



1951

The status of beavers in the delta area of the San Joaquin River, San Joaquin County, California, 1950-1951

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THE STATUS OF BEAVERS IN THE DELTA AREA
OF THE SAN JOAQUIN RIVER, SAN JOAQUIN COUNTY, CALIFORNIA

1950-51

A Thesis

Presented to

the Faculty of the Department of Zoology

College of the Pacific

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Delbert David Cram

April 1951



Golden beaver (Castor canadensis
subauratus Taylor. (Photograph
courtesy of California Division
of Fish and Game.

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Especially, I wish to express my gratitude to my wife, Thelma Gram, without whose assistance and forbearance this material would not have been written.

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INTRODUCTION

The term "delta area" refers to a region roughly 40 miles long and 15 miles wide situated 63 miles east of San Francisco Bay where the San Joaquin and Sacramento Rivers join and enter Suisun Bay. See map, Figure 1. The waterways in this area are of fresh water from these rivers, but they are affected by the ocean tides and to some extent by the salinity of the ocean water. The region encompasses about 307,000 acres, most of which has been reclaimed for agricultural purposes by the construction of levees to contain the tides and high waters. The word "islands" is used locally to designate this area.

The expense of construction and maintenance of the levees, and continuous drainage of the land, can be sustained only by the production of valuable high yield agricultural crops. Within this area exists a native race of beaver whose alleged proclivity for digging burrows in the levees is said to make it incompatible with the prevailing agricultural practices. It is the purpose of this study to examine and determine in so far as possible the exact nature and extent of this type of damage by beavers in the delta area of San Joaquin County. As will be subsequently pointed out, the beavers of this area played a historic and economic role of relatively great importance during the early developmental era of the region. It is a second purpose of this study to determine the present economic

