Abundance Monitoring of Juvenile Salmonids in Oregon Coastal Streams

Oregon Plan for Salmon and Watersheds

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Jeffrey D. Rodgers

Western Oregon Rearing Project
Oregon Department of Fish and Wildlife
28655 Highway 34
Corvallis, OR 97333

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Executive Summary

This report summarizes the results of two studies currently being conducted by the Western Oregon Rearing Project. The first study (chapter 1) involves the coast wide sampling of the abundance of juvenile coho in coastal streams. In this study, as in previous years, the Mid-South Coast had a higher mean density and frequency of occurrence of juvenile coho than any of the other areas sampled. Compared to data collected in 1999, juvenile coho abundances observed in the summer of 2000 were significantly higher in the North and Mid-Coast. Analysis of the relationship between the number of juveniles produced by spawning adults suggests that there was a two-fold increase in the egg to parr survival of the 1999 brood compared to the 1998 brood. This increase in survival appeared to be coast wide.

Chapter 2 describes the results from the first year of a study conducted in Smith River designed to provide information on the utility of using electrofishing estimates for juvenile steelhead in tributary streams as a way of monitoring trends in the status of steelhead in the basin. In the summer of 2000, expansion of electrofishing estimates yielded a population estimate of 9,064 (95% CI $\pm$ 4661) 1+ juvenile steelhead in the tributary streams in the Smith River basin.

Chapter 1: Abundance of Juvenile Coho Salmon in Oregon Coastal Streams in the Summer of 2000.

Introduction

In the summer of 1998, as part of the Oregon Plan for Salmon and Watersheds, the Oregon Department of Fish and Wildlife (ODFW) began a project to monitor juvenile coho in Oregon's coastal streams. Specifically, this project is designed to monitor trends in abundance of juvenile coho salmon rearing in each of the five coastal coho Gene Conservation Areas (GCA) (Figure 1). This report summarizes the results obtained from data collected during the summer of 2000 and compares it to data collected in 1998 and 1999.

Methods

Study Design and Sampling Methodology

A detailed description of the study design and sampling methods can be found in Rodgers (2000). The only change in sampling methods in the summer of 2000 was the addition of electrofishing at certain sites in the North Coast, Mid-Coast, Mid-South Coast, and Umpqua GCAs. Electrofishing was not conducted at any sites in the South Coast GCA due to the lack of a Section 10 permit from the National Marine Fisheries Service (NMFS). The purpose of the electrofishing was to provide information on the percentage of pools containing juvenile coho at sites where no pools could be snorkeled due to poor water visibility. Electrofishing was conducted using Smith-Root model 12-B backpack electrofishers following NMFS electrofishing guidelines (NMFS 2000). Electrofishing was conducted by making a single pass upstream in each pool that met the size and depth criteria for conducting snorkel surveys. If a juvenile coho was captured during electrofishing, the pass was terminated and coho were recorded as being present in the pool. No block nets were used for this sampling.

Data Analysis

Two basic metrics were used to analyze the juvenile coho data: 1) the percentage of pools at a site that contained at least one juvenile coho; and 2) the average density (fish/m^2) of juvenile coho at each site. Because these data were not normally distributed, and no transformation could be found to normalize the data, standard methods of calculating sample variance that rely on data normality could not be used to calculate confidence intervals or to test for differences among GCAs and/or years. However, statisticians contracted by the U.S. Environmental Protection Agency have recently developed a new geospatially referenced method of calculating sample variance that does not rely on normalized data. This new method (Stevens, 2001, Dynamic Corporation, draft) was used to calculate sample means and variances from which Z-values (Snedecor and Cochran 1980) were obtained to compare means.

Results

Site Visitation

The locations of year 2000 candidate sample sites in each GCA are shown in figures 2-6. In 2000, the most sites were sampled in the Mid-Coast, and the fewest in the Mid-South Coast (Table 1). Site access denial was highest the Mid-South Coast and South Coast. A potential spatial bias may be developing in these two GCAs since most of the landowner denials came from distinct subbasins. In the Mid-South Coast, access denials were most frequent for sites in the South Fork Coquille (Figure 4). In the South Coast, access denials were most frequent for sites in the Illinois River (Figure 6). Additional outreach activities explaining the importance of the juvenile survey data, and how it is used will be implemented next summer in these subbasins in an effort to reduce access denials.

Table 1. Status of candidate sites for random juvenile coho surveys conducted during the summer of 2000.

	Sampled		Not Sampled			
GCA	Snorkeled	Electrofished	Could Not Be Sampled	Above Barrier	Access Denied	Not Visited
North Coast	35	4	6	2	0	0
Mid-Coast	42	0	1	2	6	2
Mid-South Coast	28	3	4	1	9	0
Umpqua	30	6	5	5	7	0
South Coast	29	0	5	0	9	4

Juvenile Coho Frequency of Occurrence

The percentage of pools at each sample site that contained at least one juvenile coho is shown for each of the GCAs in Figures 7-11. In the summer of 2000, the Mid-Coast had the highest percentage of sites that contained at least one juvenile coho while the Umpqua had the lowest. The Mid-South Coast had the highest mean percentage of pools per site with juvenile coho, while the South Coast had the lowest (Table 2). Table 3 shows the results of comparisons between GCAs of the mean percent of pools per site that contained juvenile coho where $P \leq 0.2$.

Table 2. The occurrence of juvenile coho as observed by snorkeling or electrofishing in coastal GCAs, 2000.

GCA	Percentage of sites with at least one pool containing coho	Mean percentage (and standard error) of pools per site with coho	Median percentage of pools per site containing coho
North Coast	79	58(5.5)	67
Mid-Coast	83	51(5.0)	55
Mid-South Coast	74	66(5.6)	94
Umpqua	73	50(4.9)	56
South Coast	81	41(5.5)	20

Table 3. Comparisons between GCAs sampled in 2000 of the mean percentage of pools per site that contained juvenile coho. Only those comparisons with a P level ≤ 0.2 are shown.

Comparison	P for difference
Mid-South Coast vs South Coast	<0.01
Mid-South Coast vs Umpqua	0.04
Mid-South Coast vs Mid-Coast	0.05
North Coast vs South Coast	0.03
Mid-Coast vs South Coast	0.18

The mean percent of pools per site that contained juvenile coho for each sample year and the percentage of sites with at least one pool containing juvenile coho for each sample year are shown in Figures 12 and 13, respectively. With the exception of the percentage of sites with at least one pool containing juvenile coho in the Mid-South Coast, both of these parameters showed increasing trends from previous years. Table 4 shows the results of comparisons for GCAs between years of the mean percent of pools per site that contained juvenile coho where $P \leq 0.2$.

Table 4. Differences between years within the same GCA in the mean percentage of pools per site that contained juvenile coho.

Comparison	P for difference
North Coast 00 vs North Coast 98	0.03
North Coast 00 vs North Coast 99	<0.01
Mid-Coast 00 vs Mid-Coast 98	0.07
Mid-Coast 00 vs Mid-Coast 99	<0.01
Mid-South Coast 00 vs Mid-South Coast 98	0.22
Mid-South Coast 00 vs Mid-South Coast 99	0.39
Umpqua 00 vs Umpqua 99	0.82
South Coast 00 vs South Coast 98	0.18
South Coast 00 vs South Coast 99	0.26

Juvenile Coho Density

The average density of juvenile coho in pools at each sample site is shown for each GCA in Figures 14-18. In the summer of 2000, the percentage of sites that had juvenile coho densities $\geq$0.7 fish/m^2 ranged from a high of 29% in the Mid-South Coast to a low of 5% in the Mid-Coast (Table 5). The mean density of juvenile coho in the Mid-South Coast was significantly higher than in any of the other GCAs sampled ($P < 0.01$). Mean densities of juvenile coho in the North Coast, Mid-Coast, Umpqua, and South Coast GCAs were not significantly different from each other ($P > 0.20$).

Table 5. Density (fish/m^2) of juvenile coho observed by snorkelers in coastal GCAs in 2000.

GCA	Percent of sites with an average density $\geq$ 0.7 fish/m^2	Mean density (standard error)	Median density
North Coast	9	0.24(0.04)	0.14
Mid-Coast	5	0.20(0.04)	0.07
Mid-South Coast	29	0.44(0.06)	0.44
Umpqua	7	0.21(0.04)	0.08
South Coast	7	0.18(0.05)	0.01

The yearly mean density and yearly percentage of sites with an average density $\geq$ 0.7 fish/m^2 in each GCA are shown in Figures 19 and 20. The mean density of juvenile coho in 2000 was higher than either 1998 or 1999 in the North Coast, and higher than in 1999 in both the Mid-Coast and Umpqua (Table 6).

Table 6. Results of Z statistic tests for significant differences between the mean density of juvenile coho observed in 2000 and that observed in either 1998 or 1999.

Comparison	P for difference
North Coast 00 vs North Coast 98	0.01
North Coast 00 vs North Coast 99	<0.01
Mid-Coast 00 vs Mid-Coast 98	0.56
Mid-Coast 00 vs Mid-Coast 99	<0.01
Mid-South Coast 00 vs Mid-South Coast 98	0.41
Mid-South Coast 00 vs Mid-South Coast 99	0.71
Umpqua 00 vs Umpqua 99	0.17
South Coast 00 vs South Coast 98	0.25
South Coast 00 vs South Coast 99	0.22

Juvenile Recruitment

Figure 21 shows the relationship between estimated number of adult coho/mile that spawned in each GCA in 1998 and 1999 and the estimated number of juvenile coho/mile the following year. In all five coastal GCAs, the number of juveniles produced by a given number of adults was higher in 2000 than in 1999. In fact, the regression equation for the 1999 adult/2000 juvenile data (juveniles per mile = 328.112 + (16.896 x adults per mile) yielded over twice the number of juveniles/mile for a given number of adults/mile than the regression equation for the 1998 adult/1999 juvenile data (juveniles per mile = 52.375 + (15.670 x adults per mile). These results suggest that egg to parr survival for the 1999 brood of juvenile coho was significantly higher than the 1998 brood. The mechanism for this apparent increase in survival is unknown, but is probably related to milder streamflow conditions experienced by the 1999 brood during their incubation and early fry stages than those experienced by the 1998 brood. Further analysis will be conducted on streamflow differences between years and presented in a future report.

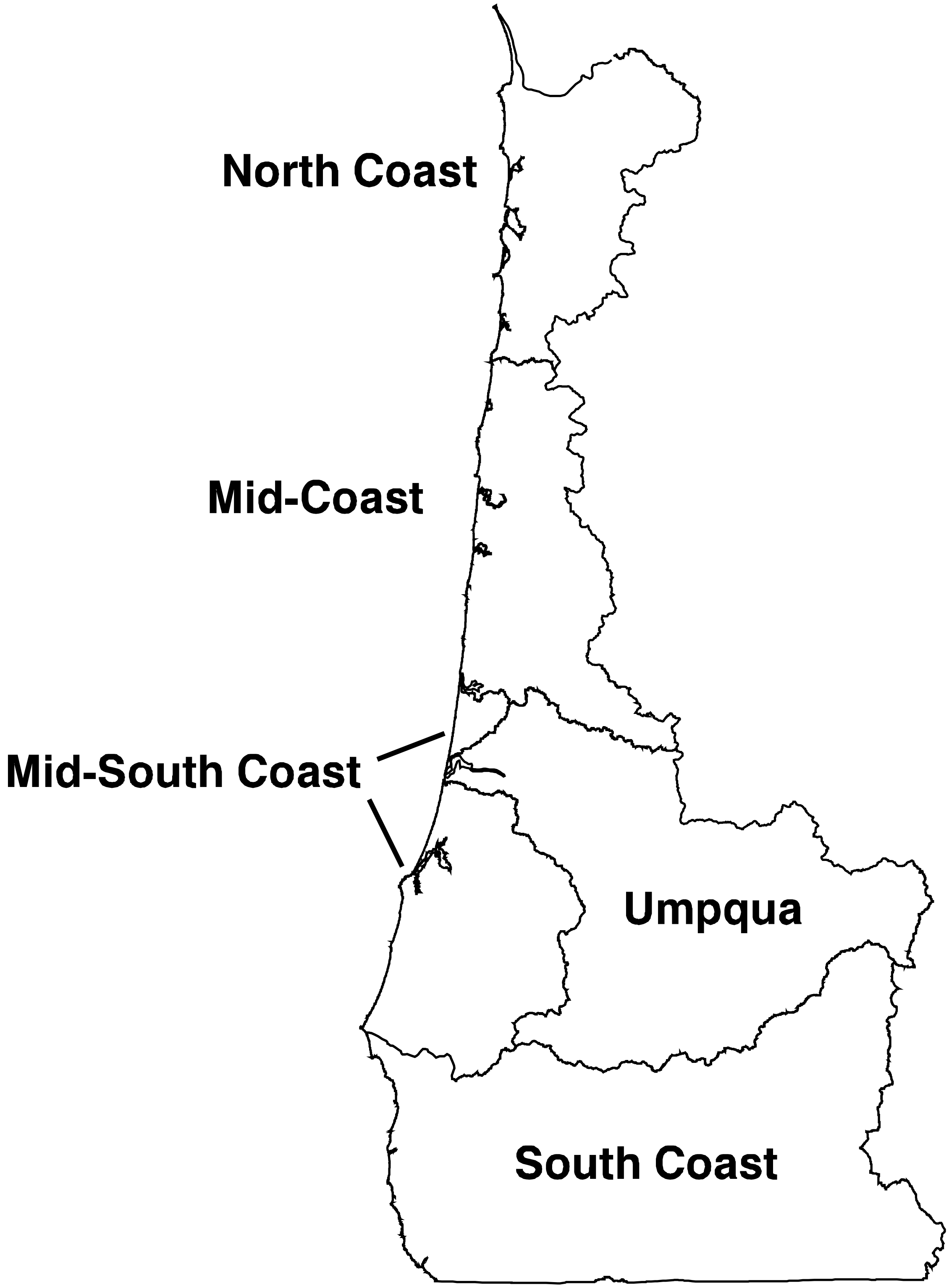

Figure 1. Location of five Gene Conservation Areas for coho salmon along the Oregon Coast.

SITE	BASIN NAME	SUBBASIN NAME	REACH
12	TRASK RIVER	SOUTH FORK	BOUNDRY CR
98	NESTUCCA RIVER	MAIN STEM AND BAY	ELK CR
250	NESTUCCA RIVER	MAIN STEM AND BAY	SANDERS CR (SMITH CR)
432	NESTUCCA RIVER	THREE RIVERS	ALDER CR
576	TRASK RIVER	MAIN STEM	RAWE CR
584	TRASK RIVER	MAIN STEM	GREEN CR
669	TILLAMOOK RIVER	MAIN STEM	SUTTON CR
714	TILLAMOOK RIVER	MAIN STEM	TILLAMOOK R
796	TILLAMOOK RIVER	MAIN STEM	UNNAMED TRIB, KILLAM CR
823	TILLAMOOK RIVER	MAIN STEM	KILLAM CR
895	NESTUCCA RIVER	BEAVER CREEK	E BEAVER CR
949	NESKOWIN CREEK	MAIN STEM	SLOAN CR
1098	NEHALEM RIVER	MAIN STEM	CRONIN CR, N FK
1149	NEHALEM RIVER	MAIN STEM	COW CR
1248	NEHALEM RIVER	ROCK CREEK	ROCK CR, S FK
1378	NECANICUM RIVER	SOUTH FORK	NECANICUM R, S FK
1416	ROVER CREEK	MAIN STEM	NECANICUM R
1458	ROVER CREEK	MAIN STEM	KLOOTCHIE CR
1481	ROVER CREEK	MAIN STEM	LITTLE MUDDY CR
1574	NEHALEM RIVER	MAIN STEM	NEAHKAHNIE CR
1680	NEHALEM RIVER	NORTH FORK	NEHALEM R, N FK
1711	NEHALEM RIVER	NORTH FORK	NEHALEM R, N FK
1798	KILCHIS RIVER	MAIN STEM	THOMAS CR
1878	MIAMI RIVER	MAIN STEM	MIAMI R
1891	MIAMI RIVER	MAIN STEM	WALDRON CR
1944	KILCHIS RIVER	MAIN STEM	KILCHIS R
2023	NEHALEM RIVER	MAIN STEM	KEBBE CR
2050	NEHALEM RIVER	MAIN STEM	FOLEY CR
2154	NEHALEM RIVER	MAIN STEM	GILMORE CR
2203	NEHALEM RIVER	MAIN STEM	BENEKE CR
2226	NEHALEM RIVER	MAIN STEM	LOUISGNOT CR
2254	NEHALEM RIVER	MAIN STEM	BENEKE CR
2265	NEHALEM RIVER	MAIN STEM	HAMILTON CR
2336	NEHALEM RIVER	MAIN STEM	OAK RANCH CR
2365	NEHALEM RIVER	MAIN STEM	SAGER CR
2459	NEHALEM RIVER	MAIN STEM	ADAMS CR
2484	NEHALEM RIVER	MAIN STEM	FORD CR
2535	NEHALEM RIVER	ROCK CREEK	ROCK CR
2576	NEHALEM RIVER	MAIN STEM	PEBBLE CR
2670	NEHALEM RIVER	ROCK CREEK	ROCK CR
2720	NEHALEM RIVER	MAIN STEM	OAK RANCH CR
2939	WILSON RIVER	MAIN STEM	BEN SMITH CR
2943	WILSON RIVER	MAIN STEM	BEN SMITH CR
3000	WILSON RIVER	DEVIL'S LAKE FORK	WILSON R, DEVIL'S LAKE FK
3028	WILSON RIVER	DEVIL'S LAKE FORK	DEO CR
3064	TRASK RIVER	NORTH FORK	CLEAR CR, #2
3079	WILSON RIVER	MAIN STEM	JORDAN CR

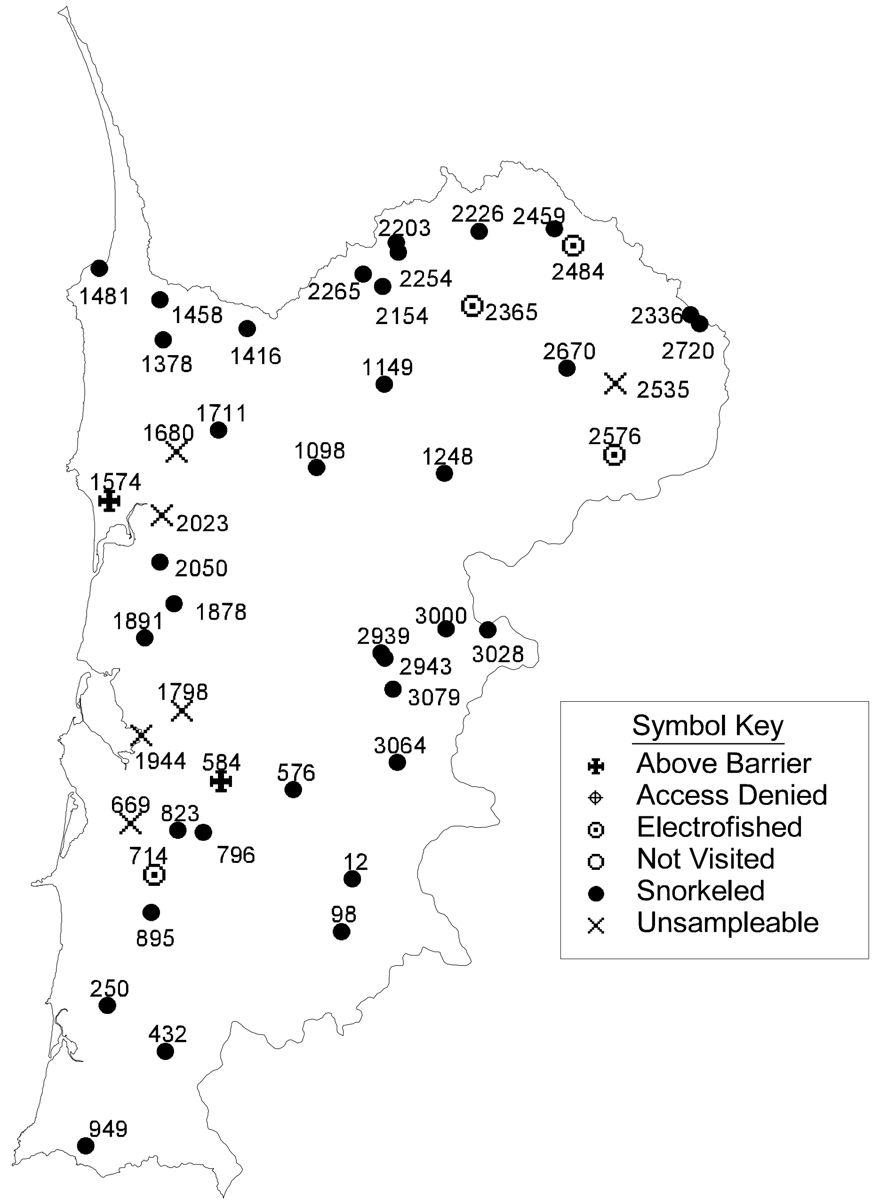

Figure 2. Location and status of candidate sites for juvenile coho sampling in the North Coast GCA, summer 2000 (see Appendix A for geographic coordinates).

