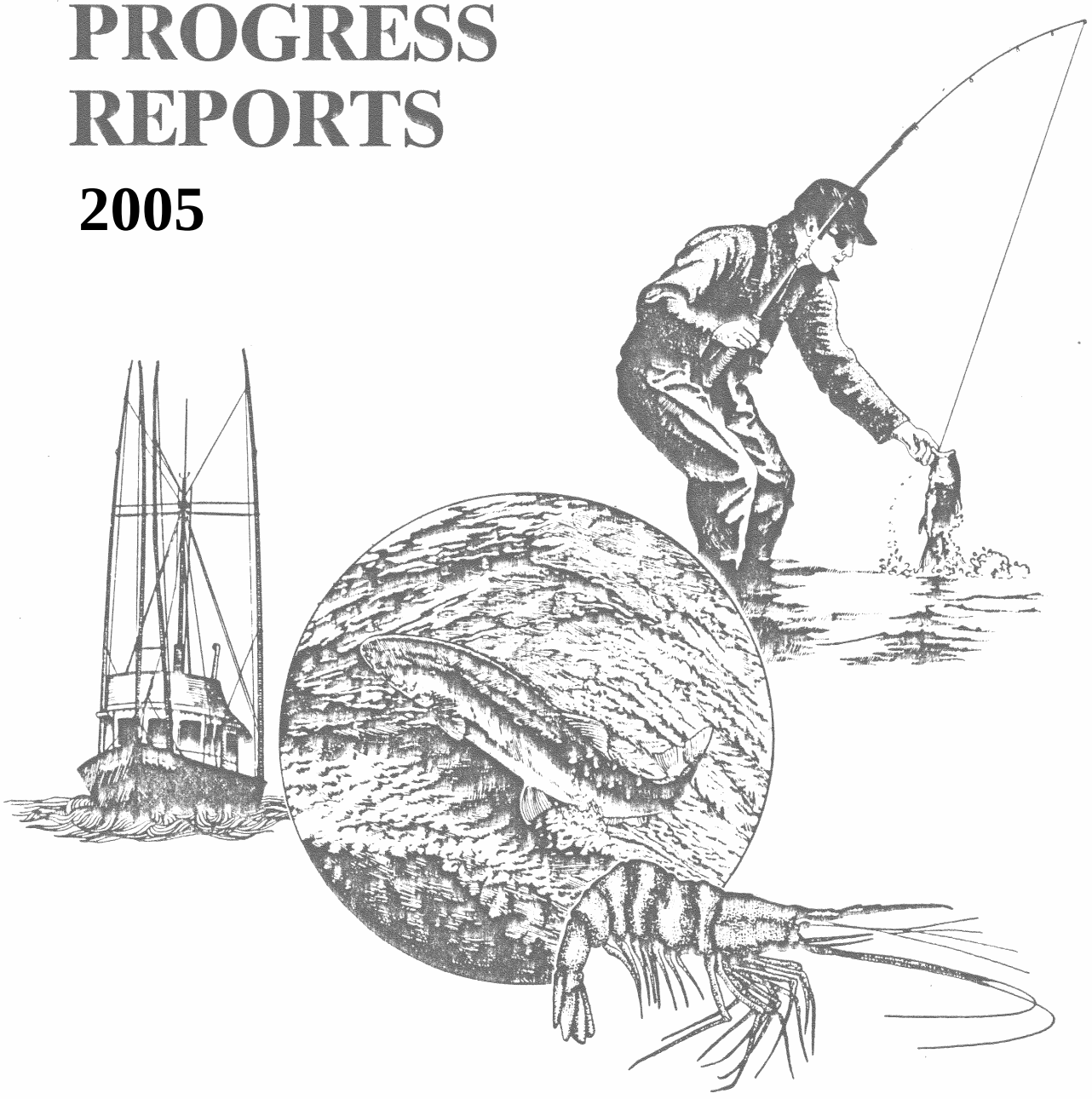
PROGRESS REPORTS

2005



FISH DIVISION

Oregon Department of Fish and Wildlife

Assessment of the status of Nestucca River Adult Winter Steelhead

2005 ASSESSMENT OF THE STATUS OF NESTUCCA RIVER ADULT WINTER STEELHEAD

Nestucca River Native Winter Steelhead Broodstock Monitoring – Adults

Annual Progress Report

September 12, 2005

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List of Figures

List of Tables

ABSTRACT

A spatially balanced stratified random probability design was employed to determine if Nestucca River wild adult winter steelhead (Oncorhynchus mykiss) were sufficiently abundant so 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, spawner occupancy rate, and adult abundance were determined for the 2005 spawning year. Steelhead were observed actively spawning from the first week of February through the last week of May. Five fin-marked hatchery origin adults and 87 non-marked wild adults were observed. Hatchery origin adults made up 5.4% of the natural spawning population. This potentially underestimates the proportion of hatchery fish because of possible bias associated with different detection rates between marked and unmarked adults. Spawning steelhead or redds were observed in 33 of the 35 randomly selected stream reaches. Redds were counted at each site over the course of the spawning season. Nine-hundred and fifty redds were observed. This was reduced by 5.4 % to account for the proportion of hatchery adults spawning naturally. The adjusted count expands to a basin wide estimate of 3,992 $\pm$ 1,240 redds produced by wild spawners. 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 a total of 4,190 wild adult winter steelhead adults 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. From 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 the 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 objectives were to reduce genetic risks associated with using the non-native Alsea brood stock and to provide extended angler harvest opportunity through March. The transition to Nestucca native brood stock is planned to occur over two steelhead generations or until about 2010. 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 healthy 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 returned in 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 2005 spawning year on Nestucca River adult winter steelhead spawning timing, spawner distribution and abundance. The proportion of hatchery origin adults spawning naturally in the basin is also documented.

