

*International Symposium  
on*

***Steelhead Trout  
Management***



**January 23, 1991  
Portland Convention  
Center**

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*Organized by:*

*Pacific States Marine Fisheries Commission  
Association of Northwest Steelheaders*



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# **EXECUTIVE SUMMARY**



# INTERNATIONAL SYMPOSIUM ON STEELHEAD TROUT MANAGEMENT

## EXECUTIVE SUMMARY

by

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Division of Sport Fish

### Purpose of Symposium and Participants

The first ever coastwide meeting on steelhead trout management was held January 3-5, 1991 in Portland, Oregon. The purpose of the "International Symposium on Steelhead Trout Management" was to bring together managers and scientists of the Pacific coastal states along with user-groups to discuss current and future Steelhead trout management issues. Steelhead habitat loss emerged as the major coastwide concern.

The three day symposium ran concurrently with one of the Northwest's largest sportsmen's fishing exposition. The first two days of the symposium were primarily for agency data exchanges with the third day specifically designed for active public participation. Approximately 200 people attended the meeting which was jointly sponsored by the Pacific States Marine Fisheries Commission and the Association of Northwest Steelheaders. Agency representatives from Oregon, Washington, Idaho, Alaska, British Columbia and California participated in the symposium.

### AGENDA:

#### Stock Status Panel

-West Coast steelhead stocks are characterized by increasing angler interest and fishing pressure with some stocks showing significant declines.

-Steelhead return is annually estimated at 1.6 million fish coastwide.

-These highly prized fish represent less than one percent of the anadromous run and therefore all agencies had relatively small steelhead research programs. Little stock specific information is available to manage the resource. As a result, most agencies are unsure of specific stock status or trends.

#### Management Practices and Research Activities Panel

-Agency frustration for inadequate funding and staff support to properly manage and research Pacific Steelhead stocks.

-All agencies are aware of increased public interest in steelhead.

-All agencies have steelhead planning processes underway or newly revised plans in place.

#### High Seas Interception Panel

-Massive amounts of drift gill net is being fished on the high seas by fishermen from Japan, Korea, Taiwan, and People's Republic of China in pursuit of squid.

\_The sanctioned(legal) fisheries are valued at almost \$1 billion annually

-There are grave concerns for the bycatch of sea birds, marine mammals, sharks, and fishes.

-There has been significant progress made in the international arenas (Bi-lateral discussions, UN Moratorium) and collection of information by observers.

\_Summaries of existing data are inadequate to describe or refute concerns for steelhead harvests by the High Seas Drift gill net fleet.

-Northwest Steelhead Association Executive Director Blanchard Smith summarized it best by saying that this is an issue in which the public has gotten out ahead of the government and the public is pushing the case for banning high seas drift gill nets. The public is unwilling to wait 10 or 20 years for science to gather enough data to prove that there is a problem.

#### Hatchery Overview Panel

-All jurisdictions have steelhead hatchery programs and success of them has been mixed.

-There are both scientific and public concerns for genetics issues particularly impacts of hatchery steelhead on wild stocks.

-All jurisdictions are reviewing genetics policies and tighter policies are being implemented in most jurisdictions.

-Enhancement programs (even bad ones) are hard to terminate due to public expectations.

-One of the panel members described this effort is another situation where we are long on policy and short on practice.

#### Habitat Restoration and Protection Panel

-Agencies described major habitat problems for steelhead trout, and the presence or absence of steelhead is a barometer of the ecological health of watershed.

-Impacts include urban development, agricultural, water diversions and lack of screening, dams and other fish passage problems, logging and mining , draught, and the list goes on.

-Recently there has been some improvements. We have seen mitigation programs to off set the effect of dams, stronger laws and policies have been adopted e.g., Tongass Timber Reform Act in Southeast Alaska, and the California Steelhead and Salmon Program Act of 1988.

-There is considerable habitat rehabilitation work being done. Examples include:

- . \$33 million in California in the past 10 years paid by revenue from horse racing.

- . In Oregon there is a new program emphasis due to recent direction by the Oregon Fish & Wildlife Commission funded by a temporary surcharge on fishing licenses.

- . There is considerable use of volunteer for rehabilitation efforts; in Oregon they have the STEP program, in British Columbia they have over 8000 volunteers in the Salmon Enhancement Program.

-Agency opinion of current habitat losses in their jurisdiction:

- . Idaho - no habitat loss at the present time

- . Alaska, British Columbia, and Washington have slowed the rate of loss

- . Oregon and California are still loosing ground to development

-Jill Zarnowitz, Assistant Chief of Habitat Division, Oregon Department of Fish & Wildlife summarized the habitat loss issue in the Pacific Coastal States saying that more dollars are being spent on development than habitat rehabilitation.

#### Data Needs and Management Panel

-Agencies identified the following information needs:

- . Improved stock status information for trends, inseason management, allocation disputes, etc.

- . Inventory of habitat loss/rehabilitation needs

- . Closer examination of genetic issues on wild and hatchery stocks

- . Marine and river survival

- . Predation of adults and juveniles
- . Economic studies on the value of steelhead
- . Determine angler demand--How does the public want the agencies to manage steelhead?

-Major concern/frustration is loss of habitat. Problems:

- . Agency lack of funding and personnel
- . Agencies generally only in an advisory capacity to land managers, but the public looks to the fisheries agencies to solve the fish habitat issues.
- . There is a need for more public involvement in the land managers decision making process.
- . Agencies trying to do more with less; existing staff are spending more time handling paperwork for habitat permitting than time in the field resolving problems.

#### Public Discussion of Coastwide Steelhead Management Issues

Commenters:

- E.R. Boinowski, President of the Steelhead Society of British Columbia
- Pete Sarverall, Chairman, Steelhead Committee of the Federation of Fly Fishermen
- Jim Beausard, Oregon State Enhancement Board
- Other individuals
- Interested Biologists in other agencies and academia

WHERE DO WE GO FROM HERE:

- . Scientific workshop scheduled for March 3-5, 1992 in Port Townsend, Washington sponsored by the Pacific States Marine Fisheries Commission. It will be a more informal workshop to share ideas and progress on steelhead research and management issues. Of particular concern is coordination of research to hopefully broaden application of results coastwide. Participating will be WA, OR, CA, AK, ID and BC.
- . Additional coastwide public meetings similar to the Portland meeting in January 1991.

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# ALASKA



## A Review of Steelhead in Alaska

by

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### Steelhead Stock Status

#### Distribution and Life History:

Steelhead are found in coastal streams in Alaska from Dixon Entrance, north and westward around the Gulf of Alaska to the Cold Bay area on the Alaska Peninsula (Figure 1). The majority of steelhead streams in Alaska, however, are located in southeast Alaska. Most of the 331 known steelhead populations in southeast Alaska contain 200 or fewer adults, but some of the larger systems like the Naha River, Karta River, and Thorne River probably support runs in excess of one thousand spawning adult steelhead. The largest known steelhead producer in southeast Alaska is the Situk River in Yakutat, which supports a run of 3,000 to 6,000 adult steelhead.

In southeast Alaska and Yakutat, steelhead stocks displaying a "spring" run timing are most common, with immigrations of adult fish typically peaking during May. North of Yakutat, "fall" run timing patterns are prevalent. Immigrations of adult "fall" run steelhead typically peak from September through October, and emigrations of these fish usually peak from mid-May through June.

Throughout Alaska, most steelhead spend three years in fresh water before moving to the ocean, and the age classes 3.2 and 3.R are usually dominant. In those populations from which significant numbers of samples have been collected, initial spawning fish are evenly divided between males and females. Repeat spawning fish usually comprise 25 to 33 percent of the total adult return, and 65 to 80 percent of those repeat spawning fish are typically female.

#### Harvest Patterns:

Steelhead trout harvests in Alaska by sport fishermen have generally increased since the Statewide Harvest Surveys were started in 1977 (Table 1). Most of the increased harvest has occurred in southeast Alaska; harvests in southcentral Alaska have generally declined (Figure 2). The five-year average steelhead harvest in southeast Alaska has increased 157%, from 1,820 (1977-1981) to 4,678 (1986-1990). The 1989 harvest in southeast Alaska was a record 5,409 steelhead. In southcentral Alaska, harvests have declined from a five-year average of 2,003 steelhead (1977-1981) to 1,339 (1986-1990), a decline of about 33%. Harvests represent only those

decline. It is becoming evident that more restrictive regulations will be necessary in some areas if we are to preserve wild stocks of steelhead.

#### Kenai Peninsula:

Fall-run steelhead return to streams in this area beginning in mid-August. The peak of the runs are in late September, with runs essentially over by mid-November. The sport fishery for wild stock steelhead occurs on Anchor River, Deep Creek, Stariski Creek, and Ninilchik River. All are roadside streams crossed by the Sterling Highway. The Anchor River receives most of the sport fishing effort, and Deep Creek is the next most popular. Harvests of steelhead in the Anchor River peaked in 1978 at 1,460 fish, and steadily declined to less than 200 fish in the mid to late 1980's. Harvest estimates from the other streams in the area show similar declining annual harvest trends.

Regulations governing this fishery have become increasingly restrictive. In 1977 the bag and possession limit was two steelhead trout daily, and the season was closed from May 1 to June 30. By 1984 the bag and possession limit had been reduced to one fish daily, a seasonal limit of two fish was imposed, and a harvest record required. The season has been gradually reduced, and by 1984 fishing was permitted only from July 1 through December 31. From 1984 through 1988, bait was prohibited after September 15. On October 7, 1988, the Anchor River steelhead trout fishery was closed by emergency order. In 1989 the use of bait was prohibited after August 14 in all southern Peninsula streams, and the steelhead trout fishery was restricted to catch-and-release only.

The evolution of hook-and-release fisheries for steelhead in Alaska first occurred on the Kenai Peninsula because of the fishing pressure exerted on these systems. During the years that retention of steelhead trout was permitted (before 1989), anglers gradually adopted a voluntary catch-and-release philosophy. In 1978 creel survey data revealed 65% of the fish landed were retained. Retention was voluntarily reduced in subsequent years. In 1984 it was estimated that 38.4% of steelhead trout were retained; in 1986, 40%; 1987, 23%; and in 1988, before the emergency closure, the retention rate was 29%. Although the department does not know the retention rate in the other streams, it assumes that the retention rate on these streams mirrors the trend on Anchor River.

A management plan for the steelhead fisheries in this area was completed in 1990. The need for this planning effort was prompted by conservation concerns and legitimate differences of opinion over the merits of wild stock management versus stocking of steelhead. In 1981 the ADF&G Division of Sport Fish developed a plan for supplemental production of salmon and steelhead for Cook Inlet fisheries. This plan identified enhancement of Anchor River steelhead as a high priority, but a controversy developed over the concept of stocking Anchor River with hatchery-produced smolts. As there was no clear consensus of public sentiment, a Kenai Peninsula steelhead planning team consisting of local fish and game advisory committees, sportsmen's associations, and a local chamber of commerce was

organized by ADF&G in November 1989 to resolve the issues. This team resolved most of their differences during a series of meetings, and supported a series of policy statements concerning the management of the steelhead fisheries on the Kenai. The team also recommended detailed evaluation of possible habitat enhancement and stream improvement.

Accordingly, the ADF&G will manage the Anchor River and the three other lower Kenai Peninsula streams to maintain a wild steelhead fishery. Hatchery-produced fish will not be stocked into these systems unless native runs deteriorate to the point where natural recovery is unlikely. A stocking project would then be initiated using fish stocks derived from the Anchor River, and would be continued only until native stocks rebuild to a self-sustaining level.

The Kenai Peninsula steelhead trout have been investigated by resource management agencies since the 1950's. Research has focused on Anchor River, since this stream has been most popular with the recreational angler and was assumed to support the largest trout population. Research has consisted primarily of weir projects and creel survey programs, some of which were begun by the Fish and Wildlife Service in 1954. The ADF&G Division of Sport Fish conducted its first creel survey to estimate harvests of steelhead from the Anchor River in 1960. This survey program was again conducted in 1968, 1978-1985, and 1987-1989. Population estimates of steelhead trout were made through tag and recapture programs in 1978, 1980, 1983, and 1984. In 1988 and 1989, the population was estimated by weir.

#### Copper River Steelhead Stocks (Prince William Sound):

All steelhead populations in the tributaries of the Copper River are thought to be relatively small, ranging from less than one hundred in some systems, to a few hundred in the Gulkana River. All known populations return during the fall. These stocks are harvested by the commercial gill net fishery off Cordova Flat, a personal-use fishery using dip nets and fishwheels, a subsistence fishwheel fishery, and the sport fishery. Sport fishing pressure has increased on the readily accessible populations; sport fishing guides currently target steelhead on the Tebay River.

Although no population estimates have been made of these stocks, the increased fishing pressure and small size of these populations has prompted the ADF&G staff to propose more restrictive sport fishing regulations. A staff proposal to limit the gear used in this area to artificial, unbaited hooks will be considered by the Alaska Board of Fisheries this winter. Hook-and-release regulations are also being considered for some of the tributaries. The desire for hook-and-release regulations is not universal among users.

Inriver distribution of steelhead was documented using radio tags in 1983, but no additional research is planned at this time.

## Kodiak Archipelago and Alaska Peninsula:

The Kodiak Archipelago has 17 known steelhead streams. Very little is known about steelhead populations on the Alaska Peninsula. Steelhead are known to exist in at least nine peninsula river systems, but the population are not thought to be very large in size. All stocks are thought to return during the fall.

The daily bag limit in this area is three steelhead over 20 inches in length; the possession limit of six fish was reduced to two fish, only one of which may be over 20 inches, in 1988. Despite this reduction, harvests of steelhead in the Kodiak Area during 1988 and 1989 were still the highest and third highest on record.

A research project that would identify the causes of the decline of the Karluk River steelhead population has been proposed. Subsistence, commercial, and sport fisheries remove fish from the population, and there may be a mortality factor associated with delayed emigration caused by a weir for sockeye salmon on the system.

## Yakutat:

The Situk River is the primary stream used by sport anglers for steelhead in the Yakutat Area, although other streams in the area are known to support steelhead. Steelhead return to the system primarily during the spring months of April and May, but there is also a smaller population that returns in the fall. The Situk River is accessible by road, and has been receiving increasing angler pressure since the early 1980's. The percentage of steelhead released by anglers has decreased in recent years, along with total catch and catch per hour.

Regulations for steelhead have not changed appreciably since 1983. Current regulations allow anglers to harvest one fish daily, and to have two fish in possession. Only unbaited, artificial lures may be used from June 15 through September 31.

Most nonlocal anglers favor catch-and-release fishing, a seasonal limit of one or two fish, and/or a restriction on the use of bait. Local anglers, who generally utilize the fall run, generally endorse the current or more liberal regulations.

The instream migrations of adult steelhead in the Situk River have been monitored using radio tags. Thirteen adult steelhead were tagged during the fall of 1989, and four adult steelhead were tagged in the spring of 1990. All of the fish tagged during the fall migrated into Situk Lake, where they remained until the first week of May. At that time all these fish descended into the Situk River to spawn.

Three steelhead marked with Peterson disk tags, presumably from high-seas tagging activities, have been seen in the Situk River during the last three years but none have been recovered. Net marked fish have also been seen in the river during the spring run before any local commercial net fisheries.

## Southeast Alaska:

Most of the steelhead systems in Alaska are found in the southeast region of the state, and the area has become very popular with steelhead anglers. Spring steelhead returns predominate in the region, but many systems support smaller fall returns as well. The recreational catch and harvest have increased, especially in the southern half of the region, due to an influx of steelhead fishermen, freshwater guides, and lodges targeting on steelhead, and to articles in several outdoor magazines detailing the attributes of steelhead fishing in southern Southeast Alaska.

The regulations have not changed in the majority of Southeast Alaska streams since 1983. The general daily bag limit is one steelhead over 16 inches in length, and two fish may be in possession. The daily bag limit is increased two fish over 16 inches in length if one of these fish has a missing adipose fin (indicating hatchery production). Exceptions to these regulations occur; several streams in the Sitka area are closed to the retention of rainbow/steelhead during periods when spring-run steelhead are in the streams. The use of single-hook, unbaited, artificial lures is also required in areas closed to retention. Sitkoh Creek, also in the Sitka area, has a possession limit of only one steelhead.

Anglers are becoming concerned about the continued health of wild stock steelhead runs, and generally favor restrictive regulations. A proposal to designate an extensive list of streams as hook-and-release will be considered by the Alaska Board of Fisheries this winter. The department is soliciting recommendations from anglers concerning their goals for steelhead management. A site specific management plan will subsequently be developed.

Research activities in Southeast Alaska have been limited, and consist of isolated creel survey and weir projects.

## Steelhead Enhancement

### Southcentral Alaska:

The Kodiak Conservation Club and the U.S. Fish and Wildlife Service began releasing hatchery reared steelhead in southcentral Alaska in 1953. Steelhead eggs from the Karluk River stock were hatched at the conservation club hatchery and were released as fry into the Buskin River and into many lakes from Kodiak to Glennallen. The U.S. Fish and Wildlife Service and the Alaska Territorial Department of Fisheries expanded the hatchery-reared steelhead release program in 1954, by incubating steelhead eggs from the Kodiak Conservation Club at hatcheries the Kodiak, Fairbanks, Anchorage, and Juneau hatcheries, and releasing the fry into lakes and streams in interior, southcentral, and southeastern Alaska.

Steelhead fry were released into approximately 25 creeks, open-drainage lakes, or landlocked lakes in the Anchorage area, and 40 Kodiak area waters by the U.S. Fish and Wildlife Service in 1953 and 1954. By 1956, successful fisheries were established in six Anchorage area lakes and seven Kodiak area lakes; an additional five Anchorage lakes and 16 Kodiak area lakes had some survival from the fry plants. Steelhead released into three Kodiak area lakes in 1958 as fry later produced successful sport fisheries.

Historically, the Karluk River had been used as a source of steelhead-rainbow eggs to rear for release into Kodiak and southcentral Alaska lakes and streams. This source was eventually determined to cost more than eggs and fry from other sources. Finclipped rainbow and steelhead fingerlings were released into three southcentral Alaska lakes in October 1956. Gill netting, one year later, indicated the domesticated rainbow trout broodstock fingerlings had a faster rate of growth and somewhat better survival than the Karluk River steelhead. Imported or domestic rainbow trout fry replaced the Karluk steelhead brood stock in southcentral Alaska lakes in 1960, and in Kodiak lakes in 1961.

In 1981, the Division of Sport Fish developed a plan for supplemental production of salmon and steelhead for Cook Inlet recreational fisheries. This plan identified enhancement of the stock of steelhead in the Anchor River as a high priority. The Anchor River is the most popular of four streams on the Kenai Peninsula that support indigenous runs of fall-run steelhead. In response to this plan, 25 adult steelhead were collected at the Anchor River during the fall of each year from 1981 through 1986.

In 1984, before the release of any steelhead smolt, the department reviewed the proposed stocking project for the Anchor River. That review addressed both stock status concerns and public sentiment regarding the release of hatchery fish in the Anchor River. Public input, then as now, is strongly mixed with no clear consensus. From a conservation perspective, the Anchor River steelhead stock status in 1984 was healthy and the fishery successful. The department decided at that time to identify other systems for experimental release and use Anchor River stocks in very low numbers for brood source only. Campbell Creek in Anchorage was chosen as the release site.

No steelhead were observed at a weir operated on Campbell Creek in 1986, while in 1987 three steelhead were observed. Because a significant steelhead fishery did not develop, the Campbell Creek project was deemed unsuccessful at the conclusion of fall 1987 and no further egg takes from Anchor River were planned. These decisions left the department with approximately 34,000 steelhead smolt of Anchor River origin on hand awaiting a spring 1988 release at a yet undetermined site. After considering recommendations offered by local sportsmen's groups, the department decided to return 5,000 smolt to the Anchor River in an attempt to replace the adults which were removed from the stream for egg-take purposes. The department would release the remainder of the smolt into other sites in lower Cook Inlet that had no native steelhead. This plan was abandoned after threat of legal action by groups arguing

that the Anchor River had not been identified as a steelhead release site in the department's five-year stocking plan that was adopted in 1986.

Since no alternative anadromous release sites were identified in the stocking plan, the 34,000 steelhead smolt were released as sub-catchable size rainbow trout into landlocked lakes located throughout southcentral Alaska including Bridge Creek reservoir, the headwaters of the Anchor River, where a fish-tight barrier was established. The department then stated that additional releases of steelhead into the Anchor River would not occur unless an approved plan was agreed upon by the user groups and the department.

The Division of Sport Fish convened the Kenai Peninsula Steelhead Planning Team in November 1989 to resolve the concerns of groups favoring increased enhancement and those opposed to releases of hatchery steelhead into Kenai Peninsula streams that contained wild steelhead. Individuals opposed to the program were generally concerned about genetics, disease, the effects on the currently viable wild stock of steelhead, and future overcrowding in the resulting steelhead fishery. The Team made a series of recommendations regarding the focus of research, sport fishing regulations, stream rehabilitation, and stocking practices that are expected to guide future ADF&G programs.

Regard hatchery release practices, the Team supported wild stock management, and recommended that ADF&G initiate an Anchor River steelhead hatchery release project only if the actual counts of steelhead at the Anchor River weir are less than 500 fish or the total estimated escapement is less than 700 fish. Broodstock collection should begin the following year. The goal of the resulting project would be to produce a return of 2,000 to 3,000 natural steelhead into the Anchor River, and allow a harvest once the estimated population reaches a level of 2,500 fish. Only hatchery fish that are certified to be disease-free, and from a hatchery stock of the same genetic composition as those from the stream to be rehabilitated, could be introduced. The hatchery release program would be stopped as soon as steelhead stocks reach historic levels.

#### Southeast Alaska:

The United States Forest Service (USFS) incubated and reared 450,000 steelhead fry in the Ward Creek Hatchery (Ketchikan) and released them in Ward Creek and Lake in 1937. Similarly, the USFS in conjunction with the U.S. Navy transplanted 50,000 eyed-eggs from Sashin Lake to Blue Lake (Sitka) in 1939. Steelhead were first released in northern southeast Alaska near Juneau in 1941, as eyed-eggs at Peterson Creek and Windfall Lake.

In an attempt to create a resident trout fishery, the Alaska Department of Fish and Game (ADF&G) released 134,831 steelhead fry and fingerlings into Peterson Lake from 1961 through 1968 using broodstocks that originated from Pleasant Bay, Lake Eva, and "a remote southeast Alaska lake". A small indigenous steelhead run reportedly existed in Peterson Creek at that time. Peterson lake and creek were

1

treated with rotenone before the 1961 release, but that did not totally eradicate resident species. Peterson Creek currently supports an annual steelhead return of approximately 200 fish. It is not known what portion of the current population are descendants of the released fish.

No additional steelhead hatchery releases occurred in Southeast Alaska until after the construction of ADF&G Crystal Lake Hatchery at Petersburg in 1972. The first steelhead broodstock for the hatchery was acquired from Petersburg Creek in 1974. Approximately 99,200 steelhead smolts were produced at the hatchery between 1974 and 1984, almost all of which were released in the immediate Petersburg area.

Six thousand five hundred (6,500) steelhead smolts from the Crystal Lake Hatchery were released into Montana Creek near Juneau in 1976. This release was not properly evaluated, and the single steelhead known to have been caught in Montana Creek may or may not have originated from the release.

Steelhead enhancement began in the Ketchikan area in 1980 as the result of a major chlorine spill in Ward Creek by Ketchikan Pulp company. Additionally, enhancement of Ketchikan Creek, as well as the Klawock River on Prince of Wales Island, began in 1980. Hatchery steelhead were released at all three sites at varying levels and using a variety of brood sources. From 1980 to 1984, from 5,000 to 31,000 fry or smolts averaging from just under 5 grams to over 155 grams in weight were released. Releases were evaluated using harvest estimates obtained from a statewide harvest survey, and from public comments.

The ADF&G Division of Sport Fish conducted a steelhead workshop in 1985, a primary objective of which was to establish an optimum size for steelhead smolt released from Alaskan hatcheries. A size standard of 170-180 mm for hatchery-reared steelhead smolt was established, based on hatchery steelhead programs in Oregon and Washington, and on limited size data from wild steelhead smolt in Alaska. Based on the experience of Oregon and Washington, a smolt to adult survival goal of 5% was also established. To date, these standards have not been consistently achieved in southeast Alaska.

For the period 1984-1989, approximately 485,000 steelhead eggs were collected for incubation and rearing in Crystal Lake Hatchery, which have or will result in the release of 178,200 smolt (36.7% egg to smolt survival). The weighted average of those smolt released from 1985 through 1988 was 9.28 grams, and the average length was 98.6 mm, substantially less than the desired 170-180 mm size. Mechanical and cultural practices have been changed at Crystal Lake Hatchery in order to produce 2-year-old steelhead smolt of the desired size.

Steelhead eggs were taken annually from 1983 through 1987 from Peterson Creek on the Juneau road system. The objective of the program was to produce steelhead smolts at Snettisham Hatchery for release into Montana Creek. The overall success of the program was low due to the small brood stock, the extended rearing time needed to produce smolts at Snettisham Hatchery, and to disease problems incurred

- in the hatchery. Approximately 27,000 steelhead smolts were transported to Montana Creek from Klawock Hatchery in 1987. Additional releases of less than 2,500 fish occurred in 1986 from the Crystal Lake Hatchery, and in 1987 from the Snettisham Hatchery. A creel program on Montana Creek during 1989 showed that only 16 steelhead were taken in the sport fishery. Additional steelhead were observed in the stream, but the overall return from enhancement efforts was poor. Additional returns of adult steelhead are expected through 1991.

From 1985 through 1989, both the Klawock River and Ward Creek were stocked with 20,000 to 50,000 steelhead smolts of various sizes. The resulting returns have been evaluated via on-site creel survey projects. Contributions to angler catches at the Klawock River approached 50%, but only 10% to 20% of angler catches in Ward Creek were of hatchery origin. The best enhancement results appeared to be produced when steelhead smolts averaging at least 45 grams and 170-180 mm in length were released. Future enhancement in the Ketchikan area will be limited to the Klawock River and Ketchikan Creek to evaluate time and size of release criteria.

### Habitat Restoration and Protection

#### Habitat Restoration:

Public and privately sponsored programs oriented toward restoration of steelhead habitat in Alaska have been virtually non-existent. Hundreds of wild steelhead populations exist within the natural range of this species in Alaska. The majority of these stocks consist of populations numbering under 500 fish, with less than a few dozen numbering over 1,000 fish and only a handful approach 4,000 fish in size.

The vast majority of these stocks have not been significantly impacted by habitat degradation, and are presumed to be healthy and capable of supporting sport fisheries. While there are no programs in Alaska specifically designed to improve steelhead habitat, steelhead stocks may benefit from federal (primarily U. S. Forest Service (USFS) and state (ADF&G Fisheries Research Enhancement and Development (FRED) Division) programs to open "barriered" watersheds for other salmon species. The USFS has opened new fisheries habitat through fish ladders. The FRED Division has maintained and developed fish passages, and has been involved in pool construction, flow control, and bank stabilization projects on streams that have been impacted by urban development, highway construction, gravel and timber extraction, and natural processes such as post-glacial succession.

Future private and public sector activities oriented toward steelhead may become more common as the impacts of rapid development in Alaska, such as wide spread timber harvest, mining, and increased access, alter the habitat utilized by this species throughout its range.

Finally, more information regarding the size and behavior of wild steelhead smolt will be needed to develop successful hatchery or enhancement programs. Assumptions regarding where steelhead smolts reside in streams, their size as they move to the ocean, and the time of year that they migrate are based largely on information from other areas or for other species. To mimic the emigration patterns of indigenous smolts, or to identify important steelhead habitat, the applicability of these assumptions should be verified with comparable studies in this region.

#### ACKNOWLEDGEMENTS

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Table 1. Alaska sport steelhead harvests by region and area, 1977-1990.

AREA FISHED	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
<b>SOUTHEAST</b>														
Ketchikan	708	496	290	748	480	773	634	791	907	1,002	737	1,400	1,654	1,423
Prince of Wales Island	357	660	373	1,445	362	618	1,115	1,698	1,108	1,834	1,950	831	1,277	789
Petersburg, Wrangell	412	236	281	198	262	313	475	826	305	865	848	756	609	1,046
Sitka	70	36	36	35	65	83	176	109	156	145	270	64	193	153
Juneau	67	45	99	85	11	62	209	33	111	206	382	265	280	240
Haines, Skagway	0	0	9	0	0	0	0	7	153	168	36	123	142	32
Glacier Bay	0	0	0	0	0	0	0	0	0	8	0	0	42	0
Yakutat	136	145	336	258	357	519	860	696	348	494	454	870	1,212	591
<b>TOTAL</b>	<b>1,750</b>	<b>1,618</b>	<b>1,424</b>	<b>2,769</b>	<b>1,537</b>	<b>2,368</b>	<b>3,469</b>	<b>4,160</b>	<b>3,088</b>	<b>4,722</b>	<b>4,677</b>	<b>4,309</b>	<b>5,409</b>	<b>4,274</b>
<b>SOUTHCENTRAL</b>														
Glennallen	187	45	55	34	76	73	21	137	162	58	134	91	84	34
Prince William Sound									0	15	0	18	39	0
Cook Inlet Kenai Pen.	1,530	2,513	1,181	1,358	1,338	974	1,572	1,546	683	734	850	1,017	67	217
Kodiak	232	162	318	671	313	258	302	696	790	321	253	853	788	1,120
<b>TOTAL</b>	<b>1,949</b>	<b>2,720</b>	<b>1,554</b>	<b>2,063</b>	<b>1,727</b>	<b>1,305</b>	<b>1,895</b>	<b>2,379</b>	<b>1,635</b>	<b>1,128</b>	<b>1,237</b>	<b>1,979</b>	<b>978</b>	<b>1,371</b>
<b>ALASKA TOTAL</b>	<b>3,699</b>	<b>4,338</b>	<b>2,978</b>	<b>4,832</b>	<b>3,264</b>	<b>3,673</b>	<b>5,364</b>	<b>6,539</b>	<b>4,723</b>	<b>5,850</b>	<b>5,914</b>	<b>6,288</b>	<b>6,387</b>	<b>5,645</b>

Table 2. Reported commercial harvest of steelhead in southeast Alaska, 1969-1990.

Year	Seine	Drift Gill Net	Set Gill Net	Troll	Other <sup>a</sup>	Total
1969	1,130	1,203	0	81	0	2,414
1970	427	1,933	6	33	2	2,401
1971	148	1,639	2	13	0	1,802
1972	19	1,629	0	5	0	1,653
1973	290	1,529	7	10	0	1,836
1974	629	1,253	5	53	0	1,940
1975	34	485	0	14	0	533
1976	153	861	0	11	2	1,027
1977	274	682	0	4	3	963
1978	362	1,239	0	9	0	1,610
1979	210	795	0	26	0	1,031
1980	746	661	0	5	0	1,412
1981	315	613	0	6	0	934
1982	371	1,596	1	21	0	1,989
1983	2,133	1,931	0	9	1	4,074
1984	2,554	2,795	0	39	2	5,390
1985	1,822	5,257	0	32	1	7,112
1986	5,697	5,638	0	195	10	11,540
1987	363	3,097	55	99	7	3,621
1988	1,639	2,362	209	108	21	4,339
1989	837	2,073	242	57	0	3,209
1990	852	2,276	114	67	0	3,309

<sup>a</sup> Includes trap, longline, and unidentified.