SITE	BASIN NAME	SUBBASIN NAME	REACH
114	YACHATS RIVER	MAIN STEM	YACHATS R
143	ALSEA RIVER	FIVE RIVERS	ALDER CR
162	ALSEA RIVER	FIVE RIVERS	CRAB CR
165	ALSEA RIVER	FIVE RIVERS	CRAB CR
220	SIUSLAW RIVER	LAKE CREEK	ROGERS CR
295	SIUSLAW RIVER	LAKE CREEK	BUCK CR
333	SIUSLAW RIVER	LAKE CREEK	NELSON CR
374	ALSEA RIVER	SOUTH FORK	ALSEA R, S FK
385	ALSEA RIVER	MAIN STEM AND BAY	SCHOOLHOUSE CR
390	ALSEA RIVER	MAIN STEM AND BAY	ALSEA R
411	ALSEA RIVER	NORTH FORK	CROOKED CR
424	ALSEA RIVER	NORTH FORK	HONEY GROVE CR
520	SIUSLAW RIVER	MAIN STEM	JEANS CR
547	SIUSLAW RIVER	MAIN STEM	BEAR CR
582	SIUSLAW RIVER	MAIN STEM	PATAHA CR
609	SIUSLAW RIVER	MAIN STEM	CLAY CREEK
636	SIUSLAW RIVER	MAIN STEM	ESMOND CR
748	SIUSLAW RIVER	NORTH FORK	CONDON CR
769	SIUSLAW RIVER	NORTH FORK	UNCLE CR
826	TENMILE CREEK	MAIN STEM	MILL CR
839	SIUSLAW RIVER	MAIN STEM	CLEVELAND CR
935	SIUSLAW RIVER	LAKE CREEK	CHAPPELL CR
970	SIUSLAW RIVER	MAIN STEM	BERKSHIRE CR
1026	YAQUINA RIVER	ELK CREEK	SPOUT CR
1028	YAQUINA RIVER	ELK CREEK	ELK CR
1033	YAQUINA RIVER	ELK CREEK	JOHNSON CR
1076	YAQUINA RIVER	LITTLE ELK CREEK	OGLESBY CR
1078	SILETZ RIVER	ROCK CREEK	LITTLE ROCK CR
1124	SILETZ RIVER	SOUTH FORK	ROGERS CR
1174	SILETZ RIVER	MAIN STEM	CEDAR CR
1211	SILETZ RIVER	NORTH FORK	CARTER CR
1238	SILETZ RIVER	MAIN STEM	SAM CR
1244	SILETZ RIVER	MAIN STEM	CERINE CR
1247	SILETZ RIVER	MAIN STEM	MILL CR, N FK
1352	YAQUINA RIVER	MAIN STEM AND BAY	OLALLA CR, TRIB A
1386	SALMON RIVER	MAIN STEM AND BAY	CROWLEY CR
1402	SILETZ RIVER	DRIFT CREEK	WILDCAT CR
1447	SALMON RIVER	MAIN STEM AND BAY	SALMON R
1463	CUMMINS CR	MAIN STEM	CUMMINS CR
1567	YAQUINA RIVER	ELK CREEK	BEAR CR
1605	YAQUINA RIVER	MAIN STEM AND BAY	MILL CR
1662	TENMILE CREEK	MAIN STEM	WILDCAT CR
1665	ALSEA RIVER	FIVE RIVERS	FIVE RIVERS
1670	SIUSLAW RIVER	LAKE CREEK	DEADWOOD CR
1712	SIUSLAW RIVER	LAKE CREEK	LAKE CR
1769	SIUSLAW RIVER	WOLF CREEK	WOLF CR
1813	SIUSLAW RIVER	MAIN STEM	SIUSLAW R
1876	BIG CREEK	MAIN STEM & SFK	BIG CR
1880	SIUSLAW RIVER	LAKE CREEK	INDIAN CR
1907	SIUSLAW RIVER	LAKE CREEK	DEADWOOD CR
1983	SILETZ RIVER	DRIFT CREEK	DRIFT CR
2006	YACHATS RIVER	NORTH FORK	YACHATS R, N FK
2067	ALSEA RIVER	MAIN STEM AND BAY	CARNS CANYON

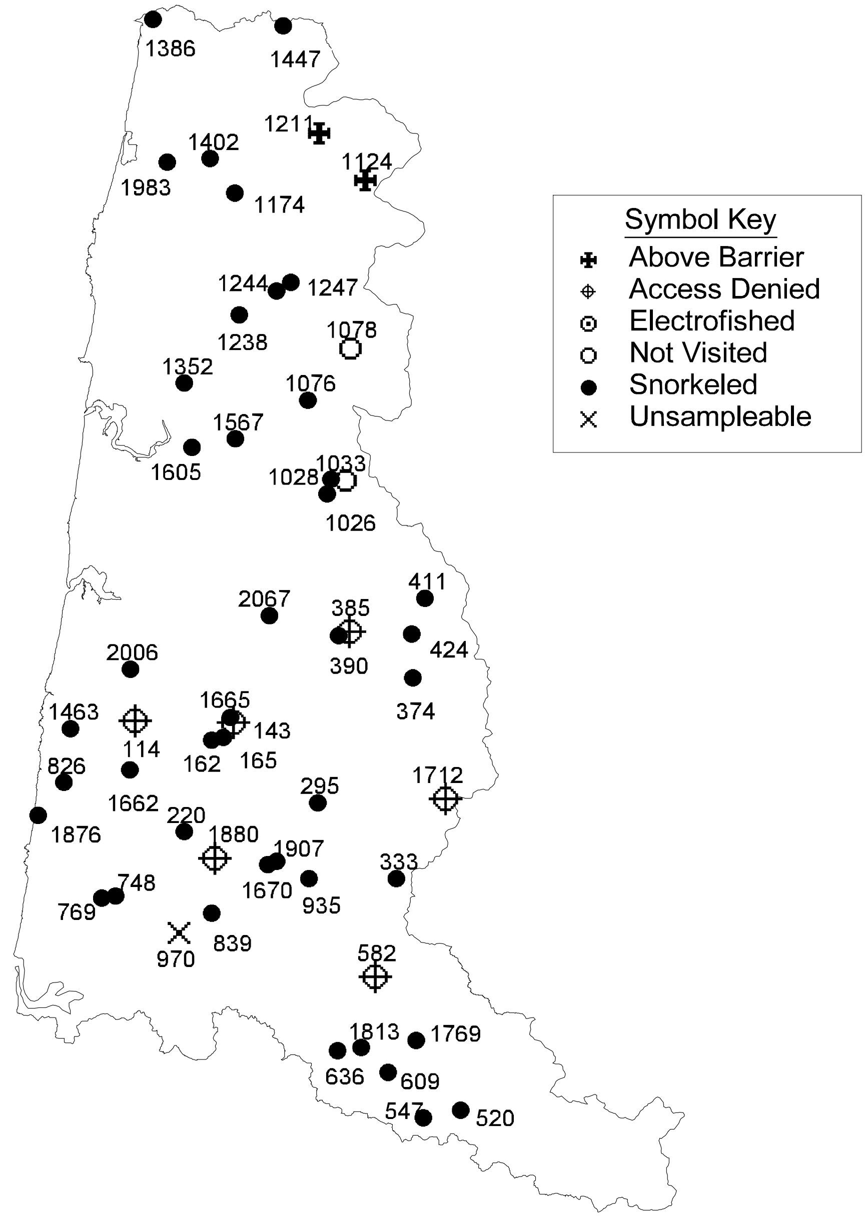

Figure 3. Location and status of candidate sites for juvenile coho sampling in the Mid-Coast GCA, summer 2000 (see Appendix A for geographic coordinates).

SITE	BASIN NAME	SUBBASIN NAME	REACH
46	COOS RIVER	SOUTH FORK	WILLIAMS R
156	COQUILLE RIVER	SOUTH FORK	RHODA CR
227	COQUILLE RIVER	SOUTH FORK	WOODWARD CR
290	COQUILLE RIVER	SOUTH FORK	CATCHING CR
326	FOURMILE CR	MAIN STEM	FOURMILE CR
365	COQUILLE RIVER	NORTH FORK	JERUSALEM CR
509	COQUILLE RIVER	NORTH FORK	HUDSON CR
582	COQUILLE RIVER	NORTH FORK	HUDSON CR
650	COQUILLE RIVER	EAST FORK	ELK CR
689	COQUILLE RIVER	NORTH FORK	JOHNS CR
737	COQUILLE RIVER	MIDDLE FORK	ROCK CR
781	COQUILLE RIVER	SOUTH FORK	SALMON CR
805	COQUILLE RIVER	SOUTH FORK	PYBURN CR
835	COQUILLE RIVER	SOUTH FORK	JOHNSON CR
858	SIXES RIVER	MAIN STEM	SIXES R
893	NEW RIVER	MAIN STEM	BUTTE CR
1005	TENMILE CREEK	NORTH TENMILE LAKE	ALDER CR
1094	TENMILE CREEK	SOUTH TENMILE LAKE	BENSON CR
1187	COOS RIVER	MAIN STEM	WILLANCH CR
1247	COQUILLE RIVER	NORTH FORK	COQUILLE R, N FK
1319	COOS RIVER	SOUTH FORK	WREN SMITH CR
1328	COOS RIVER	SOUTH FORK	DANIELS CR
1331	COQUILLE RIVER	NORTH FORK	COQUILLE R, N FK, TRIB Y
1385	COOS RIVER	MILLICOMA RIVER	MILLICOMA R, E FK
1426	COOS RIVER	MILLICOMA RIVER	WOODRUFF CR
1526	COQUILLE RIVER	NORTH FORK	STEELE CR
1640	COQUILLE RIVER	MAIN STEM AND BAY	LITTLE FISHTRAP CR
1698	TWOMILE CREEK	MAIN STEM	TWOMILE CR
1757	TAHKENITCH CREEK	FIVEMILE CREEK	FIVEMILE CR
1761	TAHKENITCH CREEK	FIVEMILE CREEK	BELL CR
1844	SILTCOOS RIVER	MAPLE CREEK	ROACHE CR
1875	SILTCOOS RIVER	FIDDLE CREEK	BILLY MOORE CR
1905	COOS RIVER	SOUTH FORK	WILLIAMS R
1959	COQUILLE RIVER	SOUTH FORK	CATCHING CR
2080	SIXES RIVER	NORTH FORK	SIXES R, N FK
2149	COQUILLE RIVER	SOUTH FORK	DELTA CR
2207	SIXES RIVER	MAIN STEM	SIXES R
2288	COOS RIVER	MAIN STEM	PALOUSE CR
2314	TENMILE CREEK	SOUTH TENMILE LAKE	SHUTTER CR
2322	TENMILE CREEK	EEL LAKE	EEL CR
2363	TENMILE CREEK	SOUTH TENMILE LAKE	JOHNSON CR
2378	COOS RIVER	MAIN STEM	LILLIAN CR
2438	COOS RIVER	MILLICOMA RIVER	PACKARD CR
2449	COQUILLE RIVER	MAIN STEM AND BAY	BEAVER SL, TRIB D
2591	FOURMILE CR	MAIN STEM	FOURMILE CR

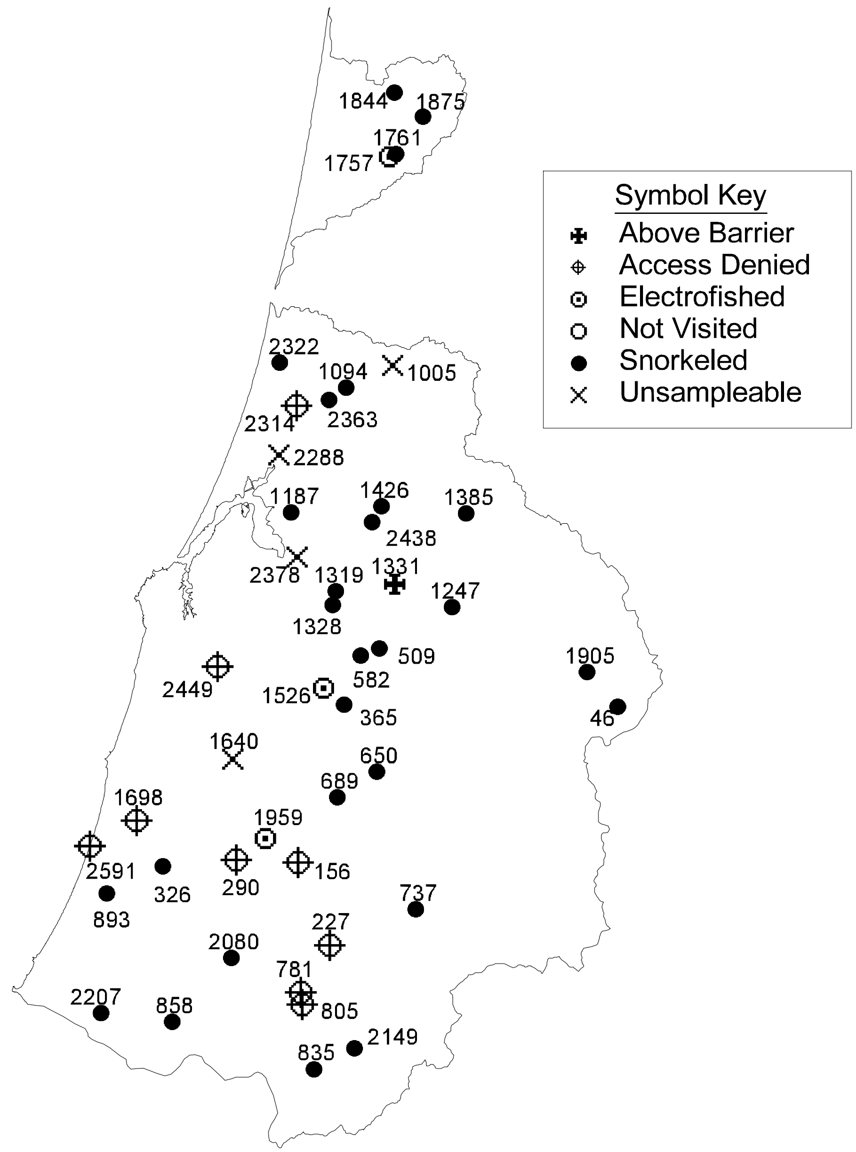

Figure 4. Location and status of candidate sites for juvenile coho sampling in the Mid-South Coast GCA, summer 2000 (see Appendix A for geographic coordinates).

SITE	BASIN NAME	SUBBASIN NAME	REACH
37	UMPQUA RIVER	CALAPOOYA CREEK	CALAPOOYA CR
42	UMPQUA RIVER	CALAPOOYA CREEK	COON CR
117	UMPQUA RIVER	SOUTH UMPQUA	BILGER CR
122	UMPQUA RIVER	SOUTH UMPQUA	DEER CR
694	UMPQUA RIVER	SOUTH UMPQUA	SMITH CR
737	UMPQUA RIVER	SOUTH UMPQUA	MCCULLOUGH CR
780	UMPQUA RIVER	SOUTH UMPQUA	BILGER CR
813	UMPQUA RIVER	SOUTH UMPQUA	DAYS CR
870	UMPQUA RIVER	SOUTH UMPQUA	CANYON CR
891	UMPQUA RIVER	SOUTH UMPQUA	W WILLIS CR
915	UMPQUA RIVER	SOUTH UMPQUA	WOOD CR
950	UMPQUA RIVER	SOUTH UMPQUA	COW CR, FORTUNE BR
958	UMPQUA RIVER	SOUTH UMPQUA	CLEAR CR
972	UMPQUA RIVER	SOUTH UMPQUA	BULL RUN CR
995	UMPQUA RIVER	MAIN STEM AND BAY	CHARLOTTE CR
1033	UMPQUA RIVER	MAIN STEM AND BAY	MILLER CR
1034	UMPQUA RIVER	MAIN STEM AND BAY	DRY CR
1069	UMPQUA RIVER	MAIN STEM AND BAY	OAR CR
1074	UMPQUA RIVER	SMITH RIVER	BUTLER CR
1094	UMPQUA RIVER	MAIN STEM AND BAY	LITTLE WOLF CR
1113	UMPQUA RIVER	MAIN STEM AND BAY	WOLF CR
1151	UMPQUA RIVER	MAIN STEM AND BAY	LUTSINGER CR
1156	UMPQUA RIVER	MAIN STEM AND BAY	CAMP CR
1200	UMPQUA RIVER	SMITH RIVER	RAILROAD CR
1210	UMPQUA RIVER	SMITH RIVER	SPENCER CR
1270	UMPQUA RIVER	SMITH RIVER	BEAVER CR
1311	UMPQUA RIVER	SMITH RIVER	SMITH R, N FK, M FK
1378	UMPQUA RIVER	SMITH RIVER	SCARE CR
1414	UMPQUA RIVER	MAIN STEM AND BAY	HOUSE CR
1999	UMPQUA RIVER	CALAPOOYA CREEK	PINE TREE CR
2039	UMPQUA RIVER	CALAPOOYA CREEK	LONG VALLEY CR
2054	UMPQUA RIVER	NORTH UMPQUA	HONEY CR
2099	UMPQUA RIVER	NORTH UMPQUA	HUNTLEY CR
2134	UMPQUA RIVER	CALAPOOYA CREEK	DODGE CANYON CR
2180	UMPQUA RIVER	CALAPOOYA CREEK	DRIVER VALLEY CR
2221	UMPQUA RIVER	NORTH UMPQUA	SUTHERLIN CR
2233	UMPQUA RIVER	MAIN STEM AND BAY	UMPQUA R
2248	UMPQUA RIVER	NOT IDENTIFIED	OLLALA CR TRIBUTARY
2307	UMPQUA RIVER	SOUTH UMPQUA	SHEILDS CR
2309	UMPQUA RIVER	SOUTH UMPQUA	FALCON CR
2334	UMPQUA RIVER	SOUTH UMPQUA	NICHOLS CR
2351	UMPQUA RIVER	SOUTH UMPQUA	BURNT CR
2368	UMPQUA RIVER	SOUTH UMPQUA	BOULDER CR
2393	UMPQUA RIVER	SOUTH UMPQUA	DONEGAN CR
2414	UMPQUA RIVER	SOUTH UMPQUA	BLACK CANYON CR
2439	UMPQUA RIVER	NORTH UMPQUA	ROCK CR, E FK
2472	UMPQUA RIVER	NORTH UMPQUA	CAVITT CR
2513	UMPQUA RIVER	SOUTH UMPQUA	ANDERSON CR
2525	UMPQUA RIVER	SOUTH UMPQUA	DREW CR
2590	UMPQUA RIVER	SOUTH UMPQUA	S MYRTLE CR
2631	UMPQUA RIVER	SOUTH UMPQUA	FALCON CR
2649	UMPQUA RIVER	MAIN STEM AND BAY	DEAN CR
2705	UMPQUA RIVER	SMITH RIVER	SMITH R, N FK

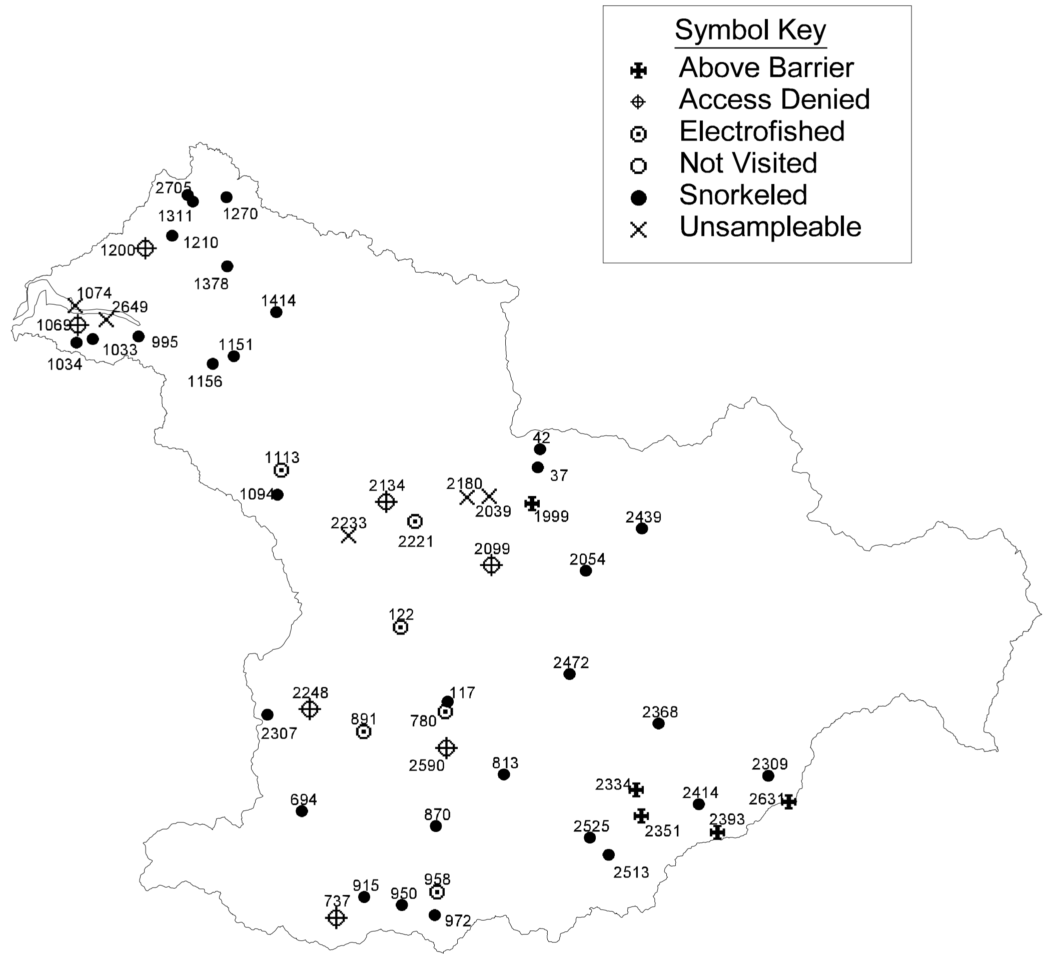

Figure 5. Location and status of candidate sites for juvenile coho sampling in the Umpqua GCA, summer 2000 (see Appendix A for geographic coordinates).

SITE	BASIN NAME	SUBBASIN NAME	REACH
10	ROGUE RIVER	MAIN STEM	GRAVE CR
36	ROGUE RIVER	MAIN STEM	GRAVE CR
53	ROGUE RIVER	MAIN STEM	SUGARPINE CR
62	ROGUE RIVER	MAIN STEM	BITTER LICK CR
68	ROGUE RIVER	MAIN STEM	SUGARPINE CR
111	ROGUE RIVER	MAIN STEM	LITTLE BUTTE CR, N FK
122	ROGUE RIVER	BIG BUTTE CREEK	BIG BUTTE CR, N FK
126	ROGUE RIVER	BIG BUTTE CREEK	BIG BUTTE CR, N FK
165	ROGUE RIVER	MAIN STEM	EVANS CR
180	ROGUE RIVER	MAIN STEM	EVANS CR
194	ROGUE RIVER	MAIN STEM	SAMS CR
216	ROGUE RIVER	MAIN STEM	COLD CR
257	ROGUE RIVER	MAIN STEM	JUMPOFF JOE CR
259	ROGUE RIVER	MAIN STEM	JUMPOFF JOE CR
301	ROGUE RIVER	MAIN STEM	TAYLOR CR
309	ROGUE RIVER	MAIN STEM	JUMPOFF JOE CR
317	ROGUE RIVER	MAIN STEM	LOUSE CR
349	ROGUE RIVER	MAIN STEM	QUOSATANA CR
362	ROGUE RIVER	LOBSTER CREEK	LOBSTER CR, S FK
397	ROGUE RIVER	LOBSTER CREEK	LOBSTER CR
411	ROGUE RIVER	LOBSTER CREEK	LOBSTER CR
415	ROGUE RIVER	LOBSTER CREEK	LOBSTER CR, N FK
432	ROGUE RIVER	MAIN STEM	JIM HUNT CR
465	ROGUE RIVER	ILLINOIS RIVER	WOOD CR
512	ROGUE RIVER	ILLINOIS RIVER	ELDER CR
520	ROGUE RIVER	ILLINOIS RIVER	ALTHOUSE CR
541	ROGUE RIVER	ILLINOIS RIVER	THOMPSON CR
549	ROGUE RIVER	ILLINOIS RIVER	LITTLE GRAYBACK CR
590	ROGUE RIVER	ILLINOIS RIVER	ELK CR
619	ROGUE RIVER	MAIN STEM	LITTLE BUTTE CR, N FK
629	ROGUE RIVER	MAIN STEM	SODA CR
652	ROGUE RIVER	MAIN STEM	BEAR CR
655	ROGUE RIVER	MAIN STEM	ASHLAND CR
657	ROGUE RIVER	APPLEGATE RIVER	LITTLE APPLEGATE R
700	ROGUE RIVER	MAIN STEM	FOOTS CR
722	ROGUE RIVER	MAIN STEM	LOUSE CR
753	ROGUE RIVER	APPLEGATE RIVER	POORMANS CR
773	ROGUE RIVER	APPLEGATE RIVER	THOMPSON CR
781	ROGUE RIVER	APPLEGATE RIVER	WILLIAMS CR, E FK
793	ROGUE RIVER	ILLINOIS RIVER	DEER CR, S FK
801	ROGUE RIVER	ILLINOIS RIVER	DEER CR, N FK
867	ROGUE RIVER	APPLEGATE RIVER	SLATE CR
869	ROGUE RIVER	APPLEGATE RIVER	WATERS CR
885	ROGUE RIVER	ILLINOIS RIVER	CLEAR CR
913	ROGUE RIVER	ILLINOIS RIVER	CROOKS CR
914	ROGUE RIVER	ILLINOIS RIVER	CROOKS CR
933	ROGUE RIVER	ILLINOIS RIVER	THOMPSON CR

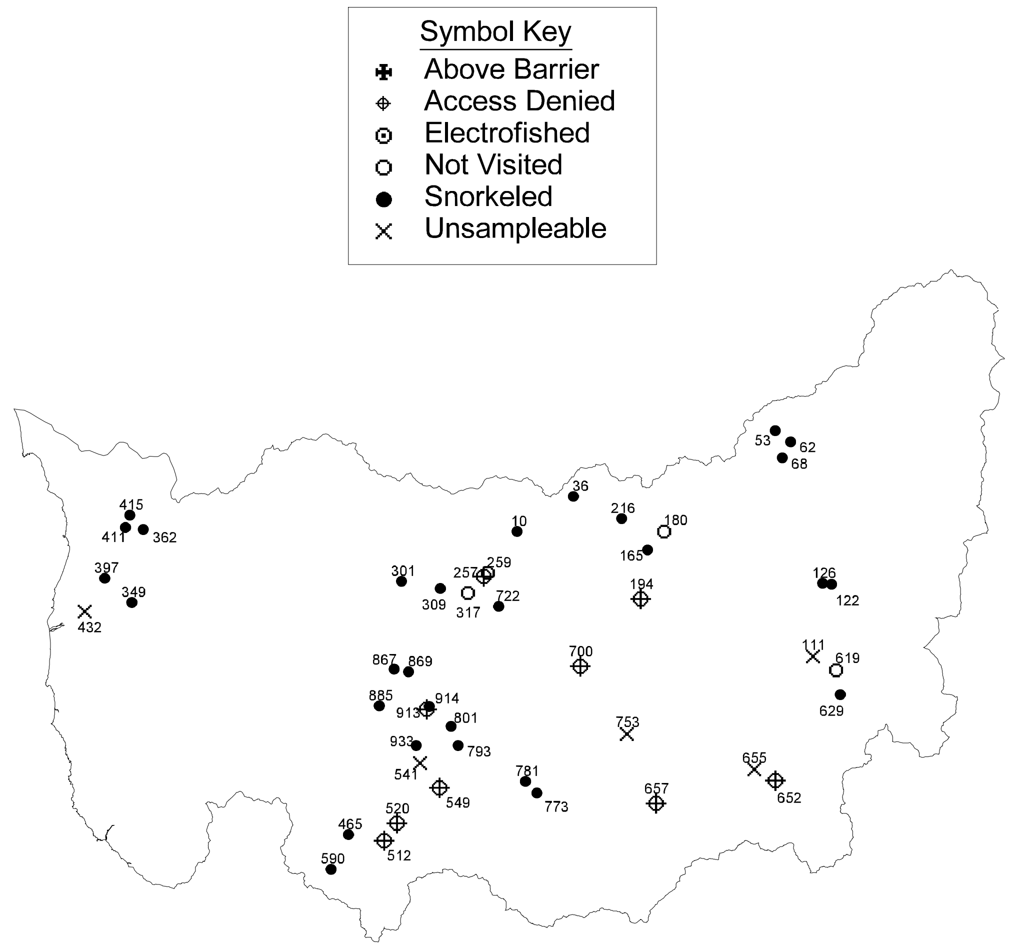

Figure 6. Location and status of candidate sites for juvenile coho sampling in the South Coast GCA, summer 2000 (see Appendix A for geographic coordinates).

