Proceedings
Of The
STEELHEAD MANAGEMENT WORKSHOP
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INTRODUCTION

Oregon Department of Fish and Wildlife biologists gathered in Corvallis on June 29, 1994, to attend a steelhead management workshop. Many of the issues surrounding steelhead management in Oregon are common to fishery managers across the state, but too often information isn't shared between regional boundaries or different geographic areas of the state. Efficient management of Oregon's steelhead stocks depends on data that is both accurate and timely. This workshop was held to allow both research and management fish biologists to openly discuss the results of several ongoing projects designed to improve the way Oregon manages its steelhead populations. This report is a summary of the presentations and information shared at this meeting.
The "Punchcard" Program: Past, Present, and Future
Charlie Corrarino

The Oregon Game Commission introduced the Punchcard program in 1953 as a means to estimate catch of salmon and steelhead in Oregon. This method prompted anglers to record their catch and submit this information at the end of the year. However, it was determined that anglers who turned in their punchcards often caught more fish than those who did not which manifests an overestimate of catch when expanding figures for a specific river. In the mid 1960's the Oregon Game Commission contracted with the Oregon State University Survey Center to conduct a "Nonresponse-Bias" survey to determine the disparity in catch between anglers who didn't submit their punchcards and anglers who did. A correction factor for this bias was determined by the survey and has been in use since. Fisheries managers feel this method is outdated and inaccurate, and needs to be refined to more accurately reflect present day catch rates of salmon and steelhead.

Punchcard data is useful in many ways. Fish biologists use the information to evaluate angler success in certain steelhead and salmon fisheries, determine stock abundance, and to evaluate trends in abundance over time. Hatchery managers use the information to evaluate a program's success. Punchcards offer district biologists a means to create log books of successful anglers who can be contacted for current information on a certain fishery. Anglers use the data to determine where the "hot" fishing streams are. Sturgeon lengths are now required to be recorded on punchcards, giving fishery managers more length frequency information. Punchcards also give fish managers a clearer picture on seasonal catch distribution of salmon and steelhead, thereby offering the opportunity to more effectively manage the fishery.

Part of the problem with using punchcards as an estimate of catch is getting anglers to return them at the end of the year. The return rate for Oregon has fluctuated from a high of 51% in 1957 to a low of about 10% in the early 1970's. The long term average is about 20%. To maintain this return rate the Oregon Department of Fish and Wildlife communicates with 1,000 state licensing agents to inform anglers who buy salmon and steelhead tags of the importance of returning them. News releases are occasionally used and sports writers often report the need to return punchcards in articles written for local newspapers. The Northwest Steelheaders have offered a lottery for the past several years to encourage anglers to return their punchcards.

The Oregon punchcard program was compared to other states methods for collecting catch data. Idaho uses an annual phone survey of anglers to determine catch. However, Idaho sells approximately 20,000-30,000 punchcards annually while Oregon sells from 150,000-300,000. Idaho uses volunteers to conduct the surveys which reduces the cost of the program. In Washington anglers are paid to return their punchcards but this has been shown to increase the nonresponse bias. Alaska has no statewide punchcard program and California is presently reviewing its options.

To improve the return rate of punchcards, ODFW is considering some strategies. A "Point of Sale" computer screen is being used at many license outlets. The design of the computer allows both the buyer and the seller to view a separate screen on either side of the service table. All information typed in is shown. A question is asked at the end of the transaction: has the buyer
returned last years punchcard? This strategy acts as an immediate reminder. Another way to remind the fishing public would be to print a similarly defined statement on the cover of the angling synopsis. The ODFW Information and Education section has developed a single page information handout which describes some of Oregon's top fishing rivers with the intent of distributing them at kiosks at certain outdoor events and at larger sporting goods stores. A reminder to turn in punchcards is printed on these.

It's been about 30 years since the first nonresponse bias survey was conducted, and fishery managers feel that its time for an update. A pilot study is being proposed for 1995 to develop a more precise estimate of salmon and steelhead catch in Oregon streams, with a full study to follow in 1996. The pilot study would 1) pretest the survey questions, 2) compare two phone survey groups (ODFW and a private consultant) for differences in angler response, and 3) test the "spatial cluster theory"; that is do anglers tend to fish largely in streams near where they live or purchased their licenses. The approximate cost of the pilot study would be about $12,000.

