released in Youngs Bay (1989 to 1993 broods).

Evaluation of two new coho release sites began with the 1993 brood year. The 1993 to 1995 brood coho released at Blind Slough survived at an average rate of 1.11%, and were caught mainly in Columbia Basin gillnet and other freshwater fisheries (Figure 11). The 1993 to 1995 brood coho released at Tongue Point survived at an average rate of 1.50% and were also caught mainly in Columbia Basin gillnet and other freshwater fisheries (Figure 12).

The 1989 to 1993 brood Willamette Basin stocks of spring chinook released in South Fork Klaskanine River survived at a average rate of 0.04% (Figure 13). These fish were caught mainly in Alaska and British Columbia ocean, and Columbia Basin gillnet fisheries (Figure 13)..

The 1989 to 1993 brood Willamette Basin stocks of spring chinook released in Youngs Bay survived at a rate of 0.27% (Figure 14). These fish were caught mainly in Alaska ocean and Columbia Basin gillnet fisheries (Figure 14)..

### **Gnat Creek Hatchery**

Gnat Creek Hatchery is located east of Knappa off Highway 30 on Gnat Creek a tributary to the Lower Columbia River. Gnat Creek Hatchery released summer and winter steelhead and cutthroat trout none of which were coded-wire tagged for evaluation. Due to budget cuts the hatchery has switched in 1996 to rearing Willamette River spring chinook for acclimation and release in lower Columbia River net pens in cooperation with CEDC. For discussion of these programs see the CEDC section above.

### **Eagle Creek National Fish Hatchery**

Eagle Creek National Fish Hatchery (NFH) is located on Eagle Creek a tributary of the Clackamas River southeast of Portland. Eagle Creek Hatchery presently rears and releases coho salmon in Eagle Creek. Additional coho are reared for ODFW, and are transported to the CEDC net pens for acclimation in Youngs Bay near Astoria. For results of the Youngs bay releases see the CEDC discussion above (Figure 8).

### **Clackamas Hatchery**

Clackamas Hatchery is located on the Clackamas River 4 miles west of Estacada near McIver Park. Clackamas Hatchery rears and released spring chinook salmon, summer and winter steelhead trout.

The 1989 to 1993 brood Clackamas River stock spring chinook released in the Clackamas River survived at an average rate of 0.34%. They were caught primarily in Oregon freshwater fisheries, and secondarily in ocean fisheries from Alaska to Oregon, and Columbia Basin gillnet fisheries (Figure 15).

Clackamas stock spring chinook are also released in the Sandy River. Coded-wire tagging of these fish started with the 1991 brood year. The 1991 to 1993 brood years survived at an average rate of 0.08%. These fish were caught mainly in Alaska, British Columbia, and Oregon ocean fisheries and Oregon freshwater fisheries (Figure 16).

None of the Clackamas hatchery summer and winter steelhead releases have been marked with coded-wire tags for evaluation.



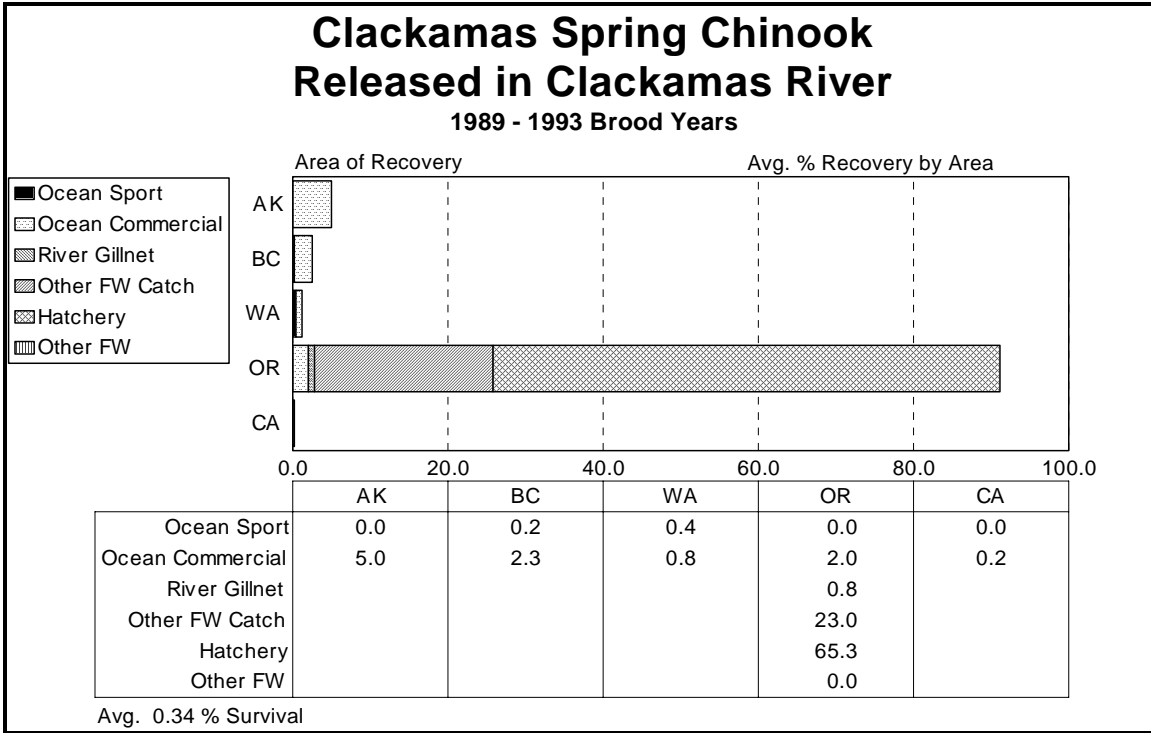


Figure 15. Average survival and catch distribution of Clackamas hatchery stock spring chinook, released in Clackamas River (1989 to 1993 broods).

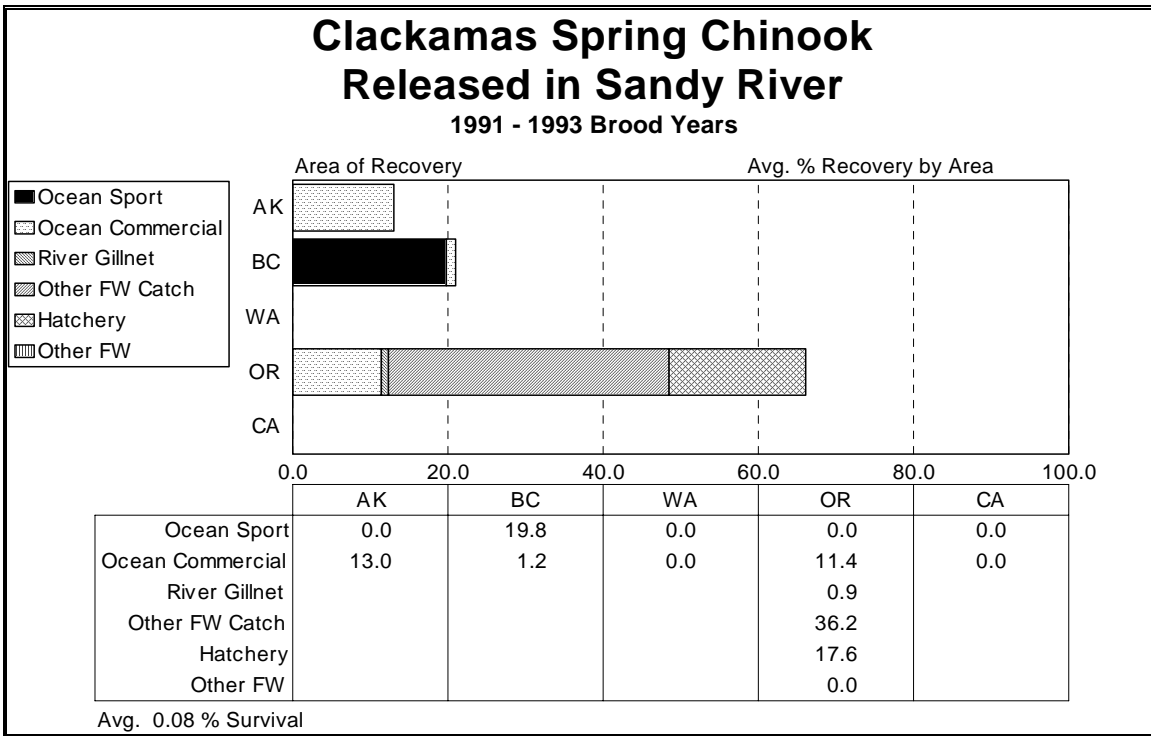


Figure 16. Average survival and catch distribution of Clackamas hatchery stock spring chinook, released in the Sandy River (1991 to 1993 broods).

**Marion Forks Hatchery**

Marion Forks Hatchery is located on the North Santiam River 10 miles east of Idana on Highway 22. Marion Forks Hatchery rears and releases spring chinook salmon, winter steelhead, rainbow and cutthroat trout.

The 1989 to 1993 brood North Santiam River stock spring chinook salmon released in the North Fork Santiam River survived at an average rate of 0.29% and were caught primarily in Columbia Basin freshwater, and Alaska and British Columbia ocean fisheries (Figure 17).

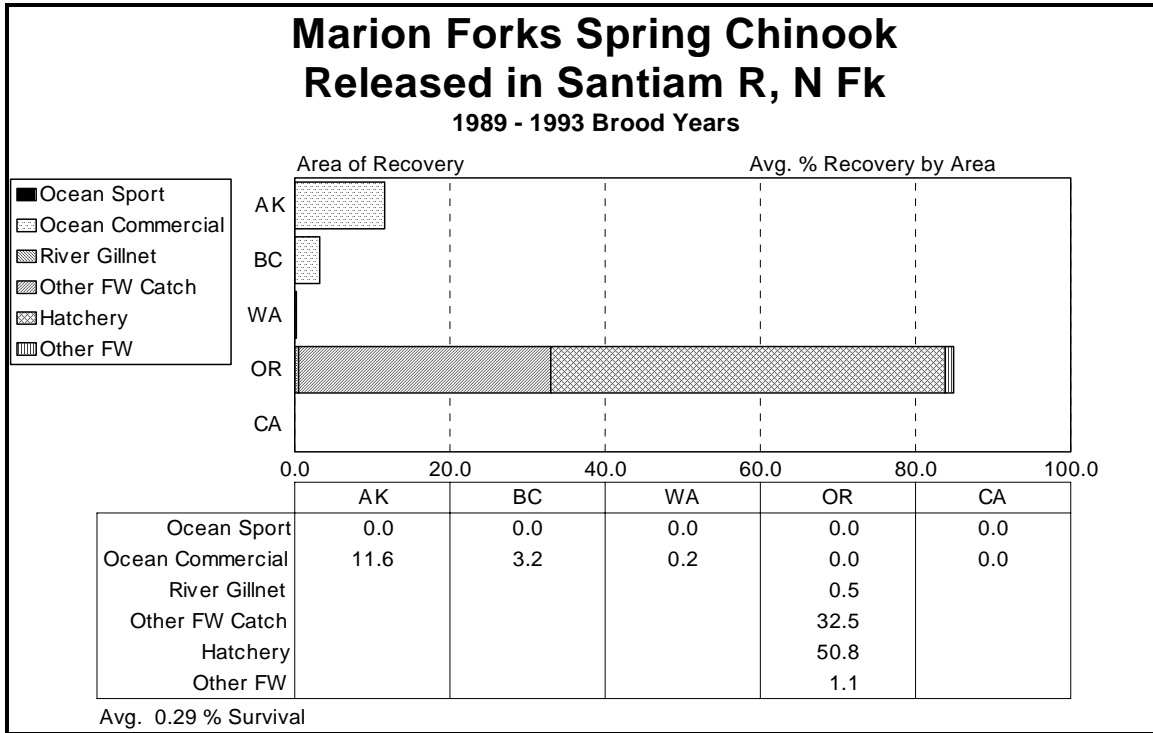


Figure 17. Average survival and catch distribution of Marion Forks hatchery North Santiam River stock spring chinook, released in North Fork Santiam River (1989 to 1993 broods).

Although prior brood years of winter steelhead have been coded-wire tagged, none were tagged for the current 5 year evaluation. All other rainbow and cutthroat trout released by the Marion Forks Hatchery were not coded-wire tagged for evaluation.

**South Santiam Hatchery**

South Santiam Hatchery is located below Foster Dam on the South Santiam River near Sweet Home. South Santiam Hatchery rears and releases spring chinook salmon and summer steelhead trout.

The 1989 to 1993 brood South Santiam River stock spring chinook released in the South Santiam River survived at a average rate of 0.40% and were caught primarily in Columbia Basin freshwater, and Alaska and British Columbia ocean fisheries (Figure 18).

Winter steelhead trout released by South Santiam Hatchery have not been coded-wire tagged to permit evaluation.

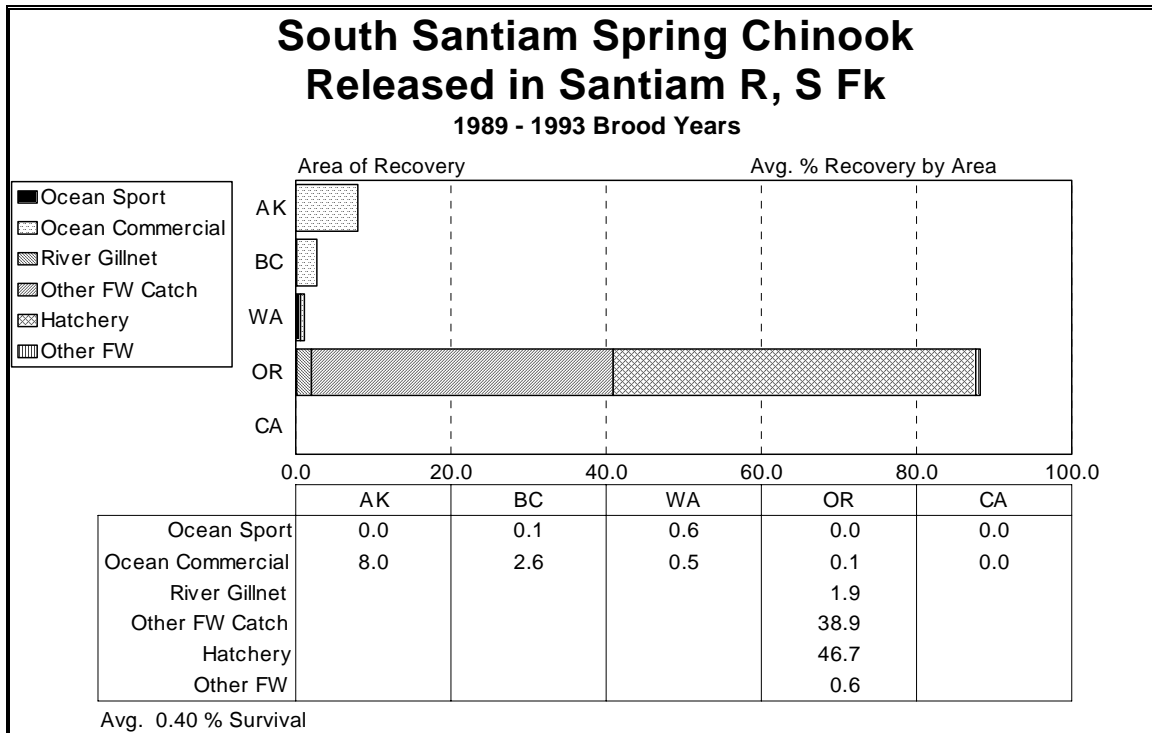


Figure 18. Average survival and catch distribution of South Santiam hatchery stock spring chinook, released in Santiam R, South Fork (1989 to 1993 broods).

#### Stayton Rearing Pond

Stayton Pond, a refurbished gravel pit located south of Stayton was operated as a satellite of the South Santiam Hatchery. Production at Stayton Pond was discontinued after the 1994 brood year due to budget cuts and flood damage to the facility.

The 1989 to 1993 brood tule stock fall chinook released from Stayton pond survived at an average rate of 0.17% and were caught primarily in British Columbia, Washington and Oregon ocean fisheries (Figure 19).

#### Roaring River Hatchery

Roaring River Hatchery rears and releases winter steelhead and rainbow trout. None of these fish have been coded-wire tagged for evaluation.

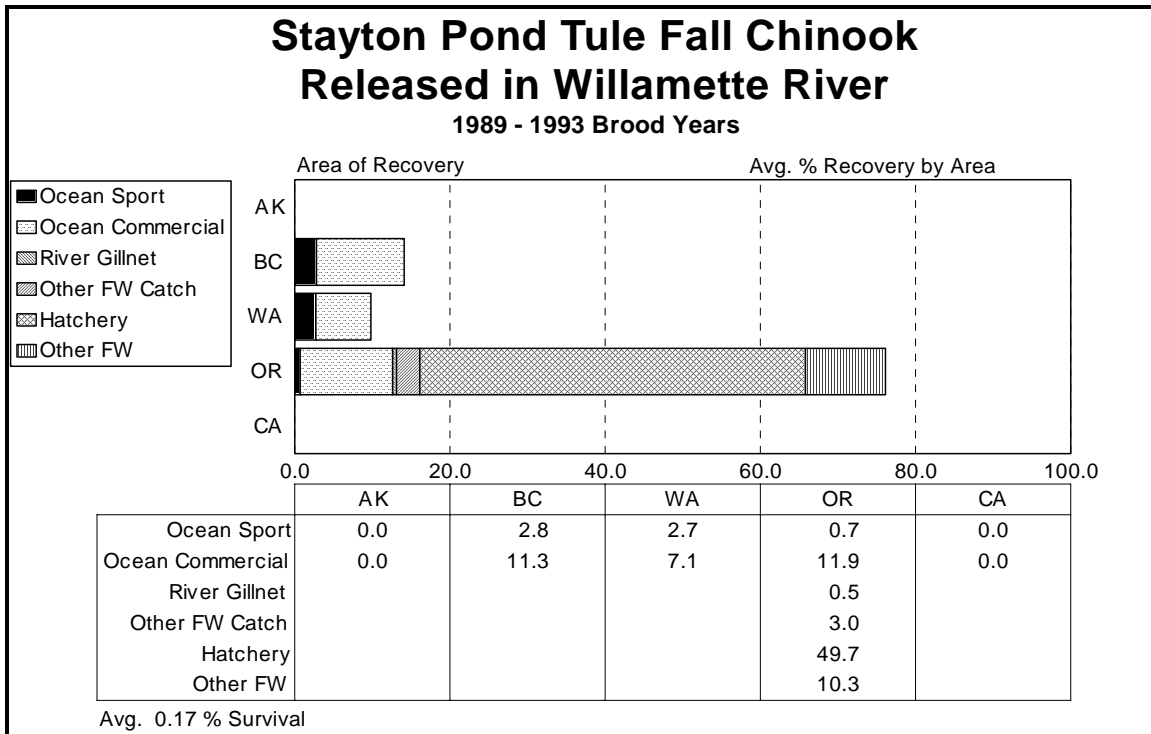


Figure 19. Average survival and catch distribution of Stayton Pond tule stock fall chinook, released in the Willamette River (1989 to 1993 broods).

#### McKenzie Hatchery

McKenzie Hatchery is located on the McKenzie River 16 miles east of Springfield. McKenzie Hatchery rears and releases spring chinook salmon and summer steelhead trout.

