





*With the new technology, screens would block young fish, not irrigation water.*

## The Problem

The Yakima valley gets very little rain — only about seven inches per year. The lifeblood of the Yakima valley — “Fruitbowl of the Nation” — is irrigation water from the Yakima River and its tributaries. Since the 1800s, Yakima valley farmers have used irrigation ditches to bring that precious river water to their fields.

But at the same time, irrigation ditches were contributing to losses in salmon and steelhead runs. Yakima’s adult fish runs — once estimated at over a half million fish — had dropped to barely a few thousand.

At first, flat metal screens were put in irrigation ditches to keep migrating fish in the stream. But debris clogged these screens, blocking the flow of water to crops and fields.

Later, rotating drum screens were installed. But often they were set perpendicular to the stream flow and the screen mesh was too big. The screens killed some fish on impact or allowed smaller ones to pass through and become stranded in fields. And they had to be cleaned and lubricated practically every day.

## The Solution

In 1982, the Northwest Power Planning Council approved measures for restoring fish runs in the Yakima Basin. The goal was challenging: to save fish without reducing irrigation water flows.

The task involved BPA, the U.S. Bureau of Reclamation, National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington departments of Fisheries, Wildlife and Ecology, Yakima Indian Nation, Bureau of Indian Affairs and Yakima irrigation districts.

They formed a technical work group to study the problem. After many years of cooperation and creativity, they came up with a new concept in fish screens. They used the new idea at major irrigation diversions such as Sunnyside and Toppenish. This was called the Phase I fish screen project.

Biologists found the new screens kept out 99 percent of the fish without affecting irrigation water. They also discovered the concept worked well for smaller creeks.

In 1988, WDF used the new screen concept at Brewer ditch, a small irrigation ditch near Naches,

Wash. The success of this prototype became the basis for beginning Phase II of the fish screen project in 1989.

Phase II plans to replace about 60 old screens with the new screen technology. The screens would be built at sites along the Yakima, Naches, Teanaway and Tieton Rivers, and at other locations in the Yakima Basin. BPA and Reclamation would pay for the work. They estimate Phase II would cost about \$12 million. Reclamation and BPA representatives are now studying the project and talking to landowners. Washington Department of Fisheries would do the work. Phase II construction could begin in 1991 and finish in 1995.

## Fabrication and Installation

Fish screens would be built by the Washington Department of Fisheries at their screen shop in Yakima. WDF workers would make the screens from a 1/8inch stainless steel wire mesh. This is small enough to keep young fish from passing through. Workers would wrap and weld mesh into a drum around a steel frame. The steel is

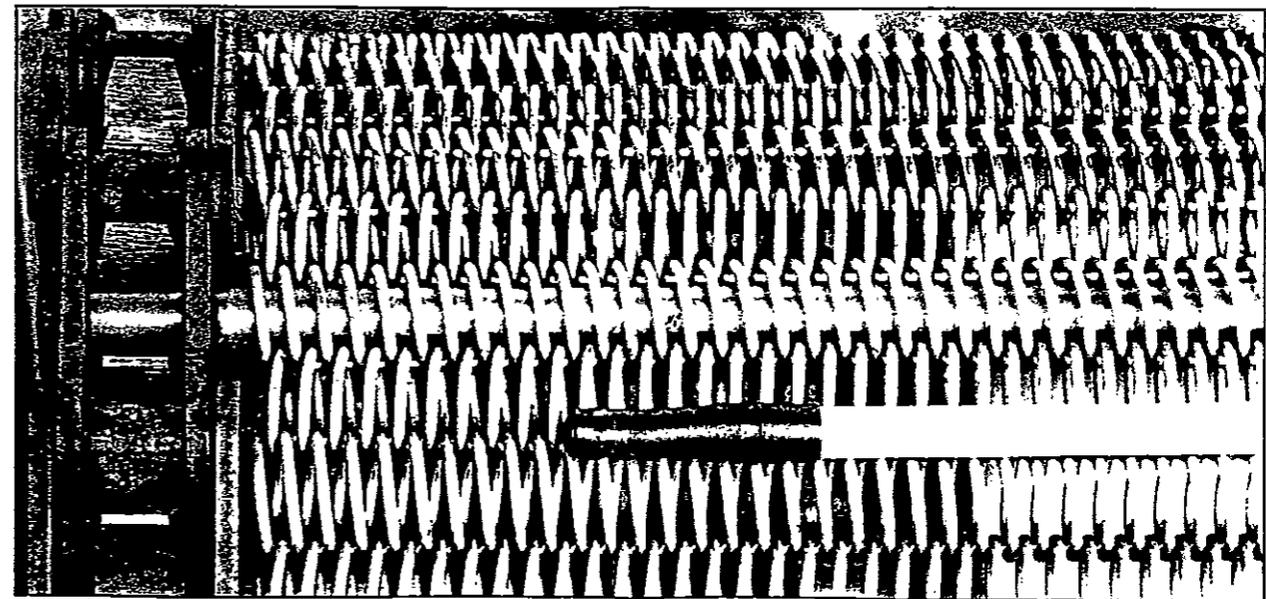
coated with epoxy to prevent corrosion. Each screen would be made to fit the stream where it would sit.