The recent introduction of catch and release regulations for wild steelhead could effect the future accuracy of this survey. An estimated 30%-40% of anglers don't report what they release even though there is a place for this information on the punchcard. This makes it difficult to determine what the true catch rates of steelhead are, and the escapement estimate of wild fish.

A more accurate estimate of catch is needed to efficiently manage Oregon's stocks of steelhead and salmon. Harvest rate is an important component in estimating population abundance, and gives fishery managers a clearer picture of stock status. It was agreed the pilot project would be a positive step forward to reevaluate the punchcard program and should be implemented in 1995.
Uses of Acclimation in Fisheries Management
Richard Carmichael

Acclimation has recently become a fisheries management buzz word. However, its success as a fish management tool is still uncertain, as results often do not meet expectations. Fishery managers have a great number of prospects for acclimation which include:

1. Improving smolt-to-adult survival by
   a) applying natural temperature regimes to fish undergoing smoltification
   b) reducing stress on smolts associated with loading and transporting
2. Improving homing accuracy
3. Reducing straying
4. Increasing management flexibility and production at hatcheries by freeing up rearing space

Studies are currently being conducted on the Wallowa and Imnaha Rivers in Northeast Oregon to determine if acclimation can meet management goals. The acclimation project underway on the Imnaha River is part of a fisheries management program focused on enhancing the natural production of spring chinook. The program, which began in 1982, uses wild fish for broodstock. An adult collection and juvenile acclimation facility are located at RM 50, near the midpoint of chinook spawning distribution on the river. Adults are collected at the facility and transferred to Lookingglass Hatchery for spawning. Juvenile chinook are reared to full term and then transported back to the Imnaha where they are acclimated for 30 days prior to release. The acclimation pond is larger than the rearing ponds at Lookingglass and therefore rearing densities are reduced. This also frees up rearing space at Lookingglass for this time period. Since 1990 an evaluation has been conducted to determine if acclimation increases smolt-to-adult survival as compared to direct stream release. Results will be conclusive by 1998.

Acclimation is currently being evaluated on the summer steelhead program in the Wallowa River, a tributary to the Grande Ronde River. This hatchery program is directed at enhancing and restoring the summer steelhead fishery in the Wallowa River. Broodstock are collected at both the Wallowa Hatchery and the Big Canyon facility located downstream on the small tributary of Deer Creek. Adults are spawned on-site and the fertilized eggs are transferred to Irrigon Hatchery for incubation and rearing. The water at Irrigon Hatchery is relatively warm and promotes quick growth but also induces crowding by late winter. To alleviate this condition, a proportion of the young steelhead are transferred back to Big Canyon and Wallowa Hatcheries to finalize growth before release as smolts at 5/lb. This process also acts to acclimate the fish to the release sites. The remaining steelhead juveniles at Irrigon are kept on a feeding regimemon to ensure that they will be released at the same size and about the same time as the acclimated group. These fish are transported to the Wallowa River and directly released.

Acclimated and direct release strategies for five brood years of summer steelhead were evaluated to compare the smolt-to-adult survival rates for each test group. The study concluded that the acclimated group survived consistently at 1.5 times the rate of the direct stream release fish. The experiment also used catch-to-escapement ratios as an index of straying. This method showed no
difference in the stray rate of either group. Creel surveys conducted in the upper Grande Ronde showed no incidence of Wallowa released hatchery summer steelhead in the catch. Homing of both acclimated and direct stream released summer steelhead appears accurate once steelhead enter the Wallowa River. However, it should be noted that the Irrigon Hatchery is a closed system facility and has no outlet to the Columbia river to falsely attract fish. Some hatchery steelhead have been found in small tributaries to the Wallowa River, however.

Residualization of hatchery summer steelhead smolts and consequent competition effects on rearing populations of juvenile spring chinook was also addressed. The Washington Department of Fish and Wildlife conducted a study on the Tucannon River to determine how to reduce residualization of hatchery summer steelhead. Results showed that by allowing hatchery steelhead to volitionally release themselves through an outlet in the rearing pond as many as 20% of the fish which would potentially residualize remained in the pond. Also, the proportion of males in the remaining group increased. Pre-release sex ratios of study fish was about 50/50 but the proportion of males increased to almost 90% toward the end of the release period. The shift in sex ratios of outmigrating smolts does not clearly express itself in the adult returns, however, but this may be because males return as 1-salt fish at higher rates than females and therefore have a proportional survival advantage by not having to endure another year in the ocean.

