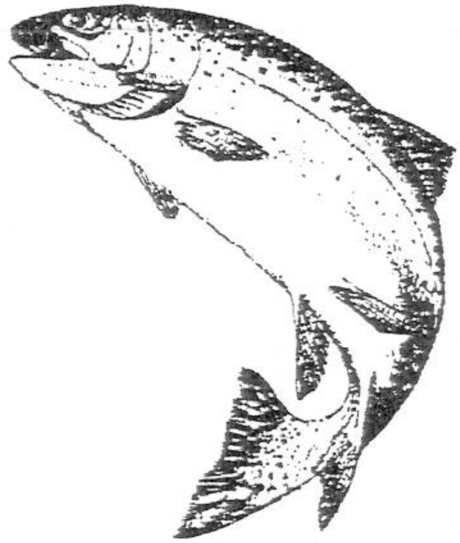
Summary of
the Fourth

Pacific Coast Steelhead Management Meeting



March 15 - 17, 1994
Fort Worden State Park Conference Center
Port Townsend, Washington

Sponsored by:
Pacific States Marine Fisheries Commission
and
U.S. Fish and Wildlife Service

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Pacific Coast Steelhead Management Workshop
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INTRODUCTION

During March 15-17, 1994, the Pacific States Marine Fisheries Commission in conjunction with the U.S. Fish and Wildlife Service sponsored the fourth in a series of workshops on steelhead (*Oncorhynchus mykiss*) management.[1] The workshop was attended by approximately 34 West Coast fisheries managers and researchers representing the states of Alaska, Washington, Idaho, Oregon, and California, and the province of British Columbia. Topics for this workshop included:

- an update on the status of Endangered Species Act (ESA) petitions;
- discussion of steelhead harvest management issues;
- a discussion of the ecosystem/watershed management approach to habitat protection; and
- attempts to quantify the relationship between steelhead production and habitat.

The workshop was structured as a series of panel presentations, followed by discussion and/or questions from the audience. It was intended as a forum to allow steelhead managers and researchers on a coastwide basis to discuss common problems and to share insights into possible solutions. The following paper prepared from notes and taped proceedings of the workshop summarizes the presentations.

Workshop Steering Committee:
Bob Gibbons, Washington Department of Fish and Wildlife
Doug Jones, Alaska Department of Fish and Game
Art Tautz, Ministry of Environment, British Columbia
Dexter Pitman, Idaho Department of Fish and Game
Mick Jennings, Oregon Department of Fish and Wildlife
Tim Curtis, California Department of Fish and Game
Al Didier, Pacific States Marine Fisheries Commission

1 This workshop was partially funded though Agreement No. 14-16-0001-88516 with the U.S. Fish and Wildlife Service.

SESSION I: ENDANGERED SPECIES ACT UPDATE

Session Chair: Bob Gibbons, Washington Department of Fish and Wildlife

Peggy Busby - National Marine Fisheries Service

The Oregon Natural Resources Council (ONRC) and others petitioned to list Illinois River winter steelhead in May 1992. Evidence offered for reproductive isolation of this stock were: differences between northern and southern Oregon coastal steelhead; distance traveled to the spawning grounds; the presence of a seasonal barrier falls in the river; differences in life history and body size; the absence of half-pounders in this stock despite their presence in others nearby; spawning time and smolt age differences; and a lack of evidence of hatchery influence. Examples offered for evolutionary significance were: geographic location in the lower third of steelhead range; reported thermal adaptation; spawning distribution above the barrier falls; and value as hatchery stock for the local area. The review of Illinois River steelhead life history and morphological characteristics showed they were not so different from other stocks in the area. Genetic analysis grouped samples from the Illinois River basin with stocks in the Klamath, Eel, and other rivers in the area. While temperatures tolerated in the Illinois River were higher than commonly reported for steelhead, this characteristic was not unique to the Illinois River stock. The temperature data were also problematic, since they did not necessarily account for pools of colder water which steelhead could have sought when temperatures in the rest of the river were high. NMFS formally rejected the petition to list the Illinois River winter steelhead in May 1993, determining that the stock did not represent a "species" under the ESA. NMFS then began a review of all coastal steelhead stocks in Washington, Oregon, and California to determine whether a wider steelhead ESU may need protection. This voluntary review is somewhat unique, and NMFS is uncertain if it is subject to the same time constraints as a formal petition. Presuming that it is, however, NMFS hopes to have a decision on the coastal ESU by May 1994.

The petition to list Deer Creek summer steelhead was received in September 1993, was accepted in December 1993, and should be reviewed by September 1994. The stock is being affected by a landslide which occurred in the 1980's and the resulting/continued influx of fine soil material. The drainage had been roaded and logged historically, but it is uncertain whether the landslide resulted from timber activity or was a natural event resulting from local soil conditions. NMFS maintains that any stock that is an ESU (species + evolutionarily significant) is listable. A finding that this is "an act of God" will not affect that ESA determination, but could limit NMFS' ability to do a recovery plan.

ONRC petitioned to list all steelhead in the region in February 1994, and NMFS has until May 17 to decide whether the petition is warranted. The petition allows the options to: list all stocks; list summer and winter stocks separately; determine appropriate ESU's and list those separately; or list specific named stocks. It is likely NMFS will proceed as they have with similar coho petitions, starting first with the whole group and looking at smaller units if there are identifiable ESU's. The ONRC petition is similar to the coastwide review that NMFS is already conducting, except that it includes interior stocks and the ESA listing deadlines are now mandatory. NMFS plans to address the Deer Creek petition first.

In evaluating the significance of hatchery influence, NMFS asks: a) whether plants were made from outside of the basin; and b) if an ESU is established, whether the natural population is self-sustaining without the hatchery. NMFS attempts to determine if there are still unique genetic resources left in the basin, but there are no formal guidelines for that decision.

