

The Effects Go On and On

Between 1963 and 1967, researchers at Caspar Creek Experimental Watershed made preliminary measurements for a paired-watershed logging study on California's redwood coast. The effects of logging would be identified by comparing flow and sediment measurements from a logged watershed with those from a similar, unlogged watershed.

The study site was a wet coastal forest that had been logged around the end of the 19th century and was now covered with fast-growing 90-year-old redwoods. The study would document the effects of a tractor-yarded selection harvest on the South Fork of Caspar Creek that would take out about two-thirds of the timber. (In tractor yarding, the logs are dragged out of the woods by a bulldozer.) The operation would start with extensive road-building.

Researchers expected that the South Fork operation would have a substantial effect on the landscape of the 400-hectare (1,000-acre) watershed. And when the operation took place between 1967 and 1972, indeed, it hit the watershed pretty hard. Sediment more than tripled from the road-building in 1968, and then doubled again when the site was tractor-logged from 1970 to 1973. Major post-logging landslides occurred, peak streamflows increased, and numbers of coho salmon in the South Fork declined.

The magnitude of the effects was not a surprise to those early researchers, says Liz Keppeler, a hydrologist who oversees the research at Caspar Creek. In the 1960s and early 1970s, logging operations were mostly unconstrained by the kinds of protective rules taken for granted today. "There were no requirements to leave a buffer along the stream, for example," she says. "You could even drive a bulldozer in the streambed, and they did."

The researchers did expect peak streamflows and sediment to settle back to pre-logging levels relatively quickly. These expectations also seemed reasonable, and after a few years they seemed to be coming to pass: streamflows and sediment levels in the South Fork were declining, and salmon numbers seemed to be rebounding.

In 1985, with recovery from the South Fork logging well underway, the scientists moved on to a second watershed-scale experiment, planning a cable-yarded clearcut harvest in the North Fork watershed. This operation



Stream gage and sediment sampling station in a tributary of North Fork Caspar Creek.

too produced a pulse of sediment and higher peak flows, but the sediment input was not as extreme as it had been in the South Fork. The cable yarding was much lighter on the land because it required fewer roads, and skid trails were constructed only in the few low-gradient areas that were yarded with tractors.

The simple conclusion—and a correct one—would be that logging with bulldozers in such steep, wet country is hard on the environment. And indeed, the California Forest Practice Act, passed in the early 1970s, sets forth forest-practice rules that, among other things, restrict where bulldozers can operate (not through a stream, for instance), limit the size of a logging operation, and require that trees be left along streams to protect the channel and its riparian environment.

Caspar Creek scientists can't claim credit for the whole forest practice law, says Tom Lisle, research hydrologist and program leader at



Caspar Creek, “but our work has helped make and refine the rules.” Thanks in part to Caspar Creek research, the days of unregulated logging are forever past. And that, says Lisle, is the beauty of hard data: “You can always deny there is an effect, until somebody actually measures it.”

Yet the Caspar Creek story does not end here. In the early 1990s, the sediment levels in the South Fork—thought to have recovered from the logging—started creeping higher. Lisle and Keppeler attribute this to the gradual failure of roads and culverts constructed during the logging. This hypothesis is in keeping with other findings on logging and roads in steep, moist coastal forests.

“The point,” says Liz Keppeler, “is that the effects go on and on.” Indeed, she notes, the watershed was surely greatly altered by the original, turn-of-the-century old-growth logging, although it is impossible to know how much because there are no baseline pre-logging data.

“But if we’d walked away from the forest in 1985 after measuring the effects of the South Fork selection cuts,” says Keppeler, “we would have a very different story from what we have now. This underscores the value of these long-term experiments, this long-term data set. If we walk away from here tomorrow, we will never know what long-term effects we failed to discover.”



The California Division of Forestry and Forest Service have worked together to maintain a continuous record of stream flow and sediment transport in Caspar Creek since 1962.