294). At their lowest ebb a few remained in the larger rivers, however, and during the past quarter century under the awakened interest in wildlife and the most rigid legal protection that could be given them in an area of extensive wilderness they have come back to some of their old haunts and increased locally until they now may be found in many of the streams and lakes of the State. In fact, they are apparently more common now in the Grand Ronde and Walla Walla Valleys than they were a hundred years ago when these valleys were occupied by settlements of Indians who depended largely on the native animals for food and clothing.

In recent years beavers have been reported as more or less common locally in Clatsop, Columbia, Tillamook, Benito, Lane, Hood River, and Jackson Counties west of the Cascades, and in Wasco, Sherman, Crook, Wheeler, Gilliam, Umatilla, Wallowa, Union, Baker, Grant, and Malheur Counties east of the range.

General habits.—Beavers are so highly specialized for life in the water and so slow and clumsy on land as to be closely restricted to streams, lakes, and ponds, the shores of which they rarely leave for more than a short distance in search of food. In the water they are rapid and powerful swimmers and great divers, often remaining under water for several minutes at a time and swimming long distances without appearing at the surface, digging, cutting roots and sticks, and gathering much of their food under water. The very large and fully webbed hind feet are powerful swimming members, while the broad, flat muscular tail is used in steering and diving, for a prop in standing up, or for striking a signal blow on the water or ground. Beavers are intelligent, skillful, and industrious workers, building extensive dams across streams to hold back sufficient depth of water in ponds to protect their houses and winter stores of food, and building large, strong, and comfortable houses in which to live and raise their young. They cut trees and bushes for food and building material and show great skill and industry in getting material and carrying on their building and food-storing operations. When much hunted and trapped for their valuable fur they become very shy and difficult to catch, but when protected for a time become gentle and unsuspicious. They are easily tamed and make interesting pets if properly handled. Often in their native haunts they can be baited with favorite food plants, such as the aspen and cottonwood branches, thrown in the water or laid on the shore every day until they come regularly for the food. In this way they may be kept in localities where desired, and even induced to come out before dark to feed in places where they may be observed at close range. While largely nocturnal in habits, and strictly so when persecuted by much trapping, they usually come out and begin work before dark and continue their activities until after daylight if unmolested.

Breeding habits.—Female beavers have normally 4 pectoral mammae on 2 large breast mammary glands, and 4 seems to be the usual number of young in a litter. In yearling females breeding for the first time there are often only 2 young, while in older females the number is sometimes 6 and there are a few records of 8 embryos in old females. The young are nursed by the mother in the houses or bank dens until old enough to dive through the

long waterway to the open water and begin to get a part of their own food from tender plants, twigs, and leaves. They remain with the mother during at least the fall and first winter, and if undisturbed probably longer if the food supply is ample. The relation of the males to the family life is not fully known, but they are sometimes found with the mother and larger young and are probably on friendly terms with their various families.

Food habits.—Beavers are purely vegetarian, feeding mainly on bark, twigs, leaves, roots, and a great variety of water and shore plants. Aspens, cottonwoods, and willows are their principal tree food; these are cut along the shores, and the bark is eaten from the branches and the small trunks. In autumn the branches and sections of small trunks are cut and stored in masses in deep water near the houses or bank dens, where they are accessible all winter under the ice, but much winter food is also obtained from roots and water plants along the banks and on the bottoms of ponds and streams. During the summer much of the food is from green vegetation in the water or on the shores and few trees are cut except as needed for building. Coniferous trees are rarely cut and not generally used for food.

Beavers eat large quantities of coarse food and under favorable conditions become moderately, and sometimes extremely, fat.

Economic status.—In past years the beaver has been the most valuable fur animal of North America, and with proper control and management might well take again that place among fur bearers. While in many places beavers do serious damage and ought not to be encouraged, in suitable localities on public or private lands where they can be fenced and supplied with the right kind of food they should afford profitable returns in fur and meat. Great care should be taken, however, to stock areas with animals producing the darkest, most valuable fur, as it is just as easy to raise high-priced as low-priced beaver fur, and there is a wide range of prices between the pale and the very dark beaver skins. As a private industry beaver farming promises to be a complete success, but many of the details have not yet been worked out, and if undertaken it should be at first on a small scale with careful experimental advances (Bailey, *1927*).

Since 1924 only partial protection has been given beavers in Oregon, and most of the animals have been destroyed.

The report of the district forester for Oregon, dated February 14, 1930, says:

> The open season on beavers in Oregon has proved an expensive mistake and every effort should be made to repeal the law. The present law allows trapping everywhere except on the national-forest land. However, the patented land is so intermingled that this restriction has no effect. A check on the raw furs shows that most of the beaver were caught before the fur was prime. This was because every trapper was afraid every other trapper would get in ahead of him. The number of beaver in the State has been reduced almost to the vanishing point and this has affected stream flow, fish, grazing, and erosion to a serious degree. The beaver dams originally held back the run-off on the heads of streams, supplying the irrigation sections of eastern Oregon. The dams are now gone. These dams originally formed rearing ponds for the small fish and helped to restock the streams. * * * Erosion followed and many of our best grazing areas have changed in type from wet meadows of high carrying capacity to a dry, rapidly eroding type of extremely low or no carrying capacity.