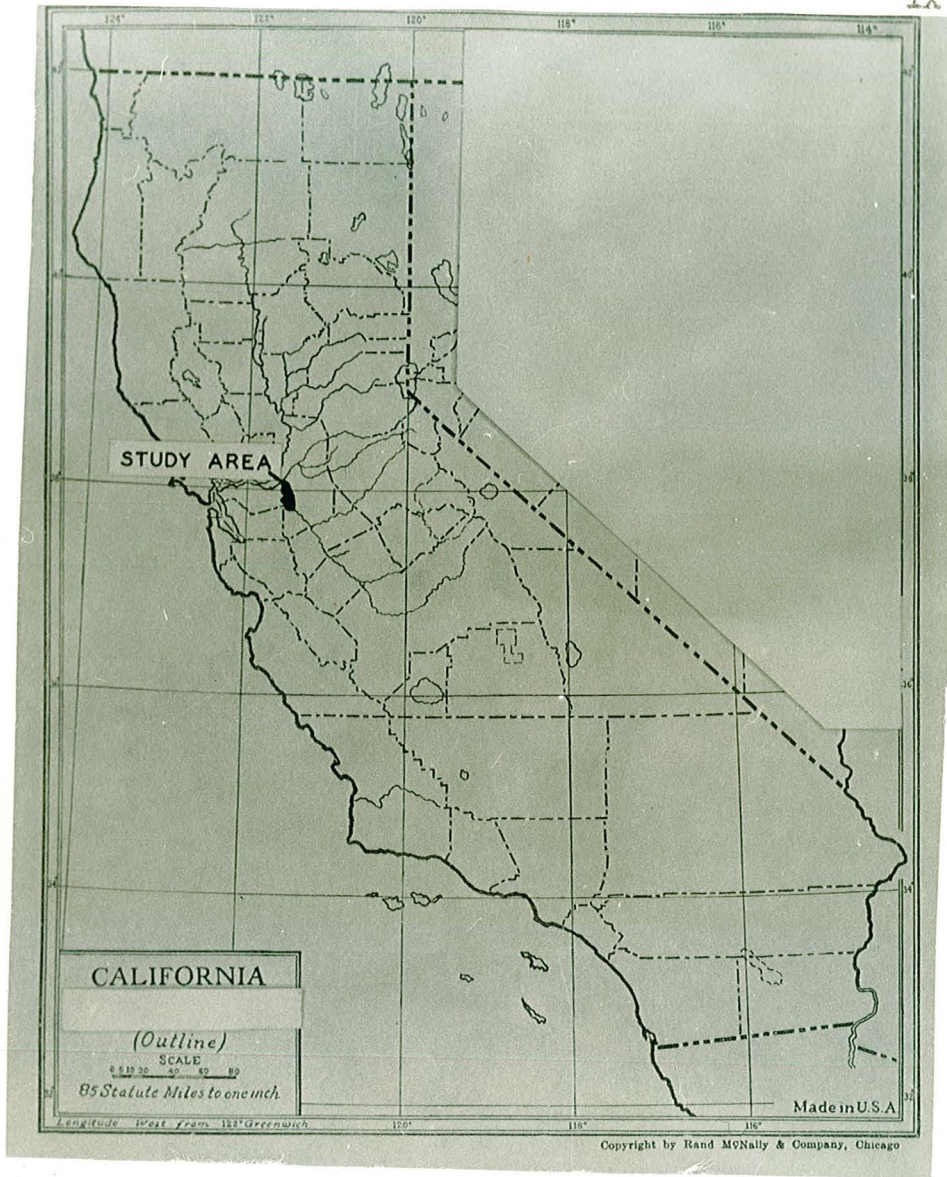


FIGURE 1
Location of Study Area

value of the beaver in this locality.

The race of beaver which is found in this region is the golden beaver, Castor canadensis subauratus Taylor (Grinnell, Dixon and Lindsdale, 1937, p. 634). The same authors state concerning this native race:

There is really slight difference between the golden beaver and other races in gross structural characters. A person familiar with eastern or northern beavers must not expect to find any conspicuous peculiarities about the Californian animals. The color of the coat, more brightly than in more northern races, is distinctive only for skins subject to close comparison; the two chief differentiating features of the skull, broadness of nasals and flattened outline of the foramen magnum, are found in the great majority of examples but require careful study of series of specimens for their appreciation. Because of the relative slightness and variability of these diagnostic characters, we prefer to consider the form subauratus as a subspecies of the North American species Castor canadensis (See Frontispiece) rather than a full species by itself. (Grinnell, Dixon, Lindsdale, 1937, p. 637).

Two readily observable environmental factors are seen to be present when the beaver in this area are to be considered. These are: (1) an easily accessible, widely dispersed food supply and (2) a plentiful, constant supply of water. Both of the above factors tend to aid in the natural production of beavers. Two land-use factors which must be considered are: (1) the intensive agricultural use of the land, and (2) the intensive recreational use of the waterways. Both of the above uses tend to diminish the importance of beavers as a fur resource.

Of the many roles played by beavers in the development of America, the economic one, either direct or

indirect, is probably the most important. Generally speaking, the effects of beaver activity are classified as either harmful or beneficial; however, careful observation has shown that such a classification is neither just nor completely accurate. In many instances something that appears superficially to be harmful may have long-range benefits that far outweigh the harmful aspects. The various interactions between the beaver and his environment are extremely complex, and accurate conclusions cannot be made until careful, long-range studies have been undertaken.

The economic value of beaver pelts trapped in North America has been very great, and only within comparatively recent times has it been accurately measured. Such value has ranged from that in which vast economic empires have been built to that in which a farm youth earns a few dollars annually. At present the economic importance of beavers is a small source of income for a large number of individuals.

Water impoundment is a beaver activity which may be considered either beneficial or harmful depending upon prevailing conditions. When human enterprise is interfered with it is often because the beaver, by building dams to impound water, causes flooding of cultivated crop land or pasture land, flooding of roads or raising the underground water level to such an extent that land becomes waterlogged. Conversely, the above occurrences (with the possible exception of road flooding) can, if conditions prevent their

being carried to extreme limits, be considered beneficial. Many valuable areas of pasture land owe their usefulness to the fact that a beaver pond has stabilized the water level of the region. In conjunction with conserving water many beaver ponds serve as a check on soil erosion.

In irrigated areas and regions where man controls water by the construction of levees, the beaver often finds a suitable habitat. In these areas the beaver can often be a nuisance by damming headgates or by burrowing in banks and levees, thereby interfering with human control of the water.

The aesthetic value of any wild animals such as beavers is a most difficult factor to measure. However, in employing total land-use theories, the aesthetic value of wild animals in general, and beavers in particular, must be considered. Popular expressions such as "busy as a beaver" and the slang expression "sager beaver" testify as to the place of high esteem which the beaver occupies in the minds of most people. Other aspects of the aesthetic worth of the beaver are manifest in the photography and nature study activities carried on by interested individuals and organizations. The attendance records of our National Parks are perhaps the most concrete evidence of the appeal which wild animals have for the people of this country.

The part played by beavers in the exploration and colonization of this nation was a very important one. The fur trappers in their quest for new areas in which to trap,

vigorously explored unknown regions. Knowledge concerning the geography of the new land was passed on to colonists who were eagerly seeking new and suitable sites for homes and farms. Thus did the beaver and other fur-bearing animals indirectly speed the development of the nation.