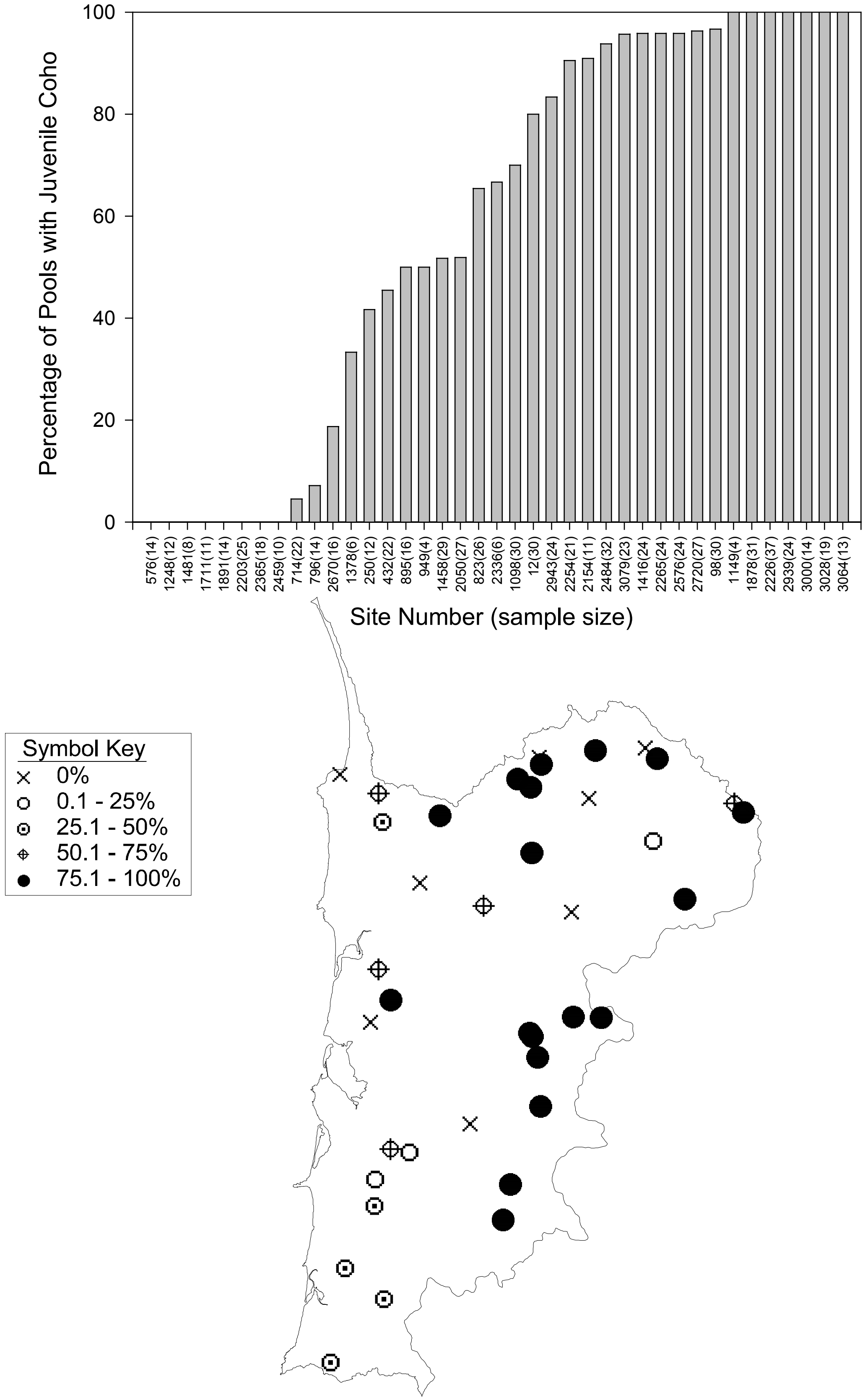

Figure 7. Percentage of pools that contained juvenile coho at each site snorkeled or electrofished in the summer of 2000 in the North Coast GCA (see Appendix A for site data).

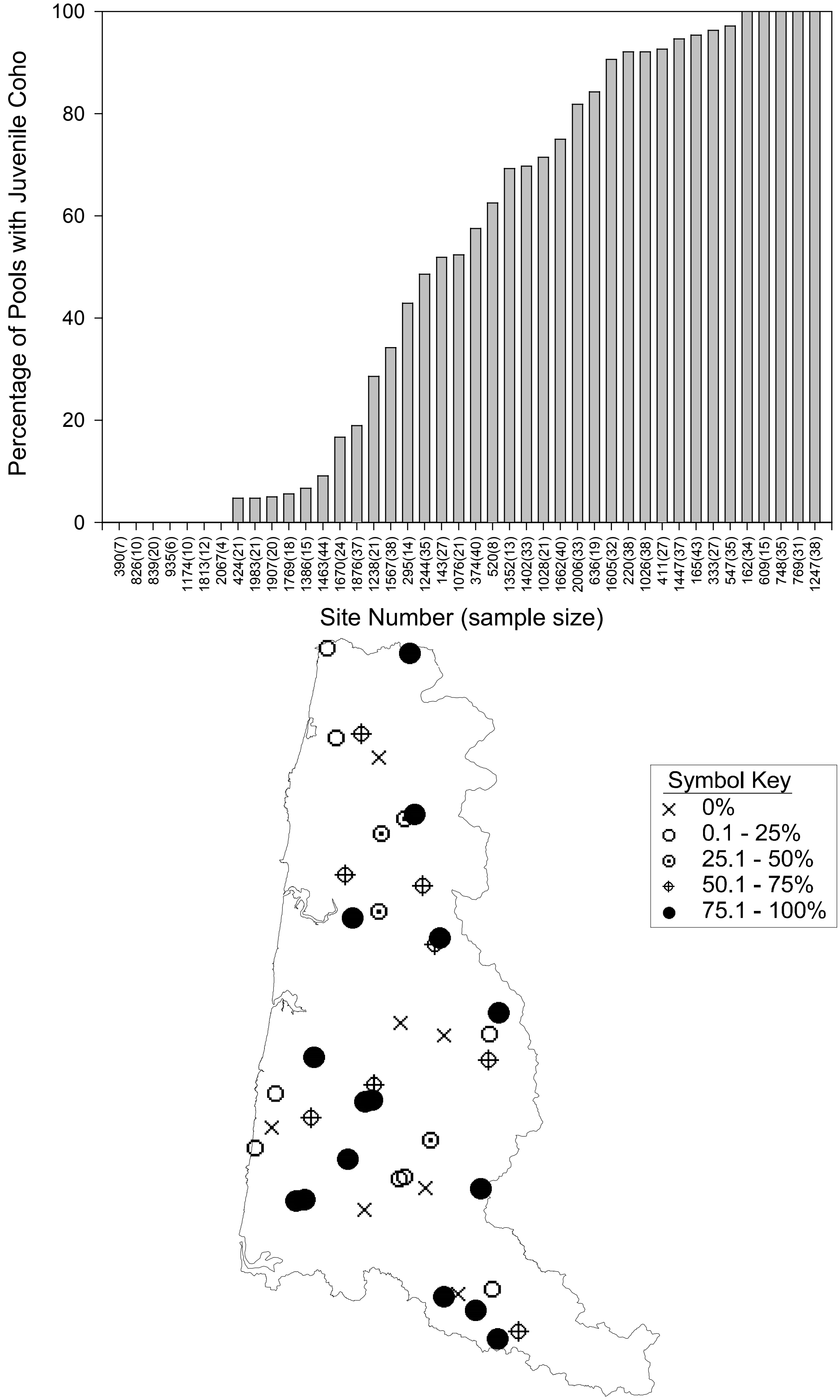

Figure 8. Percentage of pools that contained juvenile coho at each site snorkeled or electrofished in the summer of 2000 in the Mid-Coast GCA GCA (see Appendix A for site data).

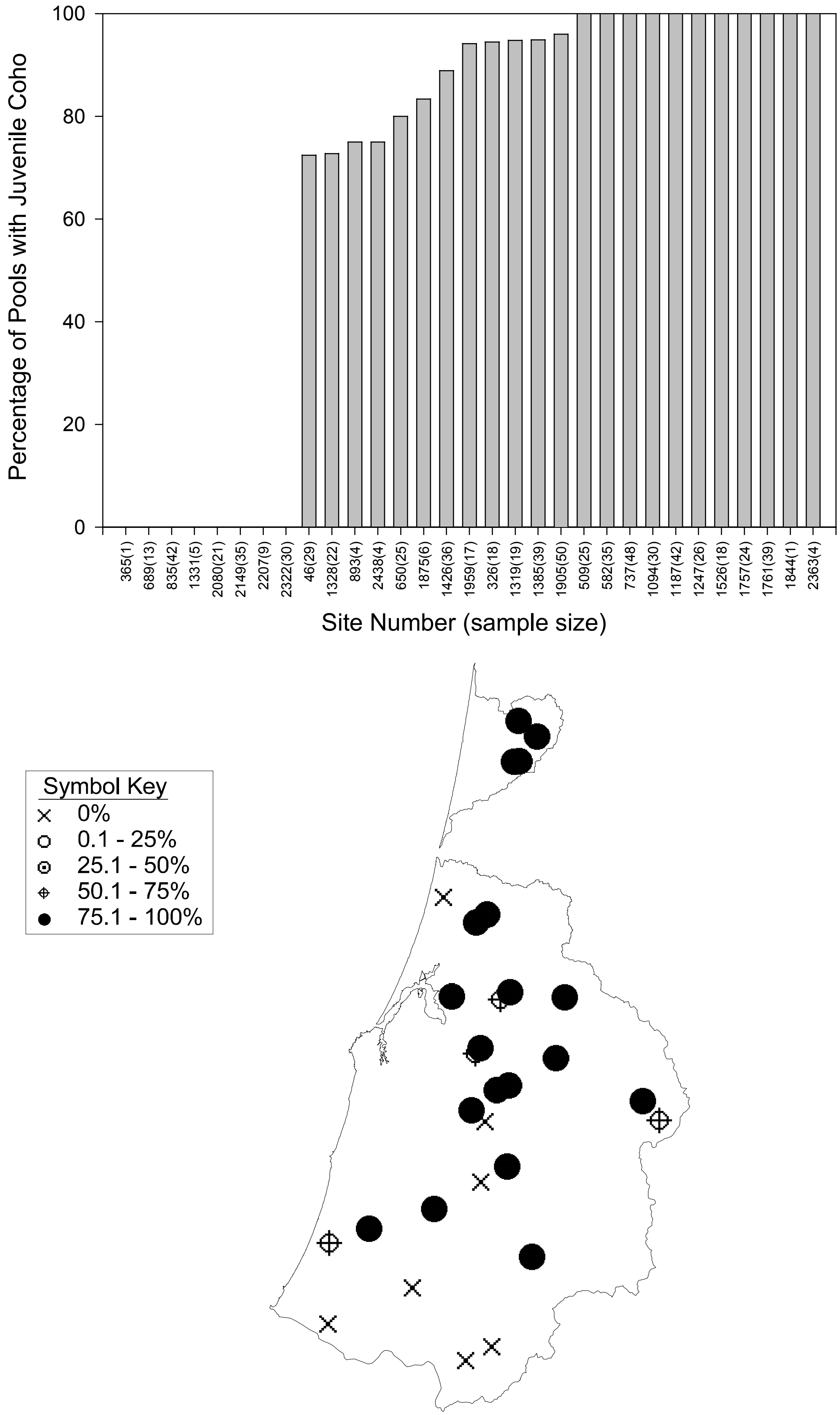

Figure 9. Percentage of pools that contained juvenile coho at each site snorkeled or electrofished in the summer of 2000 in the Mid-South Coast GCA GCA (see Appendix A for site data).

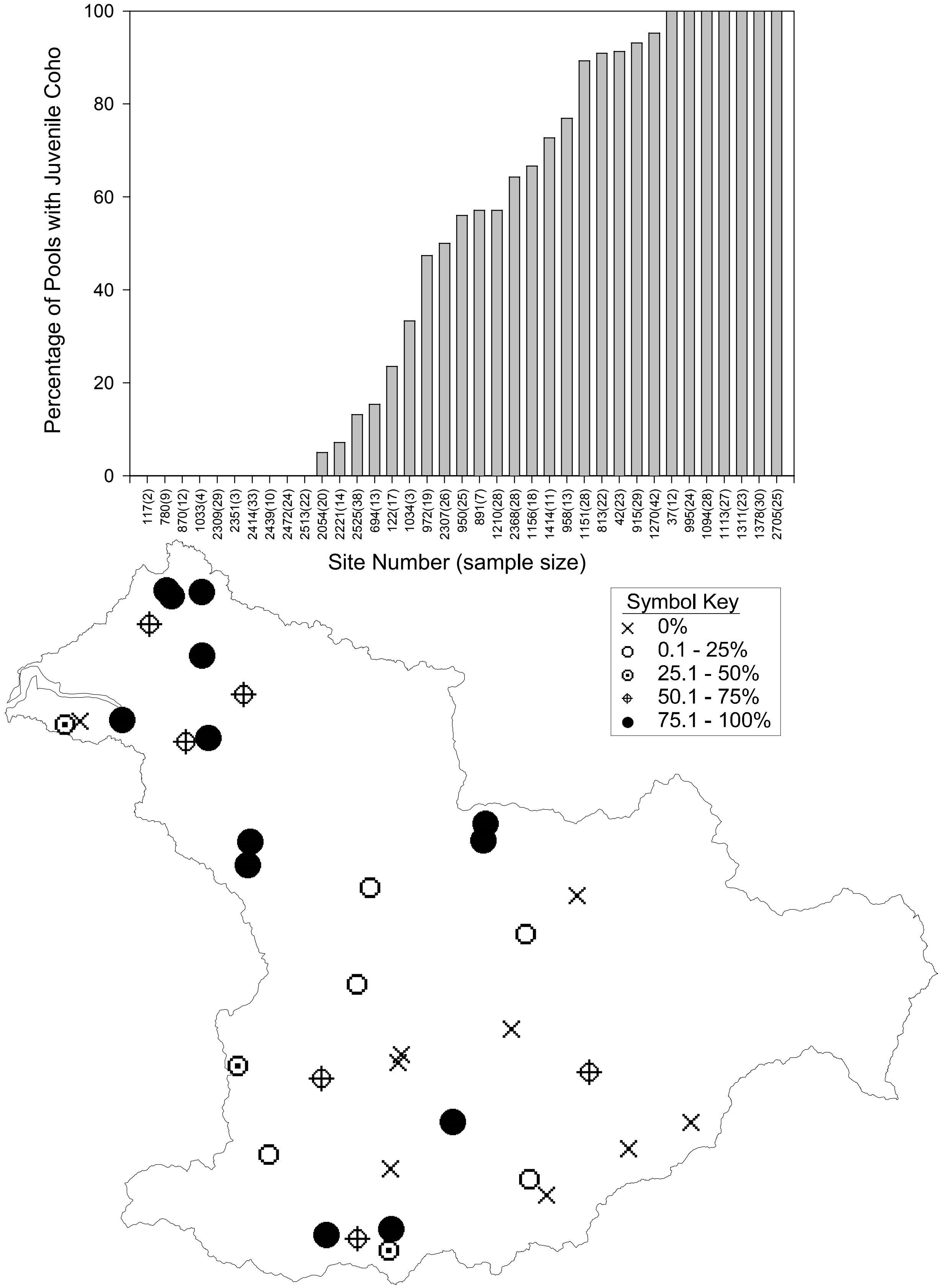

Figure 10. Percentage of pools that contained juvenile coho at each site snorkeled or electrofished in the summer of 2000 in the Umpqua GCA GCA (see Appendix A for site data).

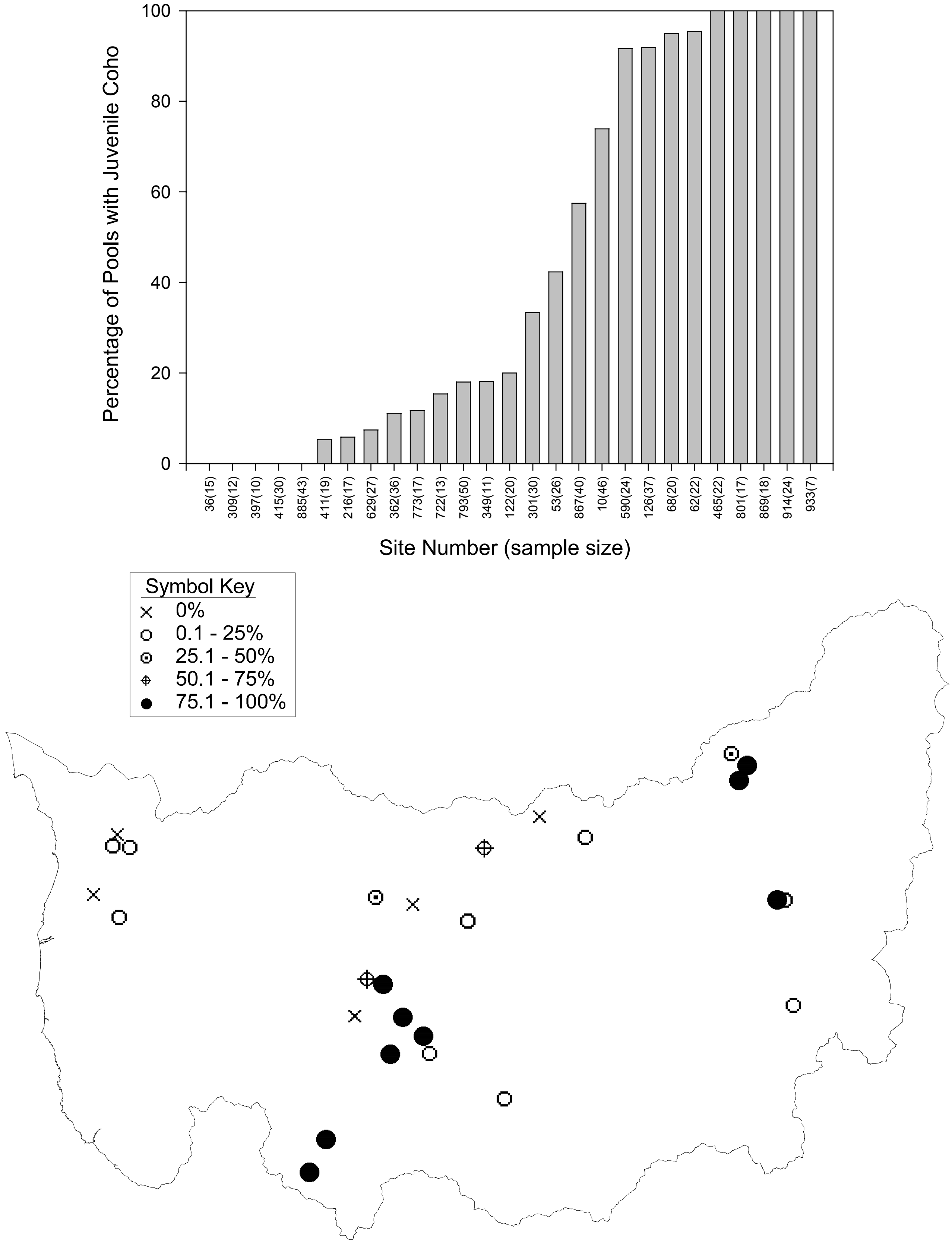

Figure 11. Percentage of pools that contained juvenile coho at each site snorkeled in the summer of 2000 in the South Coast GCA GCA (see Appendix A for site data).

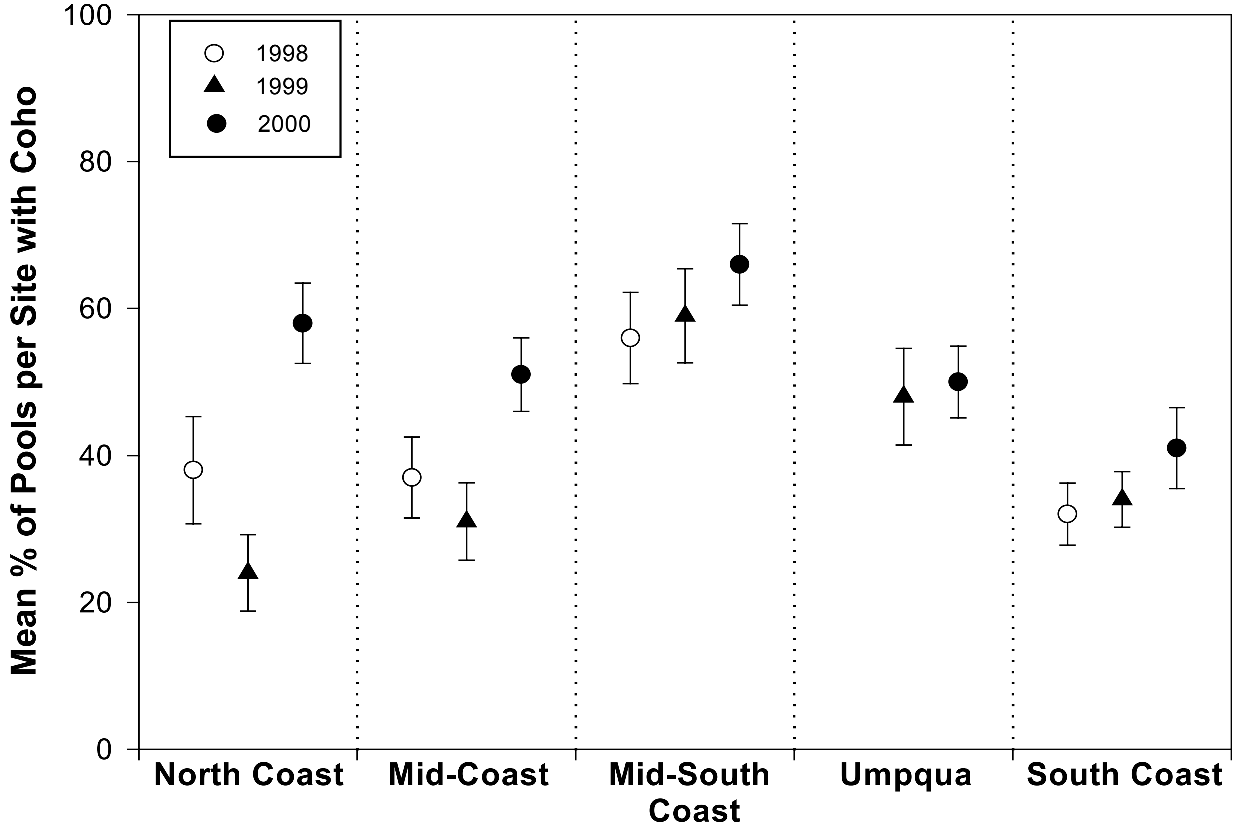

Figure 12. Percentage (mean and standard error) of pools per site that contained juvenile coho in each GCA, 1998-2000. No sampling was conducted in the Umpqua in 1998.