**Table 3. Reported commercial harvest of steelhead by district for southeast Alaska, 1969-1990.**

YEAR	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	180	Total
1969	167	0	26	1,065	0	618	0	66	1	1	369	48	0	8	45	0	0	2,414
1970	529	3	17	324	0	481	44	109	4	0	824	19	0	12	29	0	6	2,401
1971	180	3	31	103	0	597	0	62	0	0	632	0	0	4	190	0	0	1,802
1972	42	0	0	7	1	697	1	193	5	1	574	1	0	2	128	1	0	1,653
1973	379	4	0	281	0	506	0	67	3	2	554	0	2	1	30	0	7	1,836
1974	377	2	5	648	0	339	4	57	1	1	466	0	0	6	27	1	6	1,940
1975	155	7	0	25	0	223	1	6	0	0	89	0	0	2	25	0	0	533
1976	154	16	6	125	0	130	6	20	0	1	508	0	0	0	59	0	0	1,027
1977	202	24	0	226	0	68	2	24	0	0	363	0	0	0	54	0	0	963
1978	585	7	4	316	0	204	8	60	0	0	397	1	0	0	28	0	0	1,610
1979	219	11	3	201	0	320	3	3	0	0	245	1	1	2	22	0	0	1,031
1980	329	101	1	600	0	91	0	8	3	0	246	0	0	1	32	0	0	1,412
1981	146	15	3	274	0	187	0	9	0	2	262	8	15	4	9	0	0	934
1982	787	8	1	330	0	282	0	32	1	5	476	7	3	1	54	1	1	1,989
1983	1,582	24	11	1,847	3	274	4	81	0	2	183	23	18	0	22	0	0	4,074
1984	2,061	93	7	2,042	0	513	6	5	17	2	366	69	35	15	159	0	0	5,390
1985	5,156	0	19	1,379	4	0	0	5	2	2	499	12	28	6	0	0	0	7,112
1986	4,339	193	21	5,180	2	1,071	3	8	11	0	529	12	145	6	13	3	4	11,540
1987	2,359	25	5	319	3	494	0	6	9	4	273	9	30	14	10	4	57	3,621
1988	1,517	38	13	1,625	3	590	1	9	13	0	233	2	31	5	39	7	213	4,339
1989	1,474	8	5	788	3	407	1	12	10	3	215	5	18	4	7	7	242	3,209
1990	942	20	17	776	4	1,019	5	30	17	0	310	4	35	10	5	1	114	3,309

River	1982	1983	1984	1985	1986	1987	1988	1989	1990	Average
Karluk	1,100	4,200	2,500	1,900	300	700	200	600	1,000	1,400
Red	100	1,400	1,300	700	1,000	700	900	800	1,000	900
Afognak	110		30	60	130	130		20	190	90
Buskin				220	70	110	360	210	150	190
Dog Salmon		274	80	239	270	384	179	103	454	250

Year	Survey Dates Included	Effort (hrs)	Steelhead		Percent Released	Catch per Hour
			Kept	Released		
1985	April 29-June 02	6,490	201	2,485	92.5	0.41
1986	April 14-June 01	9,338	239	2,025	89.4	0.24
1987	April 06-May 17	10,466	391	3,785	90.6	0.40
1988	March 28-June 05	12,995	417	4,980	92.3	0.42
1989	April 04-June 04	11,078	332	1,974	85.6	0.21
1990	March 29-May 27	15,661	321	1,139	78.0	0.09

Table 6. Summary of Sitkoh Creek creel survey information.						
Year	No. of Anglers	Angler Hours	Total Catch	No. of Fish Kept	Catch per Hour	Percent Released
1976	111	2,107	98	49	0.05	50.0%
1978 <sup>a</sup>	150	763	70	32	0.09	54.3%
1982 <sup>a</sup>	116	-- <sup>b</sup>	348	45	-- <sup>b</sup>	87.1%
1987	123	807	216	53	0.27	75.5%
1990	134	1,205	278	35	0.23	87.4%

<sup>a</sup> 33-inch size limit in effect.

<sup>b</sup> Data not comparable; 238 angler-days reported.

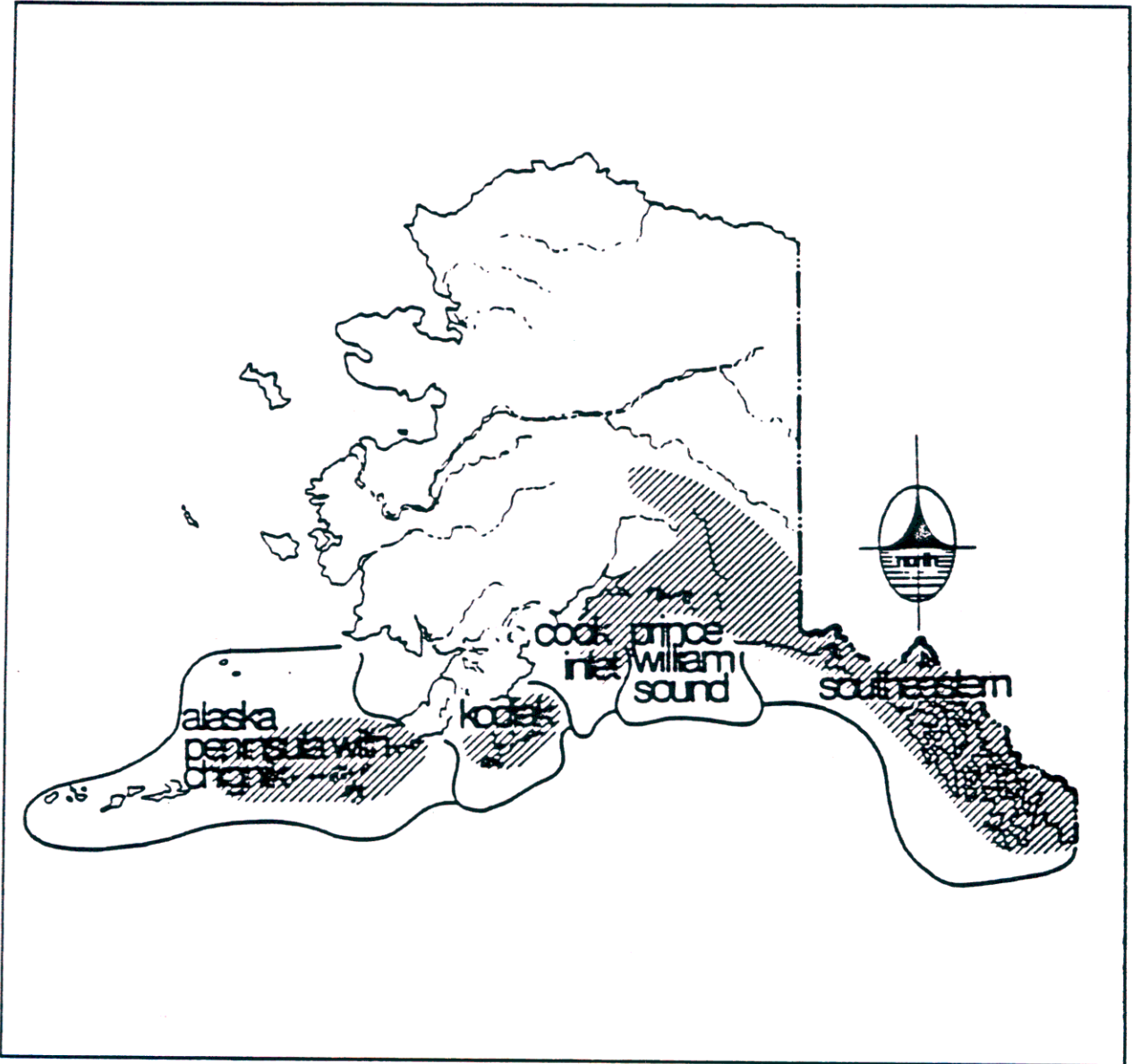


Figure 1. Documented range of steelhead trout in Alaska.

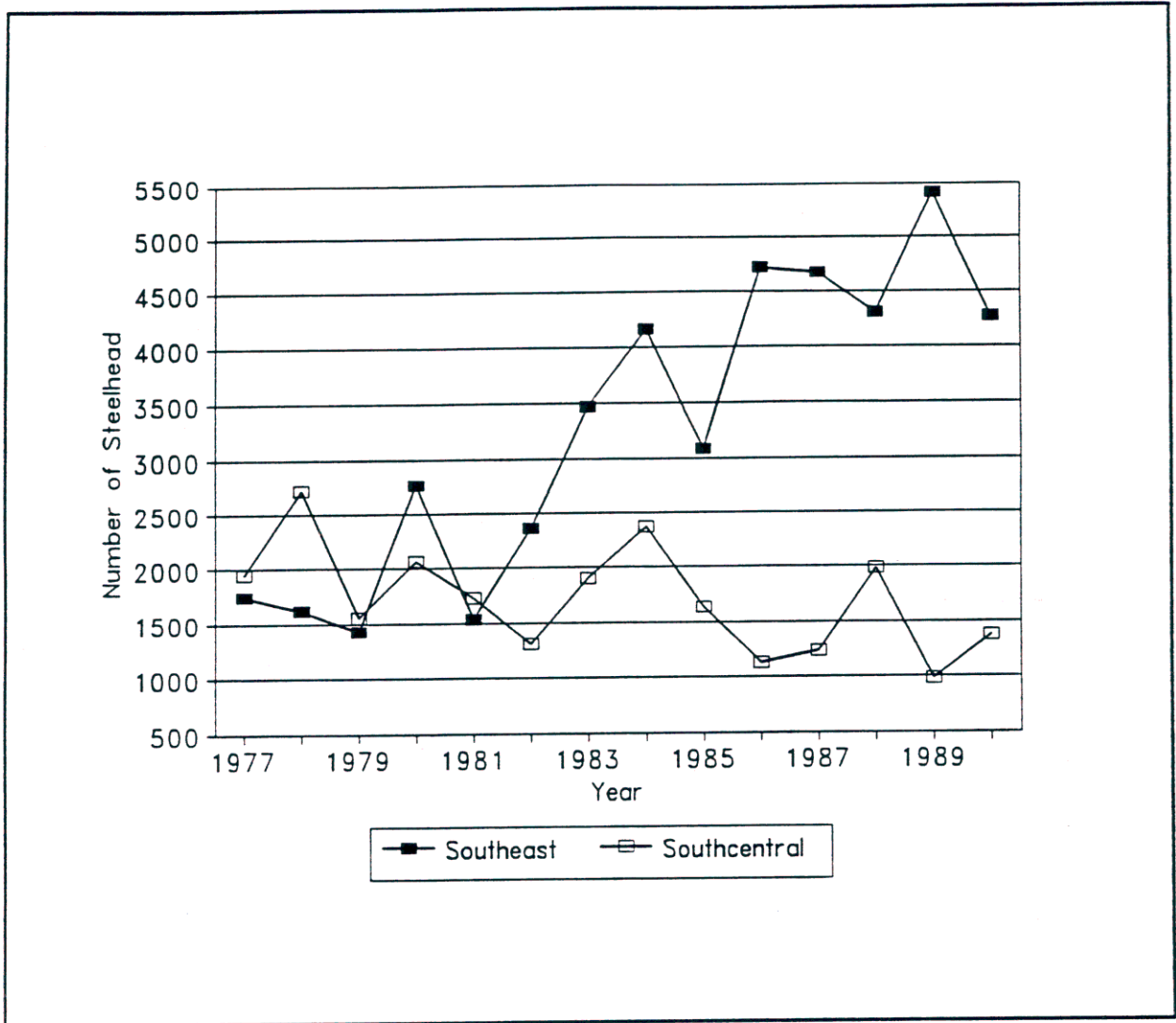


Figure 2. Sport harvests of steelhead in Alaska by region and year, 1977-1990.

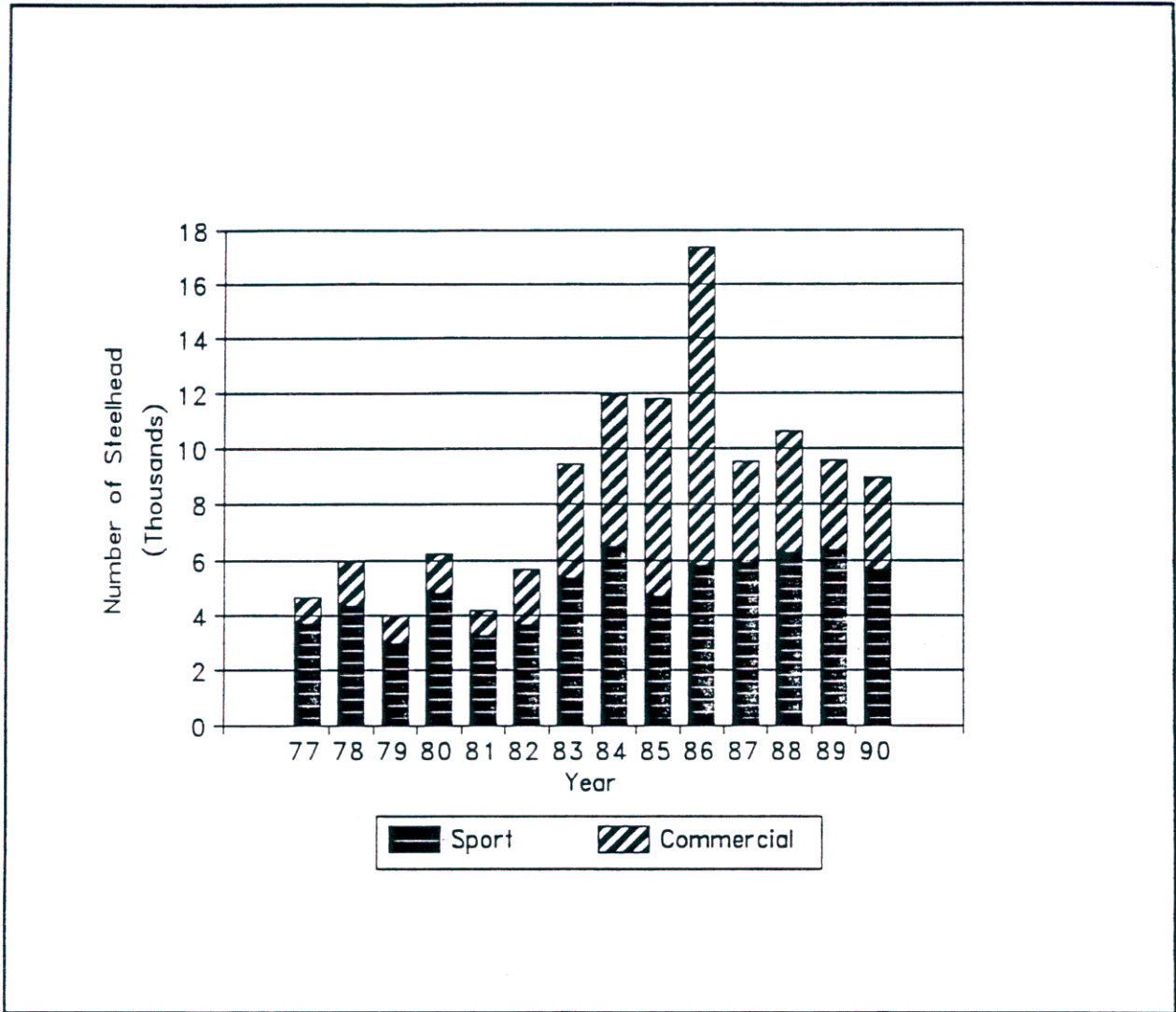


Figure 3. Harvests of steelhead in Alaskan sport and commercial fisheries, 1977-1990.

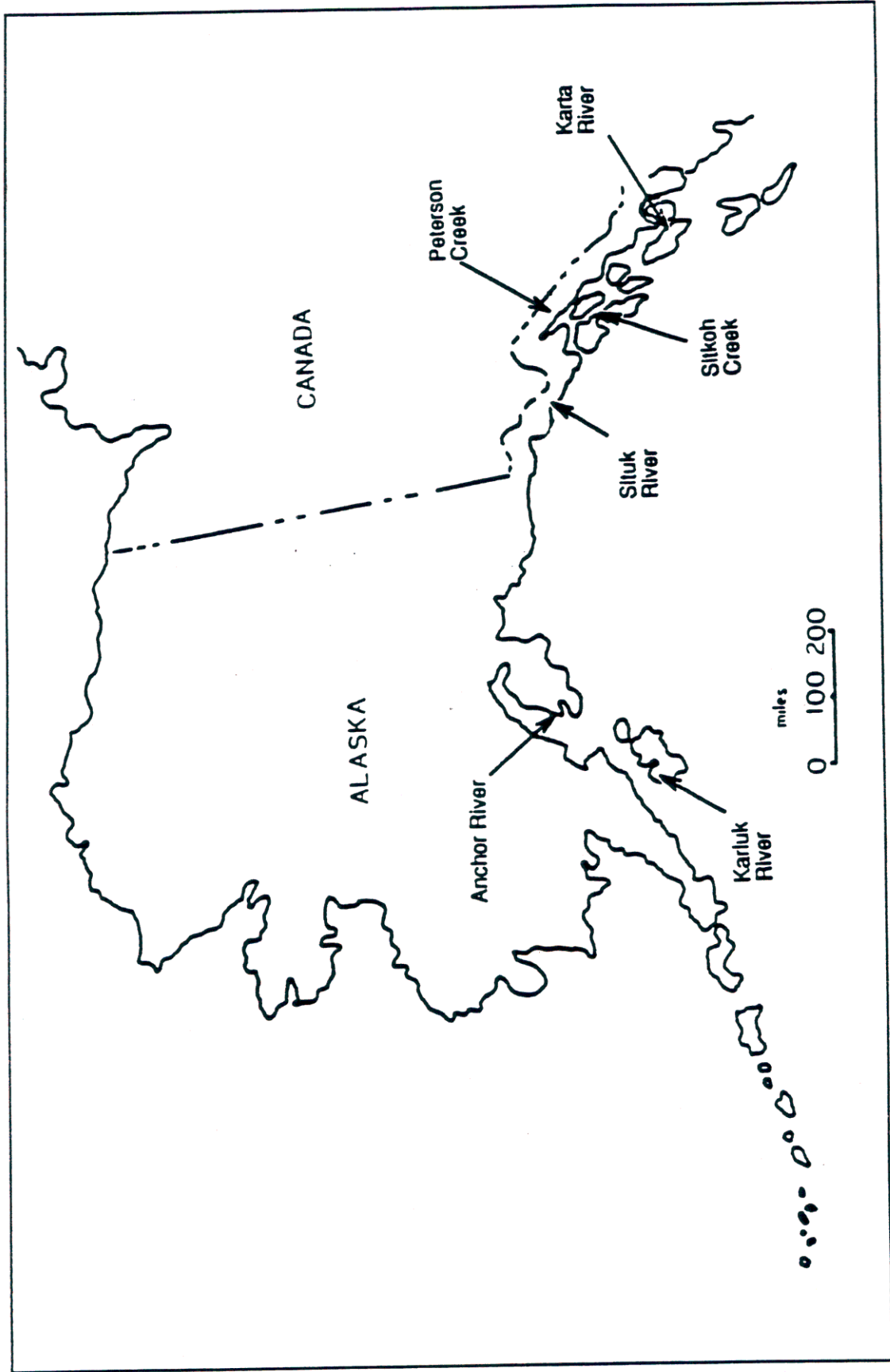


Figure 4. Location of important steelhead streams in Alaska.

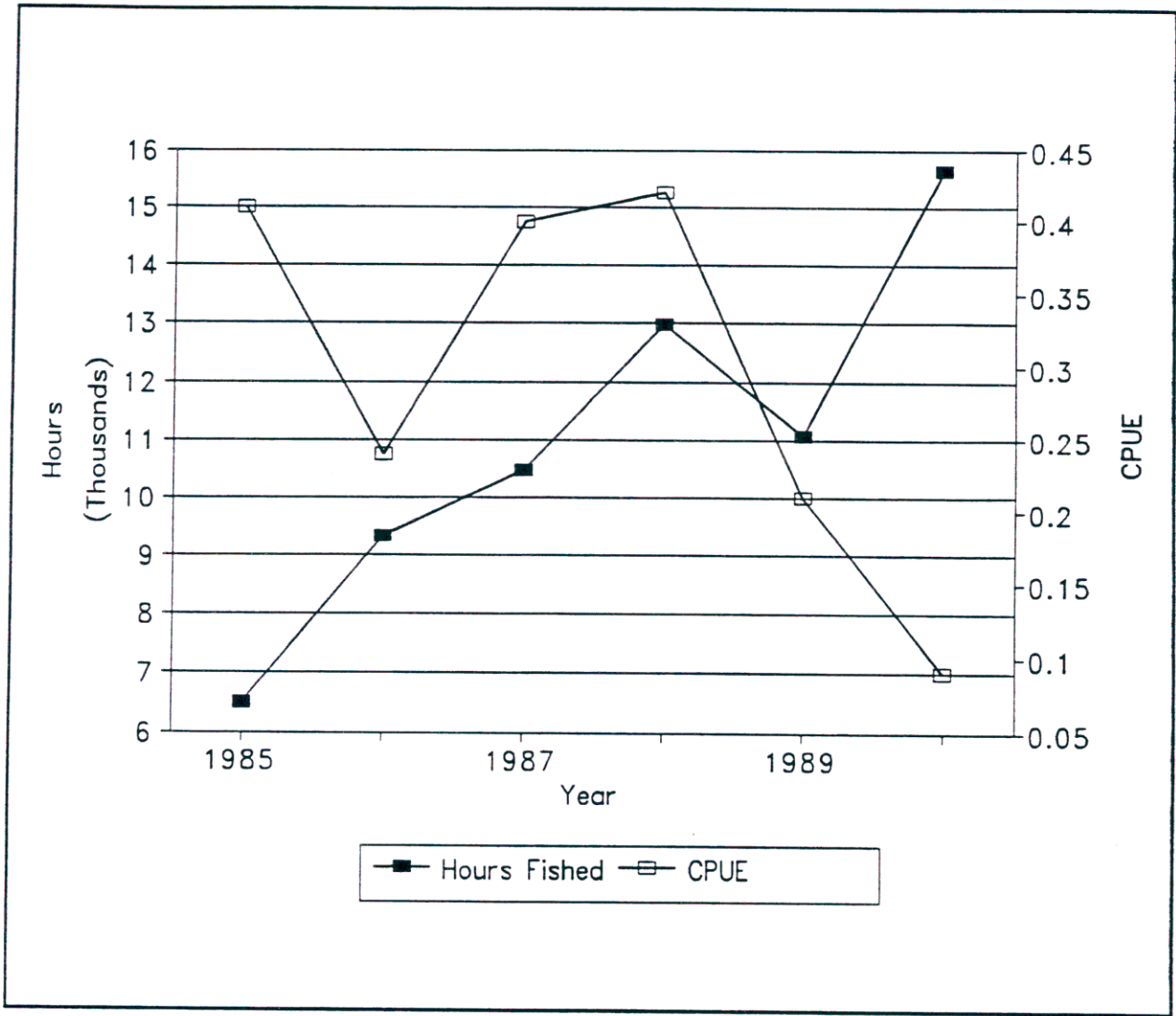


Figure 5. Situk River steelhead effort in hours and catch per unit effort (CPUE = catch per hour).

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# **BRITISH COLUMBIA**



## Steelhead Stock Status - British Columbia 1990

by  
Bob Hooton  
B. C. Ministry of Environment  
Fisheries Branch

### STOCK CHARACTERISTICS

British Columbia steelhead stocks are characterized by three basic types - **coastal** winter runs, coastal summer runs, and interior summer runs. Each of these types is dominated by naturally produced or wild fish but hatchery production contributes significantly to winter steelhead abundance on the south coast.

Winter steelhead occupy outer coast streams throughout the entire length of British Columbia. Abundance generally declines with increasing latitude. More southern stocks enter natal streams from late fall through late spring whereas northern stocks generally return in late spring only. There is no clear boundary beyond which **one** or the other pattern prevails.

Coastal summer steelhead return in early to mid summer and are generally associated with precipitous streams containing canyon reaches affording protected holding waters. These populations often enjoy exclusive use of habitat due to their unique ability to ascend migration obstacles which exclude other anadromous species.

Interior summer steelhead are associated with streams arising inside coastal mountain ranges, usually 100 miles or more inland. They are characterized by mid summer through fall run timing. The five major Pacific drainages in the province all support similar populations.

### ABUNDANCE

In descending order of abundance B.C.'s steelhead stocks are ranked first **winter** stocks, second interior summer stocks, and last coastal summer stocks. Hatchery contributions are confined to south coast winter stocks (with one exception) and to a smaller number of southern summer stocks including one interior stock. Biophysical constraints generally preclude hatchery smolt programs elsewhere in the province.

### FISHERIES

#### i) Commercial

Allocation of steelhead among competing users and escapement is **variable** between stock groups. In general coastal winter steelhead are not impacted by domestic commercial fisheries. Coastal summer steelhead are intercepted heavily by commercial salmon nets in some locations while other broad

geographic areas are unaffected. All interior summer stocks are subject to interceptory commercial fisheries targeting on salmon. High seas drift net undoubtedly account for some fish from all stock types but the extent of this catch is speculative.

ii) Native

Native fisheries operate on all of the major interior drainages and a growing number of coastal streams. Steelhead harvest by these fisheries is variable but increasing. Catches often significantly reduce upriver populations. Neither commercial nor native fisheries distinguish between hatchery and wild fish.

iii) Sport

Sport fisheries for wild steelhead in B.C. have come under heavy restriction in the past decade. Many coastal and interior streams which collectively support the majority of the province's steelhead production are now subject to wild steelhead release or one steelhead per year restrictions. These regulation measures place sport fisheries a distant last in terms of overall impact on wild steelhead abundance. Hatchery steelhead are the focus of a substantial consumptive fishery but even here the majority of the catch is released.

Escapement goals for most steelhead stocks and stock groups have been met in most years. However there is growing discontent among anglers over allocation imbalances. Bare minimum steelhead conservation requirements are no longer an acceptable escapement goal for commercial and native fishery managers. There is also some concern that conservation requirement be increased to offset habitat degradation associated principally with logging.

Trends in abundance of B.C. steelhead over the decade of the 1980's will be discussed and forecasts for the 1990's offered.

Management Practices and Research in  
British Columbia

by  
A.F. Tautz  
B. C. Ministry of Environment  
Fisheries Branch

INTRODUCTION

- . Management and research in British Columbia have focused on balancing protection of wild stocks with development of hatchery programs to provide increased angling opportunities.
- . Program has evolved rapidly over the last 12 years with the development of the Salmonid Enhancement Program (SEP)
- . Development of a Fisheries Strategic Plan for the Ministry has reinforced the protection and importance of wild stocks of steelhead
- . Growing concern over the protection of natural habitat and long term changes in ocean and/or fresh water environments

MANAGEMENT PRACTICES

STREAM CLASSIFICATION SYSTEM

All steelhead streams in British Columbia are classified with respect to permitted management practices

- i) **WILD** streams are managed to protect, maintain and enhance natural fish populations. Appropriate enhancement techniques include fry plants and rarely short term smolt plants using native brood stock, stream improvement to increase stream carrying capacity, and conservative regulations to control harvest.
- ii) **HATCHERY** streams have severely depleted wild stocks and may also have damaged spawning and rearing habitat, but there is potential for angling through the annual introduction of smolts.
- iii) **AUGMENTED** streams are managed to maintain healthy wild stocks while providing for a harvestable surplus through the addition of cultured fish.

## GENETICS GUIDELINES

- . No transplants between streams except where there are no or remnant populations of wild steelhead
- . All hatchery smolts are marked with an adipose clip, Kill fishery is restricted to hatchery fish in most of the Province
- . All hatchery brood for augmented streams must be taken from unmarked (at least one generation removed) fish
- . Hatchery/wild ratio should not exceed 1:1 in augmented streams

## PUBLIC INVOLVEMENT GUIDELINES

- . To support volunteer public participation and increase public awareness where
  - i) project proposals are consistent with Ministry design and legal specifications, and meet fisheries program objectives,
  - ii) adequate provincial resources are available to provide the assistance required to ensure a reasonable chance of success for the project
  - iii) the risk to wild sport fish stocks is negligible

## HARVEST GUIDELINES

The Ministry regulations for wild stocks will emphasize the provision of angling opportunities as opposed to the harvest of wild fish

- . Where there is ambiguity regarding levels of harvest of wild fish, the Ministry shall adopt a conservative management approach which minimizes any risk to wild stocks
- . The Ministry will support provision of a fair and reasonable allocation of steelhead to sport fishermen where steelhead are subjected to a mixed stock fishery for salmon

## DEMAND MANAGEMENT

- . Streams are classified in a manner which allows for the regulation of commercial guiding, resident and non resident use.
- . Legislation now provides for river specific management plans which limits commercial activity to no more than 40 percent of the "capacity" of the river for angling

- . A Limited entry draw and reservation system has been implemented successfully on the Dean River
- . The administrative system and the more intensive management which accompanies it will be fully cost recoverable

## RESEARCH ACTIVITIES

### LIFE HISTORY

- . Productivity and survivorship
- . Habitat Capability for fry, parr and smolt production
- . Fresh Water and Ocean survival Monitoring
- . Factors governing age and size at return

### NATURAL ENHANCEMENT

- . Stream Fertilization
- . Habitat restoration and enhancement

### FISH CULTURE

- . Time of release and size of the "window"
- . Residualism and its impact on wild fish
- . Long term genetic change

### COMMERCIAL HARVEST

- . Run reconstruction and real time harvest in mixed stock fisheries
- . Radio and Sonic tracking studies to determine rates of migration, depth, and behavior
- . Methods for selective harvest including modified gill nets, trap nets, release from seiners

## Steelhead Culture Program in British Columbia

by

Bryan Ludwig  
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Fisheries Branch

The steelhead culture program in British Columbia had a modest beginning in 1972 with the release of 5000 steelhead smolts into the Qualicum River on Vancouver Island. With the onset of the Salmonid Enhancement Program in 1977, the hatchery steelhead program began a steady growth that in the 1991 brood year will see us release a total of 2.0 million steelhead from 34 hatchery facilities. Most of the hatchery facilities are located in the southern area of the province and in particular in the Lower Fraser Valley and Vancouver Island. The majority of them have been built since 1977 so they are relatively new.

In British Columbia, although the B C Environment Ministry is responsible for steelhead management and production, both Provincial and Federal hatchery facilities are involved in culturing steelhead. There are two Provincial facilities that raise approximately 15% of the steelhead released. The remaining 85% of the fish are released from what could be termed Non-Provincial facilities. These include 15 salmon hatchery facilities operated by the Federal government, 12 public involvement facilities and 5 contract facilities. For the most part, the contract facilities are run by non-profit enhancement societies. These publicly-operated facilities account for 35% of the total releases (mostly fry).

Steelhead are released at two life history stages: fry and smolts (Table 1). Of the 2.0 million steelhead released, 1.1 million are fry, and the remainder are smolts. The typical release size for fry is 0.5 to 2.0 g. About 70% of the fry are released as supplemental stockings into habitat that is not fully seeded, versus colonization releases. The smolt release size ranges from 50 to 100g with an average of 60g. All but two of the programs involve one year old smolts. Summer-runs make up 75 % of the fry releases and 25% of the smolt releases.

	Fry	Smolts
Production Goal	1,110,000	910,000
Release Systems	33	30
Release Size (g)	0.5 - 2.0	50 - 100
Release Timing	July - Sept	Apr. 15 - May 15

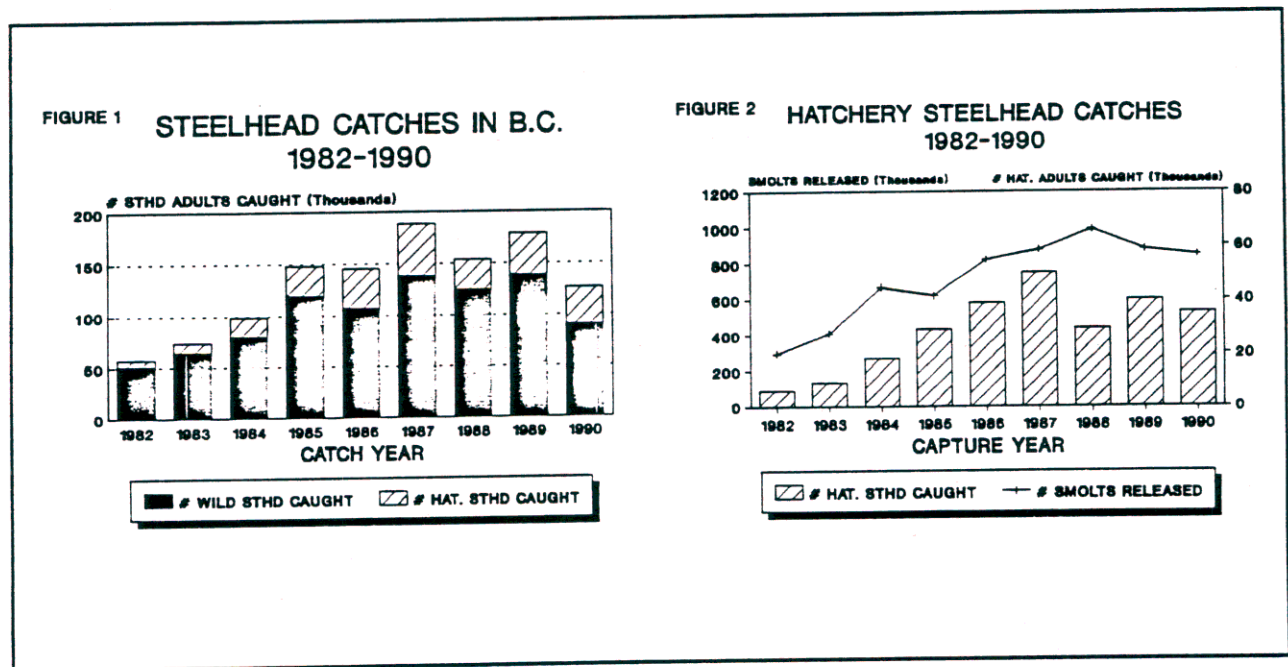
In comparison with the hatchery programs in Washington and Oregon, these production figures are very modest. The program in B. C. is perhaps best characterized by the release of small numbers of fish into a large number of release systems. In fact, there are only two smolt programs where in excess of 100000 smolts are released into a system. A more typical production goal for a small coastal stream would be 25000 smolts. Most of the programs use stocks that are native to the release system. Only 15% of the releases involve transplants and these are in systems where there is only a remnant population of wild steelhead remaining.

