Sandy River Reborn
With Marmot Dam gone, Oregon’s Sandy flows free once again

by Garth Wyatt and Nick Ackerman
— Portland General Electric —

The story of the Marmot Dam removal started when Portland General Electric (PGE) began the dam relicensing process in 1999. As per regulatory requirements, every 30-50 years utility companies must file for a new license to operate their hydropower projects. This “relicensing process” requires participation of government agencies, non-governmental organizations, and the utility company. In the relicensing process, the utility compa-

As the water churned and frothed, it quickly became apparent that the Sandy River was ‘back.’

On October 19th, 2007 the Sandy River — a tributary of the Columbia River with headwaters in Oregon’s Cascade Mountains near Mount Hood — flowed freely for the first time since 1913. As the river churned, frothed, and ate through the earthen cofferdam left behind from the removal of Marmot Dam, it quickly became apparent that the Sandy was “back.” The breaching also signaled the end of a lengthy decommissioning process and the beginning of intensive monitoring to chronicle the largest dam removal to date in the Pacific Northwest.

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Garth Wyatt also works for Portland General Electric as a fish biologist out of the West Side hydro office along the Clackamas River. Prior to joining PGE he was employed by the Confederated Tribes of Warm Springs working on the Hood River Production Program, and ODFW. Garth graduated from Oregon State University with a fisheries biology degree in 2004 and is an avid fisherman.

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See also page 11 for information on the new Osprey blog
FROM THE PERCH — EDITOR’S MESSAGE

Obama and Salmon

by Jim Yuskavitch

After eight years of environmental policies created and implemented by what history may judge as the most anti-conservation administration in the history of the U.S., we now have a new president, Barak Obama, who offers, at least in the hopes of many conservationists and wild fish advocates, an opportunity to forge new directions and real progress on a host of environmental fronts, from energy to salmon policy.

As Steelhead Committee Chairman Bill Redman notes in his column for this issue, Dr. Jane Lubchenco, a marine ecologist from Oregon State University with strong conservation credentials, was appointed as new director of the National Oceanic and Atmospheric Administration. Her leadership of that key agency is expected to produce positive things for wild salmon and steelhead. We shall see.

Funding is always key to wild salmon and steelhead recovery. In a signal that the Obama Administration thinks the salmon and steelhead issue in the Pacific Northwest is an important one, it has included $50 million in funds in its 2010 budget for salmon recovery work in Washington, California, Oregon, Idaho, Nevada and Alaska. The funding was left off the original budget proposal as a separate line item, and restored through the work of the Northwest members of Congress who were able to convince Commerce Secretary, and former Washington Governor, Gary Locke, to re-instate it. That’s a good sign, in addition to the fact that it is a $15 million increase from the salmon recovery funding provided by the Bush Administration last year.

In another interesting indication that the Obama Administration is taking the salmon issue seriously, it sent two top environmental executives — Lubchenco of NOAA and Nancy Sutley, chairwoman of the White House Council on Environmental Quality, on a salmon ‘listening tour’ in the Northwest during the last week of May.

Representatives of sport anglers, commercial fishermen and environmental groups were conspicuously left out of the talks, although Lubchenco and Sutley did meet with government officials, scientists and representatives of Columbia River treaty tribes, and a major focus of the discussions centered on the Columbia and Snake River hydro system and its impact on salmon. According to Lubchenco, she and Sutley were here to gain enough information for the Obama Administration to develop a position and policy on that long-running and contentious issue.

It’s far too soon to tell for sure how the administration will approach this and other salmon and steelhead conservation issues or what solutions it will propose. And how much of a priority Obama will give salmon and steelhead issues is also a question, since he has many other serious national issues to contend with, including the economy and wars in Iraq and Afghanistan, to name just a few. It also behooves wild fish advocates to recall that the decline of salmon, steelhead and other wild salmonids has been occurring for a long time, through many different administrations. Just because Democrats are typically seen as more environmentally friendly than Republicans, a Democratic administration is no guarantee that wild fish will automatically fare better under their rule. Constant vigilance on behalf of wild fish will continue to be the order of the day.

Sorry about that...

We neglected to mention Bruce Harang, a reader of and donor to The Osprey, who should have been listed in the 2008 Honor Roll section of the January 2009 issue under the $50 to $99 category.

Thanks to Bruce and to all our other donors who make publication of The Osprey possible.
Some Good News, for a Change

by Bill Redman

— Steelhead Committee —

It occurs to me that over the course of nine years writing this column, most of my words have raged against the atrocities committed against wild steelhead and salmon by the acts of Man, in both private and governmental capacities.

Recently, however, there has been a spate of good news for the fish, possibly not enough to raise expectations, but enough to raise hopes. Some examples follow.

Federal Appointments and Policies

1. Dr. Jane Lubchenco, a career marine ecologist most recently with Oregon State University, has been appointed and confirmed to lead the National Oceanic and Atmospheric Administration (NOAA). Described in a New York Times Editorial of April 11th as “tough, smart, respectful of science and deeply committed to the survival and growth of American’s Fisheries,” she is now the high level federal appointee most responsible for the protection and recovery of steelhead and Pacific salmon in the western United States. Amazing — a scientist to lead an organization that does science! It raises hopes that the managers of NOAA Fisheries in the Northwest can end their tortured explanations of the line between science and policy, and simply let the policy follow the science.

2. On April 28th, the administration announced that federal agencies will again be required to carry out independent scientific review on projects that might impact ESA listed species. This reverses directly an eleventh hour policy change of the previous administration.

Dams

The process of removing fish block-

ing dams in the Northwest has begun, and the outlook is that the pace will quicken. Let’s itemize:

1. Forty-five foot high Marmot Dam on Oregon’s Sandy River was removed in the Fall of 2007. The behavior of the released river went largely as the models had predicted, except that the process of flushing out the sediments that had accumulated behind the dam went much more quickly than expected, without negative impacts on fish habitat and without flooding downstream. The river regained its natural characteristics very quickly, with braiding, bars, and riffles. Some encouraging lessons were learned for future deconstruction.

2. More progress has been made on Rogue River dam removal than almost any other steelhead and salmon river, as reported by Bob Hunter in his article in the September 2008 issue. To update, by the end of this year three dams will have been replaced by a free flowing river, two on the mainstem and one on a tributary. And work is underway on a fourth removal project.