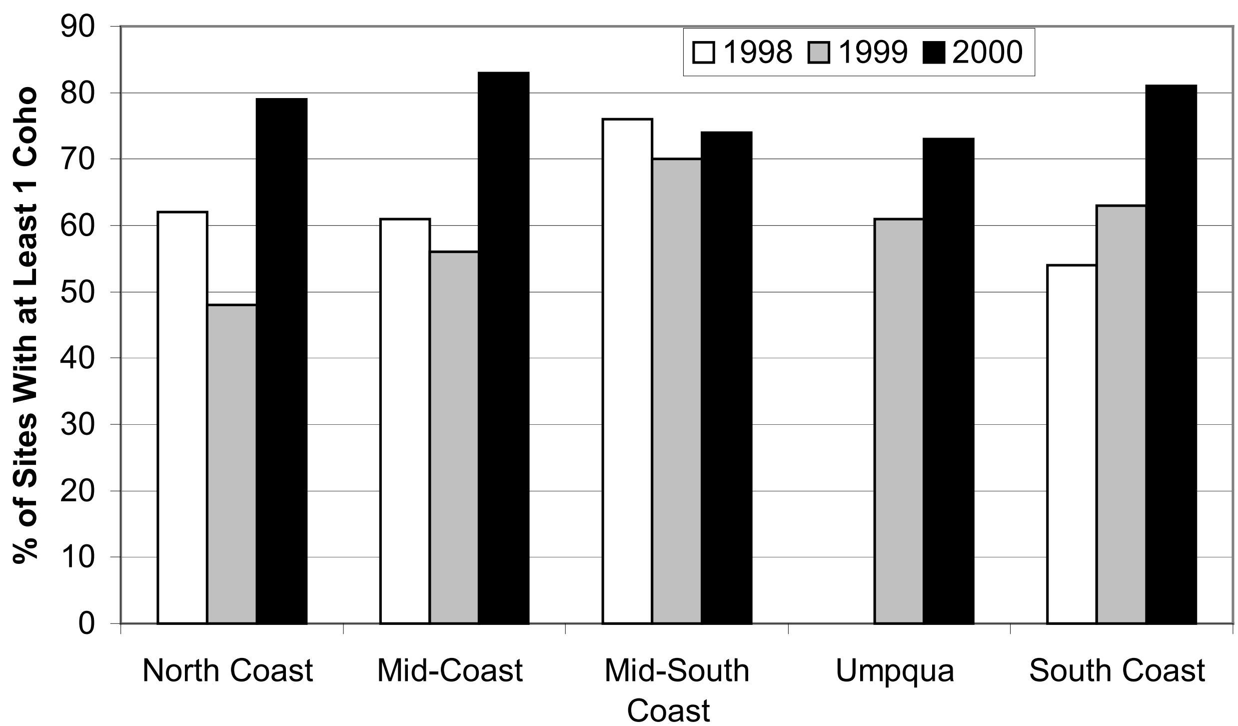

Figure 13. Percentage of sites with at least one pool containing juvenile coho in each GCA, 1998-2000. No sampling was conducted in the Umpqua in 1998.

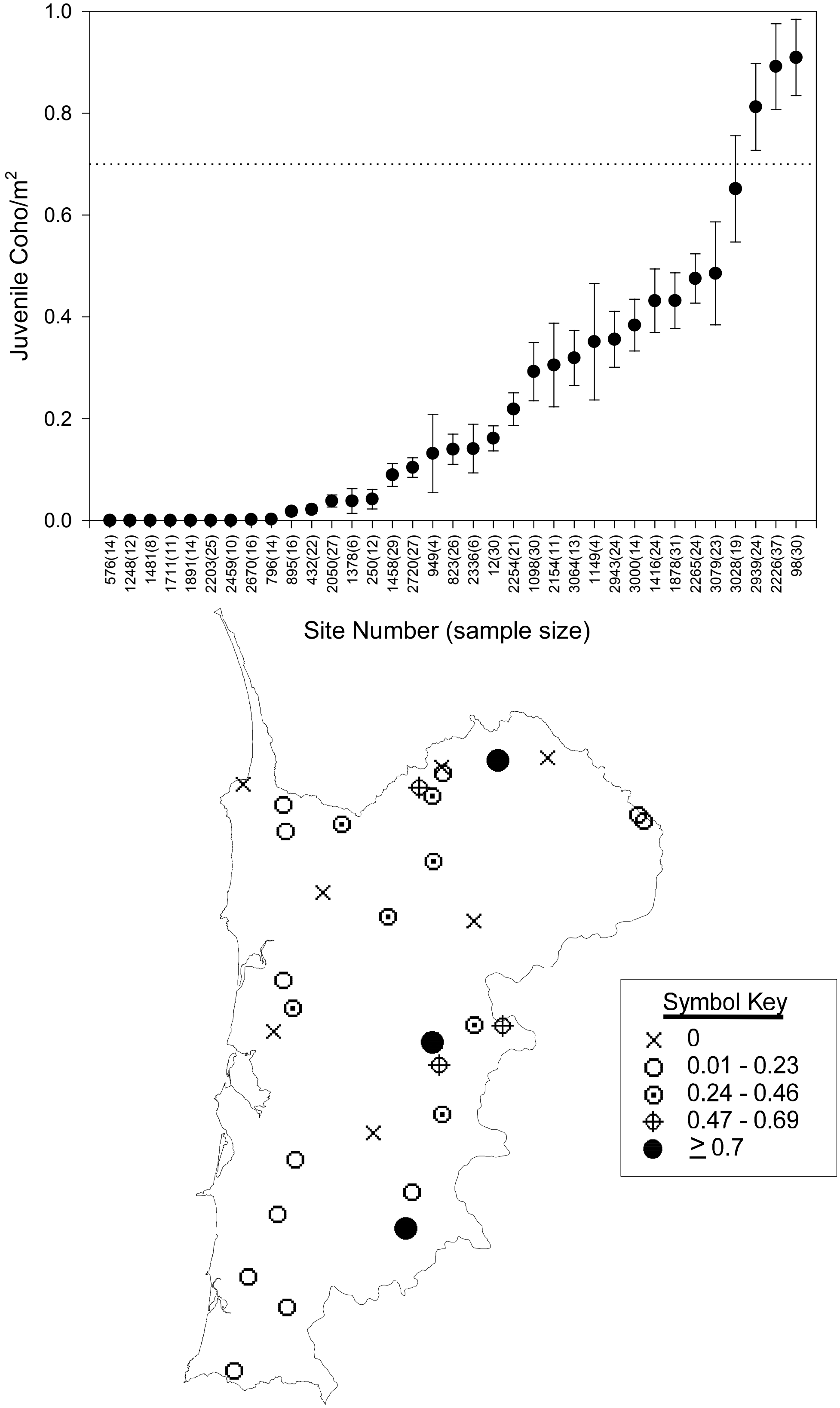

Figure 14. Density (mean and standard error) of juvenile coho at North Coast sites in 2000 GCA (see Appendix A for site data). Dashed horizontal line at 0.7 fish/m2 in graph indicates approximate full seeding level (see Rodgers 2000).

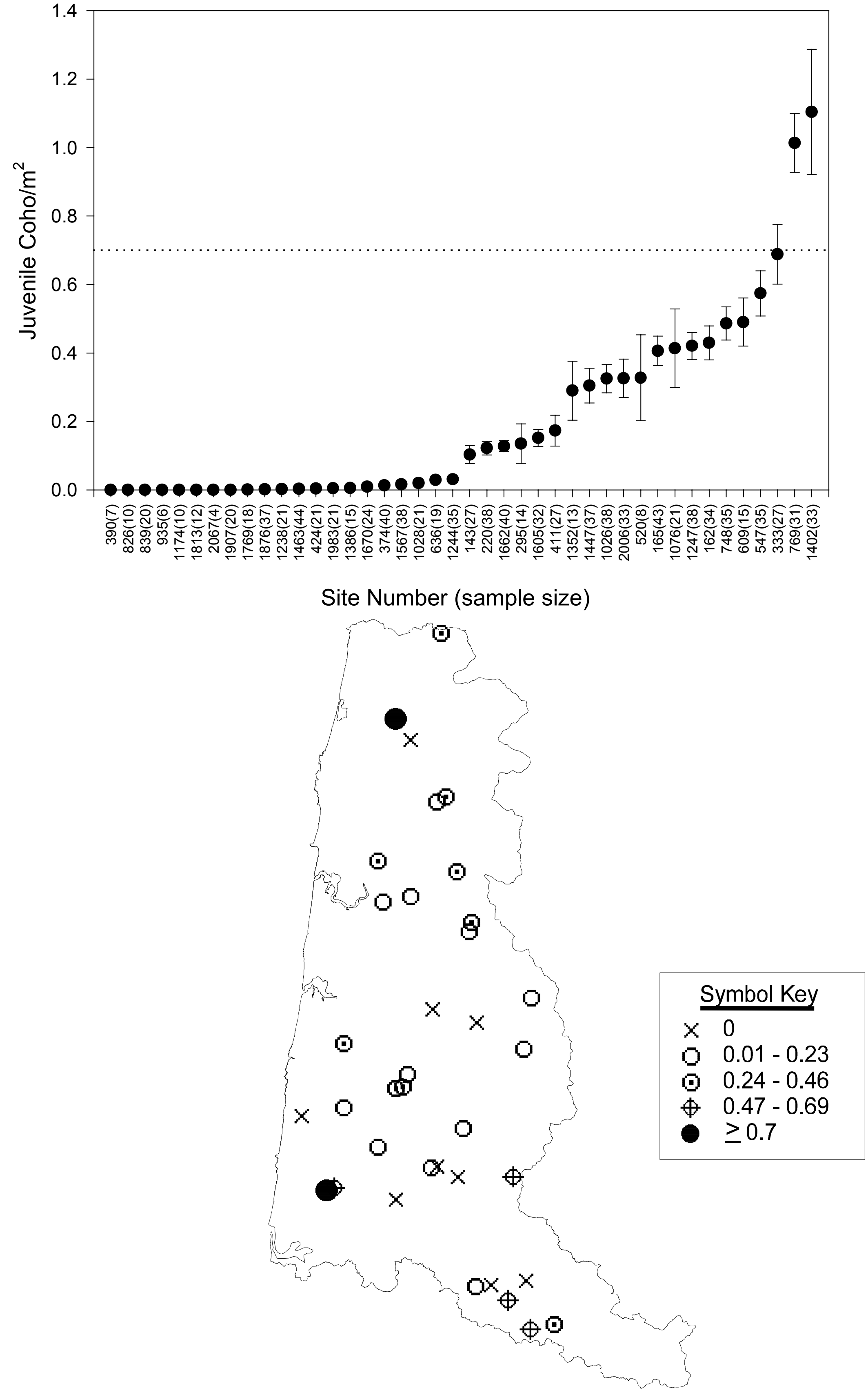

Figure 15. Density (mean and standard error) of juvenile coho at Mid-Coast sites in 2000 GCA (see Appendix A for site data). Dashed horizontal line at 0.7 fish/m2 in graph indicates approximate full seeding level (see Rodgers 2000).

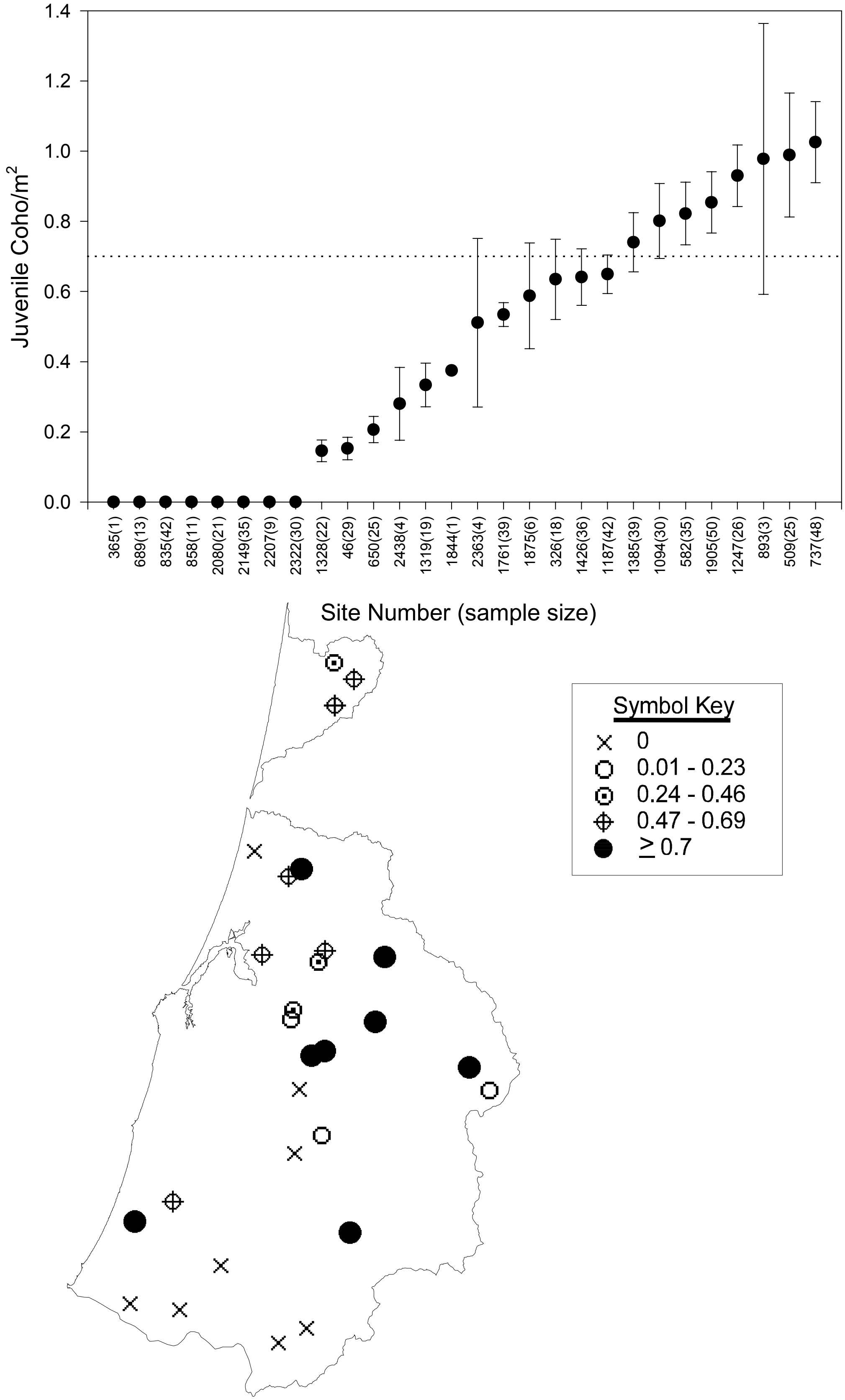

Figure 16. Density (mean and standard error) of juvenile coho at Mid-South Coast sites in 2000 GCA (see Appendix A for site data). Dashed horizontal line at 0.7 fish/m2 in graph indicates approximate full seeding level (see Rodgers 2000).

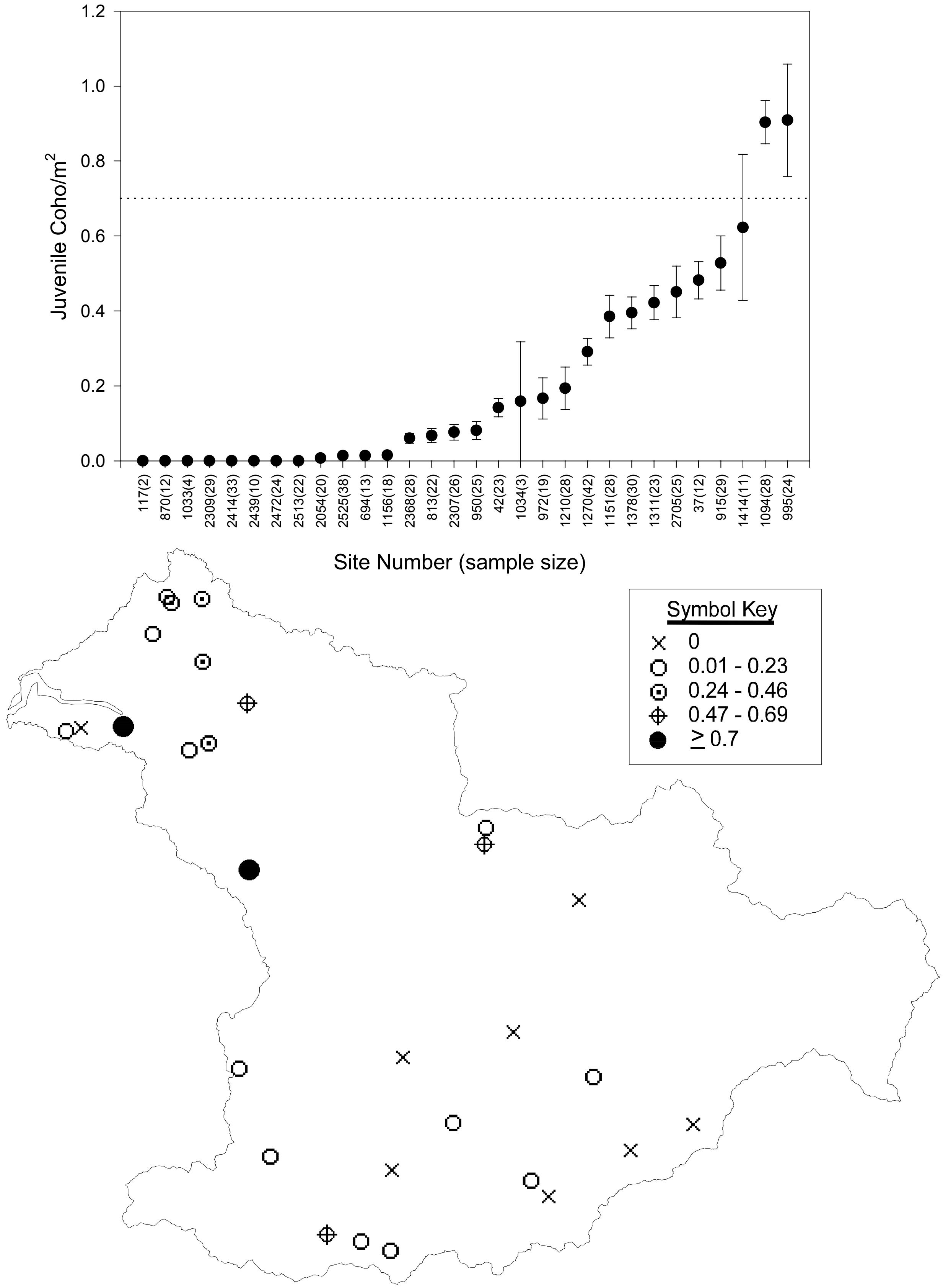

Figure 17. Density (mean and standard error) of juvenile coho salmon at Umpqua sites in 2000 GCA (see Appendix A for site data). Dashed horizontal line at 0.7 fish/m2 in graph indicates approximate full seeding level (see Rodgers 2000).

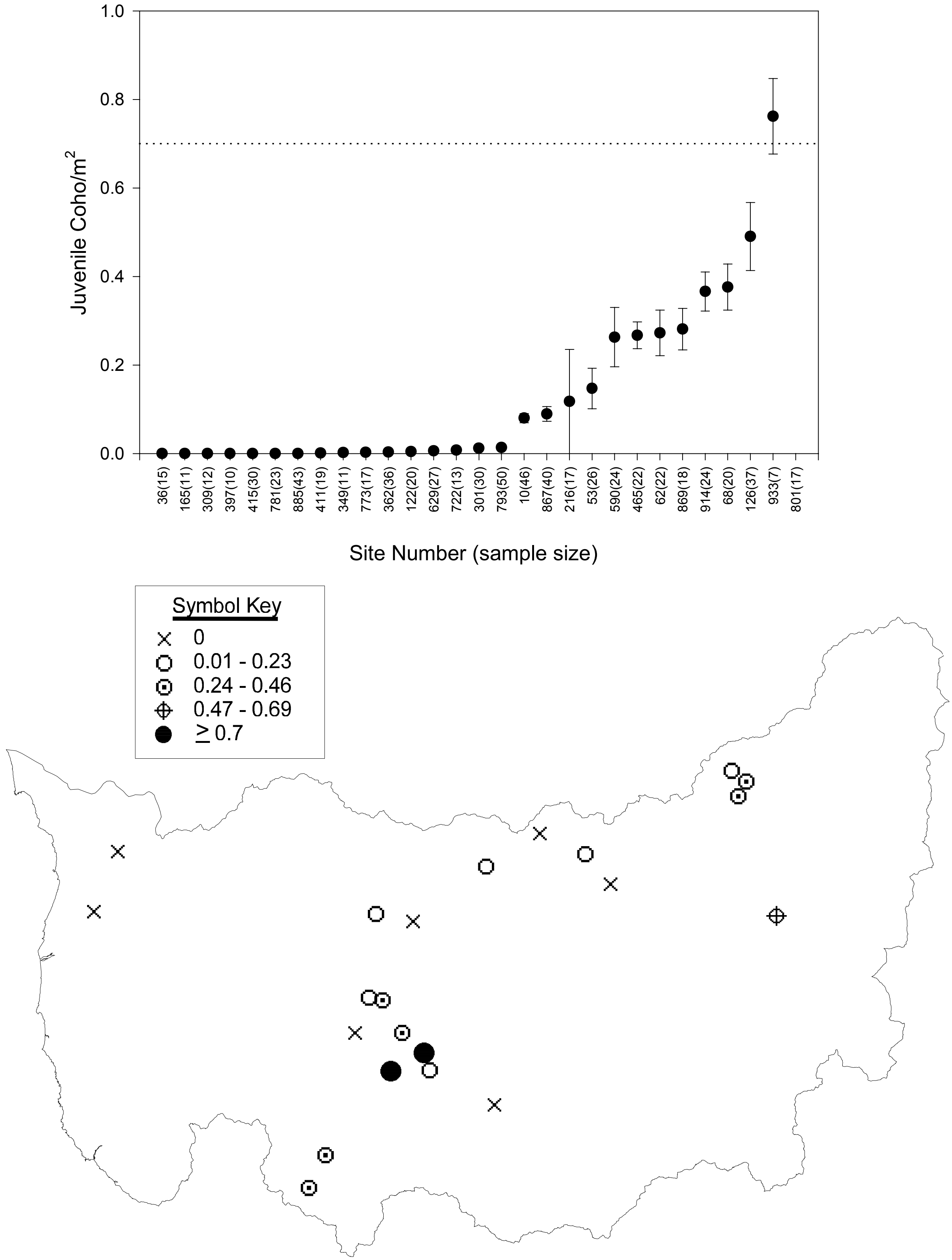

Figure 18. Density (mean and standard error) of juvenile coho salmon at South Coast sites in 2000 GCA (see Appendix A for site data). Dashed horizontal line at 0.7 fish/m2 in graph indicates approximate full seeding level (see Rodgers 2000).