Typical survivals within the hatchery are 80% between green egg and fry and 70% green egg to smolt. Disease is not a significant factor at most facilities. Losses to disease vary from 0 to 10%. Fortunately, there have not been any viral problems in steelhead. At two facilities, problems have been experienced with Proliferative Kidney disease but usually this can be dealt with by rearing at a lower water temperature.

How Well Are The Hatchery Programs Performing In The Sport Fishery?

The sports fishery data is collected by a postcard questionnaire. The questionnaire is sent to half of the anglers who purchase a steelhead license and asks: did you fish for steelhead, and if so what streams, number of days fished and number of wild or hatchery steelhead kept and released? There is likely to be a positive response bias but it has not been corrected for in this data.

In 1990, the hatchery catch was 35000 fish or 30% of the total catch (Fig. 1). This



is a 500% increase since 1982 (Fig. 2). Typically the catch is 20-25% hatchery although this increased slightly in 1990. Of interest, despite regulations that permit a kill on hatchery steelhead 75% of the hatchery fish are released. Since 1968,

angler days have varied from 125,000 to 240,000 in 1990 (Fig. 3). The decline in the late 1970's corresponded to the introduction of catch and release regulations for wild fish. The catch per angler day for hatchery and wild steelhead has increased from 0.23 fish per day in 1968 to 0.5 fish per day in 1990 (Fig. 4). The peak was 0.7 fish per day in 1985.

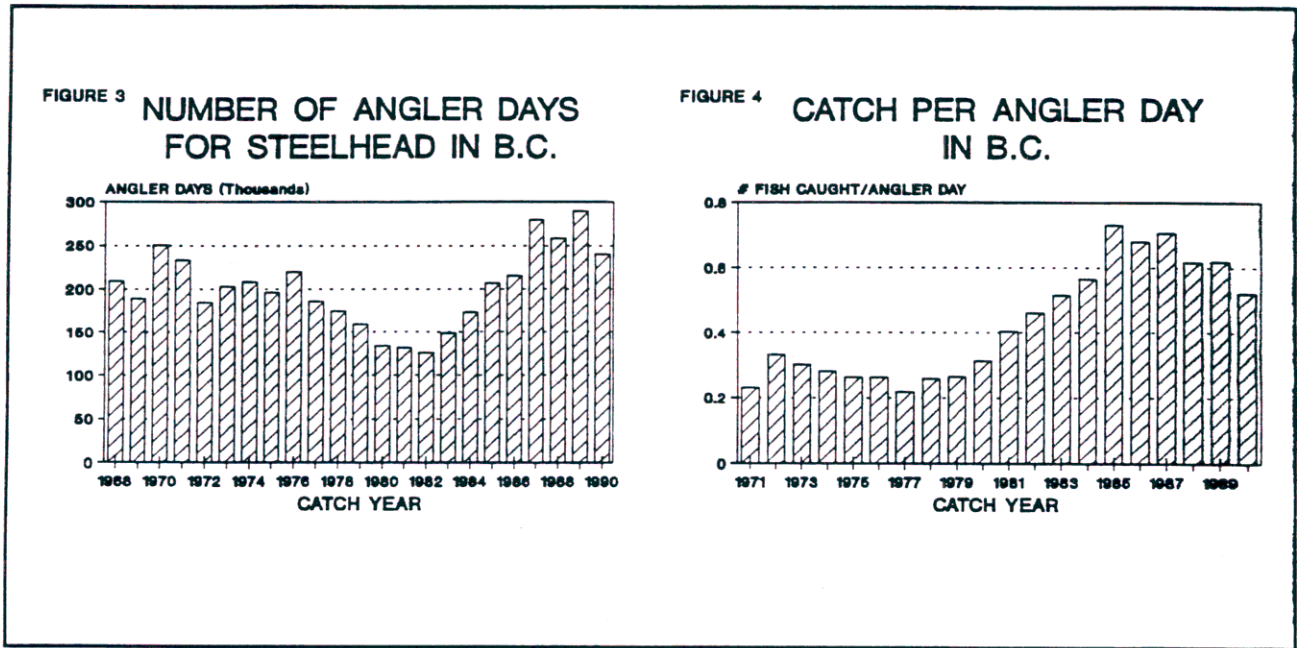


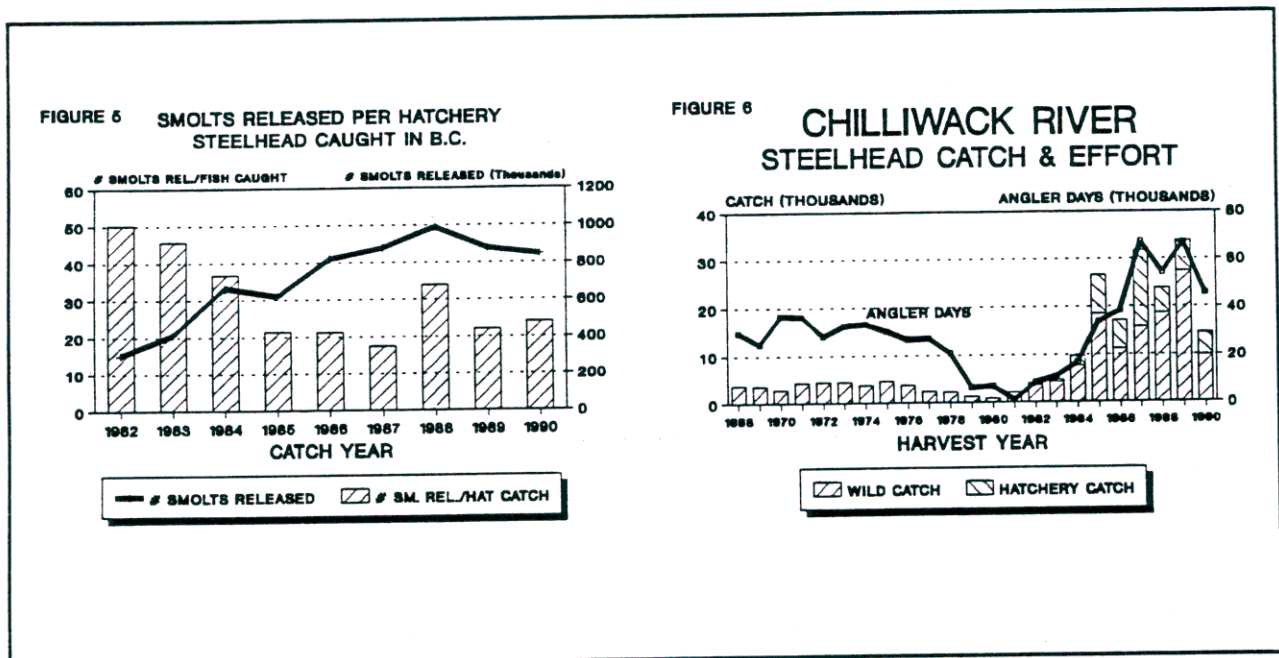
Figure 7

In terms of survival to adult for the two release stages, the early results from the fry programs have been somewhat disappointing. A survival of 1% fry to adult was expected but in several systems where 2.0 g fry were released in July and Aug., the survival to adult was only 0.5%. For one particular system, the Coquihalla where there is a long standing 14 year study of the juvenile population, survivals to adult for fry released at 0.5 g in July have varied from 0.4 to 1.3%. It appears that the stocking density for many of the early programs may have been too high. Our new strategies for fry rearing are to release fry at very conservative stocking densities taking into account the release size of the fry. Release numbers are based on assessment of the total usable area for fry as measured at the low flow stage rather than using the total wetted area. Few streams are totally usable for fry so this makes sense. Most importantly, fry programs are not considered until the stream assessment work has been completed.

For smolts, very few of the systems in which smolts are released have counting fences to determine the number of returning adults. At Robertson Ck. hatchery on the west side of Vancouver Island, returns to the brailer have varied from 1.0 to 10% depending on smolt size. For 60g smolts, the returns have averaged 3 to 4%. For the Keogh river on the north end of Vancouver Island, smolt to adult survivals have varied from 3 to 10% also for 60g smolts. The smolts per adult catch is a very useful statistic to compare the relative success of the smolt programs. The smolts per catch

is the number of smolts that must be released to generate one adult catch. On a Provincial basis, the smolts per catch has declined from 50 during the early years of the program to close to 20 in recent years (Fig. 5). In comparing the individual programs the results indicate that approximately half of the smolt programs are not performing to our expectations while one-third of the programs are exceeding expectations. The most common problems are insufficient smolt size and water quality problems in the receiving waters.

To provide some perspective on the performance of an individual program, it is worthwhile examining the catch records for the Chilliwack river (Fig. 6). As a result of the catch and release regulations and the hatchery program, there has been a sharp increase in both angler days and catch.



### Program Safeguards

As steelhead managers in British Columbia, our primary goal is to protect wild stocks. However, with the onset of catch and release regulations for wild steelhead in place for the southern portion of the Province, one of the key goals with our hatchery program is to provide a harvestable product for the angler. The challenge for the program is to do both and to accomplish this a number of safeguards have been built into the system:

1. Wild stocks are used as brood for the smolt programs. To preserve the natural run timing, adults are collected throughout the run primarily by angling. All smolts released are marked with an adipose clip. This allows us to avoid using the returning adults for brood purposes and to apply a directed harvest to hatchery stocks.

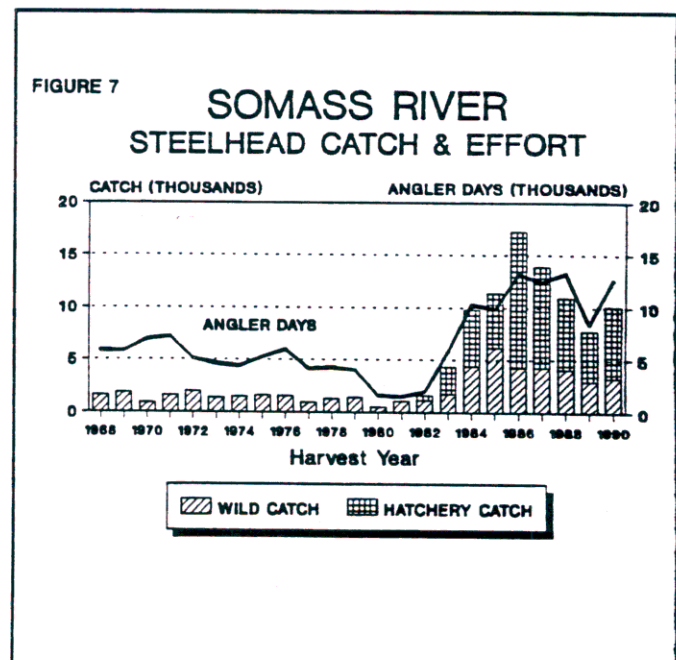
2. Streams have been classified as one of three types: wild, augmented and hatchery. The classifications spell out the allowable enhancement activities. In wild streams, enhancement is by habitat improvement only. Steelhead populations should reflect the stream's natural seeding ability and regulations are the primary means of ensuring reasonable harvest rates. Augmented streams allow for escapements that may be in excess of the streams natural seeding ability. Enhancement can include fry and smolt releases, but only wild brood may be used for the hatchery program. Wild stocks should comprise a significant portion of the adult returns thereby reducing the potential impact of the hatchery returns on the wild stock. Hatchery streams are those systems where the wild populations are severely depressed and natural recovery is unlikely. Enhancement usually involves smolt releases, but the brood source may include hatchery or non-native adults as approved by the transplant committee. Protecting the genetic integrity of wild stocks and providing a diversity of opportunity for the angler are the keys behind the classification of streams.

3. In terms of disease protection, steelhead cannot be transplanted between systems without the prior approval of a Federal/Provincial transplant committee. Transplant applications are reviewed primarily on the potential to transfer diseases. All new steelhead stocks are screened for disease within the hatchery.

4. In determining the smolt production goals, historic run sizes, the potential for impact on the wild population due to hatchery anglers, angler use, access to fishable water and proximity to human population centers are considered. The production goal is adjusted if the hatchery to wild catch ratio exceeds 1.0. As indicated earlier, fry goals are based on the amount of vacant and useable habitat.

5. For rearing strategies, the classification of the stream determines whether wild and/or hatchery brood can be collected for the hatchery program. Steps are taken to ensure that grading during rearing does not reduce this variability. Smolts are transported and released to the lower river to reduce the impact of residual smolts on wild parr. In some cases, very small smolts may be released to landlocked lakes rather than risk a residual problem.

The size of the hatchery program is not expected to increase, but a number of challenges remain. In some augmented streams (Fig.7), due to a variety of human impacts the wild stock is in decline yet the hatchery catch is still large. The result is that the hatchery to wild catch exceeds 1.0. Genetic impacts will no doubt be tempered by the safeguards built into the programs but in order to be certain that these



safeguards are sufficient protection, a better understanding of the specific ways in which hatchery programs can have a negative impact on wild stocks must be developed.

## Steelhead Habitat Protection and Enhancement in British Columbia

by

J. C. Wightman and I. McGregor  
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Fisheries Branch

### BACKGROUND

- the anadromous salmonid resource in British Columbia is dependent on about 1,800 stream systems
- of these, about 250 support steelhead trout sport fisheries as determined by an annual mailout questionnaire sent to a sample of the licensed anglers
- in recent years, the questionnaire indicates that from 30-35,000 licensed anglers spend approximately 250,000 rod days a year to catch between 125-180,000 steelhead, of which 70-80% are from wild stocks
- this is why the maintenance of these 'healthy' stream systems is so vitally important!

### STEELHEAD HABITAT PROTECTION

- in Canada, the federal government has overall constitutional authority for "sea coast and inland fisheries", while the province, with jurisdiction over freshwater and landbased resources (such as forests and minerals), controls most of the activities that affect fish habitat
- with overlapping constitutional responsibilities for regulating fish habitat and the human activities which affect it, habitat protection requires extensive on-going liaison and cooperation between the two levels of government.
- in reviewing the last 20 years of anadromous fish habitat protection in British Columbia, a number of specific milestones are worth discussing:

#### 1) The Carnation Creek Study

This research project, which began in 1970 and spanned more than 15 years, systematically and holistically documented the effects of logging on a small west coast Vancouver Island watershed.

(2) The Salmonid Enhancement Program

This major federal-provincial initiative began in 1977. In addition to a wide range of stock enhancement projects with significant capital investment, SEP also established a vigorous program of public awareness designed to focus attention on the conservation of salmonid population and their natural habitat.

(3) Amendments to the Federal Fisheries Act (1970 & 1977)

The Federal Fisheries Act is the most powerful legal instrument for protecting fish habitat in Canada. Habitat protection requirements have long been a feature of the Act, and sections pertaining to alteration and pollution of fish habitat were considerably strengthened by legislative amendment in 1970 and 1977.

(4) The 1982 Commission on Pacific Fisheries Policy

In his major report entitled 'Turning the Tide - A New Policy for Canada's Pacific Fisheries', Dr. Peter Pearse made 23 recommendations to improve the Department of Fisheries and Oceans overall performance in the habitat protection arena.

(5) Economic Surveys on Sportfishing

Every five years since 1975 National Sport Fishing Surveys have been conducted in Canada to statistically describe the trends in fresh and saltwater angling effort, catch and demographics of licensees. The British Columbia survey data, when combined with estimates of gross angler expenditures, net economic value of sportfishing, and estimates of employment and income generated by angler expenditures, have given fisheries managers a much needed economic argument in resource allocation decisions.

(6) British Columbia Coastal Fisheries/Forestry Guidelines (1987)

In British Columbia, about 2.5B cubic meters of wood were logged between 1911-89. Most notable, however, is that 50% of this volume was harvested since 1972, or a period of just 17 years. As a result of several widely publicized resource use conflicts, and with new research results from the Carnation Creek Study in hand, industry and government representatives began in 1982 to redraft coastal logging guidelines to better reflect the principles of integrated resource management.

(7) Public Environmental Awareness

The overall increase in public concern over environmental issues has had important spinoffs for fisheries managers. In British Columbia, the "think globally, act locally" ethic has seen provincial environmental organizations like

Greenpeace, the Sierra Club, and Western Canada Wilderness Committee combine forces with smaller community action groups (e.g., Friends of Strathcona; Friends of Clayoquot Sound) to confront the forest industry over logging of old growth, and other issues like chlorinated waste discharges from pulp mills.

In addition to these significant milestones, recent organizational initiatives by the provincial Ministry of Environment are evidence of government's current willingness to improve its performance in fish habitat protection issues. For example, about 18 months ago, the Ministry created regional Environmental Enforcement Unit whose sole mandate is to gather evidence and lay charges for violations under federal and provincial environmental law.

More recently, the Ministry has established a new Integrated Resource Management Branch.

### STEELHEAD HABITAT ENHANCEMENT

For purposes of this discussion, stream enhancement will be defined as "restoring, protecting and improving the capability of streams to produce anadromous salmonids".

Apart from costly steelhead hatchery programs which will be discussed by another panel at this symposium, steelhead enhancement in British Columbia has basically focused on six major techniques:

- (1) Improved spawner access;
- (2) Spawning gravel introductions;
- (3) Rearing habitat complexing,
- (4) Stream enrichment;
- (5) Water storage/flow augmentation; and
- (6) Downstream smolt deflection

#### Improved Spawner Access

One of the most widely used and potentially beneficial enhancement measures is provision of spawner access at barrier or obstruction sites.

#### Spawning Gravel Introductions

Since the late 1970's provincial fisheries staff have been actively involved in placement of new spawning gravel in streams considered gravel poor and where trout recruitment is limited. Depending on stream size, prescribed gravel is placed in small to large platforms constructed of either boulder or anchored log 'cribs'. Much of this work can be done by hand using volunteer labor and donated materials and equipment.

### Rearing Habitat Complexing

Juvenile steelhead require an extended period of stream rearing to achieve smolt size. Given initial fry seeding is adequate, the number of wild smolts produced may ultimately be affected by the amount and 'quality' of parr rearing habitat. In British Columbia, provincial fisheries staff have experimented with a wide range of different cover structures and installation designs in a few places.

### Stream Enrichment

In British Columbia, provincial fisheries staff have manipulated trophic production in streams by artificially increasing the supply of inorganic nutrients. Results have indicated that additions of phosphorus and nitrogen can increase autotrophic production in excess of an order of magnitude from the untreated condition. Related increases in insect communities and salmonid growth have also been measured, along with increases in smolt yield.

### Water Storage/Flow Augmentation

Where it is cost effective, headwater storage may be a practical solution for augmenting low summer flows. Natural runoff captured behind a storage dam can be released at rate needed to maintain desirable spawning, incubation and rearing conditions in downstream areas. Only a few projects have been undertaken however.

In the dry interior plateau, availability of summer fisheries maintenance flows is arguably the single most important factor controlling wild steelhead abundance. Provincial fisheries staff now spend considerable time negotiating with water managers and agricultural interests to ensure adequate instream flows.

### Downstream Smolt Deflection

In British Columbia, we have considerably less experience than our American colleagues in the area of diversion, capture and transport of large numbers of outmigrating salmonid smolts.

The experience we have involves the screening of irrigation ditches and canals in the province's southern interior, and most recently at a B.C. Hydro diversion dam on Vancouver Island.

Steelhead Data and Management Needs  
in British Columbia

by  
P .A. Slaney, B. Ward, and A. F. Tautz  
B. C. Ministry of Environment  
Fisheries Branch

INTRODUCTION

A list of research needs for improving management and basic knowledge of steelhead, sea-run cutthroat and Dolly Varden was assembled by the British Columbia Fisheries Research and Development Unit of the Ministry of Environment with input from Regions, Fish Culture, Fisheries Improvement and Habitat Management. These research needs were reviewed and prioritized at the April, 1990 meeting of the Anadromous Committee.

RESEARCH AND MANAGEMENT AREA AND PRIORITY (1 to 8; High, Medium, Low)

1 MIXED STOCK AND SELECTIVE FISHERIES  
(Applies mainly to Skeena, North Coast, Thompson)

- H - Stock ID Technology (e.g., DNA Finger printing)
- H - Run Heritability (Review Needed)
- H - Selective Harvest Techniques
- H - Ocean Harvest of Steelhead (Alaska, North Coast, High Seas)
- H - Determine Maximum Harvest Rates for Northern Stocks

2 ANGLER DEMAND/USE

- H - Evaluation of Demand Management (Guide policy)
- H - Responses to Enhancement (Controlling Factors) 91/92
- M - Angler Capacity/Crowding Surveys
- M - Angler Satisfaction Surveys (Curves)

3 HATCHERY PRODUCTION/INTERACTIONS

- H - Critical Time of Release in May (Vedder, Keogh)
- H - Techniques to Minimize "Residualism"
- H - Constant temperature Effects in Smolts
- M - Wild-Hatchery Interactions (Residual Impacts) domestics
- M - Residual "Clean-up" Fisheries
- L - Further Quality/Abrasion Experiments

#### 4 WILD (AND HATCHERY) MARINE SURVIVAL

- H - Size/Time Interactions
- M - Age of Return Mechanisms
- M - Simulation Modelling (Ocean Condition first)
- L - Early Marine Life History/Survival

#### 5 WILD STOCK ENHANCEMENT/LIMITING FACTORS

- H - Fertilization Efficiency
- M - LOD Manipulations in Large Streams
- M - Flow Augmentation
- M - Synergistic Enhancement (Multiple Techniques)
- L - Freshet Limitations to Production
- L - Predation Limitations

#### 6 PRODUCTION CAPABILITY/POPULATION ECOLOGY

- H - Production Capability Models (Smolts, Adults)
- H - Northern Rivers Capability and Life History
- M - Fry vs Parr Habitat Limitations to Smolt Yield
- M - Freshwater Survival/Density Dependence Models
- M - Premature Parr migrations (Causes and Implications)
- M - Sustainable Harvest of Dolly Varden
- M - Sonic Tracking (Fraser Cuts, Sthd Migration)
- M - Adult Enumeration techniques without a fence
- L - Interspecific Competition Studies/Models

#### 7 HABITAT PROTECTION PROBLEMS

- H - Low Flow Impacts (Critical Duration and level)
- H - Capability Models
- M - Fish/forestry Impacts (Coast Hydrologic, Interior)
- M - Periphyton/Insect Relationships
- M - Importance of Old Growth Riparian Forest
- L - Effects of Riparian Vegetation Manipulations
- L - No Net Loss Evaluations
- L - Sedimentation/Stock Productivity

## 8 RIVERINE SALMON SPORT FISHERIES DEVELOPMENT

This topic was ranked as lower priority, within a five year horizon.

### Chinook and Coho Sport Fisheries

- Document C&R Hooking Mortality by Species
- Non-compliance
- Use and Potential Use

### Experimental Sockeye, Chum and Pink Sport fisheries

- Hooking Mortality
- Stress mortality
- Non-compliance
- Use and Potential Use

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# CALIFORNIA



## Status of California Steelhead Stocks

by

Bob Reavis

California Department of Fish and Game

### Definition of Races:

The following three races of steelhead occur in California:

- 1. Spring run** - These fish enter fresh water from April through June; they migrate up the main stem of a large river; hold over throughout the summer in the headwaters; and then spawn the following February and March. This race, also referred to as "summer steelhead", occurs naturally in the Klamath and Eel rivers, and an artificially maintained summer run of Washougal River (Washington) origin is present in the Mad River in northwestern California. The estimated population of naturally spawning, indigenous, spring-run steelhead in California ranges from 2,500 to 3,500 adults.
- 2. Fall run** - These fish enter fresh water from July through mid-November and spawn in February and March. This is the same race of fish which migrates into the Rogue River of southern Oregon; the Oregon Department of Fish and Wildlife refer to this run as "summer run" because of the time of year they enter fresh water. This race has the "half-pounder" phase as a part of its life cycle: half-pounders are steelhead which have migrated to the ocean after spending two years in fresh water, and return to fresh water on a non-spawning migration after spending only part of a year in the ocean. Half-pounders average about one half pound and are about ten to sixteen inches long. As half-pounders, they are sought by many anglers. In California, fall-run steelhead occur exclusively in the Klamath-Trinity River system (Figure 1). The present fall-run steelhead population is estimated to be between 15,000 and 50,000 naturally produced adult fish and 4,000 to 10,000 artificially produced adult fish.
- 3. Winter run** - This race enters fresh water during December and January and then spawns in February and March. This is the principal race of steelhead in every California stream except the Klamath-Trinity River system. The present winter-run escapement in California is estimated to be between 45,000 and 55,000 naturally produced adults and 35,000 to 40,000 artificially produced adults.

### Historical Status:

The historical range of steelhead trout extended south into northern Baja, Mexico. It is likely every year-round stream and many intermittent rivers in California which flowed into the Pacific Ocean historically supported a run of steelhead.

Streams and rivers in San Diego, Orange, Los Angeles, Ventura, and Santa Barbara counties historically supported runs of steelhead. Due to the tremendous urban development that has taken place in southern California in the past 50 years, few of the streams in these counties now have steelhead. Malibu Creek near the City of Los Angeles is the southern most stream with a known steelhead run.

The Santa Ynez River in Santa Barbara County once supported runs of 20,000 to 30,000 steelhead. The Carmel River in Monterey County once supported runs of several thousand steelhead and provided a prized fishery. North of the of San Francisco Bay, streams such as the Gualala, Garcia, Navarro, Big, Noyo, Ten Mile, Mattole, and Mad rivers and Redwood Creek supported runs of 6,000 to 16,000 fish.

Historically, the larger river systems along the north coast of California supported large runs of steelhead. The Russian River had runs of about 50,000 steelhead; the Eel River system had a run of about 80,000; the Klamath River system produced a run of over 200,000; and the Smith River supported a run of about 30,000.

There are no records of steelhead in the San Joaquin River system. If steelhead were present in this system, they may have been extirpated before the turn of the century due to gold mining activities. Steelhead would have had access to this river system. Dams were constructed on the two main tributaries of the San Joaquin River around 1900; these dams may have confined steelhead to the lower portion of these rivers where environmental conditions were not adequate to support steelhead for part of the year.

The run in the upper Sacramento River, above its confluence with the Feather River, was estimated to be about 20,500 during the 1950's. About 18,000 of these fish were naturally produced and 2,500 were artificially produced. By this time steelhead had been adversely affected by the construction of Shasta Dam in 1943 which blocked them from most of their historic spawning and rearing areas in the upper Sacramento River.

#### Current Status:

The southern-most stream of the steelhead's range in North America is now Malibu Creek in northern Los Angeles County. This stream supports a run ranging from 20 or 30 to 100 fish in a three mile reach below Rindge Dam. Access to upstream habitat, which is estimated to be 65% of the total spawning and rearing habitat in the entire system, is currently blocked by Rindge Dam which is obsolete due to sedimentation of the impoundment area. There are plans to remove the dam and provide a fish passage facility. At the very least, DFG wants to maintain the run in Malibu Creek for their "intrinsic and sociological values as well as for their direct benefits to man" as mandated by the State's Fish and Wildlife Plan. Our long-term goal is to restore and maintain a stable population which will support a catch-and-release fishery.

The Santa Clara River in Ventura County may presently support a run of several hundred steelhead. The principal tributaries of this stream are Sespe and Santa Paula creeks, which provide most of the spawning and rearing habitat for the system. Much of the watersheds of these two tributaries is located on public land which insures some protection to fish habitat. A fish ladder and fish screening facility has been installed in the Freeman Diversion Dam on the main stem of the Santa Clara River. This should provide better passage to spawning and rearing areas in the tributaries, and greater survival of juveniles emigrating to the ocean.

The Ventura River just north of the Santa Cruz River supports a run of several hundred fish. Tributaries of this stream have generally have adequate year-round flows for steelhead. The principal tributary used by steelhead for spawning and rearing is San Antonio Creek. A fish passage facility on Matilija Dam would open up the entire Matilija Creek watershed for steelhead.

Gaviota Creek in Santa Barbara County supports a run of several dozen steelhead. The Santa Ynez River now supports run of about 100 steelhead. Most of the present steelhead habitat in the Santa Ynez River watershed is located in the Salispuedes Creek tributary.

Most of the coastal streams north of Santa Barbara County which historically supported steelhead still have steelhead runs, although at greatly reduced population levels. There are numerous small streams along the central coast of California from San Luis Obispo County to San Francisco County which support small runs of steelhead.

Monterey County has several significant steelhead streams. The Big Sur River supports a run of about 100 fish. A barrier located about six miles upstream from the mouth was recently removed. This will provide access to many miles of previously unused habitat. The Little Sur River supports a run of about 100 steelhead. The Carmel River steelhead run has declined to only a few hundred fish due to urbanization, flow reduction in the lower river, and barriers to upstream migration. This stream has been the subject of intense study to determine measures needed to restore the run. The Salinas River has been adversely affected by agricultural diversions and barriers which hinder or block migration. Arroyo Seco River, a tributary to the Salinas River, may support a run of a few dozen to a few hundred fish.

The Pajaro River watershed, located in Monterey, Santa Clara, Santa Cruz and San Benito counties, presently supports a run of less than 100 steelhead. It has been damaged by various human activities, but the watershed can potentially be restored.

In Santa Cruz County, several streams such as Corralitos, Soquel, Aptos and Scott creeks support runs of a few dozen to a hundred fish. A cooperative rearing program located at the site of an abandoned state hatchery on Scott Creek rears steelhead for planting in various streams in Monterey and Santa Cruz counties. The San Lorenzo River has many tributaries that are degraded and consequently support very few steelhead. The Santa Cruz County government is currently making a concerted effort

to restore steelhead to the San Lorenzo River by controlling erosion, restricting harmful logging practices, and providing access to headwaters currently blocked by natural barriers. The run in Waddell Creek has not been monitored since Shapovalov and Taft conducted their studies in the 1930's. There have been no significant changes in this watershed and no artificially reared fish are planted in this stream.

There are several small streams draining into San Francisco Bay which support runs of less than 100 steelhead. These include Coyote, San Francisquito, and Walnut creeks and the Napa River. Restoration work is underway on San Francisquito and Walnut creeks. Steelhead, reared at Feather River or Nimbus hatcheries and released into the San Francisco Bay as juveniles, occasionally return as adults to one of the smaller tributaries in the Bay.

Although large rainbow trout or stray steelhead are occasionally caught in tributaries of the San Joaquin River system, this system does not presently support a run of steelhead. The San Joaquin system has not supported a viable population in the past 60 years, and it is not known if a significant steelhead run historically existed.

The Sacramento River system presently supports a run of about 25,000 to 35,000 steelhead. Approximately 95% of this run is artificially maintained with yearly plants from Nimbus, Feather River and Coleman hatcheries. Steelhead runs in the American and Feather rivers are almost entirely maintained with hatchery-produced fish, and about 80% of the run above the City of Red Bluff is of hatchery origin. There are naturally produced runs of a few hundred fish in several upper Sacramento River tributaries: Clear, Spring, Cow, Cottonwood, Antelope, Deer, and Mill creeks and the Yuba River.

Estimates of the current population levels in California streams are shown in Table 1. There is limited information from which to make conclusions of steelhead population trends in California. Many of the smaller streams which supported runs of a few hundred fish currently have no fish or support only a few dozen fish, and rivers which supported many thousands of steelhead now support only a few thousand.

	Naturally produced	Hatchery produced
Spring run		
Klamath, Mad, Eel rivers	2,500-3,500	?
Fall run		
Klamath-Trinity River system	15,000-50,000	4,000-10,000
Winter run		
Smith River	10,000	-
Klamath-Trinity River system	10,000	-
Redwood Creek	500	-
Mad River	?	6,000
Eel River	15,000	-
Mattole River	2,000	-
Russian River	7,000	5,000
Misc. Coastal streams	5,000	-
Central Valley streams	2,000	27,000
Winter-run totals	51,500	38,000

Data collected at two counting stations located in the Eel River system which began operations in the 1930's show long-term population trends. One counting station is located at Van Arsdale Dam on the main stem and the other, which was closed in 1975, was at Benbow Dam on the South Fork Eel River. Average annual count by decade for these two counting stations are as follows:

Decade	Benbow Dam (South Fork Eel River)	Van Arsdale (main stem Eel River)
1930's	13,700 <sup>a</sup>	4,500
1940's	18,300	4,000
1950's	12,800	3,800
1960's	6,700	1,100
1970's	3,400	800
1980's	-	1,200

<sup>a</sup> based on only two counts

Data gathered from these counting stations clearly show a drastic decline in steelhead populations since the 1940's. Based on average yearly counts, the populations of the main stem and south fork have decreased to about 1/5th their former numbers from the 1940's to the 1970's. The population declines in the main stem and South Fork probably reflect trends of naturally producing steelhead populations of other north coast streams. The annual steelhead escapement did increase in the main stem Eel River above the Van Arsdale Dam counting station in the 1980's due to increased flows released from Lake Pillsbury which is located upstream of Van Arsdale Dam.

