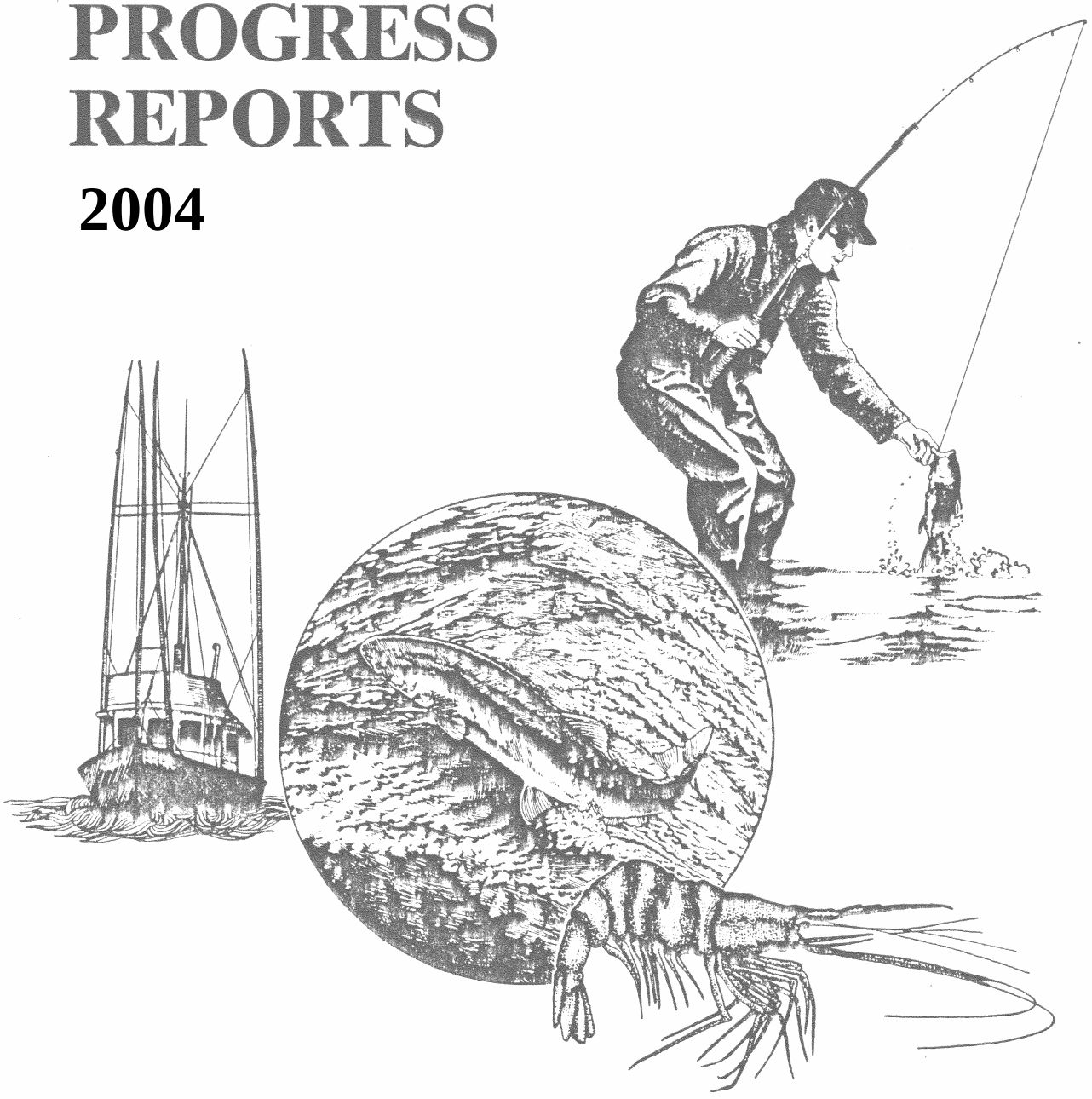
PROGRESS REPORTS

2004



FISH DIVISION

Oregon Department of Fish and Wildlife

Assessment of the status of Nestucca River Adult Winter Steelhead

2004 ASSESSMENT OF THE STATUS OF NESTUCCA RIVER ADULT WINTER STEELHEAD

Nestucca River Native Winter Steelhead Broodstock Monitoring – Adults

Annual Progress Report

August 01, 2005

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ABSTRACT

A spatially balanced stratified random probability design was employed to determine if Nestucca River wild adult winter steelhead (Oncorhynchus mykiss) were sufficiently abundant that the population could withstand removal of wild adults for a wild broodstock collection program. Adult winter steelhead spawning timing, proportion of hatchery adults on the spawning grounds, spawning distribution and abundance were determined for the 2004 spawning year. Steelhead were observed actively spawning from the second week of January through the last week of May. A total of 7 fin-marked hatchery origin adults and 81 non-marked wild adults were observed. Hatchery origin adults made up 8% of the natural spawning population. This rate potentially under estimates the proportion of hatchery adults on the spawning grounds because of possible bias associated with different detection rates between marked and unmarked adults. Spawning steelhead or redds were observed in 34 of the 37 randomly selected stream reaches. Redds were counted at each site over the course of the spawning season. Overall, 1,885 redds were observed. This count expands to a basin wide estimate of 8,379 $\pm$ 1831 redds. The relationship of 1.04 adults per redd obtained at calibration sites along the Oregon Coast was used to convert redd counts to estimates of spawner abundance. It was estimated that 8,700$\pm$ 2,271 wild adult winter steelhead spawned naturally in the Nestucca Basin. It is unlikely that the collection of up to the proposed maximum of 76 wild adult steelhead for the wild broodstock program would have an impact on the natural population.

