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Federation of Fly Fishers

FEDERATION OF FLY FISHERS
CATCH AND RELEASE

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Changing the Rules Midstream

New FERC regulations undermine fish protections at hydropower dams

by Rebecca Sherman
— *Hydropower Reform Coalition* —

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The Energy Policy Act of 2005, a 551-page tome signed into law in August 2005, contained one small provision that the hydropower industry labored ten years to pass. Contentious Section 241 of the Energy Policy Act created two new processes to challenge environmental protections at hydropower dams. One process is a 90-day "trial-type" hearing; the other is mandatory consideration of proposed alternatives.

Before explaining why these processes are, by design, a bad idea with consequences for fish across the country, let's look at the state of hydropower dam management today. No doubt hydropower dams add value to our society, but a reasoned examination shows both a positive and negative dimension to what are, at base, big pieces of concrete.

> *"Dams with hydropower facilities have their own particular suite of impacts on fish."*

What Dams Do

Dams take a wondrously dynamic thing – a river – and turn it into a controlled system. In doing so, dams block the natural migration of fish species, stopping sea-run fish in their path and fracturing resident populations into isolated segments. Instead of permitting sediment and debris to tumble downstream, dams keep these critical habitat elements behind their concrete doors.

Dams with hydropower facilities have their own additional suite of impacts on fish. Hydropower dams manage rivers for power generation, fluctuating water levels in downstream corridors and upstream impoundments to match electricity demand. Unlike a natural flow regime with a gradual, seasonal cycle of rain and drought, flow fluctuations take place on a daily power cycle — the river runs when we turn on our coffee pots and computers at 9 a.m. High flows erode habitat and flush gravel and sand, while low flows strand fish in pools or on shorelines. Hydropower dams reroute rivers through pipes to maximize the watt per cubic feet per second (cfs) ratio, leaving the natural river bed severely dewatered or even bone dry, sometimes for miles. This

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FROM THE PERCH — EDITOR'S MESSAGE

Getting Technical

by Jim Yuskavitch

Regular readers of *The Osprey* know that the subjects this publication deals with are as varied as the challenges that confront both wild fish advocates and wild fish. Some of our authors take on government policies that are bad for wild fish and advocate for better laws and rules. Others offer their opinions and insight, while others speak eloquently of their experiences fishing for wild steelhead on the rivers, reminding us of why we are all working so hard to save them. We do our best to offer something for everyone over the course of the year, with an eye to the issues that are timely and appropriate.

With this issue of *The Osprey*, we get a little technical, as we are inclined to do sometimes. But for those readers who might roll their eyes at the thought of plowing through a scientifically-oriented article, consider that "those who control the language control the debate," and the realm of wild fish conservation has, over the years, become increasingly technical. To participate most effectively in that debate, wild fish advocates know that they must be as conversant in the science of fisheries as they are in policy.

We have several articles that fall into the field of science in this issue, whose authors — fortunately for those of us without scientific backgrounds — are able to make their subjects interesting and understandable. They will fill you in on the details of steelhead straying in Oregon's Deschutes River, what's been happening with the ten-year decline of wild steelhead stocks on British Columbia's Vancouver Island, and that perpetually frustrating issue of hatchery steelhead impacts on wild steelhead. Take the time to read these three pieces — they are easy going and you'll be glad you did.

Hard science aside, we also bring you the usual fare of timely policy and issues pieces as well, including an important cover story outlining how the Federal Energy Regulatory Commission has moved to make it easier for hydropower dam operators to legally avoid protecting fish populations from the impacts of dams and what is being done about it, as well as updates on the Klamath River basin crisis and southern California steelhead.

As always, we think that you will find the subjects covered in this issue enjoyable, informative and useful in your ongoing advocacy for wild fish.

On another note, the January 2007 issue of *The Osprey* will mark its 20th year of fighting for wild steelhead and we have a special issue planned to celebrate the occasion. We're looking forward to showing it to you.

Back Issues of *The Osprey* Available On-Line

Back issues of *The Osprey* are now available for downloading from the Federation of Fly Fishers' website. Available beginning with Issue No. 1, published in January 1987, this archive will prove invaluable for researchers, natural resource managers, wild fish advocates and anyone else with an interest in wild steelhead and salmon. The back issues may be accessed at:

www.fedflyfishers.org/conOsprey.php

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The Federation of Fly Fishers is a unique non-profit organization concerned with sport fishing and fisheries

The Federation of Fly Fishers (FFF) supports conservation of all fish in all waters. FFF has a long standing commitment to solving fisheries problems at the grass roots. By charter and inclination, FFF is organized from the bottom up; each of its 360+ clubs, all over North America and the world, is a unique and self-directed group. The grass roots focus reflects the reality that most fisheries solutions must come at that local level.

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CHAIR'S CORNER

Upper Columbia Steelhead, Part II

by Bill Redman
— Steelhead Committee —

EDITOR'S NOTE: This is the second of a two part article on Upper Columbia Steelhead. The first part (published in the May 2006 issue) reviewed the last 50 years of history of these declining steelhead stocks and the recently filed lawsuit by the Federation of Fly Fishers and other conservation organizations in opposition to: (1) the ESA downlisting from Endangered to Threatened; and (2) the new NOAA Fisheries Hatchery Policy, which combines wild and hatchery steelhead for ESA listing purposes.

This part concludes with a brief discussion of some of the science related to local broodstock hatchery reform (heavily used with Upper Columbia Steelhead) and a review of some alternative strategies for recovery.

Hatchery Reform

Agencies at the federal and state level are basing a large part of their recovery efforts on hatchery reform. For example, reform based on use of local or locally adapted broodstock injected with some percentage of naturally produced broodstock is a major focus of the Washington Department of Fish and Wildlife (WDFW). While it's better to use wild and local hatchery broodstock than transplanted broodstock, hatchery reform is still early in implementation and unproven as a recovery strategy. There is no guarantee that it will be successful in recovering self-sustaining wild stocks. Indeed, the evidence suggests otherwise. Yet this entire strategy is based on the assumption that this type of reform will be successful.

The Salmon Recovery Science Review Panel (RSRP) consists of "seven highly qualified and independent scientists" who provide scientific counsel to NOAA Fisheries. In their meeting with NOAA staff in the late summer of 2004, the RSRP reported that "the bulk of the evidence indicates that, on the whole, hatchery fish are not equivalent to wild fish, genetically or phenotypically." ... "Relative fitness of hatchery fish (in the studies examined) declines regularly with the number of generations in culture. An exponential curve fit to the data indicates that fitness is lost in excess of 20 percent per generation. ... hatcheries will never produce salmonids with the same evolutionary potential as those reared in the wild." It should be noted that the RSRP studies examined were only those that used local native broodstock for hatchery supplementation, transplanted broodstock having previously been proven ineffective. All of this puts the NOAA Hatchery Policy and the WDFW Upper Columbia Steelhead recovery plan squarely at odds with NOAA's primary scientific advisors. We go with the independent scientists.

> *"We must continue managing Upper Columbia Steelhead as Endangered regardless of NOAA's downlisting to Threatened."*

In another report, Bruce R. Ward, a Fisheries Scientist with the Ministry of Environment in British Columbia, released his findings: "The Case for Wild Steelhead Recovery without Artificial Fish Culture Intervention," based on his extensive review of steelhead hatchery supplementation experiments. Three quotes from his report pretty well cover his findings. (1) "Little evidence is available to support the contention that hatchery steelhead can serve as a tool to re-build the wild population directly through the spawning of hatchery returns in wild rivers. Indeed, the evidence suggests the opposite may be true." (2) "Supplementation can reduce the natural spawning fitness component in the integrated wild and hatchery spawners, and this reduction in wild fitness will persist for a number of generations after the termination of supplementation ..." (3) "In summary, the relative risk of employing hatchery fish as a conservation tool appears high in comparison to allowing natural recovery. The latter appears entirely possible and relatively rapid for a productive stock where habitat remains more-or-less intact and relatively productive."

Add to these studies the comprehensive review described in Bill Bakke's article on the front page of the January 2006 issue of *The Osprey*, and the evidence builds.

Alternative Strategies

The question remains: What will the strategy be if hatchery reform fails? We suggest a few strategic alternatives for WDFW's Upper Columbia Steelhead plan:

1. Continue to manage Upper Columbia Steelhead as Endangered based on the very depressed numbers of wild fish, regardless of NOAA's downlisting to Threatened.

2. Establish a robust wild steelhead sanctuary in the Upper Columbia region. Although we applaud WDFW setting aside a river, the Entiat River, as a wild steelhead river, we are concerned that it will not portray the full potential of a wild fish only river, because of its small size and the threat to the fish of very low water. The Wenatchee system would be a much

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plumbing, and the transmission lines that bring electrons from the dams to our coffee pots, have terrestrial impacts on and around the river corridor.

Fifty or so years ago, when most major dams were built and salmon runs were healthy, putting utilities in charge of rivers didn't seem like a terrible idea. In effect, we were handing a treasured public resource, our rivers, over to private control. Today, with limited quality habitat available and salmon runs in decline, we need a better balance between power demands and river health.

That balance is chiefly managed by a federal energy agency, the Federal Energy Regulatory Commission, or FERC. FERC is responsible for administering operational licenses for all non-federal hydropower dams that affect navigation, interstate commerce, or federal property. Licenses last for 30 to 50 years.

In the Pacific Northwest, there are nearly 150 licenses presently managed by FERC. That number only increases as more utilities and companies apply to build new dams, new hydropower facilities on existing dams, and tidal instream power devices.

When older dams must renew their FERC licenses, they make a substantial leap forward into modern conservation law. Grandfathered out of the Clean Water Act, Endangered Species Act, and any other major law enacted since the last license was issued 50 years earlier, the old dams must now, for the first time, comply.

Licensing decisions last for decades. The choices we make today may be the only opportunity to affect river management in our lifetimes.

The Federal Power Act

FERC cannot issue a new license alone. Licensing is a legal spaghetti of sorts: relevant laws intertwine complexly at various points, with important responsibilities vested outside of FERC in several state and federal resource agencies.