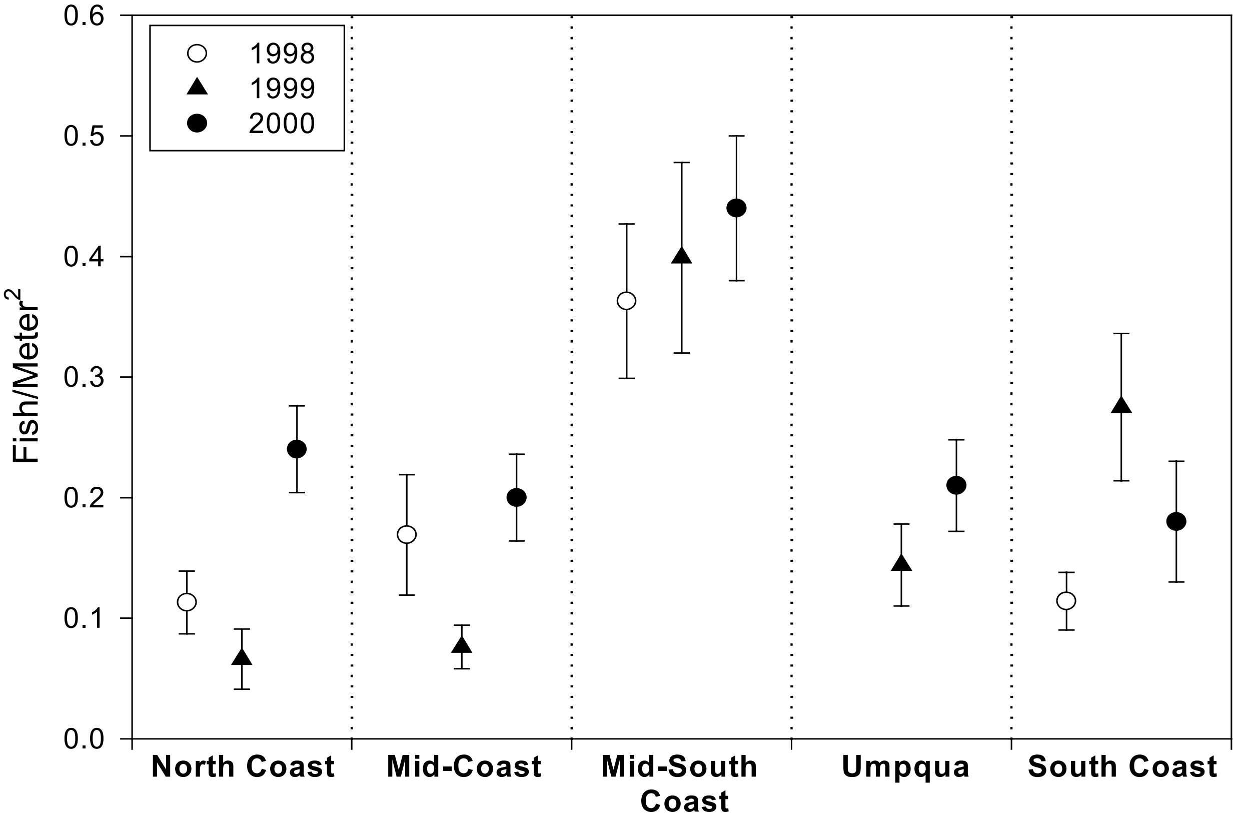

Figure 19. Density (mean and standard error) of juvenile coho for each GCA, 1998-2000. No sampling was conducted in the Umpqua in 1998.

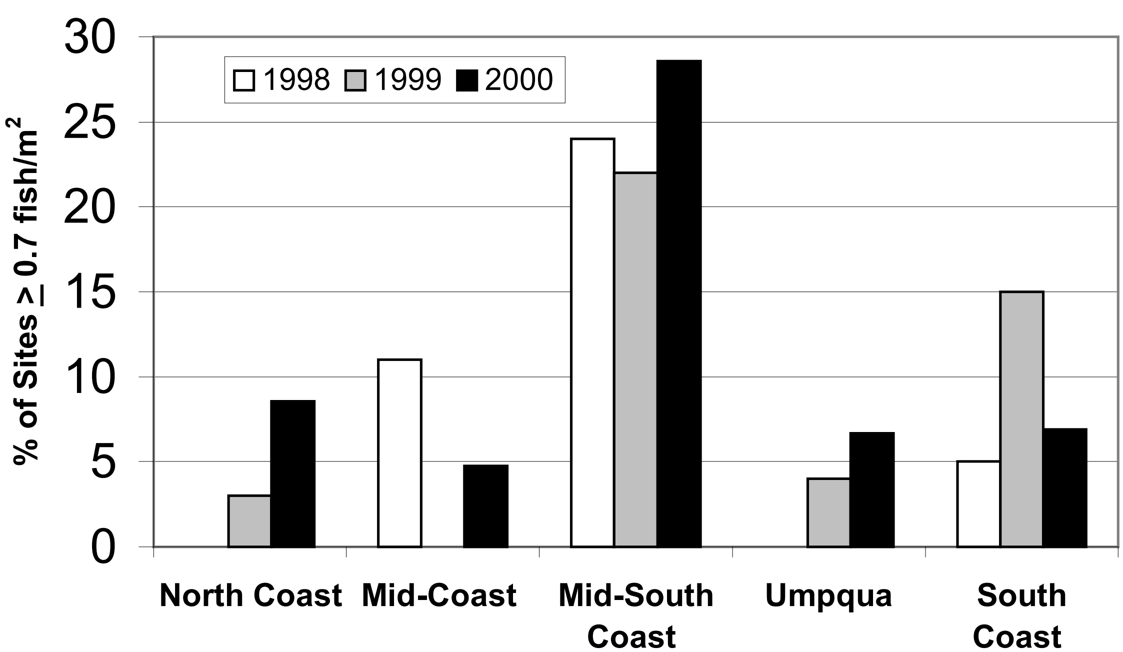

Figure 20. Percent of sites with an average density > 0.7 fish/m^2 for each GCA. 1998-2000. No sampling was conducted in the Umpqua in 1998.

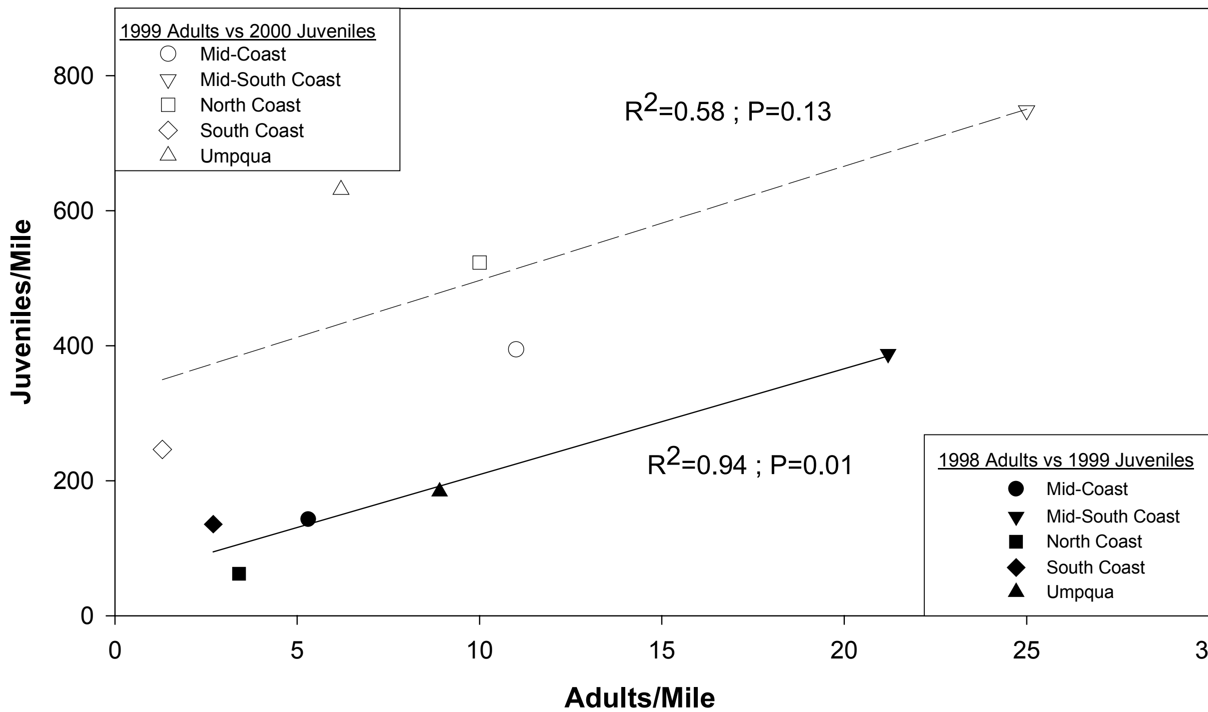

Figure 21. Relationship between number of adults/mile in each GCA in 1998 and 1999 and the number of juveniles/mile the following year.

Chapter 2: Smith River Steelhead Monitoring Verification Study: Results of Juvenile Salmonid Sampling, Summer 2000

Introduction

Historically, the Oregon Department of Fish and Wildlife (ODFW) has used a combination of dam passage counts and angler catch card records to track trends in naturally produced steelhead (Kenaston 1989). In 1992, ODFW restricted the harvest of natural origin steelhead resulting in the loss of catch card data as a way to monitor trends in natural steelhead populations along the Oregon Coast. In 1997, ODFW's Western Oregon Research and Monitoring Program was directed to develop protocols for monitoring coastal salmonid populations, including new ways to track trends in coastal steelhead populations.

In 1998, after a review of published and unpublished information, pilot studies were begun to evaluate various survey methods for adult steelhead. The focus of these pilot studies was to compare survey counts of redds and live adults to known numbers of steelhead spawners above adult counting stations. While the results of these pilot studies showed a good relation between redd counts and the known population of adults (Susac and Jacobs 1999), two major questions exist about the utility of steelhead redd counts as a way to monitor steelhead populations coast wide. First, these pilot studies were conducted in small streams where the probability of observing individual redds may be higher than in larger river systems. Second, the protracted spawning period and widespread spawning distribution of winter steelhead in coastal streams may make surveys cost prohibitive.

In developing population health goals for Klamath Mountain Province (KMP) steelhead in southern Oregon, ODFW is using summer electrofishing estimates of juvenile steelhead populations as one index of steelhead population health (Satterthwaite, 2001, Oregon Department of Fish and Wildlife, draft). While monitoring juvenile steelhead has certain advantages over adult surveys, such as not being influenced by adverse winter streamflow conditions and less cost per site sampled, there are also questions about these surveys. Electrofishing estimates can only be conducted in "wadeable" streams. Since, in many river basins, a considerable amount of juvenile steelhead rearing habitat is in the larger, "non-wadeable" river reaches, it is unknown how population estimates conducted in wadeable streams relate to the population as a whole. Also, without knowledge of the relationship between juvenile and adult steelhead numbers, it is difficult to use data on juvenile abundance as a indicator of population health since ultimately, from a genetic standpoint, the number of spawning adults is a major consideration in population health.

The goal of the Smith River Steelhead Monitoring Verification Study is to determine the utility of using spawning surveys and/or juvenile population surveys as a way of monitoring the status of winter steelhead in large river basins. It has three main objectives: 1) estimate the total adult run size of winter steelhead above Smith River Falls using mark-recapture; 2) estimate the number of adult steelhead spawners using redd counts; and 3) estimate the population juvenile steelhead and other salmonids using electrofishing. The purpose of this report is to summarize the results of juvenile salmonid sampling conducted during the summer of 2000. The results of the first year of sampling for objectives 1 and 2 may be found in Jacobs et al. (2001).

Study Area

The location of the study area is shown in Figure 22. The study area begins above a waterfall approximately 48 km from the confluence of Smith River with the Umpqua River. The basin area above the falls is approximately 525 km^2 with approximately 463 km of mainstem and tributary streams at the 1:100,000 map scale.

The climate is Pacific Maritime with portions of the basin receiving up to 250 cm of rain annually, the majority of which falls in November through February. Riparian vegetation is dominated by red alder *Alnus rubra* with an understory of salal *Gaultheria shallon*, sword fern *Polystichum munitum*, and vine maple *Acer circinatum*. Average channel gradient of all sample sites was less than 3%. Active channel widths of sample sites ranged from 1.5 – 11.5 m.

Methods

Study Design

Sites sampled for juvenile salmonids were restricted to wadeable sized streams ($\leq$ 60 km^2 basin area) that occur on a 1:100,000 digital map within the presumed rearing distribution of steelhead above Smith River Falls. The rearing distribution of juvenile steelhead was determined by combining three GIS databases: 1) ODFW's winter steelhead distribution database (Bowers, 2000); 2) ODFW's coho distribution database (Bowers, 2000); and 3) ODFW Salmonid Inventory Project's coho salmon distribution database (Steve Jacobs - ODFW, personal communication). Coho distribution databases were used in addition to the steelhead distribution database because there were a few instances were coho salmon were shown to have a farther upstream distribution than steelhead and it was felt that steelhead should be able to access all areas accessible to coho. Two different coho distribution databases were used because there were slight differences between them, and there was no reasons to assume that one database was more accurate than the other. The spatial extent of the combination of these three databases is shown in Figure 23.

Once the sampling universe was identified, Environmental Monitoring and Assessment Program (EMAP) protocols (Diaz-Ramos et al. 1996) were used to randomly select 30-36 sites per year. To track individual brood years, a four-year rotating panel design (i.e. revisiting sites every four years) was used since the majority of Oregon coastal steelhead are four years old when they return to spawn.

The EMAP site selection process provided the geographic coordinates of each of the candidate sample sites. These points were printed onto topographic maps and loaded into a handheld Geographic Positioning System (GPS). The topo maps were then used to navigate to the approximate location of the sample point, while the GPS was used to find the precise location of the sample point.

Sampling began at the sample point, and continued upstream on a habitat unit by habitat unit basis until a length of stream equal to approximately 20 active channel widths was sampled. Side channels entering the survey were not sampled. Independent population estimates were made of young of the year trout (< 90 mm fork length), juvenile steelhead $\geq$ 90 mm, cutthroat $\geq$ 90 mm, and juvenile coho. Block nets were used at the tail and head of all fast water and pool units so that estimates could be obtained for each habitat unit.

A pass-removal estimate (Armour, et al. 1983) using a minimum of two passes was conducted in all units. Decisions on whether additional passes were necessary were based on the number of fish captured and the reduction in catch from one pass to the next. When 10 or fewer fish were caught on a pass, the next pass needed to have a 50% reduction or another pass was made. When more than 10 fish were captured, the next pass needed to be reduced by 67%. These rules apply independently to all species/age classes. In complex pools, fish captured during the pass-removal estimates were given a small notch in their upper caudal fin and released for a mark-recapture estimate (Armour, et al 1983). Marked fish were distributed throughout the pool so that they could mix with the remaining unmarked fish. Marked fish were given a minimum of one hour to recover in the pool before recapture efforts began. Recapture efforts continued until a minimum of 50% of the released marked fish were recovered.

Fish lengths were measured to the nearest millimeter. All captured trout were measured, as were 50 coho from each site. A species identification was made for all measured trout regardless of size, with the category “unknown trout” used for smaller trout that could not be field identified to species.

Habitat type was classified using ODFW’s Aquatic Inventory definitions for pools, glides, riffle/rapids, and dry stream channels (Moore et al. 1997). We measured the length (to nearest 0.1m) for all habitat units as well as the average width (to nearest 0.1m) and maximum depth (to nearest cm) of all wetted units. For all wetted habitat units, we also estimated substrate composition using the following categories: 1) silt and fine organic matter; 2) sand; 3) gravel (2-64mm); 4) cobble (64-256mm); 5) boulders (>256mm); and 6) bedrock, and counted the number of boulders ≥ one meter in diameter that were in or touching the wetted channel.

Data Analysis

The total population of each species/age class of salmonid present at a sample site was determined by summing the individual population estimates for all the habitat units sampled at a site. This total estimated population was then divided by the sum of the lengths of all habitat units in the survey (both wet and dry) to obtain the number of fish per meter of stream channel. To obtain an estimate of the total population of fish in our sampling universe (wadeable streams above Smith River Falls within the presumed rearing distribution of steelhead), we multiplied the average number of fish/meter for all sites by the total length of stream channels in our sampling universe (338.4 km). The 95% confidence interval around each species/age class population estimate was determined using a statistical analysis outlined by (Stevens, 2001, Dynamic Corporation, draft).

Results

The physical characteristics of the sites sampled for juvenile salmonid abundance in Smith River during the summer of 2000 are shown in Figures 24 – 28. A total of 3,299 meters of stream channel was sampled of which 321 meters were dry. Three sites were completely dry, 13 sites had greater than 50% pool habitat, and 10 sites had greater than

50% riffle/rapid habitat. Average wetted channel width ranged from 0 m at the three completely dry sites to 7.9 m. No maximum water depths were measured over 80 cm. Bedrock substrate dominated 10 sites, silt/sand 9 sites, and gravel/cobble/boulder 15 sites.

Figures 29 - 32 show the spatial abundance of juvenile salmonids in the Smith River study area in the summer of 2000. Age 0+ trout and 1+ cutthroat were the most widespread, both occurring at 79% of the sites. Juvenile coho were found at 59% of the sites. Age 1+ steelhead were the least widespread, occurring at only 38% of the sites.

Length frequency histograms for each species are shown in Figures 33 - 36. Juvenile coho averaged 70mm, 1+ steelhead averaged 121 mm, 1+ cutthroat averaged 125mm, and 0+ trout averaged 58 in fork length. For 0+ trout $\geq$ 60mm, 61% were identified as steelhead, 32% as cutthroat, and 7% as unknown. The spatial pattern of the 0+ trout speciation is shown in Figure 37.

Overall, in the "wadeable" stream reaches that comprised our sampling universe, juvenile coho were the most abundant, followed in order by 0+ trout, 1+ cutthroat, and 1+ steelhead (Table 7). The population estimate was least accurate for 1+ steelhead and most accurate for 0+ trout, reflecting the relative high amount of between site variability for 1+ steelhead as compared to 0+ trout. The relatively sparse occurrence of +1 steelhead suggests that many older age juvenile steelhead may be rearing outside of the wadeable stream sampling universe of this study. Snorkel surveys will be conducted in the summer of 2001 in the "non-wadeable" stream reaches above Smith River Falls to ascertain if this is the case. This additional sampling will also be evaluated over the long term to see which monitoring method (electroshocking in wadeable streams or snorkeling throughout the rearing distribution of 1+ steelhead) provides the best trend information of the status of steelhead in Smith River.

Table 7. Estimated population size, 95% confidence interval, and percentage that the confidence interval is of the population estimate of juvenile steelhead, coho, 0+ trout, and cutthroat trout in the Smith River study area.

Species	**1+ Steelhead**	**Coho**	**0+ Trout**	**1+ Cutthroat**
Population Estimate	9,064	184,959	119,502	28,949
95% Confidence Interval	4,661	74,801	35,821	10,851
Confidence Interval % of Estimate	51	40	30	37

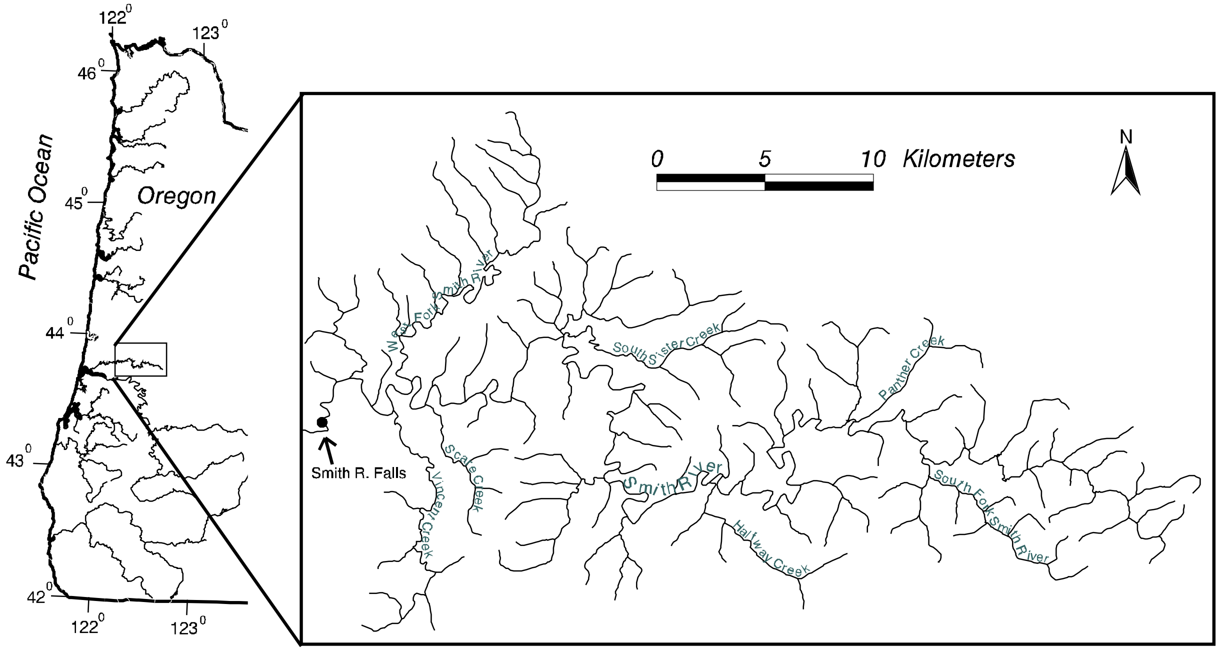

Figure 22. Location of Smith River study area.

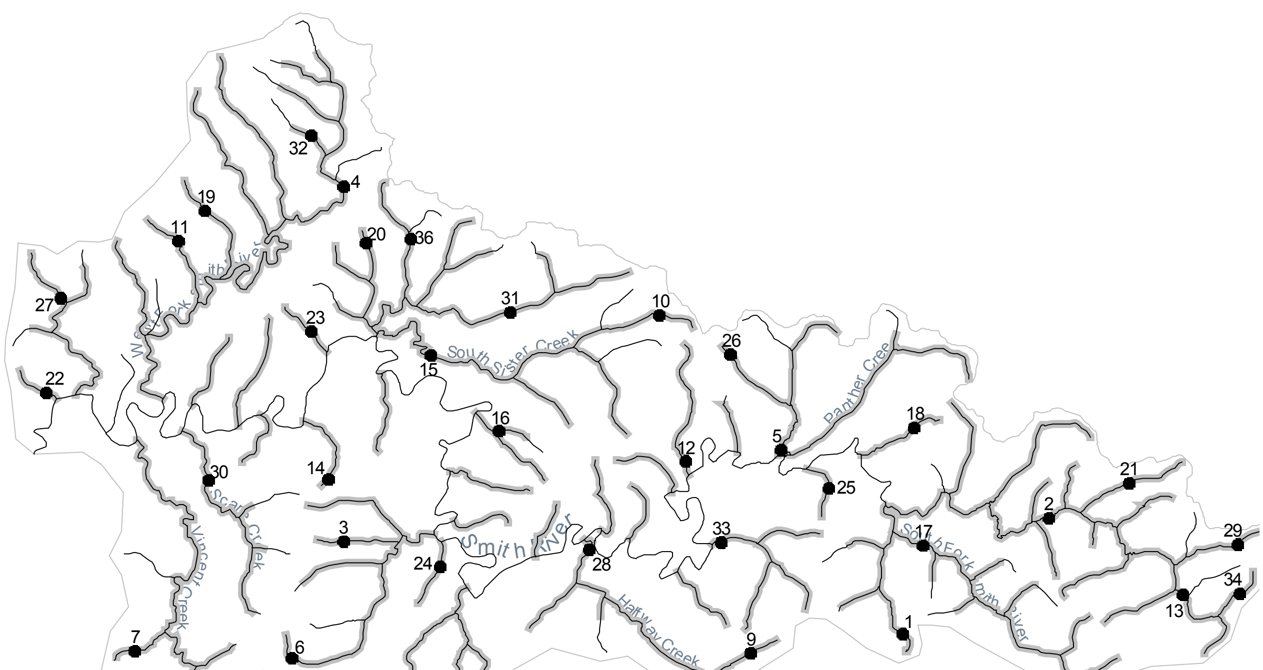

Figure 23. Location of sites sampled for juvenile salmonid abundance, summer 2000. Highlighted areas indicate candidate stream reaches (i.e. wadeable sized streams within the presumed rearing distribution of steelhead). The numbers above the sample points are the site numbers for referencing data in Appendix B.