At Savage Rapids Dam, the downstream most of the four, a north side cofferdam is in place, dam removal will begin in June, and by October, the River should be flowing unimpeded through the section now occupied by the north six bays. Upstream 14 miles from Savage Rapids, Gold Hill Diversion Dam was removed in July 2008. Upstream another five miles is Gold Ray Dam, where environmental review and dam removal await procurement of grant money and federal stimulus money. Depending on procurement of these funds and successful environmental review, dam removal could happen from 2010 to several years later. Elk Creek Dam on one of the most important spawning tributaries to the upper Rogue was notched in September 2008. When all is done 50 free flowing miles will have been added to the mainstem, all the way to Lost Creek Dam at river mile 157, and an important tributary made more accessible.

3. Removal of Hemlock Dam on Trout Creek, the primary steelhead spawning tributary of southwest Washington’s Wind River, is scheduled to begin this summer. Deconstruction of this small dam built in 1935 increases hopes that the Wind will regain its former status as a premier steelhead sport fishery.

4. Removal of Condit Dam on the lower White Salmon River just east of the Wind has been delayed from this year to next due to concerns at the Washington Department of Ecology about sediment loads and mercury content in the sediments. Our sense is that this is a temporary delay with issues that can be resolved, and that removal will move forward.

5. Olympic National Park will receive $54 million in federal stimulus funds to accelerate the completion of projects prerequisite to removal of the Elwha and Glines Canyon dams on the lower Elwha River. The schedule to start deconstruction of the dams has been moved forward from 2012 to 2011. With dam removal approved by

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ny must demonstrate that the benefits of the energy produced by the project outweighs environmental impacts from the project.

Early in the relicensing process, during talks around the Bull Run Hydro Project (of which Marmot Dam was a component), it became apparent that significant upgrades to facilities and changes in operating conditions needed to be made. A central issue in the negotiations was reducing project impacts on salmon and steelhead listed under the Endangered Species Act (coho, Chinook, and winter steelhead). This meant adding passage facilities at the Little Sandy dam, and upgrading the existing facilities at Marmot Dam. It also meant bypassing more water into the lower Little Sandy River to provide habitat for salmon at the expense of generation. In the end, costs of lost generation and facility improvements were so high that in 2002 PGE filed an application to the Federal Energy Regulatory Commission (FERC) to surrender and decommission the Bull Run project.

The decommissioning plan called for the removal of Marmot Dam, the Little Sandy dam, the water conveyance system and Roslyn Lake. Four removal options were seriously considered. The first was to remove the dams and as much of the impounded sediment as possible in one construction season. The second option entailed removing the dam, but leaving all of the impounded sediment to wash downstream. The third option would span two construction seasons to remove the dam and sediment in a tiered approach. The first season the upper portion of the dam would have been removed, and the upper layer of stored sediments would have been allowed to wash downstream. In the second season, the lower portion of the dam would have been removed, and all of the remaining sediment stored behind the dam would be removed. This option allowed for some replenishment of sediment downstream of the dam without risking inundation of the lower river. The final option was similar to the first, except that instead of removing all of the impounded sediment, only half of the sediment would have been removed. Otherwise all work would have been conducted in one season and any remaining sediment would be allowed to flush downstream. PGE, the regulatory agencies, and the non-governmental organizations came to the consensus that option number two was to be utilized.

The decommissioning plan also called for an intensive pre- and post removal monitoring program. The program included geomorphological monitoring to evaluate sediment dispersal, water quality monitoring, a one-year fall Chinook conservation program, and monitoring to ensure safe passage for migrating salmon.

The top photo shows Marmot Dam in its original condition. The above photo shows water flowing through the breach in the cofferdam. Photos by Portland General Electric.

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The plan was designed to ensure the protection of salmon until such time that the river reached a dynamic equilibrium that more or less resembled the natural state of the river.

The Breach

On October 18th, 2007 significant rains fell on several inches of snow in the northern Oregon Cascades. This event triggered a sudden increase in flow the evening of the 18th and on the 19th. The upper cofferdam put in place to control flows while the concrete Marmot Dam was being removed was engineered to withstand flows of 2,000-2,500 cfs. By the morning of the 19th it was clear the river would enter that flow range. In response, PGE mobilized its contractors and commenced activities necessary to breach the cofferdam. Between 5:00 p.m. and 5:30 p.m. the cofferdam was finally breached on its south shore, and over the next half hour the flow over the cofferdam moved from a trickle to a torrent. By the morning of the 20th, the river had scoured out the entire cofferdam and had made significant progress in mobilizing sediment trapped behind the cofferdam. In the process, old log jams were unearthed, and gravel bars were formed and eroded as the river put on a morphological display at “hyper-speed.”

Perhaps the most critical variable determining decommissioning success was the fate of the 750,000 cubic meters of material stored behind Marmot Dam. Would the material evacuate the former reservoir or be left high on terraces created by the receding flows? Following the breach, the United States Geological Survey (USGS) calculated that approximately 15% of the stored material was evacuated in the first 48 hours resulting in a bed load transportation rate of up to 100 kilograms per second. Put another way, that’s 14,800 dump truck loads of material evacuated in the first 48 hours, or 5 dump truck loads every minute for 48 hours! In the ensuing five to six weeks, the river’s thalweg [Editor’s Note: a line connecting the lowest points of successive cross-sections along the course of a valley or river] meandered back and forth across the active channel as the river struggled to find its identity again. The Sandy near Marmot Dam had temporarily transformed from a high energy mountain stream to a dynamic alluvial stream resembling its cousins on the Olympic Peninsula. Boulder garden rapids below the former dam site were replaced with long riffles approaching 500 meters in length dominated by 4-8 inch cobbles. At first glance the simplified morphology of the newly created channel raised concern that passage problems may have been present due to lack of complexity. Upon closer inspection small pockets of holding water were available so no real fish passage problems ever existed. Fish were observed passing the site within three days of the breaching.

During the first four months subsequent to breaching, the river profile changed substantially in response to relatively small flow events.

During the first four months subsequent to breaching, the river profile changed substantially in response to relatively small flow events, turning every monitoring trip into an exercise of show and tell. In the first year after breaching, roughly 365,000 square meters, or 49% of the total sediment stored, was evacuated from the former reservoir. The USGS estimated that ~82% of that total had been moved by late February 2008 (Figure 2). Perhaps the most impressive geometrical artifact from the breach was the increase in river bed elevation downstream from the former dam site. Surveys of the river bed profile showed that in some locations the river bed had aggraded up to 15 feet in the first mile below the former dam site (Figure 1)! After the initial four month dispersion period following the breach, changes in river morphology became much more subtle until a large rain-on-snow event occurred on January 1st, 2009. As flows reached 19,000 cfs, the largest post-breach event, major changes were realized near the dam site for first time in 10 months. As flows receded, dramatic changes in the riverscape began to emerge. Inundated boulders, once the dominant feature in the vicinity of the former dam site, began to peek through the aggraded material as the substrate was transported downstream. The large mid-channel bar (roughly 25 meters by 100 meters) that had formed just downstream of the footbridge had 1 to 1.5 meters of material eroded off the top, redistributing that material nearly a mile downstream. The well known “Slaughter Hole” that had been filled with cobbles to the point it had become an unrecognizable riffle was once again cleared. This proved to be the first event when the net change of material immediately downstream of the dam appeared to be negative, possibly signaling the end of sediment wave in the vicinity of the former dam site.