The Federal Power Act itself, the principal statute that governs hydropower licensing, gives rights to other federal agencies. Under Section 4(e) of the Act, any federal agency which administers federal lands affected by a hydropower dam — most commonly the U.S. Forest Service, Bureau of Indian Affairs, or Bureau of Land Management — may place conditions on the dam's license that assure "adequate protection and utilization" of the lands or waters. Under Section 18 of the Act, NOAA Fisheries and the U.S. Fish and Wildlife Service can require fishways, such as fish ladders, at the dam to benefit resident and anadromous fish species. These two rights are referred to as "mandatory conditioning authorities."

To put the value of these rights into perspective, it is worth investigating a recent court decision on the North Fork Skokomish River in Washington. Here the federal lands authority, captured by and so named "Section 4(e)" of the Federal Power Act, required new, higher flows from Tacoma Power's Cushman dams. Constructed in the late 1920s, the dams provided no minimum flow until 1988.

Using Section 4(e), the Department of Interior required a desperately needed baseline flow of 240 cfs with seasonally higher flows to mimic natural cycles and improve habitat conditions for salmon and steelhead. FERC issued a license in 2003 arguing that it was not obliged to accept Interior's 4(e) and simply required 240 cfs or inflow, whichever is *less*. When the license came under scrutiny in the Washington, D.C. Circuit Court of Appeals, the judges plainly put the case into reality check:

"On May 3, 2005, we granted a motion for a stay of the 240 cfs minimum-flow requirement. Tacoma thus continues to operate the Cushman Project without any significant license conditions, as it has done for approximately eighty years. It also continues to divert nearly all the water from the North Fork River, as it has done for approximately eighty years."

The decision then reinstituted Interior's more protective flow measure and handed FERC a sharp rebuke:

"The FPA gives FERC no discretion in this regard. Though FERC makes the final decision as to whether to issue a license, FERC shares its authority to impose license conditions with other federal agencies."

Issued August 22, 2006, the Cushman decision rippled through relicensings across the West, where FERC has illegally sought to limit the geographic, temporal, and substantive scope of fire prevention plans, fish habitat enhancements, recreational access, and other basic land and water mitigation.

The Clean Water Act

Under Section 401 of the Clean Water Act, FERC must also receive a certification from the state water quality agency that a hydropower dam will meet water quality standards. For most dams in relicensing today, this certification is the first time that they will be required to meet water quality standards.

Because of the simple power of the Clean Water Act requirement, Section 401 has been a regular target for legislative campaigns and litigation. However, the United States Supreme Court confirmed in May 2006 that, Congress's silence permitting, the Clean Water Act is legally a permanent fixture in dam licensing.

The Supreme Court decided to respond to a Maine hydropower dam owner's appeal that questioned whether dams actually discharge water into a river. Since above the dam is the Presumpscot River and below the dam is the Presumpscot River, how can the Presumpscot River logically discharge into itself? And if it cannot, if the dam does not "discharge," then can the Clean Water Act be applied to dams at all? No, the dam owner argued, the Clean Water Act should not apply at all to licensed hydropower dams.

The dam owner's case, titled "S.D. Warren v. Maine Board of Environmental Protection," received a spectacular array of opposition. With supporting briefs from 33 state attorneys general, the federal government, Tribes, recognized river scientists, conservation and recreation organizations including the Federation of Fly Fishers, the Supreme Court disagreed with the hydropower industry. In its

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own words in a 9-0 unanimous decision:

"Warren's arguments against reading the word 'discharge' in its common sense fail on their own terms. They also miss the forest for the trees. … Changes in the river like [drying river beds, blocking passage for fish, elimination of fishing opportunities and of recreational access to the river] fall within a State's legitimate legislative business, and the Clean Water Act provides for a system that respects the States' concerns."

The Clean Water Act is now established as one of the public's strongest tools for protecting waters impacted by hydropower dams.

The Energy Policy Act

Within the Energy Policy Act of 2005 is a controversial provision that failed for years to pass as independent legislation. This provision amended the Federal Power Act to provide for two challenges to Section 18 fishways and the Section 4(e) land and water mandatory conditions.

Biases in the design of the Energy Policy Act challenges favor dam owners. First, the new section of the Federal Power Act permits any party to request a factual hearing within 30 days of an agency's preliminary conditions. Hearings must only take 90 days, and must offer witness examination and full discovery. As a result, these hearings take extensive time, finances, and legal resources, which are reasonably only available to dam owners.

Second and also within 30 days, any party may submit an alternative license condition. The agency has no choice, it must accept the alternative if it costs less or generates more power and provides an adequate (but in the case of 4(e), not necessarily equal) level of protection. If the alternative does not meet those criteria, then the agency must still review it and give equal consideration to legislated criteria such as navigation, flood control, and energy supply when justifying its original environmental condition. How should an agency weigh energy supply against habitat protections?

In November 2005, the federal departments in Washington, D.C. published rules implementing this provision of the Energy Policy Act. The rules were labeled the paradoxical "interim final," meaning that they took effect immediately without public notice or comment but would, at some later date, be finalized.

By making the rules available so quickly, the Hells Canyon Hydroelectric Project – Idaho Power's 1000-plus megawatt, three-dam complex, which blocks all salmon and steelhead migration on the Snake River, was able to squeak in and use the rules. The Departments also specifically let any project that was past the process trigger take advantage of the rules. The effect of retroactive application? A new monkey wrench was thrown into the most contentious, delayed licensings.

Current FERC relicensing rules allow dam operators to challenge agency required fish protections such as fish ladders. Photograph by Jim Yuskavitch

All told, dam owners filed for retroactive application on 15 hydropower projects by the December 19, 2005 deadline. According to the rules, interested parties such as conservation and recreation organizations had two weeks to intervene, providing copies of this intervention to all licensing parties by courier, next day mail, or by hand. Conservationists responded by scrubbing their holiday plans, filing interventions, and a lawsuit to boot.

Oral argument was heard in federal court Seattle on August 29, 2006. The court heard our petition over whether it is legal to make these rules effective without notice and comment, or to retroactively apply the rules to old cases. At the time of this article's publication, a decision was expected at any time.

In the interim, the rules continue to undermine environmental protections at projects across the country.

On the ground, the result is clear: agencies agree to minimize protections to avoid hearings. Hells Canyon went first. The Forest Service held undisclosed meetings with Idaho Power and cut a deal to, among other losses, reduce the acreage of protected wetlands from 1,500 to 50 acres. The final settlement did not agree to a set of facts; instead, the settlement required the Forest Service to submit wholly new less protective conditions.

The pattern was repeated. Another example: on Boulder Creek in Utah, the Forest Service settled with Garkane Energy Corporation and reduced an instream flow requirement by half — not enough to protect the sensitive native Colorado River Cutthroat trout fishery. Some agencies even go so far as to settle in advance of publishing preliminary conditions, as on the Spokane River in Washington and Idaho. Dam owners, who have been the sole requestors of hearings outside of the Klamath proceeding, submit sizeable requests hundreds of pages long.

There is a ray of hope. When PacifiCorp challenged fish ladders and other environmental protections for dams the company operates on the Klamath River, agencies working on the Oregon and California relicensing refused to settle. NOAA Fisheries defended its fish ladders requirements, a crucial measure to protect the dying Klamath River fishery. On September 27, the hearing judge released his final decision in favor of almost every agency-supporting fact, including the quality of habitat for salmon within and above the project. At this point, PacifiCorp's argument for trap and haul — a much cheaper solution to moving fish around the hydropower dams — cannot credibly say that trap and haul does as much to save salmon as fish ladders.

From the Klamath case, dam owners must now acknowledge the real risks of undertaking an Energy Policy Act hearing. The rest of us are grateful that, when legal theories and facts are put to the test, it is the river and fish who win the day.

A Conservation Crisis

Steelhead Stock Declines on Vancouver Island

by Craig Wightman

— British Columbia Ministry of Environment —

Author Craig Wightman is mananger of the Salmon and Steelhead Recovery Team for the British Columbia Ministry of Environment. The assistance of Bruce Ward, Don McCubbing, James Craig and Al Lill in preparation of this article is also greatly appreciated. "All four have been integral to steelhead management and conservation on Vancouver Island since the crisis was first recognized in the mid- 1990s," says Wightman.

Vancouver Island is the largest island on the west coast of North America, comprising about 3.2 million hectares (7.9 million acres) of land, or about 3.5 percent of the land base of British Columbia. There are 90 primary watersheds (i.e., those that terminate in salt water) on Vancouver Island that exceed 5,000 hectares (12,000 acres) in area. Sixty of these are on the west coast and 30 on the east coast. Including large primary and smaller watersheds, there are approximately 200 streams known to support wild steelhead trout (*Oncorhynchus mykiss*) on Vancouver Island.

Of these, 80-90 have traditionally experienced steelhead sport fishing effort and catch, as reported since the late 1960s by a sample of licensed anglers through an annual mail-out questionnaire. Island-wide, there are only about 40 streams known to support coastal summer-run steelhead, and about 90 percent of total angling effort is directed at coastal winter-run stocks.

The largest island on North America's West Coast, Vancouver Island has been, until the mid-1990s, a major stronghold for wild steelhead. Photograph by Jim Yuskavitch.

For several decades, streams on the east coast of Vancouver Island supported much of the angling effort for steelhead, mainly because they are highly accessible and located near the most populous urban centres. By the early 1980s, several rivers on the central east coast became the first on the Island to be "augmented" each year with hatchery-raised smolts, based on wild steelhead broodstock programs. This was done to provide anglers with harvestable (i.e., adipose-fin clipped) fish, as "catch and release" regulations for all wild steelhead became mandatory in 1985-86.

For most of the 1980s, Island steelhead fisheries produced high angler effort and catch rates based on strong returns of wild and hatchery fish. Improved ocean survival and recaptures of released wild fish in streams more than doubled overall steelhead catches in many waters.

However, beginning in the early 1990s catch success trends started to decline as both wild and hatchery steelhead returned in fewer numbers to east coast Vancouver Island streams. This was particularly true for the central east coast, where streams had previously supported thousands of angler days and catch rates of one steelhead for every 1-2 days fished. By the 1996-97 season, average winter steelhead catch success on many east coast streams had declined to levels three times lower than experienced a decade earlier. On some rivers it now took anglers 10-20 days to land a single steelhead.

In late February 1997, with early winter steelhead returns to the island's east coast streams near record lows, the provincial Ministry of Environment, Lands and Parks (MELP) closed six of the most popular sport fisheries for conservation purposes. This action resulted in a public "outcry" and widespread media coverage of the possible causes for the collapse of Vancouver Island steelhead populations.