<u>Tom Wainwright - National Marine Fisheries Service</u>
The process NMFS uses to recommend listing, and the level of listing (i.e., threatened or endangered), is a series of threshold determinations. Species designations are guided by the Waples paper, and threshold determinations by the definitions of threatened and endangered in the ESA. These determinations are based on the stability of the population, and not on the reason for the decline. Threshold determinations include: absolute numbers; current abundance and trends; factors causing variability; threats to genetic integrity; and recent events with predictable consequences that may indicate whether the problem is short- or long-term. These determinations are based on: angler catch trends; passage counts at dams or weirs; spawner surveys; and the opinions of biologists (as contained in stock status summaries, agency reports, published literature, etc.).

Since the stated purpose of the ESA is to protect ecosystems, natural production should be emphasized over artificial production. For mixed production stocks, NMFS attempts to determine whether the natural component is self-sustaining. In data-poor situations, NMFS makes its best guess at what natural production would be without hatcheries. If a stock is an ESU and would not be self-sustaining without a hatchery, it would be a good candidate for listing. There is no good explanation or formal policy on what constitutes self-sustaining. Absolute numbers of animals usually do not come into play until the total population size is less than 500 animals, but even then the rate of migration between populations must be considered. No threshold determinations were performed for the Illinois River petition because the stock was not found to be a species for ESA purposes.

SESSION II: STEELHEAD HARVEST MANAGEMENT ISSUES

Session Chair: Doug Jones, Alaska Department of Fish and Game

Roger Harding - Alaska Department of Fish and Game

Steelhead in Alaska are subject to commercial, sport, subsistence, and (at one time) high seas harvest. Commercial harvest by gill net and purse seine averages about 2,800 fish sold annually. Not all fish caught are sold, however, and recent regulations prohibiting the sale of steelhead from purse seines will further erode that data source. Less than 2% of steelhead are caught in troll fisheries. Commercial harvest occurs primarily in the southern Southeast Alaska fisheries near Tree Point and Noyes Island. Due to migration timing of local stocks and some coded-wire tag recovery information, biologists believe that most of the steelhead taken originate in Canada. Sport harvest averages 4,800 fish per year, as measured by a statewide postal survey. Some subsistence harvest occurs in a few locations (Karluk, Situk, Klawock) but it is unclear who is eligible to take steelhead for subsistence. High seas harvest have hopefully ended but could have taken considerable numbers of fish. Healed gill net scars were observed on 16% to 21% of steelhead returning to two systems in 1991-92 during a time when no local fisheries were ongoing.

Most steelhead streams in Alaska support fewer than 100 adult fish, and only one stream consistently has over 5,000 fish. Steelhead stock status is based on some weir counts, float counts of the Situk River, sport harvest data, and angler reports. Indicator streams in Southeast Alaska generally show declining trends; a few stocks in Central Alaska are either stable or increasing. Freshwater angling effort for all species is increasing, but steelhead harvests have been declining since 1989. Catches (including release) have declined 44% in the past three years.

ADFG recently completed a major steelhead management planning process. A 9-member committee surveyed 1,700 statewide harvest survey respondents who reported fishing in steelhead streams. The 600 who replied indicated: they fished steelhead because they enjoyed fishing; they wanted different steelhead fishing regulations, preferring catch and release; and if they could not get catch and release preferred restrictions in gear and seasonal bag limits over permit drawings or time closures. As a result, new regulations were adopted to limit harvest of steelhead to 1 fish per day, 2 fish per season, over 36 inches in length. Harvests of trout 12 to 22 inches in length are limited to 2 fish per day. ADFG estimates these restrictions will make only 5% to 7% of returning steelhead available to harvest.

Bob Hooton - Province of British Columbia, Ministry of Environment, Lands and Parks

British Columbia has 3 major stock groupings: Interior summer, Coastal summer, and Coastal winter. Winter stocks return in December and January in the south, April and May in the north. Steelhead hatcheries are generally restricted to the southwest corner of the province because water elsewhere is not warm enough to produce smolts in one year.

Interior summer stocks occur in the major river systems (Taku, Stikine, Skeena, Nass, Dean, Fraser) and return commingled with salmon, so they experience substantial incidental harvest in commercial fisheries. Biologists generally estimate that current population sizes are only half what they were in the late 1970's and 1980's, and commercial fisheries are still taking an average 60% of the stocks. In the most northern systems (Taku, Stikine) returns average 2,000 to 3,000 fish, most of the harvest is commercial, and allocations to other users are similar to previous years except that there are fewer fish now. The Skeena system has had an unprecedented three consecutive years of declining returns, coupled with three years of strong sockeye salmon returns and large commercial fleets. Some of the commercial harvest pressure on the Skeena and Nass systems has been relieved due to a recent catch and release program in commercial fisheries, but commercial catch statistics for steelhead are considered unreliable, a federal phased reduction of steelhead interception has had no measurable effect, and commercial fisheries continue to harvest proportionally higher in the early part of the return. Sport fisheries for steelhead in these systems have been catch and release for three years, and native harvests have declined due to reduced numbers of fish. In the Dean River, commercial exploitations may be down from 55% to 20% recently due to poor salmon returns and restricted commercial seasons. Weed lines have been used on commercial gill nets in an attempt to reduce steelhead harvest, but the technique is apparently less effective at high gear concentrations.

Coastal summer stocks generally come back during times when commercial fisheries are not as active, so neither commercial nor native harvest is as significant. The sport fishery was significant but is now gone by regulation. Total abundance of these stocks is down 25% to 30% from the late 1970's. Allocations of Coastal winter stocks are also relatively unchanged. There is not much commercial or native harvest, and sport harvest which once took 5% to 10% of the total run has now been essentially eliminated by regulation. Hatchery stocks make up about 20% of the return, but returns of both hatchery and wild stocks are currently down about 25%. The overall decline in all three stock groupings, and a general decline in average fish size, has led to speculation that ocean productivity must somehow also be involved.

