

# PROGRESS REPORTS

2003



## FISH DIVISION

Oregon Department of Fish and Wildlife

Nestucca River Native Broodstock Monitoring – Juveniles

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**NESTUCCA RIVER NATIVE WINTER STEELHEAD BROODSTOCK MONITORING –  
JUVENILES**

**2003 Annual Progress Report**

**December 2003**

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**Citation:** Jepsen, DB. 2003. Nestucca River Native Winter Steelhead Broodstock Monitoring – Juveniles. 2003 Annual Progress Report, Oregon Department of Fish and Wildlife

The Nestucca River Native Steelhead Broodstock Monitoring Project was financed in part by the Sports Fish Restoration Program administered by the U. S. Fish and Wildlife Service, Grant Number F-181-D.

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## **Abstract**

As part of a broodstock removal evaluation program for Nestucca River winter steelhead, a spatially balanced stratified random probability design was used to select sites for summer snorkel surveys of juvenile salmonids. Fish counts from pools during the summer of 2003 provided estimates of rearing abundance and distribution for juvenile steelhead and coho rearing in pools in 2003. A total of 30 sites were visited but 8 sites were not sampleable, therefore data from 22 sites were used in analyses of snorkeling data. Juvenile steelhead  $\geq 90$  mm and coho salmon were observed at over 85% of the sites, with cutthroat  $\geq 90$  mm occupying 100 of sites. Averaged across sites, coho were observed in over 70% of pools, and cutthroat and steelhead were present in over 50% of pools. The average number of fish/meter of stream sampled was 1.02, 0.08, and 0.04 for coho, steelhead, and cutthroat, respectively. In comparisons between three years of snorkel survey data (2001-2003) the percentage of sites that contained at least one fish were similar for each of the three species. Steelhead densities in 2002 were less than in 2001 ( $p = 0.004$ ), but were the same between 2001 and 2003 ( $p = 0.284$ ) and between 2002 and 2003 ( $p = 0.0819$ ).

## **Introduction**

In the spring of 2001, the Oregon Department of Fish and Wildlife (ODFW) adopted a proposal to collect approximately 70 wild winter steelhead females from the Nestucca River Basin for hatchery broodstock. A description of the project and its' rationale relative to adult fish are described in Sucac (2003). As part of an effort to monitor the impact of this broodstock collection on the wild winter steelhead population in the Nestucca, ODFW's Western Oregon Rearing Project was given the task of monitoring trends in the abundance and distribution of juvenile steelhead in the basin. This report presents the results of the sampling conducted during the summer of 2003.

## **Methods**

### **Study Design**

We had a target of surveying juvenile steelhead rearing habitat at 30-35, one-kilometer stream reaches in the Nestucca River Basin. Sites were randomly selected using a stream reach database maintained by ODFW's Coastal Salmonid Inventory Project. A description of the theory and general approach to the survey design is described in Stevens (2002). On the Little Nestucca River, candidate stream reaches included all areas accessible to steelhead above tidewater. On the main Nestucca River, candidate stream reaches included all areas accessible to steelhead above the confluence of the Nestucca River and Beaver Creek. In total, 373 km of stream channel fell within the snorkeling sample universe.

Once completed, the site selection process provided the geographic coordinates (i.e. latitude and longitude) of each of the candidate sites. We then produced topographic maps showing the location of each sample point. Field crews used a handheld geographic positioning system (GPS) to find the start and end of each survey reach.

## **Survey Methodology**

Surveys began on August 2, 2003 and concluded on September 30, 2003. To conduct the surveys, a two-to-four person snorkel crew counted the number of 1+ juvenile steelhead, 1+ cutthroat trout, and all coho salmon in each of the sample reaches. 0+ juvenile cutthroat and steelhead (< 90 mm fork length) were not counted. Age 1+ trout that could not be identified to species were counted as unknown trout. To reduce problems associated with snorkeling in shallow or fast water habitat, only pools  $\geq 6 \text{ m}^2$  in surface area and  $\geq 40 \text{ cm}$  deep were snorkeled. In smaller streams, crewmembers either alternated the pools that they snorkeled or one crewmember snorkeled the entire reach. In larger streams where one snorkeler could not effectively enumerate fish, surveys were conducted with snorkelers swimming side-by-side.