While changes in the river near the dam have been dramatic and obvious, changes farther downstream have been much slower and more subtle. Monitoring has shown that fine sediments moved into the lower Sandy relatively quickly and most passed through. Gravel only began to reach the lower Sandy in the winter of 2009, and few cobbles have moved into the lower river. Concerns over the potential blockage of salmon and steelhead passage in the lower Sandy from the release of sediment behind the dam have never been realized, and it looks as though conditions will only improve as the river continues to digest the once stored sediment.

The Little Sandy

In the spring of 2008 the Little Sandy dam was removed and anadromous passage was restored for the first time in over 100 years. While the Little Sandy dam removal project received less press coverage than its bigger brother, Marmot Dam, the benefits to anadromous fish could be significant. The Little Sandy dam was 16’ high and lacked fish passage facilities, effectively exterminating anadromous salmonids from 6.5 miles of habitat upstream of the dam. In addition, there
was no minimum flow requirement, so that the only flow available for 1.7 miles below the dam in the summer was from accretion and seepage through the dam. Since anadromous extirpation 100 years ago, there was some question as to how the Little Sandy would be recolonized. Would removing the dam allow resident rainbow trout to express their anadromous life history form, or would adult winter steelhead expand into there new found habitat on there own? Flash forward nine months and adult winter steelhead are already present in the Little Sandy above the former dam site. Two USGS personnel observed the fish holding in the deep pool below the stream gauge. This was great news to all those involved!

**Fish Management**

Despite the adverse effects the Bull Run hydro-project had on salmonids, Marmot Dam played a critical role in determining the basin’s fish management plan. By providing a point of interception for hatchery fish, Marmot Dam allowed the Sandy River to be managed as a consumptive fishery below the dam and a wild fish sanctuary above the dam, as well as providing reliable run data for ESA listed fish. The Oregon Department of Fish and Wildlife (ODFW) removed hatchery fish at the dam, thereby minimizing the genetic and ecological interactions associated with hatchery programs.

Early on it became clear that without Marmot Dam in place, the fish management plan had to be re-evaluated and new strategies developed to minimize effects of the existing hatchery program on wild fish. The following management changes were applied to the hatchery program:

1. Spring Chinook: Change of stock from Willamette to localized Sandy River broodstock and total numbers planted decreased from ~460,000 to ~300,000. All spring Chinook acclimated at Sandy Hatchery. A mix of (25%) wild to (75%) first generation hatchery fish (F1s) will be followed.

2. Winter Steelhead: Change of stock to a localized wild broodstock program, 160,000 smolts acclimated at Sandy Hatchery. Brood fish are collected throughout the run with a spawning ratio of (25%) wild and (75%) F1s.

3. Summer Steelhead: All smolts are now acclimated and released at the hatchery

4. Coho: Less than a 2% stray rate to the upper Sandy, no change.

5. Fall Chinook: 1 year broodstock collection program in 2007 and subsequent hatchery release of 60,000 subyearlings in 2008 to provide a buffer should a year class be lost due to siltation of redds.

6. Fishing regulation changes included

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**Figure 1.** Pre and post-breach transects across the Sandy River in the vicinity of Marmot Dam (Stillwater Sciences, 2008).

**Figure 2.** Marmot dam reservoir cumulative erosion rate (meters) (John Major, 2009).
opening up the Sandy River to the mouth of the Salmon River year-round for adipose fin-clipped steelhead and from February 1 through October 31 for adipose fin-clipped Chinook salmon.

So what effect did the changes in hatchery management have? Spring Chinook spawning surveys conducted in 2008 produced the highest redd count on record at 1,314 redds (1996-1999 and 2002-2007). The down side of this was that many of these fish were hatchery origin. Carcass surveys conducted in 2008 by ODFW estimated that ~45 percent of the spawning spring Chinook above the former Marmot Dam site were of hatchery origin. Pre-spawn mortality above the former dam site was considerably lower in 2008 than in previous years when Marmot was in place, < 1% compared to 9% average (2003-2007). Though the removal of Marmot may have had an effect in reducing the pre-spawn mortality rate, excellent water conditions may have also played a part as pre-spawn mortality rates in the nearby lower Clackamas River also hit a record low in 2008.

Another post-removal challenge managers overcame was obtaining spring Chinook and winter steelhead broodstock. Whereas previously broodstock could be collected from the fish trap in the Marmot Dam fish ladder, now broodstock needed to be collected from free-flowing river. This laborious task was taken on by Todd Alsbury (ODFW District Biologist) and his crew in the upper Sandy near the confluence of the Sandy and Salmon rivers. Beach seines were employed as the primary method of capture and 136 adult spring Chinook were caught. Approximately 32% of the captured 136 were wild fish to be used in the hatchery program. Winter steelhead broodstock collection efforts have been much less intrusive utilizing angler caught wild steelhead in combination with hatchery origin adults return-
Research focused on steelhead and lagoon processes has been carried out in Central California by the National Marine Fisheries Service Southwest Fisheries Science Center in Santa Cruz, California. This work, headed by Sean Hayes and Bruce MacFarlane, is ongoing and funded by both NMFS and the California Dept. of Fish and Game. Morgan Bond worked on the project from 2002 to 2008, completing his Master’s degree on the effects of lagoon rearing and steelhead survival in 2006 at UC Santa Cruz. Morgan is currently a PhD student at the University of Washington, School of Aquatic and Fishery Sciences, working with salmonids in a much larger and surprisingly similar lagoon in Southwestern Alaska.

A midsummer trip up or down California’s coastal Highway 1 is often hot, dry, and when the fog has lifted, breathtakingly beautiful. The road snakes along the coastline allowing for a spectacular view of the Pacific Ocean. Steelhead fishermen, however, may be glancing inland, trying to glimpse some water in one of the many small creeks and rivers that drain the steep coastal range. I have made this drive several times and always wonder how many of the small creeks and rivers are occupied by steelhead. As it turns out, steelhead do manage a living in many watersheds as far south as San Diego. In spite of their amazing tolerance for seemingly inhospitable conditions, steelhead in many coastal California drainages have experienced serious declines in recent years and most are currently listed under the Federal Endangered Species Act.