As now understood, steelhead abundance declines have been strongly influenced by reduced ocean survivals, combined with the effects of impaired freshwater habitats from expanding industrial and urban growth over previous decades.

In response to this conservation crisis, MELP's fisheries staff produced a draft 1998 recovery plan for the Island's east coast steelhead populations most at risk. The main goal of the plan was to, "Restore healthy steelhead populations and habitats in selected watersheds on the east coast

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of Vancouver Island." For purposes of the plan, a "healthy" steelhead stock would always exceed minimum genetic spawner abundance and exceed 30 percent of estimated habitat capacity in terms of wild smolt yield annually.

The draft plan outlined recovery strategies for 19 major watersheds in the target east coast area, integrating improved inventory, research, regulation, enhancement, protection and enforcement activities. A strong commitment to on-going public consultation was included. Funding to support implementation of the plan from 1998 – 2006 was largely provided by the province's Habitat Conservation Trust Fund (http://www.hctf.ca/index.html).

Vancouver Island Steelhead Stock Abundance Trends

In order to better determine steelhead stock status, regional fisheries staff and contractors have used a combination of assessment techniques since the mid 1970s. These vary from in-season methods such as direct observations of adults by snorkelling or fence/trap counts, to juvenile population estimates, angler creel census and mail-out questionnaires. Many of these techniques have been applied annually to a small group of "index streams," building a valuable time series of data since the mid 1970s. Taken in aggregate, results from these methods provide compelling "weight-of-evidence" scientific support for tracking abundance trends of this valuable species.

The most important of Vancouver Island's long-term index systems is the Keogh River, near Port Hardy on the northeast coast. A counting fence positioned near the mouth of the river has been operated annually by the province's Fisheries Research Section since 1976. The fence facilitates trapping and enumeration of steelhead smolts migrating to sea each spring, and the subsequent counting of adults upon their return as maiden or repeat spawners two or more years later (Figure 1).

From 1976 to 1990, adult returns to Keogh averaged 1,168 fish, with a maximum of nearly 3,000 wild adults in 1987. From 1991 to 1997, adult counts were significantly lower, with a mean escapement of just 187. From 1998 to 2006, uncorrected (for counter efficiency) adult returns have averaged 191, with returns since 2002 consisting of both wild and hatchery ("Living Gene Bank") fish.

During the period 1977-1989, smolt-to-adult survival of Keogh steelhead averaged 15-16 percent, and deviations were strongly correlated with smolt numbers and size at ocean entry. Since 1990, smolt-to-adult survival has averaged closer to 4 percent, with worst years near 2 percent for wild fish. Moreover, previous strong relationships between smolt numbers and subsequent adult returns and mean smolt length and adult returns have not been statistically significant.

For other streams on the Island's east coast, steelhead survival patterns have mirrored that of Keogh. For example, at Englishman River, near Parksville, peak adult winter-run snorkel counts averaged about 21 fish/km for the period 1982 to 1994, but declined to just over 4 fish/km annually from 1995 to 2006 (Figure 2).

For the earlier period, annual Englishman counts consisted of both wild and hatchery returns, whereas in the latter period wild steelhead dominated following suspension of the hatchery stocking program due to annual wild broodstock shortfalls. The pattern is similar for summer-run steel-

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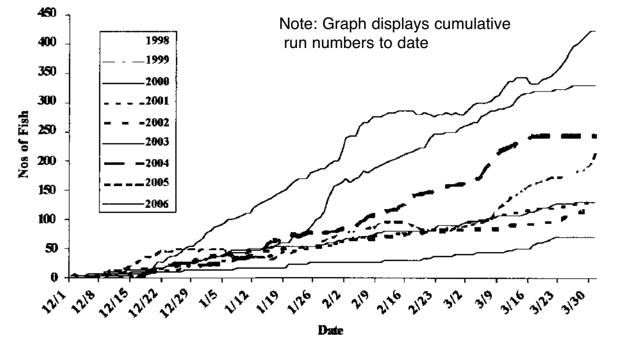

Figure 1. Keogh River adult winter steelhead returns from 1998 to 2006.

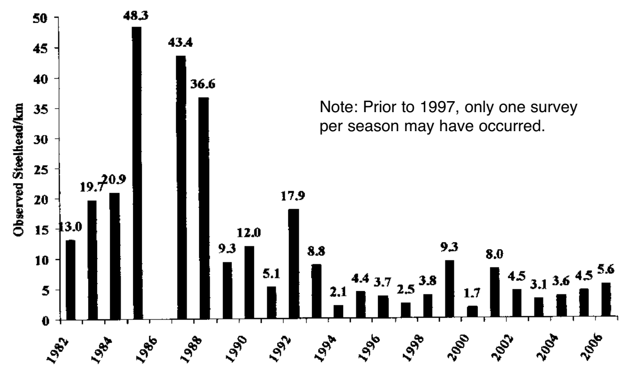

Figure 2. Peak adult winter steelhead snorkel counts for the Englishman River, 1982-2006.

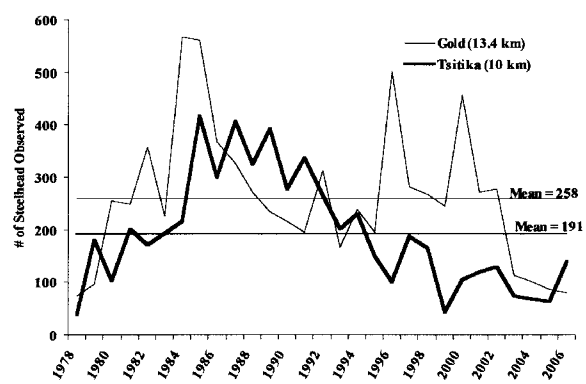

Figure 3. Summer steelhead abundance trends for the Gold (west coast) and Tsitika (east coast) rivers, 1977-2006.

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head on the island's east coast. For the Tsitika River, average escapements to the two index reaches were 234 fish from 1976 to 1995, but only 108 fish a year from 1995 to 2006, inclusive.

Abundance trends on the east coast of the island were not matched by steelhead returns to west coast streams for most of the 1990s. For example, Gold River summer steelhead counts averaged 271 in the two upper watershed index reaches from 1975 to 2002, but recently only 96 fish from 2003 to 2006 (Figure 3). A similar pattern has emerged in other west coast summer run streams from Gold River south to Port Renfrew on the Strait of Juan de Fuca.

Although there is a much shorter time series for Gold River winter steelhead counts, they have paralleled the summer runs with peak estimates averaging 482 fish in the lower river index reach from 1998 to 2002, followed by a significant drop to 120 fish from 2003 to 2006. This strongly suggests a decrease in ocean survival for Gold River steelhead smolts starting in the spring of 2001.

While these observations have irrefutably documented serious stock declines on the island since the early 1990's, there is cautious optimism following the winter of 2005/06. In many Island streams there were modest increases in winter steelhead escapements. These included the Keogh River where 118 wild and 498 hatchery ("Living Gene Bank") spawners were counted. While the total number of steelhead returning to Keogh was comparatively good, the wild component represents only 10 percent of estimated carrying capacity, and 35 percent were repeat spawners. Considerable uncertainty remains about the recruitment potential of hatchery-origin spawners in the Keogh, now subject to on-going research.

Summer steelhead snorkel surveys in September-October 2006 may provide further evidence of improved survivals for other Island stocks.

BC's Conservation Response

The focus on Vancouver Island steelhead and release of the draft recovery plan in 1998 became an important catalyst in a broader conservation review of south coast B.C. populations. This eventually led to preparation of the Greater Georgia Basin Steelhead Recovery Action Plan in 2002 (http://www.bccf.com/steelhead/), which examined status of the species in 58 of the largest watersheds on the inner south coast (i.e., from Juan de Fuca Strait north to Johnstone Strait, including the lower Fraser River downstream of Hope).

The action plan's objectives are to "stabilize and restore wild steelhead stocks and habitats to healthy self-sustaining levels," while "maintaining and restoring angling opportunities which benefit both local communities and the provincial economy." Over the last year recovery activities on Vancouver Island and in the Lower Mainland received more than $1.5 million in partnered funding for projects in high priority watersheds. Increasingly, these have involved direct habitat restoration including nutrient enrichment, rearing habitat improvements, spawning gravel placements, flow augmentation and erosion/sediment control.

"Research from the Keogh River has demonstrated the value of a holistic approach to watershed restoration."

Research from the Keogh River has demonstrated the value of a holistic approach to watershed restoration in stabilizing and rebuilding wild steelhead, salmon and trout populations. The Keogh experience, and growing evidence from elsewhere, suggests that remediation of freshwater limiting factors is an effective conservation strategy for the whole fish community, not just steelhead as the target species. The critical importance of managing water supply and quality has also assumed a higher profile in the face of on-going climate change in the Pacific Northwest.

In 2005, B.C. also announced a new program called the Living Rivers Trust Fund (LRTF) with the following primary objectives:

1. Improve the science basis for watershed protection and restoration;

2. Increase public understanding and commitment to watershed protection, restoration and sustainable use of water;

3. Strengthen partnerships and identify priorities through watershed councils, cooperative mechanisms and planning frameworks;

4. Enhance effectiveness of community groups and councils by developing science capacity and decision support tools; and

5. Support specific watershed management and restoration activities.

The Fund is supported by the provincial government through a $21 million gift to the Vancouver Foundation, with direction from an advisory group and program delivery through three non-profit organizations headquartered in the Vancouver area. Current focus is on the Georgia and Fraser basins where there are well-recognized fish conservation problems and widespread public interest in watershed sustainability and fish habitat restoration. LRTF support is now considered crucial to on-going steelhead recovery as the Habitat Conservation Trust Fund ends its ten year program-level funding in March 2007.

Consequently, a stronger and growing partnership approach, involving all sectors, is more important than ever for ensuring the preservation of wild steelhead and rebuilding of sport fisheries in Vancouver Island and other BC south coast rivers.

River of Consequences

The Klamath Basin crisis five years later

By Steve Pedery
— *Oregon Wild*—

Steve Pedery, Conservation Program Manager for Oregon Wild (formerly Oregon Natural Resources Council), brings us up to date on the Klamath River basin crisis since it first erupted five years ago. Pedery last reported on the issue for the May 2002 issue of The Osprey.