In most cases snorkel methodology involved a single upstream pass through each pool, but at some larger mainstem sites, counts were made while swimming downstream. Counts of the number of juvenile coho, cutthroat, steelhead, unknown trout, chinook, blackside dace, and redbside shiner were recorded for each pool. After snorkeling, we ranked the underwater visibility of each pool during the snorkel count on a scale of 0 to 3 where: 0 = not snorkelable due to extremely high amount of hiding cover or zero water visibility; 1 = high amount of hiding cover or poor water clarity; 2 = moderate amount of hiding cover or moderate water clarity neither of which were thought to impede accurate fish counts; and 3 = little hiding cover and good water clarity. We measured the maximum pool depth and estimated the length and average width of all snorkeled pools. More information on snorkel methodology and general survey design can be found in Rodgers (2002).

To provide some quality control of the snorkel data, and to provide information on temporal changes in abundance during the course of the sampling season, supervisory staff had a goal of resurveying a random sample of 10 to 20 percent of the sites surveyed.

## **Data Analysis**

Only pools with a visibility rank of two or three were used in data analysis. The percentage of snorkel sites and the percentage of pools at each site with at least one fish were calculated for juvenile coho,  $\geq 90 \text{ mm}$  steelhead, and  $\geq 90 \text{ mm}$  cutthroat. For each snorkel site, the number of fish/ $\text{m}^2$  of pool habitat was



calculated for each of the three species/size classes by averaging the density estimates for each pool at that site. A basin-wide density for each of the three species/size classes was obtained by averaging the individual site densities. The 95% confidence interval around each species/size class frequency of occurrence and density estimate was determined using the statistical analysis outlined by Stevens (2002). This analysis also provided sample variances from which Z-values (Snedecor and Cochran 1980) were obtained to compare means. A Mann-Whitney rank sum test (Snedecor and Cochran 1980) was used to compare medians.

## Results

We visited a total of 30 sites during the summer of 2003 (Figure 1). We were denied access at one site and found that two sites were above barriers to anadromous fish passage. At six sites the water clarity was poor (visibility code=1), therefore these sites were not included in analyses. As a result, we analyzed snorkel data from a total of 22 sites in the Nestucca River Basin during the summer of 2003.

Table 1 shows the summary statistics for the percentage of sites that contained at least one fish, the mean percentage of pools per site that contained at least one fish, and the density of fish observed in the Nestucca River Basin during the summer of 2003. Juvenile steelhead  $\geq 90$  mm and coho salmon were observed at over 85% of the sites, with cutthroat  $\geq 90$  mm occupying 100 of sites. On average, coho were observed in over 70% of pools, and cutthroat and steelhead were present in over 50% of pools. Coho had higher average pool densities (fish/ m<sup>2</sup>) than steelhead and cutthroat (Table 1). A total of 22,527 coho, 1,843 steelhead, and 855 cutthroat were observed in 574 snorkeled pools (Appendix A). The average number of fish/meter of stream sampled was 1.02, 0.08, and 0.04 for coho, steelhead, and cutthroat, respectively. Multiplying these numbers by the total length of stream in our sampling universe resulted in estimates of 367,932 juvenile coho, 30,102 steelhead  $\geq 90$  mm, and 13,965 cutthroat  $\geq 90$  mm.

Table 1. Summary statistics for juvenile salmonid snorkel surveys conducted in the Nestucca River Basin in the summer of 2003.

Species	Coho	$\geq 90$ mm Steelhead	$\geq 90$ mm Cutthroat
Sample size	22	22	22
Mean Fish/m <sup>2</sup> (95% confidence interval)	0.48(0.158)	0.06(0.017)	0.05(0.024)
Median density	0.35	0.06	0.03
Number of sites with at least one fish	19	18	21
Percentage of sites with at least one fish	86	86	100
Mean percentage of pools per site with at least one fish (95% confidence interval)	71(14)	62(11)	59(8)
Median percentage of pools per site containing at least one fish	95	71	60

## Annual Trends

There are still too few years of data to compare trends within brood cycles, however, annual comparisons are available. In comparisons between three years of snorkel survey data (2001-2003) the percentage of sites that contained at least one fish were similar for each of the three species (Figure 5). There were also no detectable annual differences in the mean and median percentage of pools per site that contained at least one fish (Figure 6) for any of the three species (z-test mean:  $p > 0.131$  in all cases; Kruskal-Wallis median:  $p > 0.432$  in all cases).