California is almost universally viewed as an annually drought stricken and arid place. However, coastal California from the Monterey Bay northward often receives a surprising amount of rain, though nearly all of it falls from December to March. The lack of snowpack in the coastal range means that streams are often parched by late summer, supported only by small headwater springs. Now protected due to inexplicable declines and small population sizes, steelhead can often be found in the most unlikely of habitats. I have often found small populations of steelhead in tiny coastal streams covered with dense brush right down to the water, where a small trickle from a spring keeps a miniscule amount of cool water moving throughout the summer.

The drive up the coast is interesting for another reason, though. In the summer, many watersheds no longer flow enough water to remove sand that is continually being transported along the shore by Pacific Ocean currents.

By midsummer, many streams will succumb to the ocean and become fully closed lagoons with no surface connectivity to the open water. At first glance this appears to be a death knell for steelhead. Smolts can no longer move to the ocean and adults can no longer return to spawn. The lagoons often appear stagnant and warm. Is this bad for steelhead? Should we open the lagoon to help steelhead? These management issues have been debated for some time. Breaching of lagoons has probably been practiced for as long as there have been people living near them, whether as a management tool to “help” fish or prevent property flooding, or even as a fun beach activity with a couple of shovels (Wow! Look at it go!). Despite the management debate, recent research has illuminated the benefits lagoon habitat can pro-

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In the spring of 2002, I was lucky enough to help initiate a new study of steelhead life histories in Scott Creek, a small central California watershed about 70 miles south of San Francisco. Scott Creek was chosen because of its manageable watershed area, where a small research crew could conduct studies throughout the entire anadromous drainage, and because the vast majority of the watershed can be accessed with the permission of only two amenable landowners. In addition, because of the lack of development within the watershed (likely the result of responsible land practices from the same two landowners), it is considered to have some of the most intact habitat on the central coast. A moderate but stable population of 300-500 steelhead adults returns to spawn each year. In addition to steelhead, Scott Creek also has the southernmost regular run of coho. Each summer, as flows in Scott Creek drop below 20 cubic feet per second, the ocean dutifully piles up sand, deepening and broadening the lagoon habitat until the lagoon becomes fully formed directly under the Highway 1 bridge.

Our earliest research in Scott Creek revolved around determining which habitats are being used by steelhead, and what type of growth fish experienced in each habitat. To do this, we began tagging fish with passive integrated transponder (PIT) tags, identical to the radio-frequency identification chips now commonly placed in pets. PIT tags allowed us to permanently identify individual fish to track their growth, movement, and ultimately survival. Although it was not our original intent to focus on the lagoon habitat, several sampling events there indicated that a substantial number of young steelhead were using the habitat, and those fish were growing at a phenomenal rate.

Steelhead smolts in Scott Creek begin migrating to sea in the late winter, and the run peaks in late March. The mean size of those fish is about 110 mm (roughly 4.5 inches) fork length, unusually small for a steelhead to migrate. Interestingly, all of the larger individuals (the few greater than 150 mm) go directly to sea early in the spring, while a subset of the smallest nearly 85% of returning adult steelhead over the last six years over-summered in the lagoon as juveniles. This high return rate of lagoon reared fish is extraordinary considering that on average only 20% of the downstream migrating fish can be found there during the summer, the rest having gone to sea in the spring or suffered at the beak of an avian predator.

As critical as the current lagoon habitat appears to be for Scott Creek steelhead, these results should be viewed in light of the substantial alteration the lagoon has undergone in the last century. Like many central California lagoons, the largest alterations occurred during the construction of Highway 1. In the mid-1930’s the Scott Creek lagoon was fairly large, encompassing several large meanders and likely maintaining some deep water habitat even in its open state. With the construction of the Highway 1 bridge, the lagoon was straightened, channelized, and no longer maintains deep water habitat during the winter and spring months. It also does not contain any woody structure, as the straight channel ensures that all woody debris is quickly carried to the ocean. This reduction in habitat has likely had two serious consequences. First, we now observe a strong density dependent growth, meaning that as the number of summer residents increases, their growth rates drop. In fact, at the current lagoon size, as the number of smolts exceeds 3,000, the growth benefits of the lagoon may be lost. Second, the lack of meander to the stream means that it does not maintain any deep bends or structure, and our recent studies indicate that lagoon residents may be extremely susceptible to predation by various birds (e.g. western gulls, cormorants, mergansers).

Lagoons and estuaries have often been considered “one way valves” in fish migration. The dogma is that fish rear in the lagoon while it is closed and move to the ocean when it opens, not to be seen again until they return as adults. Our tagging work indicates that young steelhead have a more complicated behavior than we expected. In the late fall, the lagoon often becomes devoid of young steelhead, but because the sandbar holding the lagoon in place is not removed until the first substantial storm, they cannot have completed their seaward migration. In 2007 and 2008, with the help of PIT tags and instream tag detectors, we confirmed that at least half of the lagoon residents moved upstream in the fall. Further, these fish remained in the upper watershed until the early spring when they were some of the first fish to migrate out of the system. They comprised nearly all of the large downstream migrating smolts and moved directly to the ocean (remember those 150+ mm fish?). Although the reasons behind the upstream migration remain a mystery, we can come up with a few plausible explanations. First, the first big storm that opens the lagoon often comes in late December or early January. The thick of winter is universally accepted as a lean time in the ocean, as prey is not nearly as abundant as in the spring and summer months. In addition, the first storm may be associated with poor water quality in the lagoon as anoxic sediments are mobilized. It is also plausi-
ble that some fish grow enough in the lagoon to become precocious and attempt a spawning bout before going to sea.

Some of our newest research indicates that the extreme productivity of the lagoon is driven in some years by marine nutrients. This is counterintuitive because we traditionally view the lagoon in its closed summer state, as a freshwater body, completely disconnected from the ocean. However, we now know that in some years there is a large contribution of marine derived carbon and nitrogen in juvenile lagoon steelhead. This is likely the result of kelp detritus brought into the lagoon during large swell and tide events. In many years this input appears to drive a robust population of gammarid amphipods [Editor’s Note: small shrimp-like crustaceans anglers often refer to as scuds], which comprise the vast majority of lagoon steelhead diets. More work is needed however to fully understand the tenuous balance between a productive, healthy lagoon and one where anoxic conditions and fish kills occur.

Despite their declines in recent years, steelhead populations do appear to be fairly resilient. In low densities steelhead probably receive a small boost as they are relieved from many of the competitive processes that would occur when spawner numbers are high. In addition, genetic analysis indicates that steelhead in central California are unique, despite substantial stocking of northern California fish into central coast streams in years past. The fact that these fish did not “take” is an indication that southern steelhead may be locally adapted, and highlights the need to protect these unique fish.