Tim Curtis - California Department of Fish and Game
There are no commercial or Indian fisheries affecting steelhead in California. Sport harvest is the only source of legal mortality in freshwater. No catch information was available until the recent implementation of a punchcard system, and the first year of data from that program is currently being analyzed. There are no statewide steelhead bag limits or harvest restrictions, but there are individual regulations to protect special cases. In general, steelhead in North Coast rivers were affected by damming and these runs are now supported by hatcheries, while steelhead in South Coast systems are impacted by water removals. CDFG views providing angler opportunity, while still protecting small populations and genetic integrity, as its major challenge with steelhead.

License sales are currently down in California, reportedly because the public has no time to fish or it is not convenient. CDFG wants to provide the maximum opportunity close to home, even if the fish cannot be kept. CDFG provides public information through participation in sport shows and though school programs involving hatch boxes and fry release. Opportunity is a critical issue in southern California, where steelhead populations are small and human ones are large. Stream closures protect fish in holding areas, and there are size limits to discourage fishing in juvenile rearing areas. A combination of private and mitigation hatcheries can provide many fish to catch (Mad River is the only one devoted exclusively to steelhead), but they can be detrimental to wild populations and often do not provide fish close to population centers. Some hatchery/wild interaction studies are in progress.

Anglers are still allowed the opportunity to catch and keep wild steelhead in some systems. Stock problems are exacerbated by water diversions and the introduction of predators to some systems (squawfish in the Eel River). Low water closures are almost annual due to water diversion and drought conditions. Since small steelhead population sizes are a constant (population size is unknown in most streams, but often less than 10 fish), at what point should harvests be stopped? Steelhead populations appear resilient, and have continued to return despite dams and human population pressures.

Strict stock transfer policies are now in effect to protect genetic integrity, although these policies did not exist in the 1970's. Volunteer efforts have been used in some instances (Carmel River) to maintain native populations during in-stream construction activities. Withstanding public pressure to spread hatchery fish to areas where they could provide fishing opportunity, but could also affect wild fish, has been an ongoing problem.

<u>Don Swartz - Oregon Department of Fish and Wildlife</u>

At one time up to 16 million fish returned to the Columbia River; that number was reduced to 2 million by the late 1980's and is currently lower than that. There are now four dams on the Columbia River downstream of the Snake River, five or six upstream of the Snake, and another four to the Idaho border. The first of these (Bonneville) was completed in the 1930's and the last (Lower Granite) was completed in 1975. Fish runs have declined with dam construction. Fisheries management involves the states of Washington, Oregon, and Idaho, and the Columbia River tribes. Sport fisheries take place from the mouth of the river to the headwaters, non-Indian commercial fisheries take place below Bonneville dam, and Indian commercial fisheries take place between Bonneville and McNary dams. Harvests target a complex mix of species and stocks. Some of these stocks are endangered and some, like Columbia River summer chinook, have continued to decline despite many years of no targeted harvest by inriver or ocean fisheries. Tribal fishermen can sell commercially taken steelhead, while other commercial fishermen cannot.

The most recent management plan was renegotiated in 1982 to deal with production as well as harvest; it calls for a 50/50 split between tribal and other fishermen of all fish going over Bonneville Dam, and there are provisions to protect wild steelhead. The current interim goal (achieved only once since 1984) calls for passage of 75,500 wild steelhead over Bonneville Dam (62,200 wild A-run, 13,300 wild B-run). For under-escaped runs, treaty fisheries are not to take more than 15% wild A's and 32% wild B's. Samples are collected at the dams to determine hatchery/wild composition and age structure.

Recreational fisheries allow selective harvest of marked hatchery fish only, with release of wild fish, and the recreational fishery is closed in peak spawning areas. Hatchery fish are mass-marked with adipose fin clips; the mark is easily identified and thus minimizes handling stress on wild fish. Time/area/gear restrictions are used to make gill net fisheries more selective.

Mike Matylewich - Columbia River Intertribal Fisheries Commission
Managers of treaty fisheries must consider both the types and species of fish available for harvest at any point. They pick fishery days based on historic run timing, abundances over the dams, and escapement/management goals. A-run and B-run steelhead have their own peculiar characteristics: i.e., their abundances appear as two peaks at Bonneville Dam but only as a single peak at McNary Dam. Steelhead that come over early do not move much during the warm water months of summer and are still available when the treaty fishery starts in August. Before 1977, treaty fishery regulations targeted fall chinook. During 1977 through 1982, minimum mesh size restrictions were imposed to minimize steelhead catch and the number of fishing days was reduced due to diminished numbers of fall chinook salmon. After establishment of interim goals in 1983, mesh restrictions were dropped and there were some targeted steelhead harvests. Hatchery releases of summer steelhead have tripled since 1982. Managers attempt to make treaty harvests responsive to the total numbers of wild fish, and to provide at least 30% wild spawners over Lower Granite Dam.

Dexter Pitman - Idaho Department of Fish and Game
Fishery managers often list factors other than fishing as a major determinant of stock status. But fishing is listed as a threat to most of the stocks named in the recent region-wide steelhead listing petition. Most people know intuitively that fishing kills fish, so if there is a problem with stock status it must be due to fishing. If that perception is not reality, then fishery managers should say so. It may not be right for harvest statistics to be used against sport fishermen, requiring them to be the only conservationists, when the hydroelectric power, timber, and commercial fishing industries can use the lack of data to deny all responsibility.