INTRODUCTION

The Nestucca Basin is noted for its winter steelhead (*Oncorhynchus mykiss)* sport fishery. The basin supports an intense fishery for returning adults from mid November through March. Sport angler catch estimates from salmon-steelhead tag returns from 1980 to 1999 averaged over 5,000 adults. During November through January the fishery relies heavily on adults derived

from hatchery smolt supplementation of non-native Alsea Hatchery stock brood. During February through March the fishery relies mostly on wild adults. In October 2001 Oregon Fish and Wildlife Commission (OFWC) under the guidance of Oregon's Wild Fish Management Policy (ODFW 1992), ordered by rule the transition from the traditional hatchery program using non local Alsea brood stock to one using Nestucca native brood stock. The objective was to reduce genetic risks associated with using the non-native Alsea brood stock and to provide extended angler harvest opportunity through March. The transition is planned to occur over two steelhead generations or about eight years. During the transition, OFWC mandated assessment of potential influences that the change in brood stock may have on the natural winter steelhead population. The Oregon Department of Fish and Wildlife (ODFW) Western Oregon Fish Research and Monitoring Program, was charged with studying the natural spawning and juvenile rearing populations in the Nestucca basin. Studies were initiated in February 2001 to determine if the natural population was sufficiently abundant to allow for the removal of up to 76 wild adults for the wild broodstock program. The first adult returns from the wild broodstock program are not expected to return until 2004-2005. The information collected from 2001 through the spring of 2004 will be used as baseline information for future evaluation of the broodstock program.

This report presents results from 2004 spawning year on Nestucca River adult winter steelhead spawning timing, spawner distribution and abundance. The proportion of hatchery origin steelhead spawning naturally on the spawning grounds is also documented.

See Jepsen (2004) for the juvenile rearing aspects of this study.

Study Area

The Nestucca River is located on the northern Oregon coast. The basin drains the west slope of the coast range in western Yamhill and southern Tillamook counties. It enters the ocean near Pacific City (Figure 1). The basin consists of four major sub drainages, Nestucca main-stem, Little Nestucca, Three Rivers and Beaver Creek. The Nestucca watershed encompasses 180 square miles, and contains 350 linear miles of streams, of which 210 miles are identified as steelhead spawning habitat. Tributary streams account for 163 spawning miles and main stem reaches account for the remaining of 47 miles. Cedar Creek Hatchery is located on Three Rivers approximately three miles upstream from the confluence with the main stem Nestucca.

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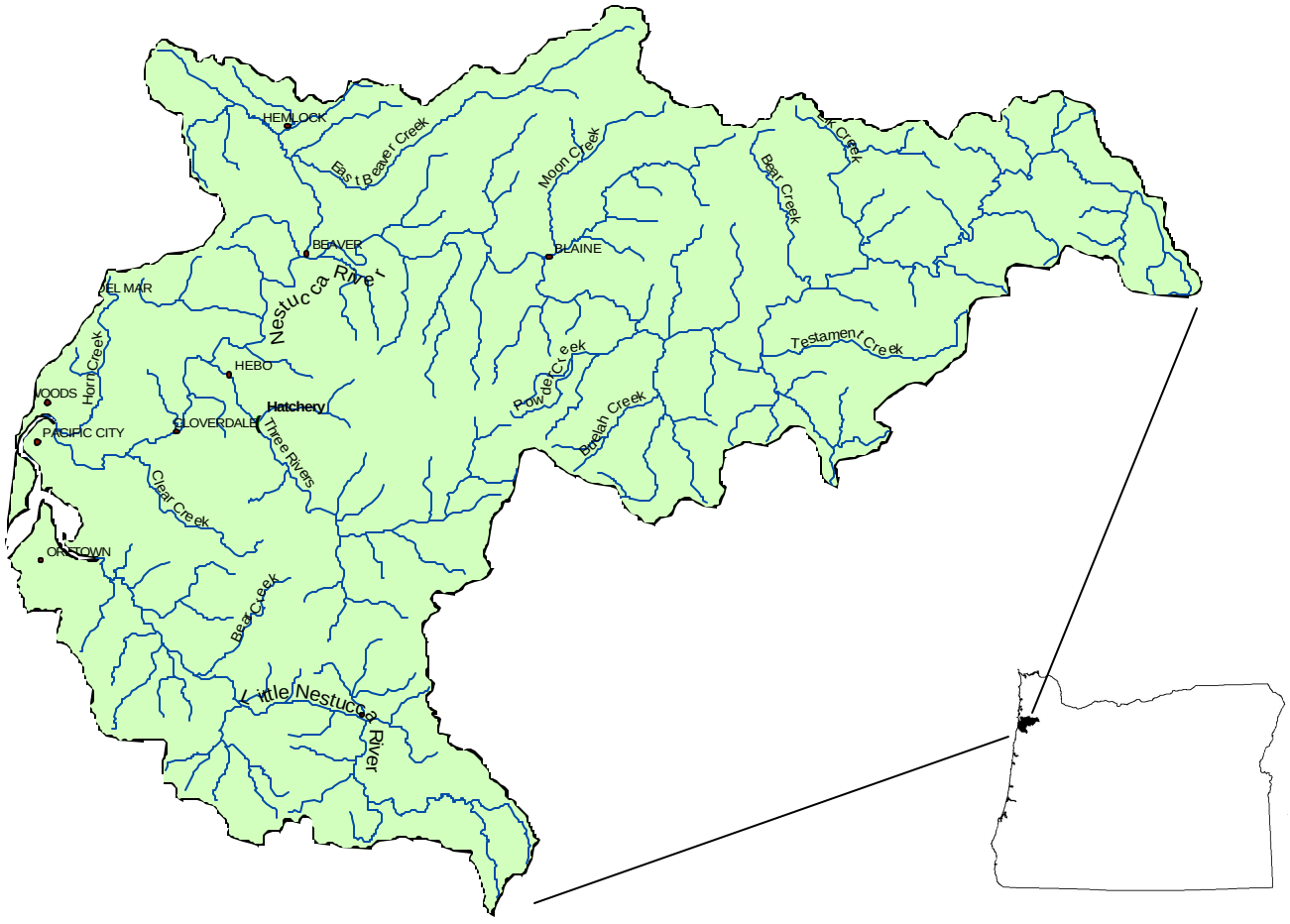

