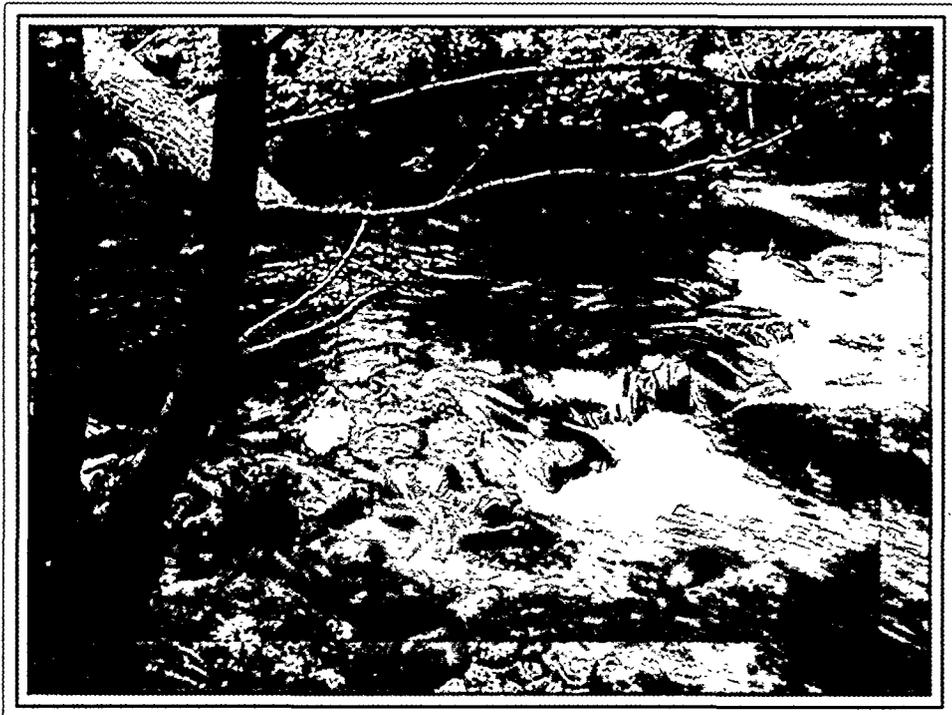


# COWLITZ FALLS FISH PASSAGE



RECEIVED

OCT 3 1 1995

OSTI



MASTER

## **DISCLAIMER**

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

## **DISCLAIMER**

**Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.**

## COWLITZ FALLS FISH PASSAGE

*A big fish-saving effort is bringing neighbors together in a common cause.*

On top of the brand new Cowlitz Dam, on a cool morning in the spring of 1994, and unlikely collection of people are staring down through grates into a gate well. Some are flat on their bellies, shading their eyes, very intent. This is a test. This is an important test of a state-of-the-art system for attracting fish. Baffles and slots in the gate below have been designed to draw out-migrating young fish — smolts — to the surface, away from deadly turbine intakes. Watching are managers from two power companies, state fish biologists, and representatives from federal agencies. The Bonneville Power Administration observer is lying next to a Friend of the Cowlitz who earlier

filed a lawsuit against BPA. Here's a sport-fishing guide. There's a wood-cutter.

Somebody flips a switch to start the flow through a baffle in the gate well. The water — whose flow attracts the smolts to the proper opening — starts moving. In the water, a five-inch fish noses the right opening. Then a pair. Then swarms of yearling spring chinook find where they're supposed to go.

Up top, observers break into a spontaneous cheer. A biologist high-fives an engineer. They know they have just witnessed a successful first step in rebuilding the salmon and steelhead run.



DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

MASTER

***John Squires, Wood Cutter  
and Local Resident***

*"People in this valley don't trust the utilities or the government", says Squires. "We've been lied to. Since these dams were built, we heard a lot of empty talk about how they were going to take care of fish."*

*Squires, 35, is a third-generation Packwood native. His family survived the Depression catching salmon and hunting deer and elk in the upper Cowlitz River watershed. He knows how rich with salmon the upper Cowlitz once was.*

*Wanting to do something about the lost runs, Squires got involved in 1990 with Friends of the Cowlitz. Since then he has worked for Harza, an environmental consulting firm, and for Lewis County PUD on special projects such as counting fish or snorkeling to find salmon redds. These projects are funded by BPA. In short, Squires is working for the utilities and government outfits he once despised.*

*What's the difference now?*

*"They're asking what is the best science," he says, "and they're putting the money on fish. This project could fail, but it won't fail for lack of honest effort. They're trying to do it right"*



## The Big Idea

The successful first test of the fish attraction system at Cowlitz Falls Dam was a critical step in a project underway to restore naturally spawning salmon, steelhead and sea-run cutthroat trout in the upper Cowlitz.