What role do harvest issues play relative to stock status? Harvest rates on wild steelhead in the Columbia River appear high, and it is tempting to say that elimination of those harvests would allow all other industries to continue unaffected. But if harvest was totally eliminated on B-run stocks they might stabilize at escapement goals and no fishing (or very little) could ever be allowed in the future; A-run stocks would not even reach escapement goals, and would likely decline even with no fishing. We could then blame the decline on ocean survival, and close all fisheries until ocean productivity improves. Meanwhile, the hydroelectric system continues to have an effect on the productivity of our fish, for we know that flow levels in the system are directly related to smolt-to-adult survival rates. NMFS has asked managers to accept low flow conditions and still solve ESA problems.

If a stock status problem is due just to over-fishing, managers would not let stocks get to the 10's or 100's of fish before deciding to close fishing. Closing fisheries when the stocks are relatively healthy might actually have some impact. At low levels of productivity, like those found in Idaho and California, it just buys a little time. We can close those fisheries reluctantly and penalize fishermen, but the closures in themselves will not do much good. Managers should complain about changes in productivity, and make the public aware that fishery closures alone will not bring stocks back to former levels. Stocks will continue to decline despite those measures, and by accepting those closures the public may forever forgo the opportunity to take those fish. Basic changes are needed to the factors that affect productivity. Managers may even need to resist closures more in order to elevate the issue.

Fishery managers must help the public confront the reality that the real choice is dams versus fish. Idaho thought that the ESA would bring federal clout to bear on this issue, but was proven wrong given the "no jeopardy" ruling for dams. Natural resource management as a national policy should be based on conservation and wise use of all resources, and choices should be presented as <u>and</u> rather than as <u>either/or</u>. The public does not necessarily have to choose hydroelectric power, timber, or mining over fisheries. The Pacific Northwest does not need the world's largest hydroelectric system, if having a little smaller one with higher rates would allow fish to survive. The region could have both timber and fishing by allowing timber development to progress at a slower rate. Fisheries managers need to focus as much attention on those issues as they do on changing fishing regulations.

SESSION III: THE ECOSYSTEM/WATERSHED MANAGEMENT APPROACH TO HABITAT PROTECTION

Session Chair: Steve Elliott, Alaska Department of Fish and Game

Rollie Geppert - Washington Department of Fisheries and Wildlife
Integrated Landscape Management (ILM) is the second phase of a WDFW initiative to restructure its methods of operation. In its first phase, the agency used a GIS mapping system to identify over 139 priority species and 19 priority habitats. This information, which currently covers 70% of the state, is digitized and placed into data sets which are made available to any interested landowner, tribe, or local government. In the ILM phase, this information on current status is used as the start of a public discussion of where resource management should go, how should it get there, and how managers will know they have arrived. ILM is an attempt to manage ecosystems through cooperative management plans developed between landowners and fish and wildlife managers. It is a proactive approach for providing landowners with voluntary options for managing resources to their benefit while protecting fish and wildlife into the next century. It is not being promoted as a regulatory program.

The goal of the program is to work with the public to identify objectives, and to prepare, implement, and evaluate management plans. This planning will be tied to department work plans, budgets, goals, and objectives, and will eventually become the department's standard method of business. It will replace species-by-species management with landscape management. A pilot program of the approach is currently underway in the Lewis River watershed, and will be used to identify mitigation needs associated with a hydroelectric reservoir prior to relicensing. It focuses on 11 species and 7 habitats. The agency's options for implementing ILM are through advise and consultation with existing landowners, cooperative and/or mitigation agreements, I&E in schools, permits, direct land management on public lands, or through land acquisition. The agency will go to landowners and try to convince them to do those things that are needed for the landscape. From landowners who can accommodate these changes, the agency will try to secure agreements and to determine what beyond those voluntary agreements are needed to reach public goals. The program is just starting (the citizen's committee was formed a week ago and some preliminary public meetings have been held); initial public reaction can generally be described as nervous but willing to participate. Meetings with landowners are scheduled to begin in July or August. Evaluation of the planning process may take a month or more, but it will take years to evaluate real effects in the field since all activities are voluntary. There are currently no monetary or other incentives to encourage landowner participation, but tax or other incentives may be considered in the future.

Nancy Sturhan - Washington State Department of Natural Resources
Watershed analysis is an assessment and prescriptive tool used by DNR to tailor standard statewide forest practice rules to specific locations and sites. The analysis is directed at cumulative effects, i.e., natural processes plus forest practices. It deals with the dirt/fish/water aspects of watersheds and does not include other wildlife at

this time. In the past, DNR has reviewed each of the 12,000 forest practice applications it receives each year on a site-by-site basis, and has not had a framework with a basin perspective in which to consider the cumulative effects. Watershed analysis looks at the basin as a whole using a basin-wide investigation, identifies areas of special concern in advance, and writes a prescription for forest activities in those areas that will take the place of evaluating individual applications site-by-site. Field personnel can then spend more time enforcing the rules, because they do not need to spend the time site-by-site figuring out what to do. Watershed analysis also lays out the groundrules for voluntary mitigation, and can help convince timber companies of the value or utility of these activities.

Basins are analyzed by looking at slope and stream processes (mass wasting, hydrologic change, surface erosion, etc) and at the input variables (sediment, water, wood, temperature, etc.), and by evaluating how they affect resources like fish habitat or water quality. Processes are rated as high/medium/low likelihood of adverse change. Resources are rated as high/medium/low vulnerability. The two are cross-tabulated in a matrix which identifies cells with a high likelihood of a problem, and in need of special rules. The analysis identifies a problem (like mass wasting) in a watershed and its causes, and relies on a team of experts to prescribe a solution that directly addresses those causes. Multi-disciplinary teams work together to assess the physical and biological parameters of the watershed as a whole, and describe the areas of resource sensitivity. The rule (matrix) determines whether standard rules are adequate or whether special rules must be applied. By providing all prescriptions for forest practices in a basin at once, it is also possible to consolidate all of the required state EPA (SEPA) assessments that were done in the past site-by-site. Landowners like that aspect because it reduces the administrative burden and gives them the assurance of knowing permit conditions in advance.