The 1989 to 1993 brood McKenzie River stock spring chinook salmon released in the McKenzie River survived at an average rate of 0.18% and were caught primarily in Columbia Basin freshwater, and Alaska and British Columbia ocean fisheries (Figure 20).

McKenzie hatchery is involved in a net pen acclimation experiment for spring chinook. The goal of the experiment is to determine the effect of releasing smolts, both acclimated and direct releases, at several sites below Willamette Falls on catch in the Lower Willamette fishery. The 1992 to 1993 brood spring chinook salmon released below Willamette Falls survived at an average rate of 0.05% and were caught primarily in Columbia Basin freshwater, and Alaska, British Columbia, and Oregon ocean fisheries (Figure 21).

None of the summer steelhead released from McKenzie Hatchery have been coded-wire tagged for evaluation.

#### Leaburg Hatchery

Leaburg Hatchery is located on the McKenzie River off Highway 126, 18 miles east of Springfield. Leaburg Hatchery rears and releases summer steelhead and rainbow trout. None of these fish have been coded-wire tagged for evaluation.

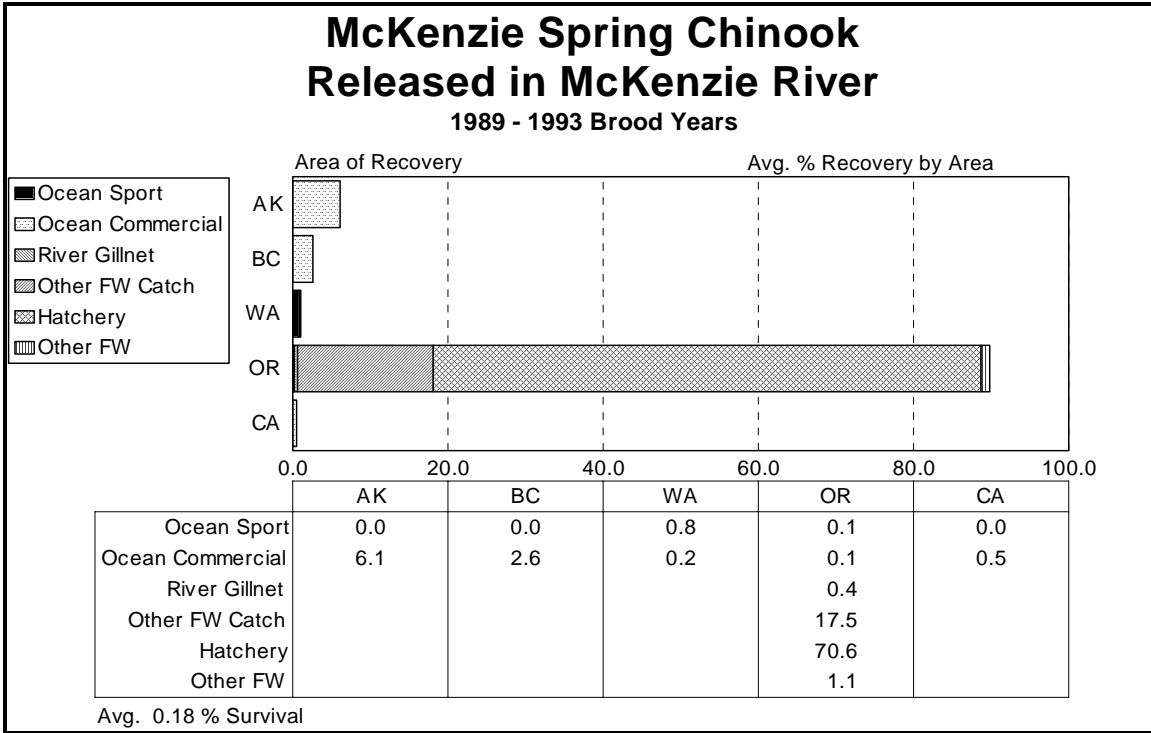


Figure 20. Average survival and catch distribution of McKenzie hatchery stock spring chinook, released in McKenzie River (1989 to 1993 broods).

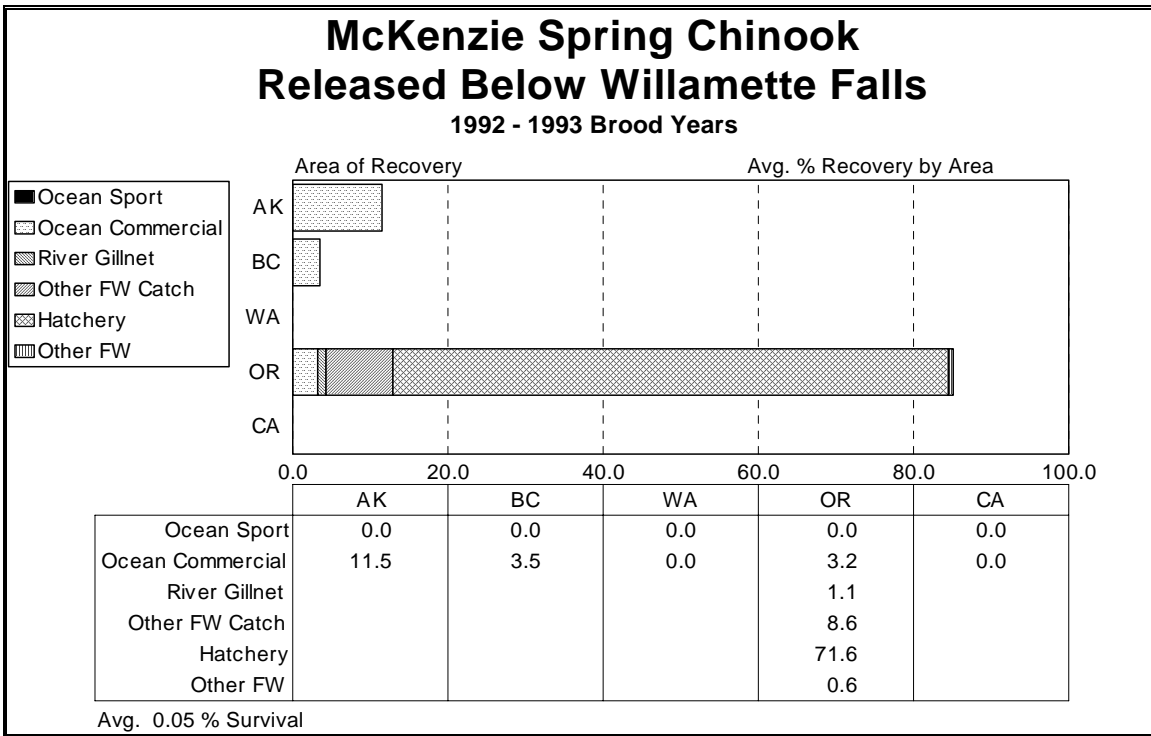


Figure 21. Average survival and catch distribution of McKenzie stock spring chinook, released below Willamette Falls, net pen study, (1992 to 1993 broods).

**Willamette Hatchery**

Willamette Hatchery is located on the Middle Fork Willamette River 1 mile east of Oakridge off Highway 58. Willamette Hatchery rears and releases spring chinook salmon, summer and winter steelhead and rainbow trout.

The 1989 to 1993 brood Mid-Willamette River stock spring chinook salmon released in the Middle Fork Willamette River survived at a average rate of 0.44% and were caught primarily in Columbia Basin freshwater fisheries, and Alaska and British Columbia ocean fisheries(Figure 22).

None of the steelhead or rainbow trout released from Willamette Hatchery have been coded-wire tagged for evaluation.

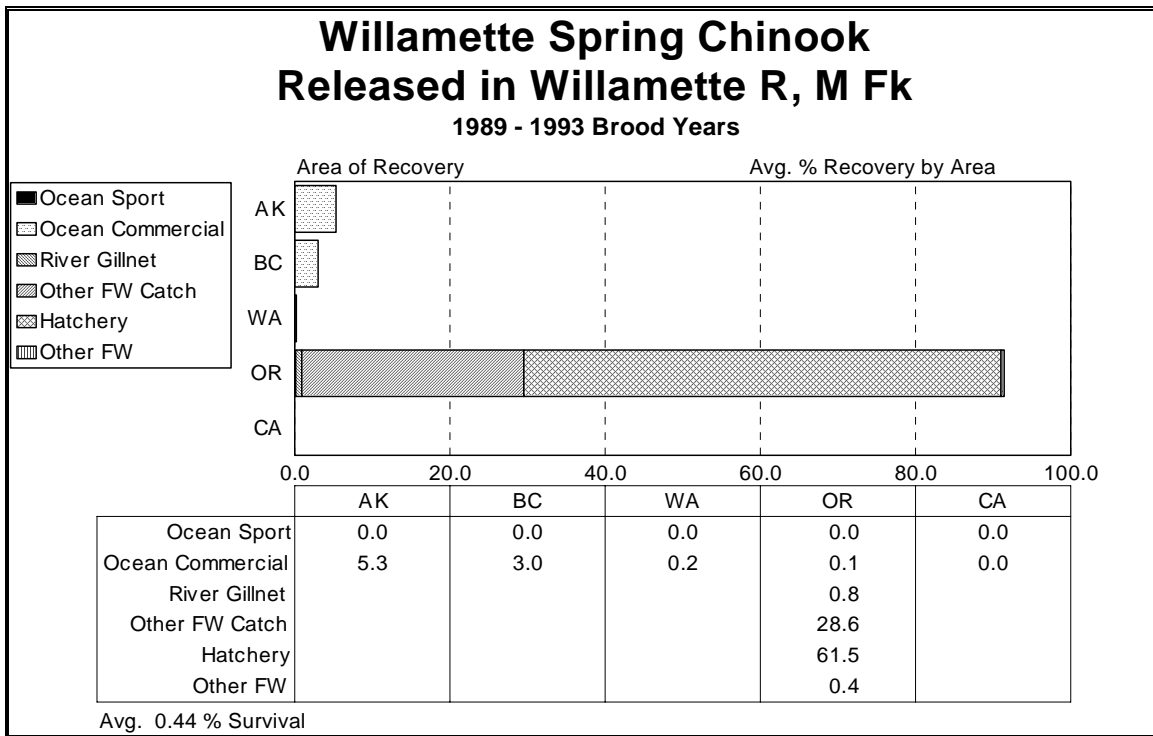


Figure 22. Average survival and catch distribution of Willamette hatchery Mid-Willamette River stock spring chinook, released in Middle Fork Willamette River (1989 to 1993 broods).

**Sandy Hatchery**

Sandy Hatchery is located on the Sandy River 1 mile northeast of the city of Sandy off Highway 26. Sandy Hatchery rears and releases coho salmon, rainbow and brook trout.

The 1991 to 1995 brood years of Sandy River stock coho released in the Sandy River survived at an average rate of 0.54% and were caught primarily in the British Columbia and Washington ocean fisheries, and Columbia Basin freshwater fisheries (Figure 23).

None of the rainbow or brook trout released by Sandy Hatchery were coded-wire tagged for evaluation.

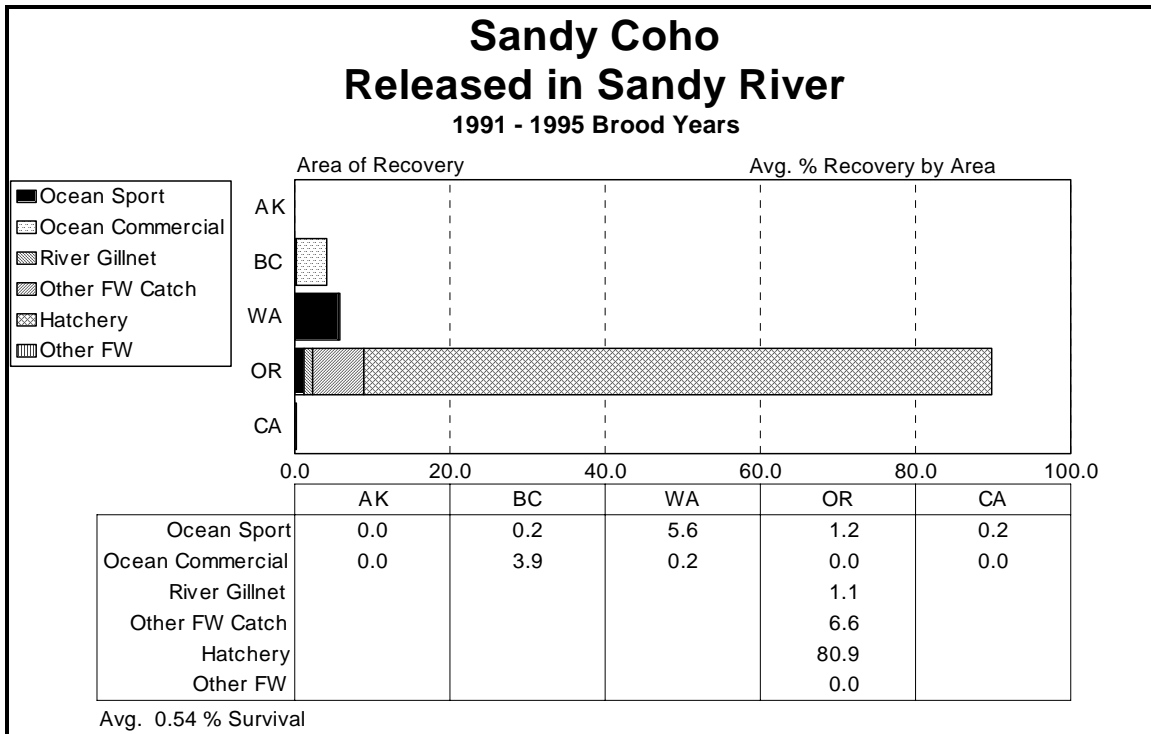


Figure 23. Average survival and catch distribution of Sandy hatchery Sandy River stock coho, released in Sandy River (1991 to 1995 broods).

#### Cascade Hatchery

Cascade Hatchery is located off Highway 84 just above Bonneville Dam. Cascade Hatchery rears coho salmon that are acclimated and released in the Yakima and Umatilla River Basins.

The 1991 to 1995 brood years of Tanner Creek stock coho released in the Umatilla River survived at an average rate of 0.19% and were caught primarily in Columbia Basin gillnet and other freshwater fisheries, and ocean fisheries from British Columbia to Oregon (Figure 24).

The 1991 to 1995 brood years of Tanner Creek stock coho released in the Yakima River survived at an average rate of 0.07% and were caught primarily in Columbia Basin gillnet and other freshwater fisheries, and ocean fisheries from British Columbia to Oregon (Figure 25).

#### Bonneville Hatchery

Bonneville Hatchery is located on the Columbia River off Highway 84 just below Bonneville Dam. Bonneville Hatchery rears and releases up-river bright fall chinook, spring chinook, sockeye and coho salmon.

Tule stock fall chinook production was discontinued after the 1995 brood year. The 1989 to 1993 brood years released at Tanner Creek survived at an average rate of 0.08% and were caught primarily in British Columbia and Washington ocean fisheries and the Columbia Basin freshwater fisheries (Figure 26).

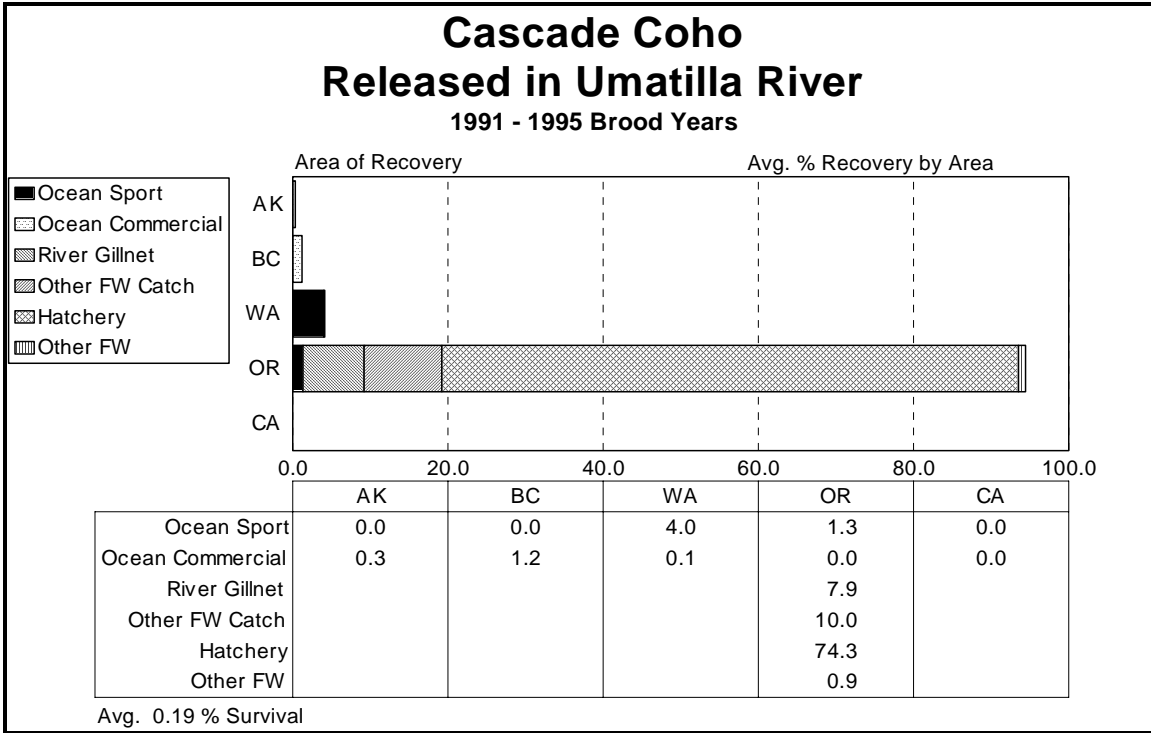


Figure 24. Average survival and catch distribution of Cascade Hatchery Tanner Creek stock coho, released in Umatilla River (1991 to 1995 broods).

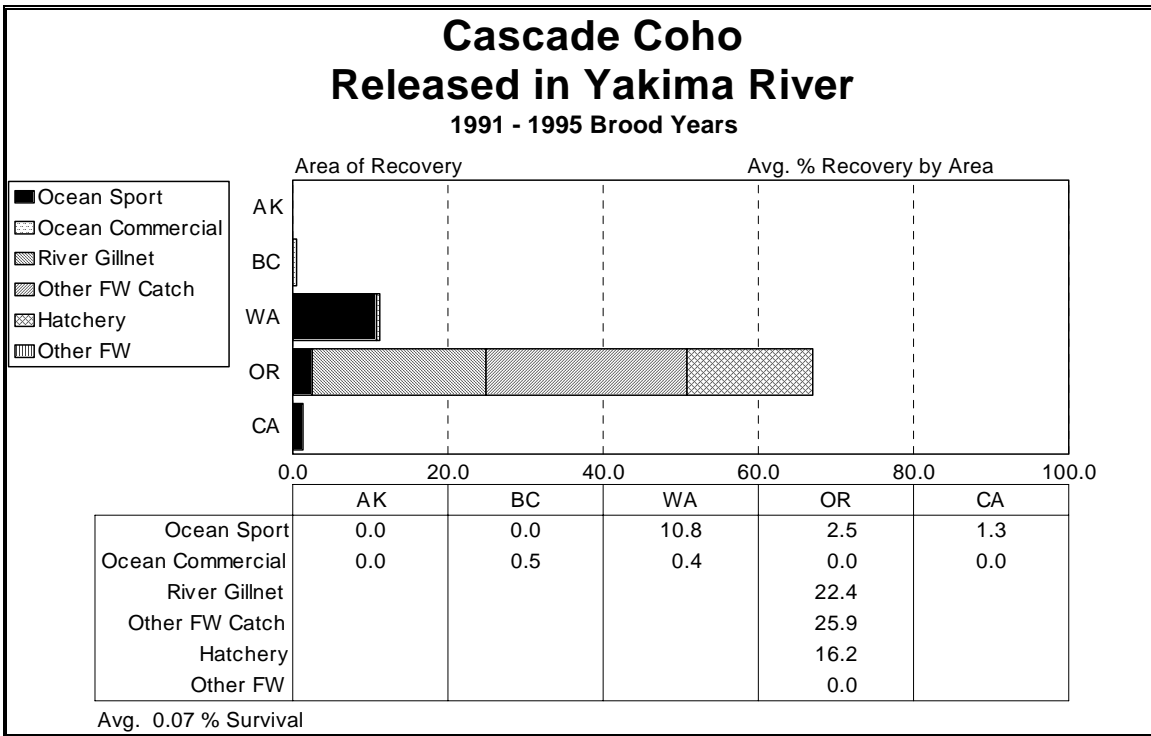


Figure 25. Average survival and catch distribution of Cascade Hatchery Tanner Creek stock coho, released in Yakima River (1991 to 1995 broods).