The upper Cowlitz was once home to native salmon and steelhead. But the combined impacts of over-harvest, farming, logging and road building hammered fish runs. And in the 1960s, a pair of hydroelectric dams blocked the migration path of ocean-returning and ocean-going fish. The lower Cowlitz still supports hatchery runs of chinook, coho and steelhead. But some 200 river miles in the upper river basin — much of it prime spawning and rearing habitat — have been virtually cut off from the ocean for over 26 years. Now the idea is to trap-and-haul salmon and steelhead both ways — adults upstream, smolts downstream — and bypass previously impassable obstacles in the path of anadromous fish.

There are reasons to proceed cautiously. Gains for anadromous fish could lead to losses for others. But biologists who coordinate this multi-agency project are optimistic the Cowlitz Falls Fisheries Management Plan is a unique and vastly complicated undertaking. Parts of it have been tried here and on other rivers, but nowhere have all the elements come together like this. The plan can be summarized, for the sake of explanation, in three steps:

### **1) Trap and Haul Adult Fish.**

Collect ocean-returning adult fish at the lowermost Cowlitz dam, and truck them upstream.

2) **Re-seed.** Release the ripe adults above the uppermost dam, and let them spawn naturally. At the same time, supplement these runs with hatchery born fry that are reared and imprinted in ponds and net pens in the watershed.

### **3) Trap and Haul Smolts.**

Collect the new generation of young fish as they arrive at the uppermost Cowlitz dam, truck them past the three dams, and release them to continue their downstream migration to the sea.

## Background

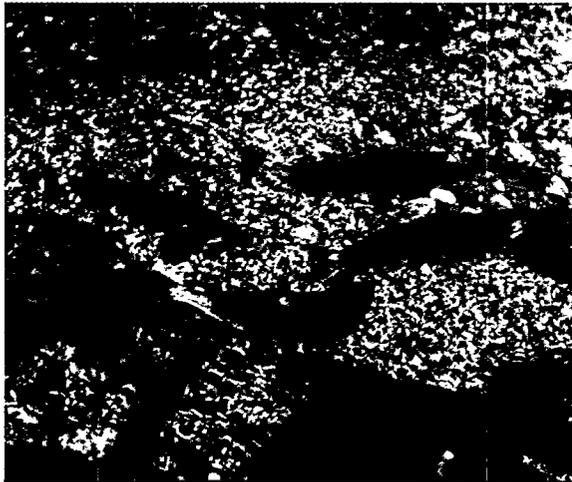
The Cowlitz watershed has suffered from nearly every kind of damage civilization can inflict upon a river and its fish. Like other Northwest streams, the Cowlitz fishery was over-harvested, not only within the river but also by commercial fishing near the mouth of the Columbia River. And then the fishery expanded into the Pacific Ocean, drastically reducing the number of salmon returning to spawn. The once-teeming anadromous fish runs of the Cowlitz were in trouble 80 years ago.

As fish were being caught in great numbers, their habitat also came under intense pressure. The Cowlitz River Valley was originally covered with dense forest that held back water and evened out the river's flow through the dry and wet seasons. But farmers cleared the wide valley bottoms, and cattle grazed to the riverside.

Roads followed the main streams and tributaries, adding pollution to that from farms and small towns in the valley. Logging, before the rules changed, involved splash dams on the tributaries to make holding ponds for logs. The dams were blasted out to float logs to the mill, scouring deep channels and causing

devastation. Salmon lost protective cover and shoreline shade plants, eliminating a major source of food for young fish. Exposed hillsides were eroded by winter rains which quickly ran off, depositing silt over gravel spawning areas.

Then, in the 1960s, fish heading for spawning grounds beyond river mile 50 were blocked by hydroelec-



tric projects. Mayfield Dam, completed in 1962, included both upstream and downstream fish passage facilities, but Mossyrock Dam, in 1968, did not. Mossyrock Dam is a tall dam — 365 feet high — operated for water storage and flood control as well as for power generation. Original plans for fish ladders at Mossyrock Dam, and extensive efforts to seed the upper basin for anadromous fish production, were shelved when the state decided that adult fish would "get lost" in Riffe

Lake and that downstream migrants could not be effectively collected.

Tacoma City Light, the builder and owner of both dams, trucks adult fish to the upper basin for sport fishing. But the utility's fish-mitigation efforts have focused primarily on rearing fish at state-operated hatcheries near Mayfield Dam.

These efforts have helped make the lower Cowlitz one of the best producers of salmon and steelhead in the Pacific Northwest. But since 1969 there has been no natural passage of adult salmon or steelhead past the two dams.