Figure 1. Map of the Nestucca River basin.

METHODS

We used the United States Environmental Protection Agency's Environmental Monitoring Assessment Protocol (EMAP) to select sites from a spatially balanced random sampling design (Stevens 2002) to estimate the spawning timing, distribution and abundance of adult winter steelhead in the Nestucca Basin. Sampling was divided into tributary and main stem strata. The tributary stratum consisted of the sampling frame used to estimate coho spawning in the basin (See Jacobs and Nickelson 1998). The main stem stratum was comprised of streams downstream of coho spawning habitat but upstream from tidal influence. The stream network coverage used for selecting survey sites was based on 1:100,000 digital maps. Some streams known to have spawning habitat were not listed at this scale. We developed a digitized coverage for these streams and added them to the sampling frame. Survey site selection and survey setup followed the procedure described in Jacobs et al. (2002).

A total of 21 tributary (18.0 miles) and 16 main stem (19.5 miles) site surveys were conducted. The number of sites was set to achieve a target precision of the overall redd estimate within $\pm$ 35% (Jacobs and Nickelson1998). Surveys were initiated during the first week of January and continued through the end of May. Survey sites were walked or floated every 7-10 days throughout the spawning season. We used cumulative total redd counts divided by survey mileage as our metric of spawner abundance. Individual redds were flagged and marked, and not recounted on subsequent surveys. Redd identification and tracking methods are described in Susac and Jacobs (1998).

No information exists for the ratio of spawners per redd in the Nestucca basin. We used the equation $y=1.0379x + 42$ where y is the number of adults and x is the number of redds to estimate the number of spawners in the Nestucca basin (Susac 2005).

We estimated the proportion of adults of hatchery origin spawning naturally on the spawning grounds by the observation of adipose fin-clips on spawning and dead adults. In Oregon, all hatchery origin steelhead smolts receive an adipose fin-clip prior to release. Survey

observations of adults were divided into 3 categories: 1) positively adipose intact; 2) positively adipose fin clipped; 3) unknown fin-mark status. The ratio of fin clip / non-clipped were used to estimate the proportion of hatchery fish among natural spawners.

Scales provide baseline information on Nestucca Basin steelhead life history characteristics. Scale samples were taken from all wild origin adult steelhead carcasses collected during the spawning surveys in 2004. Few carcasses were collected during the surveys, so we supplemented the collection with scales taken from wild adults collected for the wild broodstock program.

RESULTS

Spawning Timing

Steelhead spawning activity was observed from the middle of January to end of May and peaked during the first week in April (Figure 2). The cumulative percent of steelhead redds observed at weekly intervals indicate that 20% of the spawning activity occurred prior to the second week of March and 70% of spawning was complete by the third week of April. Spawning time was slightly earlier than observed during the last several years (Susac and Jacobs 2003)