In March of 2002, when U.S. Senator Gordon Smith (R-Ore) made plans to appear with Bush administration officials at a photo-op in Klamath Falls, Oregon, the event probably seemed like a no-brainer. In the previous year the Klamath Basin had become ground zero in the national debate over water and efforts to restore threatened salmon runs, and the administration had recently announced plans to repeal fish recovery efforts in the troubled Klamath River. Instead of boosting river flows to aid salmon, the new plan favored politically powerful agribusiness interests in the sprawling Klamath Irrigation Project.

For Smith, appearing jointly with then-Secretary of the Interior Gale Norton and speaking to a crowd of cheering anti-government activists must have seemed like an easy way to cement his pro-agriculture credentials.

But decisions have consequences, and in the spring of 2002 fisheries biologists were already warning that strangling flows to the Klamath River would have devastating effects on salmon. Now, in 2006 Senator Smith and the Bush administration have found themselves in the midst of another Klamath crisis. This time the controversy isn't the result of reduced water deliveries for agribusiness, but the collapse of Klamath River Chinook salmon runs and resulting shut down of the commercial salmon fishing ports from Northern California to the Columbia River.

An aerial view of Tule Lake National Wildlife Refuge in California shows row crops on land that was supposed to be set aside for waterfowl and other wildlife. Photograph courtesy Steve Pedery, Oregon Wild.

A Long Running Problem

Though it has slipped into relative obscurity in the last few decades, the Klamath River was once among the top sport fishing destinations on the West Coast.

The river and its tributaries stretch across nearly 10 million acres in Southern Oregon and Northern California, from rugged mountains and high desert sagebrush to foggy redwoods and the Pacific Ocean. Historically, the river boasted enormous runs of spring and fall Chinook salmon, coho, and steelhead, including a run of feisty "half pounders" (12-to 16-inch long fish that spend only a few months to a year in the ocean before returning to the river.)

The Klamath and its fisheries served as the engine for much of the Northwest's commercial salmon fishing industry. Prior to dams, water diversions, and development, Chinook runs are estimated to have been as high as a million fish annually. Upon entering the ocean, these salmon ranged north and south for hundreds of miles. Fishing communities from Fort Bragg, California to Newport, Oregon have historically harvested fish from the Klamath.

The decline of the Klamath began over a century ago with reckless mining, logging, and harvest practices. But to find the largest culprits in the collapse of the river's salmon runs, one must look to two events in the early 1900s.

The first began in 1906, when the construction of the U.S. Bureau of Reclamation's massive Klamath Irrigation Project began a radical transformation of the river's headwaters. A landscape that was once a green oasis in the midst of juniper and sagebrush, defined by lush wetlands, lakes, and spring fed creeks, is now a vast network of dams, diversion struc-

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tures, and irrigation ditches. Nearly 80 percent of the 350,000 acres of water-cleansing wetlands that once flourished in the Klamath's headwaters are now gone, along with the natural buffer they once provided against drought and floods.

The second turning point for Klamath salmon came in 1917, with the construction of the first major dam on the Klamath River. Built amid promises of fish ladders and a continued abundance of salmon, Copco 1 (as it would later be known) literally cut the river in half. Over 200 miles of upstream spawning habitat was lost. Other barriers have since been thrown up across the river, including three other hydroelectric dams (Copco 2, JC Boyle, and Iron Gate). In total there are six dams on the Klamath today.

But the negative effects of the dams are not limited to lost spawning habitat. Located in an arid area along the Oregon-California border, during the summer the dams serve as giant "warming pools" for the water that is allowed to flow out of the Klamath Irrigation Project. Water carrying natural nutrients along with animal wastes, pesticides, and fertilizers simmers behind the dams, brewing a toxic soup of algae that is ultimately released downstream. In August of 2006, concern over toxic algae blooms in the reservoirs led the U.S. Environmental Protection Agency and California Water Quality Control Board to issue a health advisory urging people to avoid contact with water from the Klamath River.

For salmon, a river that was once a cradle has become a grave. Summer flows are reduced to a trickle, and low water, unnaturally high temperatures, and agricultural run-off create the ideal conditions for fish-killing parasites. Today the Klamath River's once abundant coho salmon are listed as threatened under the federal Endangered Species Act, and total numbers of wild spring Chinook returning to spawn have dropped to just a few hundred. The 2006 fall Chinook returns are expected to fall below the 35,000 fish threshold needed to maintain a harvestable population.

Klamath Fish Kills

Within weeks of the 2002 photo-op celebrating the decision to cut flows, signs emerged that already weak Klamath salmon runs were in serious trouble. Low flows, combined with poor water quality and parasites, led to a juvenile fish kill that claimed tens of thousands of young fish during the spring out-migration. The disaster was compounded by the rapid cut in river flows in April of 2002, which left thousands more juvenile salmon and steelhead stranded in pools and side channels.

But despite warnings from the California Department of Fish and Game, conservation groups, and biologists working for Native American tribes that live along the river, the Bush administration's new water policy was left in place. As spring turned to summer, river flows dropped to near historic lows. During much of July and August, more water was diverted down the main canal in the Klamath Irrigation Project than was allowed to flow out of Iron Gate Dam and into the Klamath River. The U.S. Geological Survey has since estimated that by September the river was flowing at less than 2,000 cubic feet per second (cfs), the second-lowest reading ever recorded.

When a modest-sized run of fall Chinook returned to the river in early September, they found it flowing sickly and hot. Mid-day water temperatures ran as high as 80 degrees, forcing the salmon to crowd into deeper pools and creek mouths to seek the shelter of cooler water. In early September, when common parasites began to appear in the fish, the crowded conditions, temperatures, and stress combined to spark an epidemic. Within days, tens of thousands of salmon went belly up.

> ***"A river that was once a cradle for salmon has become a grave."***

Biologists rushed to the scene to document what may have been the largest man-made fish kill in American history. For dozens of miles, the banks of the Klamath were an apocalyptic spectacle of dead and dying fish. Not only Chinook perished, but also threatened coho, steelhead, and even a few giant green sturgeon. Photos of the tragedy quickly began to appear on the front pages of newspapers throughout the country. The California Department of Fish and Game estimates that as many as 70,000 fish perished in the 2002 Klamath River fish kill—over half the expected run.

Almost as soon as the fish began dying, Bush administration officials, Klamath agribusiness leaders, and Pacific Power (the owner of the Klamath River dams) began trying to duck responsibility. "Too soon to tell the cause" was the line from the administration. Klamath Falls agricultural interests tried to blame the salmon, arguing that there were simply too many of them (though the 2002 run was roughly one-tenth of historic levels). Pacific Power ducked the issue, saying they had done all that was required of them by federal and state agencies.

Later analysis of the disaster by the California Department of Fish and Game and US Fish and Wildlife Service concluded what conservation groups had been warning all along—that favoring agribusiness and reducing river flows meant lethal conditions for salmon. In their report, California biologists concluded "*…flow is the only controllable factor and tool available in the Klamath Basin to manage risks against future epizootics* [animal epidemics] *and major adult fish-kills*."

Consequences

After the fish kill, some modest changes were made in Klamath water policy, but the Bush administration has continued to strongly favor agribusiness over salmon. A program of leasing water temporarily from irrigators to boost river flows was expanded, and the timing of water releases has been modified to increase September flows. But many experts, including California state officials, argue that these concessions have fall-

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en far short of what is needed. Low flows, poor water quality, and juvenile fish kills have continued to plague the river, and biologists estimate that these conditions claim up to 80 percent of the river's juvenile salmon each year.

It is the ongoing juvenile kills that have had the most serious long-term effect on Klamath salmon. Conditions have grown so bad that in 2006 the Pacific Fisheries Management Council, the entity charged with managing commercial fishing up and down the West Coast, imposed severe harvest restrictions in a last-ditch effort to protect what remains of the Klamath's stocks. Up and down the Northern California and Oregon Coasts, commercial harvest has been restricted to just a handful of days this year, with severe economic consequences for fishing families and communities.

The fisheries closures have in turn sparked a major political crisis—especially for Senator Smith and the Bush administration. Politicians throughout the region are scrambling to secure disaster assistance for fishing ports, and Smith is no exception. However, while Smith is seeking money for fishermen, he has not embraced legislation to actually address the problems of the Klamath River. Both of California's Senators, and Oregon's senior Senator Ron Wyden, all Democrats, are backing such legislation.

In contrast to the speedy arrival of federal disaster money for the Klamath Irrigation Project during the 2001 drought, assistance for fishermen has been mired in politics and red tape. Before money could be delivered, the Bush administration had to first declare a fisheries disaster. But despite knowledge of the closure as early as March of 2006, the declaration did not actually occur until August. Many Klamath-watchers have concluded the administration feared implicating their own policies as a cause of the disaster.

When the declaration finally came, the officials blamed the fishing closure on "5 years of drought," despite the fact that water for Klamath irrigation has not been curtailed since 2001. The administration's August, 2006 press release announcing the disaster declaration made no mention of either the devastating 2002 adult fish kill or the ongoing juvenile kills that actually led to the closure.

The declaration may well be too little, too late. Because of the ongoing costs associated with the war on Iraq, it is doubtful disaster funding will actually be available in 2006. Even greater economic losses for coastal communities could come next year, when closures may be extended to include offshore sport fishing. Long-term, disaster assistance means little if steps are not taken to improve flows and water quality in the Klamath River.

Cautious Optimism

But while 2006 has brought hard times to fishing ports, there are signs of a Klamath revival.

First, the Pacific Power's license to operate the dams on the Klamath River is expiring. In order to re-license them, the corporation must go through a complex process before the Federal Energy Regulatory Commission. Conservation groups, fishermen, and Native American Tribes are seeking the removal of the lower four dams, arguing that the damage they cause to water quality cannot be ignored, while state and federal agencies are asking that fish ladders be installed on all the dams.

There are signs that the lower four Klamath dams could come down, or at least be modified to be less deadly for salmon. In March of 2006, the two federal agencies in charge of salmon recovery in the Klamath signaled their desire to require major re-engineering of the dams, with modern fish ladders. Such facilities could cost hundreds of millions of dollars to construct. Governors Arnold Schwarzenagger of California and Ted Kulongoski of Oregon have both signaled their support for such improvements. Given the cost of these measures, it may be cheaper for Pacific Power to simply remove the lower four dams. In a recent interview with the *Newport News Times*, Kulongoski said he preferred removal.