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 about 211 miles are identified as steelhead spawning habitat. Tributary streams account for 163 spawning miles and main stem reaches account for the remaining 48 miles. Cedar Creek Hatchery is located on Three Rivers approximately two miles upstream from the confluence with the main stem Nestucca.

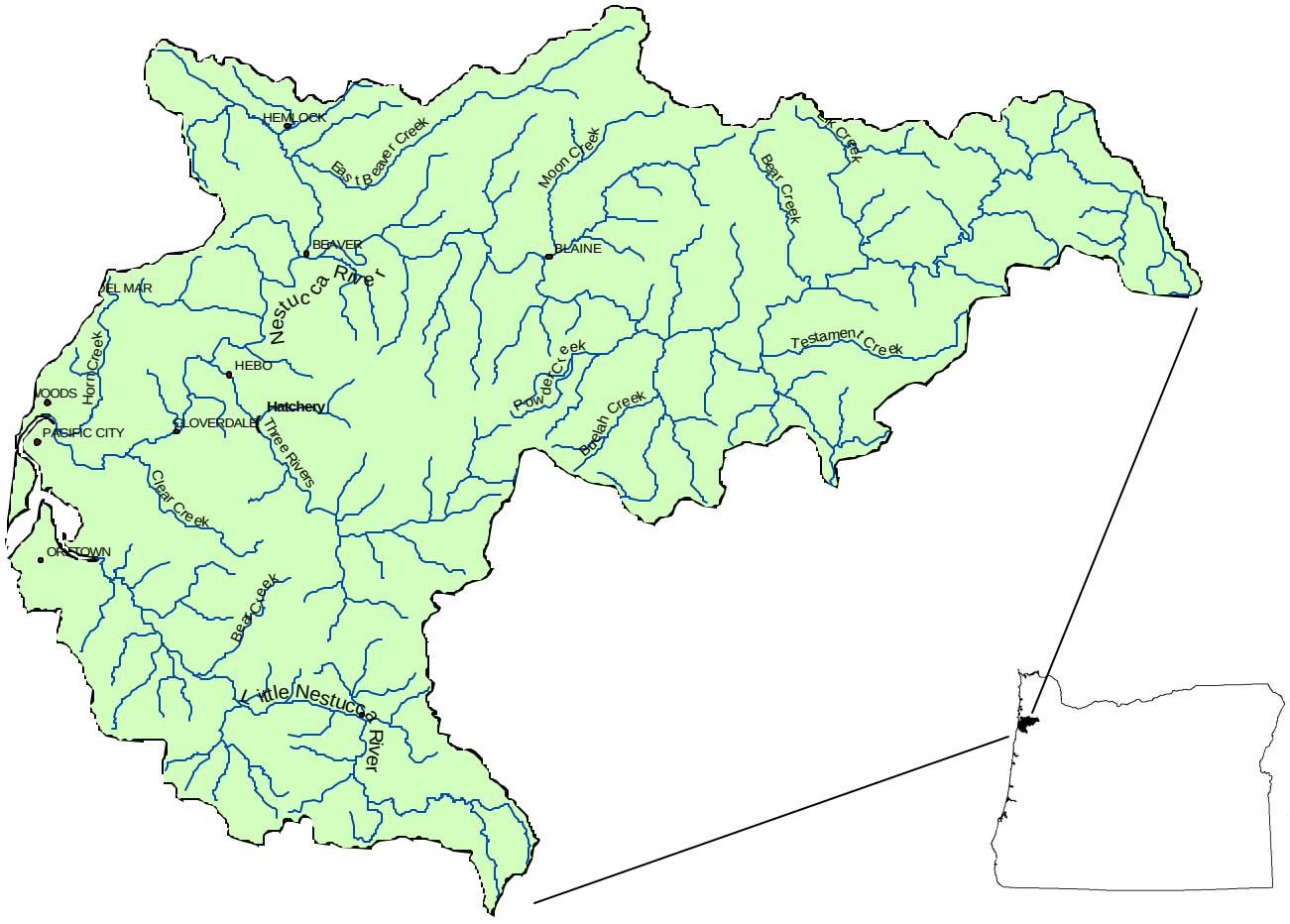

Figure 1. Map of the Nestucca River basin.

METHODS

We used the United States Environmental Protection Agency's Environmental Monitoring Assessment Protocol (EMAP) to select a spatially balanced random sample of sites (Stevens 2002) used 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 17 tributary (16.1 miles) and 18 main stem (20.1 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 February 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 length 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).

We have not evaluated the ratio of spawners per redd in the Nestucca basin. So we used the ratio developed during our calibration studies to convert redds to adults (Susac and Jacobs 2003; Susac 2005b). The equation used was $y=1.0379x + 42$ where y is the number of adults and x is the number of redds.