So what does all of this mean for coastal California steelhead? First, more research on the value of lagoons for steelhead in watersheds outside of Scott Creek is needed, particularly in northern and southern California, where the potential benefits of lagoon habitat may differ. I would wager that many lagoons provide similar benefits for young steelhead, but we have simply not invested in evaluating them. Second, lagoons in watersheds with steelhead should be protected from further perturbations. Because we do not fully understand how fragile these systems are, we should work to prevent lagoon alteration. One particularly egregious practice is the mid-summer breaching of lagoons when the habitat is most useful to steelhead. Finally, we should take advantage of opportunities to restore lagoons. Like many watersheds, the Scott Creek lagoon only comprises about 5% of the watershed accessible to steelhead, yet helps to produce nearly all of the returning adults in recent years. In budget conscious times lagoon restoration could produce a lot of bang for the buck. Although lagoon restoration is unlikely to singlehandedly bring steelhead back, it is one of the most promising and feasible restoration techniques we have encountered. Healthy lagoons will add to the resiliency of small streams where environmental conditions are wildly dynamic. In some years the lagoon habitat may not be suitable, but in other years it may help to increase the overall productivity of the system and boost adult returns.

Currently the California Transportation Department is evaluating plans to replace several aging Highway 1 bridges in central California, including the one over Scott Creek, which was built in 1939. This is an excellent opportunity to return the lagoon to a state more resembling the habitat that dominated the lower watershed before highway construction. Because the lagoon acts as a nursery for steelhead, there is some reluctance to alter the habitat for fear of unintentionally degrading it further. However, with almost nine years of continuous steelhead monitoring, Scott Creek provides an excellent opportunity to experimentally test lagoon restoration as a steelhead recovery tool.

The benefits of the lagoon in Scott Creek are now well established. It is my hope however, that our research will encourage others to look more closely at lagoons. We, as scientists and conservationists, need to resolve how lagoons can benefit steelhead throughout their range and take action to prevent further degradation of these unique habitats.
The Osprey Blog

Log on to Osprey Steelhead News, the official blog of The Osprey, where readers can get the latest information on issues affecting wild fish, and the opportunity to post comments and initiate discussions about wild salmon and steelhead and the stories covered in The Osprey. Some of the postings you will currently find on Osprey Steelhead News include: climate change; Columbia River salmon and steelhead restoration; beavers and their benefits to fish habitat; construction of a new Columbia River fish hatchery; and an Oregon State Forest alert.

Check out Osprey Steelhead News and have your say. You’ll find it at:

http://ospreysteelheadnews.blogspot.com
The Yakima River
Can it’s once-robust anadromous fish runs be restored?

By Will Atlas
— Steelhead Committee —

The Yakima River drains a huge swath of the eastern Cascade Mountains. With a watershed area in excess of 6,000 square miles stretching from central Cascades around Interstate 90 south to the Columbia River, it is by far the largest Columbia River tributary originating in Washington state. By the time it reaches the Columbia near Pasco, the Yakima has flowed 214 miles from its source at Keechelus Lake. Passing through high gradient subalpine terrain, to fertile semiarid valleys, it provides water for some of the most productive orchard lands in the world as it rolls towards the Columbia. With the quantity and diversity of stream and river habitats available in the watershed, it should be one of the most productive salmon and steelhead rivers in the state of Washington. In spite of its inherent potential to produce anadromous fish, the total combined run of wild and hatchery coho, Chinook and steelhead has averaged fewer than 20,000 individuals over the last decade. At present only fall Chinook spawning in the lower river are considered healthy, with upper Yakima, Naches, and American rivers spring Chinook all considered depressed by the Washington Department of Fish and Wildlife (WDFW). Summer steelhead are also depressed. Both stocks are listed as threatened under the Federal Endangered Species Act.

With the current state of salmon and steelhead runs on the Yakima, it is hard to imagine that it was once among the most productive rivers in the state. Historic reconstructions of the productivity of anadromous fish in the Yakima estimate it once supported between 50,000 and 280,000 spring Chinook, 38,000 to 100,000 fall Chinook, 20,800 to 100,000 summer steelhead, 44,000 to 150,000 coho, and while there are no official estimates of historic sockeye abundance, many believe they were the most numerous of all the salmonid species. All told, in a productive year the Yakima probably saw a return of close to one million adult salmon and steelhead. A century later, dam building, irrigation projects and habitat loss have reduced runs to roughly one fiftieth of their former size.

While the Yakima was once a huge producer of anadromous fish, anglers and managers currently consider it a primarily resident fish system. The upper Yakima is managed for catch and release trout fishing and is one of the most popular and successful fisheries in the state. The highly productive nature of the upper Yakima, and the healthy population of wild trout that inhabit the river provide hope that someday soon the upper river could again support robust runs of anadromous fish.

**History of Decline**

With the growth of agriculture in the Yakima valley beginning in the 1850s, irrigation demand quickly changed the natural hydrology of the Yakima. Water diversions removed instream flow, causing many smaller tributaries and off channel areas to dry up completely, and water diversion dams were constructed with no consideration for the upstream passage of salmon and steelhead. Additionally, irrigation diversions were almost entirely unscreened, trapping fish in irrigation ditches and resulting in extremely high mortality in smolts. As irrigation demand continued to grow through the early 1900s, several water storage reservoirs were constructed to provide irrigation throughout the dry summer months. Without exception, these dams failed to consider fish passage, resulting in the loss of hundreds of miles of prime spawning habitat. Dams on the upper Yakima, Kachess River, Cle Elum River, Bumping River and Tieton River all blocked fish access. These dams also dramatically altered the natural hydrology of the Yakima system. Storing water during spring runoff reduced the annual peak flow that normally transports sediment and wood, and creates the diversity of habitat juvenile salmon and trout rely on. Summer irrigation releases now keep the river running bank full from June to early September, creating poor rearing conditions for emergent steelhead and rainbow trout fry.

The construction of Roza Dam in the lower canyon was perhaps the most devastating. Built in 1940, engineers recognized the need to provide fish passage. A poorly constructed fish ladder, however, meant that it was typically above the waterline and dewatered once irrigation flows were reduced in fall. Not until spring runoff

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would the ladder again provide passage for migratory fish into the upper river. The original ladder remained in place until 1989, with devastating effects on populations of both steelhead and coho. Today, with the new ladder, steelhead have begun to return to the upper river. Recent returns however have numbered between 100 and 200 fish, remnants of the former run.