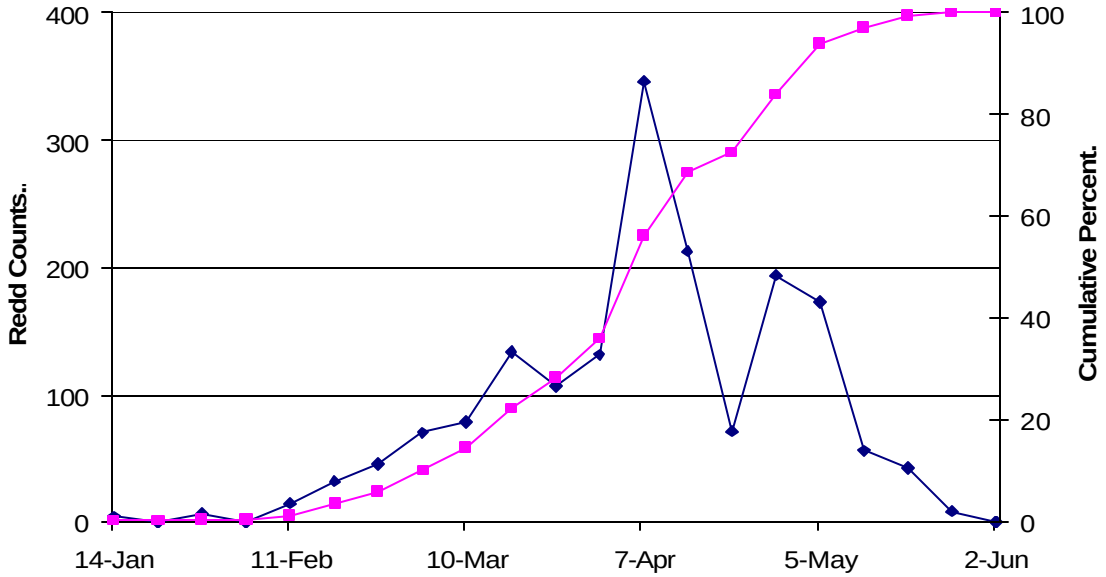

Figure 2. Number and cumulative frequency of new winter steelhead redds observed each week on random spawning surveys in the Nestucca River Basin, 2004.

Detection of Hatchery Spawners

Surveyors observed 384 live steelhead adults during spawning surveys in the Nestucca Basin in 2004. Of these, 88 were seen clearly enough to detect the presence or absence of adipose fin-clips. Seven fin-clipped fish (8.0%) were observed. A total of 17 dead winter steelhead were collected on the spawning grounds. Two (11.8%) were adipose fin-marked. Analysis of the proportions yielded no significant difference between samples (P=0.478). Counts of live adults and carcasses were combined for an overall estimate of 8.5 %. This proportion of hatchery adults on the spawning grounds is slightly higher than the 7.2%, 5.0% and 4.0% observed in 2003, 2002 and 2001 respectively. Figure 3 shows the temporal segregation of marked and unmarked adults. Hatchery adults were scattered throughout the basin (Figure 4), indicating little spatial segregation between hatchery and wild adults. Also note that there is no clustering near the hatchery.

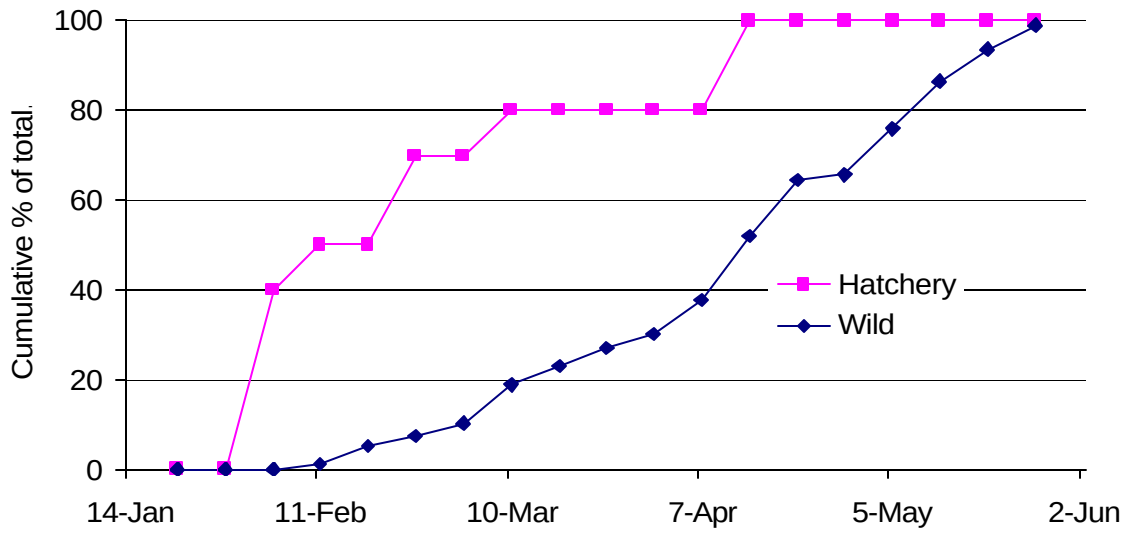

Figure 3. Timing of marked hatchery and non-marked wild adult winter steelhead observed on the Nestucca River during the winter and spring of 2004. Determination of origin was based on visual observation of fin-marks.