The power to rotate the screen and keep it clean would come from either an electric motor or a new, high-tech paddlewheel developed by the WDF screen shop.

WDF, BPA and Reclamation would talk to landowners to arrange replacing old screens with new. The diameter, length and number of screens per ditch would vary depending on the amount of water diverted.

The Bureau would build the concrete foundation and related works. WDF would install the screens. Workers would install screens as close to the head of the canal as possible to keep out trash and sediment. They would schedule the work at the landowner’s convenience and would keep the number of machines and crew working on the landowner’s property to a minimum. Most screen construction would take place in the winter months—outside of the irrigation season.

WDF and Reclamation would take care of raising screens out of canals at the end of each irrigation season.



*Screen mesh is small enough to keep fish from passing through. It's coated with epoxy to prevent corrosion.*

## How They Work

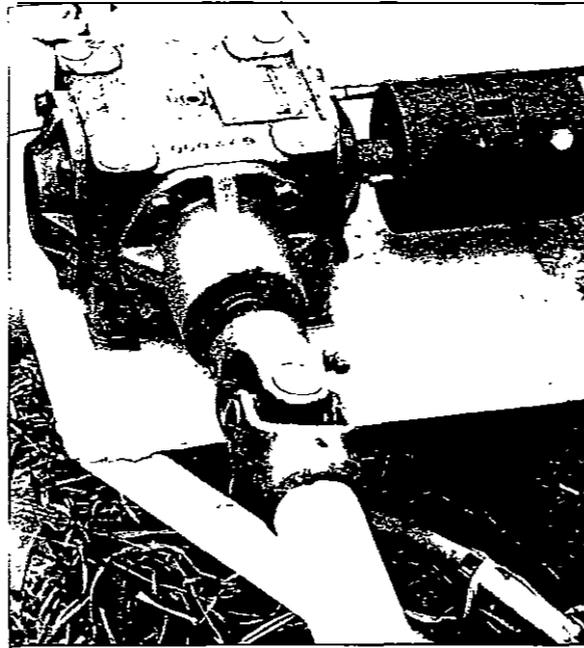
Fish screens are drums of wire mesh placed on their side in the irrigation canal.

Fast-moving water can smash young fish against the screen. A velocity of 0.4 feet per second is considered best for keeping young salmon and steelhead from hitting the screen.