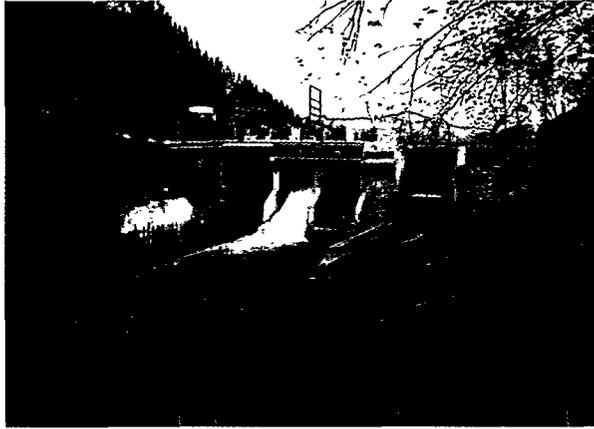
The project to restore upriver fish runs didn't get off the ground until the early 1990s. After BPA contracted to buy the power produced at the new Cowlitz Falls Dam, a local public interest group called the Friends of the Cowlitz sued BPA, arguing that the upper basin fishery deserved better treatment than it had had over the years from the state and the interests of hydroelectric power. The Friends also noted that the new dam, because of the nature and shape of its reservoir, afforded new possibilities for collecting young fish.

BPA, settling the lawsuit out of court in 1991, agreed that the upriver fish runs probably could be restored.

Bonneville commissioned GAIA Northwest, Inc., a natural resource

consulting firm, to determine the most cost-effective way to do it. Dr. Percy Washington led the team from GAIA. Reviewing the history and gathering new ideas, GAIA came up with over 30 alternatives for restoring anadromous fish to the upper Cowlitz. The advisory committee then narrowed the options to five. In December 1993, Washington's team wrote a formal Management Plan for the Cowlitz Falls Project.





**Bob Reid, President, Friends of the Cowlitz**

*"Well, we're just all kinds of people," says Reid, at the Friends of Cowlitz office in Toledo. "I'm a river guide, semi-retired. We have doctors, loggers, teachers. Most of the Friends are fishermen of one kind or another, and our first push is to get fish back in the river to catch."*

*Reid served on the Friends' legal team that sued BPA in 1991. He argued that the new Cowlitz Falls Dam was going to nail the coffin lid on upriver salmon runs unless extraordinary steps were taken. Reid thought that Tacoma City Light, the utility that owned Mayfield and Mossyrock dams, had not done all it could have to meet its fish obligations. He figured Lewis County PUD wasn't likely to do much better. The Friends' big break, says Reid, was when BPA contracted to buy the power produced at the new dam. In BPA, the Friends had a federal target with a strong recent history of backing fish and wildlife projects.*

*Reid was surprised and pleased when BPA settled out of court and seemed eager to get on with things.*

*"I think we convinced them," he says, "how important this project is. We have an incredible natural spawning and rearing area up there, just waiting to be re-opened."*

## A Cooperative Effort

Restoring naturally produced anadromous fish runs on the upper Cowlitz is a unique and enormously complicated endeavor. A Technical Advisory Committee meets once a month to coordinate their various interests toward the common goal — a productive future for the upper Cowlitz fishery.

The **Bonneville Power Administration** is involved because it contracted to purchase the power from the Cowlitz Falls Dam. BPA, by law, is required to help build up fish and wildlife populations damaged by federal dams on the Columbia River and its tributaries. Although this is not a federal dam, BPA will use a portion of its revenues from the sale of electric power — not from taxpayers — to mitigate the effects of the Cowlitz Falls Dam. BPA has agreed to acquire and install fish collection facilities at the dam, and to fund the fish restoration project, if it works, until the year 2032. BPA also agreed to pay for fish ladders at the dam if they are required later.