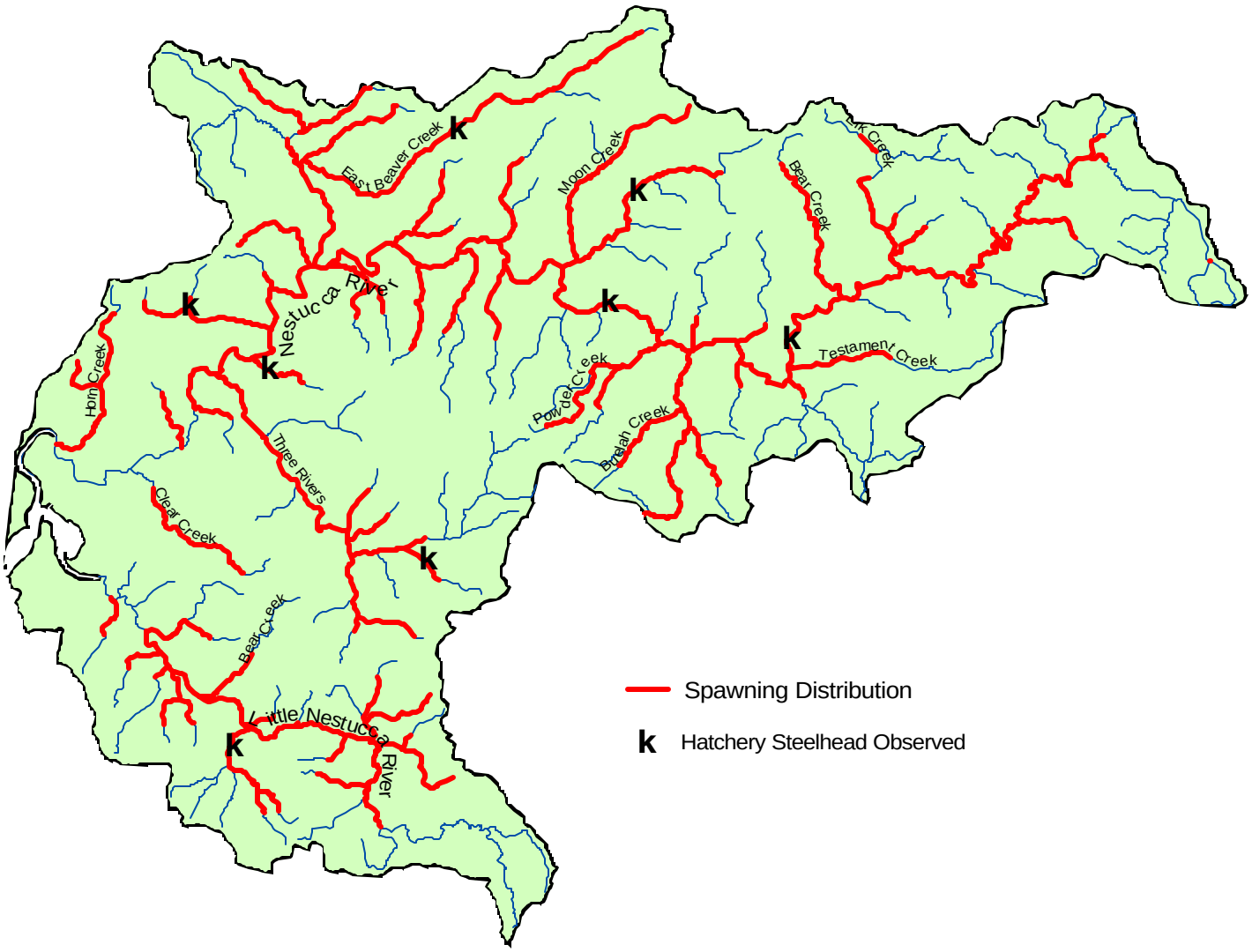

Figure 4. Distribution of hatchery origin winter steelhead in the Nestucca Basin during the 2003-2004 spawning season, based on observation of live adults and carcass recovery.

Spawning Distribution and Abundance

Spawning was well distributed throughout the Nestucca basin. Redds were observed at 34 of the 37 sites surveyed (Figure 5). Of the sites that contained redds, density ranged from 2 to 146 redds per mile. Redd densities exceeded 25 redds per mile in 28 (75.6%) of the sites surveyed. The highest redd density was observed in East Beaver Creek. The redd density in the sites upstream from Testament Creek averaged 78.5 redds per mile. Overall redd density

was higher in the main stem stratum than in the tributary stratum (59.9 versus 39.1 redds/mile). Overall, 1,820 winter steelhead redds were observed in the Nestucca basin in 2004. This expands to a basin total redd estimate of 8,379 ± 1831 (Figure 6). The 95% confidence interval comprised 21.9 % of the estimate. Redd estimates and 95% CI for tributaries and main stem strata as well as a pooled total for the 2004 spawning year area summarized in Table 1. Table 1 also shows the estimated number of spawners and corresponding 95% CI. Data for individual survey sites are listed in Appendix A.