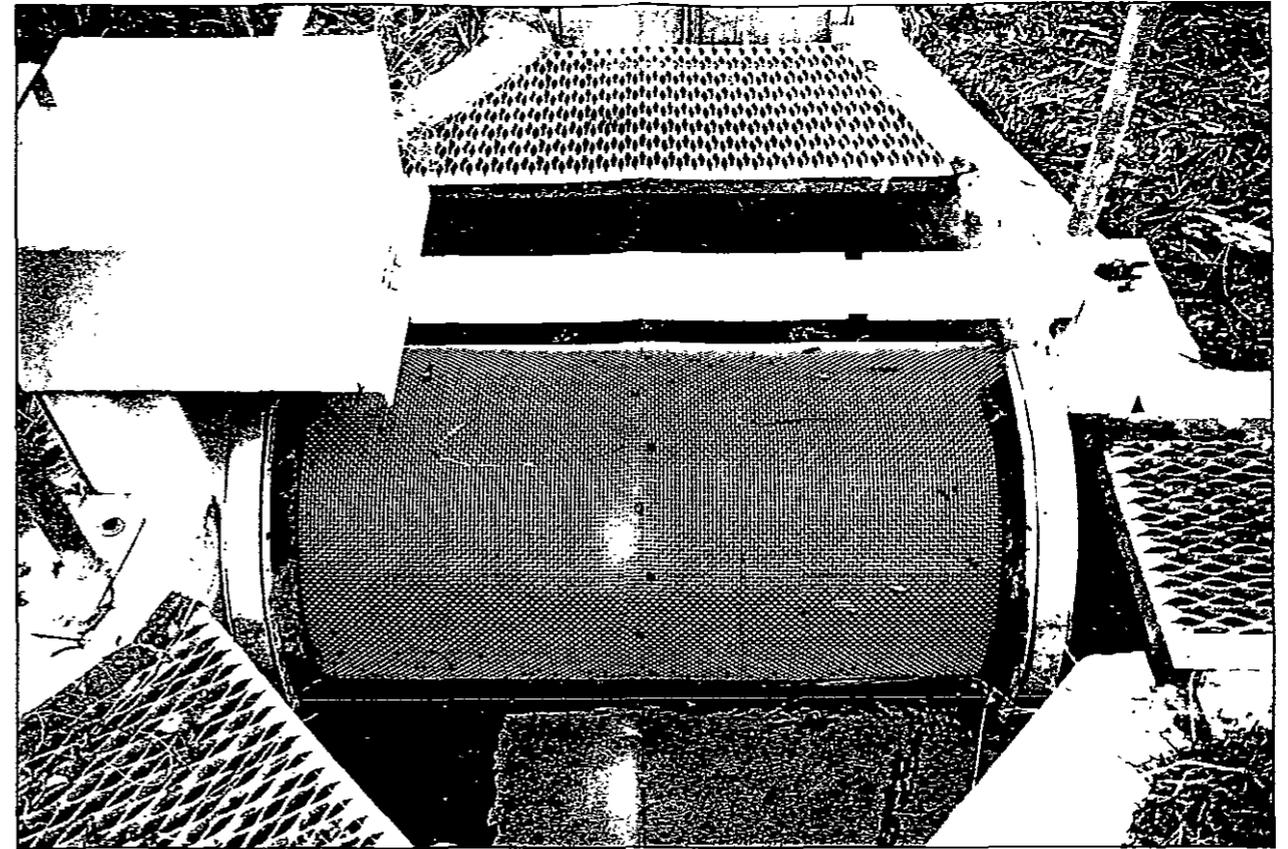
The trick to controlling velocity is in keeping the screen constantly submerged at the proper depth

Irrigators control water flow at the head gate or control gate -at the upstream end of the canal. But check boards or a concrete check structure built downstream of the screen controls water depth. WDF would build the structure so the screen would be submerged, clean and safe for fish no matter the amount of water flowing in the ditch — and without blocking any delivery of irrigation water.

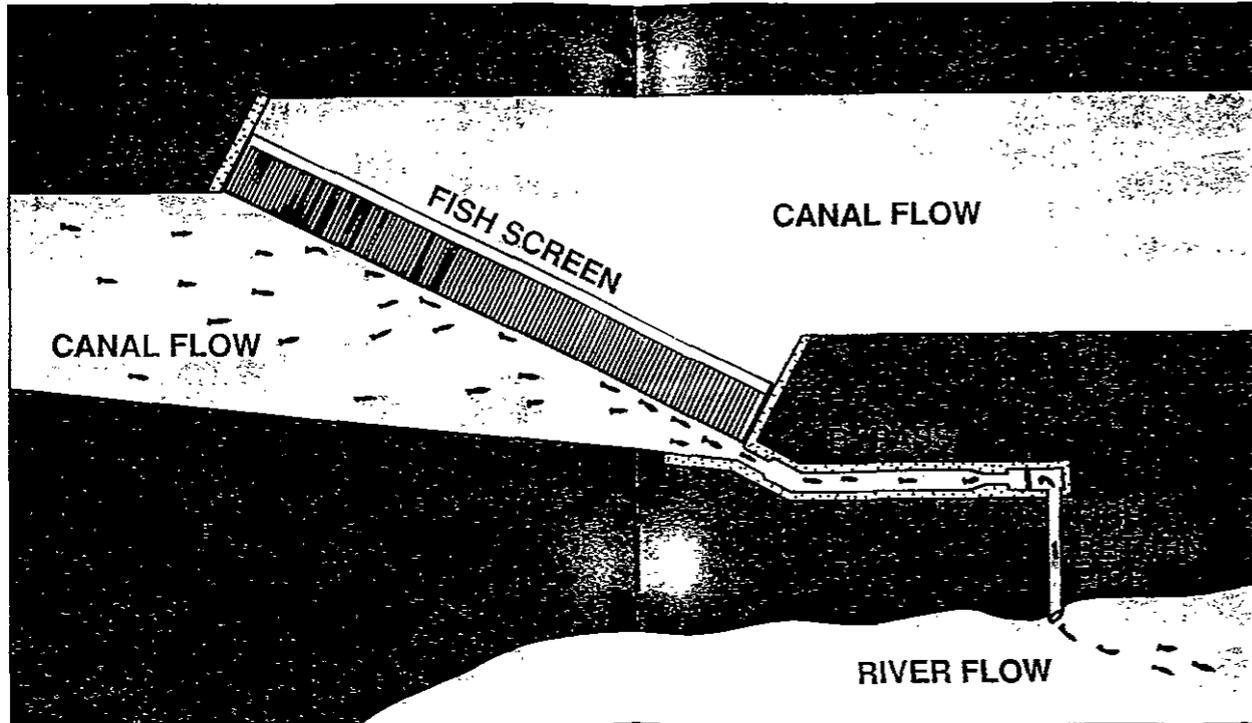
WDF workers would set the screens at an angle so water flow could sweep fish along the screen and into a bypass channel. The bypass leads fish