The 1989 to 1993 brood years of up-river Bright stock fall chinook released at Tanner Creek survived at an average rate of 0.29% and were caught primarily in Alaska and British Columbia ocean, and Columbia Basin gillnet and other freshwater fisheries (Figure 27).

The 1990 to 1993 brood years of up-river Bright stock fall chinook released in the Umatilla River survived at an average rate of 0.13% and were caught primarily in British Columbia ocean and Columbia Basin freshwater fisheries (Figure 28).

The 1989 to 1992 brood spring chinook from Bonneville hatchery released in the Umatilla River survived at an average rate of 0.15% and were caught primarily in Columbia Basin freshwater fisheries (Figure 29).

The 1989 to 1991, and 1993 brood Lookingglass Creek (1989-1990 broods) and Deschutes River stock (1991 and 1993 broods) spring chinook reared at Bonneville Hatchery and released in West Fork Hood River survived at a average rate of 0.03%. These fish were caught exclusively in Columbia Basin freshwater fisheries (Figure 30).

The 1991 to 1995 brood Tanner Creek stock coho released in Tanner Creek survived at an average rate of 1.09% and were caught primarily in Columbia Basin freshwater fisheries, and ocean fisheries from British Columbia to Oregon (Figure 31).

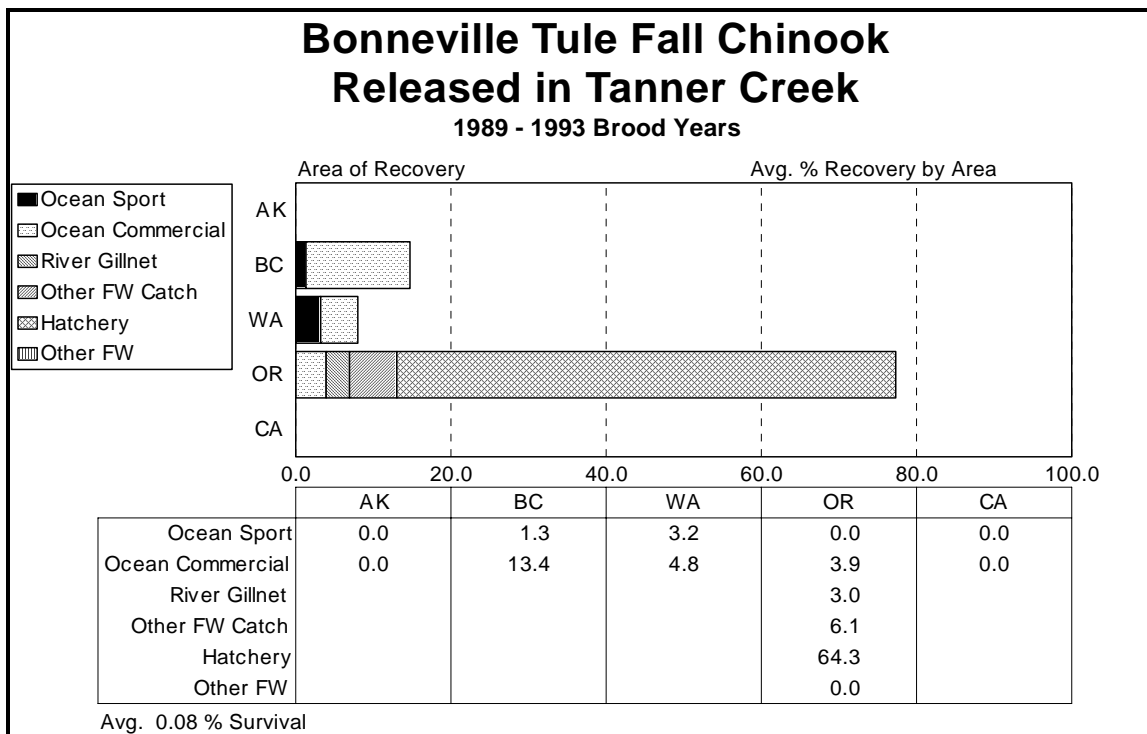


Figure 26. Average survival and catch distribution of Bonneville Hatchery tule stock fall chinook, released in Tanner Creek (1989 to 1993 broods).

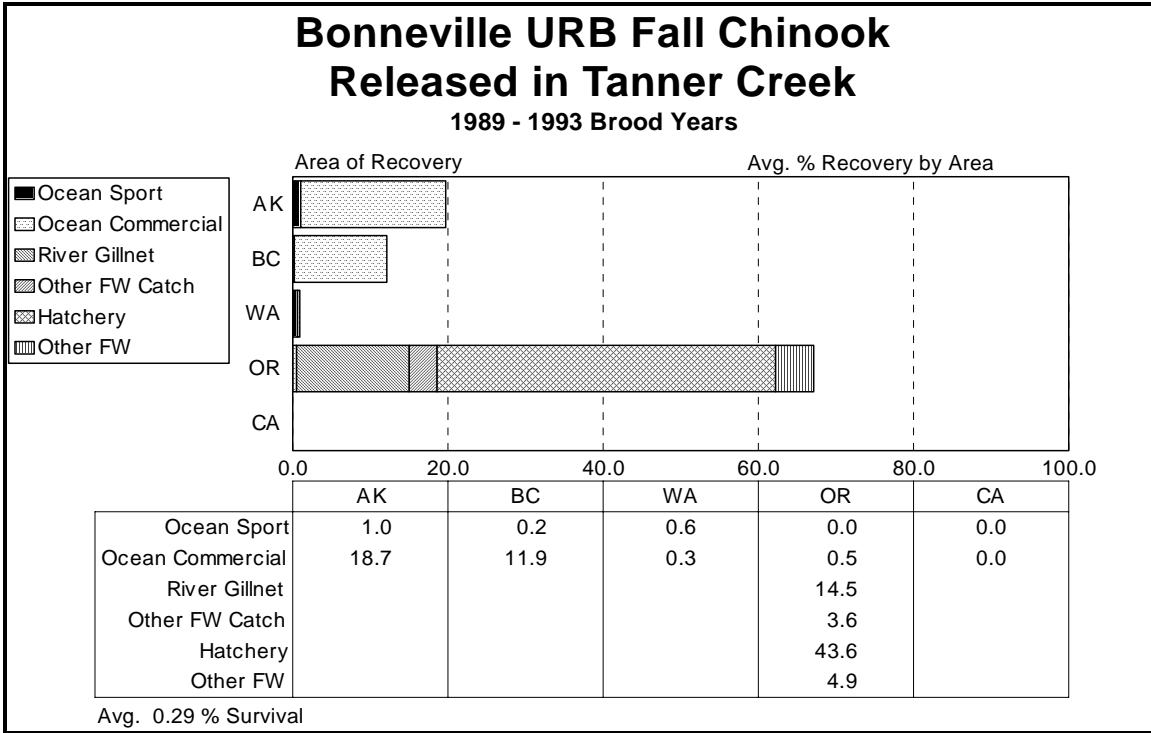


Figure 27. Average survival and catch distribution of Bonneville Hatchery up-river Bright stock fall chinook, released in Tanner Creek (1989 to 1993 broods).

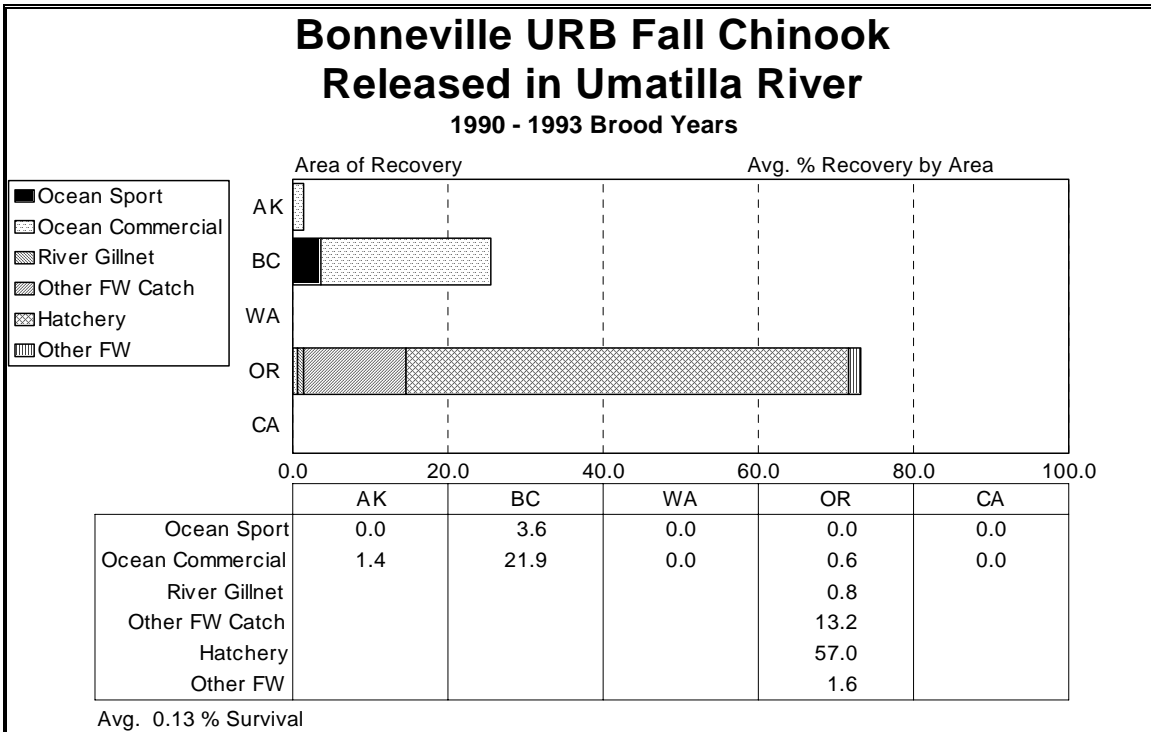


Figure 28. Average survival and catch distribution of Bonneville Hatchery up-river Bright fall chinook, released in Umatilla River (1990 to 1993 broods).

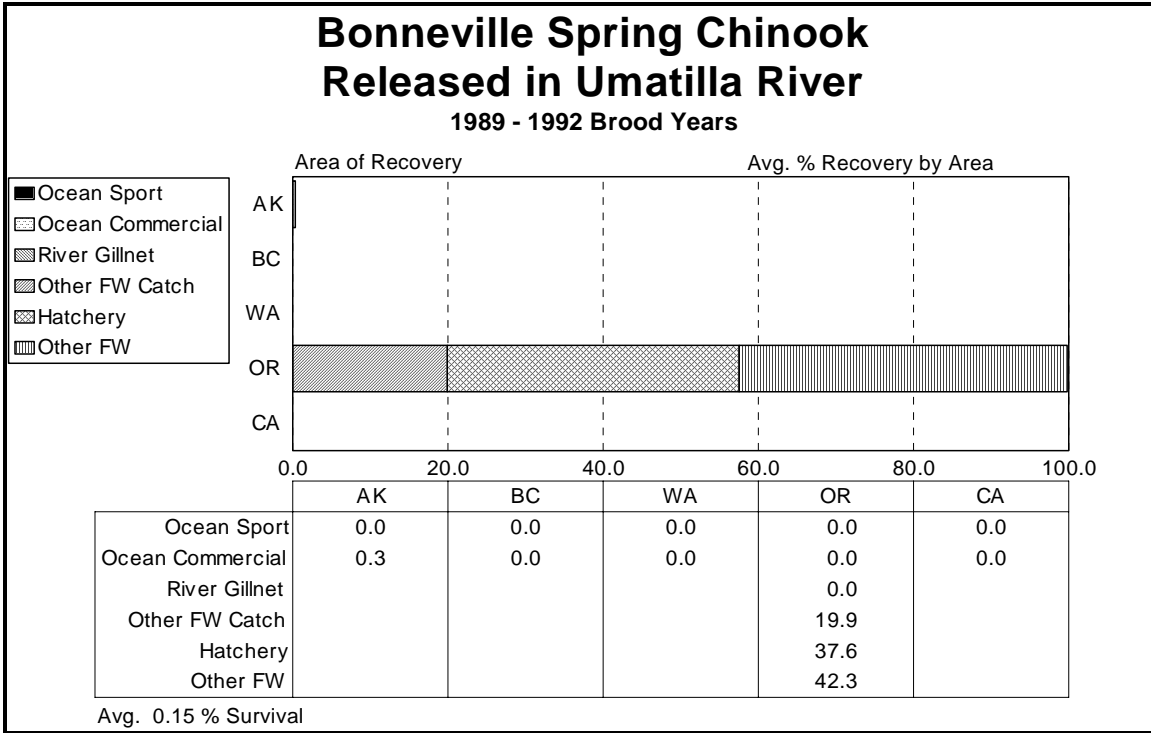


Figure 29. Average survival and catch distribution of Bonneville Hatchery spring chinook, released in Umatilla River (1989 to 1992 broods).

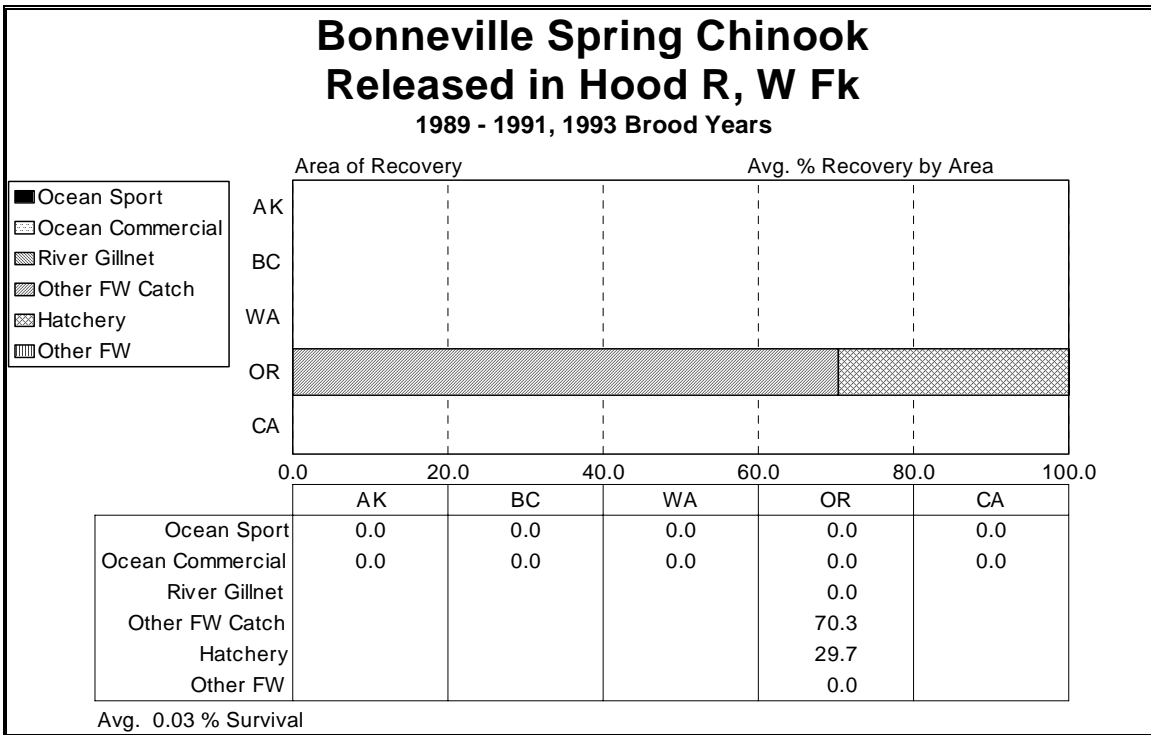


Figure 30. Average survival and catch distribution of spring chinook from Bonneville Hatchery, released in W Fk Hood River (1989-1991, 1993 broods).

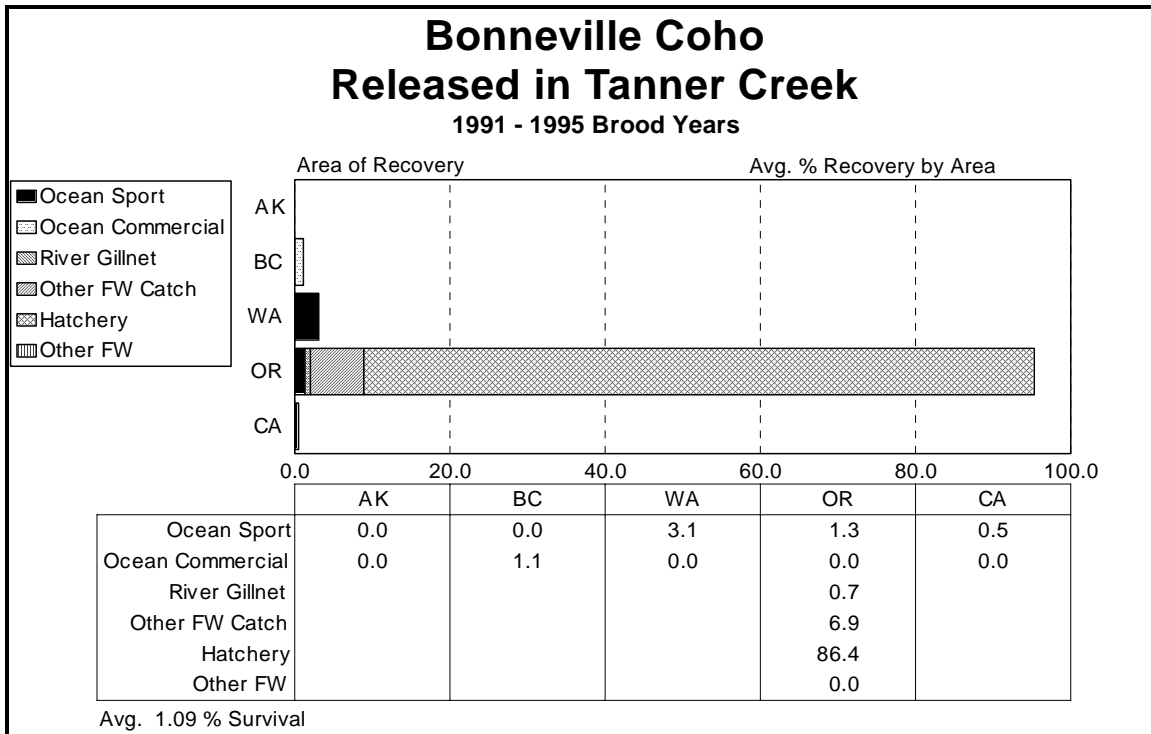


Figure 31. Average survival and catch distribution of Bonneville Hatchery Tanner Creek stock coho, released in Tanner Creek (1991 to 1995 broods).