In Oregon, all hatchery origin steelhead smolts receive an adipose fin-clip prior to release. 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. 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 was 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 2005. Few carcasses were collected during the surveys, so we supplemented the collection with scales taken from wild adults collected for the broodstock program.

RESULTS

Spawning Timing

Steelhead spawning activity was observed from the first of February to the end of May and peaked during the last week in April (Figure 2). The cumulative percent of steelhead redds observed at weekly intervals indicate that 25% of the spawning activity occurred prior to the second week of March and 75% of spawning was complete by the last week of April. Spawning was slightly later than observed in 2001, 2002 and 2004, but slightly earlier than 2003 (figure 3).

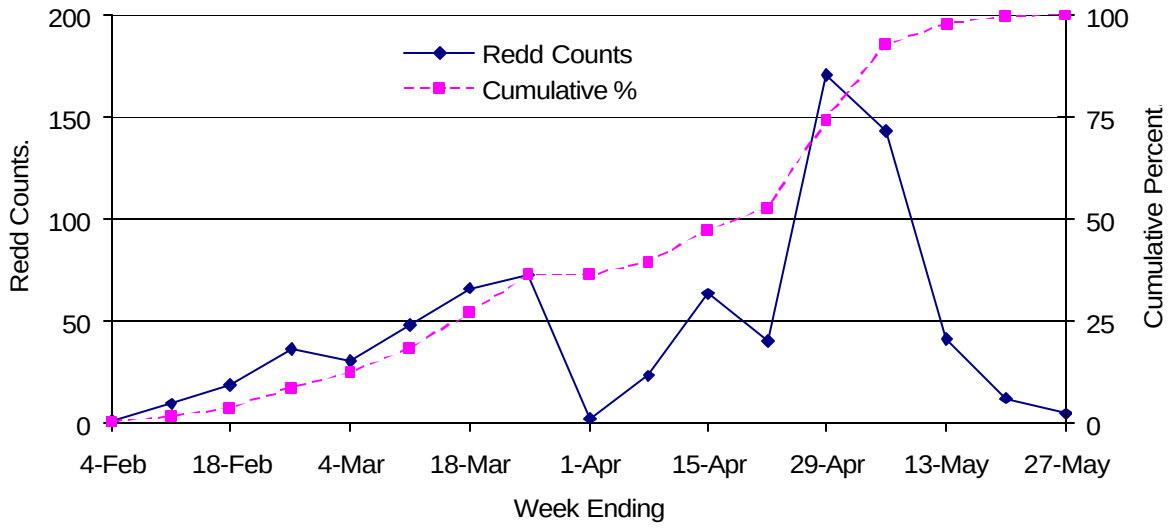

Figure 2. Number and cumulative frequency of new winter steelhead redds observed each week on random spawning surveys in the Nestucca River Basin, 2005.

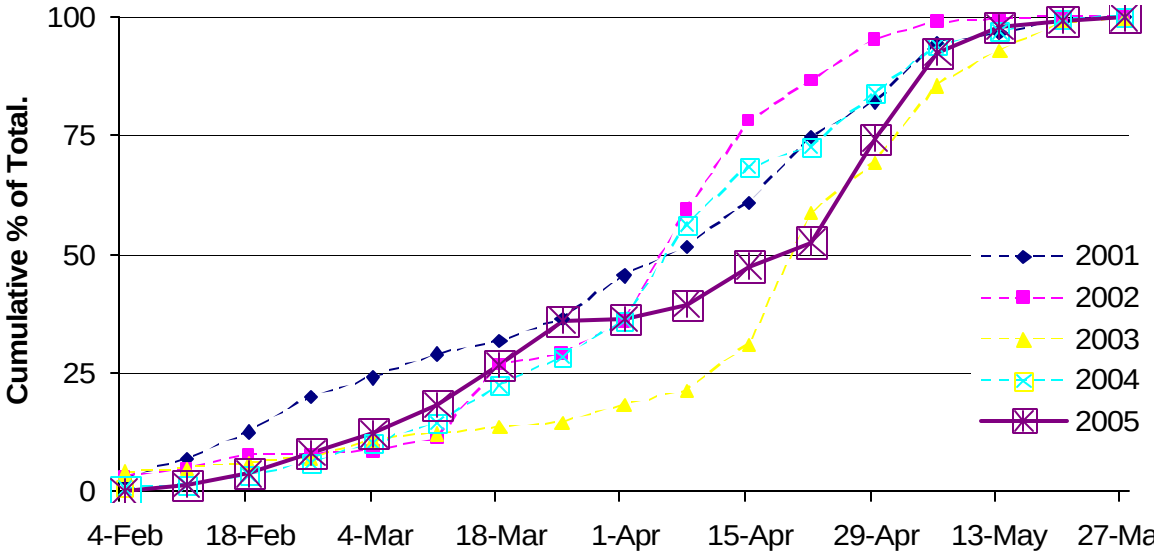

Figure 3. Cumulative frequency of new winter steelhead redds observed each week on random spawning surveys in the Nestucca River basin, 2001 through 2005 spawning years.