The watershed administrative units considered are typically 10,000 to 50,000 acres. The analysis is done landowner-blind, and conditioned as if forest practices are going to take place on all of the land. Federal lands are included in the analysis; although the prescriptions cannot be enforced on federal lands, federal managers are often pleased to have them to use as a basis for their own actions. Analyses are initiated by DNR or by private landowners; private landowners have initiated most of the analyses done to date because the process offers predictability and stakeholder involvement from the beginning. DNR-initiated analyses are selected using a GIS exercise of prioritization by slope stability, rate of hydrologic change, location of fish hatcheries, miles of stream used by fish, etc. Scores for each of these features are combined to prioritize watersheds throughout the state. After about a year of work, 10 or 12 basins have been completed and about 30 are in progress, of approximately 400 in the state.

Steve Riley - Idaho Department of Fish and Game

The various definitions of ecosystem consider both the organism and its interaction with the environment. Ecosystem studies have included studies of lake ecosystems, plant succession, and energy flow through the ecosystem. As the definition of ecosystem has matured beyond entities or specific groupings of organisms, it has become hard to define where an ecosystem ends without establishing arbitrary boundaries. The Forest Ecosystem Management report defines "ecosystem management" as "a strategy or plan to manage ecosystems to provide for all associated organisms, as opposed to a strategy or plan for managing a single species." How well it will work depends on how well agencies can work together.

In general, traditional management is smaller in scale, and involves relatively few participating groups, generally all of a single discipline. It focuses on individual species populations and uses measures of population or harvest response to assess success. Ecosystem management is much larger in scale, involves many groups, is multi-disciplinary, focuses on multiple species and the larger system, and must be monitored using species diversity indices. The techniques for monitoring ecosystems have not really been developed yet. Ecosystem management also tends to focus more on values than traditional management. It is difficult to tell if ecosystem management has become the new paradigm for resource management, or whether it is simply a passing political fad.

The National Forests in the Idaho panhandle have been using an ecosystem strategy to provide high quality aquatic habitat for bull trout. Each of the five forests in the area have been defined as ecosystems, watersheds have been classified based on levels of disturbance and importance for bull trout, riparian reserves will be established, watershed analysis and restoration activities are planned. While the focus is on bull trout and not the ecosystem, it is intended as an interim program that could be expanded to other species. Bull trout do not move much, however, so it is possible to define an identifiable ecosystem around them.

The scale of an ecosystem, however, depends on the scale of movement. The ecosystem for Columbia River steelhead is less manageable since it must include rearing areas, the migration corridor, and the growth area (ocean). The scale is huge, encompassing 10 identifiable ecoregions or habitat types, and the problems of steelhead must be addressed where they occur. The size of the ecosystem means that the number of parties involved is so large that it may be impractical.

<u>Mason Bryant - U.S. Forest Service</u>
PACFISH is a cooperative effort between the Forest Service and the Bureau of Land Management to develop a common strategy for management of Pacific salmon and steelhead habitats and associated watersheds on USFS and BLM administered lands in the West. The general decline in aquatic habitat over time in the Pacific Northwest due to land management practices is the central reason behind development of the PACFISH strategy. Its goals are to develop forest management strategies that reduce risk to fish habitat by focusing on the riparian area, restore degraded habitat, and provide long term protection to aquatic resources. A basic principle is that forest management activities may be conducted only to the extent that they do not alter key processes. The program involves the disciplines of geology, hydrology, stream geomorphology, and forestry. It will affect land use, forest planning, and the way forests are managed throughout the region in the future. It is a policy that deals with

fish habitats not fish, and does not consider sociological consequences or political acceptability.

When proposed for implementation in southeast Alaska, many felt that conditions in Alaska were different and that the problems of other states were not pertinent to Alaska. An examination of trends in fish stock conditions on Forest Service lands in southeast Alaska shows, however, the areas where forest management has had a detrimental effect on habitat are the same areas where most of the declining fish stocks occur. These results argue for the need to change the way business is done even in southeast Alaska.

PACFISH policy groups defined "good" salmonid habitat using physical features of geology, land form, climate, vegetation, and stream size. One key quantitative feature (pool frequency) and four supporting features (water temperature, amount of large woody debris interacting with stream channels, streambank stability and bank angle, and width to depth ratio of stream channels) were used to describe habitat quality. While based primarily in historical data from Washington and Oregon, threshold levels were applied to the region as a whole and were not constrained by USFS regional boundaries, ranger districts, or national forest boundaries.

PACFISH provides forest management direction in the form of goals, objectives, standards and guidelines for stream channel, riparian, and watershed conditions that are measurable and can be used as indicators of watershed maintenance and restoration. These include standards for: water quality; stream channel integrity; sediment input/transport; natural timing and variability of the water table elevation; and the quantity, diversity, and productivity of native and non-native plant communities in riparian zones. Key watersheds will be identified for special attention based on the presence of stocks at risk, good remaining habitat, or habitat with a good probability of being restored.

Watershed analysis is a formal systematic evaluation of physical and biological processes used to characterize watershed history, processes, landforms and conditions. A key difference in PACFISH is that watershed analysis puts the burden for detrimental effects in the watershed on commodity groups rather than on fish habitat. PACFISH watershed analysis is an attempt to pull ecosystem management into the riparian zone. For fishery resources, PACFISH places more emphasis on steep slope and V-notch areas that have been largely considered outside fish habitat in previous management plans; special consideration is given to riparian-dependant resources. Riparian habitat conservation areas (commonly called buffer strips) defined by the watershed analysis team are zones where riparian dependent resources receive primary emphasis and special rules apply. In the absence of watershed analysis, PACFISH would expand the 100-ft. Tongass Timber Reform Act buffers to 300 feet, or to include the operating riparian area of the stream, whichever is greater. Variations to this minimum would depend on the findings of watershed analysis. Conservation areas are not necessarily no-harvest zones, but timber companies must show that trees can be removed without adversely affecting watershed parameters. Some protection would also extend to the headwaters of fish-bearing streams.