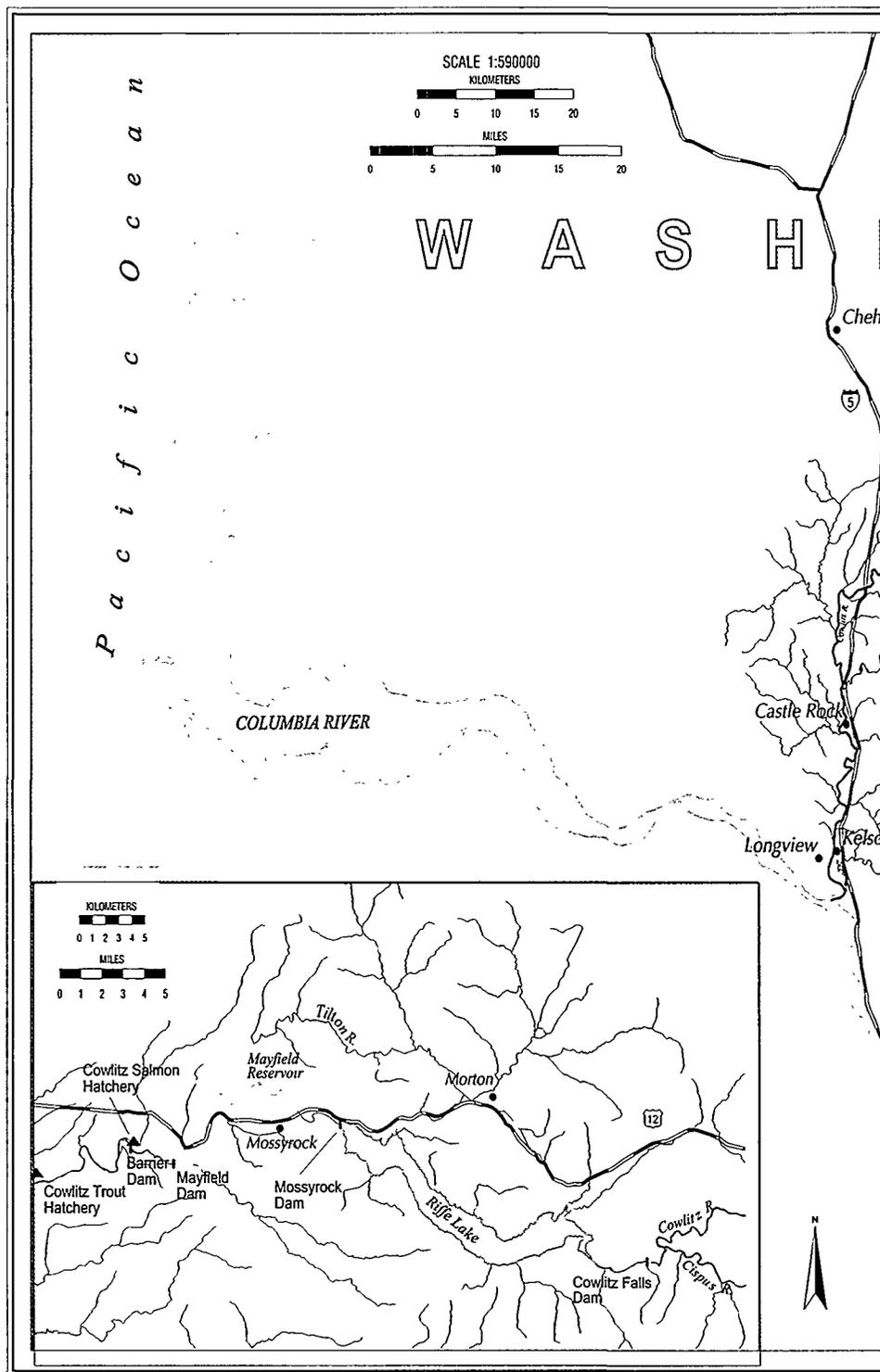
**Friends of the Cowlitz**, after spurring initial action, supply volunteer labor. Members, for example, backpack 10-gallon containers full of steelhead fry to a roadless area tributary. They monitor net pens and feed young fish. They take on habitat-repair projects, and they help educate the public, posting explanatory signs near spawning grounds.