Detection of Hatchery Spawners

Surveyors observed 419 live adult steelhead during spawning surveys in the Nestucca basin in 2005. Of these, 83 were seen clearly enough to detect the presence or absence of adipose fin-clips. One fin-clipped fish (1.2%) was observed. A total of 9 dead winter steelhead were collected on the spawning grounds. Four (44.4%) were adipose fin-marked. Analysis of the proportions yielded a significant difference between samples (P= <.001). Because of the low sample size, counts of live and dead adults were combined for an overall estimate of 5.2 %. This proportion of hatchery adults on the spawning grounds is slightly less than the 5 year average of 6.0 % (Table 1). Figure 4 shows the spawning timing of marked and unmarked adults. In 2005 marked hatchery fish were observed through the first week of May. This is the latest that we have observed hatchery origin steelhead since we began surveys in 2001 (Figure-5). Figure 6 shows the spatial distribution of hatchery adults in relation to smolt release sites in the Nestucca basin in 2005. Recoveries were limited to two sites on Three Rivers and two sites on the mid-mainstem. Half of the smolts were released at Cedar Creek Hatchery and the balance was divided evenly and released at the first four bridge crossings above Beaver in the main stem.

Table 1. Proportions of adipose clipped hatchery origin adult winter steelhead observed on the Nestucca River spawning grounds from 2001 to 2005. Counts are a combination of live and dead observations.

Year	2001	2002	2003	2004	2005
% hatchery	4.0	5.0	7.2	8.5	5.4

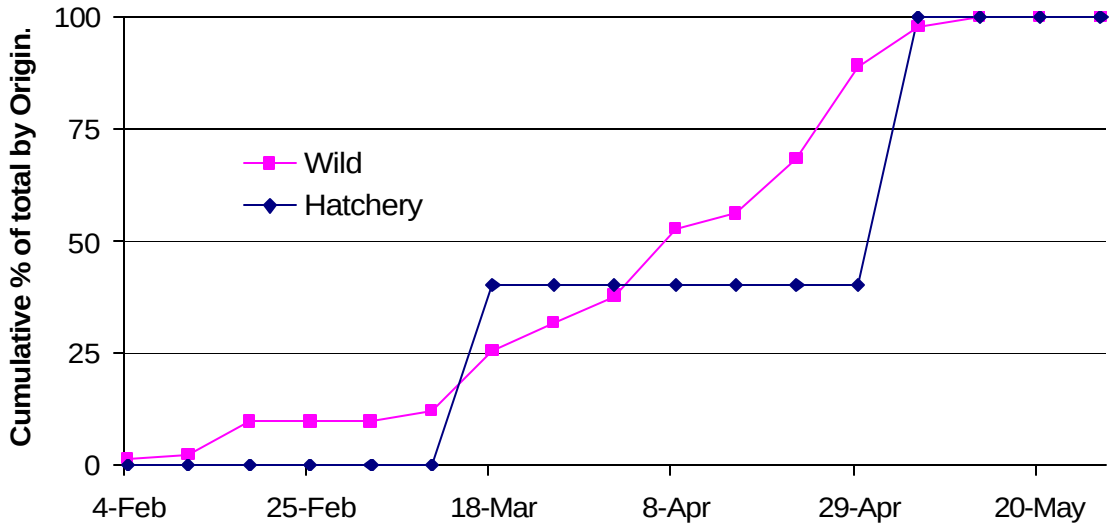

Figure 4. Timing of fin-clipped hatchery and wild adult winter steelhead observed on the Nestucca River during the 2005 spawning year. This includes live and dead adults.

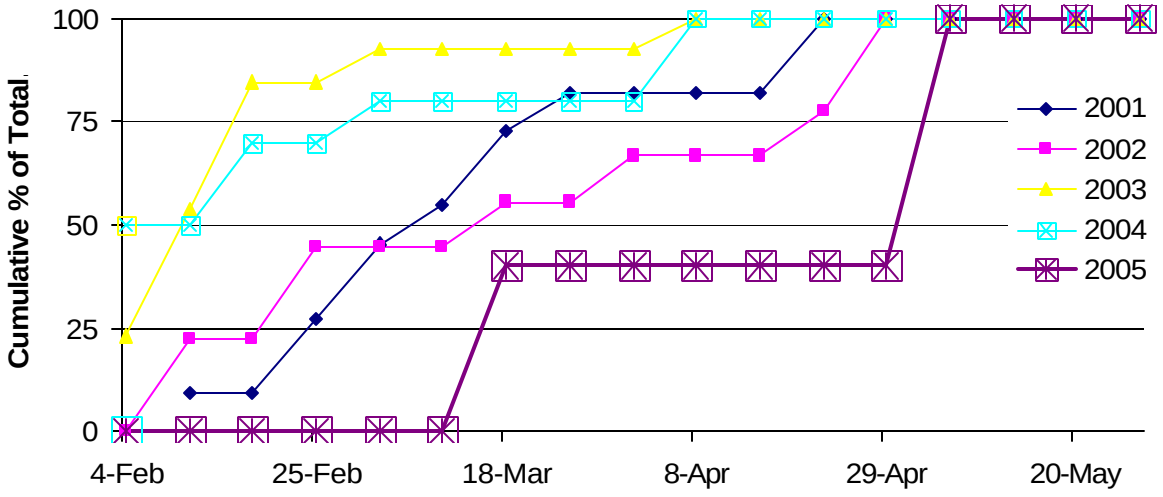

Figure 5. Timing of the observations of fin-clipped hatchery origin adult winter steelhead in the Nestucca River basin 2001-2005. Counts include live and dead adults.