A comparison of population estimates made during the 1950's with estimates made during the 1980's shows a drastic decline of naturally producing Central Valley steelhead. Based on data from a tagging and recapture study conducted from 1953 through 1958, the estimated average yearly escapement of naturally spawning steelhead in the Sacramento River above Red Bluff was about 16,200 fish. The estimated average yearly escapement of naturally produced steelhead migrating above Red Bluff during the last 10 years was 500 fish. A comparison of the artificially maintained run for the same time periods show this run has declined by 1/3rd.

Factors affecting California's steelhead populations:

A number of human activities have adversely affected steelhead in California. Gold mining in the Sierra Nevada foothills during the late 19th century and the Klamath Mountains into the early 20th century had a devastating impact on salmon and steelhead populations: sediments resulting from hydraulic mining destroyed many miles of spawning and rearing habitat. Dam construction for water supply and flood control blocked fish from their historic spawning and rearing areas and resulted in reduced flows and higher water temperatures in streams throughout the state. Inadequate screening of water diversions has resulted in high mortalities of juvenile steelhead attempting to migrate to the ocean. Improper logging practices and road construction have had a devastating impact on siltation of gravel particularly in north coast watersheds where soils are very unstable.

# Steelhead Streams of California\*



\* The San Joaquin River is a major stream system and only shown for reference. It does not support a steelhead population.

Figure 1. Steelhead streams of California.

## Management Practices and Research Activities

by

Bob Reavis

California Department of Fish and Game

### History of Research:

The work of Shapovalov and Taft (1954) on Waddell Creek, Santa Cruz County from 1933 to 1942 was one of the first major efforts to collect quantitative life-history data of steelhead in California. Such data were needed for sound regulatory, stocking, and other management programs. A major objective of this study was to observe steelhead and coho salmon in their natural habitats. Waddell Creek is located on the central coast of California and its general characteristics are typical of a majority of California's coastal streams. Based on observations made 50 to 60 years ago, the authors expressed concern that "...many of the problems encountered and many of the ill effects on the fishes have resulted from the methods of land and water use ..." They also pointed out that control over these factors was largely outside the province of the Department of Fish and Game (DFG), and recommended legislation prohibiting the cutting of trees within a prescribed distance of any stream. They urged that physical habitat improvement be thoroughly explored.

In 1952 DFG initiated a study in the upper Sacramento River to determine the effectiveness of planting steelhead to supplement natural production (Hallock et al, 1961). The steelhead sport fishery, life history, and upper Sacramento River population were also studied. During the period of the study (1953-1958), the annual steelhead run in the upper Sacramento River above the confluence of the Feather River was estimated to be 20,542 fish. Of this total, 2,494 were of hatchery origin and 18,048 were wild fish; this contrasts to the present total upper Sacramento River population which is approximately 3,000 fish, largely of hatchery origin.

During the 1971 through 1974 period, a creel census and tagging-and-recapture study was conducted on the lower American River to determine size of run, timing of migration, angler harvest rate, use by anglers, and the portion of the run entering Nimbus Hatchery (Staley, 1976). Based on the results of this study, an estimated 19,600 steelhead entered the river during 1971-72 and 12,300 entered the river during 1973-74; during both seasons about 27% of the steelhead migrating up the American River were caught by sport anglers.

The lower American River flows through the City of Sacramento, a major metropolitan area. Steelhead have been restricted to the lower 23 miles of stream below Nimbus and Folsom dams since 1954 when construction of these dams was completed by the U. S. Bureau of Reclamation. The Bureau constructed Nimbus Hatchery to mitigate for blocking salmon and steelhead from their historic spawning areas. The results from the studies conducting during the early 1970's and recent observations clearly show steelhead populations in the American River have been almost entirely the result of artificial production.

During the first few years of operation of Nimbus Hatchery, few adult steelhead returned and there were shortages of eggs; consequently, winter-run eggs were brought from the Eel River to augment the Nimbus Hatchery egg supply. From 1969 through 1971 and in 1973, summer-run steelhead eggs were obtained from hatcheries on both the Washougel River in Washington and the Siletz River in Oregon. There were attempts to keep summer-run fish separate from the winter-run fish that were present at the hatchery, but over time these races have been commingled. After the construction of Nimbus and Folsom dams, there was no habitat available in the lower American River to support natural spawning steelhead. These events resulted in a reliance on artificial production to maintain a steelhead population and probably led to the extirpation of the native steelhead run. The artificially sustained steelhead population usually provides a fine sport fishery.

DFG initiated the Coastal Steelhead Project in 1972. This project was to determine management needs of winter-run steelhead in smaller coastal streams. Some of the factors investigated were contribution of hatchery-reared steelhead to the angler's creel; population assessment using a tagging-and-recapture program; and evaluation of an experimental rearing program using cages in ponds. The study was carried out on the Gualala River, a small coastal stream located just over 100 miles north of San Francisco. The results of this study showed that hatchery supplements contributed an insignificant portion to the total fishery. This project was completed in 1978. The next phase of the steelhead study which was to examine larger river systems was initiated in 1977 on the Klamath-Trinity River system, a major river system in northern California, but due to the passage of the Magnuson Act (Public Law 94-265) and the establishment of the Pacific Fishery Management Council (PFMC), the focus of this project abruptly changed from steelhead to salmon. The change was the result of the Department's sudden obligation to provide PFMC with data from which it could promulgate ocean harvest regulations for salmon. This change is an example of how DFG occasionally has had to quickly alter programs to suddenly respond to intense concerns regarding a new issue.

In 1987, a monitoring system of coastal indicator streams was established including small coastal streams north of San Francisco Bay and 2 small streams in the Monterey area. Juvenile coho and steelhead populations are monitored annually to develop information on wild production trends.

The intense pressure in California to develop water for agriculture, industrial, and domestic purposes has impacted the manner in which the Department prioritizes its work activities. The great concern for past, present, and potential future degradation of fish habitat makes it imperative that DFG focus much of its effort towards preventing habitat degradation and the environmental review processes. This results in considerably less time and effort that can be directed toward fisheries assessment and management issues.

## Polices Which Direct Management of Steelhead in California:

There are management plans, policies, and legislative acts which state goals and objectives for DFG. The following is a review of the more important plans, policies, and legislative acts which direct the Department's steelhead management activities.

Fish and Wildlife Plan- This plan provides some philosophical bases for conserving, restoring, and enhancing fish and wildlife resources. The plan pointed out that there will be pressure to react to issues which generate sudden and intense public concern. The plan stated that DFG would be in much better position to deal with these shifts of public attitudes and surprises of daily affairs if we have previously developed a set of "deeply rooted convictions".

The plan recognized the following concepts:

1. Long range planning incorporates all fields in which the state is involved: food, health, population growth, housing, industry, and others including fish and wildlife.
2. The plan should take its place in the development of the State as a whole, as a compatible part of broad spectrum of human existence. It should also be a guide for government, business, industry, and private individuals whose actions affect fish and wildlife.
3. The human need for fish and wildlife is an accepted part of the entire scope of life and progress in California.

The plan stated several goals that managers are to use to guide their actions. Some of the goals affecting steelhead are as follows:

1. Provide for diversified recreational use of fish and wildlife.
2. Maintain and enhance the fish and wildlife of the State and the habitat upon which they depend.
3. Achieve and encourage the optimum beneficial uses of fish and wildlife resources recognizing recreational, commercial, scientific, and economic issues.
4. Recognize that fish and wildlife have great value, some of which cannot be measured in economic terms.

Steelhead Trout Policy- This policy was adopted by the California Fish and Game Commission (the regulation making body). Some of the more important items of this policy are as follows:

1. "The steelhead rainbow trout is recognized as a valuable resource with strict environmental requirements and a limited range".
2. "The greatest fishery value of this resource is its potential to provide recreational angling for sea-run fish. Management shall be directed toward providing such angling and maintaining a vigorous healthy resource. Angling for juvenile steelhead will be restricted to the extent necessary to insure optimum spawning stock and angling opportunity for sea-run fish".
3. "California's steelhead resources are largely dependent upon the quality and quantity of habitat. Because of damage and threats to this restricted habitat, emphasis shall be placed on management programs to inventory and protect and, wherever possible, restore or improve the habitat of natural steelhead stocks".
4. "The Department shall seek prevention or alleviation of those aspects of projects, developments or activities which would or do exert adverse impact on steelhead habitat or steelhead populations. All available steps will be taken to prevent loss of habitat, and the Department shall oppose any development or project which will result in irreplaceable losses of fish.
5. "The Department shall develop and implement plans and programs to improve the protection of steelhead habitat including, but not limited to, assessment of habitat status and adverse impacts, land use planning, acquisition of interests in streams threatened with adverse developments, and research on effects on habitat changes caused by activities such as overgrazing, gravel extraction, logging, road construction, urbanization and water development.
6. "The Department shall develop and implement programs to measure and, where appropriate, increase steelhead population size and angler use and success, consistent with the objectives of providing quality angling and maintaining a healthy resource.
7. "Artificial propagation of steelhead, except for mitigation, shall be for the purpose of improving angling for sea-run fish, and should include strains or varieties of steelhead which have the greatest potential to contribute to recreational angling. Artificial production of rearing and stocking programs shall be managed so as to produce minimal interference with natural salmonid stocks, and such programs shall be periodically reviewed to assess their effects on these stocks.

Steelhead and Salmon Policy- This Fish and Game Commission policy specifies the following:

1. "To maintain an adequate breeding stock, suitable spawning areas, and provide for the natural rearing of the young to migratory size. Hatchery

production shall be limited to areas where it is necessary to supplement natural production in coastal streams.

2. "That resident fish will not be planted or developed in coastal steelhead and salmon streams, except after prior Commission approval..."

Water Policy- The Fish and Game Commission has a water policy which states that the quantity and quality of water of this state should be apportioned and maintained so as to produce and sustain maximum numbers of fish and wildlife. The Commission recognizes that the waters of the state are a limited resource subject to ever increasing demands; and that conservation and the efficient management of water resources are necessary to meet the competing needs of urban communities, industry, agriculture, recreation, and fish and wildlife.

This policy requires DFG to (1) review proposed water development; (2) recommend and seek the adoption of proposals necessary or appropriate for the protection of fish and wildlife and their habitat (The primary habitat objective is the maintenance of natural conditions in state waters...); (3) oppose the issuance of permits or licenses, or the authorization of appropriation of funds for water use projects which have not prevented or adequately compensated for damage to fish and wildlife resources; (4) prepare reports on water use or development in relation to their effect on fish and wildlife at the request of federal or state agencies whenever the same may required by law or otherwise be appropriate; (5) monitor and maintain surveillance over existing water use projects to prevent avoidable damage to aquatic habitat and to insure compliance with fish and wildlife protection or enhancement requirements; (6) take an active part in the planning of water development projects and take appropriate action designed to insure adequate water supplies to maintain and enhance fish and wildlife habitat; (7) assist, cooperate, and negotiate agreements with Federal, State, public, or private agencies or organizations, subject to the approval of the Commission...; (8) seek an allocation of water for fish and wildlife on an equitable basis with other uses, and protect fish and wildlife from the hazards created by such other uses; (9) periodically reassess permit and license terms and conditions...; and (10) advise the Commission at one of its regularly scheduled meetings of any project which may have significant adverse impacts on fish and wildlife, and the measures by which fish and wildlife will be protected from damage.

This policy requires DFG to support efforts to maintain or restore a high quality of water and inform the State Water Resources Control Board (the agency which issues permits for taking water from streams) and the various Regional Water Quality Control Boards (the regional agencies which enforce water quality standards) of water quality problems affecting fish and wildlife.

The Trout and Steelhead Conservation and Management Act- This act was passed by the California Legislature in 1979. Some policies initiated by this act are as follows:

1. To establish and maintain wild stocks in suitable waters of the State, and to establish regulations designed to maintain a wild trout fishery in such water by natural reproduction.

2. The Act declares it is the intent of the Legislature for the Department to (1) conduct a biological and physical inventory of all California resident trout and steelhead streams to determine the most suitable angling regulation for each stream, and (2) make recommendations for each stream regarding whether it should be a wild trout stream.

3. The Act directed DFG to (1) establish an ongoing program to determine the viability of various forms of catch-and-release regulations for resident trout and steelhead streams, and (2) annually submit to the Fish and Game Commission a list of no less than 25 miles of stream or stream segments and at least one lake for consideration as catch-and-release trout fisheries.

Salmon, Steelhead Trout, and Anadromous Fisheries Program Act- This Act was passed by the State Legislature and signed by the governor in 1988. The major findings and declarations in the act are as follows:

**1 Legislative findings:** (1) natural production of steelhead has declined to 150,000; (2) naturally spawning salmon and steelhead resources have declined primarily as a result of lost stream habitat; (3) much of the resource loss has occurred in the Central Valley; (4) protection of, and an increase in, the naturally spawning salmon and steelhead trout resources of the State would provide a valuable public resource to the residents of the State; (5) proper salmon and steelhead trout resource management requires maintaining adequate levels of natural, as compared to hatchery, spawning and rearing; (6) reliance upon hatchery production of salmon and steelhead in California is at or near the maximum percentage that it should occupy in the mix of natural and artificial hatchery production in the State; (7) the protection of, and increase in, the naturally spawning salmon and steelhead trout of the state must be accomplished through the improvement of stream habitat; (8) funds provided by the Legislature since 1978 to further the protection and increase of the fisheries of the State have been administered by the DFG in a successful program of contracts with local government and nonprofit agencies and private groups in ways that have attracted substantial citizen's effort; (9) DFG's contract program has demonstrated that California has a large and enthusiastic corps of citizens that are eager to further the restoration of the stream and fishery resources of this State and are also willing to provide significant amounts of time and labor to that purpose and (10) there is need for a comprehensive salmon, steelhead trout, and anadromous fisheries plan, program and State government organization to guide the State's efforts to protect and increase the naturally spawning salmon, steelhead, and anadromous fishery resources of the state.

**2. Legislative declarations:** (1) the State will develop a plan that strives to double salmon and steelhead populations by the end of the century, (2) the State is to recognize and encourage the participation of the public in privately and publicly funded mitigation, restoration, and enhancement programs, and (3) it is State policy that existing natural salmon and steelhead habitat shall not be diminished further without offsetting the impacts of the lost habitat.

The Act directs DFG to prepare and maintain a detailed and comprehensive program for the protection of anadromous fisheries with the advice of the Advisory Committee on Salmon and Steelhead Trout and the Commercial Salmon Trollers Advisory Committee (both are citizen's advisory committees whose members were selected by the governor of California). DFG is to consult with every public agency whose policies or decisions may affect the goal of the program to determine if these agencies can help DFG achieve the goals of this program. Specifically, the Act directs the new program to (1) survey and classify anadromous streams; (2) evaluate the effectiveness of the new program and; (3) make recommendations for structure, staffing, budgeting, changes in state statutes and regulations to accomplish the purposes of the new program.

Other acts have been passed by the Legislature which affect the management, restoration and enhancement of steelhead in California. These include the Fish and Wildlife Habitat Enhancement Act of 1984, the Keene-Nielsen Fisheries Restoration Act of 1985, and the California Wildlife, Coastal, and Parkland Conservation Act of 1988.

#### Angling Regulations:

Angling regulations are an important tool used to manage and protect steelhead populations in California. Such regulations also serve to distribute the catch more fairly among anglers. Angling regulation changes are proposed to the Fish and Game Commission by individual anglers or organizations. Proposals are reviewed and evaluated by DFG, after which the Fish and Game Commission votes to accept or reject the proposed regulation change.

In general, there is a two-fish daily bag limit for steelhead throughout most of the state. Some streams, which have spring-run steelhead that are vulnerable to poaching or have very few winter steelhead, have a zero bag limit to protect existing populations. Klamath River tributaries, where spring run are known to occur, were not specifically cited in the regulations to avoid attracting attention of poachers to these streams. A zero fish limit is also in effect on Malibu Creek, Los Angeles County, which is the southern-most limit of this species' range.

In general, regulation of season is less restrictive in the northwest portion of the state where steelhead are the most numerous. Regulations become more restrictive south of San Francisco Bay where the season is only a few months long and fishing is limited to weekends, Wednesdays, and holidays.

There are also regulations which prohibit angling when flows are below established minimums. These regulations are intended to protect salmon and steelhead in coastal streams during a period when they would be most vulnerable to overharvest. Such regulations exist for the coastal streams in the three counties north of San Francisco and on the Carmel River in Monterey County.

A number of sportsmen became concerned that steelhead were being overharvested by drift-boat anglers. There is the perception among these sportsmen that drift-boat anglers are much more proficient than shore anglers. This led to the adoption of a regulation prohibiting fishing from drift boats on the Gualala River. In response to this concern, DFG recently conducted a study on the South Fork Eel River and the results have shown that drift-boat anglers did not catch a disproportionate share of steelhead ; the study showed that shore anglers and boat anglers were equally proficient. These results have been used to argue against recent proposals to prohibit drift-boat fishing on other coastal streams.

#### Environmental Review:

Presently, much of DFG's efforts are directed at protection of fish habitat. This is necessary because of our state's increasing human population and resultant pressure to develop water for agriculture, industrial, and domestic uses. Logging, road construction, gravel mining, and grazing also continue to adversely affect steelhead habitat. DFG has assigned personnel to the task of attempting to alleviate the adverse impacts of these activities. It is imperative that such effort be directed at protecting fish habitat; unfortunately, it must be done at the expense of steelhead management activities.

DFG reviews and comments on water development projects that have been constructed by the U. S. Army Corps of Engineers, U. S. Bureau of Reclamation, California Department of Water Resources, and various local agencies. DFG also reviews and comments on the relicensing of hydroelectric power projects by the Federal Energy Regulatory Agency and land-management plans proposed by the U. S. Forest Service.

There are several sections in the California State Fish and Game Code which are intended to protect fish habitat. Persons working in streams are required to notify DFG and provide a written description of their proposed streambed alteration (Section 1600-1607); DFG then provides recommendations stating the procedures to be followed which will prevent damage to fish habitat. Water diversions which adversely affect juvenile salmon and steelhead migrating downstream are required to be screened (Section 5980-6100). It is unlawful to deposit or allow to pass in to State waters any substance or material which may be deleterious to fish life (Section 5650). Permits are also required to use suction dredges in streams (Section 5650). Dams proposed on anadromous streams must have a fish passage facility (Section 6100). Existing dams must provide sufficient downstream releases to maintain existing fish populations (Section 5937).

## Steelhead Hatchery Overview

by  
Michael Bird  
California Department of Fish and Game

### PURPOSES:

Steelhead hatcheries in California are operated to produce fish:

1. To mitigate for habitat losses;
2. for the enhancement of local fisheries;
3. and for the reintroduction to restored habitats

### GOALS:

Goals were established at each mitigation hatchery to replace fish habitat that has been lost upstream as a result of a barrier (usually a dam).

These production goals are closely monitored by the California Department of Fish and Game. Each of these hatcheries that produce or rear steelhead trout must conform to the formal production goals and constraints placed on hatchery operation.

The goals and constraints for each hatchery are reviewed by appropriate Department of Fish and Game fishery professionals and approved by the Chief of the Department's Inland Fisheries Division.

### PRESENT SYSTEM:

There are 7 state steelhead hatcheries and 1 federal, and usually 3 or 4 cooperative steelhead hatcheries that operate in any given year. The cooperative steelhead hatcheries are small programs, that rear fish on designated streams that are tied into habitat restoration efforts to jump start a fishery ... so to speak. The fish are either trapped by the Contractor or provided by the Department of Fish and Game after the Department's needs have been met.

Only Mad River Hatchery and the cooperative hatcheries are operated for enhancement or restoration from funds derived from non-mitigation sources.

**Costs for operation of hatcheries:**

**Iron Gate Hatchery is funded by Pacific Power and Light and the Department of Fish and Game (80% PP&L, 20% DFG)**

**Feather River Hatchery is reimbursed by the Department of Water Resources**

**Mad River Hatchery is funded entirely by the Department of Fish and Game**

**Mokelumne River Fish Installation is supported by the East Bay Municipal Utilities District**

**Nimbus Fish Hatchery is funded by the United States Bureau of Reclamation**

**Trinity River Hatchery is funded by the United States Bureau of Reclamation**

**Warm Springs Hatchery is supported by the United States Army Corps of Engineers**

**Coleman National Fish Hatchery is funded and operated by the United States Fish and Wildlife Service**

**The cooperative pond rearing programs are either funded through contracts with the California Department of Fish and Game or through volunteer efforts. Funding for these cooperative rearing projects come from legislative mandated monies, such as Proposition 99 (a Cigarette and tobacco products Surtax Fund).**

**DESCRIPTION OF HATCHERY PRODUCTION:**

**The Department of Fish and Game has established a relationship between survival and size of fish at release and timing of release. As a result, the State of California's steelhead trout policy for release of steelhead trout from state hatcheries and cooperative ponding programs is 10/lb. or larger at time of release. Time periods for releases are between March 15 and May 1 except with approval of the Inland Fisheries Division Chief.**

**Occasionally, the Department releases fingerlings when eggs are taken in excess of those needed to meet mitigation goals.**

2. Ensure that existing natural salmon and steelhead trout habitat will not be diminished further without offsetting the impacts of the lost habitat.
3. Encourage public involvement

As part of this statewide program two important new positions have been approved. One is a statewide steelhead specialist and the second is a basin planner. Typical duties include:

1. Steelhead Specialist

- A. Develop a statewide steelhead trout management plan.
- B. Inventory native steelhead streams and determine distribution, abundance, and condition of habitat.
- C. Monitor and evaluate habitat rehabilitation projects and benefits that will accrue to steelhead.

2. Basin planner:

- A. Write comprehensive basin habitat restoration plans for targeted basins.
- B. Survey all streams in target basin. This will include stream classification and habitat typing.
- C. Cooperate and assist federal, state and private organizations to develop and implement fish habitat projects.

The Department of Fish and Game is in the process of finalizing a "California Salmonid Stream Habitat Restoration Manual". This manual describes the Department's ground level approach to cooperative restoration of fishery resources and standardizes the descriptive methods and terminology. It will be used to guide all of our stream restoration efforts.

For management purposes California anadromous streams are separated into two major geographical areas: the Central Valley, which includes the Sacramento and San Joaquin River systems; and the coastal rivers and tributaries. The problems and restoration solutions are really quite different for each.

#### Central Valley

Almost all Central Valley steelhead return to the Sacramento River system. The average yearly run of steelhead into this system is about 35,000 fish, most of which are hatchery produced.

The construction and operation of the California State Water Project and the Federal Central Valley Project has resulted in significant adverse impacts to salmon and steelhead populations of the Central Valley. Anadromous fish hatcheries at the base

## **CONCLUSIONS:**

If the Department of Fish and Game is to succeed in its goal to double the number of salmon and steelhead by the year 2000 several needs will have to be met. These include:

1. Support, staff and funds to complete fish habitat restoration plans for all of California's major watersheds.
2. Development of a consensus with all the various watershed user groups to implement fish habitat restoration and enhancement efforts.
3. Development of a long-term, stable, and broad based funding source for this program.

If the California Department of Fish and Game's program is successful and receives the support that it needs, our efforts should translate into more fish for commercial and sport harvest, and the continued existence of wild salmonids in California streams and rivers. Passage of the Salmon, Steelhead Trout and Anadromous Fisheries Program Act is a clear message from our elected officials that they recognize the enormity of the problem and the need to take corrective action.

## Data Needs and Management

by

Bob Reavis

California Department of Fish and Game

A state-wide steelhead management program must examine overall research needs. Research goals should be based on deeply rooted principals and not on knee-jerk responses to the most recent issues, which may generate intense but short-lived concern. Habitat protection must be one of the primary goals of California's anadromous fishery management program because resources are constantly threatened, and the Department must be mindful of this fact when it assesses data needs. Land-use activities such as road construction, gravel mining, urbanization, and logging will continue; therefore, the Department will need reliable data to persuade the various agencies that control these activities of the needs of the state's fishery resources. There will also be more proposals to appropriate water that is now used by fish, and the Department should have data which can convince the State Water Resources Control Board of the need for adequate flows for fish.

In response to past damage to fish habitat, California has made a major commitment to habitat restoration. It will be a major challenge to make the restoration efforts as effective as possible. The chances of success are greatly increased if there is information available that will allow managers to determine which proposed restoration projects have the greatest potential. If there is little data available on which to base such determinations, the chances of failure will increase, as will the likelihood that there will be public rejection of the program in the future.

Completed restoration projects need to be evaluated. Anadromous fish populations can fluctuate ten fold over a five-year period in a system where there have been no changes in the stream habitat; this fact greatly complicates evaluation of restoration projects. Because there is a need for accountability for the use of public funds, there is pressure to obtain quick answers to respond to concerns about the effectiveness of the restoration work. Data on long-term population trends should show the general results of restoration efforts in a watershed.

The Department is committed to a state-wide inventory of anadromous fish habitat. This will provide us with information that will show where restoration work is most needed. Annual population surveys are also planned, and over time these data can be used to evaluate restoration work and to address other management issues. In California, considerable effort has been directed at improving nursery and spawning habitat and fish passage (barrier removal for upstream passage and installation of screens for downstream passage). Still, our management goal is to take a broad-based approach and look for other factors, perhaps unknown at this time, which may not be obvious but may be depressing populations more than the factors of which we are presently aware. The use of counting weirs which provide long-term population monitoring should be considered.

Because of the great need to respond to degradation of fish habitat and to gather salmon data needed by the Pacific Fisheries Management Council, more personnel must be directed toward these urgent concerns, which means that fewer personnel can be directed toward management issues. Steelhead population assessment has, therefore, been given a lower priority. Development of funding for this research will be a major problem in California: revenues from fishing license sales are declining and the State may be \$14 billion in debt during the 1991-92 fiscal year.



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**IDAHO**



# An Overview of Steelhead Status and Management in Idaho

by  
Idaho Department of Fish and Game

## Introduction

Idaho's tributaries of the Snake River produce approximately 55 percent of the Columbia Basin's summer steelhead. Adult summer steelhead are behaviorally adapted to long distance riverine migration (450-1,000 miles) to spawning and juvenile rearing streams in Idaho. Summer-fall migration is interrupted by overwintering in the main stem Columbia and Snake rivers as well as major tributaries such as the Clearwater River, Salmon River, and Grande Ronde River, Oregon. With spring runoff, summer steelhead proceed to the headwater tributaries for spawning April through June.

The juvenile rearing cycle includes two to three-year tributary stream rearing for wild fish and one-year rearing for hatchery fish. Smolts leave Idaho with spring run-off from mountain snow melt from late April through June. During ocean rearing, Idaho stocks range broadly and are harvested by ocean and coastal fisheries primarily north of the Columbia River. On their return they provide major components of Columbia River sport and tribal commercial and subsistence fisheries.

Summer steelhead are very important to people of Idaho. Snake River salmon stocks have declined to critical levels. Idaho sport fisheries for salmon are restricted to a very limited directed fisheries on hatchery stocks. Wild steelhead numbers are also low and apparently in decline. Wild steelhead are protected from harvest in Idaho; traditional major tributary fisheries are prohibited. While these important traditional fisheries have been lost, hatchery produced steelhead abundance has grown to levels supporting substantial fishing opportunity. Record run sizes and fisheries for hatchery fish occurred in 1985-86 and 1989-90 fish-run years. The average Idaho sport fishery during 1985-89 involved approximately 30,000 anglers, 196,300 angler days of effort, 80,900 steelhead caught, and 36,300 hatchery steelhead harvested. Anglers expend an average of 58 percent of their effort and catch 55 percent of the steelhead during the fall season, October through December.

The character of our steelhead resource is extremely variable. Naturally produced stocks are at a depressed level while hatchery stocks range annually between record high and low numbers. Annual fishery opportunity and effort fluctuates widely with hatchery run size.

## Stock Status

Idaho's summer steelhead are broadly grouped into two categories for Columbia River regional management. Group A adults migrate up the Columbia passing Bonneville Dam generally between July 1 and August 25. The majority of the fish are one-ocean reared and destined for streams throughout the Columbia Basin above Bonneville. In Idaho A-steelhead originate in the Snake River, Salmon River, and small tributaries of the lower Clearwater River.

Group B steelhead migrate past Bonneville primarily after August 25 and before November 1. These steelhead are large, two-ocean rearing fish destined for Idaho's Clearwater and Salmon rivers tributaries. The size at age difference between A and B steelhead is great enough that a stock separation technique based on length is being explored to improve Columbia River harvest management procedures.

Historical production of steelhead in Idaho came from a Snake River basin range involving 16,000 miles of stream. In the early 1960's over 100,000 wild steelhead returned to the Snake River. Approximately 65,000 of these fish were destined for the Salmon and Clearwater rivers.

Major habitat alterations began in the late 1950's and 1960's with development of the main stem Snake and Columbia river's hydroelectric generation system. The Idaho Power Company Hells Canyon Project blocked adult migration and created a reservoir environment unnavigable by migrating smolts. Production area was reduced to 6,400 miles by this project. The A-group mid-Snake River steelhead production area was severely impacted. As mitigation, a series of hatcheries were developed to perpetuate mid-Snake steelhead returns to the Hells Canyon region and relocate these runs to the Salmon River system.

Following the Idaho Power project, the federal Lower Snake River four-dam hydroelectric generation system was completed to complement the four main stem Columbia dams below the mouth of the Snake River. Juvenile and adult migration survival rates declined precipitously. A series of mitigation hatcheries were constructed to increase production to compensate for the increased mortality rate and to maintain fishable steelhead populations in Idaho.

Finally, Dworshak Dam was constructed on the North Fork Clearwater River, blocking that river to B-run steelhead. Mitigation was to be provided by the Dworshak National Fish Hatchery. Endemic North Fork B's were trapped as brood stock to produce annual returns of adults to the North Fork and other tributaries of the Clearwater.

Steelhead response to these environmental impacts was immediate declines of wild fish. In 1974-75 only 3,000 wild steelhead returned to Idaho spawning tributaries. The total adult run size at Ice Harbor Dam was only 12,200 steelhead. A combination of commercial and sport fishery closures and restrictive harvest regulations, hydroelectric system turbine screening and bypass provisions for smolts, truck and barge smolt transport operations, and a wet hydrologic cycle proved favorable.

Hatchery production began to play a major role in production. Hatchery and wild fish populations increased (Figure 1).

Following the mid-1980's factors occurred which began influencing Snake River steelhead abundance. Snake River hydrologic conditions entered a prolonged drought cycle, and coupled with increasing hydroelectric generation demand in the region, Snake River discharge was vastly reduced. Smolt migration mortality elevated at the hydroelectric projects and major adult losses occurred during Snake River immigration. At the same time, commercial gill net fisheries by Tribal fishermen increased replacing the non-Tribal Lower Columbia River commercial fishing which had been curtailed since 1975.

Overall, stock productivity declined. Wild fish escapement declined precipitously (Figure 2). Hatchery steelhead run sizes fell to very low numbers some years followed by record numbers in others, depending largely on migration flow conditions. Ratios of wild fish to hatchery fish widened, increasing mixed stock commercial fisheries implications and probabilities for overharvesting wild stocks. Genetic concerns have elevated due to the imbalance.

Currently, naturally produced steelhead are well below the interim guidelines of the Columbia River Management Plan (CRMP) which calls for 20,000 wild A-run and 10,000 wild B-run fish. Rebuilding progress is questionable and the successive A-run abundance decline is alarming. Juvenile abundance indicators range between 9-90 percent of the estimated carrying capacity of available stream habitat. Most are well below 50 percent. Production from the low 1990 spawning escapement will not be parr until 1991-1992.

### Management and Research

The Department's management program since the decline of the mid-1970's has focused on maintaining and recovering wild populations to harvestable levels and achieving adult returns of hatchery fish expected of each mitigation program. Actual accomplishment of these goals has been hampered by poor fish survival and failure of wild fish to rebuild to optimum levels. Much of our recent effort is directed at identifying and resolving the major survival limitations related to harvest and production.

#### Harvest:

Idaho fisheries are for sport and tribal ceremonial and subsistence anglers. Sport harvest and most tribal fishing is for hatchery fish. Low wild fish abundance precludes sport harvest of those fish. All hatchery steelhead produced in Idaho are identified by excision of the adipose fin of juveniles prior to release. Catch-and-release regulations are in effect statewide for non-adipose clipped wild fish. Anglers may fish only with barbless hooks in wild fish migration corridors. Trap and haul of hatchery surplus adults for fisheries in

urban areas near Boise, beyond the current spawning range for steelhead, are not regulated with barbless hook requirements. Fall fishing is a major activity in the lower main stem areas of the Snake, Clearwater, and Salmon rivers. Spring fishing shifts to the various hatchery and upstream tributary terminal locations. Wild fish tributaries are closed at all times.