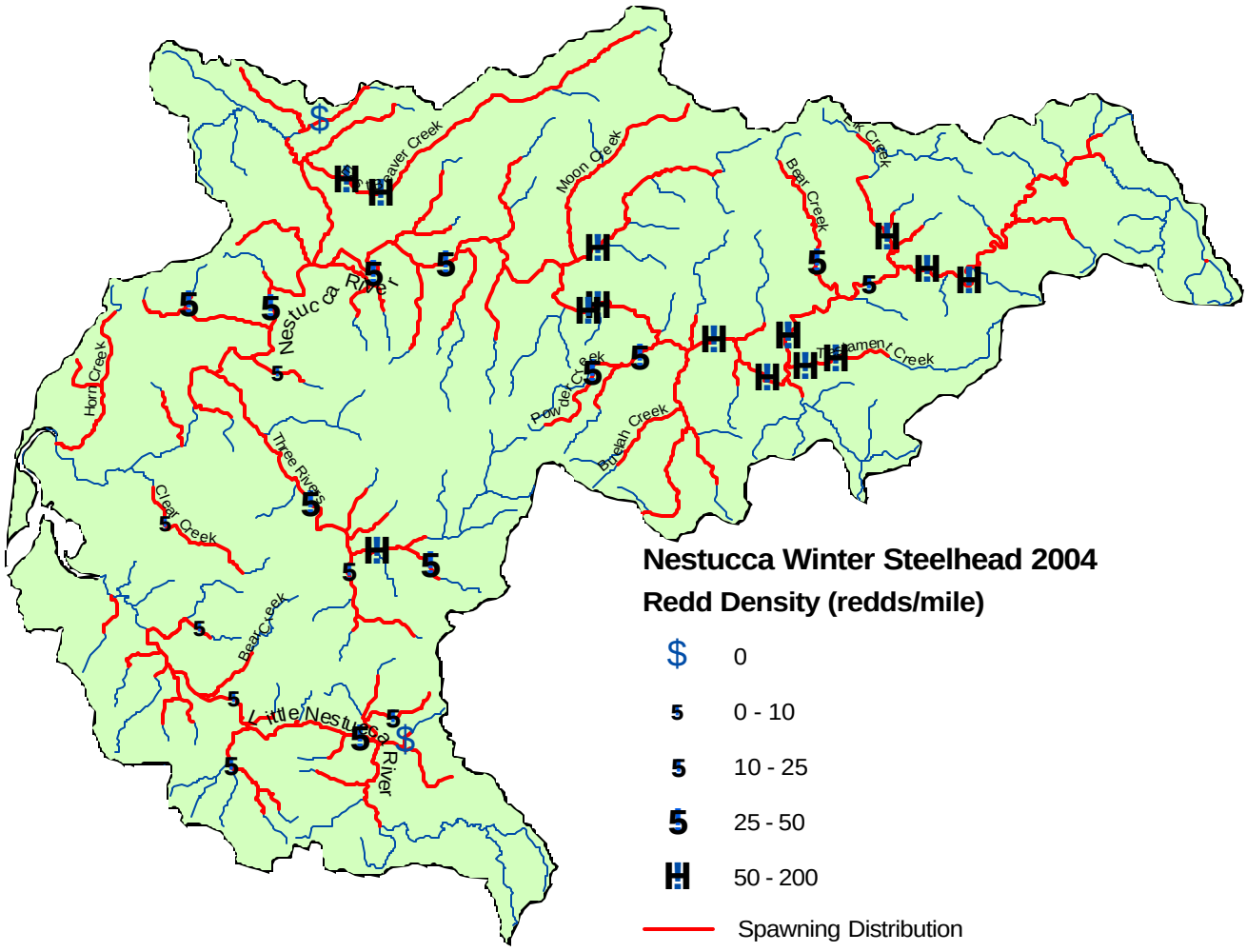

Figure 5. Winter steelhead redd density observed in 37 randomly selected survey sites in the Nestucca Basin, 2004.

Table 1. Estimates of winter steelhead redd and spawner abundance in the Nestucca River Basin, 2004. Estimates are derived from redd counts on randomly selected spawning surveys.

		Survey Effort		Redds		Spawners	
Stratum	N	Sample Weight	Frame Miles[a]	Estimate	95 % CI	Estimate	95% CI
Tributary	21	6.9	144	5,796	1,757	6,057	2,062
Mainstem	16	3.0	48	2,583	516	2,722	653
Total	37		192	8,379	1,831	8,738	2,271

[a] Adjusted for non-response bias

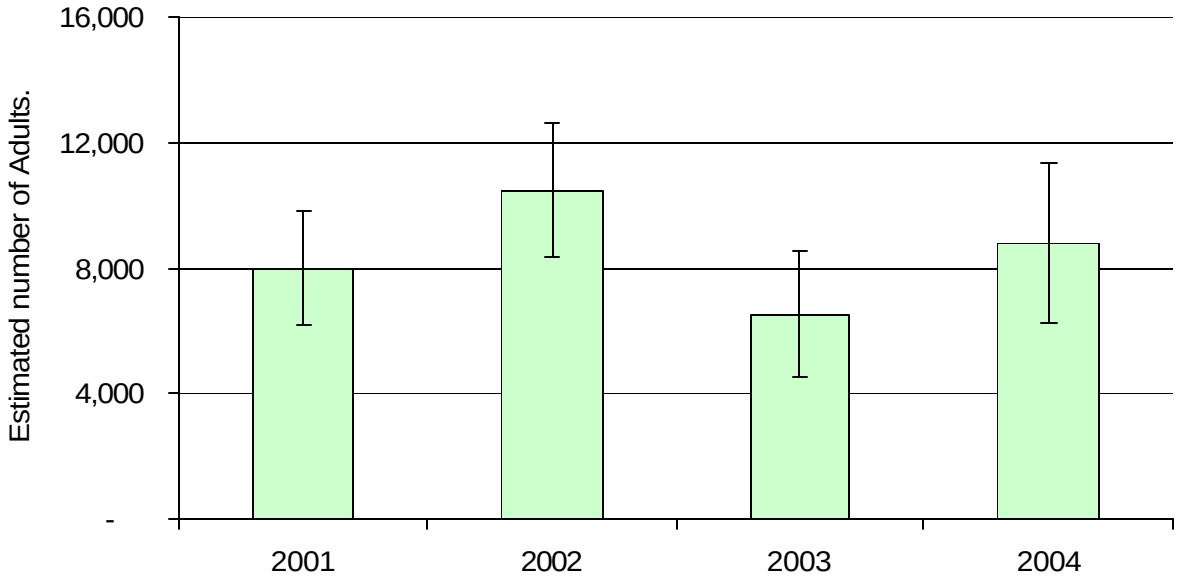

Figure 6. Estimated number and 95 % confidence interval of wild winter steelhead spawning in naturally in the Nestucca basin 2001-2004

