

**DROUGHT IMPACTS ON FISH, WILDLIFE,
AND RECREATION IN NORTHERN CALIFORNIA**

Ralph N. Hinton
Department of Water Resources
Red Bluff, CA 96080

Abstract.

The drought of the past two years was in many respects the most severe on record in California. However, although runoff in the Central Valley and Sierra Nevada areas were near record lows, many North Coast streams were well above record lows, and runoff in south coastal basins was near normal.

The positive effects of the drought included greatly increased efforts at conservation of water and energy by both municipal and agricultural users. Hopefully, both sectors acquired lasting water-conservation habits.

Anadromous fish, and fish living in middle elevation streams and some reservoirs, were hard hit by the drought. Fish and wildlife species are generally expected to recover quickly from the effects of the drought if suitable habitat is available. Recreation at major North State reservoirs was greatly reduced, although a few smaller reservoirs and natural lakes escaped serious impact. White-water boating was greatly restricted last spring.

The Spring Creek pollution problem on the Sacramento River near Redding received much greater attention this year than in the past and a major fish kill was apparently averted. Understanding of the problem has increased substantially and may lead to a permanent solution.

The political implications of the drought are important. SB 345, which would have repealed the State's Wild and Scenic Rivers Act, and AB 1653, which would have weakened the Act, are examples of proposed legislation threatening fish and wildlife which resulted from the drought. The recent proposal to construct three major dams on the Eel River as an alternative to SB 346 will be important legislation to watch.

INTRODUCTION

The drought we have experienced in the West for the past two years was, hopefully, an unusual event. Certainly the Associated Press thinks so. By a wide margin, the drought was voted the top California news story of 1977 in a poll of the State's newspaper editors. Precipitation over the State last year averaged about 45 percent of normal. This intensified the dry conditions begun in 1976 when statewide precipitation

was about two-thirds of normal. In the Sierra Nevada where snow is king, the snowpack was the lowest in 47 years, and resulting runoff averaged only about 25 percent of normal.

The drought reduced many of California's rivers, streams, lakes, and reservoirs to their lowest recorded levels. California's extensive water development system is based on the conditions observed in the years 1927-34, which was the driest period on record, although recent tree-ring studies indicate even drier periods have occurred.

From the standpoint of water supply, the drought of the past two years was critical. Both 1976 and 1977 were among the five or six driest years on record in the Sacramento, Feather, Yuba, and American river basins, which supply much of California's water storage. Last year was by far the driest for the Feather, Yuba, and American Rivers, and it was the third driest for the Sacramento.

However, in terms of fish and wildlife, 1976 and 1977 may not have been the disaster we might have expected.

Last August and September, the Department of Water Resources (DWR) measured the minimum flow of many Northern California streams. We measured streamflow, water temperature, and turbidity at about 800 Northern California locations. These data revealed that streams in the Central Valley and Sierra Nevada areas were near record lows last summer, but many other Northern California streams were well above minimum recorded levels. For example, the Smith River near Crescent City had 200 cfs in August, 1977, compared to only 160 cfs in October, 1964. The unimpaired flow of the Trinity River at Lewiston was 70 cfs last August and 23 cfs in July, 1924. The Eel River at Scotia had 24 cfs last year and only 10 cfs in August, 1924. So, while streamflow conditions were bad last year, they could have been worse.

One good effect of the drought was that it made us take stock of our situation. It could be a view of things to come. It gave great impetus to conservation of water and energy. Communities throughout the State reduced their water use by 20, 40, even 60 percent. Of course, agriculture is by far the biggest water user in California, and despite the reduced water supplies and grim predictions of doom last spring, gross agricultural production in 1977 was higher than 1976, although net farm income was reduced.

Farmers responded to the drought by reactivating old wells and drilling new ones—about 20,000 new wells were drilled in California last year. They also recycled water they would have wasted in prior years and resorted to drip irrigation in some areas.

This experience proved that we can manage with less water. The trick will be to get people to continue using less water even though supplies are normal. Some people in DWR think a new water conservation ethic has developed. They believe people have developed some good habits and won't forget them after the drought ends. Time will tell.

IMPACT ON FISH, WILDLIFE, AND RECREATION

Bad effects of the drought included the impact on fish and wildlife populations and recreation opportunities in Northern California.

Anadromous fish probably were hard hit by poor water conditions due to the drought. Spring- and fall-run king salmon, particularly in the Sacramento, Feather, Klamath, and Trinity Rivers, faced very low flows and high water temperatures.

During 1976, cool water from Trinity Reservoir was mixed with warmer water from Shasta Reservoir to reduce the temperature of the Sacramento River. However, during 1977, storage in Trinity Reservoir was too low to help, and fall temperatures in the Sacramento River were too high, until early November, for successful egg incubation.