#### Oxbow Hatchery

Oxbow Hatchery is located on the Columbia River 2 miles east of Cascade Locks off Highway 84. Oxbow Hatchery rears coho and spring chinook salmon. Coho reared by Oxbow hatchery are released at Tanner Creek, Youngs Bay, or Umatilla River after acclimation and/or extended rearing. For results from these programs see the Bonneville, CEDC and Oxbow discussions above. The Spring chinook from Oxbow are transferred to Clackamas hatchery for rearing and release, results are reported under the Clackamas hatchery section. Wahkeena Pond was operated as a coho rearing satellite of Oxbow Hatchery through the 1992 brood. Wahkeena pond is now being developed as a public fishing area instead of a hatchery rearing facility.

#### Wahkeena Pond

Wahkeena Pond is a lake rearing location near Multnomah Falls State Park off Highway 84. Coho stocked in Wahkeena Pond were fed daily by the crew from Oxbow Hatchery. Coho production was discontinued after the 1992 brood year. Wahkeena pond is now being developed as a public fishing area instead of a hatchery rearing facility.

The 1991 to 1992 broods of coho reared in Wahkeena Pond survived at an average rate of 0.20% and were caught primarily in Columbia Basin gillnet and Washington ocean fisheries (Figure 32).

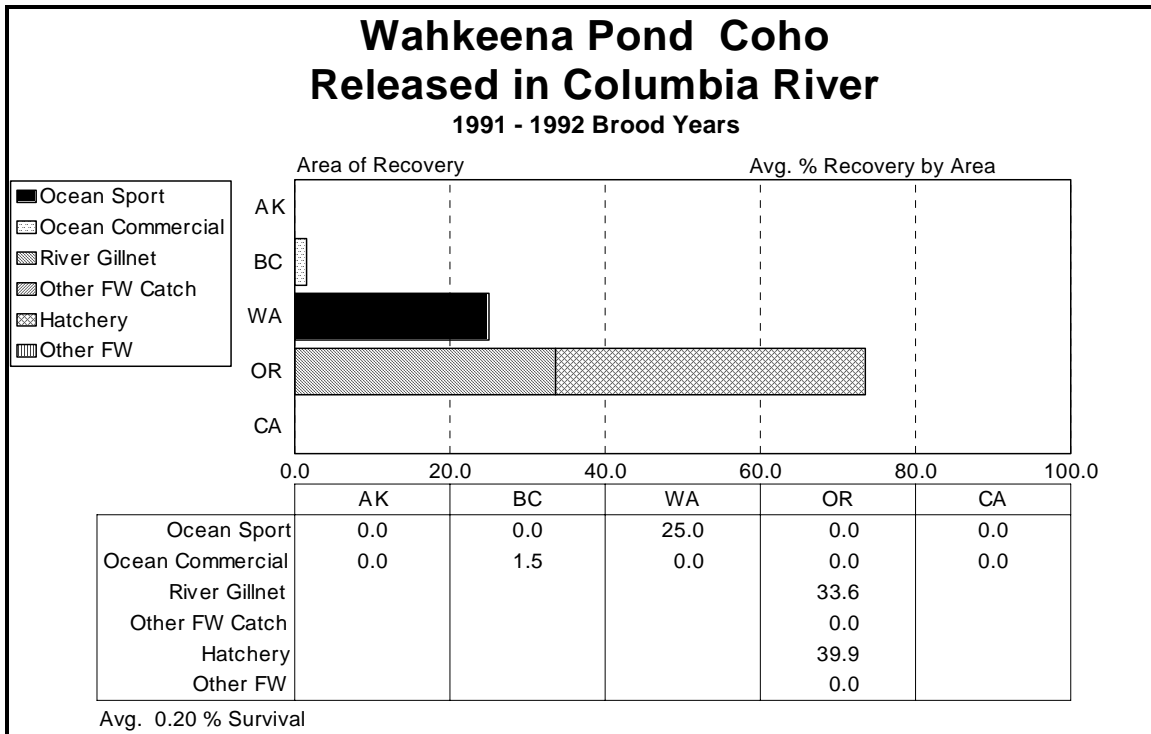


Figure 32. Average survival and catch distribution of Wahkeena Pond coho, released in the Columbia River (1991 to 1992 broods).

#### Round Butte Hatchery

Round Butte Hatchery is located at the base of Round Butte Dam on the Deschutes River east of Madras. Round Butte Hatchery rears and releases spring chinook, summer steelhead and brown trout.

The 1989 to 1993 brood Deschutes River stock spring chinook released in the Deschutes River survived at an average rate of 0.39% and were caught almost exclusively in freshwater fisheries in the Columbia and Deschutes Rivers (Figure 33).

The summer steelhead and brown trout released from Round Butte Hatchery have not been coded-wire tagged for evaluation.

#### Oak Springs Hatchery

Oak Springs Hatchery is located on the Deschutes River 3 miles north of Maupin. Oak Springs Hatchery rears and releases summer and winter steelhead and rainbow trout.

The 1993 to 1994 brood Hood River stock winter steelhead reared at Oak Springs and released in the East Fork Hood River survived at a rate of 0.37%. They were caught exclusively in Columbia Basin gillnet and other freshwater fisheries (Figure 34).

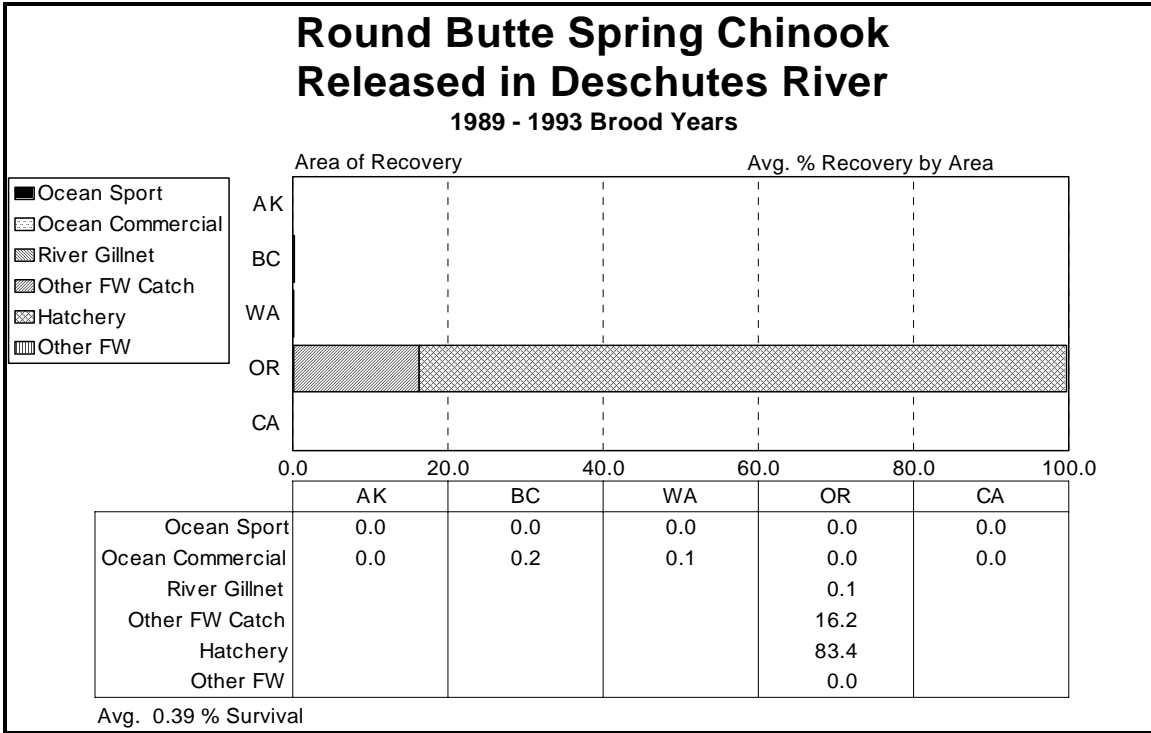


Figure 33. Average survival and catch distribution of Round Butte Hatchery Deschutes River stock spring chinook, released in Deschutes River (1989 to 1993 broods).

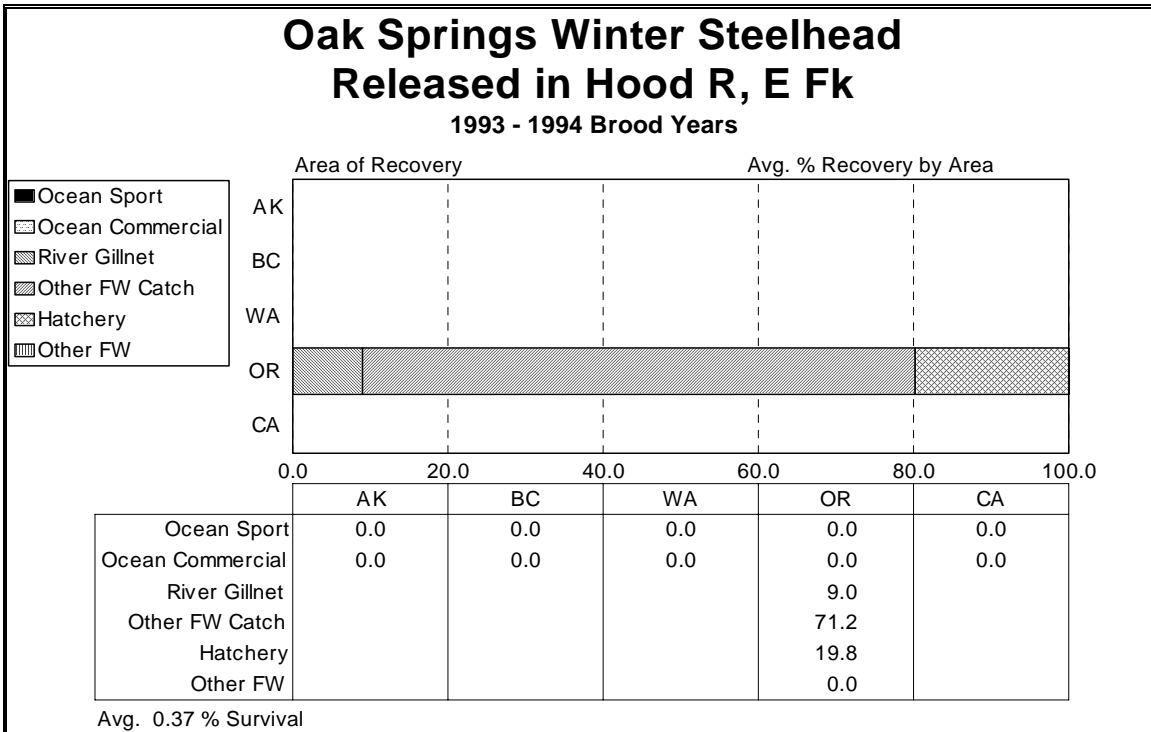


Figure 34. Survival and catch distribution of Oak Springs Hatchery Hood River stock Winter steelhead, released in East Fork Hood River (1993 to 1994 brood).

**Wizard Falls Hatchery**

Wizard Falls Hatchery is located on the Metolius River 2 miles north of Camp Sherman off Highway 20. Wizard Falls Hatchery rears and releases Atlantic and kokanee salmon, brown, brook and rainbow trout. None of these fish have been coded-wire tagged for evaluation.

**Fall River Hatchery**

Fall River Hatchery is located on Fall River, a tributary of the Deschutes River southeast of Bend. Fall River Hatchery rears and releases cutthroat, brook and rainbow trout. None of these fish have been coded-wire tagged for evaluation.

**Irrigon Hatchery**

Irrigon Hatchery is located on the Columbia River off Highway 730 near Irrigon. Irrigon rears and releases summer steelhead and rainbow trout. Starting with the 1991 brood year production of spring and fall chinook salmon for the Umatilla River was taken over by the new Umatilla Hatchery.

The 1989 to 1990 brood up-river Bright stock fall chinook released in the Umatilla River survived at an average rate of 0.18% and were caught primarily in Alaska and British Columbia ocean fisheries and Columbia Basin gillnet and other freshwater fisheries (Figure 35).

The 1990 to 1994 brood Imnaha River stock summer steelhead released in Little Sheep Creek survived at an average rate of 0.38% and were caught primarily in Columbia Basin gillnet and other freshwater fisheries (Figure 36).

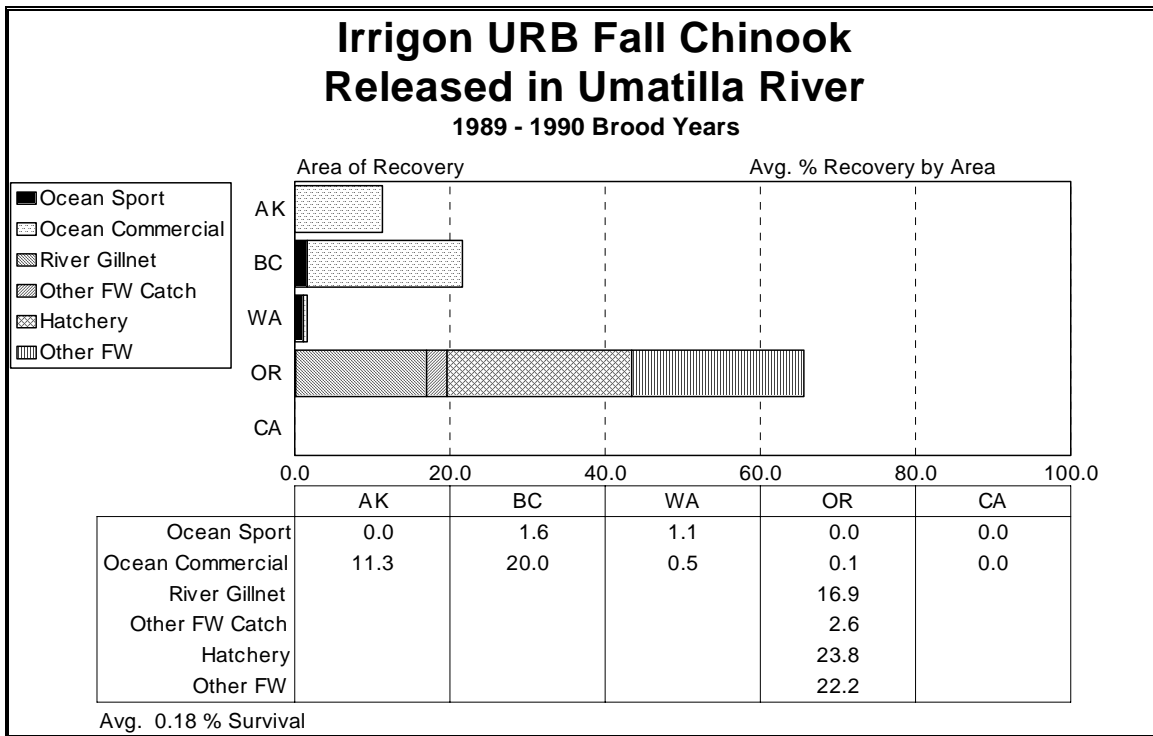


Figure 35. Average survival and catch distribution of Irrigon Hatchery up-river Bright fall chinook, released in Umatilla River (1989 to 1990 broods).

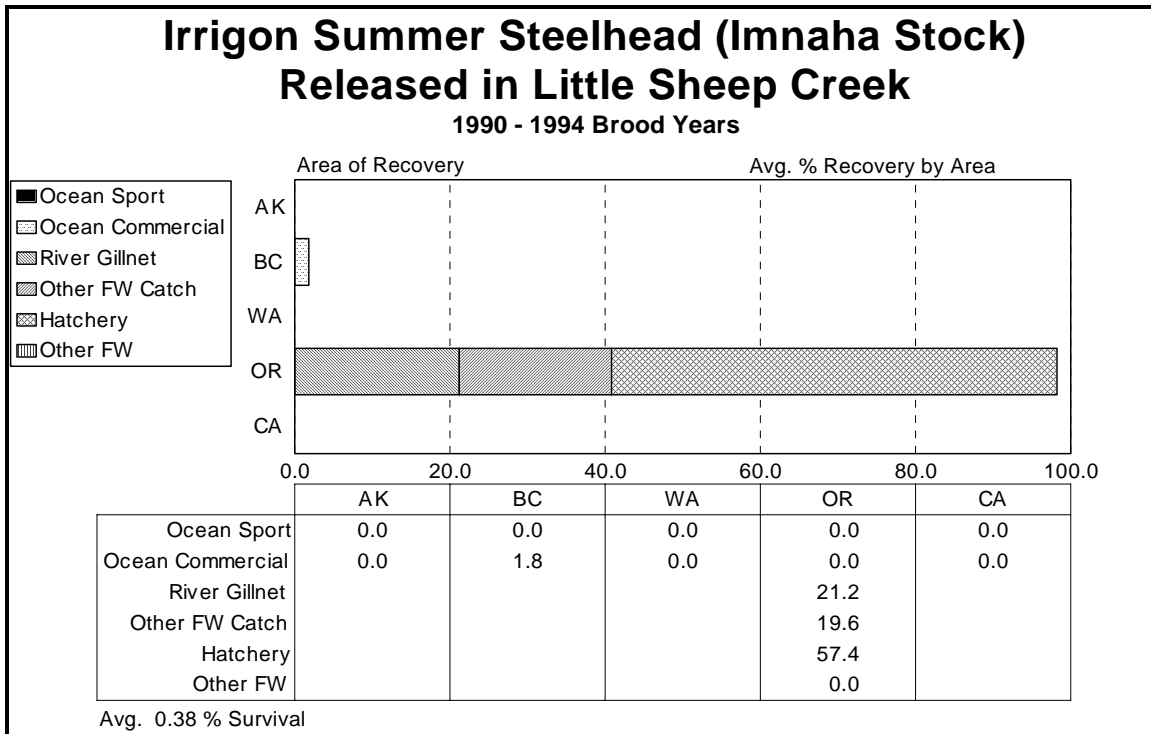


Figure 36. Average survival and catch distribution of Irrigon Hatchery Imnaha R. stock summer steelhead, released in Little Sheep Cr. (1990 to 1994 broods).

#### Umatilla Hatchery

Umatilla Hatchery, constructed in 1990 is located on the Columbia River adjacent to Irrigon Hatchery. Umatilla Hatchery rears up-river Bright fall chinook salmon and summer steelhead trout.

The 1991 to 1993 brood up-river Bright stock fall chinook released in the Umatilla River survived at an average rate of 0.04% and were caught primarily in Alaska and British Columbia ocean fisheries, and Columbia Basin gillnet and other freshwater fisheries (Figure 37).

The 1991 to 1993 brood Carson stock spring chinook released in the Umatilla River survived at an average rate of 0.03% and were caught primarily in Columbia Basin other freshwater fisheries (Figure 38).

The 1991 to 1994 brood Umatilla River stock summer steelhead released in the Umatilla River survived at an average rate of 0.44% and were caught primarily in Columbia Basin gillnet and other freshwater fisheries (Figure 39).