PACFISH has not yet been implemented in southeast Alaska, following a Congressional mandate to study the program for one year. A protocol for watershed analysis is being developed, and three test watersheds have been picked for an initial trial of the strategy.

Tom Wilson - U.S. Environmental Protection Agency

From the typical federal environmental perspective, Congress passes legislation, EPA writes regulations, and state environmental agencies implement those programs, with the assumption that this will make everything right in the environment. Ecosystem management is a bottom-up process that starts with a problem, identifies solutions, and attempts to bring resources to bear to address it. EPA and state environmental agencies do not really know very much about ecosystems or fisheries. The EPA has more attorneys than biologists, so it must depend on the biologists in state, tribal, and other federal agencies to identify and agree on the problems that EPA should address. In that context EPA will probably begin to converge on riparian management, because there are significant environmental authorities that can be used to improve riparian protection that have not been used effectively in the past.

A soon-to-be-final Memorandum of Agreement between NMFS, USFWS, and EPA calls for environmental and fishery groups to begin to work together to define problems, needed actions, and how progress should be tracked. The basic mechanism to accomplish this is to form informal teams at the state level to identify problems and explore possibilities for pooling resources. The major opportunity for resource managers at the state level is the ability to drive the identification of problems and solutions, and to set up a public mechanism to track progress. Government, however, generally lacks an integrating mechanism or lead entity that can bring agencies together to facilitate this pooling process.

Ecosystem management consists of two parts: identifying ecological problems (a science issue); and, solving ecological problems (a social and political issue). Collectively, wildlife managers probably know what the problems are. Determining how to pool resources to begin to change public understanding and involvement in these issues is the real challenge of ecosystem management. In addition to cataloging wildlife resources, management agencies should also consider investments to foster grassroots stewardship, or support other social/political activities in local communities that will ultimately protect those resources.

SESSION IV: QUANTIFYING THE RELATIONSHIP BETWEEN STEELHEAD PRODUCTION AND HABITAT

Session Chair: Mick Jennings, Oregon Department of Fish and Wildlife

<u>Tim Curtis - California Department of Fish and Game</u>

In California, as steelhead approach the southern extent of their range, stochastic events such as droughts, floods, fires, changing ocean conditions, and earthquakes play an increasingly large role in determining the year-to-year anadromous fish production of individual streams. Even when major changes occur in habitat because of activities such a road building or timber harvest it may be difficult to assess the effect on anadromous fish populations because of the variability caused by natural processes. Furthermore, most of California's coastal streams are still recovering from massive disturbances that occurred 75-100 years ago, and in most cases there is insufficient historical data to determine pre-timber fish production. As a result, attempts to establish numerical relationships between specific habitat changes and fish production have been unsuccessful.

Recognizing the difficulty of relating production to habitat on a stream-by-stream basis, CDFG has recently started looking at whole river systems, starting with small watersheds of 3,000 to 10,000 acres, to determine current status of habitat and fish populations. Based on studies anadromous fish and their habitat from the scientific literature, we feel we can recognize good habitat and make recommendations were it is degraded. We also want to document the condition of fish habitat in those areas that currently support the greatest numbers of fish.

The approach has several advantages as an ecosystem approach to fishery and environmental management. It establishes a fishery habitat baseline for large areas, providing background for EIS reviewers and petitioners for species listing. It is ideally suited to our fishery GIS, which is a great way to sell the results to the public and to preserve them for the future. It documents the exact location of all major problems in fish habitat and prioritizes them for attention. Finally, the process of watershed fishery habitat restoration inventory is an opportunity to educate and build working relationships with landowners.

The habitat inventory methodology is documented in the California Salmonid Stream Habitat Restoration Manual (Flosi and Reynolds, 1991). It consists of conducting a general watershed assessment, a detailed fishery habitat inventory, and general fish distribution survey. Analysis of the data is standardized and leads to reports which list specific problem areas and make recommendations. CDFG has inventoried 250 streams in the last 3 years using this approach. The approach has been gaining favor with other land managers and even private timber companies who have recently begun inventorying streams on their lands because of threatened coho salmon listings. The data will be shared in a common GIS developed by CDFG.

The routine biological sampling collected in the inventory process is simply a one-time sample for species presence in relative numbers. This type of sampling tells industry what animals occur on their lands. Ultimately, industry will be responsible for protecting habitat for fish whether they exist there now or were only there historically. It also answers the two routinely-asked questions of where do fish still exist and how abundant are they. It does not conclusively prove that fish have been extirpated.

More extensive sampling is conducted on a very few index streams, where 3-pass depletion electrofishing is done every summer and spawner carcass counts are made in the winter. Streams selected for this sampling are usually ones with good quality stable habitats, so they serve as an index of weather or ocean conditions rather than short-term habitat change caused by land management. There are no studies which try to relate these data to habitat change.

We cannot put numbers on the relationship between habitat quality and quantity and fish production, nor can we produce mathematical models to predict the effect of small scale habitat alterations with confidence limits. We are able to demonstrate relative population levels in watersheds based on existing habitat conditions. We will also look for correlations between habitat condition and fish occurrence data that can help us understand the changes needed to reverse long term declines in anadromous fish populations, but that analysis will look for trends rather than numeric criteria. The CDFG has a monitoring program to collect data and evaluate habitat restoration activities, but this program currently evaluates only how well a project met its specific habitat-creation objectives. There are insufficient resources to determine how many more fish are actually being produced by habitat restoration programs.

