THE TROUT FISHERIES OF ANTELOPE, DAVIS, AND FRENCHMAN LAKES

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Abstract. Presents history, status and field techniques used in the management of Antelope, Davis and Frenchman lakes. Discusses nongame fish problems and planting density versus yield.

INTRODUCTION

Antelope, Davis, and Frenchman Lakes are headwater reservoirs of tributaries of the Feather River. They were built by the Department of Water Resources as part of the California Water Plan for recreation and water storage. Recreational facilities at all three lakes are managed by the U.S. Forest Service, and the California Department of Fish and Game manages the sport fishery.

ANTELOPE LAKE

Antelope Lake was formed by a dam on upper Indian Creek (tributary to the North Fork Feather River) in October 1963. Filling began November 25, 1963, and the first spill was on January 25, 1965. At spill elevation of 5,002 feet, Antelope covers 931 surface acres and contains 22,566 acre-feet of water. Maximum depth is 62 feet and average depth is 24.2 feet. It is used for irrigation, streamflow maintenance and recreation, and fluctuates 3-5 feet per year.

DAVIS LAKE

Davis Lake was formed by a dam on Big Grizzly Creek (tributary to the Middle Fork Feather River in October 1966. Filling began October 18, 1966, and the first spill was on April 19, 1969. At spill elevation of 5,775 feet, Davis Lake covers 4,026 surface acres and contains 84,371 acre-feet of water. Maximum depth is 112.5 feet and average depth is 21 feet. The lake is used for recreation and as a domestic supply for the village of Portola. It fluctuates 3-4 feet each year.

FRENCHMAN LAKE

Frenchman Lake was formed by a dam on Little Last Chance Creek (tributary to the Middle Fork Feather River) in October 1961. Filling began January 10, 1962, and the first spill was on April 18, 1965. At spill elevation of 5,588 feet, Frenchman Lake covers 1,580 surface acres and contains 55,477 acre-feet of water. Maximum depth is 102 feet and average depth is 35.1 feet. Stream maintenance and irrigation require 10,000 to 15,000 acre-feet a year, causing an annual fluctuation of 8-10 feet.

DATA COLLECTION TECHNIQUES

One day creel censuses are conducted every two weeks on the weekend on each lake. Hours fished, county of residence, and numbers and species are recorded for each angler. Additionally, the fork lengths are recorded in significant half-inch intervals. All census assistants are instructed in how to measure fish in significant intervals--so the data remain comparable regardless of who collects it.

The length recordings generate curves that can be read as they are built. These length frequency curves probably reveal more about the fishery than all other compilations and computations, and their visual simplicity is useful for angler education. The length frequency data are summarized in tabular form in year-end management reports on each lake.

Additionally, temperature profiles and dissolved oxygen readings are obtained on each census day. In 1973, some plankton sampling was done on Antelope Lake preliminary to setting up a regular program on all three lakes.

TROUT PROGRAM

All three lakes are planted annually with fingerling rainbow trout (Salmo gairdneri) ranging from 80 to 500 per pound. Trout planted in June at about 2 inches grow to 7 inches by September 1, and to 11 inches by the following May. Growth continues through the summer to 13 inches. A two-year-old trout will fall in the 16-18 inch range.

Antelope Lake is planted with 250,000 fingerlings. Angler use is estimated at 80,000-100,000 angler days, with 150,000-200,000 fish caught at an average weight of 10 ounces; a total yield of 93,000-121,000 pounds, or 100-130 pounds per acre.

Davis Lake is planted with one million fingerlings and a few assorted yearlings. Annual angler use is 125,000-150,000 days, and total yield is 400,000-500,000 pounds, or 100-125 pounds per acre. A five fish limit was imposed in 1971 and this has apparently served to extend the catch through the summer. In summer the fish take on a strong muddy flavor that renders them all but inedible to most people.

Frenchman Lake is planted with 100,000 fingerling and 50,000 yearling trout. Angler use is 20,000-25,000 days annually with a yield of 25,000 pounds of 6-ounce trout, or 17 pounds per acre. Most of the potential production of Frenchman Lake is tied up in a massive golden shiner (Notemigonus crysileucas) and brown bullhead (Ictalurus nebulosus) population. These species were first noted in 1968. Trout production slowed in 1969 and then began a plunge in 1970 that has shown marked decreases in both numbers and size of trout caught.

GOLDEN SHINERS

The infestation of golden shiners in Frenchman Lake, and the subsequent rapid decline in trout production graphically illustrates the leading obstacle to maintaining maximum yields from these waters. In 1964 the fishery opened with a bi-modal distribution of catch with modes at 10 and 13 inches. These moved to 11 1/2 and 14 inches by mid-June. In 1973 the opening modes were 8 1/2 and 10 inches, and on June 30 these fish were 9 1/2 and 10 inches. Only 5 percent of the 1973 catch exceeded 11 1/2 inches as opposed to 34 percent in 1964.

Frenchman is scheduled for drawdown and treatment in September 1974. Water commitments prevent drainage below 25,000 acre feet so the chemical cost alone for the treatment will be $60,000, and the labor cost may add another $20,000. These are direct capital costs, but they are dwarfed by the hidden lost production cost. Over the past five years the reduced annual yields of Frenchman Lake have cost the California angler more than $375,000.

This is a recurring cost in these reservoirs. Antelope Lake was treated for the same golden shiner malady in 1971, and the golden shiners have now been found in Davis Lake. In each case the shiners were brought in as bait. This problem will continue to plague these high yield (as well as many small low yield) lakes until a massive effort is undertaken to educate the California (and Nevada) angler that, regardless of what he paid for it, the golden shiner is the most expensive bait he can use. The ultimate irony is that bait fish are not even an effective method for catching rainbow trout.

YIELD AND OPTIMUM PLANTING DENSITIES

Biologic and economic input-output curves are similar in all major respects. The fixed input is the system energy, and this is also the limit of production. Total growth or yield increases rapidly until it approaches this limit, then tapers abruptly, levels off, and finally plunges. On the rising side of the curve some system energy is not being utilized, but most of the energy that is consumed is used for growth and little energy is used for maintenance. As maximum possible yield is approached, un-utilized system energy approaches zero but a greater proportion of the total energy consumed is used for maintenance. Finally, on the down-side of the curve all of the system energy is utilized, but an ever increasing proportion of the energy is consumed for maintenance and very little is left for growth.

The output-per-unit-of-input curve (average yield) peaks much sooner than the total yield curve. On the up side of this curve both energy and fish are under-utilized. Between the average yield peak and the total yield peak some energy is unused and some fish are wasted. Beyond the total yield peak both fish and energy are wasted.

The optimum use of both energy and fish is in the zone between the peak average yield and the peak total yield. Antelope, Davis, and a healthy Frenchman are planted at a density of 250 trout per acre. The problem remaining is to determine where on the yield curve that density is.