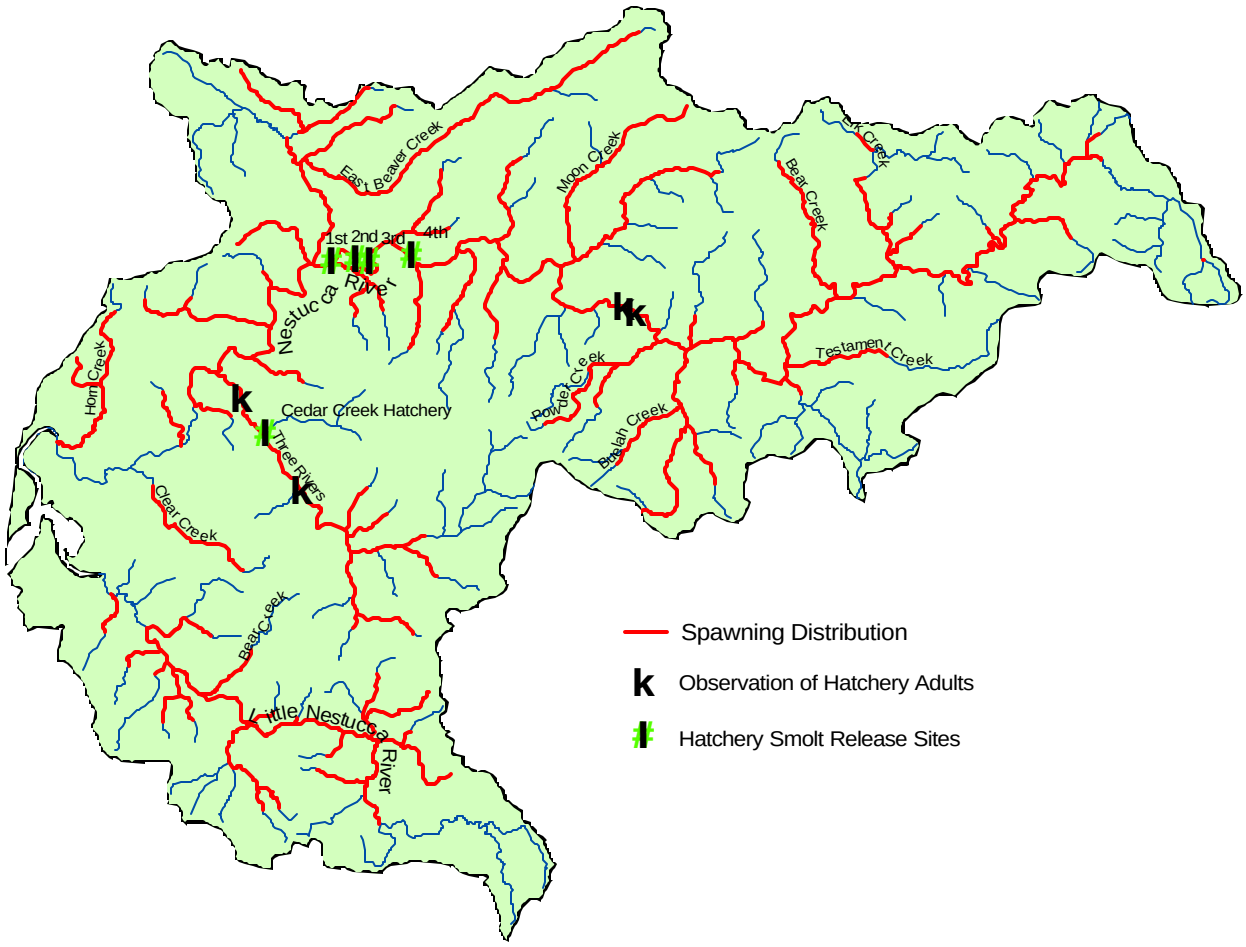

Figure 6. Distribution of adult hatchery origin winter steelhead in the Nestucca Basin in relation to hatchery smolt release sites. Distribution is based on observation of live adults and carcass recovery.

Spawning Distribution and Abundance

Spawning was distributed throughout the Nestucca basin. Redds were observed at 33 of the 35 sites surveyed (Figure 5). Of the sites that contained redds, density ranged from 1 to 67 redds per mile. Redd densities exceeded 25 redds per mile in 12 of the sites surveyed. Overall redd density was higher in the main stem stratum than in the tributary stratum (31.1 versus 15.9 redds/mile).

A total of 950 winter steelhead redds were observed in the Nestucca Basin in 2005. This expands to a basin total redd estimate of 3,992 ± 1240. The 95% confidence interval comprised 31.1 % of the estimate. Redd estimates and 95% CI for tributaries and main stem strata as well as a pooled total for the 2005 spawning year are summarized in Table 2. Table 2 also shows the estimated number of spawners and corresponding 95% CI. Data for individual survey sites are listed in Appendix A. The abundance of wild spawners was about half the 2001-2004 average (Figure 8).