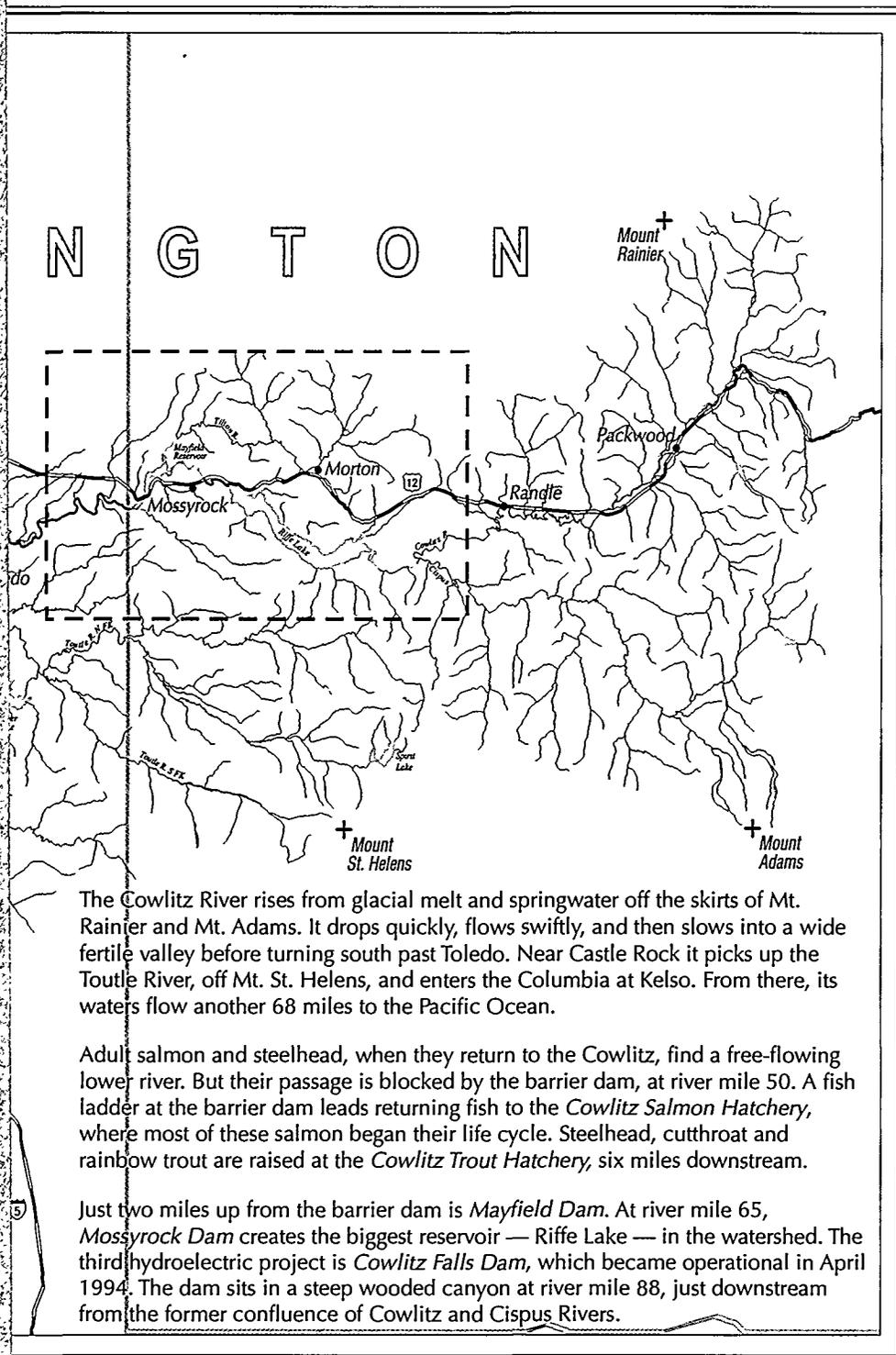
**Lewis County PUD**, the owner and operator of the Cowlitz Falls Dam, and **Tacoma City Light**, owner and operator of the two downstream dams, are required by the Federal Energy Regulatory Commission to mitigate the fishery losses caused by dams. Tacoma City Light's two projects will be up for re-licensing soon. In the meantime, the Tacoma public utility is providing land adjacent to its Cowlitz Salmon Hatchery for the Cowlitz restoration project. New facilities — such as acclimation ponds, pumps and pipelines — are being designed to fit in with the hatchery's existing works.

The **Northwest Power Planning Council** oversees power planning and the mitigation of disturbances to fish and wildlife caused by all power projects in the Northwest. The council has acknowledged the Cowlitz Falls Fishery Management Plan as a model for the kind of whole-river-basin planning it wants to encourage elsewhere.

The **Washington Department of Fish and Wildlife**, exercising its broad authority over fisheries in the state, guides the restoration effort. It brings to the table a historical perspective on Cowlitz River fish runs and hatchery performance, and it has ready access to related information.

Three federal agencies also are involved:





The Cowlitz River rises from glacial melt and springwater off the skirts of Mt. Rainier and Mt. Adams. It drops quickly, flows swiftly, and then slows into a wide fertile valley before turning south past Toledo. Near Castle Rock it picks up the Toutle River, off Mt. St. Helens, and enters the Columbia at Kelso. From there, its waters flow another 68 miles to the Pacific Ocean.

Adult salmon and steelhead, when they return to the Cowlitz, find a free-flowing lower river. But their passage is blocked by the barrier dam, at river mile 50. A fish ladder at the barrier dam leads returning fish to the *Cowlitz Salmon Hatchery*, where most of these salmon began their life cycle. Steelhead, cutthroat and rainbow trout are raised at the *Cowlitz Trout Hatchery*, six miles downstream.