HISTORY

The area of this study was, prior to its development, a tide-swept delta formed by the San Joaquin River. The delta consisted of a myriad of watercourses interspersed with islands which were overgrown with vegetation which was popularly known as "tule." This area, lying in the northern portion of the San Joaquin valley, is described by Cosby (1941, p.4) as follows:

Physiographically the area has many of the characteristics of a delta at the confluence of the Sacramento and San Joaquin Rivers, a fact that accounts for the general usage of this designation. Somewhat more correctly, however, the area represents a marsh-filled structural basin in which drainage from 50,000 square miles is temporarily restrained before passing on a westward course through the relatively narrow Carquinez Strait, its single outlet to the sea.

Throughout its entire extent the land surface of the delta area lies approximately at mean sea level. At only a few points do the elevations rise to heights of 15 feet above; whereas in many places it is as much as 5 and in a few places more than 10 feet below sea level.

A detailed description of the early human activities is not the purpose of this study; therefore, such activities will be dealt with in general terms. No definite demarcation can be made between the various activities; however, they generally fell into the class of strengthening the economic, political, or religious interests of the various agencies.

Exploration of this region was coincidental to exploring activities aimed at discovering watercourses leading to other parts of the country. Much of the exploring of this type was conducted by the personnel of the Spanish military establishments, particularly those on the west

shores of San Francisco Bay.

With the increase in number and strength of the missions in California, the Catholic fathers got into the habit of sending out expeditions to capture Indians and to return them to the missions for the good of their souls. Additional exploration was necessitated by the fact that the mission authorities often felt the need of finding and returning to the missions converted Indians who had escaped. The missionaries, with their military escorts, spent much time and effort in locating sites for new missions. This activity was so important that one significant bit of exploration by Gabriel Moraga was considered a failure because he did not locate any new sites for missions. (Hubbard, 1938 p.41)

Exploration of the delta area was the by-product of another human activity--the search for fur resources. About the year 1820 a great many trappers and hunters began a westward migration across the Sierra Nevada mountains into the great central valley of California. It is generally considered that Jedediah Smith was the first American citizen and trapper to enter the San Joaquin Valley and the area which is now Stockton. (Grinnel, Dixon, Lindsdale, 1937, p.5)

The earliest human activity in the delta area was that of the native Indians. It appears that their primary activities consisted of obtaining food and warring with

other tribes in the vicinity. In the main, these tribes were of a low social order and many of them subsisted on acorns, small rodents, insects and herbs. Those who were ambitious enough obtained fish for food. They made rafts of woven tules and often established fishing stations at suitable places in the delta region. No evidence has been found by the writer that Indians were a factor in the lives of beavers.

Trapping, primarily for beavers, was begun in the San Joaquin Valley by Jedediah Smith, who entered the region in 1825, leading a trapping party which represented his own company. He was followed by many men some of whom were representatives of other companies. The most active organization was the Hudson Bay Company which annually sent large numbers of trapping parties into central California. References to this early trapping activity generally deal with the broad area covered by the San Joaquin and Sacramento Rivers. However, several writers indicate that the region of the mouths of these two rivers was highly productive of beavers, a fact which made the area well known to trappers all through the West. Intensive trapping continued until about 1845 at which time the diminished yield of pelts made trapping unprofitable.

The discovery of gold in California brought an end to trapping activities and the delta area became one of the main supply routes to the gold country. Transportation and

commercial activity became so intense that, at the peak of the gold rush, confusion was the chief characteristic of the crude and limited dock facilities of the area. Much of the congestion was caused by vessels abandoned by gold seekers. The effect of this activity upon the beaver population cannot be estimated but probably it was not as great as it would have been if the trapper had not already depleted the numbers of beavers.

Prior to the creation of profitable markets for agricultural products the delta area was considered worthless from a farming standpoint. Figure 2. Because of the influx of large numbers of people and the resulting increased demand for farm products, the minds of thoughtful men were awakened to the production potentialities of the swamplands.

The first need was that of securing the land areas against future inundation during floods and high tides. This need was met by the construction of levees. Materials for these levees was usually obtained by dredging sediment from the channel bottoms. When the levees had been constructed and the area drained of water, the land was prepared by appropriate methods depending upon the nature of the soil. If the soil was primarily inorganic, the tule was burned when it had dried, the sod turned with plows that cut the roots, which were then burned after a few weeks' exposure to the sun. If the soil was peaty and composed mainly of organic material, fire was not employed to clear



Figure 2

Unreclaimed portion of
delta area, near Holt,
California.

the land of vegetation. In place of burning, an implement known as the tule plow was used. Figure 3 shows a modern implement which is similar to the early plows. This plow was designed to cut the vegetation and at the same time turn it completely over. This operation was followed by one which employed a spiral cutting knife that cut the sod into small pieces.