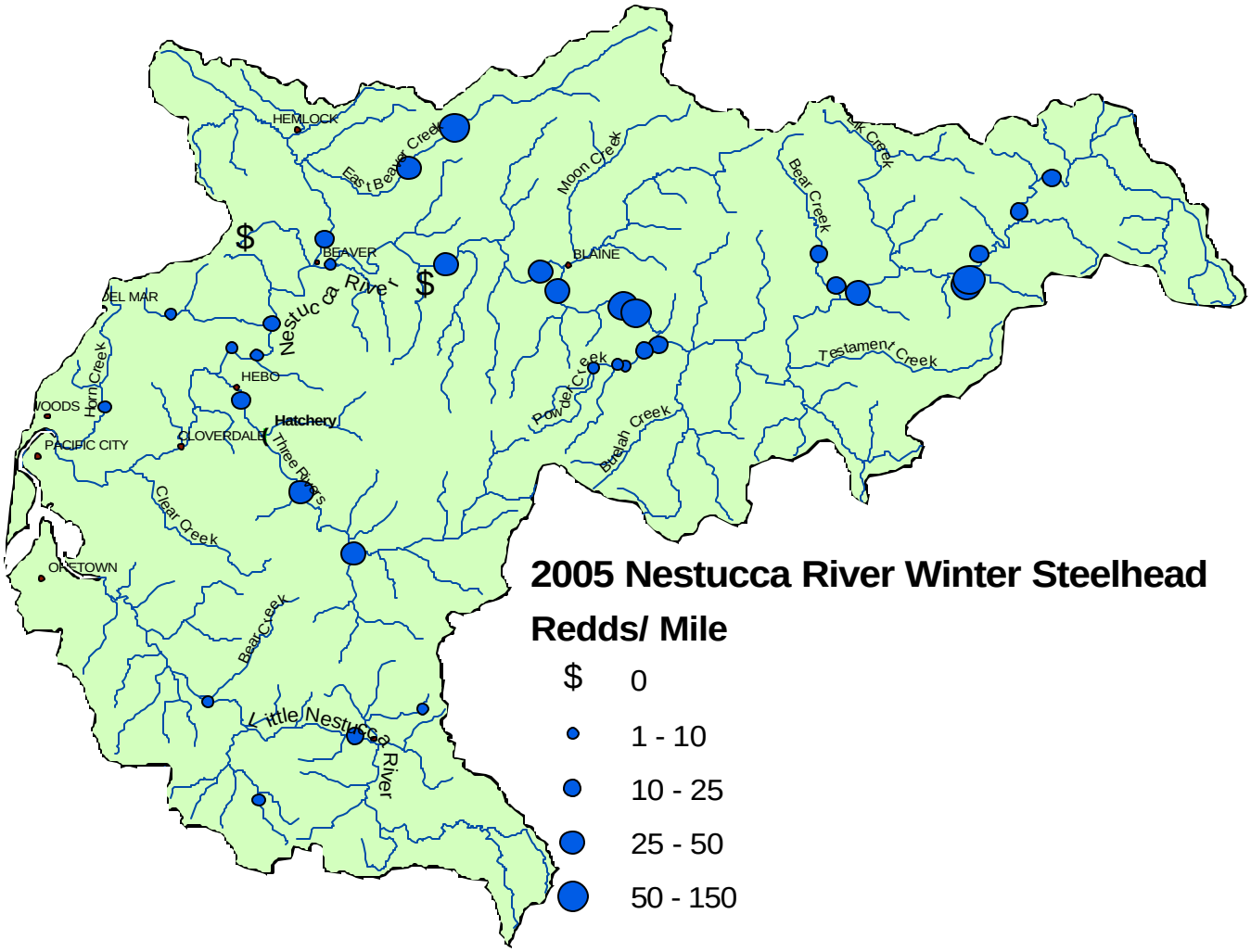

Figure 7. Winter steelhead redd density observed in 35 randomly selected survey sites in the Nestucca Basin, 2005.

Table 2. Estimates of winter steelhead redd and spawner abundance in the Nestucca River Basin, 2005. 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	17	9.6	163	2,326	884	2,438	1,007
Mainstem	19	2.5	48	1,666	356	2,722	444
Total	36		211	3,992	1,240	4,190	1,441