**Hope for Recovery**

While many of the subpopulations within the Yakima watershed have suffered in the last 100 years, there are some bright spots. Coho, eliminated from the Yakima by intense over-harvest during the 1970s, have reestablished a viable population following a planting of 700,000 smolts in Ahtanum Creek in 1992. Today between 5,000 and 6,000 wild coho return to the watershed every year. Fall Chinook also remain stronger than most stocks in the Yakima, with returns fluctuating between 1,000 and 7,000 Chinook over the last 10 years. Numbers remain relatively stable. Luckily the fish migrating to and from the Yakima only have to pass four of the mainstem Columbia dams, far fewer than their Snake River and upper Columbia counterparts.

Steelhead populations are depressed in the Naches and upper Yakima; however, improved survival in freshwater and in the ocean has led to a modest recovery with average abundance more than doubled from the 1990s. Since 2001, summer steelhead returns to the Yakima have fluctuated between 2,000 and 4,500 fish; almost all are wild. This productivity is primarily driven by two exceptional creeks. Both are tributaries of the lower Yakima which have largely avoided the human impacts that plague the Yakima. Satus and Toppenish creeks provide spawning and rearing habitat for more than 60% of the steelhead returning every year.

The fish also have allies in their recovery. The Yakima Klickitat Fisheries Project (YKFP) is a collaborative effort including the Yakama Nation, WDFW, the Bonneville Power Administration (BPA), and the Northwest Power and Conservation Council. Dave Fast, a senior research scientist with the YKFP, explained some of their efforts. Habitat and pressuring the Bureau of Reclamation to manage with, “a better balance of flows,” taking into account the needs of fish as well as irrigators. They are also working to reintroduce fish into many of the unoccupied habitats and improve smolt passage at the numerous irrigation diversions in the watershed.

Fish passage was recently added over Cle Elum dam, giving fish access to the upper Cle Elum and its numerous tributaries for the first time in decades. In 2007, 13,000 coho smolts were outplanted in the upper Cle Elum in hopes of both testing the new fish passage infrastructure and potentially facilitating the establishment of coho.

Sockeye, which rear for one to two years in lakes, have been long extinct in the Yakima. With access to the quality rearing and spawning areas in the upper Cle Elum River and Cle Elum Lake, Yakama Nation biologists hope to reintroduce sockeye. They hope to use eggs from the Okanogan River stock, identifying it as a good founder population because of the high temperatures Okanogan River sockeye face during their migration. While reintroducing hatchery-reared fish to portions of the watershed is a central part of the YKFPs salmon recovery efforts, they have taken a dramatically different approach to steelhead recovery.

Fast explains their philosophy for steelhead recovery, “I am adamant about not using hatcheries for their recovery. You are immediately severely impacting their natural life history trajectories,” he says. Rather than

With proper management, the Yakima River system could one day again have strong runs of steelhead and salmon. Photo by Will Atlas

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rlying on hatcheries to recover wild steelhead populations in the Naches and Upper Yakima, they have chosen to focus on increasing kelt survival. Kelts, or spawned out adult steelhead, may have contributed a substantial amount of productivity to our rivers historically. Today though, kelts mostly die on their way downstream through the Columbia hydrosystem. Rather than riding out on the snowmelt and reaching the ocean relatively quickly, kelts today have to swim out through four huge reservoirs, and downstream fish passage technology at dams is poorly suited to passing kelts. Biologists capture kelts at Prosser Dam, at Prosser, Washington, recondition them and then either truck them past the hydrosystem or release them directly into the river to spawn the following spring. These efforts have so far been a success, and during the first five years of the project, repeat spawners represented almost 7% of the adult steelhead escapement to the Yakima. Fast and his colleagues hope the success of the project will gain recognition, creating a valuable tool for recovery efforts across steelhead range.

The last century and a half has been devastating for the salmon and steelhead of the Yakima River. Like so many other systems, human population growth and land use changes have altered the river profoundly. Miraculously however, three of the four species originally found in the watershed are holding on, and some sub-populations are thriving. Improved fish passage measures, changes in flow management to better accommodate rearing juveniles and migrating adults, and access to portions of the upper watershed that have been cut off for almost 100 years all mean that recovery is a real possibility. With vocal advocates and a dedicated group of scientists, managers and citizens, the next century promises to be brighter than the last for the salmon and steelhead of the Yakima River.

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The Osprey on the Web

The Osprey now has its own new section on the Federation of Fly Fishers redesigned website. Learn about our mission, check on the status of wild steelhead populations, download past copies of The Osprey, subscribe and donate.

Go to: www.fedflyfishers.org and click on the Conservation tab, then the Native Fish tab to reach The Osprey pages.

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Check out our new blog at: http://ospreysteelheadnews.blogspot.com/
Columbia and Snake Rivers Lawsuit Update

By Steve Mashuda
—Earthjustice—

Steve Mashuda is a staff attorney with the Seattle office of Earthjustice. He, and other Earthjustice attorneys, represent numerous wild fish advocacy groups, including the Federation of Fly Fishers, in litigation to protect wild stocks of salmon, steelhead and other species.

The decline of Columbia and Snake River salmon and steelhead can be blamed on many factors, but none are as large as the construction and operation of the massive federal dams that have turned these free-flowing rivers into a series of slack-water lakes. The battle to save these Northwest fish began even before they were protected by the Endangered Species Act (“ESA”) in the 1990s, but has intensified in the past decade. For the past ten years, the fight has focused on the need to partially remove the four dams on the lower Snake River — Lower Granite, Little Goose, Lower Monumental, Ice Harbor — a measure supported by a broad and deep consensus among fisheries biologists as the single most effective way to restore Snake River salmon and steelhead.

The four dams on the lower Snake River create a deadly bottleneck for migrating salmon as they try to swim to the Pacific Ocean from the rivers and streams across millions of acres of pristine habitat in central Idaho and northwest Oregon. Despite their deadly migration corridor, Snake River salmon and steelhead are blessed with access to the largest area of unspoiled, cool, high-elevation wilderness spawning habitat of any Columbia River basin salmon. This wild salmon refuge will become even more critical as the effects of global warming impact the West. Because of these dams, however, wild Snake River coho swam quietly into extinction in the 1980s and today every remaining population of Snake River salmon and steelhead is listed for protection under the Endangered Species Act. In addition, many Columbia River salmon also have been listed, largely because of the harmful effects of federal hydropower dams. Bringing these wild fish back depends on changing the way the Columbia River dams are operated and bypassing the four obsolete, fish-killing dams on the lower Snake River.