Alan Byrne - Idaho Department of Fish and Game

The USFS owns most anadromous waters in Idaho, so the IDFG has let the Forest Service do the basic habitat inventory work. IDFG now needs to try to relate information both agencies have on fish abundance/densities to this habitat inventory data. Escapements are so low, however, that the relationships may not be apparent because there are so few fish relative to available habitat.

Available sources of habitat information in Idaho include:

The **General Parr Monitoring** (GPM) projects were established in the 1980's to assess habitat improvement projects designed to repair damage due to logging and dredge mining on USFS property. Snorkel transects were established in improved and unimproved areas. They were difficult to evaluate because the proximity of test and control areas made it difficult to determine whether carrying capacity was improved or fish were simply attracted to the test area. GPM was expanded to gather trend data in areas of natural steelhead and chinook salmon production. Habitat data were collected, but often have not been analyzed.

The **Intensive Smolt Monitoring** project was also started in the 1980's to determine stock recruit relationships in two systems, one of which had been severely degraded by dredge mining and the other affected by water diversion and grazing problems in certain areas. Habitat data were collected as a part of this study, but their collection was not the focus of the study.

Supplementation research begun in the last few years for chinook and steelhead can provide some habitat information. Streams in the study range from pristine to severely degraded due to mining, logging or grazing. The primary purpose is not to look at habitat effects, but information regarding habitat could be obtained. The areas will be monitored over time for increases in escapement, and it may be possible to detect some trends in those escapements due to habitat.

When trying to quantify good and bad steelhead habitat, at least five measurements should be considered. The first is a measurement of the extent of roading in the drainage (kilometers of roads per square kilometer). Pool frequency and quality should be considered, as measured by numbers of pools and depth. Some measure of stream gradient should be included, since steelhead seem to prefer a slightly higher gradient than chinook salmon. Substrate (percent fines) should also be considered. Finally stream complexity should be considered, as measured by large woody debris, and the frequency of side channels, backwater areas, or beaver dams.

Even if habitats could be scored using these parameters, there would likely be considerable variation in salmonid production among streams of apparently equivalent habitat. Some of the variables that could affect this production include: time (things change and streams can recover if given the chance); elevation (relates to temperature, growth rates, potential biomass, etc.); level of discharge (represented by stream order); productivity or nutrient content (as measured by conductivity); and numbers of available spawners.

Habitat improvements must address a limiting factor, and avoid additional damage to healthy habitat in the process. Success will depend on expanding passage through that limiting factor. Efforts to improve carrying capacity, for example, will not produce measurable results if the system is nowhere near current carrying capacity. Idaho believes its principal habitat problem or limiting factor for anadromous stocks is actually the migration corridor, as measured by velocity through the reservoirs. They do not believe Idaho will ever recoup losses through that bottleneck by habitat improvement. Idaho believes its stocks in general will benefit more from improvements to that corridor than from investments in individual structures on individual streams. Even small changes in that bottleneck will have a substantial impact on the final return.

<u>Skip Rimmer - BC Ministry of Environment</u>
The Skeena River contains the major proportion of British Columbia summer run steelhead. To manage steelhead more effectively, estimates are required of: 1) the capacity of freshwater habitat to produce smolts; and 2) stock productivity, expressed as the number of spawners required to sustain each of the Skeena's many steelhead populations. Habitat-based models of carrying capacity were examined to determine the potential of the Skeena drainage for the production of adult steelhead. Estimates

were based on smolt production per stream area, smolt production per stream length, and a process model that considered variation in stream productivity, growing season, and space required to produce smolts of varying ages.

The streams likely to contain steelhead were identified by stream order from the Ministry of Environment stream atlas (1:50,000 scale) maps, and water yield from Water Survey of Canada data. Glacial streams were excluded. Estimates of the total area and total usable area for streams containing steelhead were calculated from the summer low-flow period. Mean annual discharge was used to estimate average stream width, and usable width was derived from habitat suitability curves based on samples of steelhead populations from many streams in B.C.

Skeena values for smolt production were estimated by calibrating the physical characteristics against those of the Keogh River, which is an index stream on Vancouver Island and has served as an intensively studied index for British Columbia steelhead (approximately 20 years of upstream/downstream trapping data collected at a fence just above tidewater). Throughout the analysis a constant smolt-to-adult survival of 14%, the average ocean survival from Keogh River, was used to convert smolt production to adult production. Carrying capacity for these studies was defined as the maximum unexploited population, expressed in density or biomass, that can be sustained in the habitat over the long term.

The basic approach was to use the Keogh numbers as a benchmark and to derive Skeena numbers using four different simple models: smolt per stream length; smolt per total area; smolt per usable area; and smolts per usable area adjusted for smolt age and nutrient levels. The Keogh River is 32 km long has a watershed area of 130 km^2. The Skeena watershed is substantially larger than the Keogh system (325 times larger in total area, 432 times the stream area, 88 times the usable area, and 82 times the usable stream length), so the assumptions involved in this expansion are considerable. The Skeena extrapolations using the various models are: length alone = 82,400 adults; area alone = 400,000 adults (considered far too high); unadjusted usable area = 92,500 adults; and adjusted usable area = 80,500 adults. The significant differences between tributaries in the Skeena were reflected in the more complicated model. The 80,000 adult level could be considered the equivalent of Maximum Sustainable Yield for the Skeena system.

<u>Mason Bryant - U.S. Forest Service</u>
Few agencies in southeast Alaska have done research directed at steelhead and freshwater habitat. There has been considerable work done on coho salmon, however, and steelhead are encountered in the course of this work. In general, steelhead in southeast Alaska have a 2-4 year marine residence, return as early as February and spawn as late as May, about 38% are repeat spawners, spend 2-5 years in freshwater (about 60% spend 3 years), and smolt during May through July. We do not know whether freshwater habitat is limiting in some systems, nor whether land use practices are making a measurable detrimental impact on steelhead production. At this point we are still identifying where steelhead live. The literature indicates that steelhead densities were highest in riprap and in side channels. Coho salmon

densities, by contrast, were highest in off-channel pools. Channel types preferred by steelhead were most commonly transitional tributary streams.