Volitional releases of hatchery steelhead has promise as a fisheries management tool. Decreasing densities of residualized hatchery steelhead smolts can reduce competition with wild salmonids. Remaining fish could be planted in local lakes or reservoirs to expand recreational fishing opportunities.
Siuslaw Acclimation Study and Evaluation
Bob Lindsay

An acclimation study is being conducted on the Siuslaw River to develop recommendations that will help fishery managers decrease impacts of hatchery programs on genetic characteristics of wild steelhead. The objectives of the evaluation are to determine if acclimating hatchery winter steelhead smolts prior to release will 1) reduce straying of returning adults to non-target areas and 2) increase homing to specific sites for adult collection. The results presented are a summary of one years data.

Three test groups using Alsea winter steelhead stock were compared:
1) acclimated prior to release, 2) non-acclimated and 3) conventional mainstem release. Approximately 30,000 smolts were transferred to a portable above-ground raceway on Whittaker Creek in late February of 1992 and acclimated for 30 days. The smolts were released into a pool in Whittaker Creek on March 31. Two control releases followed on April 1: 30,000 smolts were transferred from the Alsea Hatchery and directly released into the same pool in Whittaker Creek, and about 46,000 smolts were transferred and released into the mainstem Siuslaw. Analysis of adult returns were corrected for differences in smolt release numbers.

During the winter of 1993-94, adult traps were monitored on Whittaker Creek and nine other tributary streams in the Siuslaw basin. A high percentage of the acclimated and non-acclimated fish which returned as adults migrated to the trap on Whittaker Creek but showed a low incidence of straying to other Siuslaw tributary trap sites (Table 1). The mainstem release group strayed at a higher rate into other tributaries of the basin than either of the other experimental groups. Adult homing capability was similar for both the non-acclimated tributary release and the acclimated group. Though, questions were raised about the imprinting effect the in-channel pool release site may have had on the non-acclimated fish, smolts remaining in the pool after one day were forced out with a seine.

Table 1. 1993-94 adult winter steelhead returns to Siuslaw basin trap sites.

<table>
<thead>
<tr>
<th>Stream</th>
<th>Acclimated</th>
<th>Non-acclimated</th>
<th>Mainstem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whittaker</td>
<td>292 (98%)</td>
<td>238 (96%)</td>
<td>27 (22%)</td>
</tr>
<tr>
<td>Other tribs</td>
<td>6 (2%)</td>
<td>10 (4%)</td>
<td>93 (78%)</td>
</tr>
</tbody>
</table>

A statistical creel survey conducted on the Siuslaw during the winter of 1993-94 showed that adult returns from all test groups made similar contributions to the Siuslaw winter steelhead fishery (Table 2). The catch in the Siuslaw for all test groups occurred from December to March. Acclimated and mainstem test fish had similar catch distributions but the non-acclimated steelhead made a greater contribution to the catch in January.
Most of the trapped steelhead at Whittaker Creek were trucked downstream and recycled back into the fishery to evaluate catch success. Anglers caught 18% of the 270 acclimated recycled steelhead and 11% of the 229 recycled non-acclimated fish. Recycling increased the total catch, including those caught and released, of experimental hatchery fish in the basin by 46% for acclimated and 23% for non-acclimated steelhead. However, just over 50% of all recycled fish were accounted for either in the fishery or back at the trap sites. Of the recycles recovered in traps, 92% of the acclimated adults and 94% of the non-acclimated adults were in Whittaker Creek. Recycled adults that could not be accounted for are most likely moving into tributaries below the release site at the head of tidewater or are dying from handling stress or predation. Radio tags will be used next year to track missing fish.

Table 2. 1993-94 catch summaries and distribution for test groups of Alsea Hatchery winter steelhead in the Siuslaw Basin.

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Number Caught</th>
<th>Monthly Catch Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acclimated</td>
<td>93</td>
<td>Dec 30% Jan 39% Feb 36% Mar 4%</td>
</tr>
<tr>
<td>Non-Acclim.</td>
<td>98</td>
<td>11% 64% 14% 11%</td>
</tr>
<tr>
<td>Mainstem Rel.</td>
<td>93</td>
<td>27% 42% 25% 6%</td>
</tr>
</tbody>
</table>

The North Fork Alsea Hatchery was monitored in the winter of 1993-94 to determine stray rates of experimental fish back to the hatchery of origin. A creel survey was also conducted on the Alsea to evaluate contribution of stray steelhead to the fishery from test fish released into the Siuslaw. All test groups had a relative stray rate from the Siuslaw to the Alsea close to 20%. First year results indicate that acclimation did not reduce out-system stray rates to the Alsea River compared to non-acclimated and mainstem releases.