The Department of Fish and Game (DFG) and the U.S. Fish and Wildlife Service (USFWS) blocked adult salmon at the Red Bluff Diversion Dam and hauled nearly 23,000 spring- and fall-run fish to higher elevation spawning areas in Mill, Deer, Butte, Chico, and Clear Creeks, where water temperatures were lower. Salmon were also hauled to the Feather River Fish Hatchery and Coleman National Fish Hatchery. Large numbers were forced to spawn below the Red Bluff Diversion Dam, where the threat of copper pollution from Spring Creek, near Redding, was less. The Spring Creek problem is interesting, and I'll discuss it in detail later.

Trout and other species living in middle and low elevation streams were also adversely affected by the drought. Many smaller streams were intermittent this summer, and some dried up completely, a few for the first time in memory.

Fish populations in many cold-water reservoirs were affected. A few reservoirs lost their cool water and thus lost their trout populations and fishing. Some were so low that access for fish stocking and angling was difficult. Natural reproduction and recruitment of fish in warm water reservoirs were reduced. For example, much spawning habitat for large and smallmouth bass was lost in reservoirs drawn down to low levels, due to reduced area, rapid drawdown, and silt-covered substrate. In a few cases, fisheries were lost because reservoirs were drained or high temperatures and/or low dissolved oxygen in residual pools caused fish kills.

However, the DFG has taken advantage of the low water conditions in several reservoirs by constructing brush shelters which will provide additional fish habitat when the reservoirs refill. Nature is doing the same thing in the Sacramento River arm of Shasta Lake near Lakehead. The lake bottom has grown a forest of young willow, cottonwood, and other plants since the lake receded during the drought. Bass and crappie habitat will be temporarily enhanced when the lake's level rises to cover the new growth.

DFG officials were concerned that waterfowl losses would result from the lack of flooded areas in the Central Valley this fall, but mild weather in the north delayed the birds until conditions improved—a natural regulating mechanism. Now, of course, large portions of the Central Valley are flooded, providing ample room for wintering waterfowl.

In general, fish and wildlife are very resilient creatures. If we protect their habitat, they will survive and populations will return to normal.

Recreation at major reservoirs in the North State was greatly diminished by the drought. At Lake Shasta, recreation was about 10 percent of normal due to extremely low

water levels, difficult access, and bad publicity. Shasta reached its lowest level since it first filled in 1945. Recreation use at Trinity Reservoir was about 20 percent of normal for similar reasons. Resorts at both reservoirs had little business and many are near bankruptcy. Bridge Bay Resort at Lake Shasta was the only resort with any significant business this year.

But the recreation picture was not universally gloomy. Most of the larger natural lakes, such as Eagle Lake, Clear Lake, and Lake Tahoe, retained their recreation appeal. A few reservoirs, such as Lewiston Reservoir below Trinity Dam, Whiskeytown Reservoir near Redding, and Lake Siskiyou on the upper Sacramento River near Mt. Shasta, had good years.

Those of you interested in white-water boating know that most Northern California streams dropped below satisfactory levels quite early. By May 1, most North Coast streams were already near typical mid- or late- June levels. The Klamath River basin was near mid-July levels. The Sacramento and Klamath Rivers were the only major streams that retained at least minimum satisfactory boating conditions all summer. Other major rivers were too low for boating by early May, as were all of the smaller coastal and Central Valley streams. Conditions for white-water boating this spring look much brighter.

THE SPRING CREEK POLLUTION PROBLEM

The Spring Creek pollution problem mentioned earlier is a situation I'd like to describe in some detail. Spring Creek is a tributary to the Sacramento River above Keswick Dam which has carried acidic mine wastes from old copper, zinc, and sulfur mines for many years.

Discharge of these wastes into the Sacramento River during periods of heavy rainfall have caused fish kills since at least 1930. Shasta Reservoir, constructed in 1944, complicated the problem. At times, it provides releases which dilute the waste; at other times, it reduces Sacramento River flows when mine runoff is high.

Spring Creek Debris Dam, constructed by the U.S. Bureau of Reclamation (USBR) in 1963, was designed to collect sediment and mining wastes. It also limits releases of the acidic mine wastes to those times when releases from Shasta Reservoir provide adequate dilution. However, Spring Creek Debris Reservoir is small and one major storm can fill it. Consequently, fish kills, although apparently small in magnitude, have occurred in half the years the reservoir has been in operation, with a major kill in 1969.

The drought focused attention on the Spring Creek problem because Shasta Reservoir was very low, and the USBR released as little water as possible so the reservoir could refill. The potential for a disastrous fish kill was obvious. Work on this long-standing problem, which has been progressing for several years, was greatly accelerated.