The mean density of juvenile coho was not significantly different between the three years of surveys ( $p > 0.08$  in all comparisons, Figure 7). Cutthroat densities were also similar between years ( $p > 0.18$  in all comparisons). Steelhead densities in 2002 were less than in 2001 ( $p = 0.004$ ), but were the same between 2001 and 2003 ( $p = 0.284$ ) and between 2002 and 2003 ( $p = 0.0819$ ). Median densities were not significantly different for any species in between the three years ( $p > 0.289$  in all cases).

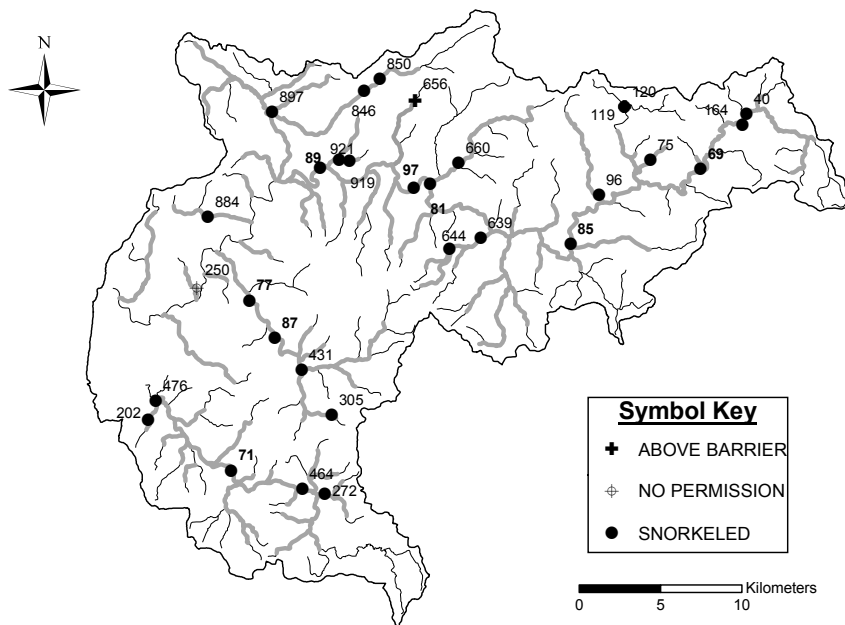


Figure 1. Location of sample stream reaches snorkeled for juvenile steelhead abundance in the Nestucca River Basin, 2003. Numbers next to site numbers are for reference to Appendix A. Gray highlighted stream areas depict candidate stream segments.