The relative survival for acclimated, non-acclimated and mainstem groups was 1.61%, 1.43% and 0.91%, respectively. However, it is uncertain whether acclimated and non-acclimated steelhead enjoyed a higher survival rate than the mainstem release group because trap data indicates they entered most spawning tributaries in the Siuslaw basin.

Acclimation is currently being evaluated by the Oregon Department of Fish and Wildlife as a management tool for steelhead to determine if consumptive fisheries can be maintained with reduced impacts to the wild stocks. Data collected in the first year of this study showed that acclimation of hatchery steelhead prior to release into Whittaker Creek performed similarly to non-acclimated steelhead released directly into Whittaker Creek. Both these test groups also showed a much greater capability to home back to their release site than the conventional mainstem release. Improved homing capability of hatchery released smolts back to their release site allows fishery managers the opportunity to remove the adults from the system either permanently or for recycling to reduce the impacts on wild stocks. More information is needed to define the role of acclimation in future steelhead management programs. Adult returns from test smolt releases made in 1993 and 1994 will be monitored during 1994-1996 to complete the evaluation.
The Coos and Coquille River systems in southwestern Oregon support popular winter steelhead fisheries. Catch in the Coquille and Coos Rivers for the run years 1981-1992 averaged about 4,500 and 1,600, respectively. However, fish managers recently became concerned that the level of hatchery fish present in the naturally spawning population of winter steelhead exceeded levels set in guidelines of the Wild Fish Management Policy (OAR 635-07-525 through 635-07-529). Traps set in tributaries to the Coquille River showed that hatchery fish represented 95% of the run in 1990-91 and 76% in 1991-92. A creel survey conducted on the Coquille in 1991-92 determined that hatchery winter steelhead composed 83% of the run. The volunteer scale program showed an average of 81% hatchery and 19% wild for the run years 1982-1989. To reduce the effects of hatchery winter steelhead interactions on wild steelhead populations in these basins the following four management strategies were implemented:

1. Localized broodstock conversion
2. Acclimation of steelhead smolts prior to release
3. Catch and release regulation for wild steelhead
4. Reduction of release numbers of hatchery oriented steelhead smolts

Coos River stock steelhead were released into the Coquille basin from 1948 until 1968. Alsea stock was used from 1968 until 1982. The hatchery release program converted to Coquille stock steelhead in 1982 and was segregated in 1990 into two stocks, South Fork stock and a North and East Fork Coquille stock. The hatchery stock of Coquille winter steelhead was completely converted to localized stock in 1994. By using a localized in-system stock of winter steelhead, compliance with the Wild Fish Management Policy can be met by not allowing the hatchery component in the naturally spawning portion of the run to exceed 50%. This compares to 10% if an out-system stock was used.

Wild adult winter steelhead were captured for broodstock conversion by a variety of means. A weir trap was constructed in the South Fork Coquille. Angling was tried but proved unproductive. Beach seines were used in the larger pools and were effective in the East and North Fork Coquille. Walking gill nets downstream through holding pools or long reaches of stream was very successful. Adults trapped in the gill nets were immediately retrieved and either moved directly to a holding tank or placed in large diameter PVC tubes to rest instream before transfer to the Bandon Hatchery. All methods were labor intensive and couldn't have been conducted without the assistance of STEP volunteers and Forest Service personnel.

Acclimation and release sites were established on several tributaries to both the Coquille and Coos River basins. This management strategy ("blackhole acclimation") is aimed at attracting hatchery fish back to specific areas as adults. Fishery managers can then remove the fish from the river for release into nearby lakes to diversify angling opportunities. Sites in the Coquille were developed at Laverne Park - a mainstem in-channel site on the South Fork, Hantz Creek, Beaver Creek, and Ferry Creek. Acclimation sites in the Coos basin were established on the West Fork Millicom
Big Creek, and Noble Creek. All sites are located downstream of important spawning grounds to minimize hatchery fish interactions with wild spawners.