Release of hatchery stocks are managed to distribute fall arriving, overwintering and spring terminal concentrations of fish so that all local fisheries have opportunities for harvest, and so that anglers can spread to as much area as possible. Releases are made directly from hatchery weirs and outplanted considerable distances away from hatcheries. Harvest rates of 60 to 80 percent of the various hatchery releases are achieved.

Fisheries are monitored by field personnel for in-season fishery monitoring, coded wire tag detection and collection, and law enforcement. Statewide telephone surveys of both fall season and spring season anglers are conducted after each season to estimate harvest and effort by fishing area. A permit (punch card) is required of anglers as an enforcement aid and to remind anglers of when and where they caught steelhead.

#### Columbia River Fisheries:

Snake River steelhead contribute to Columbia River sport and commercial fisheries. Of concern to Idaho is the take of wild fish. Sport fisheries are regulated by adipose clip harvest regulations. Non-tribal commercial harvest of steelhead by gill nets is not permitted. However, some incidental impact occurs during the commercial seasons (August through October) for fall chinook and coho salmon. Movement of summer steelhead, particularly B-group fish up the Columbia coincides with these two species. Area, time and mesh size regulations minimize steelhead catch.

Tribal commercial gill net fisheries target on steelhead as well as fall chinook in traditional fishing areas above Bonneville Dam. The CRMP allows harvest rates of up to 15 percent of the wild A-group and 32 percent of the wild B-group crossing Bonneville Dam regardless of run size. Thus harvest rates of these magnitudes are allowable under the CRMP even on severely underescaped runs. Hatchery steelhead are harvested under 50:50 sharing principles but wild steelhead impacts usually constrain harvest rates of hatchery steelhead in the fall fishery. Other tribal fisheries (commercial and subsistence) occur in the winter and in terminal areas.

#### Ocean Fisheries:

Snake River summer steelhead also contribute to various ocean fisheries. Coded wire tagged (CWT) hatchery steelhead have been encountered in many coastal and ocean commercial and sport fisheries (Table 1). Quantification of this data has not been attempted. It is likely that steelhead detection in salmon fisheries is limited by inconsistent marking and recovery programs. Pacific Salmon Treaty discussions have noted these likelihoods, and further pointed out that steelhead are often included as

salmon with catches of small salmon species. In addition, inconsistent CWT release group sizes and frequency likely hamper ocean fishery evaluation.

#### High Seas Drift Gill-Net Fisheries:

Expansion of high seas driftnet fisheries in the North Pacific has raised the concerns of Idaho along with the rest of the Pacific Northwest. Early indications were that Idaho steelhead were distributed in the fishing zones targeted by the flying squid fishery and likely comprised a portion of the salmon and steelhead taken. While quantifications of harvest are unavailable, the State of Idaho joined with others to oppose this activity and ask for moratorium on all high seas drift net fishing.

Our primary concerns are the indiscriminate take of critical wild steelhead stocks and lack of reported quantification of take of all fish and other animals necessary for effective management and conservation of these species. Responsible management requires that we understand the role this fishery plays in Snake River steelhead productivity. Idaho remains concerned about this activity and supportive of all efforts to monitor and regulate this fishery to prevent adverse effects.

#### Production:

Steelhead production is driven by optimizing hatchery production for angler harvest and rebuilding natural production to optimum levels of escapement. Natural production includes populations with history of hatchery outplanting (supplementation) which recruit by natural production (natural stocks) and endemic populations which have no history of hatchery supplementation or a limited amount unlikely to have genetic implications and which recruit by natural production (wild stocks).

Hatchery stock production dominates our program and provides for angler expectations and fishing. Spawning escapement goals largely have been met, but harvest goals often have been held below expectations to ensure that hatchery needs were met.

Low productivity of wild fish has not resulted in expected rebuilding. Juvenile seeding levels are well below optimum for the potential of rearing habitat. Adult numbers passing Lower Granite Dam are declining.

Supplementation of natural stocks with hatchery fish has not yielded results and rebuilding. Extensive outplanting with fry, smolts, and adults in the South Fork Clearwater River between 1961 and 1989 has resulted in little improvement in natural production. Poor contribution of supplemented populations is most likely caused by the same low smolt-to-adult survival that affects wild fish. Given that survival bottleneck, rebuilding through supplementation or other production mechanisms is doubtful.

Fisheries geneticists, managers and user groups have elevated concerns for anadromous fish genetics and the potential for management practices to degrade long-term stock productivity by changing inheritable traits. Continued imbalance of low wild and natural stock abundance and high hatchery stock returns, fish outplanting and supplementation activities, and the complexity of juvenile transport operations work sympatrically against genetic management.

Idaho's program direction is expected to become more conservative in response to genetic issues. Snake River steelhead and salmon survival is expected to be poor over the next few years due to current Snake River Basin drought conditions. We expect little improvement in wild and natural stock productivity and continued variation in brood year production of hatchery stocks. Our program will focus more intently on management of stock components as isolated and interbreeding units. Hatchery stocks will be managed to provide optimal harvest benefits and to maintain or improve inherent stock viability and long-term productivity. Wild stock management will continue to maintain genetic isolation and preserve the genetic uniqueness of those populations. Natural stock supplementation will become more conservative. Donor populations at levels sufficiently high to provide gametes without jeopardizing their status are scarce. Incorporation of these into hatchery production for supplementation will be implemented with research oversight. Conservation hatchery strategies and guidelines will be developed and assessed.

#### Public Perception and Satisfaction:

Sustained low wild and natural stock abundance and variable hatchery stock abundance has created a difficult public satisfaction climate. Expectations for wild and natural stock rebuilding and resumed fishing in major tributary systems were optimistic following 1977. Mitigation programs and hatchery construction raised expectations for abundant fish runs. Implementation of main stem hydroelectric system turbine screening and bypass, and barge transportation further elevated expectations. Idaho sport and tribal fishermen are becoming very impatient with continued restrictions on wild and natural steelhead fishing. Annual boom and bust harvest seasons and bag limit regulations for hatchery runs are frustrating. The overall result is low user satisfaction. Perceptions of management ineptness follow at least by some.

Altering these problems is largely a matter of informing the public. Public explanation and information are difficult to disseminate because of limited public communication resources. Specific stock information, particularly needed to clearly explain the steelhead problem pertaining to wild stock migration behavior and abundance, is largely lacking.

#### Management/Research:

Idaho's research program for steelhead is management oriented to support critical juvenile migration decisions, evaluate and monitor stock status, and develop supplementation strategies. Research is supported by mitigation funding contracts

directed at evaluating and crediting contributions of mitigation actions. Research effort, therefore, focuses primarily on harvest and spawning escapement returns and smolt production numbers. Pure research is limited by lack of funds.

Available funding is further hampered by the low priority of steelhead relative to salmon. Funding for the fish and wildlife programs of the Northwest Power Planning Council authorized by the Northwest Power Act is a major funding source for Columbia Basin anadromous fish. Funds are competitive and support programs of 18 Indian tribes, four states and three federal agencies. Funds are distributed to projects based on numerous criteria. Steelhead are not a priority species for funding support. Similar priority is assessed for Pacific Salmon Treaty funding.

### Juvenile Migration

- |                |  |   |
|----------------|--|---|
| - Ed Buettner  | Monitoring arrival and travel time through Lower Granite Pool      | PIT, CWT, Water Budget<br>Scoop/Dipp Map    |
| - Russ Kieffer | Migration behavior, travel time and survival of natural production | PIT, Snorkeling<br>Juvenile weir operations |

### Stock Status

- |                                |   |  |
|--------------------------------|---|--|
| - Russ Kieffer                 | Parr/smolt survival and abundance and spawner-smolt relationships | PIT, snorkel transects, weir operation   |
| - Dick Scully/<br>C. Petrosky  | Parr abundance/habitat relationships and trends                   | Snorkel transects  |
| - Peter Hassemer/<br>Kent Ball | Steelhead stock separation by fork length measurements            | Harvest management<br>Escapement measure   |
| - Kent Ball/<br>Dave Cannamela | Mitigation hatchery production contribution/management            | Harvest monitoring<br>Broodyear survival, release group survival, Lower Snake River Compensation Plan, Idaho Power Company |

## Hatchery Program

The Idaho hatchery program for steelhead began in 1956 as a mitigation action for loss of major production areas and elevated juvenile and adult mitigation mortality accompanying hydroelectric dam construction and operation. Since 1980 smolt releases have increased from 4.8 to 8.1 million (Figure 3).

Three mitigation programs fund the hatchery steelhead programs in Idaho: Idaho Power Company mitigation for fish losses caused by the Hells Canyon Dam projects which effectively denied access to approximately one-third of Idaho spawning grounds and smolt rearing area; U.S. Army Corps of Engineers mitigation for the construction of Dworshak Dam which denied access of fish to the North Fork of the Clearwater River; and the Lower Snake dams mitigation known as the Lower Snake River Compensation Plan, which is to mitigate fish losses caused by the four Lower Snake River federal dams and navigation locks.

### Facilities and Status:

Idaho has six existing steelhead hatcheries and one under construction. Idaho Power Company owns and funds Oxbow, Pahsimeroi, and Niagara Springs hatcheries with mitigation goals of returning 200,000 pounds of steelhead smolts to the Snake River at Hells Canyon, and 200,000 pounds of steelhead smolts to the Upper Salmon River. Oxbow Hatchery, operating since 1961, and Pahsimeroi Hatchery, operating since 1969, are utilized for adult trapping and spawning. They have the pond capacity to hold 7,000 adult steelhead and egg incubation capacity of 8,500,000 eyed eggs. Niagara Springs Hatchery is a one-year smolt rearing facility capable of rearing 1,900,000 smolts or 400,000 pounds to approximately 4.5 fish per pound and was put into operation in 1966.

The U.S. Army Corps of Engineers built and funds Dworshak National Fish Hatchery which began operation in 1969. This facility has the adult holding capacity of 3,000 adult steelhead, incubation capacity of 10,000,000, and the rearing capacity of 2,300,000 steelhead smolts at 5 to 6 fish per pound. The project goal is to produce enough smolts to return 20,000 adults to the Clearwater River.

The Lower Snake Compensation Plan has contract funding through the U.S. Fish and Wildlife Service and provides mitigation through Sawtooth, Magic Valley and Hagerman National fish hatcheries. Clearwater Fish Hatchery is under construction and should be on line in the spring of 1992. Sawtooth Hatchery began operation in 1985 and is used along with Sawtooth's satellite to trap and spawn steelhead adults and has the adult holding capacity of 3,500 adults and incubation capacity of 5,000,000 eyed eggs. It is used to supply the eggs to both Hagerman National Hatchery and Magic Valley Hatchery. Hagerman began operation in 1984 and utilizes a one-year rearing cycle to produce up to 340,000 pounds of smolts or approximately 1,749,000 smolts at 4 to 5 fish per pound. The mitigation goal is to return 13,400 adult steelhead to the Snake River basin. Magic Valley Hatchery began operation in 1987 and is designed to rear 349,800 pounds of smolts or approximately 2,100,000

smolts at 4 to 5 fish per pound in a one-year rearing cycle. The project goal is to return 11,600 adult steelhead back to the Snake River basin above Lower Granite Dam. Clearwater Hatchery is being constructed with the rearing capacity of approximately 1,750,000 steelhead smolts at 5 fish per pound or 350,000 pounds of smolts. The goal for Clearwater Hatchery is to return 14,000 adult steelhead to the Snake River basin.

A total of 8.1 million smolts were released by these programs in 1990 (Table 2). The various mitigation production goals were met.

Survival of smolts varies considerably by year and hatchery. In general, smolt to adult survival including Idaho harvest ranges between 0.8 and 2.5 percent.

#### Hatchery Management Issues:

Hatchery-related diseases present a formidable challenge. Viral infections, most notably Infectious Hematopoietic Necrosis (IHN), have caused catastrophic mortality in young steelhead at some of the hatcheries in Idaho. In turn, management brood selection and release strategies have been constrained to prevent outbreaks of disease in hatcheries and spread of disease to other hatcheries and drainages producing steelhead. Intensive culling of potential carrier stock has potentially reduced the severity of disease outbreaks but requires more brood fish. Work on procuring disease-free water sources for existing and new stations promises additional protection.

Management of hatcheries has focused on providing large numbers of smolts to enable sufficient adult returns to perpetuate hatchery production, provide harvest opportunity, and produce fish for supplementation. Idaho hatchery operations have successfully provided for perpetuation and harvest. While doing so, some inadvertent but major stock changes occurred. At Pahsimeroi Hatchery, for example, run timing and spawning dates were shifted. From 1969 through 1973, 17 percent of the steelhead run was trapped by March 31 and one-half of the fish spawned after May 1. In 1989 and 1990, 67 percent of the steelhead were trapped by March 31 and no fish spawned after May 1. This phenomenon is attributed to keeping early arriving adult eggs to meet production goals, and by the non-intentional selection process of poor feed quality resulting in small smolt size from later eggs, and poor survival of those smolts. Achieving full production at the facility was met but at the expense of losing one month of harvest opportunity since these fish now leave the fishing area one month earlier.

This behavioral change selected against late spawning fish used for natural run establishment or supplementation of existing natural populations.

We are currently involved in reassessing the objectives of our hatcheries. Some will be managed as traditional production for harvest stations. Brood stock will be managed for isolated populations breeding within themselves for specific traits. Primarily these traits will be measures of maintained stock productivity and maximized

returns to target fisheries (timing distribution and catchability). Uncertainties exist as to how to maintain stock productivity over the long term. At present, most facilities utilize one male spawned with one female. Brood stock is drawn from the entire run across time.

Other hatcheries will be managed specifically to provide the best supplementation product. Natural brood will be mined from existing populations in tributaries. Their progeny will be handled as near naturally as possible to minimize domestic influence. Rearing will be as short as possible and at low density. Measures of success will be external to the hatchery - how well do they return to spawning streams, produce progeny, and those progeny return. Many questions exist relative to the concept of a "conservation hatchery".

### Habitat and Natural Production

Idaho's habitat protection and improvement program involves a broad spectrum of land and water management entities. The majority of the watershed system of the Salmon, Clearwater, and Snake river subbasins that produce Idaho steelhead is administered by the federal government (72 percent US Forest Service, 10 percent US Bureau of Land Management). The remainder is private (16 percent), tribal (1 percent Nez Perce Tribe), or state administered (3 percent). A variety of land and water management regulations and programs exist which can affect the quality of steelhead production. Approximately 6,400 miles of streams currently are available for natural production of steelhead. Much of this habitat is excellent or good quality (29 and 28 percent, respectively). Some is fair (29 percent) and 14 percent is categorized as poor. Much of the fair and poor habitat is not degraded, but by its nature not suited for steelhead production.

Degraded habitat exists as a result of various land and water uses. Mining, logging, irrigated agriculture, and livestock operations are all historic and prominent activities. Improving riparian habitat for anadromous fish has been an activity of historic and current fish, land, and water managers.

In years following the 1974-75 steelhead declines, specific instream habitat improvement, and migration barrier alteration projects were implemented as authorized by the Northwest Power Act (1980) and the NWPPC's Fish and Wildlife Program. The Department initiated a program in 1984 to monitor juvenile production and mitigation benefits to the Bonneville Power Administration resulting from these funded projects. The program assesses yearling and older parr abundance by snorkeling standard transects. Physical and chemical habitat features are measured and likewise tracked. From this monitoring, an understanding of relationships of juvenile production, habitat capacity and spawning escapement is evolving.

### Habitat-Production:

Potential production of parr and smolt steelhead for all steelhead streams has been classified according to habitat quality (Table 3). If all habitat was fully seeded to its potential, approximately 4.5 million smolts could be produced each year under current habitat conditions. Habitat improvement would increase potential only by 10 percent.

At the present time, steelhead production streams are underseeded. In 1985-89 wild A-run steelhead parr averaged 70-80 percent of the habitat capacity, wild B-run averaged 10 percent, natural (hatchery supplemented history) A-run 10-80 percent, and natural B-run 10-40 percent. A-run steelhead habitat comprises approximately 48 percent of the parr/smolt production potential (including Oregon and Washington tributaries) yet received 70 percent of the adult spawning during this period. The 1990 decline in A-run escapement should result in reduced parr abundance.

Underseeding is principally a function of low wild adult spawning escapement. Information from Idaho parr monitoring, Washington Department of Wildlife research and parr monitoring in Oregon Department of Fish and Wildlife redd count index streams support the parr and adult spawner relationship, particularly at the lower seeding levels in Idaho.

### Main Stem Habitat-Survival:

Low adult returns are related to elevated mortality of Idaho-produced steelhead primarily since construction of the main stem Snake and Columbia rivers hydroelectric projects. Survival of smolts to returning adults declined precipitously from 1964 to 1974, but then began improving. Improvement is attributed to a series of wet years which provided ample runoff and velocities through the pool behind Lower Granite Dam and to initiation and development of a juvenile collection and transportation program at Lower Granite and Little Goose dams. Although transportation has benefitted steelhead smolt survival (Figure 4), good flow conditions are necessary to get smolts through the first project reservoir to transport facilities and optimize survival (Figure 5).

Survival of adults during their upstream Columbia River migration is also influenced by hydroelectric system operations and discharge of the Snake River. Flows less than 35,000 cfs in the Snake River during September result in poor survival of B-run adults leaving the Columbia River. minimum daily average flow of 35,000 cfs and a minimum instantaneous flow of 30,000 cfs is necessary for optimum survival.

### Management-Research Needs

Priorities for the Department's habitat program are to obtain suitable main stem velocity conditions of migration habitat for juvenile and adult steelhead and maintain and improve transportation operations for juveniles to reduce and stabilize survival. Reduced mortality is a prerequisite for success of habitat restoration activities in Idaho

spawning and rearing streams. Seeding levels of all habitats, regardless of quality, are low for most populations. Improving spawning and rearing habitat quality or quantity is unlikely to increase juvenile production as long as survival remains bottlenecked during migration and returns of wild adults remain low. Some exceptions exist, such as the South Fork Salmon River. This river system is degraded by fine sediment from historic logging and road building. Fine sediment limits egg-smolt survival. Improving habitat quality would likely result in some increased production from existing adult returns.

In terms of habitat enhancement activity, our management priority of attention and potential for benefits is:

- 1) Improving and stabilizing juvenile and adult migration habitat conditions (water volumes/velocity) and subsequent survival;
- 2) Supporting implementation and enforcement of existing state and federal water quality standards and regulations;
- 3) Completing irrigation water withdrawal screening projects and securing perpetual minimum instream flows for migration and rearing; and
- 4) Restoring critical habitat that limits early life history survival (egg-parr) of existing wild populations.

Research and monitoring activities underway or needed are directed toward improving management in Idaho and affecting management decisions beyond Idaho that influence returns of steelhead to our state:

- 1) Monitoring of adult spawning stock in tributaries and juvenile production. This information is needed to strengthen the parr-adult relationship and adult-smolt early life history understanding and refine escapement objectives;
- 2) Evaluation of habitat quality influence on egg-smolt survival and carrying capacity. This is needed to support land and water management decisions and harvest management processes relative to spawning escapement needs;
- 3) Understanding of population age and size composition useful for stock identification. This information is needed to tune steelhead management to a stock basis rather than run basis;
- 4) Monitoring genetic criteria needed to guide decisions relative to wild fish policy and management; and
- 5) Evaluation of supplementation effectiveness. Needed to assess whether supplementation of natural populations with fish reared for same period

in a hatchery can be used to rebuild natural populations. A myriad of brood stock, hatchery rearing practices, outplanting strategies, and genetics questions exist.

Table 1. Fisheries occurrences of Idaho summer steelhead in fisheries beyond the Snake River system as indicated by coded wire tag recoveries.	
Fishery	Type
Southeast Alaska	Coast Net/Seine Coast Sport
British Columbia	North Coast Net Johnstone St. Troll Johnstone St. Net Southwest Troll
Washington	St. Juan de fuca Net Coastal Sport
Oregon	North Coast Sport
High Seas	Gill Net - Japan Experimental - Japan
Columbia River	Sport Tribal Commercial Tribal Ceremonial/Subsistence

Hatchery	Number planted	Pounds planted	Percent goal
Magic Valley	2,122,900	486,750	139
Niagara Springs	1,903,300	465,400	116
Hagerman National	1,439,300	339,520	100
Dworshak National	2,663,600	400,106	107
Total	8,129,100		

Quality	Number per 100 m <sup>2</sup>	
	smolts	parr
Excellent	10	20
Good	7	14
Fair	5	10
Poor	3	6

# Lower Granite Steelhead

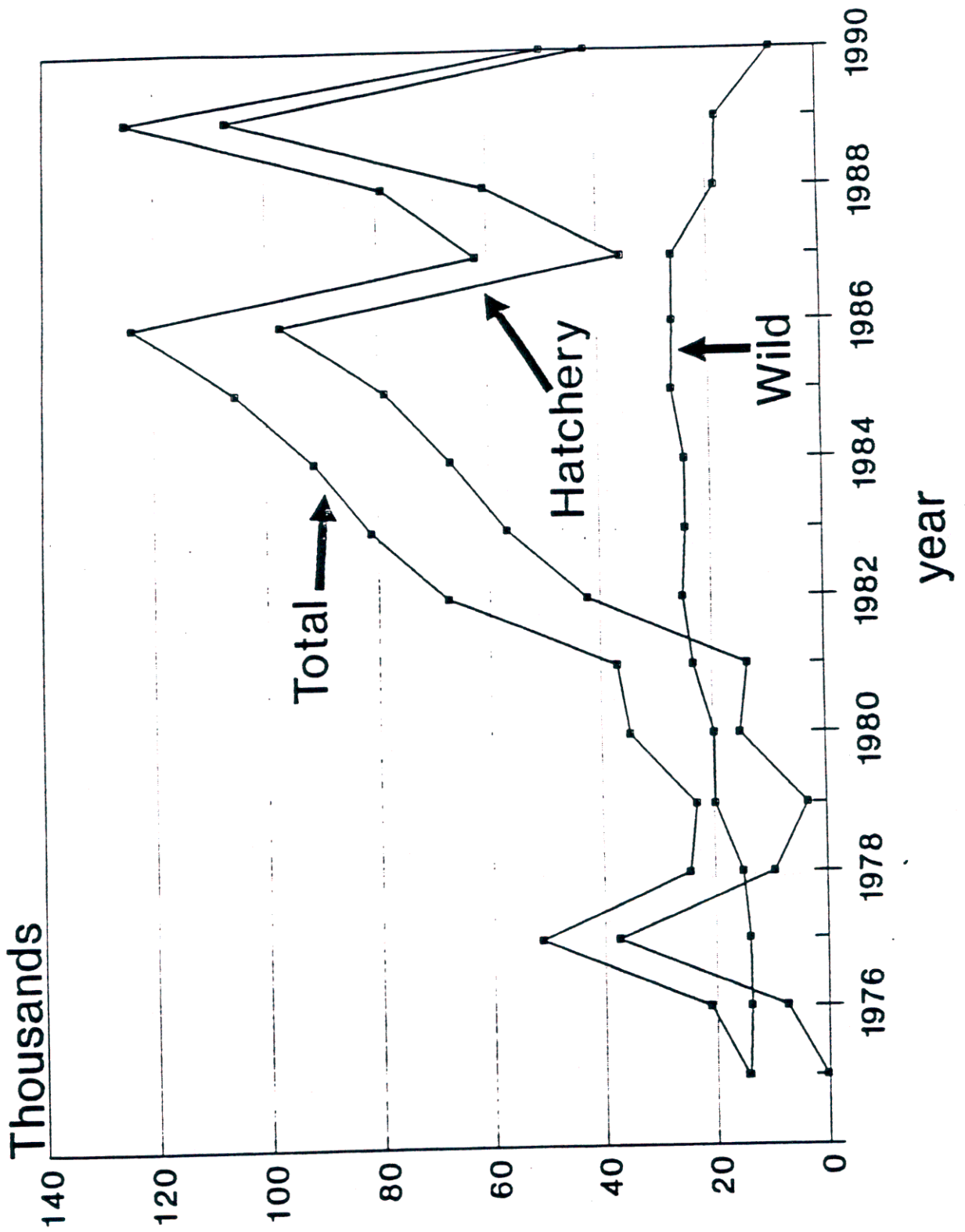


Figure 1. Hatchery and wild fish populations.

# Lower Granite Dam Wild Steelhead Counts

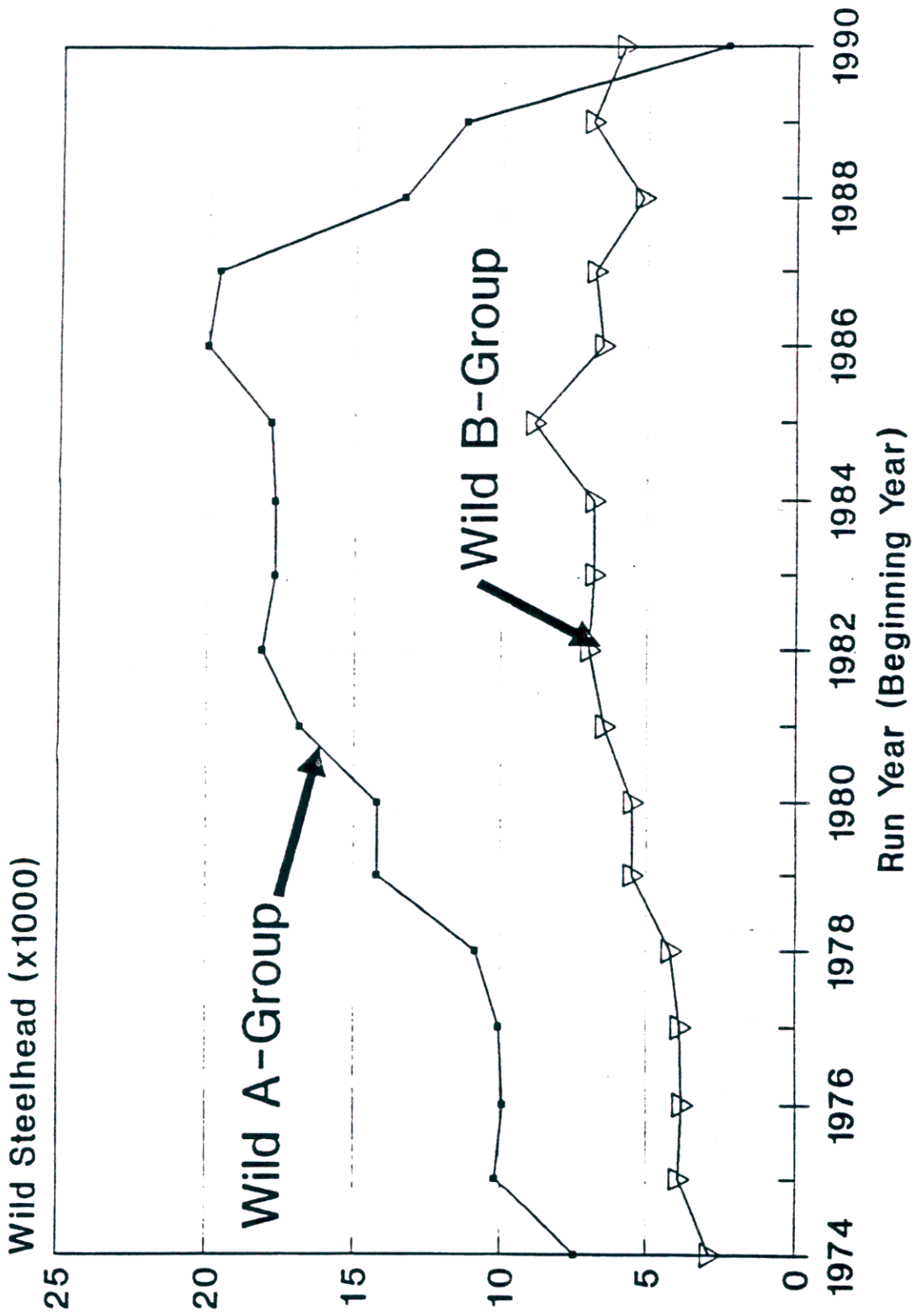


Figure 2. Wild fish escapement.

# IDAHO HATCHERY STEELHEAD

SMOLTS RELEASED 1980 - 1990

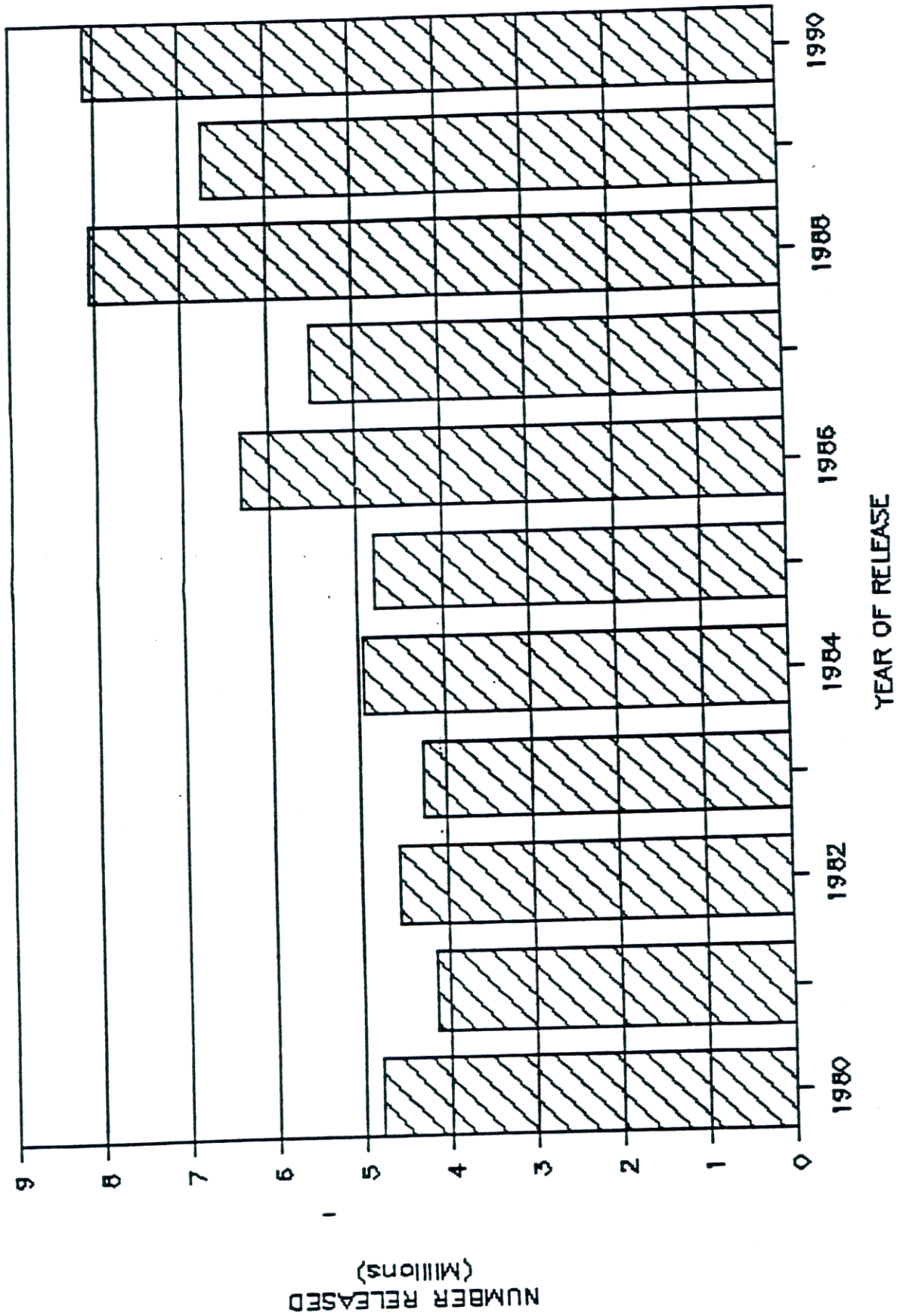
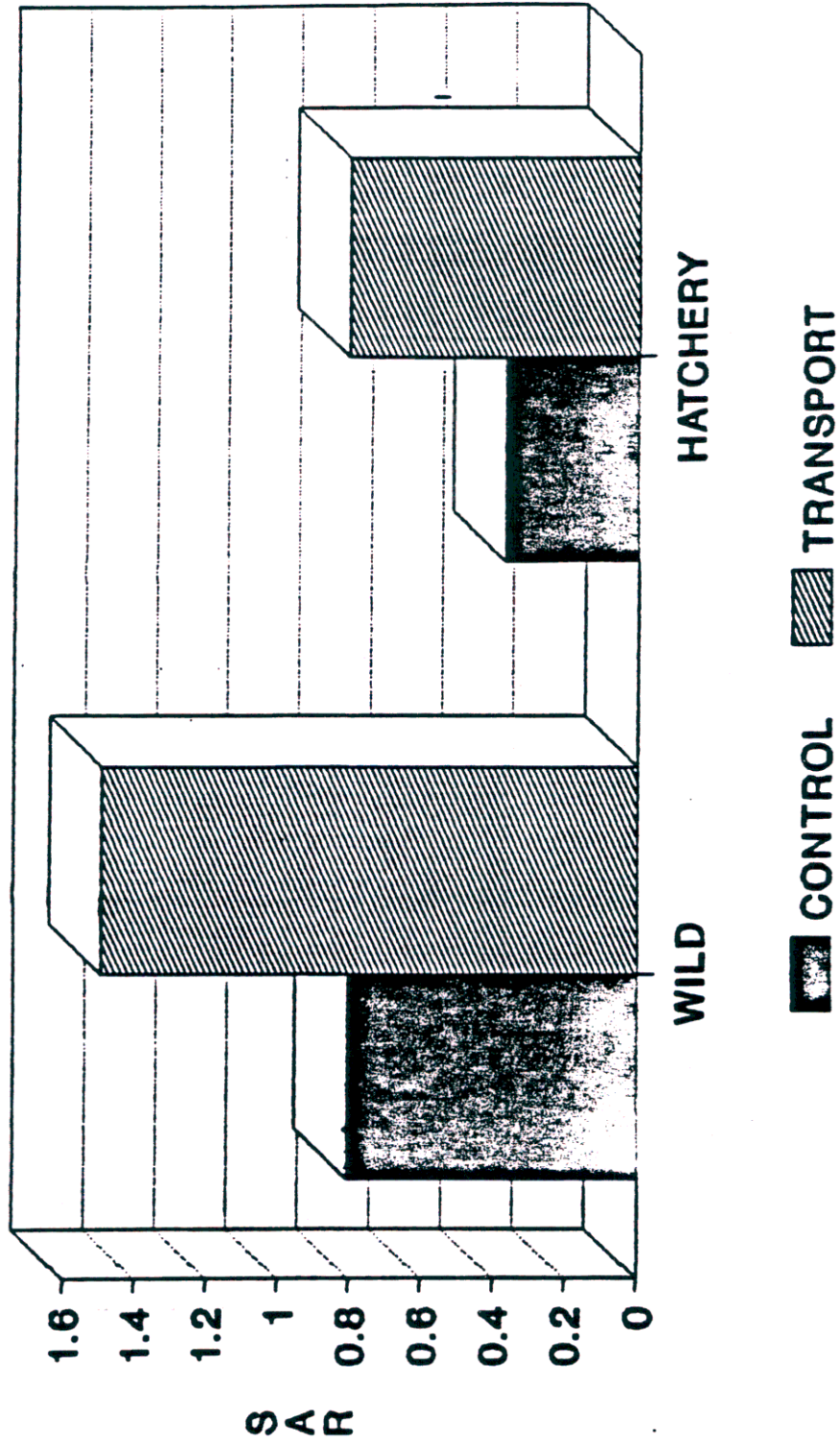


Figure 3. Smolt releases.