Life History

A total of 57 scale samples taken from wild steelhead adults captured in the Nestucca River and transferred to Cedar Creek Hatchery for brood stock in 2004 were analyzed to determine how old juvenile steelhead were when they smolted and migrated to salt water. Data suggests that 2.4 % spent 1 year (age 1) in fresh water before migrating, 65.9% migrated at age

2 and 31.7 % migrated at age 3. Fifty-five scale samples were analyzed for time spent rearing in the ocean before returning to spawn. Seventy-three percent spent 2 years rearing in the ocean (2 salt) before returning to freshwater to spawn and 27% returned as 3 salts. Only 3 repeat spawners were recovered for an overall repeat rate of 5.5%.

DISCUSSION

Adult wild winter steelhead continue to be abundant in the Nestucca basin. The 2004 estimate is up about 30 percent from 2003 but is basically the average for the four years of this study (Figure 6). Few data exist on long-term variation in run-size for Oregon Coastal winter steelhead, but for relative comparison, longer-term data are available from counts at Willamette Falls (Willamette River) and Winchester Dam on the North Umpqua River. For counts at these sites expressed as % difference from the long-term average, both rivers experienced above average returns in 2004 (Figure 7). The 2004 North Umpqua Winchester counts were a 53-year high and 200% of the long term average. The Willamette counts were 127% of the long term average. It should be noted that although Nestucca winter steelhead adults have been abundant over the last 4 years, the populations levels may be substantially above the long term average.

Abundance is not the only measure of population health that is available from this study. In Flory's (2001) population health criteria for Oregon Coastal Steelhead, health goals were to have at least 20% of the good habitat with redd densities greater than 25 per mile. Flory defines good habitat as streams with a predominance of erosion resistant or mixed geology. Most habitat in the Nestucca basin fits into the good habitat category. In 2004, 78% of the sites surveyed had redd densities greater than 25 redds per mile. Another measure of population health suggested by Flory was that no more than 20% of the available habitat should be devoid

of redds. During the last four seasons of random sampling in the Nestucca Basin, winter steelhead spawning activity was observed in 94 percent of the sites surveyed.

Another factor to address when considering the health of a population is the number of hatchery adults spawning naturally on the spawning grounds. The ODFW Native Fish Conservation Policy OAR 635-007-0507(5) interim criteria states that at least 90% of the spawners within a population must be naturally produced and not hatchery produced. During the four years of this study hatchery origin adults have made up about six percent of the natural spawners. Our visual based method however could underestimate the number of marked adults on the spawning grounds, as observations might be biased towards seeing an adipose fin rather than detecting its absence. However we would have to underestimate the proportion of hatchery fish by over 167 % to make the Nestucca Hatchery program out of compliance with the maximum allowable 10 % naturally spawning hatchery fish. Jacobs (2003) used the same methodology on Smith River and found no difference between the proportion of hatchery fish observed on the spawning grounds and what was measured at the adult trap at Smith River Falls. Although there is not enough replication to state the accuracy of our estimate, it is probably sensitive enough to detect changes in stray rates that occur during the transition to the local Nestucca broodstock.

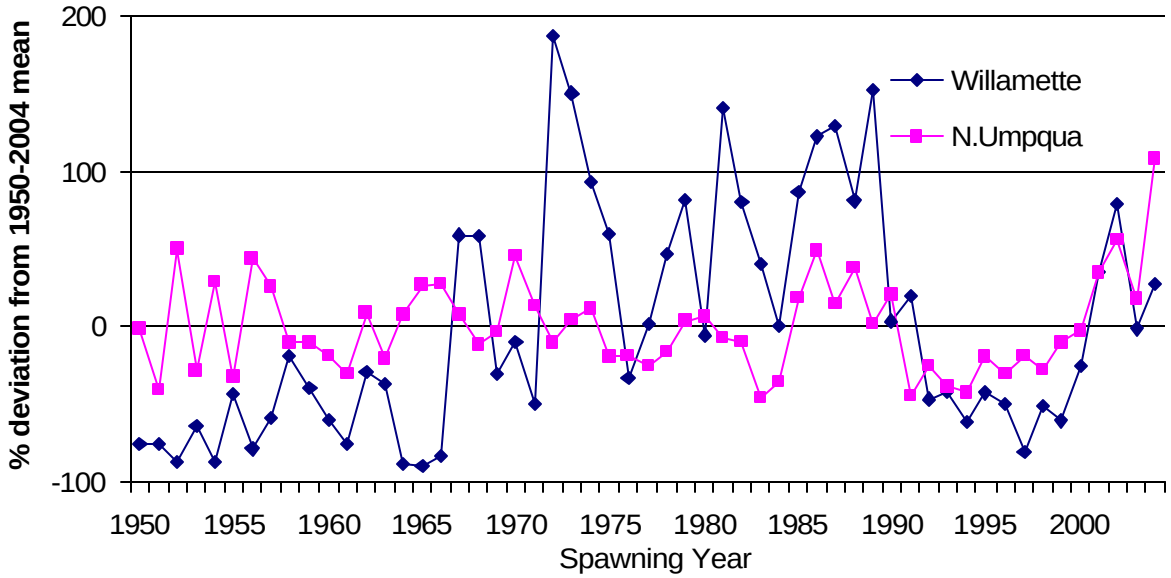

Figure 7. Annual passage counts of winter steelhead at Willamette Falls, Willamette River and Winchester Dam, North Umpqua River expressed as the % deviation from the long-term average, 1950-2004.