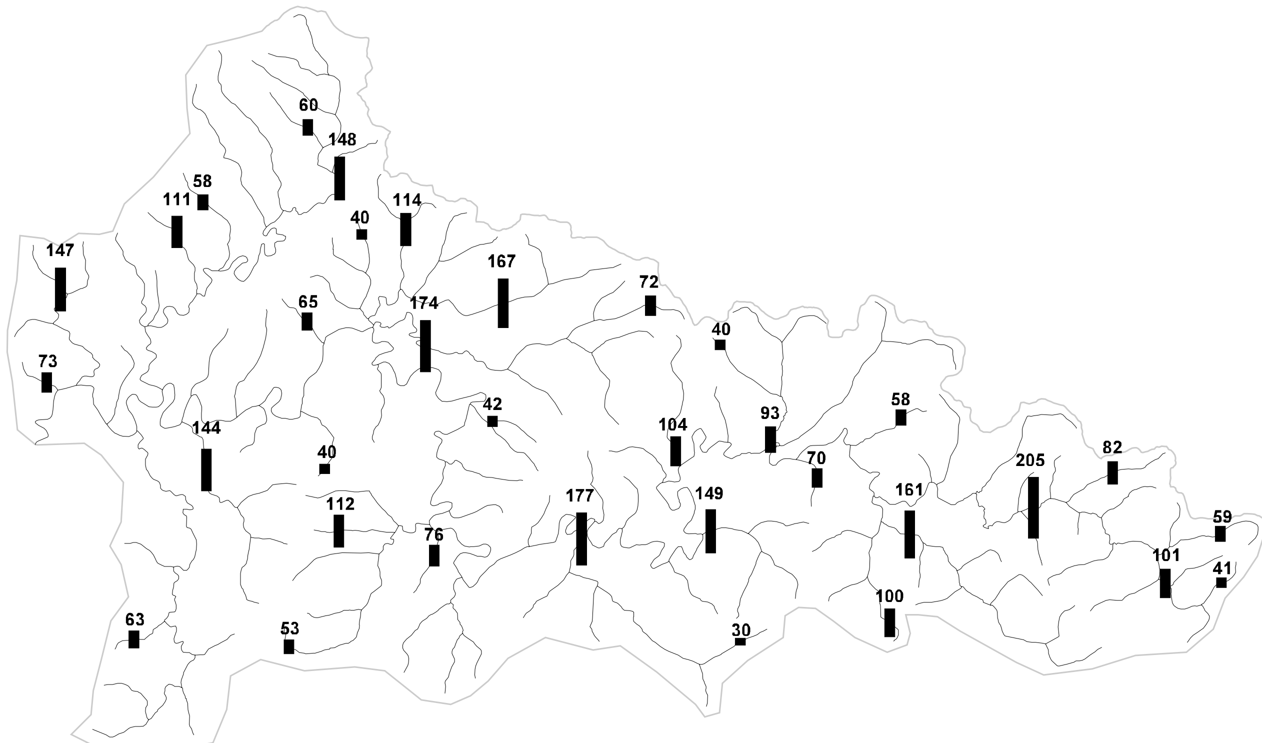

Figure 24. Length of sites sampled during the summer of 2000. Bars indicate the length of the site relative to other sites. The numbers above each bar is the length of the site (in meters).

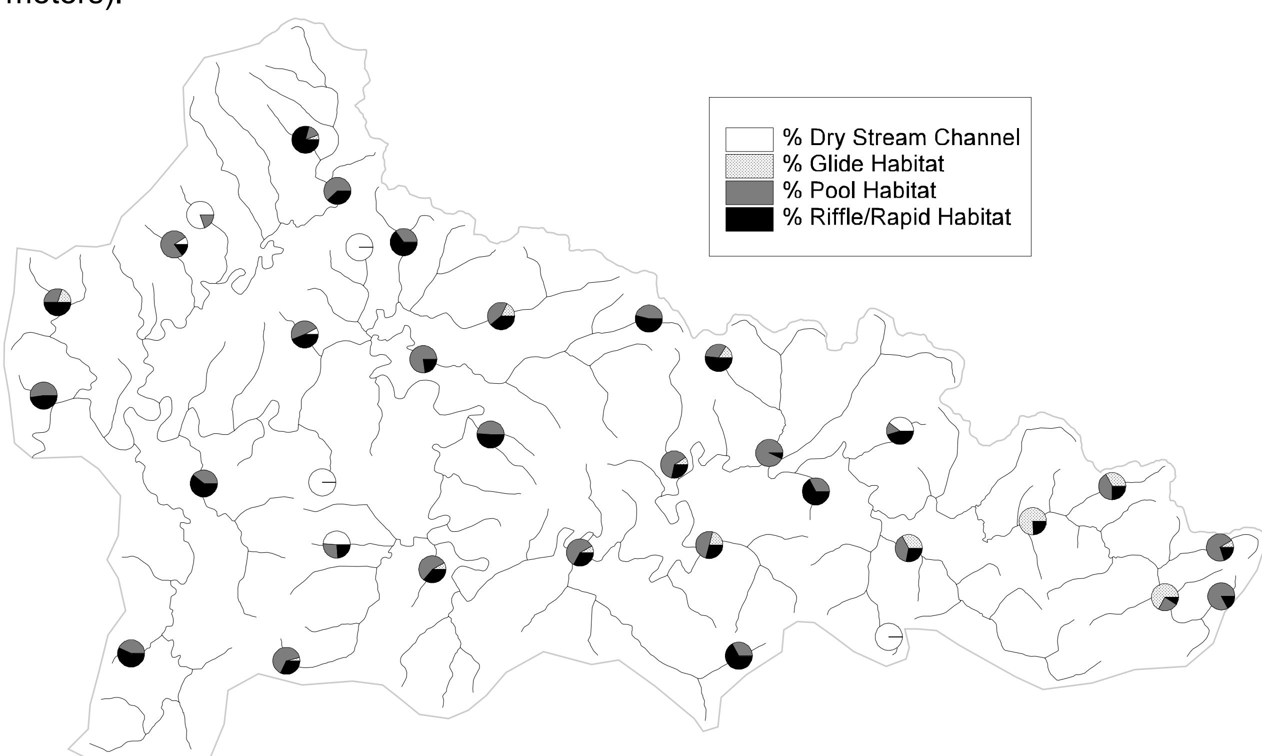

Figure 25. Percentage of the length of each site sampled during the summer of 2000 that was dry stream channel, glide, pool, or riffle/rapid habitat.

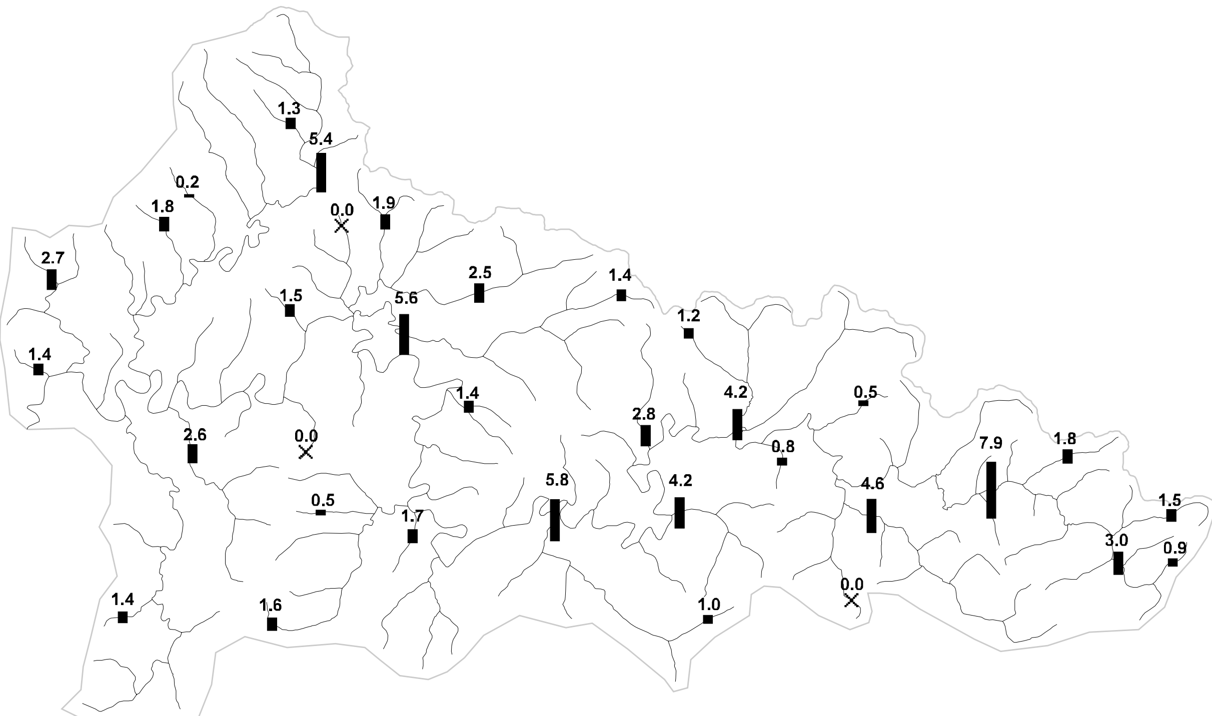

Figure 26. Average wetted width of sites sampled during the summer of 2000. Bars indicate the width of the site relative to other sites. Sites that were completely dry are indicated with an “X”. The number above each bar is the average width of the site (in meters).

Figure 27. Maximum water depth of sites sampled during the summer of 2000. Bars indicate the maximum depth of the site relative to other sites. Sites that were completely dry are indicated with an “X”. The number above each bar is the maximum depth of the site (in centimeters).

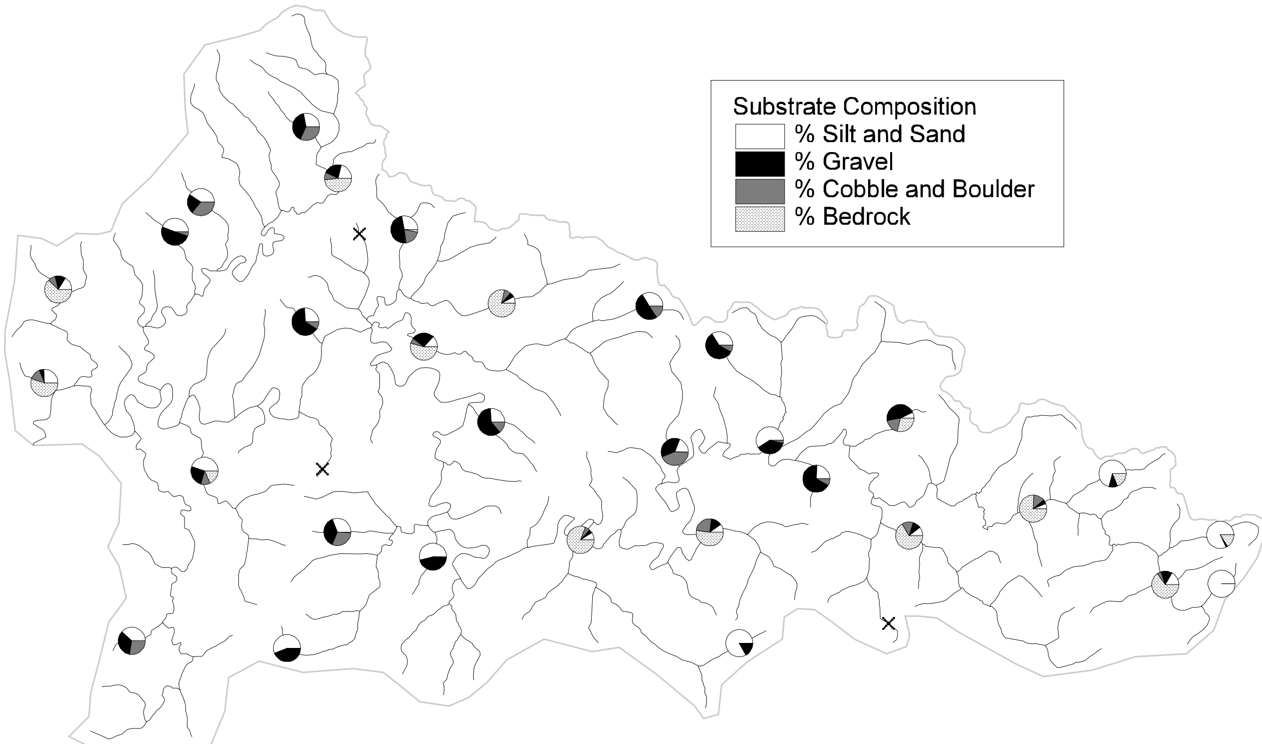

Figure 28. Substrate composition of wetted stream channels at sites sampled during the summer of 2000. Sites that were completely dry are indicated with an “X”.

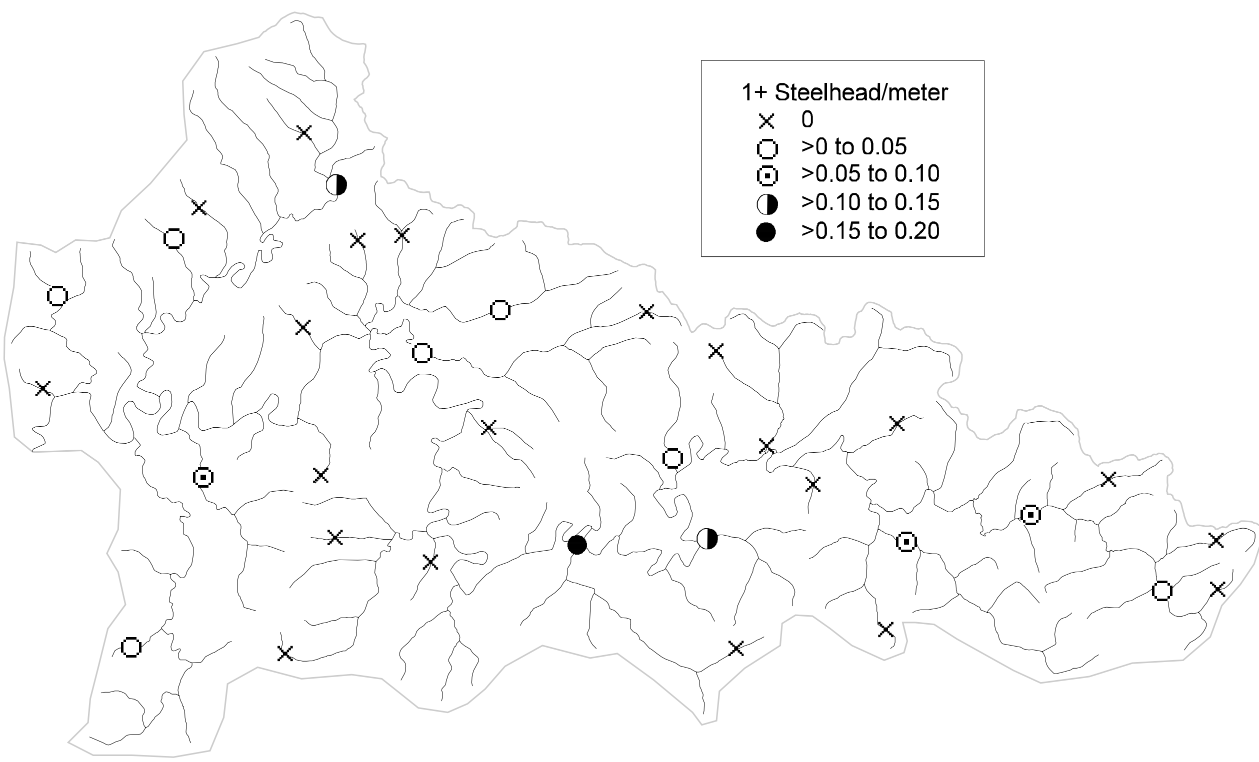

Figure 29. Number of juvenile steelhead (>90mm fork length) per meter of stream at each site sampled during the summer of 2000.

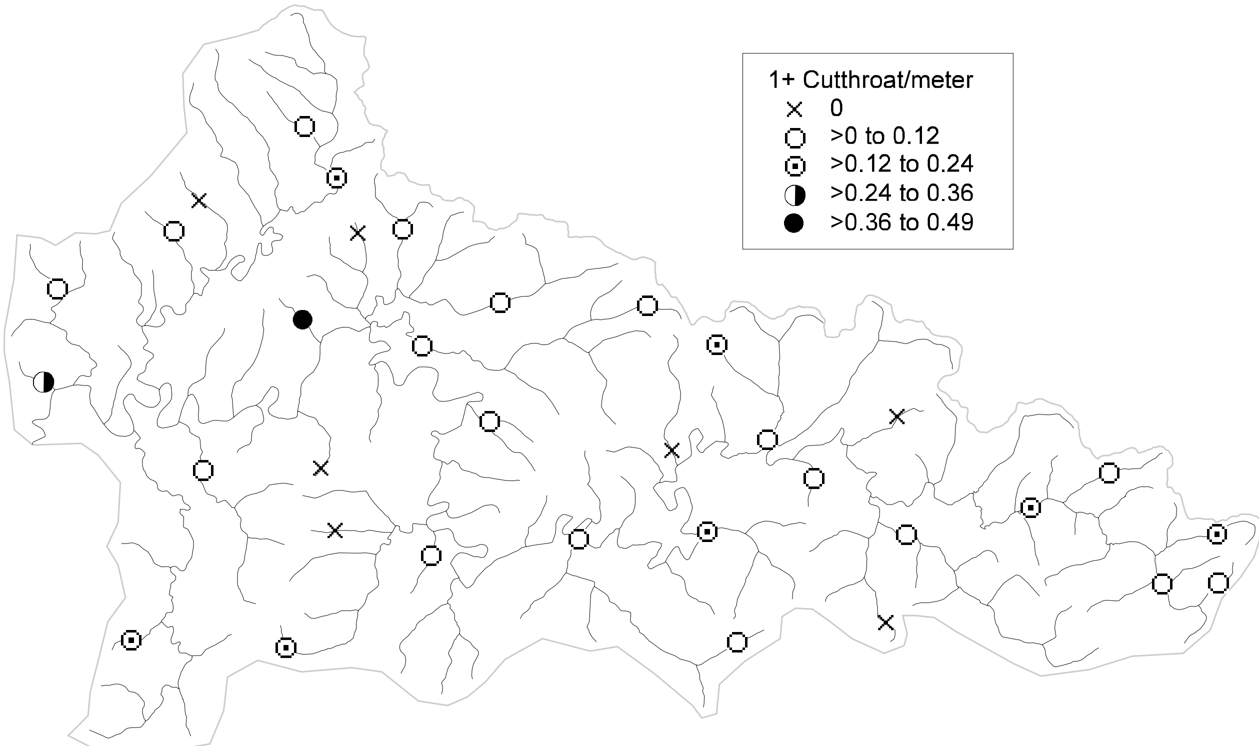

Figure 30. Number of cutthroat trout (>90mm fork length) per meter of stream at each site sampled during the summer of 2000.

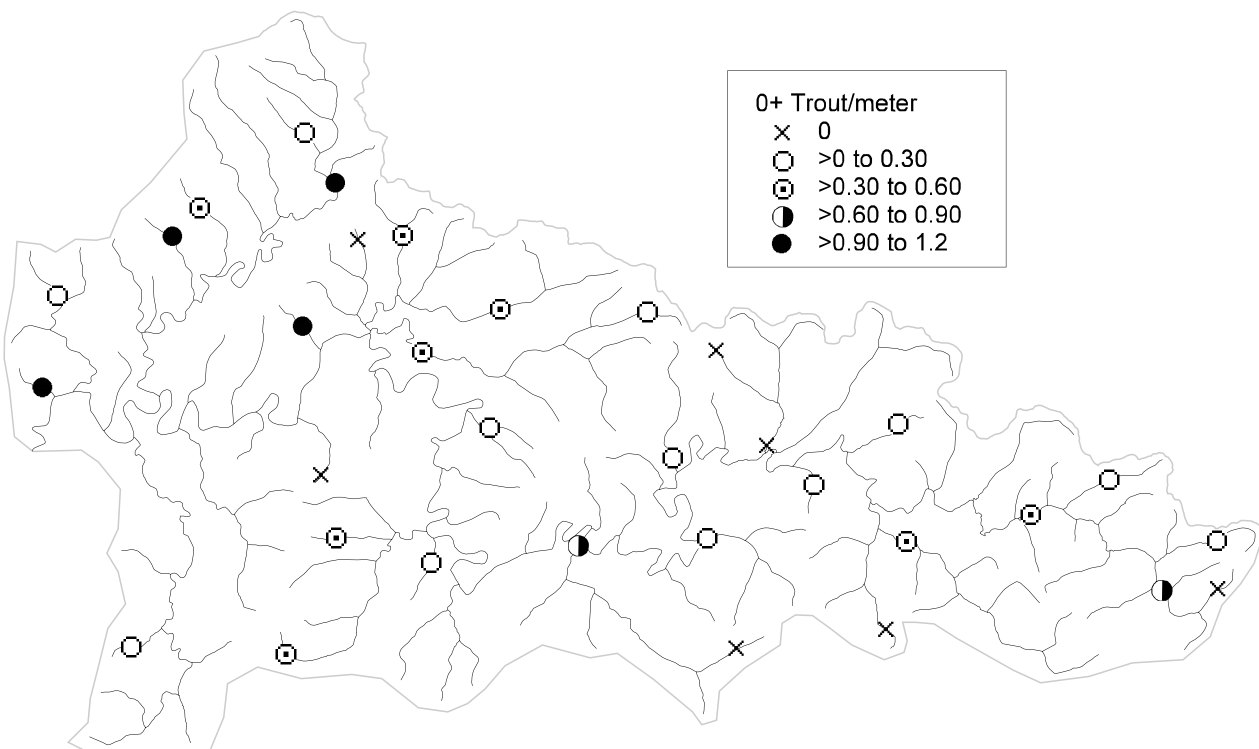

Figure 31. Number of 0+ trout (<90mm fork length) per meter of stream at each site sampled during the summer of 2000.