#### Lookingglass Hatchery

Lookingglass Hatchery is located on Lookingglass Creek, a tributary to the Grande Ronde River north of Elgin. Lookingglass Hatchery rears and releases spring chinook salmon.



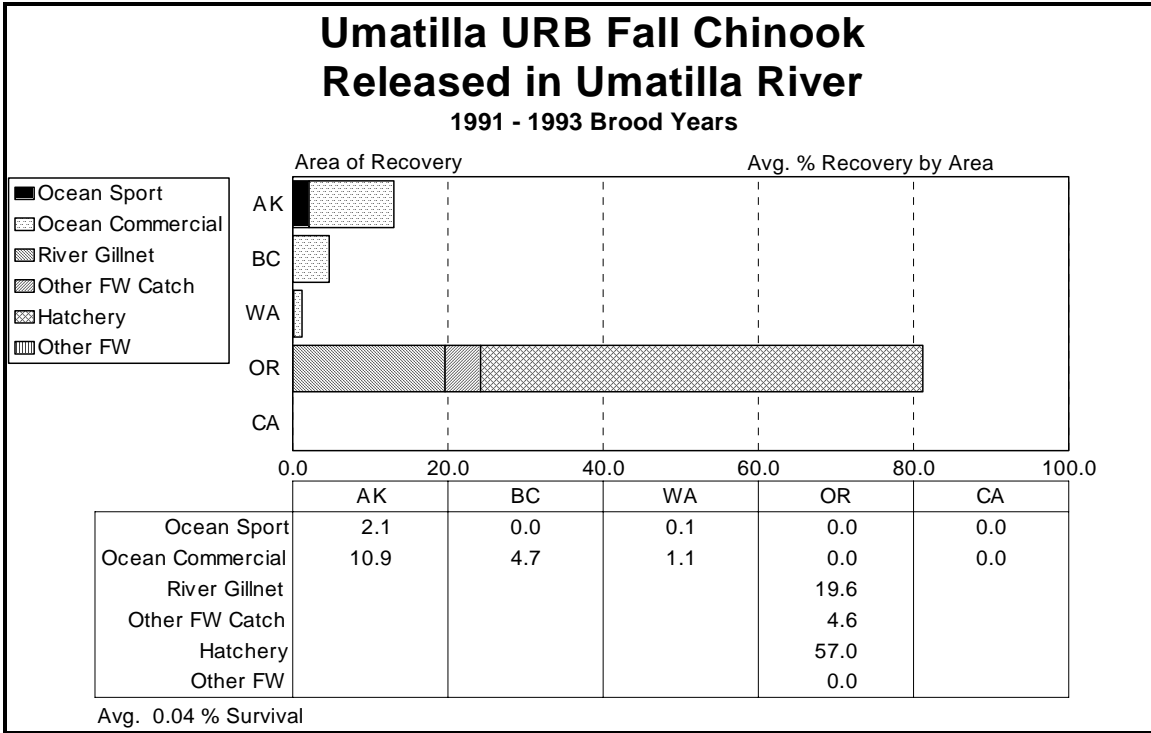


Figure 37. Average survival and catch distribution of Umatilla Hatchery up-river Bright fall chinook released in Umatilla River (1991 to 1993 broods).

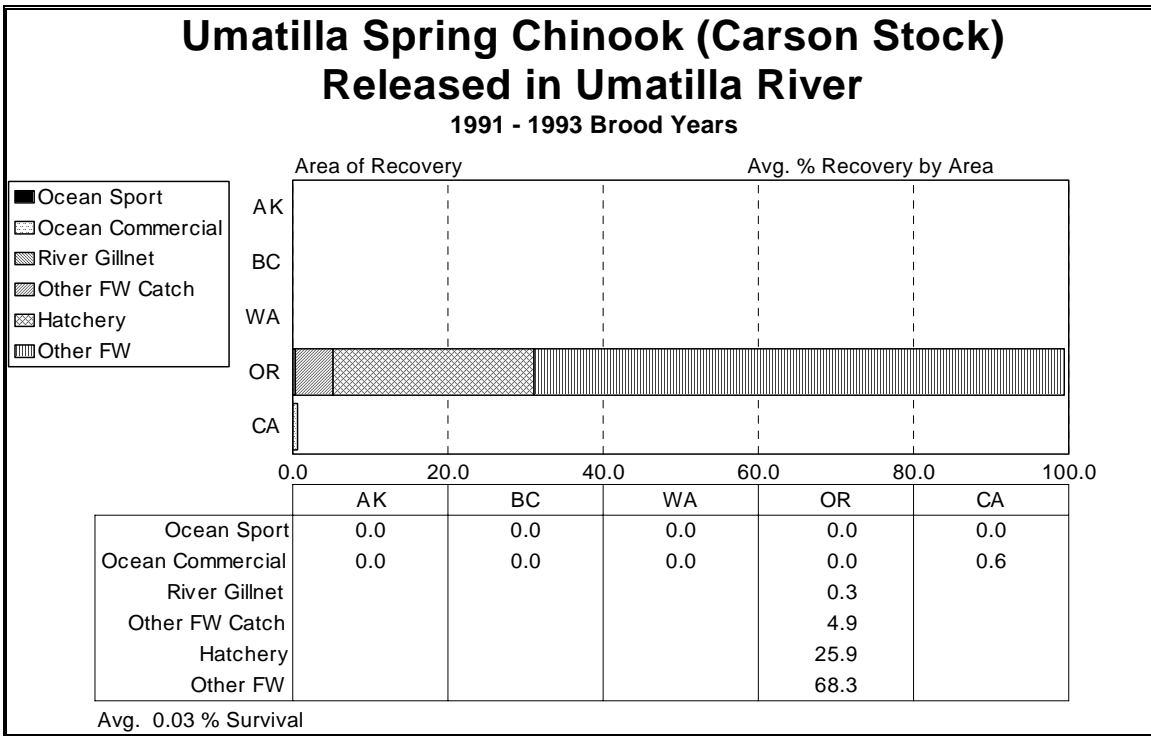


Figure 38. Average survival and catch distribution of Umatilla Hatchery Carson stock spring chinook released in Umatilla River (1991 to 1993 broods).

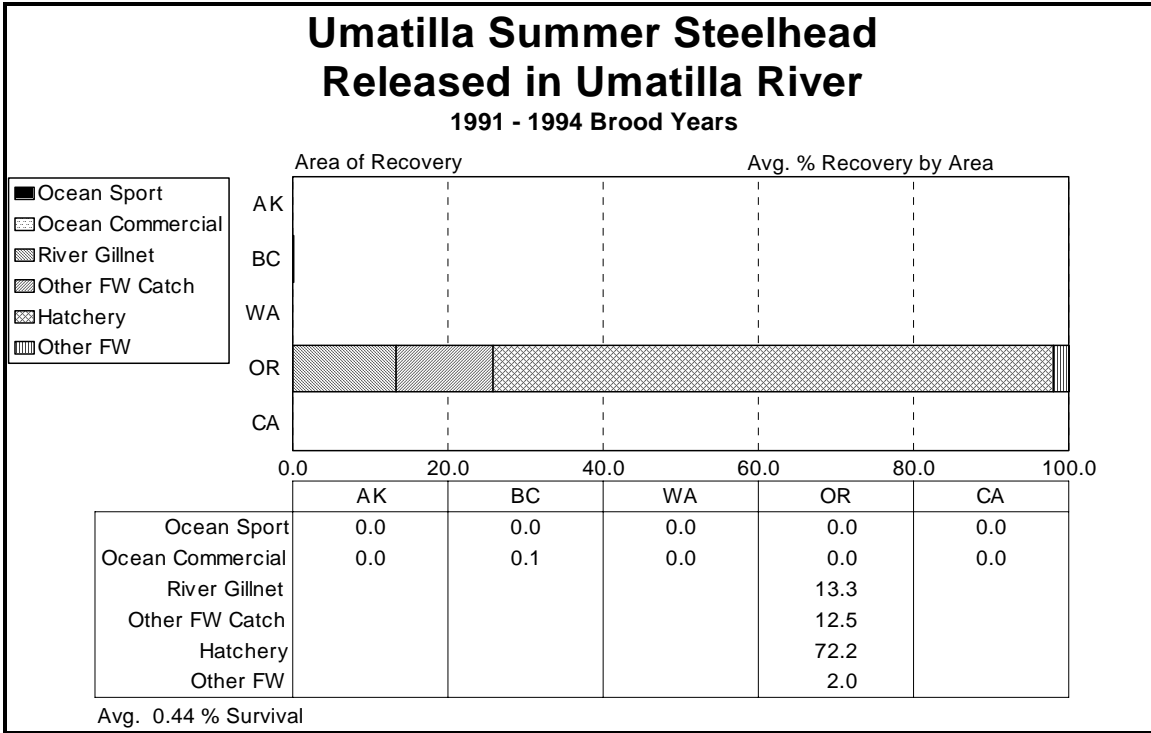


Figure 39. Average survival and catch distribution of Umatilla Hatchery Umatilla River stock summer steelhead, released in Umatilla River (1991 to 1994 broods).

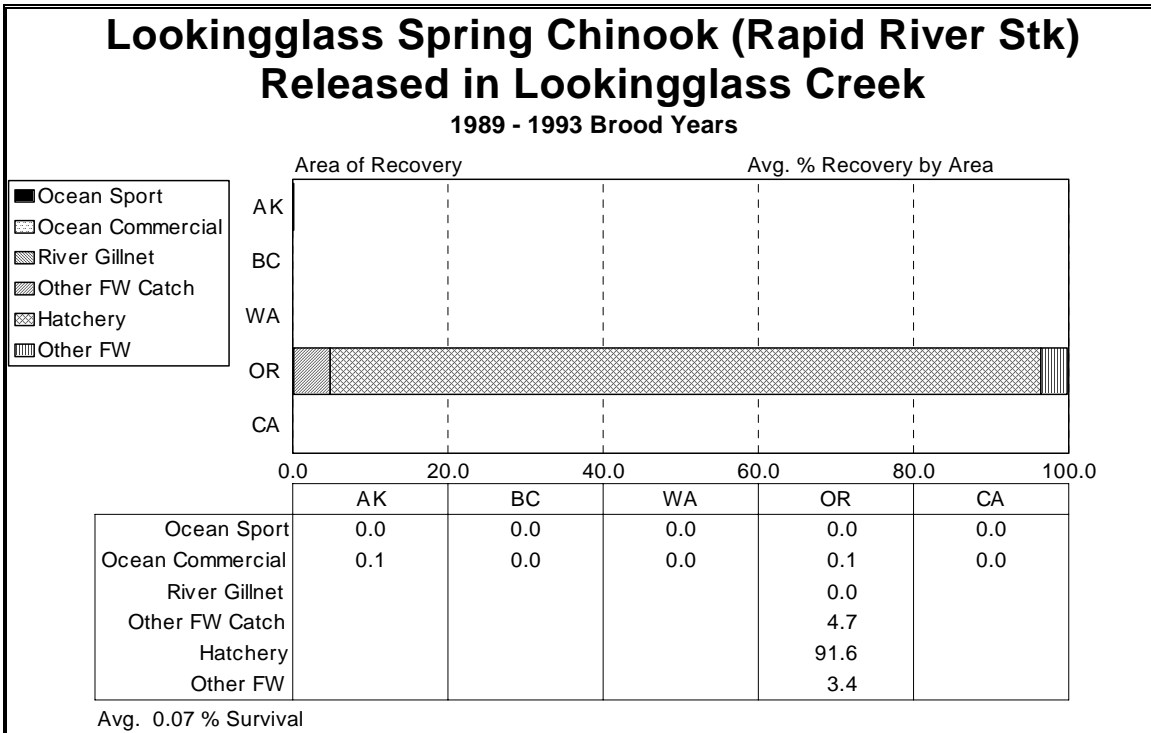


Figure 40. Average survival and catch distribution of Lookingglass Hatchery Rapid River stock spring chinook, released in Lookingglass Creek (1989 to 1993 broods).

The 1989 to 1993 brood Rapid River stock spring chinook released in Lookingglass Creek survived at an average rate of 0.07% and were caught mainly in freshwater fisheries (Figure 40).

The 1989 to 1993 brood Imnaha stock spring chinook released in Imnaha River survived at an average rate of 0.05% and were caught primarily in Columbia Basin gillnet and other freshwater fisheries (Figure 41).

### Wallowa Hatchery

Wallowa Hatchery is located on the Wallowa River near Enterprise. The Wallowa Hatchery rears and releases summer steelhead and rainbow trout.

The 1990 to 1994 brood Wallowa stock summer steelhead reared at Irrigon and Wallowa hatcheries and released in Big Canyon Creek survived at an average rate of 0.51% and were caught in Columbia Basin gillnet and other freshwater fisheries (Figure 42).

The 1990 to 1994 brood Wallowa stock summer steelhead reared at Irrigon hatchery, acclimated at Wallowa hatchery and released in Spring Creek survived at an average rate of 0.50% and were caught in Columbia Basin gillnet and other freshwater fisheries (Figure 43).

Rainbow trout are not tagged for evaluation.

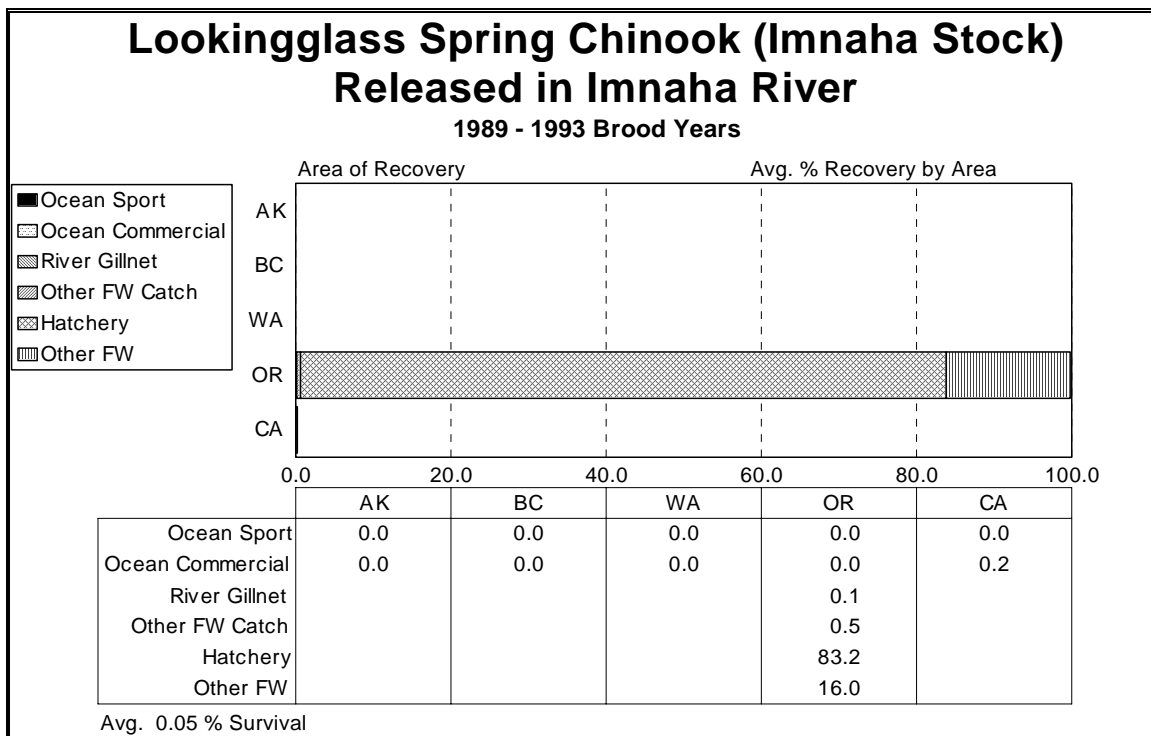


Figure 41. Average survival and catch distribution of Lookingglass Hatchery Imnaha River stock spring chinook, released in Imnaha River (1989 to 1993 broods).

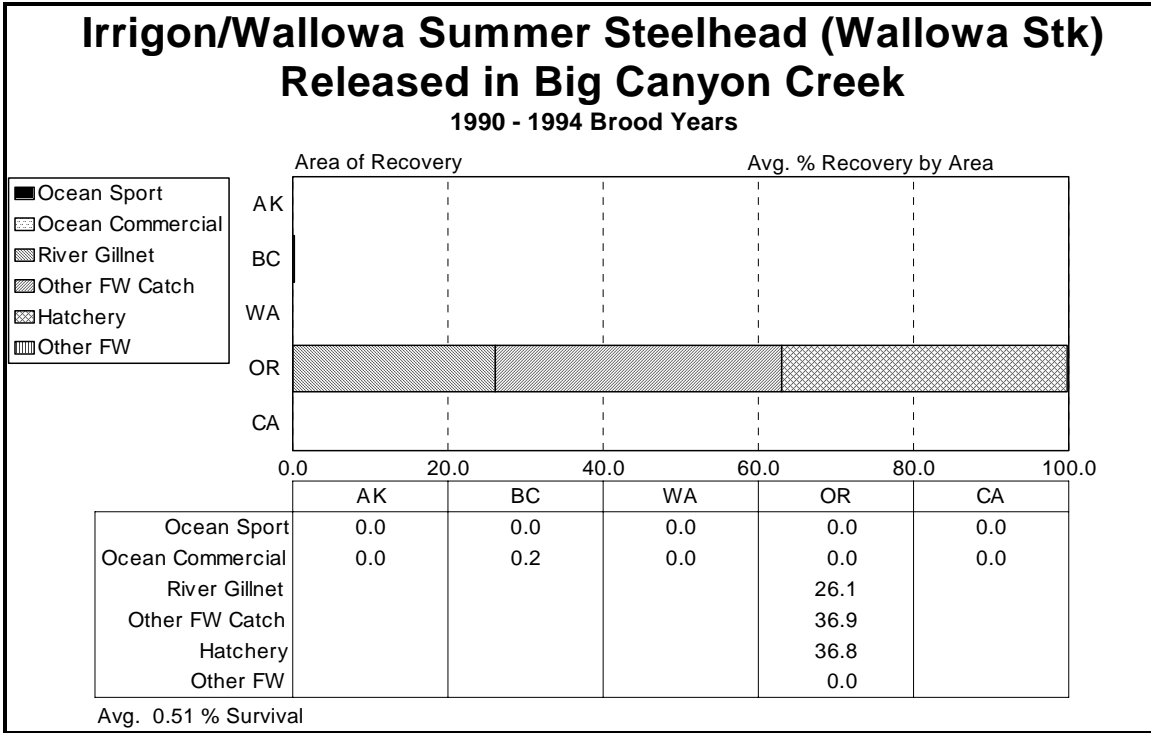


Figure 42. Average survival and catch distribution of Wallowa River stock summer steelhead, released in Big Canyon Creek (1990 to 1994 broods).