[a] adjusted for non-response bias

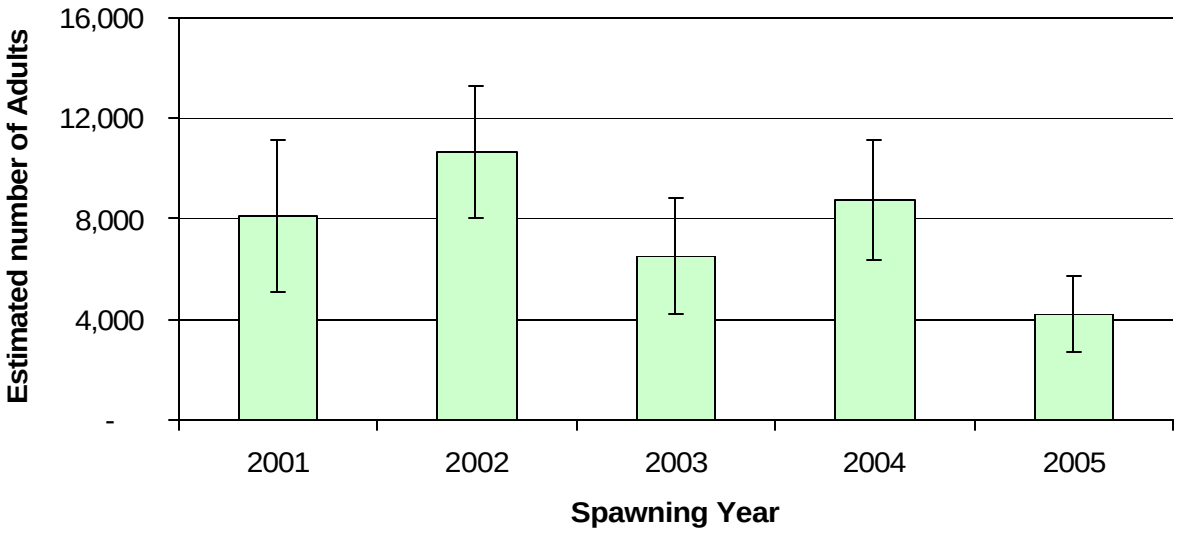

Figure 8. Estimated number and 95 % confidence interval of wild winter steelhead spawning in naturally in the Nestucca basin 2001-2005 spawning years

Life History

2005 scale analysis has not been completed as of this date.

DISCUSSION

Adult wild winter steelhead continue to be abundant in the Nestucca basin. The 2005 population abundance estimate is about 50 % lower than in 2004. The 2005 decline in winter steelhead abundance was wide spread and not just a Nestucca River phenomenon. Passage counts of winter steelhead at Winchester, North Umpqua River, and Oregon City Fall, Willamette River, experienced similar declines from 2004 levels, 49.0 and 49.6 % respectively (Figure 9). This would suggest that factors such as a reduction in near shore ocean productivity or regional weather patterns may be responsible for the decline and are unlikely to be caused by the hatchery brood stock program.

Even though the 2005 wild run-size on the Nestucca River was roughly half the 2001-2004 average, the population still meets Flory's (2001) Oregon Coastal Winter Steelhead population health goals criteria measured by this study. The wild population has a protracted spawning time, with adults regularly spawning over a four or five month period. Flory suggested that in areas like the Nestucca basin where there is a predominance of erosion resistant or mixed geology, healthy populations should occupy at least 20% of the habitat with redd densities greater than 25 redds per mile. In 2005, 32% 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. In 2005, 94% of the sites surveyed contained at least one redd and 89% of the sites surveyed contained 5 or more redds. This ensures at least some level of seeding in most of the available spawning habitat. During the last four seasons of random sampling in the Nestucca Basin, adult winter steelhead were observed at an average of 94% of the sites surveyed (Susac 2005b).

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 five 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 be underestimating the proportion of hatchery fish by over 167% to make the Nestucca Hatchery program out of compliance with the with the maximum allowable 10% naturally spawning hatchery fish.

One outcome of the wild broodstock program is the possible shift of spawning time of the returning hatchery spawners to the same spawning time as the wild adults. This would increase the chance of interbreeding between stocks. The concern of this is limited however, as long as the proportion of hatchery adults spawning naturally is maintained at a low level.

CONCLUSION

We have evaluated Nestucca River basin wild adult steelhead spawning timing, spawning duration, spawner distribution, site occupancy, adult abundance, and have developed an estimate of the proportion of hatchery spawners on the spawning grounds. Collectively these measures suggest the natural winter steelhead population in the Nestucca basin is sufficiently healthy to allow for the continued removal of the proposed 76 adults annually for the wild broodstock program. It is really too early in the evaluation to reach any definitive conclusions on the effects the transition to a wild brood is having on the natural Nestucca River winter steelhead population.

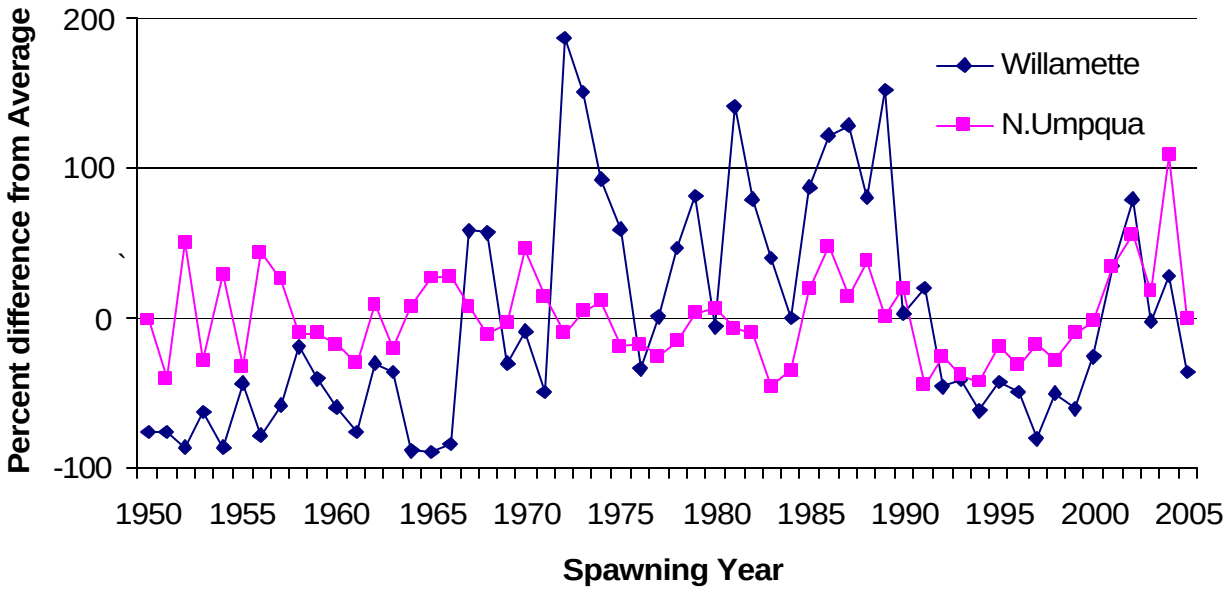

Figure 9. Annual passage counts of winter steelhead at Willamette Falls, Willamette River and Winchester Dam, North Umpqua River expressed as the percent difference from the long-term average, 1950-2005.