The following notes in the Portland Oregonian of June 1, 1931, by Ranger Ralph Elder of the Ochoco National Forest in semiarid northeastern Oregon give some idea of the beaver in conservation of water:

The removal of beaver has been a large factor in the shortage of water during the drought through which we are passing. Streams have dried up below former beaver dams to an alarming extent and water for stock has been reduced. * * * During 1914, as forest guard, I assisted Forest Ranger Anderson and Homer Ross, supervisor, to survey a road across a virtually dry draw just below the Cold Springs ranger-station cabin. It was decided that a bridge was unnecessary, as not enough water ran across the proposed road location to justify building one. During 1920 beaver moved into this draw and constructed a dam just above the proposed road location, near a large spring. Since that time these dams have been increased, and at present approximately 2 acres are wet beaver meadows and swamps, and springs have developed 300 yards below this. During the past season, the driest on record, water was plentiful for a distance of a quarter mile below the beaver dams, and springy places were increased all down the draw. * * * The actual improved area is hard to estimate and the increase in water for the dry part of the season can only be guessed at, but there is plenty of water for a band of sheep at all seasons and at least 20 acres of land that were dry in the very wet season of 1914 are kept fairly moist.

Another example of more recent date is at Little Summit ranger station. This area was formerly full of beaver, but the last, as far as we could tell, were trapped out about 1925. From that date to 1929 the old ditch and the entire meadow were fast becoming a dust bed. During 1928 and 1929 no water ran out at the lower end of the station. * * * Some beaver moved back in 1929 and by the fall of 1930 the meadow in the pasture was 75 percent irrigated. The old ditches were full of water and a nice stream was running at the lower end of the station. While hardly sufficient handily to water a band of sheep this much had been accomplished during two summers. I believe, from the evidence of a number of dams, that several beaver are there, which is probably the result of moving in rather than of natural increase. I have every reason to believe that by 1932 this entire meadow will be irrigated and that there will be plenty of water for a band of sheep at all seasons, below the station fence. * * * Water stored in this ground during the earlier part of the season will go a long way toward raising the water table for a considerable distance below, and, as the country is flat, it will undoubedly improve the forage on an area of at least 40 acres, in addition to the land actually surface irrigated. It will also provide water for sheep one-half mile farther down the stream than has existed before.

CASTOR CANADENSIS SHASTENSIS Taylor

SHASTA BEAVER; POME of the Klamath (C. H. M.)

Castor subauratus shastensis Taylor, Calif. Univ. Pubs., Zool. 12: 433, 1916.

Type (skull only).—Collected at Cassel on Hat Creek, near Pit River, in Shasta County, Calif., by H. E. Williams, in 1893.

General characters.—External characters from two skins collected at Thomas Creek, Lake County, Oreg., by H. J. Roosa, October 19, 1921. Externally scarcely distinguishable from *pacificus*, unless slightly brighter chestnut about head and tail in fresh October pelage. Skull readily distinguished by shorter, wider outline, short, wide, posteriorly pinched in nasals and heavy rostrum.

Measurements.—Medium-sized female from Thomas Creek, Lake County, Oreg.: Total length, 1,046 mm; tail, 300; foot, 185; ear (dry), 25. Weight, 42 pounds.

Distribution and habitat.—Known only from the Pit and Klamath River drainage in northern California and southern Oregon, from specimens taken at Cassel, Calif., and from Thomas Creek, a small branch of Cottonwood Creek, which flows into the northwestern

corner of Goose Lake, Oreg. (fig. 50). It is probably safe to assume that the beavers of the Klamath section, Lost River, Sprague River, and the Yamsay Mountains, are also of this form.

In January 1827 Ogden and his party of trappers in the Klamath Lake section nearly starved because they could not find enough beavers to furnish food for the party, but a few days later Ogden met McKay's party of trappers with "735 beaver skins taken on two small rivers that discharge into Klamath River." Still later, in February, he found beavers abundant along the Pit River, his trappers bringing in large numbers every day, and on February 22, completing their first 1,000 skins. On March 9, he says: "It is a sin to see the number of small beavers we destroy. Some females have no less than five young." On March 11, his trappers came in with 72 beavers and 1 otter (*1909, pp. 212–217*).

On May 19, 1860, Lord on his way from California to British Columbia with a drove of horses and pack mules crossed the Klamath River just above Lower Klamath Lake, which he described as a great tule marsh with open patches of water, which seemed to be the "head center" of the beaver population of Oregon. This beaver colony of many acres in extent was so populous that in some of the ponds there seemed "no room to jam in even a tiny beaver cottage" among those already occupying the area. Back from the lake shores "the trees had been felled for a good half mile from the water" as if busy emigrants had been making a clearing. The branches had been cut from the trees and dragged along well-beaten roads to the rushes, through which roads had been cut to gain easy access to the open water (*1866, p. 273*).

On Drew's Creek west of Goose Lake in 1897 there were several dams and ponds, a small beaver house in one of the ponds, and many trees and bushes cut for food and building material. In 1915 Jewett reported two dams freshly built of aspens and willows on Drew's Creek. In 1914 L. J. Goldman reported them on the west slope of the Yamsay Mountains, on Sprague and Yamsay Rivers, and in the Klamath Marsh. In 1896, Preble reported them along Wood River and Diamond Creek, and in 1914, Harry Telford reported them on the head of Wood River and Diamond Creek, and near the mouth of Anna Creek Canyon. Evidently they have held their own or increased in this section in recent years.

In July 1927 there were still a few beavers in Sprague River and its branches north and east of Bly, but the old colony on Drew's Creek that had been visited in 1897 was gone.

In no noticeable way do the habits of these beavers differ from other species in similar type of country. They now live mainly in creeks or small rivers, where they build dams and houses and often live in bank burrows.

CASTOR CANADENSIS BAILEYI Nelson

NEVADA BEAVER; HAK-NE-SHA of the Piute

Castor canadensis baileyi Nelson, Biol. Soc. Wash. Proc. 40: 125–126, 1927.

Type.—Collected in Humboldt River, 4 miles above Winnemucca, Nev., by J. H. Bunch, October 13, 1917.