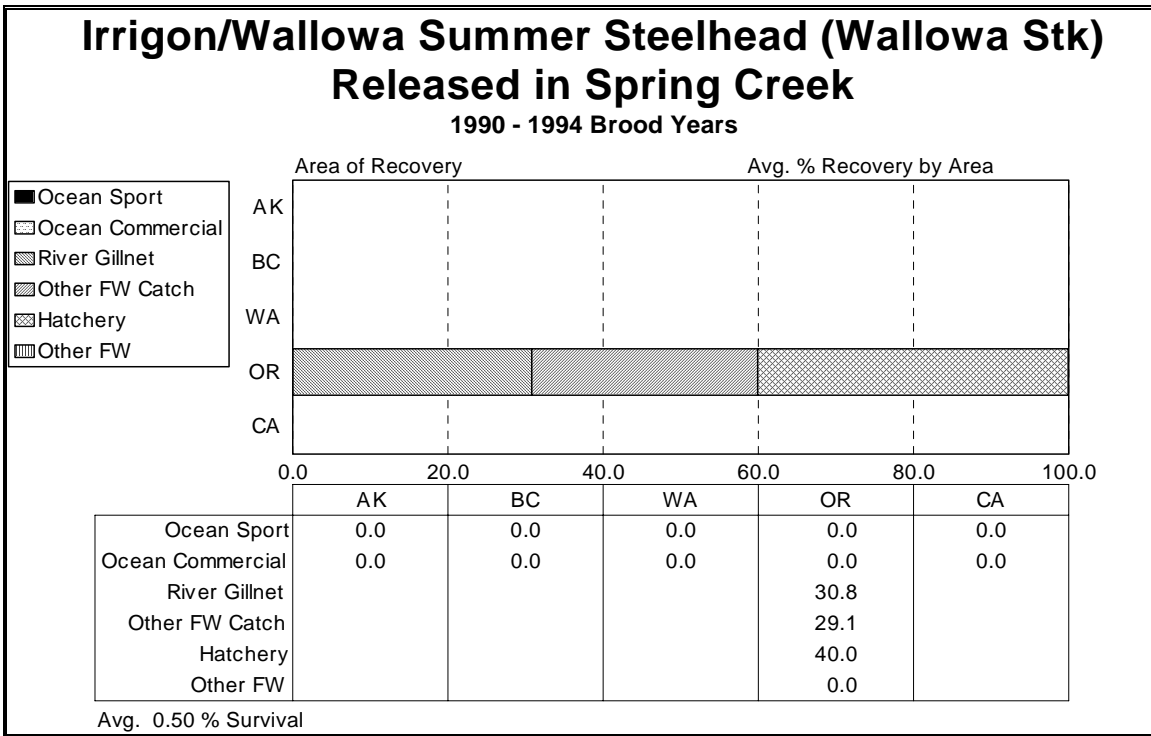


Figure 43. Average survival and catch distribution of Wallowa River stock summer steelhead, released in Spring Creek (1990 to 1994 broods).

## Wild Fish

In 1995 wild steelhead smolts were trapped and coded-wire tagged at multiple sites in the Hood River Basin. To date there have been no reported recoveries of these 490 tagged wild fish (Appendix A).

In 1995 wild spring chinook smolts were trapped and coded-wire tagged in the McKenzie River Basin. To date there have been no reported recoveries of these 1,721 tagged wild fish (Appendix A).

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- Reisenbichler, R.R., and N.A. Hartmann. 1978. Effect of number of marked fish and years of repetition on precision in studies of contribution to a fishery. Oregon Department of Fish and Wildlife, Information Report 78-2, Portland, Oregon.

APPENDIX A

Appendix Table 1. Average Percent Recovery (by Fishery) for the Last 5 Completed Brood years

(Chinook 1989 to 1993 broods; Coho 1991 to 1995 broods; Steelhead 1990 to 1994 broods)

Data through preliminary 1998 returns.

				Number		Percent Recovery for All Areas														
<b>Fall Chinook</b>				Brood	Tagged	Total Released	% Surv	Freshwater												
Hatchery	Stock	Release Site	Alaska					British Col	Washington	Oregon	Other	California								
			Spt	Com	Spt	Com	Spt	Com	Spt	Com	Spt	Com	Gillnet	Catch	Hatchery	Other	Spt	Com		
Bonneville	Tanner Cr	Tanner Cr	1989	214,085	6,464,523	0.15	0.0	0.0	0.5	31.0	9.5	12.8	0.0	3.9	2.3	5.2	34.9	0.0	0.0	0.0
Bonneville	Big Creek	Tanner Cr	1990	100,328	4,867,030	0.12	0.0	0.0	5.9	19.2	6.4	11.0	0.0	0.0	3.4	3.2	50.8	0.0	0.0	0.0
Bonneville	Big Creek	Tanner Cr	1991	106,605	7,757,835	0.03	0.0	0.0	0.0	9.2	0.0	0.0	0.0	12.7	0.0	0.0	78.0	0.0	0.0	0.0
Bonneville	Tanner Cr	Tanner Cr	1992	162,743	6,638,719	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	5.6	22.2	69.2	0.0	0.0	0.0
Bonneville	Tanner Cr	Tanner Cr	1993	52,175	5,866,287	0.05	0.0	0.0	0.0	7.7	0.0	0.0	0.0	0.0	3.9	0.0	88.5	0.0	0.0	0.0
Average				127,187	6,318,879	0.08	0.0	0.0	1.3	13.4	3.2	4.8	0.0	3.9	3.0	6.1	64.3	0.0	0.0	0.0
Bonneville	URB	Tanner Cr	1989	98,382	99,638	0.25	0.0	31.3	0.0	19.8	0.0	1.7	0.0	0.0	16.2	2.9	28.2	0.0	0.0	0.0
Bonneville	URB	Tanner Cr	1990	247,106	4,867,973	0.29	0.0	12.1	0.1	16.8	1.3	0.0	0.0	0.0	12.1	0.2	42.3	15.1	0.0	0.0
Bonneville	URB	Tanner Cr	1991	102,163	3,153,084	0.06	0.0	23.2	0.0	6.4	0.0	0.0	0.0	0.0	15.6	1.6	43.8	9.5	0.0	0.0
Bonneville	URB	Tanner Cr	1992	97,104	4,030,615	0.35	2.4	10.0	0.0	6.2	1.8	0.0	0.0	2.4	15.6	7.1	54.7	0.0	0.0	0.0
Bonneville	URB	Tanner Cr	1993	203,934	5,733,742	0.48	2.7	17.2	1.1	10.6	0.0	0.0	0.0	0.2	13.0	6.3	49.0	0.0	0.0	0.0
Average				149,738	3,577,010	0.29	1.0	18.7	0.2	11.9	0.6	0.3	0.0	0.5	14.5	3.6	43.6	4.9	0.0	0.0
Bonneville	URB	Mid-Columbia R	1989	93,127	99,686	0.33	0.0	19.7	0.0	30.8	1.4	0.0	0.0	0.0	23.4	5.5	19.3	0.0	0.0	0.0
Bonneville	URB	Mid-Columbia R	1990	190,571	848,688	0.17	0.0	18.5	0.0	18.8	0.0	0.0	0.0	0.0	17.4	0.0	37.4	8.0	0.0	0.0
Average				141,849	474,187	0.25	0.0	19.1	0.0	24.8	0.7	0.0	0.0	0.0	20.4	2.7	28.3	4.0	0.0	0.0
Hanford Netpens	URB	Hanford Reach	1993	479,106	496,746	0.13	1.1	14.2	0.0	7.6	0.0	0.3	0.0	1.4	40.6	8.2	23.5	3.2	0.0	0.0
Bonneville	URB	Ringold Pond (WA)	1993	425,289	4,258,492	0.17	1.4	16.0	0.0	13.1	0.0	0.0	0.0	0.0	39.7	11.9	17.3	0.5	0.0	0.0
Bonneville	URB	Umatilla R	1990	52,338	58,682	0.02	0.0	0.0	0.0	49.4	0.0	0.0	0.0	0.0	0.0	40.5	10.1	0.0	0.0	0.0
Bonneville	URB	Umatilla R	1991	47,102	87,337	0.04	0.0	0.0	0.0	38.2	0.0	0.0	0.0	0.0	0.0	0.0	61.8	0.0	0.0	0.0
Bonneville	URB	Umatilla R	1992	47,169	283,453	0.28	0.0	0.0	14.3	0.0	0.0	0.0	0.0	2.2	3.3	9.9	64.1	6.3	0.0	0.0
Bonneville	URB	Umatilla R	1993	49,239	227,088	0.18	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	92.1	0.0	0.0	0.0
Average				48,962	164,140	0.13	0.0	1.4	3.6	21.9	0.0	0.0	0.0	0.6	0.8	13.2	57.0	1.6	0.0	0.0
Big Creek	Big Creek	Big Cr	1989	216,589	9,746,836	0.12	0.0	3.2	0.0	21.0	11.9	20.6	0.0	4.2	1.0	1.6	32.6	4.0	0.0	0.0
Big Creek	Big Creek	Big Cr	1990	157,694	10,880,963	0.09	0.0	2.4	22.2	18.3	0.0	4.3	0.0	0.0	0.0	3.0	42.3	7.6	0.0	0.0
Big Creek	Big Creek	Big Cr	1991	160,001	9,804,926	0.18	0.0	0.0	7.0	20.4	1.8	1.2	0.0	1.1	0.0	0.0	49.1	19.4	0.0	0.0
Big Creek	Big Creek	Big Cr	1992	105,966	7,901,061	0.08	0.0	0.0	0.0	8.6	0.0	0.0	0.0	3.3	13.6	2.1	69.6	2.8	0.0	0.0
Big Creek	Big Creek	Big Cr	1993	105,425	7,025,715	0.27	0.0	3.0	4.2	15.7	2.5	7.9	0.0	1.5	14.2	1.5	48.3	1.3	0.0	0.0
Average				149,135	9,071,900	0.15	0.0	1.7	6.7	16.8	3.2	6.8	0.0	2.0	5.8	1.6	48.4	7.0	0.0	0.0

Appendix Table 1. Continued.

			Percent Recovery for All Areas																	
			Number				Freshwater													
			Brood	Tagged	Total Released	% Surv	Alaska		British Col		Washington		Oregon		Gillnet	Other Catch	Hatchery	Other	California	
Hatchery	Stock	Release Site					Spt	Com	Spt	Com	Spt	Com	Spt	Com					Spt	Com
<b>Fall Chinook</b>																				
Big Creek	Rogue R	Big Cr	1989	152,691	383,482	0.78	0.0	0.0	0.0	3.0	5.8	1.0	2.5	46.7	0.7	9.9	23.6	0.6	0.1	5.9
Big Creek	Rogue R	Big Cr	1990	153,009	785,934	0.78	0.0	0.0	0.0	0.0	4.5	1.1	1.8	27.8	3.7	8.1	46.2	4.5	0.6	1.7
Big Creek	Rogue R	Big Cr	1991	155,817	763,387	0.51	0.0	0.0	0.0	1.0	0.0	0.3	0.0	8.8	0.5	0.7	80.5	3.4	2.3	2.5
Big Creek	Rogue R	Big Cr	1992	104,250	444,718	1.54	0.0	0.1	0.1	0.5	0.2	1.0	0.0	29.2	4.8	2.9	54.5	1.6	2.1	3.0
Big Creek	Rogue R	Big Cr	1993	109,048	804,671	0.55	0.0	0.0	0.0	0.1	0.1	0.8	0.7	23.6	9.0	9.5	49.1	0.7	2.4	4.3
Average				134,963	636,438	0.83	0.0	0.0	0.0	0.9	2.1	0.9	1.0	27.2	3.7	6.2	50.8	2.2	1.5	3.5
Irrigon	URB	Umatilla R	1989	295,896	541,809	0.15	0.0	7.7	2.9	29.7	2.1	0.9	0.0	0.0	25.2	2.4	24.2	5.0	0.0	0.0
Irrigon	URB	Umatilla R	1990	503,863	3,246,468	0.20	0.0	15.0	0.4	10.4	0.1	0.0	0.0	0.1	8.6	2.7	23.4	39.4	0.0	0.0
Average				399,880	1,894,139	0.18	0.0	11.3	1.6	20.0	1.1	0.5	0.0	0.1	16.9	2.6	23.8	22.2	0.0	0.0
Umatilla	URB	Umatilla R	1991	304,968	2,678,343	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.1	0.0	82.9	0.0	0.0	0.0
Umatilla	URB	Umatilla R	1992	294,842	2,629,917	0.06	3.3	13.2	0.0	6.8	0.0	3.2	0.0	0.0	25.5	4.1	43.8	0.0	0.0	0.0
Umatilla	Washington Brights	Umatilla R	1993	308,481	2,843,212	0.07	2.9	19.4	0.0	7.5	0.4	0.0	0.0	0.0	16.0	9.6	44.3	0.0	0.0	0.0
Average				302,764	2,717,157	0.04	2.1	10.9	0.0	4.7	0.1	1.1	0.0	0.0	19.6	4.6	57.0	0.0	0.0	0.0
CEDC Fisheries	Rogue R	Youngs R	1989	50,336	127,711	1.37	0.0	0.0	0.0	1.7	2.2	0.9	2.2	40.0	36.4	11.3	3.7	0.0	0.0	1.6
CEDC Fisheries	Rogue R	Youngs R	1991	25,467	56,467	0.15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89.2	0.0	10.8	0.0	0.0	0.0
CEDC Fisheries	Rogue R	Youngs R	1993	25,351	337,915	1.17	0.0	0.0	0.0	0.0	0.0	1.0	1.0	17.6	57.4	7.1	5.7	2.0	1.4	6.8
Average				33,718	174,031	0.90	0.0	0.0	0.0	0.6	0.7	0.7	1.1	19.2	61.0	6.1	6.8	0.7	0.5	2.8
Stayton Pond	Tanner Cr	Willamette R	1989	234,784	5,869,652	0.68	0.0	0.0	2.9	16.3	5.2	21.5	1.1	5.5	0.7	4.5	42.2	0.0	0.0	0.0
Stayton Pond	Tanner Cr	Willamette R	1990	196,187	9,516,779	0.15	0.0	0.0	3.8	20.4	8.4	10.2	2.3	4.3	1.7	6.5	41.5	1.0	0.0	0.0
Stayton Pond	Tanner Cr	Willamette R	1991	196,429	10,092,295	0.01	0.0	0.0	0.0	19.8	0.0	0.0	0.0	0.0	0.0	0.0	80.2	0.0	0.0	0.0
Stayton Pond	Tanner Cr	Willamette R	1992	257,735	6,286,290	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.6	0.0	0.0	0.0	50.4	0.0	0.0
Stayton Pond	Tanner Cr	Willamette R	1993	294,883	7,301,288	0.02	0.0	0.0	7.2	0.0	0.0	4.0	0.0	0.0	0.1	4.0	84.7	0.0	0.0	0.0
Average				236,004	7,813,261	0.17	0.0	0.0	2.8	11.3	2.7	7.1	0.7	11.9	0.5	3.0	49.7	10.3	0.0	0.0
<b>Spring Chinook</b>																				
Bonneville	Lookingglass Cr	Hood R, W Fk	1989	52,068	125,327	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Bonneville	Lookingglass Cr	Hood R, W Fk	1990	52,732	163,295	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Bonneville	Deschutes R	Hood R, W Fk	1991	39,739	40,317	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.0	30.0	0.0	0.0	0.0	0.0
Bonneville	Deschutes R	Hood R, W Fk	1993	42,861	170,004	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	88.9	0.0	0.0	0.0
Average				46,850	124,736	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	70.3	29.7	0.0	0.0	0.0
Round Butte	Deschutes R	Hood R, W Fk	1991	28,133	28,810	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



Appendix Table 1. Continued.

		Percent Recovery for All Areas																		
		Number					Freshwater													
				Total	%	Alaska		British Col		Washington		Oregon						California		
Hatchery	Stock	Release Site	Brood	Tagged	Released	Surv	Spt	Com	Spt	Com	Spt	Com	Spt	Com	Gillnet	Other Catch	Hatchery	Other	Spt	Com
<b>Spring Chinook</b>																				
Bonneville	Lookingglass Cr	Umatilla R	1989	308,924	355,091	0.08	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.3	37.5	40.2	0.0	0.0
Bonneville	Lookingglass Cr	Umatilla R	1990	313,457	367,653	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.1	68.7	3.3	0.0	0.0
Bonneville	Carson	Umatilla R	1991	171,620	224,471	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.8	35.5	43.7	0.0	0.0
Bonneville	Carson	Umatilla R	1992	93,349	405,102	0.48	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5	8.7	81.9	0.0	0.0
Average				221,838	338,079	0.15	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.9	37.6	42.3	0.0	0.0
Carson NFH	Wind R	Umatilla R	1990	32,335	97,718	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Umatilla	Carson	Umatilla R	1991	642,146	1,265,950	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
Umatilla	Carson	Umatilla R	1992	747,602	1,333,319	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	11.5	17.5	70.6	0.0	0.0
Umatilla	Carson	Umatilla R	1993	866,996	1,890,965	0.08	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.5	3.1	60.2	34.3	0.0	1.7
Average				752,248	1,496,745	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	4.9	25.9	68.3	0.0	0.6
Clackamas	Clackamas R	Clackamas R	1989	136,977	138,145	0.36	0.0	16.3	0.0	5.8	0.3	4.0	0.0	1.1	1.2	24.9	46.3	0.0	0.0	0.0
Clackamas	Clackamas R	Clackamas R	1990	134,529	1,000,235	0.44	0.0	4.8	0.9	1.5	0.0	0.0	0.1	0.0	0.6	43.5	48.6	0.0	0.0	0.0
Clackamas	Clackamas R	Clackamas R	1991	118,981	1,031,558	0.22	0.0	2.1	0.0	0.6	0.0	0.0	0.0	0.0	0.6	15.8	81.0	0.0	0.0	0.0
Clackamas	Clackamas R	Clackamas R	1992	127,363	836,872	0.26	0.0	0.4	0.0	2.9	1.5	0.0	0.0	4.8	0.2	9.3	79.7	0.0	0.0	1.2
Clackamas	Clackamas R	Clackamas R	1993	131,602	1,014,225	0.44	0.0	1.5	0.0	0.7	0.0	0.3	0.0	4.0	1.1	21.4	71.0	0.0	0.0	0.0
Average				129,890	804,207	0.34	0.0	5.0	0.2	2.3	0.4	0.8	0.0	2.0	0.8	23.0	65.3	0.0	0.0	0.2
Clackamas	Clackamas R	Sandy R	1991	51,764	371,484	0.08	0.0	0.0	12.8	0.0	0.0	0.0	0.0	0.0	2.6	71.8	12.8	0.0	0.0	0.0
Clackamas	Clackamas R	Sandy R	1992	25,177	344,893	0.04	0.0	18.2	36.4	0.0	0.0	0.0	27.3	0.0	9.1	9.1	0.0	0.0	0.0	0.0
Clackamas	Clackamas R	Sandy R	1993	23,927	459,479	0.12	0.0	20.7	10.3	3.5	0.0	0.0	0.0	6.9	0.0	27.6	31.0	0.0	0.0	0.0
Average				33,623	391,952	0.08	0.0	13.0	19.8	1.2	0.0	0.0	0.0	11.4	0.9	36.2	17.6	0.0	0.0	0.0
Lookingglass	Imnaha R	Imnaha R	1989	167,990	267,670	0.12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.2	3.8	0.0	0.0
Lookingglass	Imnaha R	Imnaha R	1990	259,377	262,500	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	91.1	6.6	0.0	0.0
Lookingglass	Imnaha R	Imnaha R	1991	156,886	157,659	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.0	27.0	0.0	0.0
Lookingglass	Imnaha R	Imnaha R	1992	421,847	438,617	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.0	20.0	0.0	0.0
Lookingglass	Imnaha R	Imnaha R	1993	386,120	394,304	0.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	75.5	22.7	0.0	1.1
Average				278,444	304,150	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	83.2	16.0	0.0	0.2
Lookingglass	Rapid R (Idaho)	Lookingglass Cr	1989	171,712	331,634	0.11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6	84.8	7.7	0.0	0.0
Lookingglass	Rapid R (Idaho)	Lookingglass Cr	1990	167,115	950,868	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.8	81.6	7.6	0.0	0.0
Lookingglass	Rapid R (Idaho)	Lookingglass Cr	1991	446,248	448,219	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	97.4	0.4	0.0	0.0
Lookingglass	Rapid R (Idaho)	Lookingglass Cr	1992	739,180	765,123	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.3	97.1	0.5	0.0	0.0
Lookingglass	Rapid R (Idaho)	Lookingglass Cr	1993	630,618	658,230	0.09	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.7	0.1	0.5	97.1	0.9	0.0	0.0
Average				430,975	630,815	0.07	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	4.7	91.6	3.4	0.0	0.0

Appendix Table 1. Continued.