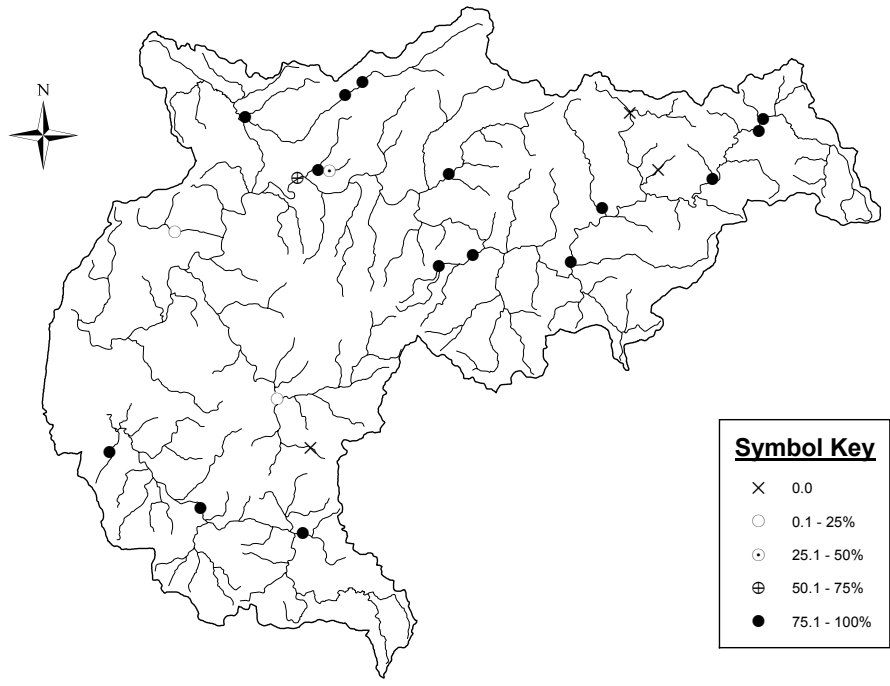
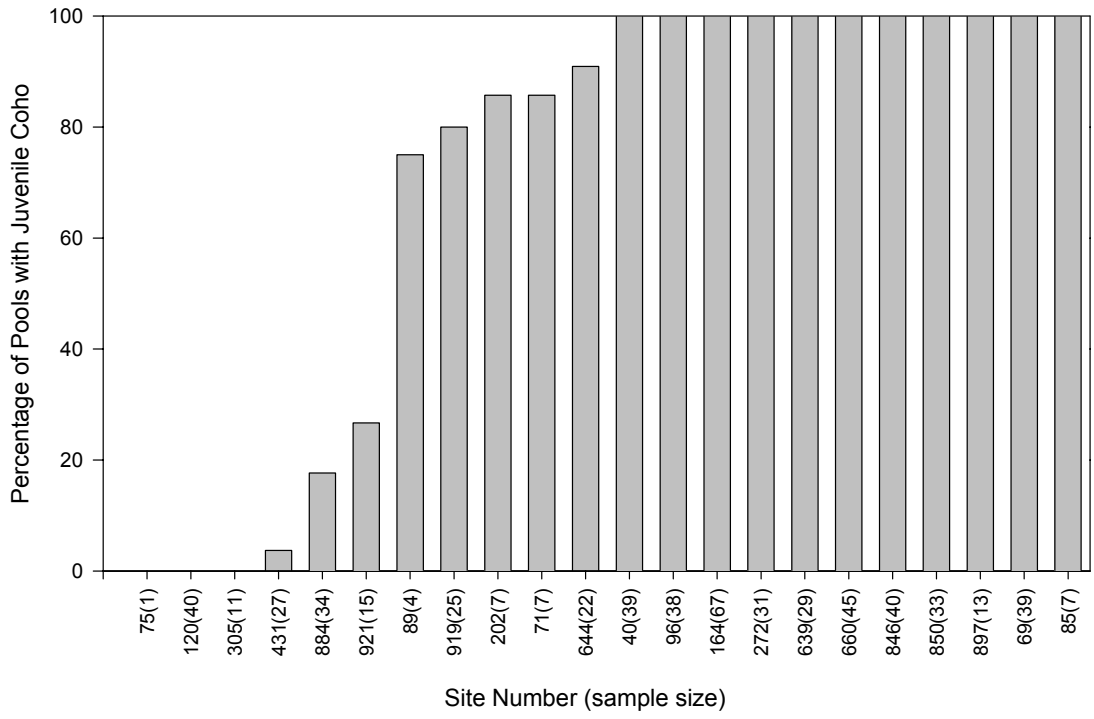


Figure 2. Percentage of pools at each site snorkeled in the Nestucca River that contained at least one coho in summer 2003.