Just two miles up from the barrier dam is *Mayfield Dam*. At river mile 65, *Mossyrock Dam* creates the biggest reservoir — Riffe Lake — in the watershed. The third hydroelectric project is *Cowlitz Falls Dam*, which became operational in April 1994. The dam sits in a steep wooded canyon at river mile 88, just downstream from the former confluence of Cowlitz and Cispus Rivers.

***The U.S. Fish and Wildlife Service***

is charged with seeing that the environmental aspects of dam licensing and re-licensing are properly addressed.

***The U.S. National Marine Fisheries Service*** administers the Endangered Species Act and watches, especially, anadromous fish. The agency has been particularly helpful by granting a series of common-sense exemptions to the ESA in order to speed this project along. It has also lent its best engineering talent to help with the design of fish-attraction and collection facilities.

***The U.S. Forest Service*** is involved because it manages large portions of the forest lands in the Cowlitz River Basin. The additional funding from BPA makes it easier for the Forest Service to put a high priority on these activities in the upper Cowlitz watershed.

In addition to the utilities, Friends, and the state and federal agencies, two consulting firms and Battelle Laboratories are directly involved. Champion International, the major private landowner near the project, has contributed staff time and facilities. Menahsa Corporation and Lakeside Industries also have been involved. Add the individual citizens who own property adjoining the new reservoir, and this project becomes as complicated as any first restoration project anywhere.

***Brian Allee, Ph.D.,  
Harza Engineers***

*"So far," says Brian Allee, a senior fisheries biologist, "this project has been very progressive and forward-looking."*

*Allee works for Harza, a firm of consulting engineers and scientists who specialize in water resources and environmental matters. Allee often consults on the licensing or re-licensing of hydroelectric projects.*

*No one can be sure that the Cowlitz Falls restoration project will work, but he sees it as a great model for how these things should go.*

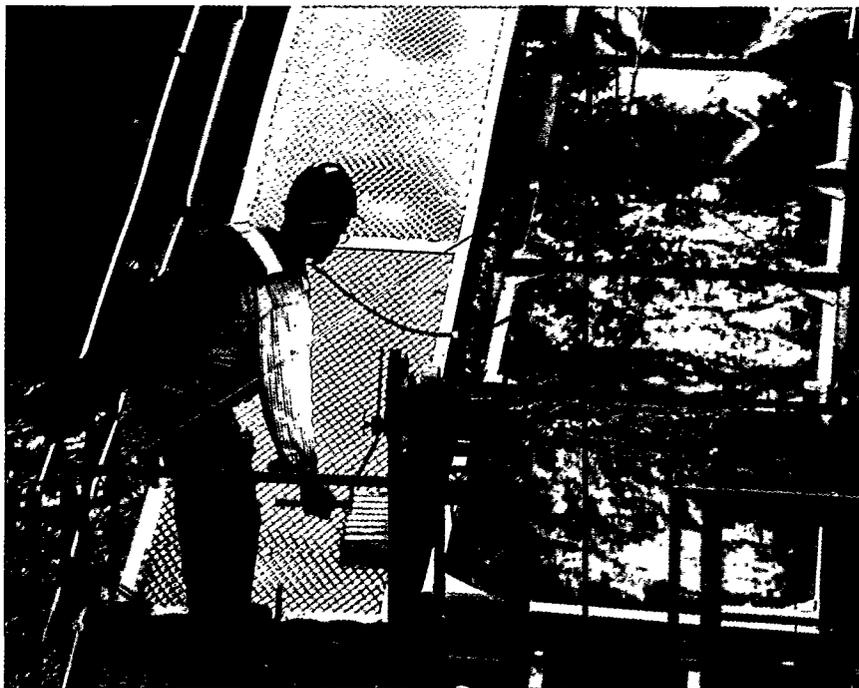
*"You can sit around and debate all day," he says, "but here we have been able to lay out action plans and go right out and do the work. We have every chance, here, to succeed."*