			Percent Recovery for All Areas																		
			Number				Freshwater														
Spring Chinook			Brood	Tagged	Total Released	% Surv	Alaska		British Col		Washington		Oregon		Gillnet	Other Catch	Hatchery	Other	California		
Hatchery	Stock	Release Site					Spt	Com	Spt	Com	Spt	Com	Spt	Com					Spt	Com	Spt
Marion Forks	N Santiam R	Santiam R & N Fk	1989	31,683	32,901	0.60	0.0	13.9	0.0	0.0	0.0	1.1	0.0	0.0	1.0	59.9	24.2	0.0	0.0	0.0	
Marion Forks	N Santiam R	Santiam R & N Fk	1990	34,835	553,887	0.17	0.0	3.0	0.0	15.3	0.0	0.0	0.0	0.0	0.0	41.6	40.1	0.0	0.0	0.0	
Marion Forks	N Santiam R	Santiam R & N Fk	1991	71,502	444,917	0.36	0.0	9.0	0.0	0.8	0.0	0.0	0.0	0.0	0.4	57.2	32.3	0.3	0.0	0.0	
Marion Forks	N Santiam R	Santiam R & N Fk	1992	28,469	489,825	0.07	0.0	12.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	84.6	3.1	0.0	0.0	
Marion Forks	N Santiam R	Santiam R & N Fk	1993	30,780	665,684	0.25	0.0	19.9	0.0	0.0	0.0	0.0	0.0	1.0	4.1	73.0	2.0	0.0	0.0	0.0	
Average				39,454	437,443	0.29	0.0	11.6	0.0	3.2	0.0	0.2	0.0	0.0	0.5	32.5	50.8	1.1	0.0	0.0	
McKenzie	McKenzie R	McKenzie R	1989	85,641	87,777	0.26	0.0	13.1	0.0	5.9	0.9	0.6	0.7	0.0	0.6	43.4	33.9	0.9	0.0	0.0	
McKenzie	McKenzie R	McKenzie R	1990	143,245	1,022,561	0.11	0.0	1.7	0.0	0.5	0.0	0.0	0.0	0.3	0.4	15.1	82.0	0.1	0.0	0.0	
McKenzie	McKenzie R	McKenzie R	1991	123,661	805,342	0.14	0.0	9.9	0.0	2.2	0.4	0.4	0.0	0.0	0.0	11.1	72.6	0.8	0.0	2.6	
McKenzie	McKenzie R	McKenzie R	1992	678,222	732,635	0.18	0.0	2.5	0.0	1.0	0.0	0.1	0.0	0.2	0.8	10.0	84.1	1.4	0.0	0.0	
McKenzie	McKenzie R	McKenzie R	1993	82,684	480,183	0.19	0.0	3.4	0.0	3.5	2.6	0.0	0.0	0.0	0.0	7.9	80.6	2.0	0.0	0.0	
Average				222,691	625,700	0.18	0.0	6.1	0.0	2.6	0.8	0.2	0.1	0.1	0.4	17.5	70.6	1.1	0.0	0.5	
McKenzie	McKenzie R	Willamette R-1	1992	178,065	256,547	0.03	0.0	14.7	0.0	4.2	0.0	0.0	0.0	5.6	0.0	4.2	71.3	0.0	0.0	0.0	
McKenzie	McKenzie R	Willamette R-1	1993	315,495	393,794	0.06	0.0	8.2	0.0	2.8	0.0	0.0	0.0	0.7	2.2	13.0	72.0	1.1	0.0	0.0	
Average				246,780	325,171	0.05	0.0	11.5	0.0	3.5	0.0	0.0	0.0	3.2	1.1	8.6	71.6	0.6	0.0	0.0	
Wild	McKenzie R	McKenzie R	1993	1,721	1,721	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Round Butte	Deschutes R	Deschutes R	1989	120,207	270,891	0.78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	36.1	63.8	0.0	0.0	0.0	
Round Butte	Deschutes R	Deschutes R	1990	118,920	270,779	0.29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.2	84.8	0.0	0.0	0.0	
Round Butte	Deschutes R	Deschutes R	1991	230,048	235,906	0.32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	93.4	0.0	0.0	0.0	
Round Butte	Deschutes R	Deschutes R	1992	232,724	237,569	0.47	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.2	0.3	15.5	83.7	0.1	0.0	0.0	
Round Butte	Deschutes R	Deschutes R	1993	230,632	239,219	0.10	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	7.8	91.4	0.0	0.0	0.0	
Average				186,506	250,873	0.39	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.1	16.2	83.4	0.0	0.0	0.0	
South Santiam	S Santiam R	Santiam R, S Fk	1989	353,726	1,102,257	0.74	0.0	13.9	0.4	5.7	0.8	2.3	0.0	0.0	3.2	45.6	27.7	0.4	0.0	0.0	
South Santiam	S Santiam R	Santiam R, S Fk	1990	413,758	1,253,738	0.42	0.0	3.3	0.0	1.0	0.1	0.2	0.0	0.6	0.3	70.9	23.5	0.1	0.1	0.0	
South Santiam	S Santiam R	Santiam R, S Fk	1991	406,765	1,291,561	0.35	0.0	9.1	0.0	4.0	0.3	0.0	0.0	0.0	1.1	38.3	46.5	0.7	0.0	0.0	
South Santiam	S Santiam R	Santiam R, S Fk	1992	104,989	945,293	0.18	0.0	7.9	0.0	0.0	1.7	0.0	0.0	0.0	2.9	20.8	66.7	0.0	0.0	0.0	
South Santiam	S Santiam R	Santiam R, S Fk	1993	110,392	919,238	0.30	0.0	5.9	0.0	2.1	0.0	0.2	0.0	0.0	1.9	18.8	69.1	1.9	0.0	0.0	
Average				277,926	1,102,417	0.40	0.0	8.0	0.1	2.6	0.6	0.5	0.0	0.1	1.9	38.9	46.7	0.6	0.0	0.0	
CEDC Fisheries	M Willamette R	Klaskanine R, S Fk	1989	27,491	118,674	0.04	0.0	0.0	0.0	0.0	10.0	0.0	0.0	40.0	0.0	50.0	0.0	0.0	0.0	0.0	
CEDC Fisheries	Clackamas R	Klaskanine R, S Fk	1990	26,472	119,627	0.03	0.0	0.0	87.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	
CEDC Fisheries	M Willamette R	Klaskanine R, S Fk	1991	26,630	74,517	0.02	0.0	40.0	0.0	0.0	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	
CEDC Fisheries	N Santiam R	Klaskanine R, S Fk	1992	24,668	109,974	0.03	0.0	0.0	0.0	28.6	0.0	0.0	0.0	0.0	42.9	0.0	28.6	0.0	0.0	0.0	
CEDC Fisheries	M Willamette R	Klaskanine R, S Fk	1993	51,829	86,978	0.07	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.7	0.0	58.3	0.0	0.0	0.0	0.0	
Average				31,418	101,954	0.04	0.0	8.0	17.5	5.7	0.0	2.0	0.0	0.0	36.9	0.0	27.4	2.5	0.0	0.0	

Appendix Table 1. Continued.

			Percent Recovery for All Areas																			
			Number				Freshwater															
			Brood	Tagged	Total Released	% Surv	Alaska		British Col		Washington		Oregon		Gillnet	Other Catch	Hatchery	Other	California			
Hatchery	Stock	Release Site					Spt	Com	Spt	Com	Spt	Com	Spt	Com					Spt	Com	Spt	Com
<b>Spring Chinook</b>																						
CEDC Fisheries	M Willamette R	Youngs R	1989	28,688	221,790	0.10	0.0	17.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.0	0.0	7.1	0.0	0.0	0.0	
CEDC Fisheries	Clackamas R	Youngs R	1990	49,189	242,534	0.15	0.0	1.1	0.0	0.4	0.5	0.0	0.0	0.0	0.0	79.7	0.0	1.3	17.0	0.0	0.0	
CEDC Fisheries	M Willamette R	Youngs R	1991	26,352	301,786	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	
CEDC Fisheries	N Santiam R	Youngs R	1992	26,418	301,361	0.36	0.0	2.1	0.0	3.1	0.0	0.0	0.0	0.0	0.0	86.5	0.0	7.3	1.0	0.0	0.0	
CEDC Fisheries	M Willamette R	Youngs R	1993	144,189	363,222	0.74	0.0	6.8	0.0	1.2	0.0	0.5	0.0	0.0	84.3	1.7	5.1	0.5	0.0	0.0	0.0	
Average				54,967	286,139	0.27	0.0	5.6	0.0	1.0	0.1	0.1	0.0	0.0	65.1	0.3	4.2	23.7	0.0	0.0	0.0	
Willamette	M Willamette R	Willamette R, M Fk	1989	526,743	947,458	0.52	0.0	9.7	0.1	3.2	0.1	1.1	0.0	0.0	1.4	43.3	41.2	0.1	0.0	0.0	0.0	
Willamette	M Willamette R	Willamette R, M Fk	1990	555,610	1,557,640	0.44	0.0	3.9	0.0	2.7	0.0	0.0	0.0	0.2	0.5	41.1	51.4	0.3	0.0	0.0	0.0	
Willamette	M Willamette R	Willamette R, M Fk	1991	494,132	1,381,464	0.41	0.0	5.6	0.2	0.9	0.0	0.0	0.0	0.0	0.9	34.9	57.4	0.1	0.0	0.0	0.0	
Willamette	M Willamette R	Willamette R, M Fk	1992	407,068	1,281,759	0.34	0.0	4.8	0.0	2.8	0.0	0.0	0.0	0.0	1.3	11.7	78.6	0.8	0.0	0.0	0.0	
Willamette	M Willamette R	Willamette R, M Fk	1993	49,710	1,187,412	0.49	0.0	2.4	0.0	5.6	0.0	0.0	0.0	0.5	0.0	12.1	78.8	0.8	0.0	0.0	0.0	
Average				406,653	1,271,147	0.44	0.0	5.3	0.0	3.0	0.0	0.2	0.0	0.1	0.8	28.6	61.5	0.4	0.0	0.0	0.0	
Lookingglass	Rapid R (Idaho)	Snake R-1	1992	79,382	84,051	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Coho</b>																						
Bonneville	Tanner Cr	Tanner Cr	1991	55,053	1,111,764	2.25	0.0	0.1	0.0	1.9	0.1	0.0	0.0	0.0	0.5	0.7	96.7	0.0	0.0	0.0	0.0	
Bonneville	Tanner Cr	Tanner Cr	1992	38,543	1,037,468	0.42	0.0	0.0	0.0	2.5	8.7	0.0	3.4	0.0	0.0	3.8	79.5	0.0	2.0	0.0	0.0	
Bonneville	Tanner Cr	Tanner Cr	1993	51,936	1,279,197	0.86	0.0	0.0	0.0	1.1	1.4	0.0	2.7	0.0	0.6	2.4	91.4	0.0	0.3	0.0	0.0	
Bonneville	Tanner Cr	Tanner Cr	1994	48,695	1,219,750	1.41	0.0	0.0	0.0	0.0	0.9	0.0	0.3	0.0	0.3	20.0	78.5	0.0	0.0	0.0	0.0	
Bonneville	Tanner Cr	Tanner Cr	1995	56,330	1,115,249	0.50	0.0	0.0	0.0	0.0	4.5	0.0	0.2	0.0	1.9	7.4	86.1	0.0	0.0	0.0	0.0	
Average				50,111	1,152,686	1.09	0.0	0.0	0.0	1.1	3.1	0.0	1.3	0.0	0.7	6.9	86.4	0.0	0.5	0.0	0.0	
Big Creek	Big Creek	Big Cr	1991	54,907	560,176	0.94	0.0	0.0	0.2	5.2	0.0	0.0	0.0	0.0	2.7	0.2	91.7	0.0	0.0	0.0	0.0	
Big Creek	Big Creek	Big Cr	1992	51,767	465,990	0.73	0.0	0.0	0.0	11.9	10.2	0.0	2.9	0.0	3.4	2.7	68.8	0.0	0.0	0.0	0.0	
Big Creek	Big Creek	Big Cr	1993	53,842	533,857	0.77	0.0	0.0	0.0	0.0	2.4	0.4	2.1	0.0	11.2	2.6	81.5	0.0	0.0	0.0	0.0	
Big Creek	Big Creek	Big Cr	1994	56,067	543,566	0.91	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	6.9	9.9	81.3	0.0	0.0	0.0	0.0	
Big Creek	Big Creek	Big Cr	1995	55,296	535,702	0.56	0.0	0.0	0.0	0.0	3.2	0.0	0.2	0.0	27.0	3.5	66.1	0.0	0.0	0.0	0.0	
Average				54,376	527,858	0.78	0.0	0.0	0.0	3.4	3.5	0.1	1.0	0.0	10.2	3.8	77.9	0.0	0.0	0.0	0.0	
Big Creek	Big Creek	Tualatin R	1991	26,885	60,052	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	83.3	16.7	0.0	0.0	0.0	0.0	
Big Creek	Big Creek	Tualatin R	1992	26,533	60,239	0.02	0.0	0.0	0.0	0.0	16.7	0.0	66.7	0.0	0.0	0.0	16.7	0.0	0.0	0.0	0.0	
Big Creek	Big Creek	Tualatin R	1993	26,303	59,250	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Big Creek	Big Creek	Tualatin R	1994	26,426	59,919	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	
Big Creek	Big Creek	Tualatin R	1995	25,222	60,000	0.02	0.0	0.0	0.0	0.0	20.0	0.0	40.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	
Average				26,274	59,892	0.03	0.0	0.0	0.0	0.0	7.3	0.0	21.3	0.0	4.0	40.7	6.7	0.0	0.0	0.0	0.0	

Appendix Table 1. Continued.

			Percent Recovery for All Areas																		
			Number				Freshwater														
Coho	Hatchery	Stock	Release Site	Brood	Tagged	Total Released	% Surv	Alaska		British Col		Washington		Oregon		Other				California	
								Spt	Com	Spt	Com	Spt	Com	Spt	Com	Gillnet	Catch	Hatchery	Other	Spt	Com
	Cascade	Tanner Cr	Umatilla R	1991	84,078	892,678	0.21	0.0	0.0	0.0	2.0	1.0	0.0	0.0	0.0	15.0	10.6	71.5	0.0	0.0	0.0
	Cascade	Tanner Cr	Umatilla R	1992	81,628	884,105	0.24	0.0	0.0	0.0	3.8	12.1	0.0	2.9	0.0	3.5	16.8	60.9	0.0	0.0	0.0
	Cascade	Tanner Cr	Umatilla R	1993	79,300	999,554	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	0.0	82.3	4.7	0.0	0.0
	Cascade	Tanner Cr	Umatilla R	1994	79,057	1,477,383	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	3.9	92.4	0.0	0.0	0.0
	Gnat Creek	Tanner Cr	Umatilla R	1995	81,160	1,365,363	0.40	0.0	1.4	0.0	0.0	7.0	0.5	3.7	0.0	4.5	18.7	64.2	0.0	0.0	0.0
				Average	81,045	1,123,817	0.19	0.0	0.3	0.0	1.2	4.0	0.1	1.3	0.0	7.9	10.0	74.3	0.9	0.0	0.0
	Cascade	Tanner Cr	Yakima R	1991	83,268	643,841	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.9	8.8	49.3	0.0	0.0	0.0
	Cascade	Tanner Cr	Yakima R	1992	78,354	710,574	0.13	0.0	0.0	0.0	2.6	38.1	2.1	12.3	0.0	14.3	20.3	10.3	0.0	0.0	0.0
	Cascade	Tanner Cr	Yakima R	1993	62,015	565,616	0.09	0.0	0.0	0.0	0.0	14.5	0.0	0.0	0.0	35.4	26.8	16.7	0.0	6.6	0.0
	Cascade	Tanner Cr	Yakima R	1994	79,406	580,379	0.08	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	20.6	73.4	4.6	0.0	0.0	0.0
	Rosa Accl. Pond	Clackamas R	Yakima R	1995	25,046	33,802	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				Average	65,618	506,842	0.07	0.0	0.0	0.0	0.5	10.8	0.4	2.5	0.0	22.4	25.9	16.2	0.0	1.3	0.0
	L W Salmon NFH	Claskanine R	L White Salmon (WA)	1995	26,754	948,592	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sandy	Sandy R	Klickitat R (WA)	1995	30,918	273,896	0.02	0.0	0.0	0.0	0.0	16.7	0.0	33.3	0.0	33.3	0.0	16.7	0.0	0.0	0.0
	Claskanine	Claskanine R	Claskanine R, N Fk	1991	25,977	848,853	0.32	0.0	6.0	0.0	3.6	0.0	1.2	0.0	0.0	67.5	0.0	21.7	0.0	0.0	0.0
	Claskanine	Claskanine R	Claskanine R, N Fk	1992	26,574	831,887	0.32	0.0	0.0	0.0	8.3	6.0	0.0	3.6	0.0	67.9	6.0	8.3	0.0	0.0	0.0
	Claskanine	Kalama R	Claskanine R, N Fk	1993	26,279	1,201,313	0.51	0.0	0.0	0.0	1.5	5.9	0.0	2.2	0.0	58.5	3.7	28.2	0.0	0.0	0.0
	Claskanine	Claskanine R	Claskanine R, N Fk	1994	24,974	837,355	0.52	0.0	0.0	0.0	0.0	2.3	0.0	2.3	0.0	63.1	7.7	23.9	0.8	0.0	0.0
				Average	25,951	929,852	0.42	0.0	1.5	0.0	3.4	3.5	0.3	2.0	0.0	64.2	4.3	20.5	0.2	0.0	0.0
	CEDC Fisheries	Clackamas R	Youngs R	1991	95,616	1,835,462	0.72	0.0	0.0	0.0	7.5	0.5	0.0	0.0	0.0	91.4	0.3	0.4	0.0	0.0	0.0
	CEDC Fisheries	Clackamas R	Youngs R	1992	48,790	1,046,376	0.58	0.0	0.0	0.0	0.0	18.3	0.0	5.5	0.2	72.7	2.5	0.7	0.0	0.0	0.0
	CEDC Fisheries	Clackamas R	Youngs R	1993	44,602	747,943	0.27	0.0	0.0	0.0	0.0	7.9	0.0	0.0	0.0	87.1	5.0	0.0	0.0	0.0	0.0
	CEDC Fisheries	Clackamas R	Youngs R	1994	48,378	557,526	1.44	0.0	0.0	0.0	0.0	0.2	0.1	0.3	0.0	82.2	16.5	0.7	0.0	0.0	0.0
				Average	59,347	1,046,827	0.75	0.0	0.0	0.0	1.9	6.7	0.0	1.4	0.1	83.4	6.1	0.5	0.0	0.0	0.0
	CEDC Fisheries	Sandy R	Youngs R	1994	26,418	295,512	0.19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	88.0	12.0	0.0	0.0	0.0	0.0
	CEDC Fisheries	Sandy R	Youngs R	1995	26,598	633,310	0.64	0.0	0.0	0.0	0.0	4.1	0.0	1.2	0.0	93.6	0.0	1.2	0.0	0.0	0.0
				Average	26,508	464,411	0.42	0.0	0.0	0.0	0.0	2.0	0.0	0.6	0.0	90.8	6.0	0.6	0.0	0.0	0.0
	CEDC Fisheries	Tanner Cr	Youngs R	1991	45,418	1,328,728	2.89	0.0	0.0	0.0	2.4	0.6	0.0	0.0	0.0	94.0	2.5	0.5	0.0	0.0	0.0
	CEDC Fisheries	Tanner Cr	Youngs R	1992	78,614	1,128,771	1.32	0.0	0.0	0.0	4.6	18.0	0.1	6.3	0.0	68.7	2.2	0.1	0.0	0.1	0.0
	CEDC Fisheries	Tanner Cr	Youngs R	1993	54,881	960,556	0.69	0.0	0.0	0.0	0.2	0.4	0.0	0.1	0.0	96.8	0.6	1.8	0.0	0.0	0.0
	CEDC Fisheries	Tanner Cr	Youngs R	1994	54,847	1,637,863	0.45	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	87.4	11.2	0.6	0.0	0.0	0.0
	CEDC Fisheries	Tanner Cr	Youngs R	1995	27,198	146,818	1.44	0.0	0.0	0.0	0.0	3.1	0.0	0.5	0.0	89.3	6.4	0.8	0.0	0.0	0.0
				Average	52,192	1,040,547	1.36	0.0	0.0	0.0	1.4	4.6	0.0	1.4	0.0	87.2	4.6	0.8	0.0	0.0	0.0

Appendix Table 1. Continued.