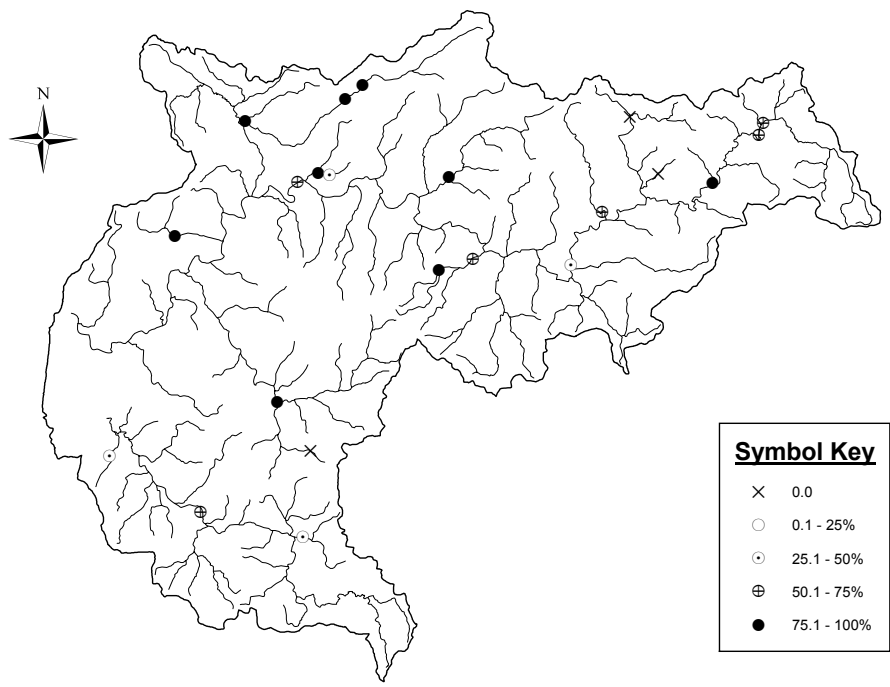
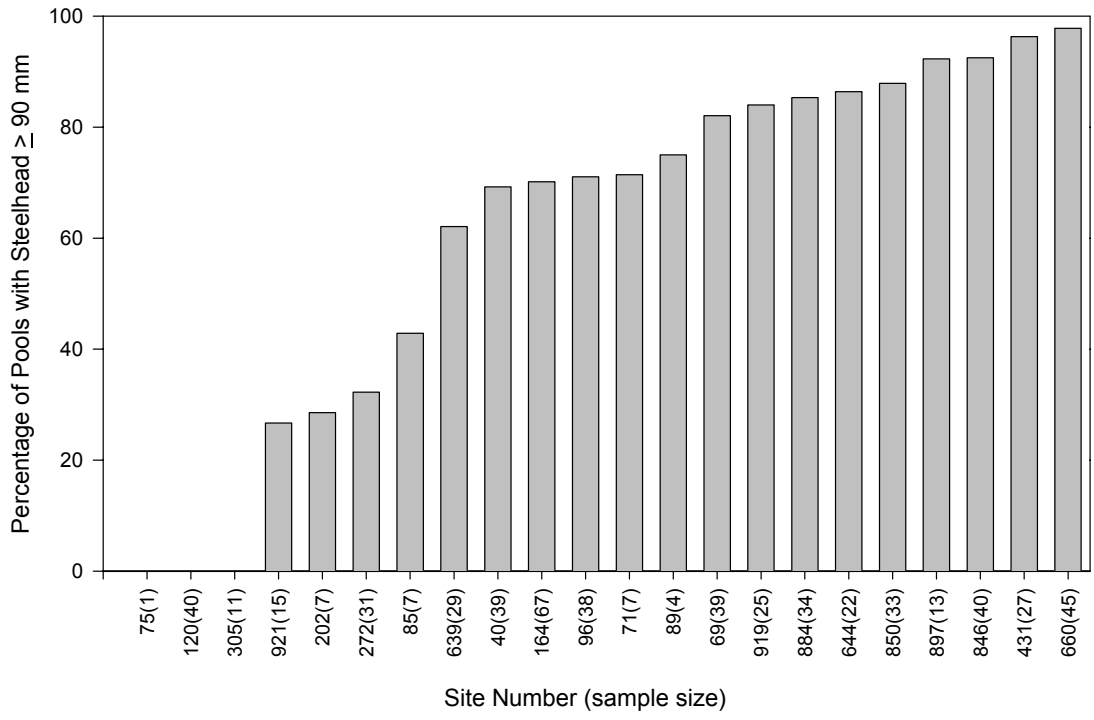


Figure 3. Percent pool occupancy of > 90 mm juvenile steelhead at each site snorkeled in the Nestucca River, summer 2004.