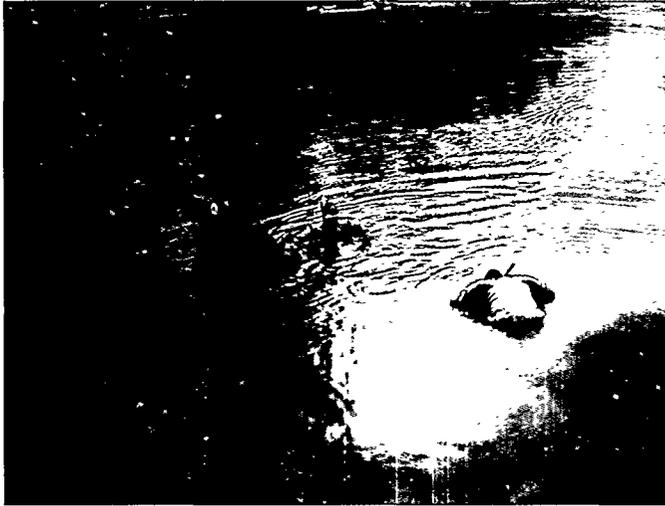
## Collecting Fish

Collection facilities are already in place to gather adult salmon and steelhead returning from the ocean. A fish ladder takes them from the barrier dam to an enclosed pool at the Cowlitz Salmon Hatchery. Some adults go to the hatchery, where they ripen in holding ponds until ready for artificial spawning. Others are loaded into tanker trucks for delivery to the upper Cowlitz watershed, a trip that can be completed in less than an hour.

The restoration project will concentrate at first on three species: coho, spring chinook, and steelhead.

In another three years, a collection and sorting facility at Cowlitz Salmon Hatchery will enable fishery managers to separate naturally spawned steelhead (those who came as smolts from the upper Cowlitz) from those who began life in a hatchery.





**Steve Kozlowski, U.S. Forest Service, Randle Ranger District**

*"We weren't sure they would spawn," says Steve Kozlowski, fish biologist for the Randle Ranger District, Gifford Pinchot National Forest.*

*In the fall of 1993, Kozlowski, Mike Kohn and others donned dry suits and snorkel masks and slipped into the frigid waters of the Ohanapekosh fork of the upper Cowlitz to see if spring chinook would take to their historic spawning grounds. Adult fish had been released at Packwood Bridge that year.*

*"These fish were in excess of what the Cowlitz Salmon Hatchery needed," Kozlowski explains. "They were trucked up here for the sport fishery. Nobody had followed up, in prior years, to see if they might spawn. Their offspring could not get past the dams to the ocean anyway, so there was no point."*

*Looking for redds — salmon nests — among river stones and gravel of swift water, Kozlowski found evidence of spawning in all the likely places. "It was exciting," he says. "We checked carcasses in the deep holes to see if they had released their eggs. Most of them had."*

*In the vicinity of La Wis Wis campground, where the river flows through virgin stands of Douglas fir, hemlock and cedar, the snorkelers found over 20 redds.*

*"Some of the adults were still in there," Kozlowski says. "Big 20-to-30-pound spring chinook, just downstream from the Blue Hole. One was very aggressive, circling me in the water. There's no doubt," he says, "they belong here. They'll use this habitat if they have a chance."*

## Re-Seeding the Upper Cowlitz

The adults will be released at several spots in the upper river, all of them upstream from Cowlitz Falls Dam. Males and females will pair off and spawn in shallow redds dug into the stream bottoms. There are lots of riffles and pools, boulders and logs in the streams to provide the varied and well-oxygenated habitat fish seek for shelter and food. Most of the fish will spend a winter in these streams before their body chemistry begins the changes that mark them as smolts, ready for their outward migration toward the ocean.

For the first few years, at least, the re-seeding will not come exclusively from adult natural spawners. As part of the restoration project, several artificial rearing ponds also are raising young salmon and steelhead.

Associated with the Cowlitz River restoration project is quite an array of on-going research projects. Biologists at one fish pen are marking young fish with temporary dye spots, so their movements can be monitored in the upper river, and their arrival times at the dam can be noted. The search goes on to define the best kinds of rearing ponds, the optimum temperatures and oxygen content of the water for raising fish. Many questions remain about how, exactly, fish of different stocks behave. Results this year will have a bearing on what goes on next year, and after.

Through it all, scientists want to find the best possible *balance* of ocean-going fish to resident fish in the upper Cowlitz. Rainbow and cutthroat trout, whitefish and others — sport fish or not — have adapted to these reservoirs and colonized the upper tributaries over the last 25 years. These fish influence the carrying capacity of the changed Cowlitz. Fish biologists proceed deliberately. They want to be sure that the relatively sudden introduction of large numbers of salmon and steelhead is not only possible but also a good thing.