			Percent Recovery for All Areas																	
			Number				Freshwater													
<b>Coho</b>					Total	%	Alaska		British Col		Washington		Oregon						California	
Hatchery	Stock	Release Site	Brood	Tagged	Released	Surv	Spt	Com	Spt	Com	Spt	Com	Spt	Com	Gillnet	Other	Hatchery	Other	Spt	Com
CEDC Fisheries	Klaskanine R	Youngs R	1991	26,556	126,866	0.75	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	86.5	5.5	6.5	0.0	0.0	0.0
CEDC Fisheries	Klaskanine R	Klaskanine R, S Fk	1991	26,817	736,929	0.63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	87.7	0.0	12.4	0.0	0.0	0.0
CEDC Fisheries	Klaskanine R	Klaskanine R, S Fk	1992	25,978	538,994	0.62	0.0	0.0	0.0	0.0	16.2	0.0	3.7	0.6	68.9	1.9	8.1	0.6	0.0	0.0
CEDC Fisheries	Klaskanine R	Klaskanine R, S Fk	1993	23,160	433,674	0.97	0.0	0.0	0.0	0.0	3.6	0.0	2.2	0.0	63.0	5.4	25.9	0.0	0.0	0.0
CEDC Fisheries	Klaskanine R	Klaskanine R, S Fk	1994	25,979	443,183	0.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.2	10.8	33.1	0.0	0.0	0.0
CEDC Fisheries	Klaskanine R	Klaskanine R, S Fk	1995	28,284	621,932	1.73	0.0	0.0	0.0	0.0	2.3	0.0	0.8	0.0	82.2	0.6	14.1	0.0	0.0	0.0
Average				26,044	554,942	0.89	0.0	0.0	0.0	0.0	4.4	0.0	1.4	0.1	71.6	3.7	18.7	0.1	0.0	0.0
CEDC Fisheries	Tanner Cr	Blind Slough (Col. R)	1993	26,258	140,267	1.95	0.0	0.0	0.0	2.0	3.5	0.2	1.6	0.0	88.9	2.5	0.6	0.0	0.8	0.0
CEDC Fisheries	Clackamas R	Blind Slough (Col. R)	1994	24,942	209,761	1.30	0.0	0.0	0.0	0.0	1.5	0.0	0.6	0.0	76.2	20.7	0.9	0.0	0.0	0.0
CEDC Fisheries	Tanner Cr	Blind Slough (Col. R)	1995	25,104	196,963	0.07	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	88.9	11.1	0.0	0.0	0.0	0.0
Average				25,435	182,330	1.11	0.0	0.0	0.0	0.7	1.7	0.1	0.7	0.0	84.7	11.4	0.5	0.0	0.3	0.0
CEDC Fisheries	Tanner Cr	Tongue Pt (Col. R)	1993	26,426	130,623	3.08	0.0	0.0	0.0	1.6	4.7	0.0	1.6	0.0	82.6	7.9	1.7	0.0	0.0	0.0
CEDC Fisheries	Clackamas R	Tongue Pt (Col. R)	1994	23,942	190,032	0.90	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	57.4	36.1	4.2	0.0	0.0	0.0
CEDC Fisheries	Tanner Cr	Tongue Pt (Col. R)	1995	26,174	430,221	0.52	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	86.7	5.2	5.2	0.0	0.0	0.0
Average				25,514	250,292	1.50	0.0	0.0	0.0	0.5	3.3	0.0	0.5	0.0	75.6	16.4	3.7	0.0	0.0	0.0
Sandy	Sandy R	Cedar Cr (Sandy R)	1991	217,454	1,022,951	0.90	0.0	0.0	0.0	7.6	0.0	0.0	0.0	0.0	0.1	1.8	90.1	0.2	0.2	0.0
Sandy	Sandy R	Cedar Cr (Sandy R)	1992	188,044	917,334	0.45	0.0	0.0	0.9	11.1	15.3	1.2	2.5	0.0	1.5	4.9	62.7	0.0	0.0	0.0
Sandy	Sandy R	Cedar Cr (Sandy R)	1993	106,492	112,610	0.33	0.0	0.0	0.0	0.7	9.2	0.0	0.0	0.0	0.3	6.0	83.8	0.0	0.0	0.0
Sandy	Sandy R	Cedar Cr (Sandy R)	1994	220,654	668,951	0.32	0.0	0.0	0.0	0.0	1.6	0.0	1.4	0.0	0.6	16.0	79.8	0.0	0.7	0.0
Sandy	Sandy R	Cedar Cr (Sandy R)	1995	130,377	670,670	0.68	0.0	0.0	0.0	0.0	1.9	0.0	2.3	0.0	3.2	4.6	88.0	0.0	0.0	0.0
Average				172,604	678,503	0.54	0.0	0.0	0.2	3.9	5.6	0.2	1.2	0.0	1.1	6.6	80.9	0.0	0.2	0.0
Trojan Pond	Sandy R	Columbia R	1991	27,809	263,571	0.21	0.0	0.0	0.0	27.1	3.4	0.0	0.0	0.0	27.1	17.0	25.4	0.0	0.0	0.0
Wahkeena Pond	Tanner Cr	Wahkeena Pond	1991	24,445	1,499,778	0.36	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	67.2	0.0	29.8	0.0	0.0	0.0
Wahkeena Pond	Sandy R	Wahkeena Pond	1992	23,472	1,503,732	0.03	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0
Average				23,959	1,501,755	0.20	0.0	0.0	0.0	1.5	25.0	0.0	0.0	0.0	33.6	0.0	39.9	0.0	0.0	0.0
<b>Summer Steelhead</b>																				
Irrigon	Imnaha R	Ltl Sheep Cr (Imnaha)	1990	94,390	243,008	1.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.7	18.6	57.8	0.0	0.0	0.0
Irrigon	Imnaha R	Ltl Sheep Cr (Imnaha)	1991	105,670	248,787	0.01	0.0	0.0	0.0	8.8	0.0	0.0	0.0	0.0	43.9	17.6	29.8	0.0	0.0	0.0
Irrigon	Imnaha R	Ltl Sheep Cr (Imnaha)	1992	95,126	286,716	0.23	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	16.8	20.2	62.8	0.0	0.0	0.0
Irrigon	Imnaha R	Ltl Sheep Cr (Imnaha)	1993	95,621	300,775	0.20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3	36.2	56.6	0.0	0.0	0.0
Irrigon	Imnaha R	Ltl Sheep Cr (Imnaha)	1994	108,595	287,836	0.42	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.2	5.7	80.1	0.0	0.0	0.0
Average				99,880	273,424	0.38	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	21.2	19.6	57.4	0.0	0.0	0.0

Appendix Table 1. Continued.

			Percent Recovery for All Areas																	
			Number				Freshwater													
<b>Summer Steelhead</b>					Total	%	Alaska		British Col		Washington		Oregon						California	
Hatchery	Stock	Release Site	Brood	Tagged	Released	Surv	Spt	Com	Spt	Com	Spt	Com	Spt	Com	Gillnet	Other Catch	Hatchery	Other	Spt	Com
Irrigon	Wallowa R	Spring Cr (Wallowa R)	1990	111,439	236,513	1.08	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	42.1	31.0	26.6	0.0	0.0	0.0
Irrigon	Wallowa R	Spring Cr (Wallowa R)	1991	50,507	496,805	0.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.0	28.7	28.3	0.0	0.0	0.0
Irrigon	Wallowa R	Spring Cr (Wallowa R)	1992	51,501	495,164	0.26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.3	44.1	31.6	0.0	0.0	0.0
Irrigon	Wallowa R	Spring Cr (Wallowa R)	1993	54,881	494,342	0.70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.6	31.0	49.4	0.0	0.0	0.0
Irrigon	Wallowa R	Spring Cr (Wallowa R)	1994	53,273	495,137	0.36	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.3	10.7	64.0	0.0	0.0	0.0
			Average	64,320	443,592	0.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.8	29.1	40.0	0.0	0.0	0.0
Irrigon	Wallowa R	Big Canyon Cr	1990	104,990	274,274	0.94	0.0	0.0	0.0	0.3	0.0	0.0	0.1	0.0	39.1	40.0	20.5	0.0	0.0	0.0
Irrigon	Wallowa R	Big Canyon Cr	1991	104,867	298,732	0.10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.9	31.9	25.3	0.0	0.0	0.0
Irrigon	Wallowa R	Big Canyon Cr	1992	99,210	275,525	0.35	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	20.9	47.3	31.2	0.0	0.0	0.0
Irrigon	Wallowa R	Big Canyon Cr	1993	99,086	155,754	0.69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.5	41.3	45.3	0.0	0.0	0.0
Irrigon	Wallowa R	Big Canyon Cr	1994	104,795	278,778	0.47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.9	24.1	61.9	0.0	0.0	0.0
			Average	102,590	256,613	0.51	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	26.1	36.9	36.8	0.0	0.0	0.0
Oak Springs	Umatilla R	Meacham Cr	1990	57,825	59,547	0.80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.3	12.0	67.0	0.6	0.0	0.0
Umatilla	Umatilla R	Umatilla R	1991	91,486	199,404	0.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.3	1.7	60.3	2.8	0.0	0.0
Umatilla	Umatilla R	Umatilla R	1992	92,952	158,268	0.39	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	3.8	5.2	86.5	4.2	0.0	0.0
Umatilla	Umatilla R	Umatilla R	1993	57,034	153,098	0.38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.9	36.3	55.8	0.0	0.0	0.0
Umatilla	Umatilla R	Umatilla R	1994	57,884	146,463	0.91	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	6.7	86.2	1.1	0.0	0.0
			Average	74,839	164,308	0.44	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	13.3	12.5	72.2	2.0	0.0	0.0
<b>Winter Steelhead</b>																				
Oak Springs	Hood R	Hood R, E Fk	1993	25,217	26,018	0.36	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4	83.2	6.4	0.0	0.0	0.0
Oak Springs	Hood R	Hood R, E Fk	1994	39,072	42,898	0.38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6	59.1	33.2	0.0	0.0	0.0
			Average	32,145	34,458	0.37	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	71.2	19.8	0.0	0.0	0.0
<b>Wild Steelhead</b>																				
Wild	Hood R	Hood R	1993	197	197	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wild	Hood R	Hood R, W Fk	1993	96	96	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wild	Hood R	Hood R, Mid Fk	1993	40	40	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wild	Hood R	Hood R, E Fk	1993	157	157	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX B

Annual Report

Project Title:

Evaluate the Technical and Biological Feasibility of Using Visual Implant  
Elastomer (VIE) Tags to Mark Large Numbers of Juvenile Coho Salmon  
(Oncorhynchus kisutch)

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### ABSTRACT

In an effort to evaluate the Visual Implant Elastomer (VIE) tag as a tool to mass mark juvenile salmonids, we marked groups of juvenile coho at Sandy Fish Hatchery in July, for release the following May. We have now marked fish for two (1998 and 1999) of three years. Fish received a red VIE tag to the lower right jaw above the sinus cavity which leads up to the operculum. Groups were Coded Wire Tagged (CWTed) and VIE tag retention checked in December of each year. If the VIE tag was not easily detected with the naked eye the fish were re-tagged with a green VIE tag to the lower left jaw. Tagging rate and pre-release tag retention improved from the first to second years of tagging. For fish tagged in 1999 pre-release VIE tag retention was 99.4%. The first adult hatchery returns of VIE tagged coho for this study will be in 2000. Of 17 jacks recovered at Sandy hatchery in 1999 12, or 70.6%, had retained there VIE tag.

### ACKNOWLEDGMENTS

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### INTRODUCTION

Based on concerns related to the ODFW Wild Fish Management Policy, there is a need to distinguish hatchery reared from naturally produced coho salmon. There may be an additional need to differentiate between stocks in a mixed stock fishery or with mixed stocks returning to hatchery racks. Presently, several fin marks are used to accomplish this task. Some fin clips are undesirable, either for their contribution to lower survival rates or for the difficulty in long term recognition by anglers, etc. The adipose fin clip has been used as an external indicator for the recovery of CWTs (PSC 1995). This study attempts to address the need for alternative external and visible marks. Our objective is to identify a mark that is easy to apply, does not harm the fish, and is recognizable in returning adults.

### METHODS AND MATERIALS

In July of 1998 and 1999, we set up a standard marking trailer with 6 to 7 work stations. Work stations were set up with hand held VIE injectors powered by compressed air. Each station had an injector, power supply, hand piece, and associated air hoses. The mixing packages for the fluorescent dye contained 6CC of colored (red) Elastomer, a jar of curing agent, a 10CC syringe, and a stir stick. After mixing the Elastomer with the curing agent,

the material was loaded into several 0.5CC injecting syringes. The system is designed to achieve a mark similar in volume to NMT's coded wire tags, about 0.05 microliter (NMT 1998). The injecting syringes that are not being used immediately were kept on ice to prevent premature curing of the Elastomer material.

The red VIE tag was injected to the lower right jaw, just above the sinus cavity which leads up to the operculum. During this initial VIE tagging session, if an injected VIE tag was not administered well enough to be easily visible, the fish was tagged a second time, in the same location as the first tag.

As the Elastomer began to cure and started to set in the injection syringes, the needles were replaced. The Elastomer syringes were replaced every 30 to 60 minutes. The time period from mixing the Elastomer material with the curing agent until the point of set up is temperature dependent. If put on ice it will stay workable for up to 24 hours. At room temperature it will begin to set up in 30 to 60 minutes.

In November or December, about four months after VIE tagging in July, the fish were coded wire tagged. At the same time fish were examined for the presence or absence of the VIE tag. If the red VIE tag was not visible with the naked eye, the fish were re-tagged with a green VIE tag to the lower left jaw.

Some of the fish receiving the secondary green VIE tag were exposed to ultra violet (UV) light at which time remnant red VIE tags were detected. Therefore, the total number of applied green VIE tags does not reflect red VIE tag loss accurately.

In order to minimize green VIE tag loss we replaced the Elastomer syringes in the injectors more frequently than was done during the red VIE tagging.

## RESULTS

In July, 1999 a total of 78,181 fish were red VIE tagged at approximately 7.5 gm (60 fish per pound) or an average of 8.8 cm in fork length. Pond side tag quality checks were performed noting zero "no tags" and about 4 percent partial tags.

In November and December of 1999 a total of 74,771 fish were marked with an adipose fin clip and CWT (code 09-27/47) and VIE jaw tag. Of these, 62,475 fish, or 83.6%, had red right jaw tags and the remaining 12,296 fish, or 16.4%, were marked with green left jaw tags. Size at tagging was approximately 30 gm (15 fish per pound) or an average of 13.9 cm in fork length for the green VIE tags.

A pre-release tag retention check was conducted on February 3, 2000, six months after the July red right jaw tagging and two months after the Nov./Dec. green left jaw tagging. A total of 500 fish were sampled for the presence of a CWT and an easily observed red or green VIE tag. All 500 fish were observed to have a CWT. Of the 500 fish sampled 419 or 83.8% had a red VIE tag, 78 or 15.6% had a green VIE tag and 3 or 0.6% had no visible VIE tag. The three fish with no VIE tag were sampled a second time, using a UV light and UV glasses, and all three fish still had no indication of a VIE tag. Thus, VIE tag retention was 99.4% for the combined groups (red and green VIE tags).

In May, 1999 the coho tagged in 1998 were released (Table 1). The fish tagged in 1999 will be released in May, 2000.

Table 1. Release information for coho salmon released at Sandy Hatchery for the VIE evaluation.

Bood Year	Tagcode	Release Date	Total Release	Red VIE (R. Jaw)		Green VIE (L. Jaw)	
				Number	Percent	Number	Percent
1997	07-13/16	05/14/99	64,077	49,951	78.0%	14,126	22.0%
1998	09-27/47						

The marking crew consisted of six people, three of whom had previous experience. By the end of the July tagging period we marked approximately 2,500 fish per person per day, ranging from a low of 227 fish per person per hour to a high of 450 fish per person per hour. The previous year, the crew size varied from 5 to 7 employees. Each crew member tagged 300-500 fish per hour. Approximately 17,000 fish were tagged per day.

Results to date indicate that as the fish increase in size, better VIE tag retention is achieved (Table 2). Experience suggests that one should avoid marking fish smaller 8 cm in fork length.

Table 2. Tag retention rates for coho salmon tagged with VIE tags at different sizes during 1998 and 1999.

Date	07/98	11/98	07/99	11/99
Avg. Fk length	9.3 cm	12.6 cm	8.8 cm	13.9 cm
VIE Tag Loss	22.0%	2.3%	16.4%	0.6%

#### CONCLUSION AND DISCUSSION

The VIE tagging crew increased their efficiency from 1998 to 1999. In 1998 66,170 fish were VIE red tagged in 266 hours, resulting in 249 fish tagged per hour per tagger. In comparison in 1999, 78,181 fish were red VIE tagged in 264 hours resulting in 296 fish tagged per hour per tagger. This shows an increase of 47 fish per hour or 18.9%.

From November 1 through December 10, 1999, precocial male coho salmon (jacks), returning to Sandy hatchery were sampled for the presence or absence of VIE tags administered in 1998. Of the 17 fish recovered with CWT code 09-13/16, 12 were observed with VIE tags (70.6%).

Sampling and analysis of adult and jack returns will continue in future years in order to adequately evaluate this method of fish identification.

#### REFERENCES

Pacific Salmon Commission (PSC). 1995. Ad-Hoc Selective Fishery Evaluation Committee. Selective Fishery Evaluation.

Northwest Marine Technology (NMT). 1998. Northwest Marine Technology Instruction Manual for Elastomer Tag Air Driven Injector System.