Installation of a fish ladder to provide access to Margaret Lake in 1991 provided an opportunity to study the invasion of newly opened territory by anadromous fish, including steelhead. Steelhead moved into the area on their own during the first year after opening. Juveniles used the lake, the main feeder stream, and smaller tributaries for rearing. Two years after the opening, at least two distinct size classes of juveniles were present in the system.

There are several potentially productive research areas on steelhead in southeast Alaska. In order to protect or manage steelhead habitat we need to know their distribution in a watershed and how they use it, and their interactions with other species. We need to know their response to habitat changes. How do they respond to second-growth riparian systems, to natural events like landslides, or to habitat enhancement/restoration activities. Lastly, we need to know the life history bottlenecks for steelhead in southeast Alaska; it may be winter habitat and the need to maintain a link between the riparian zone and the main channel. Any logging or other activities that break that link could affect steelhead survival.

Mario Solazzi - Oregon Department of Fish and Wildlife

Good steelhead habitat in freshwater generally has cool water, clean and stable gravel, and complex habitat. Assuming the first two are present, the complexity or diversity of habitat is a key to understanding the habitat requirements of steelhead. Riprap can provide good habitat if there is sufficient velocity refuge between the particles. Small deep scour pools with surface cover, usually with wood or medium to large substrate, and pocket water in deeper riffles and rapids are good habitat. Fry prefer protected and complex edge habitat. Plunge pools with a bubble curtain are also key areas for upper age class fish. Small tributaries and lakes can also be critical for rearing. Steelhead move around in a basin, so the system as a whole must be considered when evaluating it for steelhead. Bad steelhead habitat includes shallow riffles in low gradient streams, pools with low velocity and fine substrate, and low velocity pools and riffles over bedrock, especially if there is no cover. Zero-aged fish may be present in these situations, but few upper age class fish will be found.

Oregon has been correlating habitat type and salmonid densities in winter and summer for a number of years. A selection of the best examples of different habitats is being studied as a predictor of potential production, to estimate how many fish can be produced in different types of habitat during different times of the year. The distribution of age-0+ steelhead is more uniform during the winter than the summer, opposite of what we see with juvenile coho salmon. Age-1+ steelhead seem to prefer the mid-velocity habitat types during the summer, especially plunge pools and trench pools; winter distribution (collected after the first bank-full event of the season) is more uniform, with perhaps some preference for dams and slower habitat types.

BLM has been funding an evaluation of a habitat improvement project on three sets of paired streams in the Oregon coast range for about six years. Each pair consists of a treatment and reference stream in the same basin (2 in the Nestucca system, 2 in the Alsea system, and 2 on the central coast). We monitored smolt production, and summer and winter densities. Streams were monitored for three years undisturbed; habitat modifications targeted at producing more coho winter habitat were then performed in test streams. Heavy equipment was used to increase dam pools, alcoves, and slower velocity habitats at the expense of higher velocity habitats. Large amounts of wood were placed in those sections were no alcoves were built and large pools were excavated. This latter approach is a temporary fix, for in some cases deterioration of smaller wood has already been observed after only three years.

Although the habitat modifications were directed at coho salmon winter habitat, significant increases in both steelhead and cutthroat trout smolt production were realized. Not much variability of age-0 fish was observed between years, but numbers of age-1+ steelhead increased after treatment. Overwinter survival has decreased somewhat with time, possibly due to the increased numbers of fish, but smolt production is still higher than pre-treatment. In one system, a significant increase in average length of smolts was observed in the first year post-treatment which disappeared in later years, possibly due to activity in the stream which increased drift. Similar increases in length were not observed in the other study streams.

Habitat for age-0 steelhead is probably not limiting in most coastal streams, while habitat for upper age class fish is probably limiting. Increasing complex habitat of deep pools and mid-velocity types can increase smolt production, although there has been no cost/benefit analysis on the cost of improvement and maintenance versus improved adult production. The best chance of correlating habitat variables with steelhead escapement will probably come from using the habitat available for upper age class fish and some estimate of ocean productivity. To date, however, attempts to model production potential based on habitat have not worked as well for steelhead as they have for coho salmon.

CONCLUDING REMARKS

Steering Committee Chair: Bob Gibbons, Washington Dept. Fish and Wildlife

As with the previous three workshops, this meeting resulted in an excellent exchange of information and ideas on steelhead management.

- The ESA session gave us an overall perspective of where NMFS is in relation to the recent steelhead petitions. The message to us as managers is that we had better engage early in the process to insure that all information is considered when considering the appropriateness of a listing.

- In the Harvest session, Dexter made everyone do some soul searching when he challenged us to stop focusing on closing fisheries, and start addressing the real problem: i.e., habitat degradation. We are all comfortable with managing fisheries to address status problems. We need to stretch ourselves beyond the comfort zone, however, and tackle the hard issues related to habitat.

- It was clear from the ecosystem/watershed management session that managing at this level, rather than by species, is extremely complex due to the diversity of groups and habitats involved. There are no clear answers, but there are many promising programs. What is lacking is coordination of these efforts at the state or federal level, which is essential for success given the scope of impacts.

- The Habitat/Production session showed we are making encouraging progress in understanding the relationship between steelhead abundance and habitat. This will be even more important in the future when we move toward ecosystem and watershed management.

Finally, the steering committee met on March 17 and began planning for the 1995 workshop. A number of suggestions were made for next year's meeting, and we will be working on finalizing the agenda this summer and fall.

Thanks to everyone who participated and attended the 1994 workshop.

Pacific Coast Steelhead Management Workshop
March 15 - 17, 1994
Fort Worden State Park Conference Center
Port Townsend, Washington

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