Though politicians have continued to favor agribusiness over fish when it comes to water, the free market may provide a boost for salmon. An obscure electricity contract between Pacific Power and Klamath irrigators is also expiring this year. This 1917-era agreement has provided electricity to power water pumps at 1/16th of the rates paid by other Oregon farmers. Conservation groups believe that when water is free and the electricity with which to pump it costs next to nothing, there is little incentive to conserve either resource. Oregon's Public Utility Commission recently adopted a seven-year phase out of this sweetheart deal, and it is expected that California will soon follow suit.

Finally, salmon supporters are finding their political voice. With many families facing bankruptcy, commercial fishermen are demanding action from politicians like Senator Smith. Court challenges by conservation groups have managed to turn back several of the Bush administration's anti-salmon policies in the basin. And the public may be getting fed up with the entire mess. A recent poll of Oregon voters conducted by the Oregon Natural Resources Council found that over 90 percent thought it was important for elected officials to develop a plan to solve the Klamath's problems. Most also favored buying out water rights for agribusiness as a way to boost river flows.

But while opportunities for progress abound, the Klamath's greatest challenge is still political. Senator Smith is under intense pressure, but anti-conservation Representatives Greg Walden (R-Ore) and Wally Herger (R-Calif), who represent the Klamath Irrigation Project, have shown no interest in supporting either dam removal or flow improvements.

Still, most conservationists and fishermen are cautiously optimistic. A recent "Bring the Salmon Home" rally in downtown Portland brought more than 250 fishermen, Native Americans, conservationists, and businesses together to demand removal of the lower four Klamath River dams. On other Northwest rivers these disparate groups often spend more time fighting each other than advocating for fish. But on the Klamath, people who value native fish are finding common ground in their desire to save what was once one of America's greatest salmon rivers.

Impacts of Hatchery Steelhead on a Wild Steelhead Population

By Kathryn Kostow

— Oregon Department of Fish and Wildlife —

This article was adapted from two research papers for the The Osprey *by Kathryn Kostow, an analyst with the Oregon Department of Fish and Wildlife. The two articles, both published in Transactions of the American Fisheries Society (TAFS), are* Naturally Spawning Hatchery Steelhead Contribute to Smolt Production but Experience Low Reproductive Success *by Kostow, Marshall and Phelps (2003, TAFS 132:780-790) and* The Effect of an Introduced Summer Steelhead Hatchery Stock on the Productivity of a Wild Winter Steelhead Population, *by Kostow and Zhou (2006, TAFS 135:824-841). Reprints are available at* kathryn.e.kostow@state.or.us.

The effects of hatchery fish on wild populations is an ongoing debate within the fisheries profession. In a pair of recent articles published in *Transactions of the American Fisheries Society*, Kathryn Kostow (Oregon Department of Fish and Wildlife, Clackamas Oregon), Shijie Zhou (Commonwealth Scientific and Industrial Research Organization, Australia), and Anne Marshall (Washington Department of Fish and Wildlife, Olympia Washington) investigated the interactions of a summer-run steelhead hatchery stock and a native winter-run population in the Clackamas River, Oregon. The papers demonstrated that when large numbers of hatchery steelhead were allowed to enter natural spawning areas in the upper Clackamas Basin the productivity of the wild steelhead population was significantly depressed.

Hatchery fish may impose both genetic and ecological risks to wild fish. Direct genetic risks occur only if the hatchery and wild fish interbreed. Interbreeding can decrease the fitness of a population by eroding local, adaptive genetic variation in the wild population, and this could lower productivity. But ecological impacts may occur whether interbreeding occurs or not and may also lower productivity, although for very different reasons. Streams have a finite capacity to produce steelhead. The number of smolts that optimally can be produced is called a basin's carrying capacity, and it depends on the amount of spawning and rearing habitat that is available. If a large number of hatchery fish are present, they and their offspring may occupy substantial amounts of the habitat. If they do, there is less room for wild fish so the basin produces fewer of them.

The Clackamas Basin study began in the mid-1990s when the native winter steelhead population was in a steep abundance decline. The population was approaching perilously low numbers, barely reaching 100 fish by the late 1990s. The Oregon Department of Fish and Wildlife (ODFW) wanted to know the cause of this decline and, if possible, reverse the trend before the native population became extinct. One human-caused activity in the basin was a hatchery program for summer steelhead. Summer-run steelhead are not native to the Clackamas River. They were introduced in the early 1970s to provide a sports fishery, using a hatchery stock from southwestern Washington. One of the characteristics of the hatchery program was that large numbers of adult summer steelhead were being passed into natural spawning areas above North Fork Dam. From 1975 until 1999, an average of 70 percent of the adult steelhead passed above the dam were hatchery summer steelhead. The department wanted to know, was this hatchery program contributing to the wild fish declines?

The first paper investigated whether the hatchery adults were breeding after they passed above the dam. The study demonstrated that they were indeed breeding, although not very well. Poor reproductive success by adult hatchery fish that attempt to breed in a natural stream is a common result, particularly with a stock like the one used in the Clackamas. The summer steelhead stock had been in captivity since the 1950s and it was adapted to a hatchery rather than to a stream. Nor was it originally native to the Clackamas. A genetics analysis indicated that the hatchery summer steelhead were not interbreeding with the wild winter steelhead, so the hatchery fish were not posing genetic risks to the wild

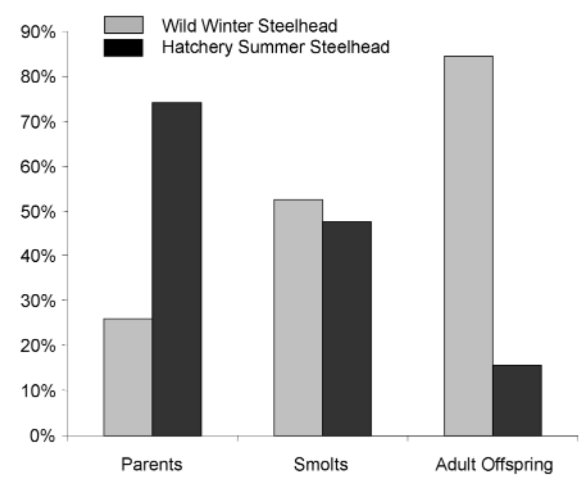

Figure 1. Relative proportion of parents, naturally-produced smolts and naturally-produced adult offspring that were wild winter steelhead verses hatchery summer steelhead. Hatchery summer steelhead adults had relatively poor reproductive success, yet they were so abundant on the spawning grounds that they still produced a large portion of the smolts. Very few of these smolts survived to adults.

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winter steelhead. Adult life history differences between winter-run and summer-run fish, particularly differences in spawning time, were probably responsible for the lack of interbreeding.

However, the hatchery summer steelhead did breed among themselves, although with only a fraction of the reproductive success of wild fish. But their limited reproduction, combined with the very large numbers of hatchery adults present, was enough for them to produce a substantial portion of the naturally-produced smolts that out-migrated from the basin. In years when more than two-thirds of the adult steelhead passed above North Fork Dam were summer steelhead (which happened often), nearly half of the naturally-produced smolts were offspring of the hatchery fish. Most of these summer steelhead smolts died before reaching adulthood (see Figure 1).

But, as reported in the second paper, they died only after occupying valuable habitat and imposing an ecological risk to the wild winter steelhead population.

A healthy wild fish population typically responds to an abundance decline by increasing the number of offspring produced per parent (Figure 2). This productivity response quickly returns the population to a larger size. Thus while a healthy population may fluctuate in size, it does not chronically decline. It always returns to number of fish the carrying capacity of the basin can produce. But when wild winter steelhead abundance in the Clackamas declined, the fish did not respond by increasing their productivity because the total abundance of steelhead was held artificially high by the presence of the hatchery fish. We determined that the carrying capacity of the river was regularly exceeded during the 25 years that hatchery adults were passed above North Fork Dam. While summer-run and winter-run steelhead have different adult life histories, they behave similarly as juveniles and use the same habitats. Juvenile steelhead rear in fresh water for two to three years before they smolt, and they are aggressive and territorial during this period. If juvenile densities increase beyond carrying capacity they have increased competition for food and territories, and they are more often displaced into marginal habitats. Increased mortalities, decreased growth and decreased condition can result. The ultimate result is that fewer wild smolts and fewer wild adult offspring are produced.

In the Clackamas River, wild winter steelhead had to compete with hatchery adults and their naturally-produced offspring, as well as with hatchery smolts that were being released each year. The resulting impact was measured with Ricker and Beverton-Holt productivity models (Figure 3). The number of winter steelhead offspring produced per parent declined by an average of 50 percent while the number of winter smolts produced by the basin decreased by an average of 22 percent during the years that the hatchery program was implemented. The wild population spiraled down to progressively lower and lower abundance.

The passage of hatchery adults and the release of hatchery smolts above the dam were stopped in 2000. This management decision by ODFW remains controversial because the sports fishery provided by the hatchery summer steelhead was very popular. However, responsible management ensures that wild populations remain viable and resilient so that they can be enjoyed not only by today's fishers, but also by future generations. Since the hatchery fish were removed from the upper basin, the productivity of the wild Clackamas winter steelhead population has returned to pre-hatchery program levels, which should increase the chance for recovery of this ESA-listed species. The hatchery program is still being implemented below North Fork Dam, a compromise that continues to impact natural production below the dam but provides a sports fishing opportunity while protecting the majority of the wild population.