*A universal joint sets the screen at an angle to sweep fish back into the river*



*WDF would install the screen so it's submerged at the proper depth and stays clean and safe for fish*

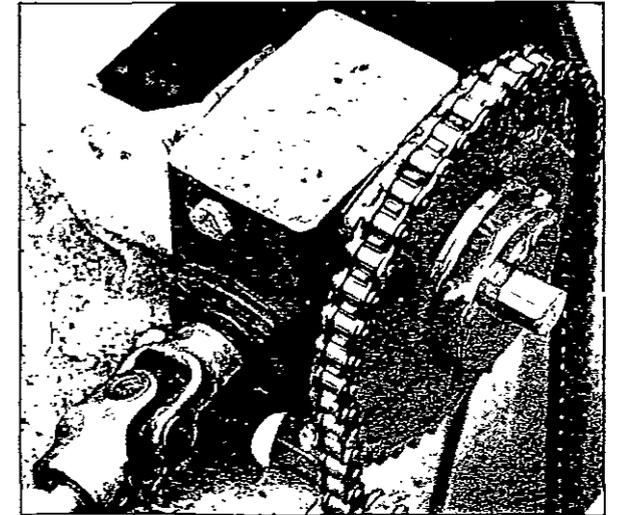


*A typical fish screen. The size and number of screens per ditch depends on the amount of water diverted*

back to the stream. For the new screens, Reclamation would build a concrete slot as deep as the canal. For some old screens the bypass offered a small entrance that was hard for fish to find.

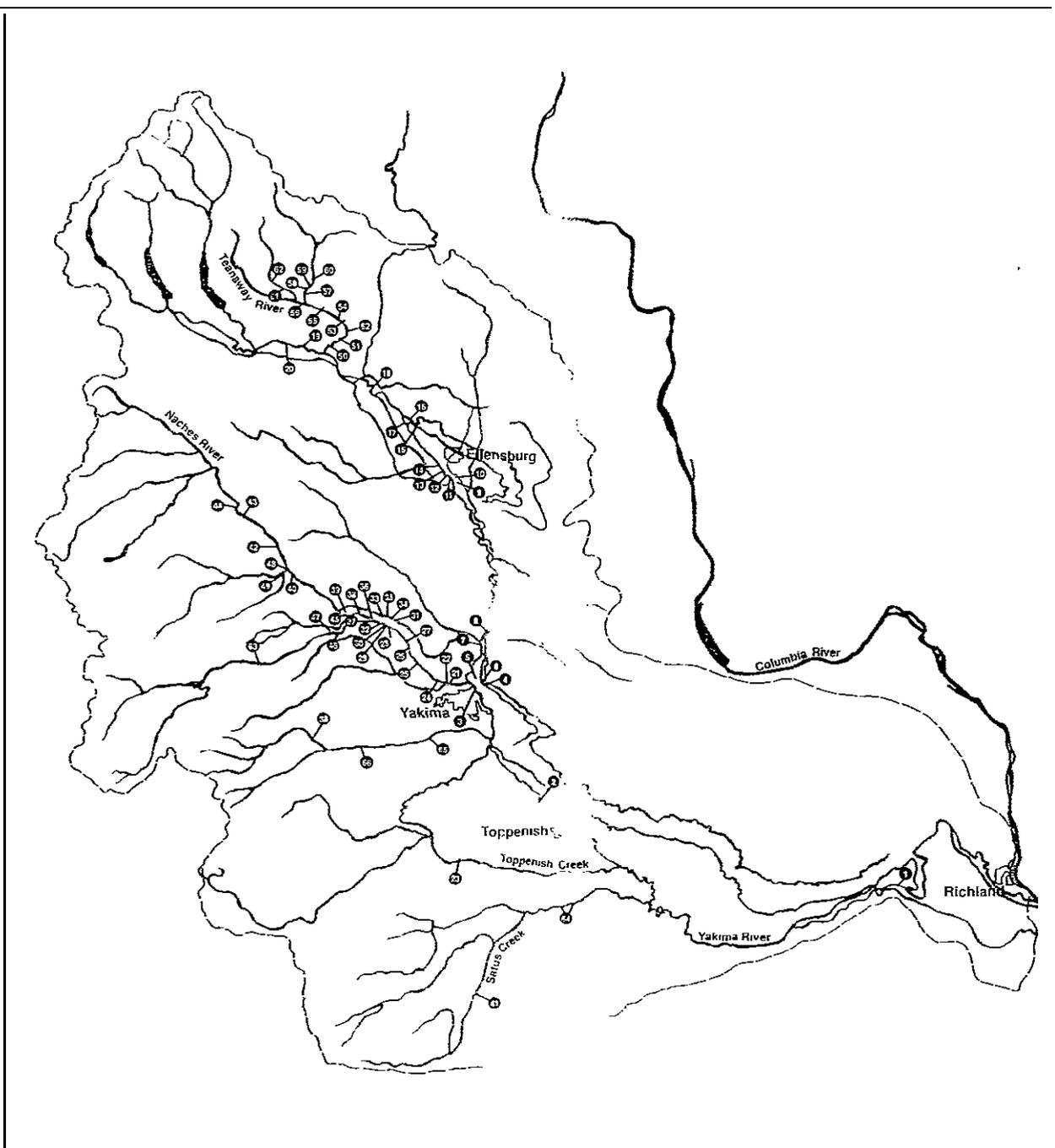
The new screens would be relatively maintenance-free. Major maintenance would be done by Reclamation. Irrigators would take care of routine maintenance—primarily removing debris or lubricating gears — once a week, if that often. The new drive system to rotate the screen uses a shaft drive and enclosed gearbox. It won't just like the old drive chain and sprocket system.