The most recent round of litigation in the federal courts under the ESA began in 2001 when a coalition of fishing and conservation groups filed a case challenging the federal government’s biological opinion (BiOp) — the plan meant to protect fish from the harmful effects of the dams — issued in December 2000. The 2000 BiOp ignored the consensus among fisheries biologists and rejected Snake River dam removal in favor of an uncertain and unsupported belief that actions like habitat restoration, hatchery and harvest reforms, and minor adjustments in dam operations would ensure the survival and recovery of the fish. While significant mitigation measures are necessary for salmon recovery,

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Fisheries biologists are in virtually complete agreement that the four dams on the lower Snake River must come down if salmon and steelhead runs are to be saved. Pictured is Lower Granite Dam. Photo by Jim Yuskavitch
without dam removal, peer-reviewed scientific studies show these other measures are insufficient to secure a future in which these fish return to the interior Northwest.

The U.S. District Court for the District of Oregon rejected the 2000 BiOp and sent it back to the National Marine Fisheries Service (known as NMFS) for an overhaul. And overhaul the plan is just what NMFS did. In contrast to every previous biological opinion, NMFS in 2004 declared that the dams did not jeopardize the continued existence of salmon and steelhead because the dams were considered an immutable part of the environment. The same coalition, joined by the state of Oregon and several Columbia River treaty tribes, quickly challenged this plan in federal court. Both the District Court and the Ninth U.S. Circuit Court of Appeals rejected this plan in strongly-worded opinions. The Ninth Circuit called the agency’s approach a “slight of hand” that “manipulated the variables to achieve a no jeopardy finding.”

After the courts sent the plan back to the federal agencies for another do-over, they granted the coalition’s request for injunctive relief to protect salmon by requiring the agencies to spill water over the dams to help juvenile fish migrate to the sea. Many scientists outside the government — including those at the independent Fish Passage Center — credit the increased spills (along with adequate river flows and good ocean conditions) with the abundant sockeye run on the Columbia River in 2008, as well as several years of improved spring, summer, and fall Chinook salmon and steelhead returns to the Columbia and Snake rivers.

After almost three years of meetings with the affected states and tribes, the government released its new biological opinion on May 5, 2008. Just before the BiOp was issued, the Bonneville Power Administration, the U.S. Army Corps of Engineers, and the Bureau of Reclamation announced that they had signed Memoranda of Agreement with several Northwest Tribes — including three of the Treaty tribes previously aligned with the plaintiffs (Warm Springs, Umatilla and Yakama) — and the States of Idaho and Montana (now joined by Washington). These MOAs promised to deliver funding to tribal and state habitat and hatchery projects. In return, the parties signing the MOAs promised to support the 2008 BiOp for its ten-year term.

In the 2008 BiOp, NMFS once again concluded that removal of the four lower Snake River dams is unnecessary by once again modifying the legal standards and analysis applied, tweaking dam operations, and relying on a plan similar to that included in the 2000 BiOp to restore habitat and reform hatchery operations. On June 17, 2008, Earthjustice – representing the same coalition of fishing and conservation groups – challenged the new plan. The state of Oregon joined the fray as a plaintiff on the side of the coalition on July 22, 2008, and the Nez Perce tribe (the fourth Columbia River treaty tribe) continued its support of the plaintiffs as an amicus curiae. The case, like its predecessors, is pending before U.S. District Court Judge James Redden in Portland, Oregon.

The case against the 2008 biological opinion focuses on the legal and scien-
The scientific failings of the new plan. On the legal side, the case primarily challenges NMFS's finding that salmon populations are not harmed by the dams so long as these populations are on a “trend toward recovery.” NMFS finds this standard is satisfied so long as the population grows at some detectable rate, no matter how slight, and regardless of whether dam operations will allow that population to actually reach a recovered level in 100, 500, or 1,000 years. At the same time, NMFS has relied on yet another suite of unspecified and uncertain mitigation measures to compensate for the harms caused by the dams. Many of these actions — especially those that NMFS expects to produce survival benefits after 2009 — are not even identified in the 2008 BiOp, let alone analyzed to determine if the predicted benefits will materialize.

The scientific flaws in the opinion are too numerous to list, but include NMFS's failure to wrestle with the additional challenges posed by climate change, its reliance on implausible numerical survival improvements from habitat actions in the tributaries and the estuary, and its decision to cut back on even past improvements to dam operations by curtailing spring spill and terminating summer spill early.

After oral argument on March 6, 2009, the fishing and conservation plaintiffs, the state of Oregon, and the Nez Perce tribe reached an agreement with the federal government to continue court-ordered spring spill operations for 2009. The parties are currently discussing whether a similar agreement can be reached for the 2009 summer migration season. More significantly, on May 1st, the Obama administration announced that it is conducting a 60-day review of the 2008 BiOp — providing the parties some time to explore a way to resolve this longstanding controversy. To help the parties explore a resolution, Judge Redden sent a letter on May 18th to all of the attorneys in the case outlining his preliminary conclusion that the 2008 BiOp is illegal. The court applauded the new administration's request for time to become fully engaged on the BiOp and reiterated his "serious reservations" about NMFS's new “trending toward recovery” jeopardy standard. The Court also stated that even if that standard were permissible, NMFS's conclusion that salmon and steelhead in the Snake and Columbia rivers are actually meeting even the low bar it sets is "arbitrary and capricious." The court urged the federal government to consider all of the options — including lower Snake River dam removal — to restore these fish. Specifically, the federal government should "study . . . what it will take to breach the lower Snake River dams if all other measures fail (i.e., independent scientific evaluation, permitting, funding, and congressional approval)." The letter further encourages the government to continue implementing court-ordered spring and summer spill programs for the ten-year life of the BiOp, to commit to additional flow augmentation in the Snake and Columbia Rivers, and to independent scientific oversight.

Over a dozen years ago, another federal judge — Judge Malcolm Marsh — rejected a BiOp much like the 2008 BiOp as "significantly flawed because it is too heavily geared towards a status quo that has allowed all forms of river activity to proceed in a deficit situation . . . when the situation literally cries out for a major overhaul." In his May letter, Judge Redden reminded the parties and the nation that salmon and steelhead and the people and the communities that depend on them have already waited far too long for the federal government to heed that call:

"Federal Defendants have spent the better part of the last decade treading water, and avoiding their obligations under the Endangered Species Act . . . We simply cannot afford to waste another decade. All of us know that aggressive action is necessary to save this vital resource, and now is the time to make that happen."