Acclimation sites located in the stream channel can block passage of downstream juvenile migrants and upstream bound adults. To accommodate passage, a surface bypass channel was installed in the Beaver Creek site on the South Fork Coquille and in Big Creek on the South Fork Coos River. It consisted of a floating trough which extended from the downstream to the upstream end of the acclimation pond. The top was covered with netting to prevent the acclimating steelhead in the holding pond from escaping, and migrating fish from entering the holding pond.

Catch and release for wild steelhead was implemented on the South Fork Coquille in January of 1993. This regulation was adopted for the entire Coquille basin in January of 1994. A complete closure to steelhead fishing was implemented on the South Fork upstream of the Siskiyou National Forest boundary near the town of Powers. This section of the river is an important spawning area for wild fish. Collectively these management strategies are used to enhance and sustain wild steelhead production, and to comply with the WFMP.

Winter steelhead smolt release numbers in both the Coquille and the Coos basins have recently been reduced to decrease the number of adult hatchery steelhead returning to these rivers. Coquille river releases averaged about 149,000 from 1982-1992 and are presently 113,000. Results of this strategy will be available in 1995 and 1996.

A two-year creel survey conducted on the South Fork Coquille River and funded by the Forest Service determined that the hatchery component in the catch of winter steelhead was 64% in 1993 and dropped to 55% in 1994. For purposes of the creel study the river was broken into five sections with section one located in the lower portion of the basin and section five located in the upper river. The hatchery component of the catch was shown to decrease overall with distance upstream. This suggests that the hatchery component of the run decreases further upstream in the watershed where important wild steelhead spawning is known to take place. Adult winter steelhead recovered in trap sites established in the Coquille basin followed a similar trend. The proportion of hatchery steelhead collected in traps was 95%, 76%, 65% and about 30% for run years 1991-94 respectively.

Adult steelhead were captured in tributary spawning grounds to the Coquille River in 1994 between January and May to determine the hatchery component in the spawning population. Results from 21 steelhead collected in Sucker, Rock and Coal creeks showed a composition of 67% wild and 33% hatchery.

Results from the first few years of the evaluation suggest that strategies implemented to manage winter steelhead in the Coquille and Coos Rivers in compliance with the Wild Fish Management Policy have been successful in reducing the hatchery component in the steelhead run. The success of this program will be more conclusive in later years when more data becomes available. The study will continue to determine trends in wild and hatchery steelhead abundance. Much of the effort directed at the project has gratefully come from volunteers and through cooperative agreements with the Forest Service. Continued assistance from these groups is necessary.
Evaluation of Straying by Coastal Stocks of Hatchery Winter Steelhead
Kirk Schroeder

Studies have shown that adult hatchery steelhead can stray into other river systems to spawn. The Oregon Department of Fish and Wildlife reported in 1987 that the catch of steelhead in coastal streams managed for wild steelhead was composed of 28% hatchery steelhead. Fishery managers are concerned about the potential effects of hatchery steelhead strays on endemic wild steelhead populations. Managing steelhead under guidelines set in the Wild Fish Management Policy is also an issue. The ODFW conducted a study in Oregon coastal rivers to assess the extent of straying of adult hatchery steelhead and to determine the origin of strays.

Three brood years (1989-91) of hatchery winter steelhead at several Oregon coastal hatcheries were differentially finclipped and released in 1990, 1991 and 1992. The release groups returned as adults in the 1992-1994 run years. Creel surveys and traps were used to evaluate the extent and origin of strays (Table 1 and 2). In addition, volunteer scale collections were analyzed if the sample size was sufficient (generally over 20).

Table 1. Composition of winter steelhead catch in creel surveys of Oregon coastal streams.