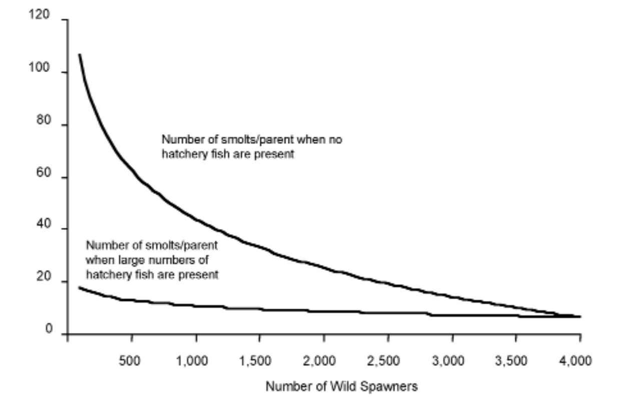

Figure 2. A simulated demonstration of how the productivity of a healthy wild population responds when it declines to low abundance compared to a population that is ecologically effected by large numbers of hatchery adults. In a healthy population, the fish substantially increase the number of smolts produced per parent (upper line), which returns the population size to carrying capacity. However, when large numbers of hatchery fish are present, the productivity of the wild population stays low even when the wild abundance declines (lower line). The wild population cannot increase back to carrying capacity; instead abundance spirals downward.

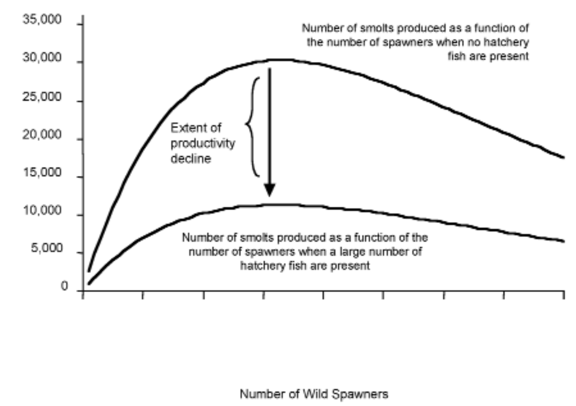

Figure 3. The difference in wild fish productivity in the Clackamas when no hatchery fish were present (upper line) compared to the years when a large number of hatchery fish were present (lower line) as modeled by a Ricker productivity function.

Hatchery Steelhead Straying in the Deschutes River Basin

By Richard W. Carmichael and Timothy L. Hoffnagle
— *Oregon Department of Fish and Wildlife* —

Richard Carmichael and Timothy Hoffnagle prepared this article for The Osprey *based on steelhead straying research they have been conducting in the Deschutes River basin. Carmichael is Program Director for the NE Oregon Fish Research and Develpment Program, and Hoffnagle is a Project Leader with the program. The authors would also like to thank the USFWS Lower Snake River Compensation Plan program for providing funding to support this work. The Idaho Department of Fish and Game and the USFWS provided approval to use data for the Pahsimeroi and Dworshak B hatchery steelhead stocks. Matt Snook compiled much of the data used in these analyses.*

The Deschutes River is renowned for its exceptional summer steelhead recreational fishery. Anglers from around the world spend over 50,000 angler days of effort annually (ODFW 1997). Tribal fishermen have fished the Deschutes River since time immemorial, and steelhead are important for cultural and subsistence purposes.

Two extant populations of native steelhead (Deschutes River Eastside and Deschutes River Westside) have been identified in the Deschutes River Basin by the Interior Columbia Basin Technical Recovery Team (ICTRT 2003). The Deschutes River Eastside population includes all the eastside tributaries and the mainstem from the mouth to the confluence with Trout Creek. The Westside population includes the westside tributaries and the mainstem from Trout Creek upstream to the Pelton Re-regulation Dam. Spawner abundance declined substantially in the late 1980s and remained depressed throughout the 1990s, and abundance in both the Eastside and Westside populations is believed to be well below levels that were present historically. Abundance declines in the Deschutes River populations and other Middle Columbia River tributary populations prompted the National Marine Fisheries Service to list the Middle Columbia River steelhead Distinct Population Segment (DPS) as a threatened species warranting protection under the Endangered Species Act in 1999. The status and viability of steelhead populations in the Deschutes Basin are critical to recovery of the Middle Columbia River steelhead DPS.

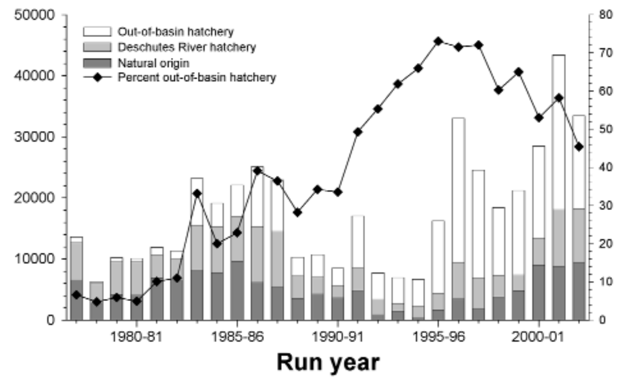

Figure 1. Estimated escapements of natural origin, Deschutes River hatchery, and out-of-basin hatchery steelhead (stacked bars) and percent of escapement comprised of out-of-basin hatchery-reared steelhead (line) above Sherars Falls (RK 69), 1977-78 through 2002-03 run years.

Population declines appear to have temporarily halted, beginning with high escapements in the 2000-2001 run year. While the number of natural-origin fish has varied considerably through time, the number of out-of-basin hatchery-origin fish estimated to have passed Sherars Falls increased dramatically from the late 1970s through the early 2000s (Figure 1). Round Butte Hatchery produces steelhead smolts for release in the basin, and all smolts released in the Deschutes River are uniquely marked, making them distinguishable from out-of-basin hatchery fish. Because of the unique fin marking, fish managers have been able to monitor the number of out-of-basin hatchery fish at multiple locations within the basin. Each run year, estimates are made of the number of out-of-basin hatchery fish passing above Sherars Falls and collected at traps located on the Warm Springs River and Pelton Reregulation Dam.

The number of out-of-basin hatchery fish estimated at all three locations portrays a consistent pattern through time. Out-of-basin hatchery fish numbers have increased significantly through time and comprise a substantial proportion of the escapement above Sherars Falls and in the spawning tributaries. The number of out-of-basin hatchery steelhead passing Sherars Falls was at least twice as large as the number of natural-origin steelhead in nearly every year in the 1990s (Figure 1). For the 1997-98 run year the out-of-basin hatchery fish were nearly ten times greater than the natural-origin fish at Sherars Falls (ODFW 2000). Out-of-basin hatchery fish comprised on average more than 50 percent of the steelhead observed at the Warm Springs Hatchery trap from 1987-1998 (Olson and Pastor 1998). At the Pelton trap out-of-basin hatchery fish accounted for over 50 percent of the fish captured in many years since 1988.

Not all of the out-of-basin hatchery fish that enter the Deschutes are strays. Out-of-basin hatchery steelhead are either harvested in

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recreational fisheries, fall back out of the Deschutes into the Columbia River, are collected and removed at traps, or remain in the system and spawn naturally. Those that remain to spawn are considered strays and are of particular concern. Based on results of radio telemetry studies and tagging at Sherars Falls, a substantial number of hatchery fish fall back out of the Deschutes River and continue their migration up the Columbia River to upriver tributaries.

Out-of-basin hatchery fish clearly make an important contribution to the recreational fishery. ODFW estimated that from 1990-1995 out-of-basin hatchery fish accounted for more than 80 percent of all hatchery fish harvested in the Deschutes River (ODFW 1997). At the same time, the abundance of stray hatchery fish spawning in the Eastside and Westside Deschutes River populations may pose a serious risk to the viability and genetic health of these populations. Numerous studies have demonstrated that stray hatchery fish spawning with natural fish can reduce the fitness of natural populations (Leider et al. 1990, Waples 1991, Reisenbichler and Rubin 1999, Chilcote et al. 1986). Chilcote (1998) concluded in the Conservation Assessment of Steelhead Populations in Oregon that Deschutes River steelhead were at significant risk of extinction and speculated that one cause for this high risk was decreased productivity due to introgression of out-of-basin stray hatchery fish. In a more recent viability assessment using the ICTRT viability criteria, Carmichael et al. (2006) concluded that the proportion of naturally spawning steelhead which were hatchery origin in both the Eastside and Westside Deschutes River populations resulted in a high risk rating for the spawner composition metric. Given the number of important management issues associated with out-of-basin hatchery strays in the Deschutes River Basin, we conducted a study to better understand the origin, magnitude, and characteristics of stray hatchery steelhead. We focused our investigation on specific Snake River hatchery stocks which are known to be a significant source of the strays. The specific objectives of our study were to: 1) assess the magnitude of straying and the origin of hatchery strays; 2) determine stray rates into the Deschutes River for all Snake River hatchery steelhead stocks; and 3) characterize spatial and temporal distribution of strays recovered within the Deschutes River Basin by hatchery stock origin.

For our study we defined strays as any fish recovered out of the direct migratory path between the ocean and the release location. This definition results in estimation of a maximum stray rate and was necessitated by the fact that once a fish is collected, it's ultimate intended spawning destination is unknowable. The approach we used was first to assemble and analyze all coded-wire-tag release and recovery data for all Snake River hatchery releases. Only individually tagged groups were used in the analyses, and only those for which there were twenty or more estimated total recoveries and there were adult recaptures at the release location. We estimated the total overall hatchery contribution for each hatchery stock by expanding the coded-wire-tagged fish recoveries to account for fish that were not coded-wire-tagged. Stray rates into the Deschutes basin were calculated by stock, tag code, and release location for each brood year and run year.

The stray rates were calculated by dividing the estimated number of coded-wire-tagged fish recovered in the Deschutes River basin by the total number recovered in the Columbia basin from the Deschutes River upstream (including Deschutes River). We determined the spatial and temporal distribution of strays within the Deschutes River, as well as the profile of location and type of recovery (fishery or trap). We characterized the temporal pattern of recoveries for migration, holding, and spawning periods

For this article we choose to present results for four Snake River hatchery stocks from the 1974-1997 brood years (Figure 2) that provide good representation of the results for all Snake River hatchery stocks:

Dworshak B — This stock was originally developed from natural-origin North Fork Clearwater River B-type steelhead. We only used tag groups that were released at Dworshak National Fish Hatchery.

Imnaha River — This stock was developed with natural-origin fish from Little Sheep Creek, a tributary of the Imnaha River. We only used tag groups that were released at the Little Sheep Creek Facility.

Pahsimeroi A — This stock was originally developed from natural-origin steelhead collected at Hells Canyon Dam that were destined for tributaries above Hells Canyon Dam. We only used tag groups that were released at Pahsimeroi Hatchery or in the Pahsimeroi River above the hatchery.