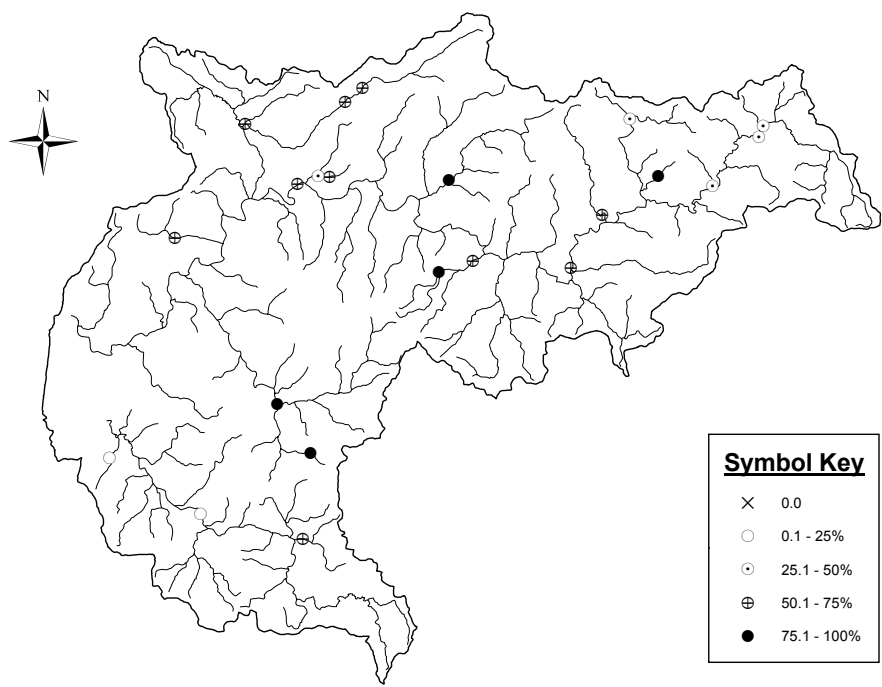
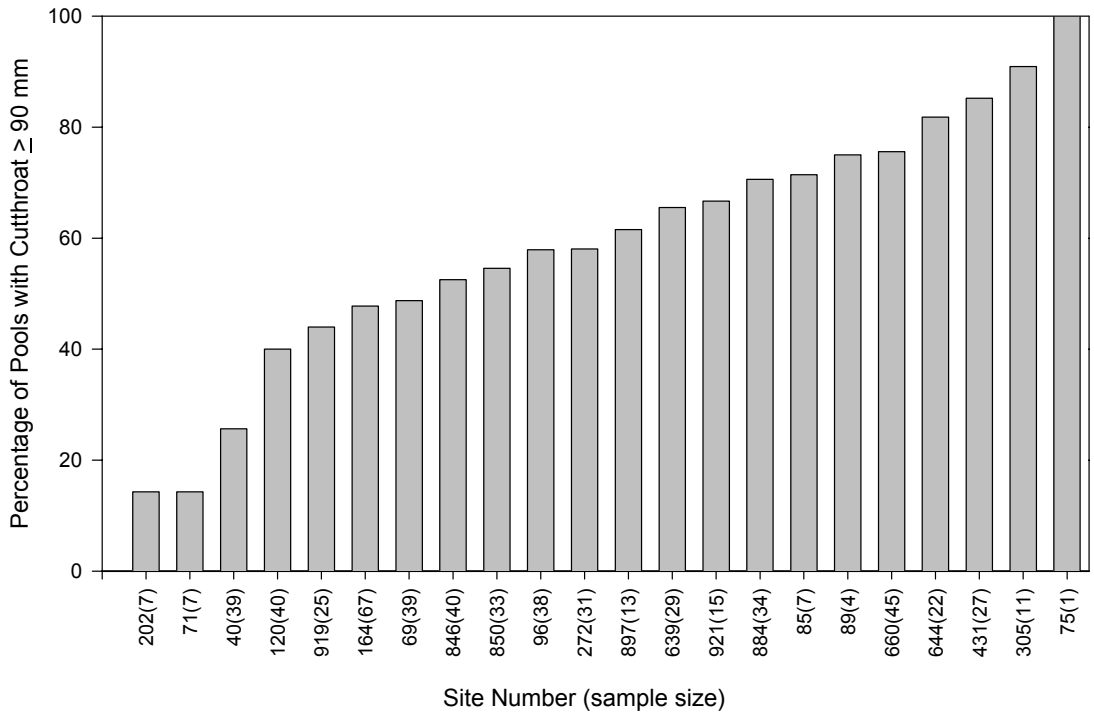


Figure 4. Percent pool occupancy of > 90 mm juvenile cutthroat at each site snorkeled in the Nestucca River, summer 2003.



Figure 5. Percentage of Nestucca River Basin sites that contained at least one juvenile coho, cutthroat, or steelhead in the summers of 2001-2003.