# 1986 STEELHEAD SMOLT-TO-ADULT RETURNS FROM LOWER GRANITE DAM



Matthews et al. 1980

Figure 4 Transportation of smolts





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# **OREGON**



Stock Status of Wild Steelhead in Oregon  
A Preliminary View with Plans to the Future

by  
Mark Chilcote  
Oregon Department of Fish and Wildlife

A comprehensive stock status assessment of wild fish in Oregon, which will include steelhead, is currently being conducted. This assessment is being primarily driven by the implementation of the newly revised Wild Fish Management Policy passed by the Oregon Fish and Wildlife Commission in January, 1990. While the singular purpose of this policy is to protect the genetic resources of Oregon's policy will be extremely helpful in maintaining a time series on run size, percent utilization of available habitat, harvest rates, and identification of factors limiting natural production of steelhead. Implementation will also highlight data gaps and future research needs.

Although stock status is often considered in terms of how many fish are present relative to past or potential numbers, the Department's view is that sustainability of fish production into the future is the most critical issue. Further, that sustainable fish production is contingent upon maintaining populations that are genetically adapted to their local habitats, yet flexible enough to respond to future changes in these habitats. We believe the protection of genetic resources facilitates the mechanism by which this adaptive yet flexible capacity is maintained.

The general policy statement in the Wild Fish Management Policy (WFMP) reflects this view. First, it says that for wild fish, protection of genetic resources is the top management priority. Second, it directs that all populations of wild fish be managed to meet specific conditions spelled out in the policy, unless withdrawn from consideration by direct action of the Commission. Third, it recognizes that the process of bringing all wild populations into compliance with the WFMP standard may take time, however, incremental progress towards this long-term goal is expected.

The WFMP standard that is desired to be met for all wild populations can be generally stated as follows. The spawning population must contain 300 or more spawners (with some exceptions). In addition, if hatchery fish exist and spawn naturally within the geographical area where a wild population is found they must not exceed 10 percent of the total spawning population during the period wild fish are spawning.

A preliminary assessment of wild steelhead populations in Oregon with respect to the WFMP reveals large data gaps and information needs. However, of the 136 populations identified, there appears to be a significant problem of hatchery fish straying into the streams where no hatchery smolts releases have occurred. This situation is particularly acute for small populations of coastal winter steelhead. With the exception of the Deschutes River summer steelhead, large wild steelhead populations appear to be better off in terms of meeting the WFMP standard (e.g., John Day summer steelhead, Rogue River winter steelhead).

Bringing many of the steelhead populations into compliance with the WFMP appears to hinge on either developing strategies to draw hatchery fish away from natural spawning areas or to reduce the number of hatchery adults. Some of the actions being considered to accomplish these strategies include: the development and use of acclimation ponds to change the time and place of release for hatchery smolts, decreases in the number of hatchery smolts released, changes in fishing regulations to focus harvest on hatchery fish.

# An Overview of Steelhead Management and Research in Oregon

by  
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Oregon Department of Fish and Wildlife

Management of steelhead in Oregon is guided by the statewide Steelhead Plan, a document published in 1986. The Steelhead Plan (known formally as *The Comprehensive Plan for Production and Management of Oregon's Anadromous Salmon and Trout, Part III: The Steelhead Plan*), outlines the basic management goals and objectives for steelhead in Oregon and provides a foundation for all activities pertaining to steelhead. The six management objectives specified in the Steelhead Plan are:

- (1) Achieve escapement necessary to seed habitats for optimum freshwater recruitment.
- (2) Maintain the diversity of existing self-sustaining stocks throughout the state and improve the diversity of hatchery stocks.
- (3) Minimize the impacts of hatchery stocks on wild fish. Hatchery programs will complement the management programs for wild stocks. Harvest strategies will be consistent with basin objectives for natural production.
- (4) Provide a diversity of opportunities for consumptive and non-consumptive use of wild and hatchery steelhead trout. Diversified opportunities will be implemented on a regional basis to appeal to the broadest spectrum of preferences, contingent upon local stock health and characteristics, habitat characteristics, access availability, primary uses of the lands and waters of the state, and other agency or jurisdiction programs or plans.
- (5) Maximize the benefits from the hatchery product to the extent possible consistent with the Wild Fish Management Policy.
- (6) Develop a common management strategy with adjoining states and treaty tribes.

The Steelhead Plan discusses the problems facing steelhead in Oregon and outlines activities necessary to overcome those problems. It gives specific directions for stock transfer and hatchery rearing and release guidelines.

## Management Activities:

Consistent with the Steelhead Plan, management activities are directed by a centralized staff of biologists representing species, habitat, and fish culture experts

from the Portland Headquarters office of the Oregon Department of Fish and Wildlife (ODFW). Directives are implemented by a decentralized staff of biologists in 17 fish districts located within five regions of the state.

Specifically, management activities include:

**Habitat protection --** Biologists review some proposed timber sales, most waterway alteration requests and other proposed development activities for protection of critical habitat for steelhead resources. ODFW has very limited jurisdiction, but advises the jurisdictional agency regarding the impact of the proposed action on fish habitat.

**Habitat restoration --** Under the direction of habitat specialists, habitat restoration activities run the gamut from riparian fencing projects that allow natural restoration to the direct placement of instream structures for fish. Many habitat restoration projects involve volunteers participating through the Salmon and Trout Enhancement Program (STEP).

**Supplementation of fisheries --** To provide additional steelhead for harvest, ODFW managers direct the release of hatchery steelhead into waters of the state. Many of these steelhead are smolts from ODFW hatcheries but some hatchery steelhead releases originate from federal hatcheries or from STEP volunteer facilities.

**Monitoring of fish populations --** ODFW personnel monitor steelhead passage at several dams, survey steelhead anglers, and conduct some spawning ground surveys.

**Resource planning --** ODFW biologists recommend or review proposed angling regulations prior to presentation to the Oregon Fish and Wildlife Commission, the governing body of public appointees that set policy for the ODFW. An increasing amount of time is spent developing basin management plans. These documents outline, in writing, the fish management objectives for the basin and the actions necessary to achieve them.

**Research Activities:**

A Research Advisory Committee directs the funding of research projects administered through the Research and Development Section of the ODFW. Twelve of the 20 research projects currently underway deal in some part with steelhead. The following gives a brief description of the objectives of each project.

### Habitat-fish abundance relationships

The Salmonid Habitat project is working to identify the specific habitat requirements for steelhead in Oregon's coastal streams and evaluate the effectiveness of habitat improvement projects to increase natural populations of steelhead.

The Port of Portland project is working to evaluate the effects of Portland Harbor and individual developments within the harbor on behavior, migration, and survival of juvenile steelhead.

The Lost Creek Dam Fisheries Evaluation project and Elk Creek Dam Fisheries Evaluation project are working to determine if the operation of these dams change important life history parameters of steelhead in the Rogue River. These projects will recommend criteria for temperature and flow releases from Lost Creek Dam and Elk Creek Dam to achieve maximum production and harvest of steelhead.

### Passage problems at dams

The Lower Snake River Adult Passage project is working to determine the most effective spill pattern for adult steelhead passage at Little Goose and Lower Granite dams. They also are experimenting with modifications to fishways to reduce the rate of fallout at fishway entrances.

The Umatilla Passage project is working to evaluate the passage of juvenile steelhead through the juvenile bypass systems at four irrigation diversion dams on the Umatilla River.

The Lowhead Hydro Studies project is working on improving fish passage for adult and juvenile fish at selected lowhead hydropower sites in Oregon. Currently work is being conducted at four sites in the upper Willamette River

### Modifications of hatchery programs

The Steelhead Production Factors project is working to develop techniques to decrease the risk of detrimental effects of steelhead hatchery programs on the genetic diversity of wild steelhead stocks. Some of that work involves developing techniques for increased use of wild steelhead for broodstock, documenting the magnitude of hatchery influence in wild spawning populations, evaluating the use of acclimation facilities to reduce the proportion of hatchery steelhead that spawn with wild fish, and assessing the feasibility of producing sterile hatchery steelhead that do not spawn.

The Lower Snake River Compensation Plan Facilities Evaluation project is working to determine the rearing and release strategies that will produce maximum

survival to adult return for hatchery-produced summer steelhead smolts. An evaluation of the use of facilities for acclimating hatchery steelhead smolts to increase the survival and catch of returning adults is underway.

The Umatilla Hatchery Monitoring and Evaluation project is just getting underway. This project will evaluate the use of acclimation facilities to increase the survival and return of hatchery steelhead to the Umatilla basin and determine if hatchery supplementation of wild steelhead populations alters the genotypic variation and life history characteristics of the native summer steelhead populations.

The Imnaha Supplementation project is working to evaluate the success of supplementing Imnaha River summer steelhead with hatchery-reared smolts and assess the effect on natural production performance, life history characteristics, and genetic characteristics of wild fish populations.

#### Predator control

The Predator-Prey project on the Columbia River is working to develop a predation index that estimates the predation losses of steelhead smolts in various reservoirs throughout the Columbia basin. The project also is working to examine the feasibility of predator control programs for reducing predation losses.

## ODFW Hatchery Steelhead Overview

by  
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Fish Propagation Program

The primary purpose for the Oregon hatchery steelhead program is to provide angler catch, and to supplement the natural steelhead populations.

The Oregon Department of Fish and Wildlife (Department) operates and maintains 33 fish hatcheries and 19 satellite facilities. Thirteen hatcheries rear winter steelhead, 11 rear summer steelhead, and six hatcheries rear both races of steelhead. The 18 steelhead producing hatcheries release smolts into 56 rivers statewide, of which 31 are coastal rivers and 25 are Columbia River tributaries.

The Department releases approximately 5.2 million pounds of fish annually, of which 22 percent or approximately 1,096,800 pounds are steelhead production. During the past two years, approximately 5,870,000 smolts averaging 5.3 fish per pound have been released into Oregon waters.

Both races of steelhead are targeted for mid-April releases with winter steelhead programmed for a release size of 6.0 fish per pound and summer steelhead release size at 5.0 fish per pound.

Hatchery adult winter steelhead normally return to coastal streams from early November through February, while the wild steelhead adults return after spending two summers in the ocean environment (two salt fish). Most summer steelhead enter freshwater from May through October and spend either one or two summers at sea.

During the past decade, approximately 70 percent of the annual steelhead harvest is comprised of hatchery fish.

Funding sources for the Oregon steelhead program are from license and salmon/steelhead tag sales called wildlife funds and by federal funding sources, primarily USACE, NMFS, LSRCP, and BPA programs. Public municipalities and private utility companies also contribute to certain facilities.

Umatilla Hatchery is currently under construction and should be completed by July 1991, and is scheduled to rear 210,000 summer steelhead smolts for the Umatilla Basin Program.

Winter steelhead released from Alsea Hatchery on the Oregon coast have shown survival rates ranging from 1.7 to 12.1 percent since the 1974 brood year releases.

Adult summer steelhead returns to Cole M. Rivers Hatchery have shown survival rates ranging from 0.12 to 5.08 percent, while

Cole M. Rivers, winter steelhead returns have ranged from 0.19 to 1.89 percent since the 1974 brood year.

Creel census and trapping data collected for three years on the Deschutes River show a return to the fishery and to Pelton re-regulating dam of 0.4 to 6.6 percent.

The Department steelhead hatchery program has been successful during the past 15 years as anglers are getting a reasonable return from their investment.

Some improvements that could be incorporated into Oregon's steelhead program would be: 1) to strengthen the hatchery broodstock by adding more native stock into the hatchery spawning regime; 2) determine if acclimation ponds would be profitable; 3) use state of the art techniques and equipment for hatchery operations; and 4) provide pathogen free water for egg incubation and early rearing capabilities sufficient to meet all of the egg incubation and fish rearing requirements.

Another concern is that a face lift is needed for today's hatcheries which were designed to produce large numbers of smolts while tomorrow's needs are to collect more native fish within each basin and perhaps rear smaller lots of fish requiring smaller pond sizes.

## Steelhead Habitat Protection and Restoration Programs

by

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Oregon Department of Fish and Wildlife  
Habitat Conservation Division

When it comes to protecting and enhancing steelhead habitat, the state of Oregon is progressive and aggressive. Numerous state statutes have been adopted to protect anadromous fish and to enhance fish habitat. These statutes include:

- 1) The "no harm to anadromous salmon or steelhead" law (ORS 543.017) for new hydroelectric projects. This prohibits the Oregon Water Resources Commission from approving any new hydroelectric projects that may cause harm to anadromous fish and their habitats. Projects involved in relicensing are required to restore, enhance or improve anadromous fish populations within the same river system.
- 2) The Instream Water Rights Act (ORS 537.332) allows the state to apply for water rights to keep water instream for fish and wildlife. This also allows the state to buy established water rights and transfer the water to instream uses.
- 3) Goal Five of the Statewide Land Use Planning Goals required counties to identify important natural resources, among these are wetlands, riparian areas, and other fish and wildlife habitat.
- 4) All artificial obstructions are required to have fishways to provide anadromous fish passage (ORS 509.605). All water diversions are required to have fish screens or by-pass devices (ORS 509.615).
- 5) The Threatened and Endangered Species Act (ORS 496.172) required state agencies to cooperate with ODFW to conserve and protect threatened or endangered species and take no action on state land that is inconsistent with adopted threatened and endangered species recovery plans.
- 6) The Salmon and Trout enhancement (STEP) program (ORS 496.435) organizes and assists volunteer efforts to enhance native salmon and trout stocks through habitat enhancement and stock enhancement projects.
- 7) The Fish Habitat Improvement program (ORS 496.260) allows anyone enhancing fish habitat to gain state tax credits. The project must be approved and certified by the ODFW.
- 8) The Restoration and Enhancement program, in part, provides funds either to volunteers or agencies for fish habitat improvement projects.

The ODFW also uses its statutory Wildlife Policy (ORS 496.012) to protect steelhead habitat. The Habitat Conservation Division (HCD) within the ODFW pursues protection of steelhead habitat through hydroelectric licensing, the federal Fish and Wildlife Coordination Act (all federally funded projects), statewide land use planning, U.S. Forest Service and Bureau of Land Management planning, water right and water quality permit application review, incorporating protection into other state agencies, planning and rule-making, such as the Oregon Water Resources Department's water basin planning and Oregon Department of Forestry's rule-making processes, involvement in state fill and removal permits in waterways of the State, and the state legislative arena. Providing steelhead habitat protection is a constant challenge, involving review and comment on many state and federal agencies programs.

The Restoration and Enhancement Program mentioned above has provided funds for fish habitat enhancement projects throughout the state. As of June 30, 1990, this program allocated \$1,712,000 for stock, habitat and fishing enhancement projects. The sixty-five projects funded also provided matching funds totally \$1.9 million. The projects ranged from hatchery to natural production; some included fishing access improvements.

Most habitat enhancement projects benefitted anadromous fish in general. An example is the Wildcat Creek Habitat Enhancement project on the Siuslaw River. The project will target improvement of rearing, spawning and winter shelter habitat for anadromous salmonids in a degraded stretch of Wildcat Creek. Wildcat Creek is characterized by extensive areas of bedrock substrate.

Through aggressive advocacy programs aimed at protecting steelhead and other fish habitat, the ODFW is attempting to stem the tide of fish habitat loss. An appropriate balance to habitat protection are the vigorous habitat enhancement programs the ODFW leads throughout the state. Combined, these two approaches are making a difference for steelhead in Oregon.

Bringing many of the steelhead populations into compliance with the WFMP appears to hinge on either developing strategies to draw hatchery fish away from natural spawning areas or to reduce the number of hatchery adults. Some of the actions being considered to accomplish these strategies include: the development and use of acclimation ponds to change the time and place of release for hatchery smolts, decreases in the number of hatchery smolts released, changes in fishing regulations to focus harvest on hatchery fish.

## Data Needs and Management Overview in Oregon

by

Mick Jennings

Oregon Department of Fish and Wildlife  
Steelhead Program

Oregon's Steelhead Plan directs steelhead to be managed by basin or stock, and directs the collection of the data bases necessary to meet that end. During development of the Steelhead Plan the public soon realized that biologists often lack good fundamental information about populations they manage and that management decisions are sometimes made without having sufficient data.

Many of the actions in the Plan call for improving our data base. Not all recommended actions or alternatives are of equal priority, and the financial resources and personnel to accomplish even a few are more than is available in present legislatively approved budgets. However, certain actions have been identified as high priority by the Fish Division of ODFW and are receiving the majority of implementation dollars. Those actions relating to data needs are listed as follows:

1. Develop a standardized habitat and steelhead population inventory program.
2. Develop and implement a catch estimation system that yields timely, reliable harvest information by run year for the Columbia basin and most coastal basins.
3. Develop additional counting stations for smolts or adult steelhead.
4. Conduct surveys to determine the proportion of hatchery and wild steelhead on the spawning grounds by month in streams stocked or indirectly receiving hatchery steelhead.
5. Conduct studies to determine the effectiveness of using hatchery stocks to establish, supplement or rehabilitate natural spawning populations.
6. Develop specific genetic guidelines for individual hatchery programs.

Presently, the highest priority for steelhead management in Oregon is to assess and gain compliance with the revised Wild Fish Management Policy. The policy is undoubtedly leading us to look at the status of wild populations and also the interactions between hatchery and wild fish. As we work through these populations we will need to make changes in some hatchery steelhead programs in order to comply with the policy. But after making changes we will need to continue data collection to see whether the management strategy has worked.

Other new or expanded steelhead management activities, including data collection, may be implemented as priorities change due to development of basin plans, coordination with other agencies, or as funds become available.

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# WASHINGTON



## Anadromous and Resident Enhancement Summary

by  
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The Washington Department of Wildlife operates and maintains on a statewide basis, 29 hatcheries with three associated rearing ponds, four rearing pond complexes, four isolated independent rearing ponds, two steelhead net pen sites and three remote egg taking stations.

In the Columbia drainage, WDW operates and maintains 11 hatcheries rearing winter, summer and searun cutthroat. These facilities release smolts primarily into the major river systems and larger tributaries of western and eastern Washington. An additional six facilities rear resident fish while six facilities rear both resident and anadromous species. Three remote resident cutthroat egg taking stations are also operated in the Columbia drainage.

The hatchery facilities can be categorized into two groups: 1. State funded facilities and; 2. Mitigation funded facilities. On a state wide basis, approximately 40% of all pounds of fish released annually are from mitigation facilities, while 60% of all pounds released are from state funded facilities. Mitigation facilities are operated through funds provided by public and private utilities.

The primary goal of the WDW steelhead enhancement program is to provide recreational opportunity while preserving, protecting and perpetuating the fishery resource. As a part of these responsibilities, WDW last year initiated the development of a hatchery broodstock genetic management guidelines. Currently, in final draft form, these guidelines are based on the premise that we must recognize that genetic diversity is the key to any successful enhancement program. Along with a new program is the need to train the staff that will be implementing such a program. WDW is proceeding with making hatchery personnel more acutely aware of genetically correct spawning practices and how those individuals may effect broodstock genetics.

However, often overlooked, in any genetic program, are the effects that harvesters have upon genetic selection. Successful anglers will often select a fish for one or more specific traits: size, sex, color (bright vs. dark), timing, etc.. Fishery managers must recognize the impacts that commercial fisheries have upon the genetic diversity of a run. Also, the coordinated and intense harvest upon limited populations during specific run times may select out very valuable genetic material.

For any hatchery program, there is always the concern for fish pathogens. One must distinguish between pathogens, which are present in all populations of fish both hatchery and wild, and that of disease (where there is actual mortality). Hatchery populations are generally more susceptible to disease because of stressful conditions

under which they are reared. Minimizing stress in a hatchery rearing condition is the most successful tool in minimizing disease.

Another tool is the use of disease and stock transfer policies. Currently under development with the resource co-managers in Washington state is a new fish health management policy. The new policy will update an existing policy now about nine years old. Additionally, in the early 1980's, a group consisting of fish pathologists and hatchery administrators was formed. This group, called the Pacific Northwest Fish Health Protection Committee, is responsible for disseminating information and open communication between the public and private sectors.

In an effort to control pathogens at specific hatcheries, WDW has proposed specific solutions. For example, at the Cowlitz Hatchery, the steelhead populations have long suffered from the parasite C. shasta. In an effort to control this incurable parasite, WDW initiated a series of studies of possible solutions in the early 1980's. From these studies, WDW proposed and Tacoma City Light is currently constructing, an ozone water disinfection plant. Other efforts are more hatchery operational. In an effort to control the transmission of IHN from parent to progeny, specific disinfection measures were first pioneered by the Oregon Department of Fish and Wildlife and adopted by most agencies throughout the Columbia drainage basin. These include the use of an iodophor (disinfection) solution at water hardening of the eggs.

Hatchery renovations are urgently needed at a number of aging WDW facilities. These renovations would incorporate new technology and philosophies for holding broodstock, program size, the rearing and releasing of smolts. With the water resource becoming increasingly scarce into the next decade and indeed the next century, the natural resource agencies will need to provide for an increase in their efficient use of this dwindling resource.

## Habitat Restoration and Protection for Steelhead in Washington

by

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### Introduction

Anadromous salmonids are managed by two state agencies in Washington: steelhead, sea-run cutthroat, sea-run char (and a few sea-run brown trout) are managed by the Department of Wildlife (formerly the Department of Game), while salmon are managed by Department of Fisheries (except landlocked kokanee are under Wildlife's jurisdiction). Wildlife also manages resident trout and most (but not all) other resident fish. Both agencies have Habitat Management Divisions concerned with protection and restoration of fish habitat. The bulk of the effort of Wildlife's Habitat Management Division is aimed at protection and mitigation rather than enhancement and restoration. Protection is achieved directly through regulation, indirectly through advice and comment on regulation by other agencies, and through cooperative land and water management efforts. Major issues addressed in habitat protection and restoration efforts include sedimentation, fish passage, cover, and instream flow.

Sedimentation is a major threat to fish habitat that is addressed in permit conditions. Timing of work and buffer areas are primary conditions for limiting sedimentation from work in or adjacent to streams.

Fish passage is another concern addressed in permit conditions, particularly in small headwater streams. If culverts or crossings of these streams are inadequate, production upstream could be eliminated. Fish passage restoration at older roads and dams is a goal of restoration projects. Several statutes (RCW 75.20.060-090, RCW 77.16.210-220 and RCW 77.12.420-425) require fish passage at dams.

Maintenance of cover and other natural channel structure is another major concern addressed in permit conditions.

Instream flows for steelhead, as well as for other fish and wildlife, have been another major focus for habitat protection activities by the Department of Wildlife. Instream flow recommendations are aimed at maximizing habitat for the most flow-sensitive lifestage at each season, maintaining fish passage upstream and downstream, providing incubation flows without jeopardizing other species or lifestages, and maintaining stream channel. Statutes requiring instream flows include RCW 75.20.010-020, 110, RCW 75.20.050, RCW 90.22 and RCW 90.54.

All water diversion intakes must be screened to prevent fish being removed from streams by water withdrawals (RCW 75.20.040, 061.080; RCW 77.16.210-220).

## Permits (HPAs, other agency permits) - conditions

A major tool of both Wildlife and Fisheries in habitat protection and mitigation is environmental permit review. When reviewing permit applications, agency biologists recommend conditions to mitigate impacts of permitted projects or, when necessary to protect fish and wildlife, recommend denial.

The Hydraulic Project Approval (HPA), the only direct environmental regulatory tool of Wildlife or Fisheries, is required for any work within the ordinary high water mark of a stream. It is authorized by RCW 75.20.100. One indication of the effectiveness of HPAs is annual legislative attempts to weaken this regulatory tool.

As the two agencies share authority for the HPA, they have divided the state into areas of primary responsibility: generally, Fisheries in areas inhabited by salmon and Wildlife in the rest of the state. Because of substantial overlap between areas inhabited by salmon and steelhead, much of the steelhead habitat protection through HPA is done by Fisheries, based on guidelines worked out jointly.

Wildlife issues about 2,500 HPAs annually; Fisheries issues about 3,500 HPAs. Both agencies deny 1.2% of applications that are for projects that would be severely damaging. All HPAs are subject to restrictions on timing and to other conditions to maintain natural functioning of the stream and mitigate project impact; there is generally a substantial change between proposed and permitted projects.

Monitoring and enforcement of HPAs has increased in recent years. In 1990, wildlife agents issued about 100 citations for HPA violations, mostly for failure to obtain permits. Wildlife has established a priority system for monitoring HPAs by wildlife agents. Over the last decade public awareness of HPAs has increased, at least partly as a function of monitoring and enforcement. This has led to proposals that are less damaging and to greater acceptance of the process and associated constraints on people's activities.

## Timber, Fish, Wildlife (TFW)

The TFW agreement provided for cooperative consultation and adaptive management in regulation of forestry on non-federal lands. The Department of Wildlife has focussed on terrestrial and wetland wildlife issues while deferring most fish issues to the Department of Fisheries and Indian tribes in TFW. Key elements of fish habitat protection in forestry are maintenance of instream cover and sources of large woody debris as future cover in the riparian zone and protection of stream channels from excessive sedimentation. The importance of protecting small, steep, intermittent headwater tributaries is recognized.

## Major projects (FWCA, FERC, NWPPC) - mitigation

The Department of Wildlife takes an active role in developing mitigation for dams and other major water projects. Hydroelectric projects, including small hydro, are the most

numerous major water projects in Washington. Other major water projects include municipal and industrial water supply, irrigation, and navigation. The Department of Wildlife becomes involved in these projects through the federal Fish and Wildlife Coordination Act, rules of the Federal Energy Regulatory Commission (FERC), Northwest Power Planning Act, National Environmental Policy Act (NEPA), State Environmental Policy Act (SEPA), and review of relevant environmental documents and permits.

Most hydroelectric projects are under jurisdiction of FERC, which has rules that provide for consultation between project proponent and the Department of Wildlife and other natural resource agencies. Most new project proposals are considered small hydro. Licenses for some larger old projects are due for renewal, giving Wildlife a second chance at mitigation or restoration through a combination of habitat restoration measures such as instream flows and passage and hatchery propagation.

One recent example is the North Fork Skokomish River, dewatered by Cushman Dams for about seven decades. Negotiations with Cushman's owner, Tacoma City Light, led to an instream flow of 30 cfs after decades of no flow in a channel that historically carried a mean annual flow over 500 cfs. In December 1990, the city tentatively agreed to release an instream flow of 100 cfs in the future, with higher releases for smolt migration and other fish needs. Wildlife and U.S. Fish and Wildlife Service personnel gathered a single set of baseline data on steelhead abundance in the North Fork Skokomish River before the release of 30 cfs. The Skokomish tribe has more extensive smolt trapping records from the same area. Together these records may provide some basis for evaluating the effectiveness of instream flows for producing steelhead and other anadromous salmonids in the Skokomish.

Sedimentation and slope stability have been major concerns in the proliferation of small hydroelectric projects. Fisheries has led the way in requiring detailed analysis of cumulative effects of many small hydroelectric projects on sedimentation in a single watershed.

Instream flows are considered one project at a time. The large number of small hydro projects has led to refinement of agency standards for instream flow studies, primarily using IFIM/PHABSIM. Results of a recent study by Wildlife appear to support a major assumption of PHABSIM. The Department of Wildlife, with support from other agencies, has set standards for hydraulic models and habitat preference criteria with its Instream Flow Study Guidelines (copy attached). Following those guidelines, project proponents and Wildlife personnel have improved knowledge of depth and velocity preferences of steelhead and other trout. Wildlife has also developed a new method for setting instream flows in plunge pools.

Under several official definitions of mitigation, the first alternative for mitigation is avoidance of the impact. Resource agencies have been reasonably successful in steering new small hydroelectric projects away from waters used by anadromous salmonids, particularly since the designation of protected areas under the Northwest Power Planning Act.

The Army Corps of Engineers funds mitigation for the Snake River Project. Some of the fish mitigation, in addition to hatchery production of steelhead and salmon, is habitat enhancement or restoration in the Tucannon River and Asotin Creek in the Blue Mountains of southeastern Washington. With Corps funds, Wildlife has placed boulders and log weirs in these streams and monitored fish use. These structures concentrate fish, but it is not clear whether they increase production of the stream.

Much of the flow of the Yakima River is allocated to irrigation. Consequently, there are many irrigation diversions, many of which were unscreened until recently. The Northwest Power Planning Council provided funds to screen these many unscreened diversions as part of the effort under the Northwest Power Planning Act to restore steelhead and salmon in the Columbia Basin. These screens should reduce the number of smolts lost irretrievably into irrigation canals and turned into incidental fertilizer.

#### Water rights & instream flows

Wildlife and Fisheries recommend instream flows to agencies with authority to establish them. Instream flows for hydroelectric projects are established by FERC as license conditions, as discussed above. Instream flows can become conditions of water rights issued by the Department of Ecology in two ways, through site-specific conditions for individual water rights and through basin-wide water planning.

Ecology sends all surface water right applications (as well as groundwater applications with significant continuity with surface water) to Wildlife and Fisheries for review and comment. Wildlife and/or Fisheries recommend conditions of the water right to avoid adverse impacts to fish. If instream flows have been adopted by rule (see below), those instream flows become conditions of any new water right. If instream flows have not been adopted by rule Wildlife and/or Fisheries recommend instream flows for the point of diversion. Water rights subject to instream flows must be curtailed until instream flows are met. If the application is for a major water project (one that diverts at least 1 cfs and at least 10% of the 90% exceedence flow at any season) Wildlife requests that the applicant conduct an IFIM study to provide a basis for instream flow recommendations.

