# BEAVER POPULATION STUDIES AT SAGEHEN CREEK

David Taylor
University of California
Berkeley, California

Abstract: No beaver were recorded in the early history of the Sierra Nevada. Present beaver populations are derived from introductions during the past fifty years. A series of studies at Sagehen Creek has afforded a very complete record of a beaver population from the initial introduction in 1945 through 1970. An initial phase of rapid increase and expansion was based on a large standing crop of aspen. When the aspen was depleted the primary food base changed to willow, with an attendant decline in the population. Life-long histories of marked animals demonstrated that mated pairs stay together for life. There was no evidence of polygamy.

---

As over much of the North American continent, beaver trappers played an important role in the early history of California. Such men as Jedediah Smith and Peter Skene Ogden led expeditions through the major river systems in the decades preceding the gold rush and shipped thousands of pelts to eastern markets. Surprisingly, there were no records of beaver (Castor canadensis) in the Sierra Nevada. The present beaver populations of the Sierra Nevada are derived from introductions during the past fifty years (Tappe 1942). There were prime stands of aspen (Populus tremuloides) along many of the stream systems at the time beaver were released. Repeatedly, local populations have followed the classic pattern of a species expending unchecked in a rich and unexploited habitat: an initial phase of rapid population growth and expansion has been followed by decline, and/or abandonment, as the aspen was decimated. This pattern must be understood to evaluate the effect of beaver upon the over-all ecology of these stream systems.

Sagehen Creek rises north of Donner Pass and flows eastward into the Little Truckee River near Hobart Mills, California. The study area includes about seven miles of stream from an elevation of about 5800 feet to 7000 feet. Stream flow past the University of California research station at 6320 feet normally stabilizes at about 2.5 C.F.S. through the dry months of late summer and early fall. Typical spring run-off is on the order of 20 - 60 C.F.S. The basic vegetation type grades from a sage-bitterbrush (Artemisia tridentata - Purshia tridentata) association, with scattered Jeffrey pine (Pinus jeffreyi) at the lower altitudes, to a mixed coniferous forest about. Much of the stream is bordered by grass-sedge meadow. There were groves of aspen along the stream and on the adjacent slopes. Willow (Salix spp.) is restricted to the riparian bottom-land.

The present beaver population at Sagehen Creek began with the introduction of four animals in 1945. Joseph Hall began a study in 1952 of the utilization of aspen and willow, which continued through 1955 (Hall, 1956, 1960). The effect of the beavers' workings on trout was studied by Richard Gard from 1954 through 1957 (Gard, 1958, 1961). This author began his field work in 1958. A dissertation has been filed (Taylor, 1970), but data are still being collected. As a result of this rare continuity, it is possible to reconstruct a rather complete picture of the twenty-five year history of this population. All of these studies have been conducted under the guidance of A. Starker Leopold.

During the first decade, the population grew and expanded. By 1952, the original two pairs had given rise to four separate colonies which were located in the most favorable sections of stream. Beaver numbers in the lower section, where the initial introduction was made, reached a maximum in 1955, and depletion of aspen was imminent. The over-all population of Sagehen was estimated at 33 animals.

In the second decade, beavers in the lower section decreased to less than half of their numbers, but the population of the stream as a whole remained at a fairly constant level as

a result of expansion into as yet unexploited habitat. The uppermost colony on the stream, which was centered in an area of extensive aspen groves, gave rise to a second, and then a third discrete colony as maturing animals left the parent colony and paired with emigrants from down-stream. The aspen were more scattered along the central section of the stream. Beaver workings were extended over a larger area during this period, but the number remained fairly constant.

By the start of the third decade, the aspen in close proximity to the water was essentially exhausted, and beaver numbers in the central and upper sections of the stream were declining. In 1969 the total population of Sagehen had decreased to about twelve animals. Two of the three upper colonies had been abandoned and the one remaining was down to a pair of adults and a two year old, which subsequently moved. There was no established colony in the central section in 1968 or 1969. Only in the lower section had the beavers come into balance with the habitat. There the population appears to have reached an equilibrium around a level of about nine animals.

It is now apparent that the period of rapid growth and high population was dependent upon a standing crop of aspen, which supplied an energy source far in excess of annual production. The trees were cut at a prodigious rate. Some sprouting did occur from the stumps, but browsing by sheep, or deer, which frequented the openings around the beaver ponds, prevented effective reproduction. The aspen proved to be, for all practical purposes, a non-renewable resource. With depletion of the aspen, willow became the primary food of the beaver. Unlike the aspen, willow appears to be capable of sustained yield under moderate or periodic grazing. The prospects for a continuing beaver population depend upon the characteristics of the site.

On the upper sections of Sagehen Creek, willow is restricted to a narrow riparian strip. With exhaustion of the aspen grazing pressure on the limited supply of willow became intense, and under heavy use the willow clumps first declined in vigor, then progressively died back. For a time the beaver ventured farther and farther from the stream to cut aspen, but, one after another these sites have been vacated. On the lower section where an equilibrium does appear to have become established, the gradient lessens and a much wider strip of bottom-land is irrigated by the stream. In this situation a considerable area of willow is available to the beavers, and the degradation apparent above has not taken place.

The group of colonies on the upper section of the stream were live-trapped, marked, and observed each year from 1958 through 1970. With similar data collected by Hall in 1952 through 1955, it has been possible to reconstruct a complete tabulation of the individual composition of these colonies for 19 years. It has long been said that beavers mate for life, but definitive proof has been lacking. These data provide a series of examples of pairs which remained together for as long as six years. In every case a pair, once formed, remained together as long as they were recorded. All evidence indicated that these pairs were monogomous.

## LITERATURE CITED


Gard, R. 1958. The effects of beaver dams on trout in Sagehen Creek, California. Unpubl. Ph.D. Thesis. Univ. Calif., Berkeley. 110 p.

_____ 1961. Effects of beaver on trout in Sagehen Creek, California. Jour. Wildl. Mgt. 25:221-242.

Hall, J.G. 1956. Willow and aspen in the ecology of Sagehen Creek, California. Unpubl. Ph.D. Thesis. Univ. Calif., Berkeley. 88 p.

_____ 1960. Willow and aspen in the ecology of beaver on Sagehen Creek, California. Ecology 41:484-494.

Tappe, D.T. 1942. The status of beavers in California. Calif. Div. Fish Game, Sacramento, Calif. Game Bull. No. 3, 59 p.

Taylor, D. 1970. Growth, decline, and equilibrium in a beaver population at Sagehen Creek, California. Unpubl. Ph.D. Thesis. Univ. Calif., Berkeley. 162 p.