***Erik Massa, Randle Trout Farm***

*"Come on in," says Erik Massa at the Randle Trout Farm. He leads the way up to a stepladder, over a hatchery wall, and through the flap of a plastic cover over a replica of two tiny riffle-and-pool mountain streams. Massa squeegees a pair of sweaty windows to reveal young fish, holding in swift water. One stream holds rainbow trout only. In the other are rainbows with spring chinook smolts.*

*"You can see they're at ease with each other right now," says Massa, eyeing seven trout and three chinook. He notes their idling positions in the deepest pool. "The young cutthroat we had in here was belligerent. He drove everybody off. We had to move him. Now these fish are hungry," Massa says. "I expect their behavior will change when we add food to the pool."*

*When it's time, Massa will add food and note how the trout and the chinook react in competition. It's all part of the research effort to find out what kind of balance can be maintained among different stocks of fish.*

*Massa is a young biologist whose business card reads Harza, the environmental consulting firm. But it's more complicated than that. This experiment, like the entire fish restoration project, is a cooperative effort. Massa's funding comes from BPA, and he observes rules set by the Washington Department of Fish and Wildlife. Harza is leasing this small hatchery, which sits in the back yard of, and owned by, a private citizen named Shorty.*

## Collecting the Smolts

When the smolts migrate downstream, they will be collected at the Cowlitz Falls Dam and trucked around the three dams. Near the barrier dam at the Cowlitz Salmon Hatchery, they will enter adaptation ponds to recover from the stress of transportation. When ready, they will continue their migration through the lower Cowlitz, into the Columbia, and on out to sea.

The critical part of any fish-collection system is the method of fish attraction. Scientists have to find the best combination of attraction system and screens that will guide

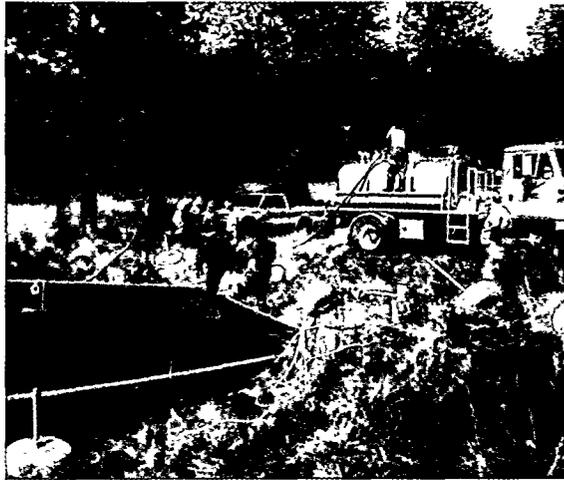
young fish to the right spot, away from the turbine intakes. Most screens are only partially effective, guiding about 60 to 80 percent of young fish to the right places. That's what the spring of 1994 test was all about, testing a prototype system of baffles and slots on the upriver face of the Cowlitz Falls Dam. The prototype worked at 90 percent efficiency in early tests, and it worked without the kind of expensive

screening devices that have been installed on other dams. Now that the success of the attraction system has been verified, Harza engineers and consultants will design and build the appropriate *collection* part of the system. A water flume will carry smolts past the spillway and down to tanks or waiting trucks on the north side of the dam. Also in the design stage are facilities to sort

and mark out-migrating fish.

If the collection and handling systems are as efficient as the attraction system, less than 1 percent of the

water and potential energy passing the dam will be used for fish.



## Working Together

### *Mike Kohn, Lewis County PUD*

*"The cooperation has just been extraordinary," says Kohn, the project biologist. In so far as any one person is responsible for day-to-day coordination of the project, it is Kohn, who works for Lewis County PUD. He has an office in a trailer atop the new dam, but he's more apt to be out in the field checking fish ponds, or attending another meeting in Chehalis or Vancouver.*

*Kohn points out a bald eagle's nest on a broken-top fir, surrounded by nine other perch trees. Also in the reservoir are artificial islands, habitat for migrating geese and other waterfowl. Here, near the confluence of Cispus and Cowlitz Rivers, the reservoir flooded important wetlands. Part of Kohn's job is to oversee the restoration of shoreline and adjoining meadows to help compensate for the losses.*

*"It's exciting work," he says. "Sometimes overwhelming. Anything this complex, and this new, is bound to put people on guard. But most people have been able to set aside their special interests. We wouldn't have come this far," he says, "without everybody working together on it."*

If this project works, in the end, it will have worked because people from different backgrounds found ways to trust one another. They agreed on a plan, and they are trying to make the plan work. They found ways to cooperate in restoring a salmon and steelhead fishery that has not given naturally spawned smolts a doorway to the ocean since the 1960s.

The project is off to a promising start, but it could still get scuttled by conflicts and misunderstandings. Establishing the best balance, for example, between anadromous fish and resident trout in the upper Cowlitz is an ongoing and controversial subject that needs to be worked out. With that in mind, BPA and the project managers encourage public involvement.

If you want to tell us what you think, or if you want to know more about anything mentioned here, contact us at the following address:

**BPA Public Information**  
**P.O. Box 3621**  
**Portland, Oregon 97208-3621**  
**(503)230-3478**  
**(800)622-4519**

BONNEVILLE  
POWER ADMINISTRATION



DOE/BP-2478  
September 1995  
2M