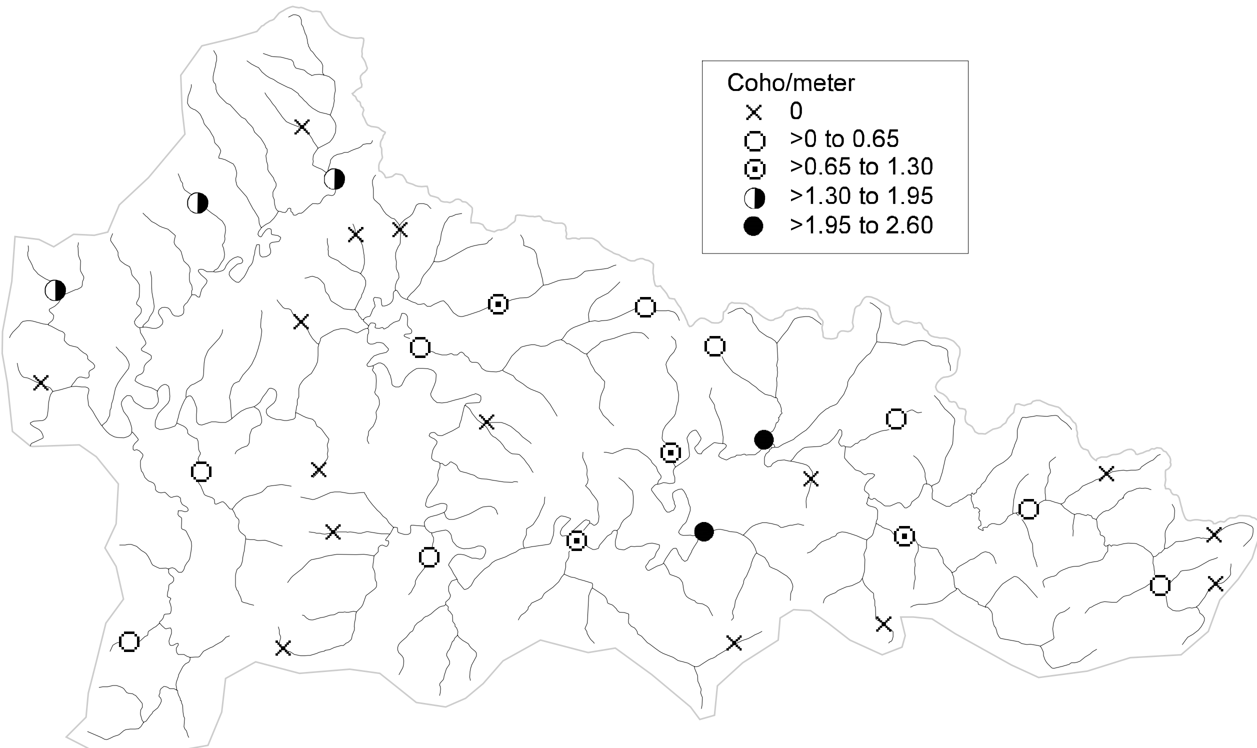

Figure 32. Number of juvenile coho per meter of stream at each site sampled during the summer of 2000.

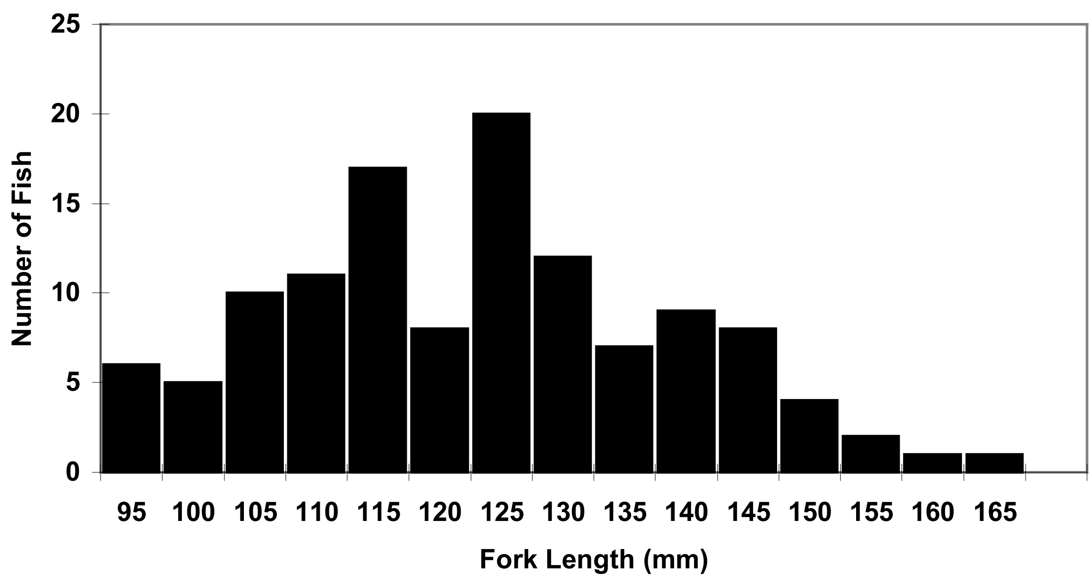

Figure 33. Length frequency (in 5 mm increments) of 1+ steelhead at sites sampled in Smith River, 2000.

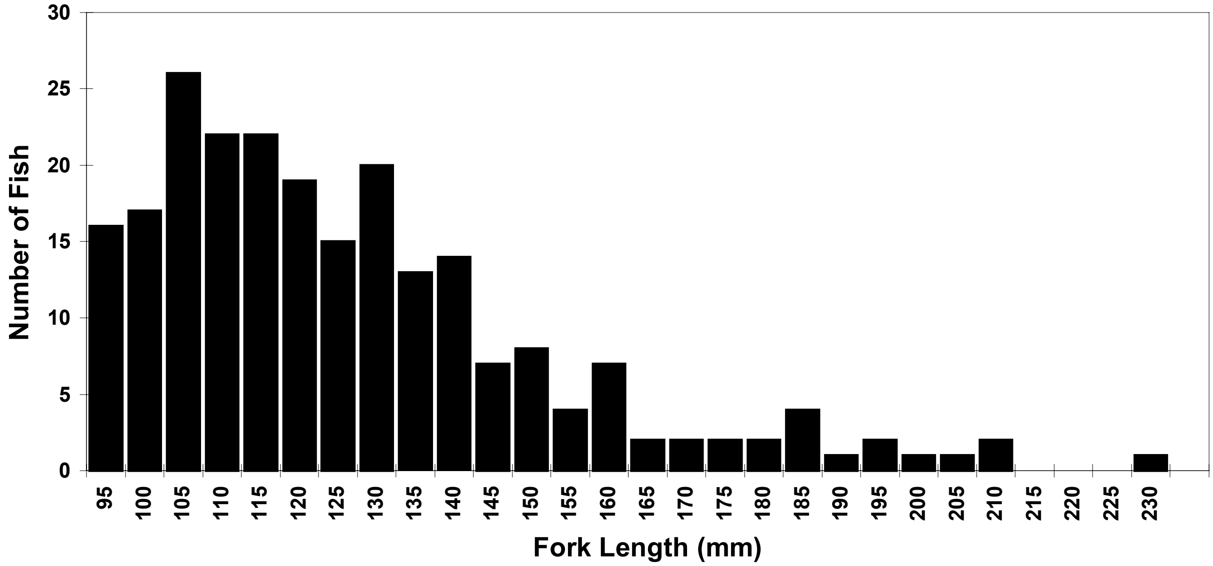

Figure 34. Length frequency (in 5 mm increments) of 1+ cutthroat at sites sampled in Smith River, 2000.

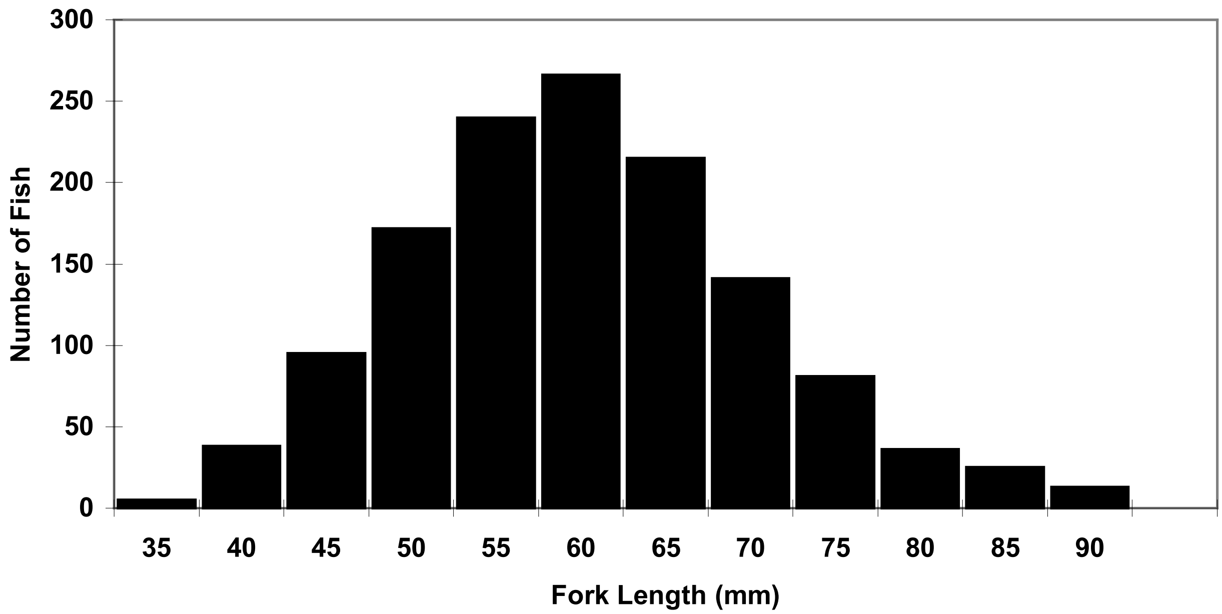

Figure 35. Length frequency (in 5 mm increments) of 0+ trout at sites sampled in Smith River, 2000.

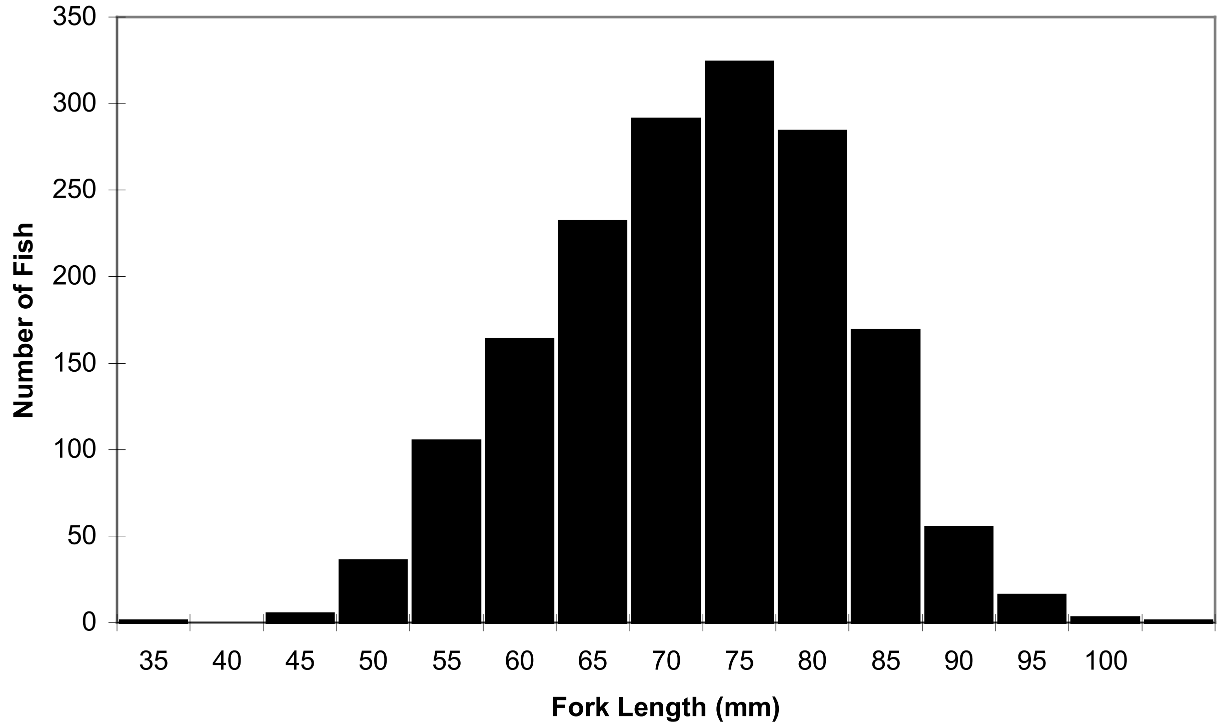

Figure 36. Length frequency (in 5 mm increments) of juvenile coho at sites sampled in Smith River, 2000.

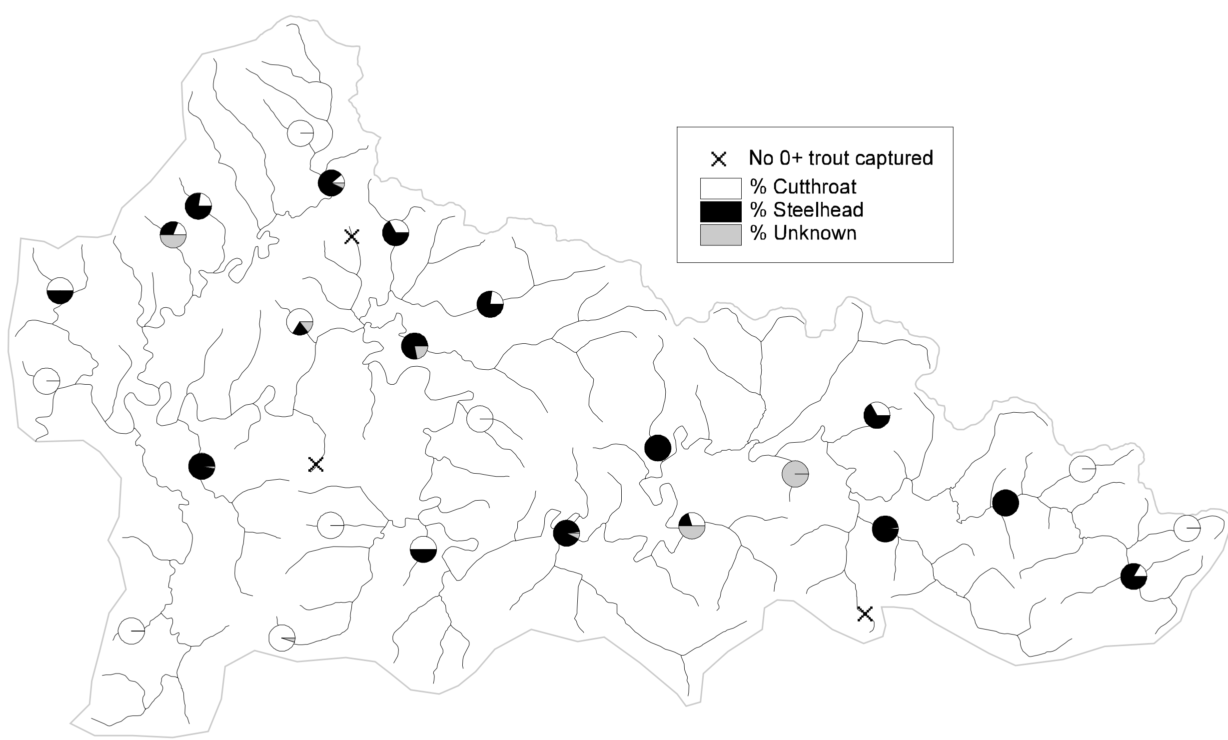

Figure 37. Species composition of 0+ trout ≥ 60 mm fork length at sites sampled in Smith River in 2000.

References

Armour, C.L., K.P. Burnham, and W.S. Platts. 1983. Field methods and statistical analysis for monitoring small salmonid streams. U.S. Fish and Wildlife Service, Washington, D.C.

Bowers, J. 2000. Oregon Department of Fish and Wildlife salmonid distribution data. Oregon Department of Fish and Wildlife, Portland.

Dias-Ramos, S., D.L. Stevens, Jr., and A.R. Olsen. 1996. EMAP Statistical Methods Manual. Environmental Monitoring and Assessment Program, National Health and Environmental Effects Research Laboratory, Office of Research and Development, Corvallis, Oregon.

Jacobs, S., J. Firman, and G. Susac. 2001. Status of Oregon coastal stocks of anadromous salmonids, 1999-2000. Monitoring Program Report Number OPSW-ODFW-2001-3, Oregon Department of Fish and Wildlife, Portland.

Kenaston, R.K. 1989. Estimated run size of winter steelhead in Oregon coastal streams, 1980-85. Oregon Department of Fish and Wildlife, Information Reports (Fish) 89-1, Portland.

Moore, K.M.S., K.K. Jones, and J.M. Dambacher. 1997. Methods for stream habitat surveys. Oregon Department of Fish and Wildlife, Information Report 97-4, Portland.

National Marine Fisheries Service. 2000. Backpack electrofishing guidelines. National Marine Fisheries Service, Portland, Oregon.

Rodgers, J.D. 2000. Abundance of juvenile coho salmon in Oregon coastal streams: 1998 and 1999. Monitoring Program Report Number OPSW-ODFW-2000-1. Oregon Department of Fish and Wildlife, Portland.

Snedecor, G.W., and W.G. Cochran . 1980. Statistical methods. Iowa State University Press, Ames.

Appendix A Location, sample sizes, average density, and percentage of pools containing juvenile coho at sites sampled in 2000.

GCA	SITE	BASIN NAME, SUBBASIN NAME	REACH	LONGITUDE (DECIMAL DEGREES)	LATITUDE (DECIMAL DEGREES)	NUMBER OF POOLS SAMPLED FOR DENSITY	JUVENILE COHO DENSITY ($FISH/M^2$)	NUMBER OF POOLS SAMPLED FOR PERCENT OCCURRENCE	PERCENTAGE OF POOLS CONTAINING JUVENILE COHO
1-NC	12	TRASK RIVER, SOUTH FORK	BOUNDRY CR	-123.5445	45.35359	30	0.16	30	80
1-NC	98	NESTUCCA RIVER, MAIN STEM AND BAY	ELK CR	-123.5573	45.29957	30	0.91	30	97
1-NC	250	NESTUCCA RIVER, MAIN STEM AND BAY	SANDERS CR (SMITH CR)	-123.8868	45.21462	12	0.04	12	42
1-NC	432	NESTUCCA RIVER, THREE RIVERS	ALDER CR	-123.8019	45.1704	22	0.02	22	45
1-NC	576	TRASK RIVER, MAIN STEM	RAWE CR	-123.6337	45.44271	14	0.00	14	0
1-NC	714	TILLAMOOK RIVER, MAIN STEM	TILLAMOOK R	-123.8309	45.35199	0	-	22	5
1-NC	796	TILLAMOOK RIVER, MAIN STEM	UNNAMED TRIB, KILLAM CR	-123.7601	45.39532	14	0.00	14	7
1-NC	823	TILLAMOOK RIVER, MAIN STEM	KILLAM CR	-123.797	45.39655	26	0.14	26	65
1-NC	895	NESTUCCA RIVER, BEAVER CREEK	E BEAVER CR	-123.8298	45.3115	16	0.02	16	50
1-NC	949	NESKOWIN CREEK, MAIN STEM	SLOAN CR	-123.9092	45.07003	4	0.13	4	50
1-NC	1098	NEHALEM RIVER, MAIN STEM	CRONIN CR, N FK	-123.6183	45.77303	30	0.29	30	70
1-NC	1149	NEHALEM RIVER, MAIN STEM	COW CR	-123.5252	45.86048	4	0.35	4	100
1-NC	1248	NEHALEM RIVER, ROCK CREEK	ROCK CR, S FK	-123.4338	45.77169	12	0.00	12	0
1-NC	1378	NECANICUM RIVER, SOUTH FORK	NECANICUM R, S FK	-123.8468	45.89738	6	0.04	6	33
1-NC	1416	ROVER CREEK, MAIN STEM	NECANICUM R	-123.7261	45.91199	24	0.43	24	96
1-NC	1458	ROVER CREEK, MAIN STEM	KLOOTCHIE CR	-123.8541	45.93796	29	0.09	29	52
1-NC	1481	ROVER CREEK, MAIN STEM	LITTLE MUDDY CR	-123.9436	45.96747	8	0.00	8	0
1-NC	1711	NEHALEM RIVER, NORTH FORK	NEHALEM R, N FK	-123.7618	45.80723	11	0.00	11	0
1-NC	1878	MIAMI RIVER, MAIN STEM	MIAMI R	-123.8158	45.62783	31	0.43	31	100
1-NC	1891	MIAMI RIVER, MAIN STEM	WALDRON CR	-123.8556	45.59171	14	0.00	14	0
1-NC	2050	NEHALEM RIVER, MAIN STEM	FOLEY CR	-123.8384	45.66992	27	0.04	27	52
1-NC	2154	NEHALEM RIVER, MAIN STEM	GILMORE CR	-123.5329	45.96014	11	0.31	11	91
1-NC	2203	NEHALEM RIVER, MAIN STEM	BENEKE CR	-123.5162	46.00563	25	0.00	25	0
1-NC	2226	NEHALEM RIVER, MAIN STEM	LOUISGNOT CR	-123.3968	46.02012	37	0.89	37	100
1-NC	2254	NEHALEM RIVER, MAIN STEM	BENEKE CR	-123.5119	45.99578	21	0.22	21	90
1-NC	2265	NEHALEM RIVER, MAIN STEM	HAMILTON CR	-123.5621	45.97241	24	0.48	24	96
1-NC	2336	NEHALEM RIVER, MAIN STEM	OAK RANCH CR	-123.0868	45.9421	6	0.14	6	67
1-NC	2365	NEHALEM RIVER, MAIN STEM	SAGER CR	-123.4055	45.94554	0	-	18	0
1-NC	2459	NEHALEM RIVER, MAIN STEM	ADAMS CR	-123.2877	46.0256	10	0.00	10	0
1-NC	2484	NEHALEM RIVER, MAIN STEM	FORD CR	-123.2626	46.01073	0	-	32	94
1-NC	2576	NEHALEM RIVER, MAIN STEM	PEBBLE CR	-123.193	45.79825	0	-	24	96
1-NC	2670	NEHALEM RIVER, ROCK CREEK	ROCK CR	-123.2626	45.88365	16	0.00	16	19
1-NC	2720	NEHALEM RIVER, MAIN STEM	OAK RANCH CR	-123.0737	45.93279	27	0.10	27	96
1-NC	2939	WILSON RIVER, MAIN STEM	BEN SMITH CR	-123.5158	45.58581	24	0.81	24	100
1-NC	2943	WILSON RIVER, MAIN STEM	BEN SMITH CR	-123.51	45.58071	24	0.36	24	83
1-NC	3000	WILSON RIVER, DEVIL'S LAKE FORK	WILSON R, DEVIL'S LAKE FK	-123.424	45.61275	14	0.38	14	100
1-NC	3028	WILSON RIVER, DEVIL'S LAKE FORK	DEO CR	-123.3636	45.61299	19	0.65	19	100
1-NC	3064	TRASK RIVER, NORTH FORK	CLEAR CR, #2	-123.4868	45.47431	13	0.32	13	100
1-NC	3079	WILSON RIVER, MAIN STEM	JORDAN CR	-123.4967	45.54923	23	0.49	23	96
2-MC	143	ALSEA RIVER, FIVE RIVERS	ALDER CR	-123.8231	44.28655	27	0.10	27	52

Appendix A (continued).