ACKNOWLEDGEMENTS

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Appendix Table A. Survey statistics of 2004 winter steelhead spawning ground surveys conducted in the Nestucca Basin.

Basin, Subbasin, Survey	Segment	Lower boundary	Upper boundary	No of Surveys	Times surveyed	Miles surveyed	Live Counts				Redds/ mile
							Total	Marked	Not marked	Un-known	
Mainstem And Bay				**23**		**24.3**	**324**	**6**	**71**	**247**	**54.2**
Clear Cr	2	Queens Cr	Headwaters		17	0.80	1	0	0	1	10.0
George Cr	1	Mouth	Headwaters		17	0.88	5	2	0	3	8.0
Farmer Cr, Trib	1	Mouth	Headwaters		16	0.40	3	0	1	2	27.5
Nestucca R	1	Farmer Cr	Saling Cr		13	1.24	6	0	1	5	32.2
West Cr, Trib C	1	Mouth	Headwaters		4	0.56	0	0	0	0	0.0
Nestucca R	1	Foland Cr	Wolfe Cr		13	1.00	4	0	1	3	26.0
Nestucca R	1	Tony Cr	Boulder Cr		14	1.30	15	0	3	12	48.5
East Cr	4	Mouth	Headwaters		16	1.30	22	1	6	15	70.8
Nestucca R	2	Limestone Cr	Morris Cr		11	1.33	27	2	0	25	63.9
Nestucca R	3	Limestone Cr	Morris Cr		11	1.03	18	0	5	13	59.3
Powder Cr	1	Mouth	Left Branch Powder Cr		19	1.10	7	0	3	4	37.3
Powder Cr	1	Left Branch Powder	Dahl Fk Powder Cr		17	0.92	17	0	6	11	31.5
Nestucca R	1	Clarence Cr	Slick Rock Cr		11	1.20	22	0	3	19	73.3
Nestucca R	1	Mina Cr	Bible Cr		10	1.00	11	0	0	11	109.0
Testament Cr	1	Mouth	Headwaters		17	1.02	13	0	4	9	58.8
Testament Cr	3	Mouth	Headwaters		19	0.60	8	0	0	8	63.3
Nestucca R	1	Testament Cr	Bear Cr		4	1.00	7	0	3	4	28.0
Nestucca R	2	Testament Cr	Bear Cr		9	1.00	26	1	4	21	84.0
Bear Cr	1	Mouth	Headwaters		19	1.42	28	0	11	17	50.2
Nestucca R	1	Bear Cr	Elk Cr		11	2.20	17	0	4	13	23.6
Elk Cr	1	Elk Cr, Trib A	Elk Cr, Trib B		17	1.10	20	0	5	15	85.5
Nestucca R	1	Elk Cr	Fan Cr		15	1.03	34	0	7	27	139.0
Nestucca R	3	Elk Cr	Fan Cr		15	0.83	13	0	4	9	116.9
Three Rivers				**4**		**4.2**	**16**	**0**	**0**	**16**	**40.6**
Three Rivers	1	Cedar Cr	Pollard Cr		10	1.14	1	0	0	1	47.5
Alder Cr	2	Mouth	Buck Cr		17	0.96	2	0	0	2	25.0
Three Rivers	1	Alder Cr	Crazy Cr		18	1.34	13	0	0	13	61.9
Crazy Cr	1	Mouth	Headwaters		16	0.75	0	0	0	0	28.0
Beaver Creek				**3**		**2.0**	**28**	**0**	**7**	**21**	**69.6**
Tiger Cr	2	Tiger Cr, Trib A	Headwaters		8	0.89	0	0	0	0	0.0
E Beaver Cr	3	Wildcat Cr	Headwaters		19	0.32	9	0	5	4	62.5
E Beaver Cr	6	Wildcat Cr	Headwaters		19	0.81	19	0	2	17	146.3
Little Nestucca				**6**		**4.9**	**16**	**1**	**3**	**12**	**13.4**
Fall Cr, Trib A	1	Mouth	Headwaters		15	0.60	0	0	0	0	3.3
Little Nestucca	1	Bear Cr	Mcknight Cr		13	1.08	2	0	0	2	1.9
Little Nestucca R, S Fk	1	Mouth	Kautz Cr		18	1.41	8	1	0	7	21.3
Little Nestucca	1	Cedar Cr	Louie Cr		17	0.76	6	0	3	3	40.8
Baxter Cr	1	Mouth	Headwaters		19	0.75	0	0	0	0	13.3
Sourgrass Cr, Trib A	1	Mouth	Headwaters		15	0.28	0	0	0	0	0.0

Appendix Table B Number of wild adults collected and corresponding smolts release for the wild brood stock program in the Nestucca Basin

Brood Year	Males Spawned	Females Spawned	Number of Smolts Released	Smolt Release Date	Mark
2002	22	22	43,461	4/21/2003	AdRM
2003	23	23	45,254	4/20/2004	AdRM
2004	25	25			

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