At first the reclaimed land was used primarily for the growing of wheat, barley, potatoes and beans. In keeping with the increased demand the land use was gradually changed to that of producing the more valuable fresh vegetable crops.

The story of human population trends has been one of unabated increase in keeping with the gradual intensification of land development practices. However, the great increase in population has been at the perimeter of the delta area and not in the area proper.

To the serious investigator of animal life one of the most regrettable things is the lack of precise and accurate information in regard to the species and numbers encountered by the early explorers and settlers. Accounts generally refer in broad terms to the large numbers of elk, deer, antelope and grizzly bear. During the fur-trapping era, which lasted for a comparatively short time, beavers were the prime objective. This specific fur resource diminished from what was thought to be an inexhaustible



FIGURE 3

A tulle plow of the type used in reclaiming delta peat land.
(Negative by courtesy of Post Brothers Tractor Service, Santa Ana, California.)

supply to the point where it became unprofitable to spend the time it took to trap them. Other fur-bearing animals are seldom mentioned, but it is doubtful if the shrewd trapper overlooked any animal during the quest for profitable objectives of his activity. That the beaver population was diminished mainly by trapping is unquestioned, but the cause for diminution of other fur-bearing animals is a matter of conjecture. If other animals can be used as a basis for comparison, it is entirely possible that the subtle encroachment by the human population was one of the causes for the depletion of cohabitants of the beavers in the delta environment.

DESCRIPTION OF STUDY AREA

As was stated previously, this study is concerned primarily with the beavers in the delta area of San Joaquin County. A precise delineation of the study area would be difficult and probably would serve no purpose but it can be broadly outlined as follows: Beginning at the northern tip of Staten Island proceed southeast to include Beaver Slough, thence south to include the western boundary of Shinn Tract, thence south to the eastern edge of Rough and Ready Island, thence south to the junction of Salmon Slough and Middle River, westward along Salmon Slough to the Grant Line Canal, west on Grant Line Canal to the San Joaquin County line and north on the County line to the northern tip of Staten Island. See Figure 4.

The land area consists of islands and tracts, both being protected from inundation due to high tides or high river waters by means of levees. For the most part the islands occupy the lower, central portion of the region and the tracts are to be found at the perimeter where the advantage of higher elevation makes it possible to secure them against flooding by building levees on only three sides. As a rule, the levees also serve as roads, some of which are two-lane county roads carrying a relatively heavy flow of traffic; others are simply one-lane roads used privately by the land-owners for agricultural and maintenance equipment.