The new screens would achieve the project's goal — they would block fish, not water.



*Gears are enclosed in a box and run in oil. They won't rust like the old system*

**Yakima River Basin Map Showing Location of Phase II Fish Screen Projects**



**Yakima Basin**

- |                          |                         |
|--------------------------|-------------------------|
| 1 . Kiona                | 37. Foster Naches       |
| 2. Snipes & Allen        | 38. Johncox             |
| 3. Boise Cascade         | 39. Naches - Selah      |
| 4. union Gap             | 40. Carmack             |
| 5 . Moxee                | 41. Holwegner           |
| 6. Hubbard               | 42. Lindsey             |
| 7. Taylor                | 43. Emerick             |
| 8 . Selah-Moxee          | 44. Anderson            |
| 9 . McAusland            | 45. Tennant             |
| 10. Tjossen              | 46. Sinclair Cobb       |
| 11. Vertrees #2          | 47. Gnavough            |
| 12. vertrees #1          | 48. Beck                |
| 13. Fogarty              | 49. McDaniels           |
| 14. Bull                 | 63. Yakima Tieton       |
| 15. Ellensburg Mill      | 64. Shattuck Complex    |
| 16. New Cascade          | 65. WIP (Lower Site)    |
| 17. packwood             | 66. WIP (Upper Site)    |
| 18. Old Cascade          |                         |
| 19. O'Connor             | <b>Teanaway River</b>   |
| 20. Younger              | 50. Bugni               |
| 21. Old Union            | 51. Seaton              |
| 22. Fruitvale            | 52. Cooper Masterson    |
| 23. WIP (Toppenish Pump) | 53. Peterson            |
| 24. Naches Cowiche       | 54. Musetti             |
| 25. Chapman Nelson       | 55. Ballard             |
| 26. Congdon              | 56. Contralto           |
| 27. Cleed                | 57. Guistetti Contralto |
| 28. Powell               | 58. Guistetti Bussoli   |
| 29. Lewis (Mill)         | 59. Bussoli             |
| 30. La Fortune           | 60. Brockbank           |
| 31. Ireland              | 61. Contralto Banchi    |
| 32. Scott                | 62. Favro               |
| 33. Brewer               |                         |
| 34. Kelly                |                         |
| 35. Lowry                |                         |
| 36. Clark                |                         |



*Fred Crase of the Bureau of Reclamation checks the motor and gears on a fish screen*

*WDF, BPA and Reclamation are working with irrigators to replace 66 small fish screens in the Yakima valley*