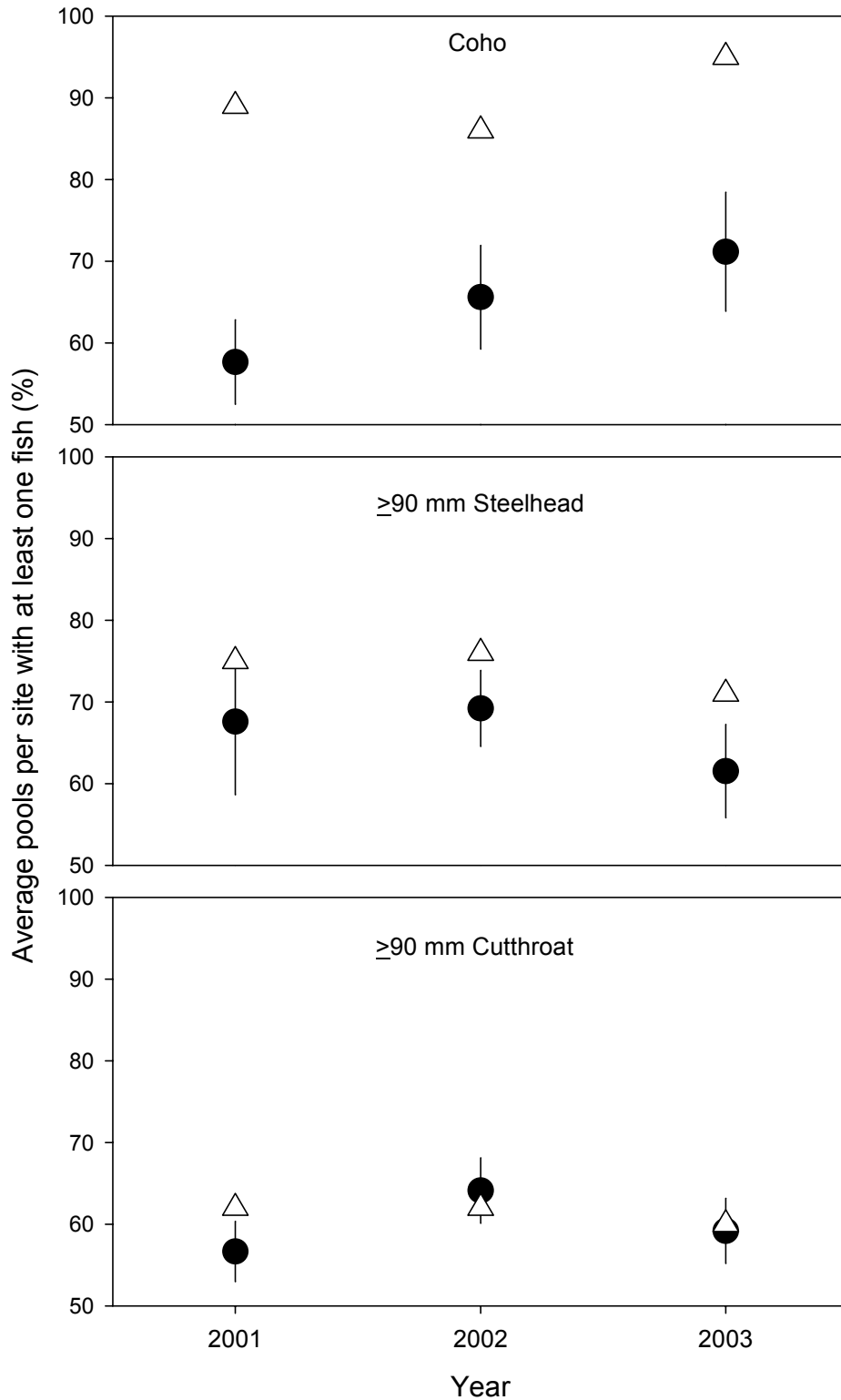


Figure 6. Mean (and standard errors) and medians (triangles) of the percentage of pools per site sampled in the Nestucca River Basin that contained juvenile coho, steelhead, or cutthroat in the summers of 2001-2003.