Wallowa Hatchery — This stock was developed primarily from unknown origin fish collected at Lower Snake River Dams in the springtime in the late 1970s. We only used tagged groups released at Wallowa Hatchery and the Big Canyon Facility.

For some stocks, there are brood years with coded-wire tag releases that we were unable to use due to insufficient number of tags recovered or a lack of specific release data. The Dworshak B steelhead have the longest data series, 1974-1984 and 1986-1997. Brood years 1985-1997 were included for the Imnaha River steelhead, 1975-1981 and 1982-1997

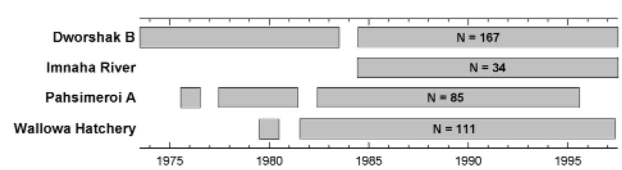

Figure 2. Brood years analyzed with a sufficient number of coded-wire tags recovered for four Snake River hatchery steelhead stocks, 1974-1997 brood years. N=total number of tag codes used in analyses.

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brood years for the Pahsimeroi A steelhead, and 1980 and 1982-1997 brood years for the Wallowa Hatchery stock steelhead. We used 397 coded-wire tag codes for these four steelhead stocks. A total of 15,888,534 tagged Snake River steelhead smolts were released, representing 18.9 percent of the 84,153,394 total smolts released from the 1974-1997 brood years that were associated with tagged smolt releases.

Adults from all stocks strayed into the Deschutes River, and stray rates varied with brood year (Figure 3). Wallowa Hatchery had the highest stray rate for most brood years and also had the greatest mean stray rate into the Deschutes River (11.2 percent) ,while Dworshak B steelhead had the lowest mean stray rate (0.9 percent). Maximum stray rates were 32.7 percent for the Wallowa River steelhead, 13.7 percent for the Pahsimeroi A steelhead, 8.1 percent for the Imnaha River steelhead, and 3.7 percent for the Dworshak B steelhead. Each stock had brood years for which no strays were recovered in the Deschutes River.

Distribution of stray Snake River hatchery steelhead recovered in the Deschutes River varied in both time and space between stocks (Figures 4 and 5). For all stocks, the greatest mean annual percentage of steelhead recovered was at the mouth during the Migration period (June - November).

Most Snake River hatchery steelhead in the Deschutes River were recovered during the Migration period and fewer were recovered during the Holding (December - January) and Spawning (February - May) periods (Figure 4). The percentage of the total steelhead recovered during the Migration period, ranged from 64.7 percent for the Wallowa River to 96.6 percent for the Dworshak B steelhead. For three of four stocks, a small percentage (<5 percent) of the fish were captured during the Holding or Spawning periods. However, for the Wallowa River steelhead, 7.0 percent of the annual recoveries occurred during the Holding period and 28.3 percent occurred during the Spawning period.

The Dworshak B, Imnaha River and Pahsimeroi A steelhead were most commonly recovered in fisheries near the mouth area (RKM 0-11), indicating that they mostly reside in the lower Deschutes River (Figure 5). The annual percentages recovered from the mouth area for these three stocks ranged from 52.6 percent to 94.7 percent. In contrast, the Wallowa Hatchery steelhead collections were more evenly distributed among the reaches, with 37.2 percent of the total Deschutes River recoveries coming from the Mouth, 26.7 percent from the Middle reach and 36.1 percent were from the two hatchery traps (Pelton Dam and Warm Springs National Fish Hatchery). For the other three stocks only 1.0 percent to 22.2 percent of the Deschutes River recoveries came from the upstream area.

When we examine the distribution data by time and location simultaneously, we see that >72 percent of the Dworshak B, Imnaha River and Pahsimeroi A stocks recoveries came from Sherars Falls or below and during the Migration period. However, for the Wallowa Hatchery steelhead, only 46.5 percent were recovered from Sherars Falls or below, while 53.5 percent of the Deschutes River strays were recovered at the Pelton Dam and Warm Springs National Fish Hatchery traps. Moreover, 29.6 percent of the recoveries were from the upstream area during the spawning period.

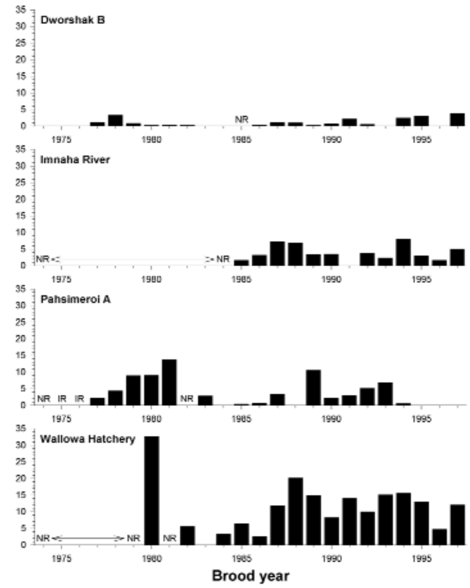

Figure 3. Stray rates into the Deschutes River for 1974-1997 brood years of four Snake River hatchery steelhead stocks. IR=insufficient tag recoveries; NR=no coded-wire tagged fish released for that brood year.

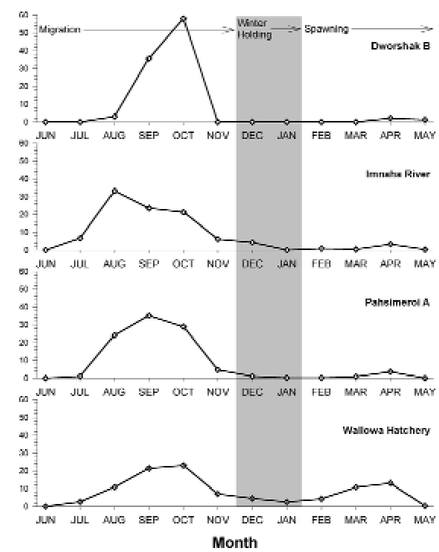

Figure 4. Mean percentage of each Snake River steelhead stock recovered in the Deschutes River during each month and during the Migration, Holding and Spawning periods.

To examine total contribution to the Deschutes River fisheries and traps, we used a larger data set that included all groups released into the basin in which the hatchery was located. This larger data set gives a better representation of the total contribution of the hatchery stocks to the traps and fisheries. An estimated 2,906 total steelhead from the 1974-1997 brood years that were represented by coded wire tagged fish were recovered from the Dworshak B, Imnaha River, Pahsimeroi A and Wallowa Hatchery steelhead stocks in sport and tribal fisheries and 1,113 were recovered at the Pelton Dam and Warm Springs National Fish Hatchery traps. Wallowa Hatchery steelhead comprised 791 (31.7 percent) of the total fishery captures and 912 (81.9 percent) of the hatchery trap captures of these four stocks. The majority (72.6-97.5 percent) of the strays recovered for the Dworshak B, Imnaha River and Pahsimeroi A steelhead stocks were in the sport and tribal fisheries (Figure 6).

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There have been a number of management actions implemented to reduce the abundance and risk of out-of-basin strays in the Deschutes River. Stray hatchery fish which are trapped at the Warm Springs National Fish Hatchery trap and at the Pelton Dam trap are removed. Trapping has been initiated on Trout Creek, and stray fish collected at this trap are also removed. Even with the removal of hatchery strays at these locations, a significant proportion of natural spawners in the Eastside and Westside populations are out-of-basin strays.

It is clear that some hatchery stocks pose greater risk than others due to their propensity to stray into the Deschutes River, as well as their spatial and temporal distribution patterns. Based on our analyses, one of the hatchery stocks that appears to pose significant risk is the Wallowa Hatchery stock. The Oregon Department of Fish and Wildlife is currently assessing an alternative broodstock development and management strategy to the current Wallowa Hatchery stock in order to reduce the incidence of straying into the Deschutes River. ODFW, in cooperation with volunteer anglers, has been collecting hatchery steelhead from the Grande Ronde River near Troy, Oregon, in the fall since 2003. The fall-collected brood are held at Wallowa Hatchery until they mature in the springtime, when they are spawned together to create fall brood offspring. Fall brood offspring smolts were released at Wallowa Hatchery in Enterprise beginning in spring 2005. Fall brood smolts, along with traditional Wallowa Hatchery stock smolts, are marked with coded wire tags and Passive Integrated Transponder tags to monitor straying and adult migration timing and patterns through the Columbia River and Snake River mainstems. The hypothesis is that, since the fall brood fish traveled through the mainstem quickly and arrived in the Grande Ronde River in the fall, they had spent little or no time in the Deschutes River and that their offspring will have less tendency to stray into and stay in the Deschutes River. If the assessment indicates that offspring of fall brood stray at a lower rate than the traditional Wallowa Hatchery stock, then the traditional Wallowa stock will be replaced with the new fall brood origin Wallowa stock.

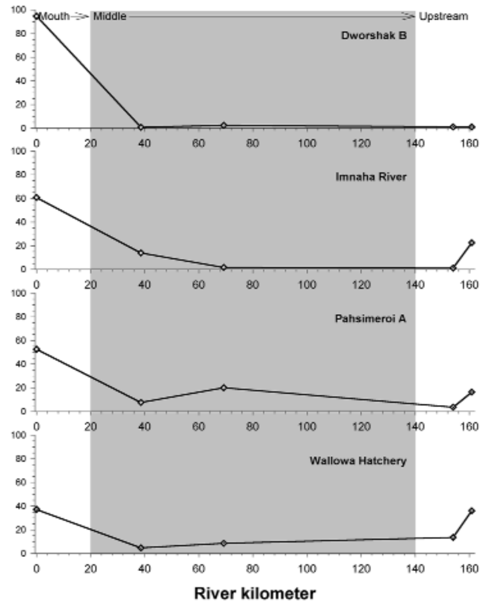

Figure 5. Mean percentage of each Snake River hatchery steelhead stock recovered in specific areas of the Deschutes River.