ACKNOWLEDGEMENTS

I would like to thank field biologists Jeff Johnson and Michael Sinnott who conducted the spawning surveys. I would also like to thank Dave Stewart who provided day to day supervision of field operations.

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Appendix Table A. Survey statistics of 2005 winter steelhead spawning ground surveys conducted in the Nestucca Basin.

Basin, Subbasin, Survey	Seg-ment	Lower boundary	Upper boundary	No of Surveys	Times surveyed	Miles surveyed	Live Counts				Redds/ mile
							Total	Marked	Not marked	Un-known	
Mainstem And Bay											
Horn Cr	2	Mouth	Horn Cr, Unnamed Trib		15	1.00	2	0	2	0	9.0
Nestucca R	1	Three Rivers	George Cr		15	1.67	7	0	1	6	5.4
Nestucca R	1	George Cr	Farmer Cr		15	1.24	9	0	0	9	5.6
Farmer Cr	1	Farmer Cr, Trib B	Headwaters		15	0.60	3	0	1	2	6.7
Nestucca R	1	Farmer Cr	Saling Cr		14	1.24	10	0	1	9	17.7
West Cr	1	West Cr, Trib C	Headwaters		14	0.90	0	0	0	0	0.0
Nestucca R	1	Foland Cr	Wolfe Cr		14	1.00	10	0	0	10	6.0
Tony Cr	1	Mouth	Headwaters		14	0.89	0	0	0	0	0.0
Nestucca R	1	Tony Cr	Boulder Cr		14	1.30	23	0	4	19	38.5
Nestucca R	2	Alder Cr	Moon Cr		12	1.00	48	0	2	46	45.0
Nestucca R	1	Moon Cr	Limestone Cr		12	1.35	45	0	4	41	49.6
Nestucca R	2	Limestone Cr	Morris Cr		13	1.33	12	0	2	10	57.9
Nestucca R	2	Limestone Cr	Morris Cr		13	1.33	12	0	2	10	57.9
Powder Cr	1	Mouth	Left Branch Powder Cr		16	1.10	8	0	3	5	21.8
Powder Cr	1	Mouth	Left Branch Powder Cr		16	1.10	8	0	3	5	21.8
Powder Cr	2	Mouth	Left Branch Powder Cr		14	0.30	3	0	0	3	10.0
Powder Cr	1	Left Br Powder	Dahl Fk Powder Cr		13	0.92	3	0	2	1	5.4
Powder Cr	1	Left Br Powder	Dahl Fk Powder Cr		13	0.92	3	0	2	1	5.4
Bear Cr	1	Mouth	Headwaters		15	1.42	29	0	8	21	22.6
Bear Cr	2	Mouth	Headwaters		16	0.80	10	0	1	9	20.0
Nestucca R	1	Bear Cr	Elk Cr		16	1.00	15	0	4	11	50.0
Nestucca R	3	Elk Cr	Fan Cr		15	1.00	18	0	7	11	67.0
Nestucca R	3	Elk Cr	Fan Cr		15	1.00	18	0	7	11	67.0
Nestucca R	4	Elk Cr	Fan Cr		15	0.93	5	0	2	3	16.1
Nestucca R	1	Bald Mtn Cr	Ginger Cr		15	0.60	8	0	5	3	21.7
Nestucca R	3	Bald Mtn Cr	Ginger Cr		15	0.85	17	0	2	15	21.3
Three Rivers											
Three Rivers	1	Mouth	Cedar Cr		9	1.24	6	0	0	6	16.9
Three Rivers	3	Cedar Cr	Pollard Cr		15	0.94	13	1	0	12	47.9
Three Rivers	1	Alder Cr	Crazy Cr		16	1.34	28	0	5	23	48.5
Beaver Creek											
Beaver Cr	1	Mouth	E Beaver Cr		14	0.86	6	0	2	4	12.8
E Beaver Cr	2	Wildcat Cr	Headwaters		14	1.06	8	0	0	8	29.2
E Beaver Cr	6	Wildcat Cr	Headwaters		16	0.81	23	0	7	16	55.3
Little Nestucca											
Little Nestuc.	1	Bear Cr	Mcknight Cr		15	1.08	1	0	0	1	0.9
South Fk.	1	Kautz Cr	Headwaters		15	0.52	0	0	0	0	3.8
Little Nestuc.	1	Cedar Cr	Louie Cr		15	0.76	3	0	1	2	19.7
Baxter Cr	2	Mouth	Headwaters		12	1.10	5	0	2	3	4.5

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	57,673	4/18/2005	AdRM
2005	20	27			

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