<table>
<thead>
<tr>
<th>Stream</th>
<th>Run Years</th>
<th>Wild</th>
<th>Instream</th>
<th>Stray</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>N.F. Nehalem</td>
<td>1992</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Necanicum</td>
<td>1992</td>
<td>19</td>
<td>65</td>
<td>15</td>
<td>26</td>
</tr>
<tr>
<td>Trask</td>
<td>1993-94</td>
<td>75</td>
<td>0</td>
<td>25</td>
<td>102</td>
</tr>
<tr>
<td>Nestucca</td>
<td>1992-94</td>
<td>38</td>
<td>54</td>
<td>8</td>
<td>445</td>
</tr>
<tr>
<td>Three Rivers</td>
<td>1992-94</td>
<td>34</td>
<td>65</td>
<td>1</td>
<td>719</td>
</tr>
<tr>
<td>Alsea</td>
<td>1992-94</td>
<td>23</td>
<td>49</td>
<td>28</td>
<td>1016</td>
</tr>
<tr>
<td>Siuslaw</td>
<td>1992-94</td>
<td>33</td>
<td>63</td>
<td>4</td>
<td>1531</td>
</tr>
<tr>
<td>Coquille</td>
<td>1993-94</td>
<td>39</td>
<td>58</td>
<td>3</td>
<td>841</td>
</tr>
<tr>
<td>Sixes</td>
<td>1992</td>
<td>96</td>
<td>0</td>
<td>4</td>
<td>141</td>
</tr>
<tr>
<td>Elk</td>
<td>1992</td>
<td>96</td>
<td>0</td>
<td>4</td>
<td>82</td>
</tr>
<tr>
<td>Winchuck</td>
<td>1994</td>
<td>85</td>
<td>0</td>
<td>15</td>
<td>118</td>
</tr>
<tr>
<td>Chetco</td>
<td>1992-94</td>
<td>71</td>
<td>23</td>
<td>5</td>
<td>1049</td>
</tr>
</tbody>
</table>

1 Adult hatchery fish returning to the stream of their release.

Creel surveys determined that, on the average, stray hatchery steelhead composed about 10% of the total catch in study streams but varied among rivers (Table 1). The highest incidence of straying in creel surveys was 28% in the Alsea River. The Trask River, where no hatchery steelhead are released, showed a similarly high stray rate of 25%. This occurrence might be a result of the large releases of hatchery steelhead made in other Tillamook Bay streams.
Table 2. Composition of winter steelhead escapement determined from traps in Oregon coastal rivers.

<table>
<thead>
<tr>
<th>Stream</th>
<th>Year</th>
<th>Catch (Percent)</th>
<th>Origin of Strays</th>
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<tr>
<td></td>
<td></td>
<td>Wild</td>
<td>In-stream Hatch.</td>
<td>Stray Hatch.</td>
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<td></td>
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<td></td>
<td>Hatch.</td>
<td></td>
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<tr>
<td>Siletz</td>
<td>93-94</td>
<td>87</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Yaquina</td>
<td>91-92</td>
<td>78</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>92-93</td>
<td>49</td>
<td>45</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>93-94</td>
<td>79</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>Alsea</td>
<td>91-92</td>
<td>45</td>
<td>7</td>
<td>48</td>
</tr>
<tr>
<td>Tribs.</td>
<td>92-93</td>
<td>56</td>
<td>22</td>
<td>22</td>
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<tr>
<td></td>
<td>93-94</td>
<td>39</td>
<td>9</td>
<td>52</td>
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<tr>
<td>Drift</td>
<td>91-92</td>
<td>38</td>
<td>0</td>
<td>62</td>
</tr>
<tr>
<td>Creek</td>
<td>92-93</td>
<td>63</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>(Alsea)</td>
<td>93-94</td>
<td>73</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>Siuslaw</td>
<td>91-92</td>
<td>57</td>
<td>38</td>
<td>5</td>
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<tr>
<td></td>
<td>92-93</td>
<td>39</td>
<td>54</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>93-94</td>
<td>16</td>
<td>83</td>
<td>1</td>
</tr>
<tr>
<td>Coquille</td>
<td>92-93</td>
<td>33</td>
<td>63</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>93-94</td>
<td>69</td>
<td>28</td>
<td>3</td>
</tr>
</tbody>
</table>

1 Numbers represent the proportion of steelhead caught in traps which are wild, hatchery stock released in the study stream, or hatchery stock originating from releases made in another basin.

2 For the purpose of the study stray steelhead from distant streams are from releases made in rivers more than two major basins away. Fish from unknown releases were not included.

Stray hatchery steelhead represented an average of 17% of the total catch of winter steelhead in traps. The stray hatchery component of steelhead in traps may differ from the figures determined by creel as trap data are more limited than creel data. Also, the hatchery stray rate in the Alsea basin is significantly higher than other study streams which increases the average. Most stray hatchery steelhead came from releases made in nearby basins. On the average, 75% of the stray hatchery fish in the creel surveys and trap catches were from nearby stream releases.
About 85% of the stray hatchery fish in the Alsea River are from out-system releases of Alsea stock steelhead based on data from both creel surveys and traps. Over 70% of these strays are from Siuslaw River releases. Alsea out-system releases also composed about 75% of the strays in the Nestucca River and could be from releases made in the Salmon River. However, because out-system releases of Cedar Creek Hatchery stock were not differentially marked from instream releases, it is difficult to determine the stray rate of steelhead releases made in Tillamook Bay streams.