GCA	SITE	BASIN NAME, SUBBASIN NAME	REACH	LONGITUDE (DECIMAL DEGREES)	LATITUDE (DECIMAL DEGREES)	NUMBER OF POOLS SAMPLED FOR DENSITY	JUVENILE COHO DENSITY (FISH/M^2)	NUMBER OF POOLS SAMPLED FOR PERCENT OCCURRENCE	PERCENTAGE OF POOLS CONTAINING JUVENILE COHO
2-MC	162	ALSEA RIVER, FIVE RIVERS	CRAB CR	-123.8493	44.26123	34	0.43	34	100
2-MC	165	ALSEA RIVER, FIVE RIVERS	CRAB CR	-123.8326	44.26439	43	0.41	43	95
2-MC	220	SIUSLAW RIVER, LAKE CREEK	ROGERS CR	-123.8854	44.15933	38	0.12	38	92
2-MC	295	SIUSLAW RIVER, LAKE CREEK	BUCK CR	-123.687	44.19705	14	0.14	14	43
2-MC	333	SIUSLAW RIVER, LAKE CREEK	NELSON CR	-123.5641	44.11697	27	0.69	27	96
2-MC	374	ALSEA RIVER, SOUTH FORK	ALSEA R, S FK	-123.5506	44.33763	40	0.01	40	58
2-MC	390	ALSEA RIVER, MAIN STEM AND BAY	ALSEA R	-123.6649	44.38085	7	0.00	7	0
2-MC	411	ALSEA RIVER, NORTH FORK	CROOKED CR	-123.5371	44.42562	27	0.17	27	93
2-MC	424	ALSEA RIVER, NORTH FORK	HONEY GROVE CR	-123.5555	44.38569	21	0.00	21	5
2-MC	520	SIUSLAW RIVER, MAIN STEM	JEANS CR	-123.4551	43.8656	8	0.33	8	63
2-MC	547	SIUSLAW RIVER, MAIN STEM	BEAR CR	-123.5108	43.85583	35	0.57	35	97
2-MC	609	SIUSLAW RIVER, MAIN STEM	CLAY CREEK	-123.5659	43.90408	15	0.49	15	100
2-MC	636	SIUSLAW RIVER, MAIN STEM	ESMOND CR	-123.6426	43.926	19	0.03	19	84
2-MC	748	SIUSLAW RIVER, NORTH FORK	CONDON CR	-123.9838	44.08586	35	0.49	35	100
2-MC	769	SIUSLAW RIVER, NORTH FORK	UNCLE CR	-124.0042	44.08282	31	1.01	31	100
2-MC	826	TENMILE CREEK, MAIN STEM	MILL CR	-124.0691	44.20784	10	0.00	10	0
2-MC	839	SIUSLAW RIVER, MAIN STEM	CLEVELAND CR	-123.8392	44.07096	20	0.00	20	0
2-MC	935	SIUSLAW RIVER, LAKE CREEK	CHAPPELL CR	-123.6952	44.11334	6	0.00	6	0
2-MC	1026	YAQUINA RIVER, ELK CREEK	SPOUT CR	-123.6859	44.55204	38	0.32	38	92
2-MC	1028	YAQUINA RIVER, ELK CREEK	ELK CR	-123.691	44.53603	21	0.02	21	71
2-MC	1076	YAQUINA RIVER, LITTLE ELK CREEK	OGLESBY CR	-123.7259	44.63809	21	0.41	21	52
2-MC	1174	SILETZ RIVER, MAIN STEM	CEDAR CR	-123.8492	44.8622	10	0.00	10	0
2-MC	1238	SILETZ RIVER, MAIN STEM	SAM CR	-123.8347	44.72863	21	0.00	21	29
2-MC	1244	SILETZ RIVER, MAIN STEM	CERINE CR	-123.7797	44.75658	35	0.03	35	49
2-MC	1247	SILETZ RIVER, MAIN STEM	MILL CR, N FK	-123.7582	44.76634	38	0.42	38	100
2-MC	1352	YAQUINA RIVER, MAIN STEM AND BAY	OLALLA CR, TRIB A	-123.9137	44.65118	13	0.29	13	69
2-MC	1386	SALMON RIVER, MAIN STEM AND BAY	CROWLEY CR	-123.9848	45.0484	15	0.01	15	7
2-MC	1402	SILETZ RIVER, DRIFT CREEK	WILDCAT CR	-123.8889	44.89871	33	1.10	33	70
2-MC	1447	SALMON RIVER, MAIN STEM AND BAY	SALMON R	-123.7863	45.04724	37	0.30	37	95
2-MC	1463	CUMMINS CR, MAIN STEM	CUMMINS CR	-124.0623	44.26709	44	0.00	44	9
2-MC	1567	YAQUINA RIVER, ELK CREEK	BEAR CR	-123.8332	44.59233	38	0.02	38	34
2-MC	1605	YAQUINA RIVER, MAIN STEM AND BAY	MILL CR	-123.8981	44.58091	32	0.15	32	91
2-MC	1662	TENMILE CREEK, MAIN STEM	WILDCAT CR	-123.9704	44.22456	40	0.13	40	75
2-MC	1670	SIUSLAW RIVER, LAKE CREEK	DEADWOOD CR	-123.7576	44.12701	24	0.01	24	17
2-MC	1769	SIUSLAW RIVER, WOLF CREEK	WOLF CR	-123.5257	43.94005	18	0.00	18	6
2-MC	1813	SIUSLAW RIVER, MAIN STEM	SIUSLAW R	-123.6073	43.93005	12	0.00	12	0
2-MC	1876	BIG CREEK, MAIN STEM & SFK	BIG CR	-124.1058	44.17071	37	0.00	37	19
2-MC	1907	SIUSLAW RIVER, LAKE CREEK	DEADWOOD CR	-123.7447	44.1307	20	0.00	20	5
2-MC	1983	SILETZ RIVER, DRIFT CREEK	DRIFT CR	-123.9536	44.89247	21	0.00	21	5
2-MC	2006	YACHATS RIVER, NORTH FORK	YACHATS R, N FK	-123.9768	44.33513	33	0.33	33	82

Appendix A (continued).

SITE	BASIN NAME, SUBBASIN NAME	REACH	LONGITUDE (DECIMAL DEGREES)	LATITUDE (DECIMAL DEGREES)	NUMBER OF POOLS SAMPLED FOR DENSITY	JUVENILE COHO DENSITY ($FISH/M^2$)	NUMBER OF POOLS SAMPLED FOR PERCENT OCCURRENCE	PERCENTAGE OF POOLS CONTAINING JUVENILE COHO
2067	ALSEA RIVER, MAIN STEM AND BAY	CARNS CANYON	-123.7706	44.40022	4	0.00	4	0
46	COOS RIVER, SOUTH FORK	WILLIAMS R	-123.6203	43.19816	29	0.15	29	72
326	FOURMILE CR, MAIN STEM	FOURMILE CR	-124.3316	42.98694	18	0.63	18	94
365	COQUILLE RIVER, NORTH FORK	JERUSALEM CR	-124.0557	43.18767	1	0.00	1	0
509	COQUILLE RIVER, NORTH FORK	HUDSON CR	-124.0029	43.25586	25	0.99	25	100
582	COQUILLE RIVER, NORTH FORK	HUDSON CR	-124.0327	43.24682	35	0.82	35	100
650	COQUILLE RIVER, EAST FORK	ELK CR	-123.999	43.11022	25	0.21	25	80
689	COQUILLE RIVER, NORTH FORK	JOHNS CR	-124.0599	43.07815	13	0.00	13	0
737	COQUILLE RIVER, MIDDLE FORK	ROCK CR	-123.9279	42.94925	48	1.03	48	100
835	COQUILLE RIVER, SOUTH FORK	JOHNSON CR	-124.0779	42.75548	42	0.00	42	0
893	NEW RIVER, MAIN STEM	BUTTE CR	-124.4188	42.95201	3	0.98	4	75
1094	TENMILE CREEK, SOUTH TENMILE LAKE	BENSON CR	-124.0749	43.56281	30	0.80	30	100
1187	COOS RIVER, MAIN STEM	WILLANCH CR	-124.1538	43.41244	42	0.65	42	100
1247	COQUILLE RIVER, NORTH FORK	COQUILLE R, N FK	-123.8901	43.30853	26	0.93	26	100
1319	COOS RIVER, SOUTH FORK	WREN SMITH CR	-124.077	43.32124	19	0.33	19	95
1328	COOS RIVER, SOUTH FORK	DANIELS CR	-124.0805	43.30503	22	0.15	22	73
1331	COQUILLE RIVER, NORTH FORK	COQUILLE R, N FK, TRIB Y	-123.9863	43.3347	0	-	5	0
1385	COOS RIVER, MILLICOMA RIVER	MILLICOMA R, E FK	-123.8746	43.41952	39	0.74	39	95
1426	COOS RIVER, MILLICOMA RIVER	WOODRUFF CR	-124.0098	43.42408	36	0.64	36	89
1526	COQUILLE RIVER, NORTH FORK	STEELE CR	-124.0928	43.20853	0	-	18	100
1757	TAHKENITCH CREEK, FIVEMILE CREEK	FIVEMILE CR	-124.0246	43.83978	0	-	24	100
1761	TAHKENITCH CREEK, FIVEMILE CREEK	BELL CR	-124.0115	43.84135	39	0.53	39	100
1844	SILTCOOS RIVER, MAPLE CREEK	ROACHE CR	-124.0177	43.91369	1	0.38	1	100
1875	SILTCOOS RIVER, FIDDLE CREEK	BILLY MOORE CR	-123.9703	43.88704	6	0.59	6	83
1905	COOS RIVER, SOUTH FORK	WILLIAMS R	-123.6707	43.2377	50	0.85	50	96
1959	COQUILLE RIVER, SOUTH FORK	CATCHING CR	-124.1737	43.02759	0	-	17	94
2080	SIXES RIVER, NORTH FORK	SIXES R, N FK	-124.2166	42.88253	21	0.00	21	0
2149	COQUILLE RIVER, SOUTH FORK	DELTA CR	-124.0155	42.78233	35	0.00	35	0
2207	SIXES RIVER, MAIN STEM	SIXES R	-124.4184	42.81032	9	0.00	9	0
2322	TENMILE CREEK, EEL LAKE	EEL CR	-124.1833	43.58884	30	0.00	30	0
2363	TENMILE CREEK, SOUTH TENMILE LAKE	JOHNSON CR	-124.1009	43.54744	4	0.51	4	100
2438	COOS RIVER, MILLICOMA RIVER	PACKARD CR	-124.0236	43.40479	4	0.28	4	75
37	UMPQUA RIVER, CALAPOOYA CREEK	CALAPOOYA CR	-123.0561	43.47254	12	0.48	12	100
42	UMPQUA RIVER, CALAPOOYA CREEK	COON CR	-123.0531	43.50172	23	0.14	23	91
117	UMPQUA RIVER, SOUTH UMPQUA	BILGER CR	-123.2325	43.09616	2	0.00	2	0
122	UMPQUA RIVER, SOUTH UMPQUA	DEER CR	-123.3416	43.21414	0	-	17	24
694	UMPQUA RIVER, SOUTH UMPQUA	SMITH CR	-123.5347	42.91455	13	0.01	13	15
780	UMPQUA RIVER, SOUTH UMPQUA	BILGER CR	-123.2396	43.08221	0	-	9	0
813	UMPQUA RIVER, SOUTH UMPQUA	DAYS CR	-123.1081	42.98392	22	0.07	22	91
870	UMPQUA RIVER, SOUTH UMPQUA	CANYON CR	-123.2491	42.89834	12	0.00	12	0

Appendix A (continued).

SITE	BASIN NAME, SUBBASIN NAME	REACH	LONGITUDE (DECIMAL DEGREES)	LATITUDE (DECIMAL DEGREES)	NUMBER OF POOLS SAMPLED FOR DENSITY	JUVENILE COHO DENSITY (FISH/M^2)	NUMBER OF POOLS SAMPLED FOR PERCENT OCCURRENCE	PERCENTAGE OF POOLS CONTAINING JUVENILE COHO
891	UMPQUA RIVER, SOUTH UMPQUA	W WILLIS CR	-123.4124	43.04609	0	-	7	57
915	UMPQUA RIVER, SOUTH UMPQUA	WOOD CR	-123.3956	42.78174	29	0.53	29	93
950	UMPQUA RIVER, SOUTH UMPQUA	COW CR, FORTUNE BR	-123.3149	42.77136	25	0.08	25	56
958	UMPQUA RIVER, SOUTH UMPQUA	CLEAR CR	-123.2445	42.7957	0	-	13	77
972	UMPQUA RIVER, SOUTH UMPQUA	BULL RUN CR	-123.2451	42.75681	19	0.17	19	47
995	UMPQUA RIVER, MAIN STEM AND BAY	CHARLOTTE CR	-123.9243	43.65763	24	0.91	24	100
1033	UMPQUA RIVER, MAIN STEM AND BAY	MILLER CR	-124.0228	43.65092	4	0.00	4	0
1034	UMPQUA RIVER, MAIN STEM AND BAY	DRY CR	-124.0575	43.64374	3	0.16	3	33
1094	UMPQUA RIVER, MAIN STEM AND BAY	LITTLE WOLF CR	-123.6126	43.41545	28	0.90	28	100
1113	UMPQUA RIVER, MAIN STEM AND BAY	WOLF CR	-123.6095	43.45645	0	-	27	100
1151	UMPQUA RIVER, MAIN STEM AND BAY	LUTSINGER CR	-123.7177	43.6325	28	0.38	28	89
1156	UMPQUA RIVER, MAIN STEM AND BAY	CAMP CR	-123.7628	43.61906	18	0.02	18	67
1210	UMPQUA RIVER, SMITH RIVER	SPENCER CR	-123.8611	43.81995	28	0.19	28	57
1270	UMPQUA RIVER, SMITH RIVER	BEAVER CR	-123.7475	43.88454	42	0.29	42	95
1311	UMPQUA RIVER, SMITH RIVER	SMITH R, N FK, M FK	-123.8195	43.87548	23	0.42	23	100
1378	UMPQUA RIVER, SMITH RIVER	SCARE CR	-123.7402	43.77484	30	0.39	30	100
1414	UMPQUA RIVER, MAIN STEM AND BAY	HOUSE CR	-123.6302	43.70499	11	0.62	11	73
2054	UMPQUA RIVER, NORTH UMPQUA	HONEY CR	-122.9468	43.3109	20	0.01	20	5
2221	UMPQUA RIVER, NORTH UMPQUA	SUTHERLIN CR	-123.319	43.38253	0	-	14	7
2307	UMPQUA RIVER, SOUTH UMPQUA	SHEILDS CR	-123.6161	43.06569	26	0.08	26	50
2309	UMPQUA RIVER, SOUTH UMPQUA	FALCON CR	-122.5452	42.99346	29	0.00	29	0
2351	UMPQUA RIVER, SOUTH UMPQUA	BURNT CR	-122.8157	42.92635	0	-	3	0
2368	UMPQUA RIVER, SOUTH UMPQUA	BOULDER CR	-122.7816	43.07165	28	0.06	28	64
2414	UMPQUA RIVER, SOUTH UMPQUA	BLACK CANYON CR	-122.6907	42.94533	33	0.00	33	0
2439	UMPQUA RIVER, NORTH UMPQUA	ROCK CR, E FK	-122.8286	43.38052	10	0.00	10	0
2472	UMPQUA RIVER, NORTH UMPQUA	CAVITT CR	-122.9745	43.14641	24	0.00	24	0
2513	UMPQUA RIVER, SOUTH UMPQUA	ANDERSON CR	-122.8799	42.86101	22	0.00	22	0
2525	UMPQUA RIVER, SOUTH UMPQUA	DREW CR	-122.9207	42.88732	38	0.01	38	13
2705	UMPQUA RIVER, SMITH RIVER	SMITH R, N FK	-123.8313	43.88516	25	0.45	25	100
10	ROGUE RIVER, MAIN STEM	GRAVE CR	-123.3017	42.6326	46	0.08	46	74
36	ROGUE RIVER, MAIN STEM	GRAVE CR	-123.1686	42.6994	15	0.00	15	0
53	ROGUE RIVER, MAIN STEM	SUGARPINE CR	-122.6829	42.82947	26	0.15	26	42
62	ROGUE RIVER, MAIN STEM	BITTER LICK CR	-122.6442	42.80962	22	0.27	22	95
68	ROGUE RIVER, MAIN STEM	SUGARPINE CR	-122.6642	42.78071	20	0.38	20	95
122	ROGUE RIVER, BIG BUTTE CREEK	BIG BUTTE CR, N FK	-122.5363	42.55293	20	0.00	20	20
126	ROGUE RIVER, BIG BUTTE CREEK	BIG BUTTE CR, N FK	-122.5585	42.55458	37	0.49	37	92
216	ROGUE RIVER, MAIN STEM	COLD CR	-123.0494	42.66209	17	0.12	17	6
301	ROGUE RIVER, MAIN STEM	TAYLOR CR	-123.5776	42.53432	30	0.01	30	33
309	ROGUE RIVER, MAIN STEM	JUMPOFF JOE CR	-123.4832	42.52352	12	0.00	12	0

Appendix A (continued).

SITE	BASIN NAME, SUBBASIN NAME	REACH	LONGITUDE (DECIMAL DEGREES)	LATITUDE (DECIMAL DEGREES)	NUMBER OF POOLS SAMPLED FOR DENSITY	JUVENILE COHO DENSITY (FISH/M^2)	NUMBER OF POOLS SAMPLED FOR PERCENT OCCURRENCE	PERCENTAGE OF POOLS CONTAINING JUVENILE COHO
349	ROGUE RIVER, MAIN STEM	QUOSATANA CR	-124.2271	42.47614	11	0.00	11	18
362	ROGUE RIVER, LOBSTER CREEK	LOBSTER CR, S FK	-124.208	42.60972	36	0.00	36	11
397	ROGUE RIVER, LOBSTER CREEK	LOBSTER CR	-124.2955	42.51753	10	0.00	10	0
411	ROGUE RIVER, LOBSTER CREEK	LOBSTER CR	-124.2511	42.61146	19	0.00	19	5
415	ROGUE RIVER, LOBSTER CREEK	LOBSTER CR, N FK	-124.2422	42.63403	30	0.00	30	0
465	ROGUE RIVER, ILLINOIS RIVER	WOOD CR	-123.6815	42.07039	22	0.27	22	100
590	ROGUE RIVER, ILLINOIS RIVER	ELK CR	-123.7201	42.00668	24	0.26	24	92
629	ROGUE RIVER, MAIN STEM	SODA CR	-122.5085	42.3526	27	0.01	27	7
722	ROGUE RIVER, MAIN STEM	LOUSE CR	-123.3407	42.49485	13	0.01	13	15
773	ROGUE RIVER, APPLEGATE RIVER	THOMPSON CR	-123.233	42.1585	17	0.00	17	12
793	ROGUE RIVER, ILLINOIS RIVER	DEER CR, S FK	-123.4266	42.23982	50	0.01	50	18
801	ROGUE RIVER, ILLINOIS RIVER	DEER CR, N FK	-123.4452	42.27442	17	1.62	17	100
867	ROGUE RIVER, APPLEGATE RIVER	SLATE CR	-123.5875	42.37444	40	0.09	40	58
869	ROGUE RIVER, APPLEGATE RIVER	WATERS CR	-123.5525	42.37043	18	0.28	18	100
885	ROGUE RIVER, ILLINOIS RIVER	CLEAR CR	-123.6197	42.30673	43	0.00	43	0
914	ROGUE RIVER, ILLINOIS RIVER	CROOKS CR	-123.4996	42.30909	24	0.37	24	100
933	ROGUE RIVER, ILLINOIS RIVER	THOMPSON CR	-123.5275	42.2374	7	0.76	7	100

Appendix B

Estimated number of juvenile salmonids and physical characteristics of sites sampled in Smith River, summer 2000.

Site	Site Length (m)	Wetted Surface Area (m^2)	Average Wetted Width (m)	Number of Coho	Number of Cutthroat (≥ 90mm)	Number of Steelhead ≥ 90mm	Number of 0+ Trout	Dry Channel Length (m)	Total Length of Glides (m)	Glide Surface Area (m^2)	Number of Glides	Total Length of Pools (m)	Pool Surface Area (m^2)	Number of Pools	Total Length of Riffles/ Rapids (m)	Riffle/ Rapid Surface Area (m^2)	Number of Riffle/ Rapids	% Silt/ Sand Wetted Area (m^2)	% Gravel Wetted Area (m^2)	% Cobble/ Boulder Wetted Area (m^2)	% Bedrock Wetted Area (m^2)	Max Water Depth (cm)
1	100.0	0.0	0.0	0	0	0	0	100	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0	0	0
2	205.0	1627.5	7.9	75	27	13	89	0	156.8	1300.4	2	0	0.0	0	48.2	327.1	2	6	5	13	76	48
3	112.3	51.3	0.5	0	0	0	62	55.5	0	0.0	0	29.9	37.5	7	26.9	13.8	3	31	38	30	0	32
4	147.7	798.5	5.4	242	25	22	162	0	0	0.0	0	91.9	568.2	5	55.8	230.3	4	21	22	9	48	80
5	93.0	391.1	4.2	215	7	0	0	0	0	0.0	0	86.7	379.9	4	6.3	11.1	1	59	38	3	0	80
6	53.3	84.5	1.6	0	13	0	22	0	2.1	1.6	1	34.2	60.8	5	17	22.2	4	56	44	0	0	60
7	63.2	85.5	1.4	13	10	2	6	0	0	0.0	0	27.2	33.5	4	36	52.0	3	38	34	28	0	60
9	30.2	30.9	1.0	0	3	0	0	0	0	0.0	0	10	12.4	2	20.2	18.5	2	83	17	0	0	35
10	71.9	97.2	1.4	12	4	0	4	0	0	0.0	0	33.1	63.0	4	38.8	34.3	4	34	50	16	0	55
11	110.9	195.2	1.8	320	8	2	101	10.6	0	0.0	0	95.1	163.2	3	18.5	32.0	2	51	60	6	0	60
12	103.7	289.8	2.8	125	0	3	11	0	9.3	29.1	1	64.9	187.8	4	29.5	72.9	3	19	37	43	0	60
13	101.3	308.9	3.0	28	6	5	76	0	67.9	214.6	4	24.2	78.0	1	9.2	16.3	1	17	13	5	65	35
14	40.0	0.0	0.0	0	0	0	0	40	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0	0	0
15	174.2	982.0	5.6	66	5	4	56	0	0	0.0	0	134.4	790.4	5	39.8	191.6	3	13	27	6	55	67
16	41.6	57.4	1.4	0	5	0	11	0	0	0.0	0	21.9	27.0	4	23.1	30.4	3	29	67	15	0	32
17	160.5	739.0	4.6	117	5	15	74	0	53.5	264.0	2	62.2	358.7	2	44.8	116.4	3	10	10	14	66	53
18	58.3	31.2	0.5	8	0	0	4	23.5	0	0.0	0	9	11.7	1	25.8	19.5	2	7	46	18	28	15
19	57.5	13.1	0.2	93	0	0	34	46.1	0	0.0	0	11.4	13.1	3	0	0.0	0	41	23	36	0	28
20	40.0	0.0	0.0	0	0	0	0	40	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0	0	0
21	82.0	150.9	1.8	0	3	0	15	0	27.1	55.2	2	34.8	71.2	4	19.6	23.4	4	71	10	0	19	40
22	72.7	100.9	1.4	0	25	0	68	0	0	0.0	0	38.1	61.1	4	34.6	39.7	3	26	5	14	55	32
23	65.4	95.4	1.5	0	32	0	78	5	0	0.0	0	31.1	62.2	2	29.3	33.1	3	26	66	9	0	42
24	76.4	130.2	1.7	28	2	0	11	0	6	10.4	1	43	93.6	4	27.4	26.2	4	54	45	1	0	70
25	69.9	57.9	0.8	0	1	0	2	0	0	0.0	0	22.9	31.3	4	47	26.6	5	24	68	8	0	45
26	39.7	47.8	1.2	12	5	0	0	0	6.2	7.0	1	12.8	17.6	3	20.7	23.1	3	34	58	8	0	60
27	147.3	398.2	2.7	277	2	4	27	0	28.8	120.1	2	43.8	93.3	3	74.7	184.7	3	16	13	9	62	40
28	177.2	1021.2	5.8	142	8	33	127	0	15	92.0	1	104	603.7	3	58.2	325.5	2	9	4	6	81	65
29	58.6	85.1	1.5	0	9	0	1	0	5	6.5	1	41.8	63.9	3	11.8	14.8	2	83	2	0	16	55
30	144.2	355.8	2.5	26	3	14	186	0	0	0.0	0	71.1	146.5	2	109.5	209.3	4	60	35	15	24	60
31	167.2	423.5	2.5	162	3	6	54	0	30.9	67.3	3	71.7	221.0	5	64.6	135.2	3	8	6	8	78	40
32	60.3	79.5	1.3	0	5	0	10	0	3.5	5.8	1	9	14.1	2	47.8	59.6	3	28	40	32	0	40
33	148.6	620.6	4.2	322	19	16	44	0	30.5	167.8	1	74.8	320.6	5	43.3	132.2	4	10	13	25	52	70
34	40.9	38.5	0.9	0	5	0	0	0	0	0.0	0	33.9	32.0	2	7	6.5	1	100	0	0	0	80
36	114.0	210.9	1.9	0	5	0	47	0	0	0.0	0	39.7	104.2	4	74.3	106.7	5	28	49	20	2	70