With the court's preliminary finding that the 2008 BiOp is illegal and the Obama administration's on-going review the 2008 BiOp, we now have the best opportunity we have seen in a long time for a change in the direction of river and dam management. There are likely many forks in the road ahead, but recent developments can provide a strong foundation for real solutions and salmon recovery in the Snake and Columbia rivers.
Chair's Corner  
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Congress in 1993, a free flowing Elwha has been a long time coming. Seventy miles of pristine national park habitat again will be accessible to steelhead and salmon, and some of us who have been around for a while may actually get to see it.

6. In November 2008, the federal government, the states of California and Oregon, and PacificCorp (the owner of four Klamath River dams) finalized an “Agreement in Principle” to resolve Klamath basin resource issues, which includes a plan to remove the four dams. If completed, it will be the largest dam removal project in history, and will open over 300 miles of river habitat to steelhead and salmon. But it will be a long process, including what critics of the agreement describe as many “off ramps.” The first step is a feasibility study, in which the federal government will scientifically weigh the costs and benefits, and then determine by 2012 whether the benefits of dam removal justify the costs.

If they do, then final authority for dam removal will be granted by the Secretary of the Interior following assessment by the federal and two state governments that dam removal is in the public interest. Congressional authority will also be required. The agreement is then designed to balance the timing of each dam’s removal with operating conditions and the cost to PacificCorp customers of replacement power. With a target date for removal of 2020, it will indeed be long, winding, complex, and loaded with potential delays and off ramps. But at least a direction has been set, and from 2009 to 2020 on the Klamath is less time than from congressional approval of the Elwha project until targeted removal date. It will take great insistence and persistence.

7. Recovery plans for the ESA listed steelhead and salmon of the Columbia River system have been sources of contention and litigation between fishing and conservation organizations and federal agencies for more than 15 years. At the heart of the conflict has been the failure of the recovery plans to seriously address mainstem passage of migrating fish through the dams and reservoirs of the Federal Columbia River Power System. The clash becomes most heated on the future of the four lower Snake River dams and whether breaching them should be on the table as a possibility. The 2008 Biological Opinion (recovery plan) is the sixth since the early 1990s, all have been challenged in court by the non-profits (including the Federation of Fly Fishers), and the non-governmental organizations have consistently won. The current suit has been briefed and argued before U. S. District Court Judge James Redden, and he could decide the case this year. On May 1st, the federal agency defendants wrote to the court explaining that the new administration wants 30 to 60 days to gain an understanding of the 2008 Biological Opinion, the lawsuit, and the issues involved. The plaintiffs agreed, and the court granted the extension. So we wait.

Hatcheries

1. The long trumpeted process of hatchery reform might actually start to bring some results. In March 2008, the Hatchery Scientific Review Group (HSRG) completed its three year investigation of the 178 steelhead and salmon hatchery programs in the Columbia basin. The findings went well beyond a review of general problems and conclusions. The HSRG recommended program by program reforms, provided scientific methodologies used, and discussed effects on and relationships with the wild stocks, habitat conditions, harvest practices, and the hydro system. If the state and federal agencies and tribes that manage the hatcheries follow these recommendations, it is likely that there will be, at last, disciplined approaches to determining if and how: (1) conservation hatcheries can help in the recovery of wild populations; and (2) harvest hatcheries can be operated in ways that drive their impacts on wild stocks to an irreducible minimum.

2. Also in March, a three judge panel of the Ninth Circuit Court of Appeals affirmed that NOAA Fisheries can “distinguish between natural and hatchery spawned salmon and steelhead when determining the level of protection the fish should be afforded under the Endangered Species Act.” This decision sustained 16 ESA listings of salmon and steelhead, that had been under ten years of attack beginning with the Alsea Valley Alliance, which sued to have wild and hatchery coho stocks lumped together for ESA listing purposes.

From the other side it was disappointing that the appeals court also restored the NOAA Fisheries Hatchery Policy and rejected a district court ruling that had supported a request by conservation groups to reject the Hatchery Policy as not

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With the completion of the Hatchery Scientific Review Group’s study of salmon and steelhead hatcheries, some real hatchery reform may be on the way. Photo by Jim Yuskavitch
clearly delineating between hatchery and wild stocks in all cases, thereby leaving open the possibility of harmful mischief in future ESA listings. On balance, though, the appeals court gave an immediate positive decision for current ESA protections.

3. The Native Fish Society and the state of Oregon have worked together to place weirs across the three main wild steelhead spawning tributaries of the Deschutes River: Trout Creek, Bakeoven Creek, and Buck Hollow Creek. The weirs are operated to remove all hatchery steelhead, many of them strays from other watersheds, and eliminate them from spawning inferior offspring. Wild steelhead are sent on their way upstream to spawn.

4. The many-lived Grandy Creek hatchery proposal on the middle Skagit River lies comatose as the evidence of early construction work now sits in mid-river, serving only as a navigation hazard, as a result of the Skagit doing what rivers do, meander and change course. An environmental disaster from the beginning, we can not yet assume it is completely dead. Powerful political interests have resurrected it in the past, so vigilance is in order.

Harvest

1. By-catch of non-target wild steelhead and salmon by commercial and tribal net fisheries has had huge impacts on the health of wild stocks in many rivers of North America, most notably the Skeena system, the Dean, and the Columbia system. So when an experimental fishery that shows results with net fisheries that allow much more selective harvest, everyone with a stake in these fish needs to pay attention.

The Colville Tribe ran a test fishery on upper Columbia summer Chinook during the summer of 2008 at the confluence of the Okanogan and Similkameen, in the Okanogan, and at the confluence of the Okanogan and the Columbia. Beach seines, purse seines, and small mesh tangle nets were used. The results were dramatic and informative. The beach seines and purse seines, which encircle the fish with very fine mesh nets, netted 211 wild Chinook, with only one direct mortality. The tangle nets (small mesh gill nets) netted 86 wild Chinook with mortality of 25. The tribe observed that in the seines the fish remained calm, possibly a partial cause of low mortality. Conversely, even the small mesh gill nets would seem to have caused different behavior and some gill damage in order to cause mortality this high. Combined with 100% fin clipping of hatchery fish and tightly enforced handling procedures of netted fish, the seines appear to offer opportunities for the dual advantages of low wild fish mortality and maximum harvest and removal of hatchery fish.

2. Conservation minded sport anglers in Washington are gearing up for another request to the Fish and Wildlife Commission to prohibit the harvest of any wild hatchery steelhead statewide. Combined, these actions offer hope for improved runs of wild steelhead and salmon. However, any one of the four H’s (habitat, hydro, hatcheries, and harvest) can extirpate a stock of wild steelhead or salmon, singly or in combination with other Hs, plus the looming threat of a warming planet. The response: sustained watchfulness and effort on all fronts.