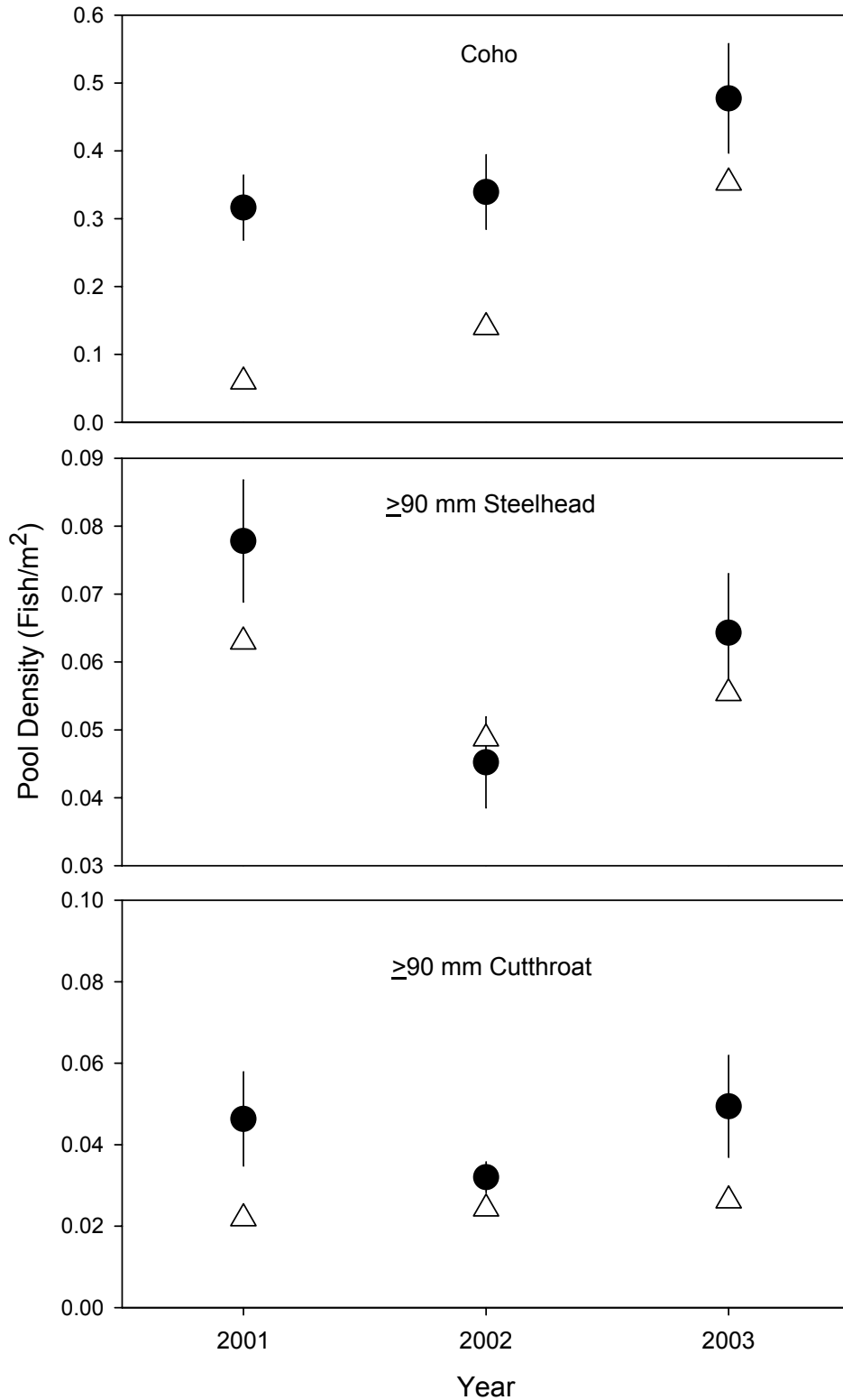


Figure 7. Mean (and standard errors) and median (triangles) density of juvenile coho, steelhead and cutthroat at sites sampled in the Nestucca River Basin in the summers of 2001-2003.



## References

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- Susac, G. 2005. Nestucca River Native Winter Steelhead Broodstock Monitoring – Adults. Alternate title: Assessment of the status of Nestucca River Adult Winter Steelhead. 2005 Annual Progress Report, Oregon Department of Fish and Wildlife, Salem

## Appendix

Appendix A. Summary data for sites snorkeled in the Nestucca River Basin during August and September 2003. Site numbers in bold are 4<sup>th</sup>-5<sup>th</sup> order streams.

Site Number	Survey Length (m)	Number of Pools	Pool Surface Area (m <sup>2</sup> )	Number of Fish Observed in Pools		
				Coho	Cutthroat	Steelhead
40	1,000	39	2,026	936	13	49
75	715	1	6	0	1	0
96	1,034	38	2,596	2,762	36	86
120	1,000	40	1,196	0	50	0
164	1,449	67	5,616	4,531	55	107
202	1,005	7	91	68	2	7
272	1,007	31	2,201	653	49	15
305	1,000	11	151	0	39	0
431	1,080	27	3,252	1	82	365
639	1,012	29	2,175	1,387	81	44
644	1,016	22	796	456	49	95
660	1,001	45	3,065	1,277	92	266
846	1,032	40	2,555	1,946	62	276
850	1,000	33	2,100	2,119	40	157
884	1,006	34	1,108	16	60	116
897	532	13	448	131	14	32
919	1,005	25	668	167	25	50
921	1,001	15	184	4	24	6
<b>69</b>	1,000	39	4,956	2,883	34	110
<b>71</b>	1,000	7	1,108	253	2	25
<b>85</b>	1,083	7	13,666	2,789	17	12
<b>89</b>	1,195	4	19,416	148	28	25





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