The study concluded that on the average the component of stray hatchery winter steelhead in most coastal streams with hatchery releases is relatively small. There are exceptions, however. The relatively high stray rate in the Alsea River is influenced by stray Alsea stock steelhead released out-system in local basins. In systems managed for only wild fish like the Trask and Winchuck, straying of adult steelhead from large hatchery releases in nearby basins is of concern. Reduction of stray hatchery steelhead in systems which are out of compliance with the Wild Fish Management Policy may include use of local broodstock in certain hatchery production programs, direct stream releases in tributaries to increase homing, full term rearing in target streams or in a hatchery far removed from the "parent" stream, and reduction in hatchery release numbers.
Relative Abundance, Distribution, and Characteristics of Residual Steelhead Released from Northeast Oregon Hatcheries

Brian Jonasson

In concordance with the Lower Snake River Compensation Plan, 1.25 million hatchery steelhead smolts are released annually into the Grande Ronde river and 330,000 into the Imnaha river. A proportion of these steelhead residualize and don't migrate to the ocean. Currently, spring chinook in these basins are listed as threatened under the Endangered Species Act. Concern has grown regarding competition effects of residualized steelhead on locally rearing populations of juvenile spring chinook. A study was conducted in 1992 and 1993 to determine the distribution, abundance, and population characteristics of residual hatchery steelhead in the Grande Ronde and Imnaha rivers.

For the purpose of the study, residualization was defined as a hatchery steelhead not migrating to the ocean after June 15 of its release year. The study showed that densities of residualized steelhead were highest near their release sites (31-55 fish/100 m² in 1992; and 10-26 fish m² in 1993). Residualized steelhead moved both up- and downstream of their release site but abundance decreased with distance. Residualized steelhead abundance decreased with time but some fish survived for over a year after release. Residuals were significantly smaller in length than the average size of the release group, and tended to be male: 81% of the sampled residuals were males as compared to 55% of the pre-release group. Sexual maturation of residual males also increased with time. Grading out smaller steelhead prior to release was a proposed management option to reduce the rate of residualization.

The study determined that residualization was independent of release strategy. Analysis of coded wire tags recovered from sampled fish in both 1992 and 1993 determined that steelhead which were acclimated prior to release residualized at similar rates to those directly released into the river.

Predation by residual steelhead on juvenile chinook is a concern. Though the majority of chinook rearing areas are located upstream of steelhead release sites, young chinook were present in areas with residual steelhead. Stomach analysis of 676 residual steelhead showed no incidence of predation on spring chinook. Dace and sculpins were found in 42 stomach samples and eight had salmonids that were determined to be juvenile rainbow. Based on sample size the study concluded that no more than 0.49% (95% confidence) of the residual steelhead had consumed juvenile chinook. Though losses of juvenile chinook to predation by residual steelhead appear low, concern still exists because of the large numbers of hatchery steelhead released and the proportion of the release fish which residualize is unknown.

The evaluation concluded that the current release locations help to minimize the impacts of residual steelhead on juvenile chinook. However, competition between residual hatchery steelhead and other species of fish is possible. The study will continue through 1994 and 1995 funding permitting.
Siletz Summer Steelhead Radio Telemetry Study  
Randy Reeve

Northwest Region fish biologists initiated a radio telemetry study in 1993-94 on Siletz summer steelhead to develop a clearer understanding of their adult life history. Prior to the construction of a ladder at the Siletz falls (RM 64.5) in the 1950's an estimated 500 wild adult summer steelhead passed into the upper basin. Since 1985 annual adult returns have declined to less than 100 wild fish. Siletz summer steelhead are the only summer steelhead stock originating in the Oregon Coast Range and more stock specific information is needed to ensure their survival. The objectives of the study were to 1) determine the upper basin distribution of both summer and winter steelhead and 2) determine if adult summer and winter steelhead have overlapping spawning distribution and timing.

Twenty radio tags with a frequency of 148 were used. Steelhead were trapped at Siletz Falls and summer and winter run fish were differentiated by run timing and color. Radio tags were orally inserted into the esophagus. Since the radio tags only had a life span of about nine months, early-run summer steelhead (May-July) used in the study were floy tagged first and then recaptured later in the upper basin by seine and fitted with a radio tag. Tagged steelhead were tracked by both airplane and automobile. Numbers and race of steelhead tagged and monitored in the study are described in Table 1.

