crews from Conservation Camps been an outstanding example of co-
operation between various state agen-
cies in implementing a worthwhile program involving human rehabilita-
tion as well as stream rehabilitation.

Under the guidance of Gerald Hol-
man, DFG fisheries manager, who served as the fish and game liaison
officer, the removal work was carried out effectively. It was his responsi-
bility to lay out work in advance with
crew foremen, observe removal opera-
tions 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-

By Willis Evans
Fisheries Management Supervisor

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

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 nurs-
ery area, at an average cost of $880
per mile.

Results Evaluated

Results of the project were eval-
uated 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 per-
cent were classed as hindrances to up-
stream movement which would cause
delays in fish migrations. These also
posed the threat of becoming total
barriers at a later time. The remain-
ing 55 percent of the logjams, being
potential hazards, were removed while
clearance work was being carried out
in these remote areas, in considera-
tion for the future.

(Please turn page)
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 Department 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 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 by food and smothering fish eggs deposited in the stream bottom.
2. Creation of logjam barriers impassable to migration of 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...
STREAM CLEARANCE . . .

(Continued from page 15)

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 streamed bed of cobbles and gravel, offering satisfactory conditions for both fish pawning 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 streams young salmon and steelhead 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 re-establishment 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 carried 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 that it is to correct the damage once done. We are hopeful that future logging damage in these drainages will not repeat the damage incurred in the past.
The Bobcat

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