During the late 1970s and early 1980s Ecology had a program, the Instream Resources Protection Program (IRPP), to set instream flows on rivers and streams of the state. In each IRPP (one for each major watershed or sub-basin of the Columbia) Ecology identified gauged control points where instream flows would be measured. Ecology established instream flows at those control points. In a basin where an IRPP had been completed subsequent water rights issued are junior to the instream flow and can only be exercised when the instream flows are met.

Ecology completed IRPPs on about 20 river basins or Water Resource Inventory Areas (there are 62 Water Resource Inventory Areas [WRIAs] in the state). The program became bogged down in political controversy over instream flow standards in the mid-

1980s. In December 1990 an agreement appears to have been reached to allow the process to resume, although there is still no agreement on standards.

#### Land use planning

Department of Wildlife habitat biologists participate in local and regional planning to try to influence future development so that its impact on fish and wildlife is minimized. Effectiveness of these efforts increases as the biologist's site-specific knowledge increases. A new effort of the department is the Priority Habitats and Species program. This program is compiling maps of fish and wildlife information on a Geographic Information System (GIS) which will be available to biologists as well as to planners.

#### Restoration/habitat enhancement

The Department of Wildlife has a small Habitat Enhancement Fund made up of damage awards from fish kills and oil and toxic spills. These funds have been used for several small projects to allow steelhead passage into areas not previously accessible or to improve steelhead passage at old inadvertent artificial barriers. Most damage assessments must be spent largely in the county where the damage occurred. A large damage assessment was used jointly by Fisheries and Wildlife (with Fisheries taking lead) was used in the Puyallup tributaries near Tacoma to fence livestock out of riparian areas and to restore fish passage.

#### Conclusion

Steelhead in Washington inhabit areas heavily impacted by rapid growth. Power production by large dams has been a big factor in reducing steelhead production. Urban, suburban, and industrial growth affect steelhead streams in the metropolitan Puget Sound area. Water demands are growing most rapidly in heavily populated western Washington, while in some arid agricultural areas most water is already appropriated for irrigation. Changing landscapes and watersheds . from unroaded to roaded, from forested to clear-cut, from rural to suburban and urban - all influence steelhead production potential of Washington's streams in complex ways. Against this onslaught of impacts fishery agencies in Washington have few weapons. Much of our habitat protection efforts depend on cajolery.

## PURPOSE OF INSTREAM FLOW STUDY

The instream flow study should produce information on the relationship between flow and fish habitat. This is not the only information that will be considered; it will be used as one of several pieces of information necessary for state natural resource agencies to make recommendations and decisions. Factors to be considered in agency flow recommendations might include (1) fish access to tributaries at proposed flows, (2) other fish passage considerations, (3) proximity of suitable hydraulic conditions to cover for fish, (4) "ground-truthing" and professional judgement of proposed flows indicated as suitable by models, and (5) results of monitoring.

## KEY ELEMENTS OF INSTREAM FLOW STUDY

Consultation with the appropriate state agency personnel and personnel of other resource management agencies (including U.S. Fish and Wildlife Service, National Marine Fisheries Service) and Indian tribes is the responsibility of the project proponent at all stages of the study. Stages of the study include:

- (1) planning or scoping - develop study plan & obtain signed approval from all parties;
- (2) fish habitat preference curve verification based on study plan pre-approved by agencies;
- (3) field data collection;
- (4) hydraulic model calibration;
- (5) habitat model runs;
- (6) interpretation of habitat models and development of proposed instream flow recommendations, including field review and finalization of proposed instream flow recommendations;
- (7) monitoring of impacts of project with instream flows in place.

Each stage will be discussed below with indications of agency preferences for techniques, programs, and emphasis.

## PLANNING

Early in the planning phase, when the project is still flexible, the project proponent should schedule a meeting when representatives of all agencies and tribes can attend. At least 2 weeks notice is usually necessary. The purpose of the meeting is to discuss possible project designs and develop a study plan to assess the potential impacts of different designs on instream resources.

In preparation for the meeting, the project proponent should conduct a thorough reconnaissance of the stream reach to be affected by the project. Documentation of the reconnaissance that expedites agency review and planning includes:

- (1) map with contour intervals no greater than 20 feet;
- (2) graph of elevation plotted with distance along the stream;
- (3) low altitude photo mosaic (preferred) or video tape of entire reach (low flow in winter is best);
- (4) on-the-ground photos or video tape of all habitat types and potential barriers to fish migration (with reference object for scale in pictures of potential barriers);
- (5) list of fish species known or expected in stream reach;
- (6) available hydrological data such as 10%, 50%, and 90% exceedence discharges by month; and information on derivation of data.

The proponent should conduct an instream flow study using PHABSIM with the 3-flow IFG4 as the hydraulic model unless otherwise approved in advance by all agencies. In preparation for the planning meeting or a follow-up site visit, the proponent should select and mark tentative transects to represent all habitats in the affected reach. Someone with IFIM experience should select these tentative transects. A site visit under suitable viewing conditions allows agency representatives to view, modify as needed, and approve placement of transects.

The final product of the planning meeting is a study plan signed by all parties agreeing to the plan. It should be as specific as possible. It should ensure that all parties understand what is expected from the study. It should ensure the project proponent that the study is not open-ended, thus allowing scheduling and budgeting of the study. It should be amendable only by unanimous agreement of all parties. The following elements should appear in the study plan:

- (1) hydraulic model(s) to be used;
- (2) range of flows to be addressed and target calibration flows;
- (3) hydrographs to be used in analysis;
- (4) locations of transects and study sites with maps and photos or videos as documentation;
- (5) habitat preference curve verification study plan (see below);
- (6) habitat models to be used (HABTAT, HABTAV, HABTAE, feeding stations, plunge pool);
- (7) fish passage flow determination procedure and criteria;
- (8) channel macrohabitat maintenance flow determination procedure;
- (9) any limiting factor analysis or time series analysis.

## FISH HABITAT PREFERENCE CURVE VERIFICATION

An instream flow study is incomplete if the project proponent has not made a reasonable effort to determine fish habitat preference at the study site or an approved substitute site. The study outlined here is a reasonable effort. If, after making a reasonable effort, the project proponent has not compiled enough data to verify or modify agencies' fallback or generalized habitat preference curves, then fallback curves may be used (see below and Appendix for discussion of fallback preference curves). Agencies will not modify fallback curves unless data collected at the site using a study plan pre-approved by the agencies. Preference curve verification may be aimed at selected species and lifestages if those species and lifestages will be given more weight in the development of an agency instream flow recommendation.

The preference curve verification study consists of three parts:

- (1) determine proportional habitat availability;
- (2) determine fish habitat utilization; and
- (3) analysis of fish preference or relative density by determining ratios of habitat utilization to habitat availability.

Useful references for habitat preference curve verification are Orth, Jones, and Maughan (1981), Bovee (1986, Instream Flow Information Paper No. 21), and Slauson (1988).

Determining habitat availability.

In PHABSIM the habitat dimensions of interest are depth, velocity, substrate, and cover. The simplest ways to determine the frequency of different ranges of habitat dimensions are either to map their distributions or to generate a table of their frequencies from PHABSIM based on an hydraulic model for the flow occurring during field measurements of habitat utilization. In either case, the field measurements of these dimensions should follow the procedures used for (and may coincide with) one of the IFG4 calibration flow measurements, as described by Bovee (1982, Instream Flow Information Paper No. 12) and Bovee and Milhous (1978, Instream Flow Information Paper No. 5). This will require measurements of depth and velocities along transects placed to represent the full array of habitat types occurring in the study reach.

The frequency of a depth (or velocity or cover or substrate) range will be weighted by the weighting factor(s) for the transect(s) in which it is measured or simulated. If the preference curve verification study reach is smaller than the IFIM study reach which the transects were selected to represent, then different weighting factors may be required for determining habitat availability than are used for the IFIM study.

### Determining fish habitat utilization.

Fish habitat utilization measurements should not be made during nor immediately after habitat availability measurements. This will minimize disturbance of fish.

Fish observations should be conducted by one or more divers swimming slowly and cautiously upstream. Divers should avoid disturbing fish. If more than one diver is participating, divers should coordinate positions to avoid disturbing fish or double-counting them. Before recording depth, velocity, substrate, and cover where a fish is observed, the diver should determine that the fish is not disturbed. The observation is a good one if fish behavior includes (a) feeding, (b) territorial defense, or (c) returning to the observation point after measurement. (The diver may determine that an observation is a good one even if these behaviors are not observed.) Divers may either measure depths, etc. as they encounter fish, or they may mark fish positions with weighted flags and return to measure when all fish in the study site have been marked.

### Analysis of fish habitat preference.

The first stage in data analysis is to determine the final ranges (or bin size, Slauson, 1988) of each habitat dimension to be used. In many studies, small sample size of fish observations will limit how narrow those ranges will be.

Begin by using uniform initial ranges that are a reasonable size for the measurement equipment precision (e.g., 0.1 ft ranges for depth measurement with English unit wading rods). For each initial range, tabulate the proportion of preference curve verification study area that falls within that range. For example, we might find the following distribution of area in X Creek, listed with observed number of fish (O) in each range:

0.00-0.09 ft	1.3%	O = 0
0.10-0.19 ft	1.4%	O = 0
0.20-0.29 ft	4.3%	O = 0
0.30-0.39 ft	4.8%	O = 0
0.40-0.49 ft	5.1%	O = 0
0.50-0.59 ft	7.8%	O = 1
0.60-0.69 ft	9.7%	O = 3
0.70-0.79 ft	14.7%	O = 23
0.80-0.89 ft	18.2%	O = 26
0.90-0.99 ft	15.0%	O = 21
1.00-1.09 ft	11.5%	O = 7
1.10-1.19 ft	4.6%	O = 3
> 1.19 ft	1.6%	O = 3

If the diver had measured depth at 87 fish positions (N=87), the null hypothesis would be that fish were distributed independently of depth and should therefore be distributed at depths proportionally to the frequency with which those depths occur. The null expectation (E) of the number of fish in each depth range would be the product of N and the percent of total area in that depth range (D):  $E = ND$ . Depth ranges and corresponding values of E for X Creek are:

0.00-0.09 ft	E = 1.13
0.10-0.19 ft	E = 1.22
0.20-0.29 ft	E = 3.74
0.30-0.39 ft	E = 4.18
0.40-0.49 ft	E = 4.44
0.50-0.59 ft	E = 6.79
0.60-0.69 ft	E = 8.44
0.70-0.79 ft	E = 12.79
0.80-0.89 ft	E = 15.83
0.90-0.99 ft	E = 13.05
1.00-1.09 ft	E = 10.01
1.10-1.19 ft	E = 4.00
> 1.19 ft	E = 1.39

Ranges will be combined using the criterion that E should be at least 5 in most if not all ranges (a standard derived from chi-square tests, which may be used in preference curve development). Combining ranges yields the following:

0.00-0.29 ft	E = 6.1
0.30-0.49 ft	E = 8.6
0.50-0.59 ft	E = 6.8
0.60-0.69 ft	E = 8.4
0.70-0.79 ft	E = 12.8
0.80-0.89 ft	E = 15.8
0.90-0.99 ft	E = 13.0
1.00-1.09 ft	E = 10.0
> 1.09 ft	E = 5.4

The ratio O/E is calculated, then normalized (see Bovee 1986) to create the preference factor so that the maximum value of P is 1.00:

0.00-0.29 ft	O/E = 0.00	P = 0.00
0.30-0.49 ft	O/E = 0.00	P = 0.00
0.50-0.59 ft	O/E = 0.15	P = 0.08
0.60-0.69 ft	O/E = 0.36	P = 0.20
0.70-0.79 ft	O/E = 1.80	P = 1.00
0.80-0.89 ft	O/E = 1.64	P = 0.91
0.90-0.99 ft	O/E = 1.61	P = 0.89
1.00-1.09 ft	O/E = 0.70	P = 0.39
> 1.09 ft	O/E = 1.11	P = 0.62

These values of P could then be compared to agency fallback values and a mutually acceptable preference curve could be adopted for the X Creek IFIM study.

Fallback preference curves, including those for plunge pools, are listed in the Appendix or are available from the agencies.

#### HYDRAULIC MODEL CALIBRATION

The agencies' first choice of hydraulic models is IFG4 using 3 sets of velocity measurements to establish regressions of velocity with flow. Agencies expect to review an hydraulic model based on measured data (unmodified input). We will consider additional models with minor modifications to the input on a case by case basis. If modifications improve extrapolation (i.e., more realistic velocities and better velocity adjustment factors at higher flows) without deterioration of interpolation, then modifications will be accepted.

The agencies request the following material for each hydraulic model calibration run (always include run with unmodified input):

- (1) field notes;
- (2) input file (bed elevations, water surface elevations, velocities, substrate/cover, and calibration discharges for IFG4; bed elevations, water surface elevations, roughness coefficients, substrate/cover, and calibration discharge for WSP or IFG2), preferably on floppy disk;
- (3) table for each transect of "calibration details" with simulated velocities paired with corresponding measured velocities for each calibration flow (thus, model needs to be run for calibration flow); or, if several "1-flow IFG4" models are being run, table of each velocity calibration flow measured velocities with predicted velocities (e.g., measured high flow velocities with extrapolated high flow velocities from medium flow and low flow models, and similar treatments of medium flow and low flow calibration measurements);

- (4) table of velocity adjustment factors (VAF) for each transect and each simulated flow over the proposed range of the model;
- (5) table of "computational details" for each simulated flow, including calibration flows;
- (6) list of options used in hydraulic model;
- (7) map of site showing placement of numbered transects in relation to pools, riffles, chutes, large boulders, large woody debris, and other channel features; and
- (8) table of stage differences between flows and between transects, for example:

	T1	diff	T2	diff	T3
400 cfs:	91.20	0.10	91.30	0.15	91.45
diff	.10		.09		.10
200 cfs	91.10	0.11	91.21	0.14	91.35
diff	.05		.07		.05
100 cfs	91.05	0.09	91.14	0.16	91.30

We recommend limiting extrapolation to flows at which all VAFs are between 0.80 and 1.20, and at which no simulated velocities exceed 10.00 feet per second. If it is necessary to model higher or lower flows, additional field work to allow calibration of an additional or extended model will be required.

Where possible, tie benchmarks together. We review stages of zero flow in different transects and expect them to make a normal upstream progression. If transects are modeled separately, this does not happen and our model review is prolonged.

Other hydraulic models can be considered as needed if conditions preclude a 3-flow IFG4, but these should only be used with prior approval of the agencies.

### HABITAT MODEL

A major product of an instream flow study is a set of tables and graphs relating an index of habitat, such as weighted usable area (WUA), to flow. In PHABSIM, this is produced by HABTAT or HABTAV, with results being listed in TAPE 8. In the plunge pool analysis, which will be discussed below, an index comparable to WUA will be calculated manually.

Separate runs of HABTAT should be run for spawning and rearing or holding. Use cover for rearing and substrate for spawning in those cells where both are recorded.

The agencies requests that both HABTAT and HABTAV be run for rearing or holding, with the adjacent velocity option used in HABTAV. Model review will be facilitated by preparing a table showing, for each flow and species/lifestage, results of HABTAT, HABTAV, and the sum of these two sets of WUAs.

In studies with multiple sites, the tables discussed above should be provided for each site individually and for all sites combined. The combined or composite tables should have results at each site weighted according to the area it represents.

The final report, in which these tables are presented, should also include:

- (1) the preference curves used with documentation of agency approval; and
- (2) a list of options used in HABTAT and HABTAV.

#### Plunge pool analysis.

In some high-gradient, boulder- or bedrock-channel streams, the only fish habitat is in pools. This approach is based on the following assumptions about habitat quality in pools: (1) surface turbulence/bubble plume should cover about half the pool surface, and, as plume coverage increases beyond or decreases below half of pool area, habitat quality will decline rapidly; (2) pool area not covered by surface turbulence/bubble plume is valuable as habitat when depth equals or exceeds 0.5 foot or 10% pool width, whichever is greater, but any depth over 3.0 feet should be considered usable, subject to preference verification; (3) spawning habitat response to changes in flow in pools is best assessed by using standard IFIM transects with depth, velocity, and substrate measurements near tail of pool.

Pool habitat for juvenile and adult trout should be calculated as follows:

$$\text{Habitat} = \frac{\text{area of calm, deep water} \times \text{preference for ratio of plume area to calm, deep area.}}{\text{of plume area to calm, deep area.}}$$

The field method for plunge pool analysis requires establishment of permanent transects and vertical depth measurement points ("verticals") along the transects. We recommend at least 3 transects. Record distances between transects. These transects should be visited at a number of different flows of interest. At each flow, depth should be measured at verticals up to 3.0 feet deep. Depths should be recorded with corresponding distances along transect. The person conducting the field work should identify the boundaries between plume and calm water and record the distances along each transect where they occur. If velocity is substantially greater than 1 foot per second, that point might be considered to be in the plume if the boundary is not otherwise obvious.

Photographs from the same high vantage point should be taken at each measurement. Colored flags at reference points along each transect will facilitate interpretation of photographs.

## INTERPRETATION OF HABITAT MODELS AND DEVELOPMENT OF INSTREAM FLOW RECOMMENDATIONS

The agencies will recommend instream flows which will not reduce habitat for the most flow-sensitive species and lifestage. Flow recommendations based on model results are subject to field verification or "ground-truthing".

This approach has been oversimplified to "recommending the peak of the WUA vs. flow curve." However, our recommendations are tempered by our knowledge of hydrology of the site and effects of hydrology on fish (e.g., scouring of redds, incubation flows), agency management objectives and risk to species (e.g., greater emphasis on rainbow trout than on whitefish even though the more numerous whitefish typically occupy deeper, faster water), and modeled responses of coexisting species to flow.

Project proponents may wish to do time-series analysis. The agencies neither request nor endorse the use of time-series. However, if requested to consider results of time-series analysis, agencies will accept such analyses only over the range of flows for which the hydraulic model is accepted by agencies. In addition, any time-series of alternative flow regimes must incorporate a temperature-based metabolism factor, the habitat-temperature index (HTI), into the analysis, as follows:

If two different flow regimes, A and B, lead to two different amounts of WUA,  $WUA(A)$  and  $WUA(B)$ , at a given time, we can calculate a difference,  $DWUA = WUA(A) - WUA(B)$ .  $DWUA$  can be plotted against time and can be positive, negative, or zero.  $HTI = 2 \cdot (T/10) \cdot DWUA$ , where  $T$  is water temperature in degrees C at that season. HTI need not be used for spawning or incubation.

## MONITORING

Monitoring of effects of flow regime (fish population response, attainment of flows) may be required. The agencies may recommend changes in flow regime based upon results of monitoring.

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(Appendices omitted)

## Steelhead Data and Management Needs in Washington

by  
Peter Hahn  
Washington Department of Fish and Wildlife

The Washington Department of Wildlife, Fisheries Division is presently engaged in describing and prioritizing research needs for anadromous game fish (steelhead, cutthroat and Dolly Varden trout). Therefore, the material presented today is not necessarily in priority order. In addition to "research" needs, there are also various monitoring needs that could benefit management. The main categories of data and management needs related to steelhead trout in Washington are:

### 1. Ways of modifying the methods and impacts of forest practices (logging).

Much of Washington is forested land managed for timber harvest by private, state and federal entities. It is an important part of our economy. However, both sport and commercial fisheries also have high economic, social and cultural values. It is imperative that forest practices be improved. Sedimentation and debris torrents from mass wasting of roads and logged mountain sides need to be prevented. Fish passage through culverts must be allowed. Riparian habitat surrounding the stream, and "large organic debris" within the stream, both need protection and replenishment. Mechanized equipment must stay out of the stream bed. The Washington Departments of Wildlife and Fisheries both are active participants in the "Timber, Fish and Wildlife" (TFW) process in our state. Hopefully this process and others will lead to better management of our forest lands. It is important to be able to document and prove the benefits or detriments of various forest practices if timber harvesters are expected to change their ways.

There is a chain of events that must occur if real change is to happen "on the ground", this chain can start at more than one place:

- a. Someone must collect and analyze data related to perturbations of forest and stream ecosystems.
- b. Someone must state the consequences of forest practice actions (other than board feet of harvest).
- c. Agencies and the public must confirm the importance of preventing negative environmental consequences and achieving positive consequences.
- d. Leaders (state, federal and corporate) must state that their forest supervising agencies and companies are expected to be concerned and do something positive about these environmental consequences. They must also realize that what they do is part of the cost of doing business.

- e. Employers of timber harvesters must translate and convey these expectations to their field supervisors.
- f. Field supervisors must explicitly state what the loggers, skidders, haulers, cat operators etc. are expected to do to minimize environmental harm. They must also monitor and correct the action of those who do not conform.
- g. Those persons who fell trees, haul logs, build roads etc. must understand and conform to expectations that minimize environmental harm. Their actions are what impacts the forest ecosystem.

It is obvious that consistent, environmentally positive action from "a" to "g" is difficult when monetary profit is the controlling influence. It is extremely difficult when there is little, or poor, data that can be used to demonstrate consequences and formulate guidelines. The same logic can be applied to the subsequent needs stated below.

2. Controlling the detrimental impacts of urbanization.

The rapid population growth in our state is both a cause and response to urban and industrial growth. It means replacement of natural riparian and watershed habitat with houses, factories, parking lots, and highways. It means an increase in non-point source pollution such as oil dripping from automobiles, fertilizers and herbicides from lawn care, high runoff from paved areas and roofs, pet feces, and households wastes. It also means increased pollution from point sources such as factories, service industries, land fills and sewage plants. It can also mean direct disturbance and mortality for spawning and rearing fish. It also means more competition to catch the same number or fewer fish. We need to monitor, control and actively prevent the detrimental aspects of providing for more people.

3. Find ways to reduce mortality caused by dams.

Passage and associated mortality of smolts and adults in the Columbia and Snake rivers is an ongoing problem. Complete lack of fish passage is a problem at other dams throughout the state. Mitigation agreements need review and modification. Proposals for new, small hydro projects require consideration for cumulative effects.

4. Reducing fish losses due to irrigation, diversions and flow fluctuations.

The loss of fish due to irrigation diversions and low or non-existent instream flows is a factor for production of wild steelhead in eastern Washington. Agreement on standards and resumption of the "Instream Resources Protection Program" by the Washington Department of Ecology is desirable.

Some water diversions and fluctuations due to power production occur below dams in western Washington. Municipal and industrial diversions are also a problem. Where standards are lacking, they need to be set and implemented to protect fish rearing, spawning and migration.

5. Understand and manage the interaction between wild and hatchery stocks of steelhead.

Many more hatchery reared smolts are released into Washington waters each year than there are wild steelhead smolts. The survival of hatchery smolts is lower than that of wild smolts, and sport and commercial harvest rates are higher for hatchery adults, but there are still substantial numbers of hatchery steelhead that escape to spawn in our rivers. Genes from hatchery steelhead can become part of the wild population, and progeny of hatchery fish can compete with wild juveniles. We believe that both can be detrimental to wild steelhead. We attempt to maximize the harvest of hatchery stocks and limit the harvest of wild stocks in a variety of ways. However, there is more that we need to know about the genetic and competitive impacts of hatchery production on our wild fish.

The genetic impacts of two alternatives in hatchery broodstock management need to be better understood. The first is the use of hatchery stocks that are very different from wild stocks in run timing or other genetic characteristics. Some evidence from our research indicates that progeny from natural spawning of these types of hatchery stocks have much poorer survival than wild fish. However, harvest rates can easily be increased for hatchery winter steelhead because they return before most of the wild fish. These two factors tend to limit genetic exchange. The second type of broodstock management is the use of hatchery stocks that come from wild fish. These mimic more closely the genetic characteristics of wild fish. The genetic differences are small but the genetic exchange is great because they spawn at the same time (though not always in the same place). For both summer and winter steelhead, adult hatchery and wild fish return at the same time, making it difficult to differentially harvest them. Which alternative is better? We need to know the long term consequences of both types of hatchery management. There is great pressure to build more hatcheries and rear more fish, but this may not be the best, holistic answer. It is desirable to find ways to decrease the number or viability of hatchery origin fish spawning naturally.

6. Expand monitoring of wild stocks.

Although we are monitoring many of our wild steelhead stocks, there are many that we are not, except for limited harvest estimates. Measuring the spawning escapement of each wild run and comparing it to escapement goals, and adjusting harvests accordingly, is good but expensive. We particularly need more information on wild stocks in the Columbia River basin and for wild summer steelhead in Puget Sound and the coast.

We would also like to find and evaluate new ways of monitoring stock status, such as index escapements, acoustic monitoring of adult fish entering rivers, or smolt or juvenile counts or indexes. This might allow us to do more with the same or fewer dollars.

7. Improve our knowledge of minimum spawning escapement requirements.

We need to improve our understanding of the minimum spawning escapements needed to insure not only adequate production but genetically sound populations of wild steelhead. Our need is greatest in the Columbia basin. Understanding how different harvest practices affect long term genetic viability is also important.

8. Reduce disease and improve hatchery steelhead smolts.

In general, we would like to see more research on the management of our hatcheries. Rearing practices, broodstock management, disease detection and control, smolt quality and return rates would likely benefit from improved monitoring and analysis. Some research and evaluation is tied to mitigation hatcheries, but more is needed for our state funded facilities. Repair and maintenance of existing facilities is also needed.

9. Understand and manage marine mammal predation.

In several areas sea lion and/or seal predation appears to be a major mortality. The Ballard Locks of Lake Washington, the marine tribal fisheries near the mouths of the Snohomish and Skagit Rivers, and the lower Columbia River are several examples. We need to know what the mortalities are and we would like to find effective and acceptable ways to reduce this mortality.

10. Understand marine survival.

The mortalities associated with river migration, estuary and early marine life stages of hatchery steelhead need to be better understood. We have evidence that there is wide variation in survival rates for different rivers in Washington (Puget Sound rivers have very low survival rates for example). The use of hatchery fish would be more efficient if we were able to moderate some of the mortalities. This knowledge might also benefit wild stocks.

Better data and better enforcement and management (or elimination) of high seas fisheries may also benefit Washington stocks. Additional tagging and improved stock identification methods could aid this effort.

11. Find reliable and affordable ways to identify stocks.

New, improved or less expensive methods of identifying wild and hatchery stocks of steelhead are needed. Such improvements could help assess the

impact of mixed stock harvests, dam passage and high seas fishery impacts. New chemical marking and genetic methods need to be evaluated and incorporated into management.

12. Improve accuracy of harvest estimates, both sport and tribal catches.

We would like to increase the accuracy of our steelhead sport catch estimates, particularly for different regions of the state. We would also like to improve our knowledge of mixed stock harvests in the Columbia and Snake rivers and in the tribal fisheries near the Snohomish, Stillaguamish and Skagit rivers. We know there is some non-reporting of catches by both sport and commercial fishermen throughout the state, but we are not sure of the magnitude. We would like to know.

13. Improve our understanding of catch & release fisheries.

As the human population increases, the demand for catching fish increases. There is a limit to wild steelhead production, however, and catch and release fisheries will become more important in our management. We need to know how to balance the wants of fishermen and the needs of wild fish populations. Hooking mortality will become more important, especially for summer steelhead which are susceptible to angling over a long time period in warm water.

14. Improve our understanding of steelhead life history and critical habitat usage.

We could benefit from greater understanding of how available habitat within a river basin is used by various segments of a run of steelhead. Wild winter steelhead with early run timing are impacted by current harvest practices more than those with late timing. Other reasons may make substocks within a river basin more susceptible to harvest than others. Habitat alteration may have a more severe effect than predicted if it impacts critical habitat or critical life stages (such as over-wintering habitat). Databases that compile critical habitat information need to be supported and mandated for use by planners and those who set standards. We also need to know more about cumulative effects.

15. Improved coordination and sharing of management and research knowledge.

Knowledge gained from management experience, monitoring and research need to be shared between agencies. Critical standards need to be shared with or mandated for those responsible for land use planning.

16. Improved public education and involvement.

Knowledge also needs to be shared with our publics. Both adult and juvenile publics should receive our attention. Efforts such as "Project Wild", which train teachers, are very valuable. Translation of technical information into a format understandable and available to the lay public is desirable.

In conclusion, the needs related to things over which our agency has the most direct control are:

1. Hatchery and wild steelhead interactions.
2. Monitoring wild stock status.
3. Improving minimum spawning requirements.
4. Improving our knowledge and quality of hatchery steelhead.
5. Improving the accuracy of harvest estimates.
6. Evaluating and using stock identification methods.
7. Evaluating catch and release fisheries.
8. Knowing more about life history and critical habitats.

Unfortunately, we do not necessarily have the money to do all that we want. Those needs related to things over we have less control are:

1. Understanding and modifying forest practices.
2. Controlling effects of urbanization.
3. Managing sea mammal predation.
4. Understanding and modifying marine survival.
5. Reducing mortality due to dams and power production.
6. Reducing mortality due to irrigation and other water diversions.
7. Coordinating and sharing information.

We hope that others can help us in our search for better information and management.



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# **PUBLIC COMMENTS**



## PUBLIC COMMENTS

Session: Saturday, January 5, 1991

Introductory Remarks: Dave Hanson, Fisheries Coordinator

E. R. Boinowski, Vancouver, B.C.  
President of the Steelhead Society of British Columbia.

If you will grant me some indulgence I would like to lay out some of the concerns and the structure of our attempts to preserve steelhead. I would like to express my appreciation, at the holding of this symposium, dealing with agencies other than provincial fisheries has been very difficult for the steelhead society. It is tantamount to try to explain steelhead angling to a non-angler, you have the feeling, it's like trying to explain sex to an alien or something. I mean, it seems inefficient, messy, ah, risky, it's vaguely dangerous and ah, sort of not a lot of fun. And ah, to have agencies here who are dealing with that issue and to be able to try to explain how we are trying to compliment their efforts and how we are hoping that they will perhaps evolve in their role has been very useful to me. So I would like to express my appreciation to everybody involved. Briefly here, I have about a page and a half, I would like to lay out who and what the Steelhead Society is and what it stands for.

We are entering now, our 22nd year, comprising seven chapters through B.C. as well as one to each in Washington state, Japan and Germany. And it's a time to reflect how the major concerns of this organization have evolved from those of the intrepid group of anglers, who in 1970, alarmed by the declining catches of steelhead gathered to do something to save their beloved wild fish. If there has been any shift in emphasis of concerns, it is probably a change in focus from the size of catches. That was the original concern, of course, it's just like any group who is responding to a social problem, you know the crime rate or women responding to violence against women or focusing on something. You focus on the thing that is effecting you personally and most immediately, but you can waste a lot of effort working towards, trying to deal with something which is basically at the phenomenal, not really just a symptom of what we are really trying to get at. And through the dedication of twenty-one years of effort and study we have found that we would rather pursue fewer steelhead who are there in spite of the mixed blandishments of man, rather than line up with the dozens to quote harvest.

That's a word I hate and I keep hearing at these agriculturally metamorphosed sessions. Synthetic creatures whose very existences is an admission that we have failed in our stewardship of the air, the land, the river and the sea. The hatchery fish, for whatever public good it provides is a sorry testament to the fact that the forces of nature that combined over eons to produce such a magnificent creature. I mean we fish for steelhead rather than for chum salmon for a variety of reasons. This is testament that nature can no longer cope, and even as we artificially bread them they deteriorate, costing us more and more to produce fewer and less vigorous specimens. And finally they mingle with the still hardy wild remanent stock, weakening the gene

pool. I, for one, you keep calling them steelhead trout here; I come from the East, I started off as an Atlantic salmon fisherman and I for one am not threatened or displeased by what the taxonomist have done. The fact that it is now *Oncorhynchus mykiss*, in my romantic vision gives, names it as the progenitor of all the more specialized salmonid species that inhabit the west coast. And I believe that, I would like to believe anyway that it came from the sea, it occupied these niches. Others that die, and it doesn't die even though it's the climax species, the rarest. Others occupied other specialized species, they all died and symbolically then I think the steelhead, the value of steelhead is enhanced as it is highly prized for us. We don't fish, we choose not to fish for them, zillions of salmon to the same passionate degree that we do for steelhead. And in that sense it is a symbol and it is one that can engage the public imagination, in a way as a barometer of what is happening in the environment, that just talking about them in river angler terms never can. I think we have to recruit that kind of interest.

There is no such thing as appropriate mitigation. The paramount struggle is to preserve and to even restore and enhance the environment, the habitat that nurtures our steelhead. DFO (Department of Fisheries and Oceans, Canada) brought in a policy a few year ago which was no net loss, in other words if there was any loss of habitat there would have to be a make up of habitat or hatcheries somewhere else. We think this is a bankrupt concept because most of our streams are already in some state of deterioration and no net less does not provide for net gain or restoration in already diminished circumstances. I think that is important to emphasize, and why I think in a way the habitat sessions here prevailed in terms of concern. Because we don't line up, as I said, with the people in a carnival atmosphere so that fish can be released at one end of a stream and rushed past us as we snag them going by. I don't think that, we have discovered that is not why we go steelhead fishing, it may be why we go salmon fishing and I have heard about the scenes in Alaska and elsewhere from biologists and other fishers. But for steelhead there is a combination of elements including some degree of solitude as well as companionship. Some degree of connecting with the idea of wilderness that appeals to us and attracts us.