Table 1. Summary of the 1993-94 Siletz steelhead radio tagging study.

<table>
<thead>
<tr>
<th>Steelhead Race</th>
<th>Origin</th>
<th>Number Radio Tagged</th>
<th>Potential Spawning Distribution or Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer Run</td>
<td>Wild</td>
<td>2</td>
<td>North Fork Subbasin</td>
</tr>
<tr>
<td></td>
<td>Wild</td>
<td>1</td>
<td>South Fork Subbasin</td>
</tr>
<tr>
<td></td>
<td>Wild</td>
<td>2</td>
<td>Predation casualties (tags recovered)</td>
</tr>
<tr>
<td></td>
<td>Hatchery</td>
<td>2</td>
<td>Harvested</td>
</tr>
<tr>
<td></td>
<td>Hatchery</td>
<td>3</td>
<td>Undetermined losses</td>
</tr>
<tr>
<td></td>
<td>Hatchery</td>
<td>1</td>
<td>Spawned in the South Fork Siletz</td>
</tr>
<tr>
<td>Winter Run</td>
<td>Wild</td>
<td>3</td>
<td>Possibly spawned in North Fork tributaries</td>
</tr>
<tr>
<td></td>
<td>Wild</td>
<td>1</td>
<td>North Fork</td>
</tr>
<tr>
<td></td>
<td>Wild</td>
<td>1</td>
<td>Spawned in upper mainstem</td>
</tr>
<tr>
<td></td>
<td>Wild</td>
<td>3</td>
<td>Potentially spawned below falls</td>
</tr>
<tr>
<td></td>
<td>Wild</td>
<td>1</td>
<td>Trap mortality</td>
</tr>
<tr>
<td></td>
<td>Hatchery</td>
<td>1</td>
<td>Spawned lower South Fork</td>
</tr>
<tr>
<td></td>
<td>Hatchery</td>
<td>2</td>
<td>Spawned in lower system tributaries</td>
</tr>
<tr>
<td></td>
<td>Hatchery</td>
<td>1</td>
<td>Spawned in mainstem below falls</td>
</tr>
<tr>
<td></td>
<td>Hatchery</td>
<td>1</td>
<td>Trap mortality (partially spawned)</td>
</tr>
</tbody>
</table>

1 Only 20 tags were available in this study so some tags were reused when possible.

2 Due to flow conditions it was often difficult to view redds and document spawning. Timing and duration of holding were used to determine if tagged adults spawned. Professional judgment was often exercised.
Results showed that hatchery and wild summer steelhead spawned in both the North Fork subbasin, and the South Fork Siletz above the old Valsetz lake site. Though early returning summer steelhead found summer holding pools in the North Fork, one tagged fish left this refuge and migrated over to Sand Creek on the South Fork to spawn later that winter. The information indicates that summer steelhead don’t necessarily spawn local to their holding areas. Wild summer steelhead displayed a more defined and steady movement to their holding and spawning areas as compared to the tagged hatchery group which moved more erratically around the upper basin.

Summer and winter steelhead were found to temporally overlap on the spawning ground. During the winter spawning period on the North Fork, one radio tagged male summer steelhead was found below an active male winter steelhead and above an active female winter steelhead. Interbreeding between wild and hatchery stocks of summer and winter steelhead are management concerns.

Problems encountered in the study were 1) angling mortality of tagged fish, 2) behavior differences of steelhead radio tagged at the falls trap site as compared to those fish seined and radio tagged above the falls, 3) flight scheduling with the Oregon State Police to track fish and 4) confirming spawning location because of access or high water. The study has been funded for the 1994-95 run year and the second year’s effort will focus in part on resolving these issues.

Future objectives of the study are:

1. Radio tag fish near tidewater to determine the spawning distribution of summer steelhead in the entire basin both above and below the falls.
2. Determine if adult summer steelhead hold in the lower river prior to moving upstream in early fall.
3. Determine if adult summer steelhead migrate into the lower river during late spring and early summer and hold, or if the run is better characterized by a continuous migration from the ocean throughout the summer and early fall.
4. Determine if adult summer steelhead can successfully migrate above the falls without the benefit of the ladder.
5. Determine if radio tagging steelhead at the falls modifies their behavior in a way which might effect interpretation of the data.