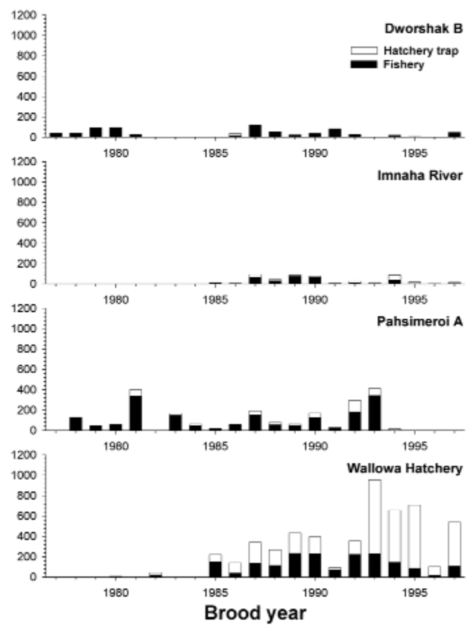

Figure 6. Total estimated number of steelhead recovered in Deschutes River fisheries (sport and tribal) and at hatchery traps (Pelton Dam and Warm Springs National Fish Hatchery), 1974-1997 brood years.

If the Wallowa broodstock alternative proves successful it will reduce the abundance of strays in the Deschutes River. However, given the magnitude of other Snake River strays ,as well as strays from other unknown sources, the stray abundance will still be high. Additional management actions will be needed to reduce the natural spawning proportion of stray hatchery fish to a low ecologically acceptable risk level.

Future management actions are being developed and reviewed as part of the Middle Columbia River steelhead recovery planning process. The proposed actions will likely be available for public review in early 2007 when the Recovery Plan for Oregon's Middle Columbia River Steelhead is completed.

References

Carmichael, R.W., and numerous co-authors. 2006. Recovery Plan for Oregon's Middle Columbia River Steelhead. Progress Report, Oregon Department of Fish and Wildlife, La Grande, Oregon.

Chilcote, M.W. 1998. Conservation status of Steelhead in Oregon. Information report 98-3 of the Oregon Department of Fish and Wildlife, Portland, Oregon.

Chilcote, M.W., S.A. Leider, and J.J. Loch. 1986. Differential reproductive success of hatchery and wild summer-run steelhead under natural conditions. Transactions of the American Fisheries Society 115:726-735.

Interior Columbia Basin Technical Recovery Team. 2003. Independent Populations of Chinook, Steelhead, and Sockeye for Listed Evolutionarily Significant Units within the Interior Columbia River Domain. NOAA Fisheries, Seattle, WA.

Leider, S.A., P.L. Hulett, J.J. Loch, and M.W. Chilcote. 1990. Electrophoretic comparison of the reproductive success of naturally spawning transplanted and wild steelhead trout through the returning adult stage. Aquaculture 88: 239-252.

Olson, D.E., and S. Pastor. 1998. Warm Springs National Fish Hatchery: An account of summer steelhead returns and strays in the Warm Springs River. U.S. Fish and Wildlife Service, Vancouver, Washington.

ODFW. 1997. Lower Deschutes River Subbasin Management Plan. Mid-Columbia Fish District, Oregon Department of Fish and Wildlife, The Dalles, Oregon.

ODFW. 2000. Middle Columbia fisheries management district annual report. Unpublished report. Oregon Department of Fish and Wildlife, The Dalles, Oregon.

Reisenbichler, R.R. and S.P. Rubin. 1999. Genetic changes from artificial propagation of Pacific salmon affect the productivity and viability of supplemented populations. ICES Journal of Marine Science 6:459-466.

San Mateo Creek Steelhead Update

By Tim E. Hovey
— California Department of Fish and Game —

Tim Hovey, an associate fishery biologist with the California Department of Fish and Game wrote an article detailing the discovery and monitoring of steelhead in the San Mateo Creek system for the January 2004 issue of The Osprey. In this article he gives us an update on developments since that time.

In December of 2003 a California Department of Fish and Game (Department) survey crew found a 13.5-inch resident trout in Devil Canyon Creek, a tributary to San Mateo Creek in San Diego, County. This fish represented a second generation resident fish, directly descended from several pair of adult steelhead that entered the drainage in 1997 to spawn. The first generation fish were discovered in 1999 and instantly propelled San Mateo Creek into the steelhead spotlight. The following year (2000) the Department documented the first successful spawn of resident fish in San Mateo Creek in over 50 years. The large individual observed in December of 2003 was the result of that spawn.

In the following years, conditions on the drainage for returning adult steelhead were excellent. In a drainage that can seasonally remain unconnected to the ocean or measure its ocean access in days during the spring, San Mateo Creek saw three consecutive years of extended ocean passage. Unfortunately, snorkel surveys conducted by the Department of Fish and Game and biologists from Marine Base Camp Pendleton during this time (2004-2006) yielded no new observed entries into the creek during these excellent conditions.

During the summer months and into fall, continued snorkel and seining surveys were conducted in the upper portion of the creek in the hopes that fry would be observed. All involved held a strong belief that due to the high water conditions on the creek during the spring, adult steelhead could have easily been missed entering the creek. Unfortunately, during the three year period where San Mateo Creek saw some of the best steelhead conditions in recent history, no new fish were detected in the drainage.

Beginning in 1999, data collected by the Department strongly suggested that the original spawners that entered San Mateo Creek in 1997 may have made their way to the Devil Canyon tributary to spawn. Devil Canyon continues to be a pristine creek free of the exotic fish species that currently plague San Mateo Creek. This is likely the reason that biologists observed a successful spawn and healthy, adult trout in Devil Canyon up until 2003, and the last documented sighting of resident trout in San Mateo creek was made in the summer of 2000.

In the fall of 2005, a concerted effort was placed on extensively surveying the lower portion of Devil Canyon Creek. It was speculated that either returning steelhead once again entered the tributary undetected to spawn or the few resident trout observed further up the creek in December of 2003 may have spawned again. A small group of biologists clad in wet suits and donning mask and snorkel started the survey of the small tributary at its confluence with San Mateo Creek. After hiking a full mile up Devil Canyon Creek and surveying every piece of available water, the survey team failed to detect any trout in the lower portion of the drainage. To date, the last documented trout observation on the drainage was in December of 2003.

Despite the lack of fish in the creek over the last three years, interest in San Mateo Creek and the resident trout population has remained high in the steelhead community. A technical advisory committee (TAC) made up of resource biologists and constituent representatives has met twice yearly since the 1999 discovery to discuss restoration projects and funding issues for the drainage. This group of dedicated individuals has remained optimistic in this endeavor, identifying priorities for restoring San Mateo Creek and ultimately the southern population of steelhead trout.

One of the key issues within San Mateo Creek and posing the highest threat to every stage of resident trout is exotic fish species presence. The TAC has made exotic control its top priority. The headwaters of San Mateo Creek start high in the hills of the Cleveland National Forest, where several citizens have private in-holdings, some of which possess small ponds. The TAC believes that one if not more of these personal ponds were the primary source of exotic fish contamination into the drainage and that educating the residents on pond issues would ultimately benefit the creek.

The last rainbow trout documented in Devil Canyon was in December 2003. Photograph by Tim Hovey

Towards this end, the TAC has created an informative and educational brochure that outlines the detrimental impacts of exotic fishes on native species. The printing of these brochures coincided with a public forum held at a resident's house in June 2006 near the headwaters of San Mateo Creek. The information was well received and several residences are looking to modify their ponds to eliminate the possibility of further contamination.

While the source issue is certainly important to identify and control re-infestation, how to deal with the current exotic load within the creek is equally important. It has been docu-

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Chair's Corner
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more extensive system in which to test the potential of a wild fish refuge.

3. Prohibit a targeted sport harvest of "rainbow trout" under ten inches long in these watersheds. They may be premigrant steelhead.

4. Take all necessary steps to discontinue the release of Upper Columbia hatchery steelhead smolts with adipose fins intact. The presence of unclipped steelhead has at least two undesirable effects. (1) It has increased the difficulty of monitoring the various interactions between hatchery and wild fish and other important measurements. (2) It has reduced the recreational harvest of unclipped hatchery steelhead, which are best removed from the river to prevent hatchery/wild interbreeding. No organization is in a better position to disabuse the court of its decision to allow unclipped hatchery releases than WDFW. If this means increasing the tribes' share of the hatchery fish harvest, so be it.

5. Encourage the tribes and commercial fishers to move toward selective fishing methods to reduce wild fish harvest, as recommended by scientists for more than ten years.

6. Take an active and aggressive role on behalf of the fish in the re-licensing of the mid- Columbia dams by requiring substantial fish passage improvements as a condition of license renewal.

7. Depending on abundance levels of adult returns, put in place steelhead sport fishing regulations in the Methow designed to maximize recreation. These regulations would include strict catch and release of wild fish and harvest of hatchery fish.

Wild fish and habitat recovery must be integral to any recovery plan.

San Mateo Creek
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mented that the populations of largemouth bass, green sunfish, black bullhead, bluegill and bullfrogs are all self sustaining and reproducing within the drainage. This illustrates that a one-time release was likely responsible for the current exotic issues in San Mateo Creek. Addressing this priority, the Department has spent years evaluating removal techniques such as seining, electro-shocking, pool pumping and fish trapping. While some methods have been moderately successful, it is clear that these manual techniques are impractical to address a drainage-wide problem.

One of the brighter spots on the creek is Devil Canyon and its lack of exotic species. The TAC team understands the importance of addressing exotic issues on the drainage, but as long as Devil Canyon tributary remains clean, returning steelhead have a refuge complete with quality spawning and rearing habitat.

The discovery of resident fish in San Mateo Creek in 1999 was the first confirmed return of native fish in over 50 years. The subsequent spawn and continued monitoring of the trout in the drainage has maintained interest in the creek throughout the steelhead community. Just this year, a short article outlining the events of San Mateo and Devil Canyon creeks appeared in a national fly fishing magazine. The *Los Angeles Times* also dedicated three full pages in their outdoor section to the San Mateo Creek cause in the fall 2005. This clearly illustrates that, despite a lack of new fish observations in the creek in the last 3 years, interest remains strong.

The TAC team will continue to work towards restoring San Mateo Creek and educating those interested in learning about the southern steelhead trout. It really doesn't matter to us that the fish no longer occupy the drainage. All members of the team understand that restoring the creek to its original state benefits all native species, including the trout. And every year that the drainage opens up to the ocean, it brings new hope that the southern steelhead trout will return to San Mateo Creek.

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