Similarly, we are not against any particularly industry. It's not jobs versus us. Whether it be commercial fishing or pulp mills. We are merely against specific methods. Every industry can exist so long as it uses methods, the employment methods that are not destructive of habitat and stocks of wild fish. When we are not a user group, we are everybody, and we are demanding that the special interest, it is important and this is another thing agencies tend to talk about user groups, we are not user groups, we may be elitists in the best sense of the term, in the sense that we make the best use of the resource but we are not exclusive. Anybody, a pulp mill CEO, a commercial fisherman, an Indian, can be a steelhead angler, but very few of us can be commercial fishermen or CEO's of pulp mills or stock holders, etc. I think we have to deny and reject that agency categorization of us. We represent everybody's interest. We are not a special interest group. Those special interest groups, the ones who are the destroyers or specific interests are the ones that have to come on line. The despoilers, they have to adjust their activities whether it be the use of purse seines that crush steelhead indiscriminately or chlorine which produces

dioxens which in parts per quadrillion research has shown is deteriorative and degrading to fish.

We in British Columbia have joined forces with larger organizations like the Western Canada Wilderness Committee. We have forced the government and first of all the Department of Fisheries to admit that there are dioxens in fish that are dangerous to human health and that insidiously they are weakening our stocks, and second that the methods have to change. Previously, it was jobs versus steelhead, as if it was an esthetics preference but it threatens everybody in the food chain. Most of all, even more importantly, it threatens the complex variety the kinds of wildlife and fish we have which I think is ultimately what we are really concerned about. So we are demanding that anybody that functions in a special user group use methods that are compatible with the preservation of steelhead because it is that rare symbol, the first to go, the most precious. We have already adjusted our methods, whether it be to give up snagging treble hooks, or even when necessary the right to kill a steelhead. But I would emphasize it might be a right we would normally choose not to exercise, however, we must strive for the restoration of stocks and the habitat that sustain them so that with healthy circumstances we would still have the right to kill a fish.

The moral choice must be ours, in terms of having a legal justified right, an allocation, of the resource to us. What I am not doing is advocating the killing of fish, the killing of steelhead right now, given the situation right now it would be like killing some sort of second cousin or being cannibalistic, even though I love to eat steelhead. But, I am saying we must push for a situation where the wild stocks are in the state of health where it is a moral choice. When one is in a position to take life one comes keenly to appreciate the value of it.

The greatest danger, however, in Canada and I suspect it is not so different in the United States, appears to be the obvious intention of governments in office in our case provincially and nationally to abdicate the responsibility of stewardship or even enforcement of the laws. The beneficiary of this dereliction of public duty are large private corporations. Who are not only given control over huge sections of natural resources merely for the purpose of making money, but are made exempt from the laws of the land and the needs of future generations. This is a formula for division and conquest that will become our greatest struggle, because there are the special deals constantly being made. We have a federal environmental assessment/review process which is being made a sham by federal governments exempting the largest diversion; and the most threatening diversion the Cammano Completion which is the hand over of huge sections of a giant river the Nechako and a threat to the Fraser the lifeblood of the province, to one corporation Aluminum Company of Canada now called AL-CAN. With pressure put on the scientist involved with the assessment there, we have tried to figure out why there has not been an absolute demand for a federal environmental review. Well we checked the Board of Directors of AL-CAN and we found out that not only are many of those connected directly to the Prime Ministers office but even one of our own an academic, Peter Pearce, who was head of the Commission and was flashed on the board here is now a board of directors and that might explain why some of these people allegedly champions of the resource

have been silent on issues like this. We have to be vigilant, we have to remain unified on these issues. Now, I can assure you this major diversion project which AL-CAN is not even using to create smelters but to create electricity that will be sold to the United States for their personal profit is just the first major diversion that we are going to be dealing with. California as you know is in its fourth or fifth year of a drought and I suspect that even now there are corporations such as North American Water and Power Alliance that is preparing to meet this need with diverted B.C./Washington/Idaho water. The Northwest trench is somewhere in the back of their minds. The hell with the consequences for the fish, the provinces, the states, British Columbians, Idahoians, Washingtonians, etc.

Now on the face of this fragmentation, the holistic approach of the native Indians to their land claims, if as they claim, they share our values of stewardship and preservation of the integrity of wildness may ironically prove to be the only major deterrent to the conquer and divvy up intentions of those faceless corporations and their toadies in government. So long as those who run either of these countries can keep us concerned about our sorted parochial concerns it will be much easier to do to either country as a whole whatever they wish. So we must resist and must garner as much support as we can from men and women of integrity in both countries to face our task and we must engage their imaginations because these are bigger issues and fortunately steelhead are a unifying concept. If we can communicate the value of these steelhead for a variety of reasons, we can recruit support. Right now we have joined forces with the Western Canada Wilderness Committee. It is a forty-thousand member group who have been instrumental in saving parts of the Queen Charlotte Islands for South Moresby National Park and the Carmina Valley which has the largest citrus fruits on the west coast anywhere. They are very willing to help us because they have come to understand what diversions like Cammano Completions mean.

Back to the approach we are taking as a non-governmental organization. And as I said at the outset, the rivers are the lifeblood of the land and we must keep them flowing free. The well being of steelhead and ultimately we have to make people realize, our own well being, is dependent upon them and we have to work together. So I am asking for us to form at least a coalition if not an international steelhead federation because I think otherwise we really don't have much hope against some of these forces. Thank you.

Pete Sarverall  
Chairman, Steelhead Committee of the Federation of Fly Fishermen

I would like to second E.R. Boinowski's comments, especially on the angling aspect and the value of steelhead. I would also second his appreciation to the agencies, the Pacific States Marine Fisheries Commission and the Northwest Association of Steelheaders for putting on the symposium the last couple of days.

I would like to touch on some areas of our concern, focusing on wild steelhead. We look at the threats to wild steelhead in five sort of generic areas: foreign interception that we talked about the other day, driftnet fishery both sanctioned and unsanctioned on the high seas, excessive commercial interception by our own citizens both in the United States and Canada. Notable examples being the Columbia, Skeena, Southeast Alaska and the Dean River where we have very large interceptions of a sportfish in a commercial fishery, often under the guise of incidental catch. There are also in many places on the west coast large tribal commercial fisheries for steelhead. Excessive sports harvest of wild steelhead with a couple of notable exceptions. Habitat degradation, dams, water diversions, timber harvest practices, urban and industrial pollution and pollution of the genetic resources with these hatchery fish. The last sort of broad areas is management of hatcheries.

We feel very strongly that hatcheries are an admission of failure. That the hatcheries signify that we have failed in our stewardship of protection of rivers and fish and that if the fish and rivers are in the proper condition wild fish will populate them as they did until our arrival here. Hatcheries also have some insidious bad side affect, they promote excessive harvests creating artificial demands in particular locations. They decrease the productivity of wild fish by intermixing with the productive strains of wild fish. The sudden introduction of huge numbers of smolts and fry have a deleterious effect on wild populations inhabiting the water shed. Maybe the most undesirable consequence of hatcheries is on us, promoting these awful scenes we see on the Cowlitz and elsewhere with hundreds of anglers pressed into one spot because the fish cannot go any farther. Their path is blocked by a dam, there are thousand of miles of unutilized watershed in the northwest that are either completely barren of fish or way below seeded capacity because of the preceding four things I have talked about. As a consequence you compress the anglers into a situation which is not pleasing to the eye, it is not pleasing to the psyche and it is not good for the fish.

Now we recognize that not all of the foregoing are under the complete control of the various wildlife agencies and departments. Indeed the commercial side, whether it is the domestic commercial interception or the high seas interception, most importantly habitat degradation are not within the direct preview of the wildlife departments and in this context I was disappointed really with the tone of the conference because I was hoping we would hear more about how agencies were going to do better here. How they were going to be more effective in the future than they have in the past, how they were going to interact more frequently and effectively to insure these myriad of laws, regulations and agreements in the habitat arena are observed. It doesn't do us any good to have timber practice laws that are on the books but inadequate enforcement. All of us who are steelheaders as well as managers have seen the consequences of these practices in the woods. Timber harvested to the water line, we saw slides where rivers are completely de-watered, where the stream channel is completely blocked with logging slash and really it is in this context as well that we find hatcheries objectionable because over the last 30 - 40 years hatcheries have masked the plight of steelhead. They create an artificial abundance while we have destroy the habitat so that the general public does not become alarmed until it is now almost too late. In the Columbia drainage, the greatest anadromous drainage

in the world, wild steelhead are at less than one percent of historic abundance and yet the Army Corps of Engineers, the Bonneville Power Administration and the Systems Operations Review will come to a public meeting such as this and claim that the salmonid population are only 25 percent of historic. That is bad, but it doesn't come to terms with the reality. One percent, in other words these fish are on the verge of extinction, whole races have been exterminated and all of this has been masked with tens of thousands of smolts that are resulted in a few thousand hatchery fish back to satisfy an angling public that has really lost its way about what steelheading is all about.

There are two areas that are under wildlife department control; sports harvest and hatchery programs. The Steelhead Committee of the Federation would like to urge that the wildlife departments promptly and aggressively exercise their responsibility in these areas. First by working harder on the interagency process to be more effective in habitat protection and restoration. That they emphasize wild production. Again with a few exceptions, most of our jurisdictions don't have area wide wild steelhead release. Unless and until steelhead are returned to their former abundance a minimum first step is requiring wild steelhead release so that the wild steelhead are not harvested along with these hatchery fish and therefore reducing the population of wild fish. We urge the department to work hard in preserving the tradition of free and unfettered public access to our steelhead rivers and resource. Clearly this is going to be a major challenge in the years ahead with the expanding populations here in the Northwest. Associated with that is to work with the sport groups such as the Federation of Fly Fishing to emphasize quality angling experiences. By this I am not proposing and the Federation does not champion fly only water. Fly fishing is a method of choice, not a method of regulation. But the quality experience is one that wherever it has been tried in the Northwest has been very popular with the public. To encourage ethical behavior astream and here a reduction in emphasis in our view is going to have a salutatory effect immediately because the steelhead will become more abundant in all these miles of river that aren't used and all of us steelheaders in this room know lonely stretches of river. They have no anglers on them because they have no fish in them. We need to fix that. We urge the departments to deemphasize hatchery reproduction. To deemphasize, as E.R. said, the agricultural metaphor of harvest. We don't fish to harvest we fish to angle. And then lastly, to recognize that mitigation is not possible. Mitigation again is a bankrupt notion. We have to protect and restore what we have. We can't enter into compromises with those who would despoil habitat. The habitat we have already compromised. What is left is 5 - 10 percent of the original resource. To ask us to compromise on that basis is unreasonable in our view and unethical and if we were going to compromise maybe we should go back to AL-CAN or WEYERHAEUSER or the users of public resources and compromise on the original basis. I wouldn't mind having 50 percent of the original resources. Thank you.

Jim Beausard

Oregon State Enhancement Board - Represents public at large on that board  
Civil engineer by trade - worked in Oregon, Washington, California, Idaho, Montana,  
some in Alaska.

I feel that perhaps I represent the average sportsman and fisherman. Having sat through your meetings for the last two days and observed your proceedings I have some observations that I would like to make about these proceedings. I would like to talk about a few ideas and concepts of maybe where we go from here.

Bear in mind that I am not a biologist, that the average fisherman that we deal with is not a biologist and as has been said before perhaps the profile of the sportsman is coming closer together than it has ever been before. There was a time perhaps when there was a diversity between one user group and perhaps the professional user groups. But we are finding that the average fisherman is better educated, more concerned about the resource, totally able to understand something about biology, hydrology, water chemistry, understand something about the legislative process. They are willing to spend time and effort to participate in the public process. As I have observed from the meetings, I am quite impressed with the various departments that are represented here, with your professionalism. The amount of information from the stock status reports that

( turned tape over - missed some comments)

over the last 30 - 40 years. Habitat restoration is a big word, it is a big concept and if there is one thing that I have observed in the panels, as the questions were being asked I thought I saw in the faces and in the comments of those participants discouragement. If there was every a time when we need it, to be aggressive and hot on fire it is now. I have talked with a number of supervisors and administrators and they are saying our people get beat are beat down on a regular basis from the public, the legislature, financial corporations and it is difficult for our habitat people to keep their head up and move forward. Research needs, there has never been a time perhaps when we need it more. Research and hard data. As I set and listen to commission meetings and I see users groups represented by legal council, the first thing they ask for is let's see your hard data. If there is a universal short coming, it is the lack of scientific hard data that we must have. We have talked about management practices and I think we need new ideas, we need to challenge some of our past concepts and practices. I think that organization comes from the top down. We need the united effort here today. If I never have a better opportunity to talk to a complete collective audience of top supervisors in this forum that have a greater impact on the steelhead resources than I do here. For you that are top managers, it is incumbent upon you to take the lead and to challenge biologist with your ideas. Challenges to the concepts that we have used in the past; are they effective, are they right or are they cockamamie ideas that we need to scrape and face the public and say that this is wrong. Let's move forward. We need to encourage young professionals to pick up the lead and move forward. We need to utilize all the top senior mangers that are capable and not discourage them.

Where do we go from here? I think we need to restructure our fish and wildlife departments from the top down. We need to strengthen our departments from within, but we need to have the strongest and the dominate within our states and provinces. Typically the department of transportation, which I work with most in my line of work are very strong and very dominate within the state political system, both in political structure and in financing. Education, agriculture, forestry are all dominate. Fish and wildlife, natural resources have always been on the back burner.

We need to develop positive aggressive leadership that says we are going to be aggressive, we are going to be dominate, we need the financing and we have the backing. The people that I contact and I travel with original meeting throughout the state in my job on the restoration of habitat touches base with fishermen throughout the entire state. There is one common cry, we need to work together, we need to do this, we recognize what needs to be done, we need the support. Perhaps the most misunderstood amongst the average fisherman that I represent is how capable you are. The public doesn't really understand how good you are, how professional you are, what you can do if you had the ability from a financial and from a legislative ability to move forward. We need to get that across to the public. We need to look more professional and I might add that I am very impressed also with the British Columbia representatives here. I think that if you represent a very professional look and demeanor about your approach and about the information that you deliver. We need to look more professional throughout the entire area, from our district biologist to our offices to our people. The concepts have been expressed here before, the comment that I think is important is that interagency action for us to promote and protect the steelhead we need to have a good interfacing with out water quality divisions in Oregon that is the Department of Environmental Quality. We need to deal with the Soil Conservation Services, the BLM, the Forest Service. We need to let them know that natural resources are not going to be ignored, that we demand attention to our requests and that we will file suite, that we will do anything to protect our resource and that has not been the common practice in the past. I have spent 30 years of my professional career in corporations. I can tell you that corporations spend a great deal of time in preparing and having their ducks in order. They research their adversaries, they understand exactly where they are going, they spend unlimited amounts of money to have professional help and they are organized when they go forward with a financial project. I have recently been hired by a corporation to represent them in a land action planning process for a renewal of a hydroelectric project. It doesn't come due for 10 years. The project starts 5 years prior to the relicensing. Frequently, corporations and this particular corporation is spending a million dollars a year for professional fees for 10 years for relicensing of just one hydroelectric project. State agencies need to be 10 years in advance on those same issues, they come up every 50 years. We have an opportunity for some great advancements and mitigation efforts and we all have that every 50 years. A million dollars a year for 10 years is not too much to spend for a billion dollar resource, a multi-billion dollar resource. I would also like to talk a little bit about some of the long range plans that I would like to see us go forward

We didn't talk a lot about long range plans, other than yesterday I heard the kind of wish list of the departments. I think one of the key things is that consumer profile. We need to know who is the fisherman. What is the age profile, what is the differences and that is changing because as I travel through the state I see that changing from what it was 2 - 3 years ago. We need to increase our habitat inventories, research data, genetics is really important. The public knows that they are willing to support that and I was really surprised that Oregon has hired a geneticist. Washington has said that they wish they could afford the luxury of a geneticist. The leading agencies that have the total responsibility over a multi-million dollar resource and we have one geneticist in two states. That tells us about priorities, if that was the corporate world they would hire five or six. We need to look at water quality, be aggressive. We need to be aggressive in instream flows, screening, and in legislative action. In many of the departments and agencies are starting to do this recognizing that we have got to get out and start reorganizing from the top and have legislative action. We need to have increased habitat legislation, increased water rights and water quality legislation, along with enforcement of the ones that we have. Probably looking at not being frightened or timid about user regulations. Perhaps, if not maybe the most important, but maybe the second important at this stage is publication education.

We need to get out and really bring the public up to speed. As I mentioned, they need to know how good you are, they need to know where we are going and I think I heard it expressed its not a true meeting. We do the same thing, we advertise regional meetings by radio, paper, advertisements, we try to talk people into coming. We may have 4 - 5 people come to a regional meeting. Twenty is a good number and the people who come in my observations are not representatives of the elite fishing group. They are professionals they are busy people, they know that you are a professional and they expect you to move forward with good programs and policies. Typically what we hear are the people that have a gripe, who like to attend meetings and are not necessarily representative. I am not sure and I am not a professional in gathering that kind of information, but I know perhaps questionnaires and there are other professional media that we need to find out what it is that these people want and we need to be tied closer to them. It is not that we are going to proceed with what the average fisherman or group wants. I think if there was ever a time for professionals to recognize that when you make a recommendation you should stand firm on that. We need to be able to say no. We need to be able to say no to the public, the special interest groups, the forestry department, the agricultural divisions, the department of transportation, mining, special interest groups that would have more today at the expense of better tomorrow, we need to be able to say no to the legislature when they have cockamamie ideas that are not realistic. But is not just being a dominate bureaucrat, its being a positive professional, we know where we are going, workable solutions, we have got some really brilliant top people within our legislature who understand fisheries, habitat, biologist. But we haven't done our homework for the large numbers who don't have this background because they may have strong interests in other areas. We need to professionally bring them up to speed, to what the demand of this resource is and to what the constituent level concern really is.

In closing, the major, major problems as we sat here and talked and I noticed when I said the comment about corporations are willing to spend a million dollars a year. One issue, financing is the bottom line and I have talked to many of you over the last two days and you are saying that we just don't have the money for this, we don't have the money for that. That is where we need to make a major overhaul. Fishing licenses are \$18 - \$19. Ten years from now that could be three times that amount. I represent utility districts and we are telling people today that your water 10 years from now will cost three times your water bill, what it is today with the increased water quality and chemical testing and the advances that are being required by statute. I think that the sportsmen and I have talked to people as I go around the state saying would you be willing to pay another \$5, would you be willing to pay another \$10 to have a better resource. Universally, I have only heard two people in the last year, at public meetings, saying no I wouldn't pay more. They are willing to pay, we need to let them know, we need to refinance. It is a financing through very creative work with our legislatures, budgeting process and its that coordination and education process that we need to pursue. I guess with that I will just leave you with the comments that I am not discouraged. I think steelhead has a bright future. I don't believe that the degradation of habitat is exceeding what we are restoring. I think we have turned the corner, at least in Oregon, perhaps five years ago. Public awareness is behind us, we are starting to make some inroads into that. Certainly the future could be much brighter but we need more technical assistance from you. Thank you

Louie Lemke - Vancouver, WA

I am a member of Southwest Washington Anglers and Association of Northwest Steelheaders but I don't claim to be representing them. I am speaking or will be speaking just my own personal views and that wasn't planned before I came in here because I thought that there probably won't be an opportunity because there would be so much input but I had seen the opportunity and I guess I couldn't help it. Put in my nickels worth and what I have to say is certainly not going to be nearly as polished as what you have heard before now because it is ad hoc.

I guess the reason that I am up here is because I have a really burning, and have had for a long time, desire to see our steelhead resource maintained for not only my benefit and the present days benefit but, of course, for our children to come. And I am disappointed that I can't go out steelhead fishing and hook or catch near as many steelhead as what I did 25 years ago when I was not nearly as knowledgeable or as efficient as I am now. So something has happened in the mean time that caused that besides me getting older. Slower on the uptake, maybe when I should be on occasion. But what I am frustrated at is this . . . what seems like a stock answer that just has been alluded to here. You go to the agencies and they say well we just don't have the people, we don't have the money, we can't do it. And what I see happening and I guess because I have always lived near the coast I see something that maybe people inland don't see with regard to the fish that ultimately, some of which ultimately get inland. Things like the Marine Mammal Protection Act, I believe in 1972, this is now and has been for sometime, essentially a sacred cow. And the

only thing that is un-sacred about it is you hear the conversation about commercial fishermen and you see it in the paper where they, not the paper I shouldn't have said that, it doesn't appear in the paper. In talking with other fishermen, where they say they are taking pictures of marine mammals offshore and so on and what they are taking pictures of them with is 30.06s and that sorts of things and the reason they are doing that is because they also are frustrated. The reason I am frustrated is not because I see so many of them but because I see the result of them and the steelhead that I catch I see lots of them with scars on the particularly in the area of the anus, from underneath where sea lions or seals have nailed them and their tails are all ripped out and chunks are gone off their tail and you can see where they have got a tail in the mouth of a seal or sea lion. That is not just an incidental thing, that's a big thing. There is a high percentage of those and I realize for all those that I see that are scared there are a hell of a lot of them that I didn't see because they never got in the river for obvious reasons. You talk to people who fly our coast and I have had the good fortune to fly into a number of rivers, not a number of them, but about 3 - 4 of them in Alaska and fly along the coast clear up even in the Bering Sea area and man there are lots and lots of marine mammals out there and its, to me just another case of the pendulum swinging extremely one way where we had maybe a real problem with out marine mammals. They were really getting knocked down and now the pendulum has swung clearly around the other way. And the fisherman all talk about it on the bank like this gentleman said but not a God damn thing gets done about it. I mean the agencies realize it, they aren't stupid, they know what's going on. But nobody does anything, why don't they do anything.

The other thing I have to comment about is our forest practices act and the enforcement of it. And the desire of our fishery agency to do something about what's going on in the rape of our forests out here, which are nearly complete in Washington and Oregon, now and that is why all the big timber companies have moved down south because that is the only place they got anything left. We do have laws, they are weak and there are lots of loop-holes in them but the agencies just don't enforce them. A hydraulics permits the state of Washington a rubber stamp deal. I spent God knows how many hours this last year observing streams that have been degraded by logging, taking pictures, sending the information to agencies, having meetings with them and . . . Yah, you'll hear from us in a week or 10 days. Six months later I haven't heard a damn thing. In the meantime they are just knocking the socks off our habitat.

You go out and look at what is happening to our streams and it's no wonder that I can't catch as many steelhead as I use to and I am not complaining about that, What I am complaining about is what is happening to our resource because of the lack of enforcement of even the laws that we have now, of doing something about some of the laws that we have now that need to have something done about them. And God dang it! Unless someone gets up on their arms about it and does it, it ain't going to happen. I found out about it the hard way from an individual standpoint. My own efforts that it isn't going to happen because I'm just whistling in the wind. I can talk to them and they know it, they aren't going to do anything about it. And its like the first gentleman said, until you get an international federation together or something

to go after them to let them know that somebody really means business it just doesn't seem like it is going to happen. But that is so cumbersome in individual cases I don't even know how that can happen. So I really have in addition to the love of steelhead I have a real frustration for the obvious things that I know are major consumers of our resource, both hatchery fish and native fish. I mean the seal doesn't give a damn, its just a fish to him and he doesn't care weather its a salmon or steelhead or a sea-run cutthroat or whatever.

So those are two areas that I am really frustrated with and you know there are a lot of other obvious ones; the problems with commercial fisheries and the pollution which is a much more insidious thing. You don't see the sulfur dioxide going into the area and then being rained out into the rivers to make an acid rain and you don't see the dioxin going into the river and those sorts of things so I guess to the general public they don't think that is a particular concern because they can't see it. But even the obvious things like the marine mammal, the forestry practices that are going on or have gone on and still are going on, even those things are not getting addressed so you know there is not sense in me as an individual trying to take somebody to takes about their sulfur dioxide emissions and their dioxin emissions and the hundred thousand gallons or whatever the hell it was that was dumped into our local Sandy River here the other day because they had to do some maintenance and they didn't have any way of voiding it, so they just dumped it into the river. Those kinds of things they just go on day after day and sometime the Department of Environmental Quality will issue a hand-slap fine of \$5,000 or \$10,000 fine which gets appealed and they end up paying \$500 or whatever. It's admittedly the old story of big money talks and I know it is and it really is frustrating to me and I and a lot of other people of the public really don't know what to do or how to go about, like a say we try to go to our public stewards and not public stewards but public agencies and ask for them to take action and to do something about the obvious things but they don't do it. And, sure, I am sure that manpower and lack of money is a major factor in that but I don't think that it is the only factor. Well, I have said my nickels worth. Thank you.

Peter Vales  
Fishery Biologist - Masters from Oregon State  
Does contract work for state and federal agencies

I learned how to fish when I was about 12, from my grandfather who has fished for about 40 years through Oregon and Washington streams and rivers. And I guess I got my love of steelhead and steelhead fishing from those experiences. And I guess he and I have both seen, over the years, the steelhead runs decline and I guess if there were one word to describe the steelhead management it would be kind of a failure to sustain and perpetuate steelhead fisheries. I think that there are a lot of reasons and a lot of things that the state agencies can't do much about; logging, urbanization, pollution, and things like that. But there are something that the state agencies can do something about. And one thing that distressed me about these meetings was

for the concerns we have exhibited. Just to close I would certainly like the idea of trying to reclassify conservation, sportsmen, anglers as public interest as opposed to special interest, because I certainly agree with those sentiments.

Jim Burn

Biologist with Washington Department of Wildlife.

I would like to speak as Jim Burn, private citizen. I have attended both days of the conference and I would like to make a few observations. The first was that both days of the conference listening to the talks that were presented, I was struck by the great deal of commonality between the problems and needs of the different agencies. But when we ended yesterday, it seemed as though we put all these things on the table and we just left them there. I didn't notice any attempt at making some sort of a technical working group or a coalition to try to put these concerns or piece this information together. Where all the agencies from the states and B.C. could have an exchange of information. And the first couple of speakers who spoke now from the sports group, right away the first thing they advocated with an attempt at coalition to work together to solve these problems. Now I am not naive enough to think that a lot of this type work doesn't go on behind the scenes amongst you people at the dais during the course of this symposium. So I hope that kind of networking and liaison is going on or will go on.

And the second comment I would like to make is directed towards the public at large. I think that all of us have an interest in the resource or we wouldn't be here. But I think we need to realized that the people that control the purse strings in the legislatures, they are hearing from a lot of differently interests. There are crime problems, health problems and their are a lot of different people competing for a certain amount of tax dollars. And I think that if we want to improve the conditions for fish and for the environment at large, we have to make our voices known to the people in power and the people in the legislatures, so that they will know that we are aware and that we do want some help. And that our concerns are as valid as crime, education and all these other competing demands for that tax dollar. Thank you.

Fred Gaffney, ADFG

I would like to respond to the first of Mr. Burns concerns. The purpose of the symposium was rather ambitious. This is the first opportunity that many of us have had to talk about coastwide steelhead management. We are also in a fairly formal setting and as a scientist I think you understand that in a formal setting, it is difficult for scientists to talk candidly. I am a bit disappointed that we didn't come up with the kind of action plan and consensus that I thought possible. However, we have made progress.

From my perspective, and I think that I can speak on behalf of the PSMFC, this topic is not going to die. We are going to make progress on a coastwide basis and there will be opportunities in the future for additional meetings and workshops. Perhaps, several years from now we will sponsor another meeting exactly like this.

So I do share your concerns and I want to let you know that we will have a proceedings from this workshop. That's a good start. We intend to have a fairly wide distribution of the proceedings to members of the public and fishing organizations. We are constantly getting requests for summary information, the kinds of information that constituents can take to their legislator, to newspapers, for whatever purpose, to get the word out.

Frankly, I have been very surprised and very pleased to see members of the public sit through three days of meeting, that's not an easy task as has been pointed out and I certainly appreciate the effort.

E. R. Boinowski, Vancouver, B.C.

I know that I have taken up more than my time, but I would like to say just one thing. In conclusion, regarding what this panel here to the legislation said and that is that in Canada at least we have been doing surveys every five years. And we don't have to be apologetic about arguing with other groups for resources for fish. I am sure this is a microcosm or smaller scale version of what is true in the United States, but too often as scientist and as bureaucrats were trained and beaten into operating in one level of analysis and we are most comfortable with that. Whereas, I think what we have to emphasize for example in Canada we have discovered its a country of 25 million people, 7 million people a year go fishing for an average of two weeks. What other activity other than living, breathing, procreating, ah you know, engages that kind of interest. We don't, we have to go beyond arguing against. We are not arguing against help in terms of dollars. What we have got to show is in terms of the help in the nation, in terms of individual interest, we are not a special interest group and certainly if we can engage the interest in the environment in general and emphasize the symbolic value of rivers. We also have been doing surveys on what motivates people to fish. The first reason they go is for solitude and the second reason is for connection with wilderness and the third reason has to do with something like the enjoyment of the environment in general. It isn't even for a specific species or for large catches, even though we use those as anglers for expressing our index of concern, because it is the first thing that we notice. And the nice thing that we have in common with biologist and anglers is that we do notice the symptoms of malaise in the streets. But let me emphasize that with those kind of statistics that we should not go cap in hand to legislators. We should not go cap in hand and argue we are a special interest group. The data are there, economically and in terms of participation and in terms of priorities we are an intergrowth to the way the population functions. And I think that we have to go beyond that kind of level to emphasize why the resources should be reorganized. Certainly, that is what I am going to be doing in the new year, going to our deputy minister of the environment

and arguing that kind of issue and I think that is what nongovernmental organizations can do. Whereas agencies can not really do that because they are just being their own grunt as far as good legislature is concerned. Thank you.

Larry Stalke  
U.S. Fish and Wildlife Service

I have traveled a good distance to attend this symposium, from New England. I work with the anadromous program in New England, primarily Atlantic Salmon. But it is amazing that the past two days and this morning almost every single issue that has been brought up here I can relate to in New England. There is not a single question that has come up here that we don't ask ourselves in New England. We have far more people, urbanization you wouldn't believe, but there is an interesting thing. The gentlemen that just stood up and talked about what do you do when you leave this place, so often we attend a symposium, we lay it all on the table and then we all walk away and then six months later we say why did I attend, what did I accomplish?

Now there are two things that we do, maybe a little differently in New England, than you do out here and one of them is we hold every year a week long session. It's called a working group meeting, in which federal agencies, forest service, NMFS and Fish and Wildlife service, and I would say 10 - 11 state/fishery agencies, we get together for one solid week. It is similar to this type of meeting but the public is not involved, its a smaller group. We bring papers, they are laid on the table, they are discussed, but at the end of the week we walk away with a document and the document contains status of all the resources we are dealing with in New England primarily, Atlantic Salmon. Also American Shad. We look at the data needs, the research needs, funding problems, etc. The document is not an agency document, it is the committee document, it goes to all the state agency heads, regional directors for the Fish and Wildlife Service, NMFS, and forest supervisors. It is also released to the U.S. Commission relative to the Nasko Treaty. It is used for negotiations, it's also used by the agencies to go after funds, etc. It is also released to the public. We find that is a fair method to stay on top of the resource issues we are dealing with. To put those issues before the public so that they have some understanding of what is going on.

Secondly, I think that most of us in New England now realize that the resources we deal with are public resources, no matter how you look at it. We have a very diverse public in New England. We feel that public outreach is probably our number one priority. In my particular position, I coordinate a river program. I do have to deal with data, I have to deal with the biological/political/social issues that exist. But I also try to spend 50 percent of my time in public outreach. And I really try to attach the public school systems. To get in with the kids. Use not the Atlantic Salmon resource or the American Shad resource as my topic, but the river systems we deal with. That these systems are very important. The integrity of these systems are very important

and that they are important to the people of New England. We move from the schools into the cities and towns and I think that we have seen in the past five years a real change in the attitude of the cities and town along most of the New England rivers that were so degraded. I think that many of you may have read about the degradation of many of the New England rivers. But these cities and towns have now jumped on top of things. They are starting to see the real importance of the rivers that run through those cities and towns. But you can't focus, at least I find, you can't focus on the fisheries issues. We have to focus on the broad spectrum. The Fisheries issues are just one particular segment of that ecosystem. And I think that when you really begin to work with cities and towns at least in our area, whether its nature trail, you're not dealing with fish, but whether your dealing with nature trails or looking at some bald eagles some of your ospreys that come in, bringing school kids in along your river systems. If you can get the towns, the city and towns interested, where they really thing they have an asset. I think that we are one heck of a way down the road to preserving, conserving and enhancing or whatever we are trying to do with our resources. Those are just some of the comments I would like to make. Thank you.