The Regional Water Quality Control Board issued Waste Discharge Requirements. The mine owners installed emergency control equipment last fall and began to control the mine effluent.

The "safe level" for releases from the debris dam into the Sacramento River was based on 96-hour acute toxicity bioassays using rainbow trout. "Acute toxicity" is the level of copper-ion in the water that kills half the trout in 96 hours. The debris dam has been operated to maintain copper concentrations in the river below levels which directly kill juvenile fish. However, very little is known about the long-term effects of copper and other heavy metals on Sacramento River salmon. The literature suggests that the levels maintained in the river don't kill juvenile salmon, but may be lethal to more sensitive life history stages, such as yolk-sac fry. Thus, the operation of Spring Creek Debris Dam, while helping to prevent a serious mortality rate among juvenile and adult salmon, may be increasing mortality of yolk-sac fry.

The increased attention given this problem revealed that the water discharged from the debris dam also has high concentrations of zinc, cadmium, aluminum, and iron. Zinc acts synergistically with copper, with a more severe combined effect on salmonid eggs and other life history stages than that of copper alone.

So, as knowledge of this problem has increased, it has become clear that the Spring Creek effluent may be a major depressant on Sacramento River salmon runs, and a much more important problem than was previously supposed.

So far this winter, despite above-normal rainfall in the Redding area, and a major spill from Spring Creek Reservoir, no major fish kills have been observed, although fish mortality has been higher than usual. Shasta Reservoir has now gained enough storage that special releases can be made to dilute the Spring Creek effluent as needed. However, it seems obvious that the long-term solution must be control and elimination of the waste, not dilution.

I'd like to leave this subject with the observation that the drought focused attention on a long-standing problem with the result that both the understanding of the problem and the probability of its being resolved have been greatly enhanced. Both the Department of Fish and Game and the Regional Water Quality Control Board feel they have learned a great deal, which will allow them to respond better to the immediate problem and to work toward a lasting solution.

POLITICAL IMPLICATIONS OF THE DROUGHT

The political implications of the drought have been interesting to date and should prove fascinating in the future. For example, were the problems caused by the drought sufficient reason to scrap California's Wild and Scenic Rivers System? Last spring, Senator Ayala (D, San Bernardino) apparently thought so, and introduced SB 345, which would repeal the Act and require the State to preserve free-flowing rivers "to the extent feasible", considering the need to provide water for the "health, safety, welfare, and sustenance of the people". A subsequent amendment reenacted the Wild and Scenic Rivers Act, relocated it to the Water Code, and deleted the Klamath, Trinity, Eel, and Van Duzen Rivers from the system. The bill was opposed by DWR and many others and died in Committee.

SB 345 should not be confused with SB 346, also authored by Ayala. SB 346 authorized the Peripheral Canal and several major off-stream reservoirs. It would meet California's water needs through the year 2000. As you know, the Peripheral Canal and SB 346 are supported by DFG and the Sierra Club, the Planning and Conservation League,

and the Delta Environmental Advisory Committee. They are opposed by Friends of the Earth, Contra Costa County interests, and some San Joaquin Valley agricultural interests.

Assemblyman Barry Keene (D, Eureka) introduced a similar but less radical bill than SB 345. His bill, AB 1633, would have retained the Wild and Scenic Rivers Act, but would have weakened most of its major provisions. The bill also was opposed by many groups and apparently died in Committee.

Last week Senator Campbell (R, Hacienda Heights) and Assemblyman Boatwright (D, Concord) caused a shock when they revealed a plan to get a proposal on the November ballot for a \$3.6 billion water project that would include three giant dams on the Eel River. In addition to the English Ridge, Dos Rios, and Yellowjacket Dams on the Eel, the plan would also include two dams on Cache Creek and one on Stony Creek in the Sacramento Valley.

The Campbell-Boatwright plan is obviously an alternative to Governor Brown's \$3.5 billion plan (SB 346), which is designed around the Peripheral Canal. Campbell said his plan would unify competing factors now fighting over SB 346 because it would mean more water for everybody. But I think he overlooks the fact that it would reopen the fight over damming the Eel River. The DWR has not yet taken a position on this proposal.

All of these legislative proposals are responses to two years of drought, just as the Bureau of Reclamation's Central Valley Project was a reaction to the seven-year drought in 1927-34. They are serious threats to California's free-flowing rivers, and to the Wild and Scenic Rivers System. I think it is foolish to think that California's legitimate water needs won't be met. The question is how to do it with the least possible damage to the State's environment in general, and to fish and wildlife resources in particular.

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