

streambed. It was estimated that \$18,000 expended over a two-year period would be required to complete the project. Written permission was obtained from all private landowners prior to starting logjam removal operations.

Operations Begin

With the aid of the Legislature, funds were made available and clearance operations began in 1959. Actual clearance work was conducted by labor crews from Conservation Camps located within Jackson State Forest. These camps, jointly operated by the Department of Corrections and the Division of Forestry, consist of state prison inmates who are available to carry out conservation projects. Inmate labor is contracted for at a given rate per hour, which includes the necessary supervision. This program has

Crews clearing debris from Olds Creek.



been an outstanding example of cooperation between various state agencies in implementing a worthwhile program involving human rehabilitation as well as stream rehabilitation.

Under the guidance of Gerald Holman, DFG fisheries manager, who served as the fish and game liaison officer, the removal work was carried out effectively. It was his responsibility to lay out work in advance with crew foremen, observe removal operations for efficiency and inspect the completed work.

Most of the log debris was cut into three 10-foot lengths and stacked above the high-water mark. Where low fire hazard conditions existed, log-

jams were burned in place. Results were gratifying. It was estimated that 388,119 cubic feet of wood debris were removed, for improvement of 21.5 miles of fish spawning and nursery area, at an average cost of \$880 per mile.

Results Evaluated

Results of the project were evaluated by making visual observations throughout the cleared area. It was estimated that only about 5 percent of the jams removed were complete barriers to fishlife. Another 40 percent were classed as hindrances to upstream movement which would cause delays in fish migrations. These also posed the threat of becoming total barriers at a later time. The remaining 55 percent of the logjams, being potential hazards, were removed while clearance work was being carried out in these remote areas, in consideration for the future.

(Please turn page)

The Big Cleanup

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Dewarren Creek, two years after stream clearance activities, showing what a cleared, clean-flowing stream can look like.



The contrast. A cleared area in the foreground points up the difference in the solidly jammed section of Olds Creek just upstream. DFG photos with this article by Gerald Holman.

improvement work within the forest was carried out by the Division of Forestry at their expense.

Type of Damage

Stream damage from logging may be divided into the following types:

1. Siltation of streambeds, destroying bottom organisms utilized as food and smothering fish eggs deposited in the stream bottom.
2. Creation of logjam barriers impassable to migration of fish life.

It All Started on the Noyo River in 1957. Today . . .

. . . Steelhead and silver salmon of our north coast streams are getting a break. Under a current 10-year program, financed by the Wildlife Conservation Board, log jams are being systematically cleared out of all important drainages supporting fish life.

These conditions are the aftermath of logging operations conducted in our coastal forests over the past 50 years. Severe damage to spawning and food-producing areas of streams has resulted from roadbuilding and general soil disturbances associated with logging operations. Debris from logging collects in stream channels and acts as a catchment basin for eroded materials. Often the natural streambed is buried several feet beneath silt and mud. This destroys use of the area by fishlife. Frequently the debris forms barriers so dense that upstream migration of fishes is prevented.

In an effort to rehabilitate such streams, the Noyo River stream clearance project was initiated in 1957, as the result of combined efforts of local sportsmen, State Division of Forestry, Union Lumber Company and the De-

partment of Fish and Game. The technical work was largely performed under the Dingell-Johnson stream and lake improvement project supported by federal aid. The Wildlife Conservation Board took over the stream clearance program financing after 1960. Logging damage is normally the responsibility of the logger or landowner. However, most of the damage was found to be the result of logging which occurred over the past 50 years.

A Big Problem

The first step in developing such a project was to assess the problem. Fisheries personnel during 1957 walked out all streams within the Noyo River drainage recording stream conditions, fishes present, location and size of logjams and access routes. These surveys revealed that the drainage contained 80 miles of streams, of which 70 miles are of fisheries value. Most of the drainage is covered with vast forests of redwood and Douglas fir, with logging being the principal land use. A sizable portion of the drainage lies within the 52,000-acre Jackson State Forest. All

California Is
Restoring Its
Coastal Streams
for Fish

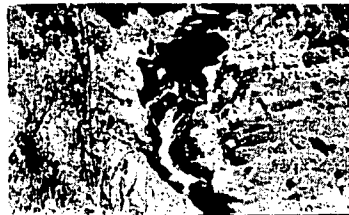
3. Compaction of gravels into a hard bottom which makes nest digging by fishes difficult.
4. Destruction of streamside cover, which causes summer water temperatures to become critically high.

The effects of past logging upon the drainage and its fisheries resources were quite evident. Although most of the watershed has regrown with timber, vast amounts of logging debris and silt were found still clogging the stream channels. Over the years, all 70 miles of the drainage were found to have suffered stream damage of one type or another, with specific logjams scattered over 36 miles of streams.

A total of 296 logjams, one small concrete dam and one natural falls barrier were found on the 16 streams within the drainage. Logjam clearance costs were calculated on the basis that all material would be either burned, or cut and removed from the



A natural bedrock barrier on Hayworth Creek. At left, the crew gets ready to blast. At right, after correction by blasting.



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DEPARTMENT OF FISH AND GAME

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STREAM CLEARANCE . . .

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One of the most important benefits of the project was the flushing out of tons of silt, sand and gravel from the stream bottom behind logjams. This exposed again the normal streambed of cobbles and gravel, offering satisfactory conditions for both fish spawning and survival of aquatic insect foods. It was amazing how great the changes in bottom conditions could be even after a single winter of heavy runoff. In some cases however, it may take 10-20 years for full recovery of streams.

Added Benefit

As an added benefit, the clean river system aids in controlling future logging damage, since wardens are now able to define responsibility for current debris accumulations. On several reaches young salmon and steelhead

An abandoned dam on Olds Creek. This was a partial barrier to the movement of fishes going upstream to spawn.



were observed the following spring, in sections previously barren. This indicated that at least some spawning fish had again used these tributaries. However, to assist in the prompt reestablishment of silver salmon runs, which appeared to be at a low ebb in many coastal streams, a restocking of hatchery-reared yearling fish, just prior to their migration to the ocean, is an added part of the overall program. Since silvers normally have a three-year life cycle, stocking is car-

ried on for three years in an effort to rebuild these runs.

Following the Noyo River cleanup completed in 1960, similar projects have been completed on several river systems, including the San Lorenzo River, Santa Cruz County, and the Big and Ten Mile Rivers, Mendocino County. The Navarro River drainage is currently being cleared, while the Gualala River system was surveyed last year preparatory to clearance work beginning in 1965. All of these but the first two are WCB projects.

One point is clearly evident to all persons that have been associated with such projects. It is much more practical and less costly to prevent logging damage to streams through application of suitable logging practices than it is to correct the damage once done. We are hopeful that future logging in these drainages will not repeat the damage incurred in the past.



Olds Creek dam was breached by conservation crews to permit fish passage.

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The Bobcat



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