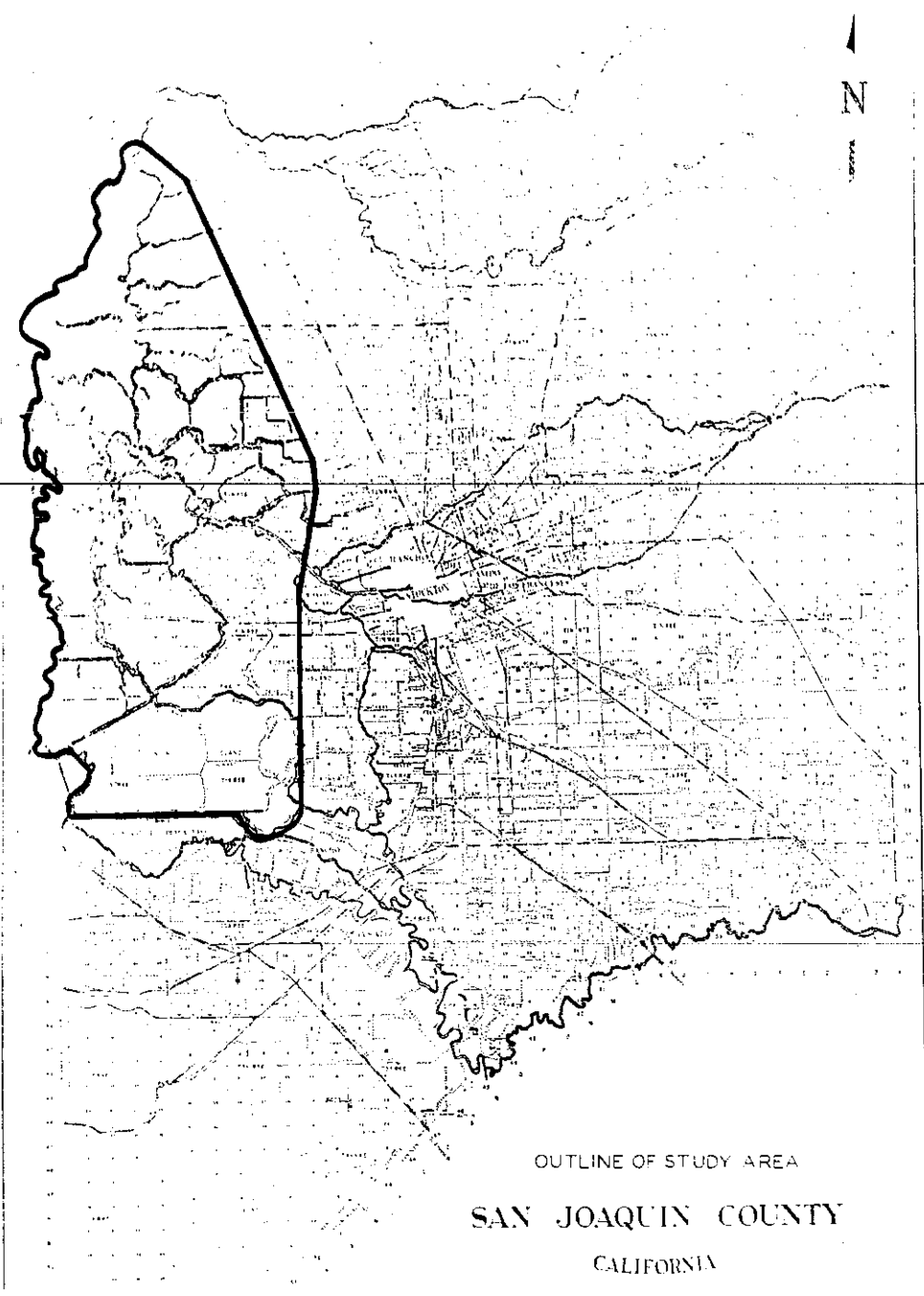


FIGURE 4

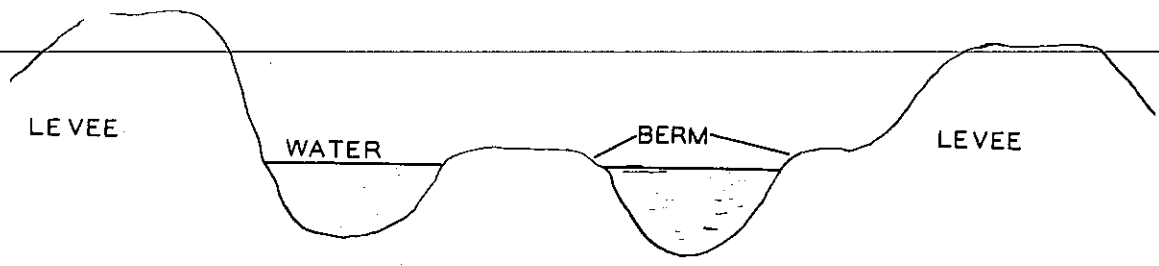
LOCATION OF STUDY AREA IN SAN JOAQUIN COUNTY

From an agricultural standpoint this land is probably as highly developed as any land that can be found. The most important crops that are grown here are asparagus, celery, potatoes, corn, grains, clover and sugar beets. For the most part the land is cropped only once each year.

The soil, especially that on the islands, is generally described as peat. It is dark, very fertile and contains enough organic material so that it will burn slowly but persistently. This soil is also light enough so that it is subject to severe erosion by wind.

Except for the multitude of fishermen who fish from the levees, the land area is little used for recreational activities.

The word "berm" is used locally to indicate (1) small, unreclaimed islands situated in the watercourses; (2) a shoulder of land near the water level at the base of some portions of the levees. See Figures 5, 6, 7. Originally the word "berm" (barne) referred to the narrow strip of land between the moat and the ramparts of a castle. Some similarity to the original meaning can be seen when it is realized that the areas locally referred to as berms are, in most cases, land that is left following dredging to obtain levee material. In the region being discussed, "berm" most frequently refers to the interfluvial portions of land. The native vegetation of importance to beavers is to be found on the water side of the levees and on the "berms."



SECTIONAL VIEW

FIGURE 5

Diagram illustrating the location of berms.

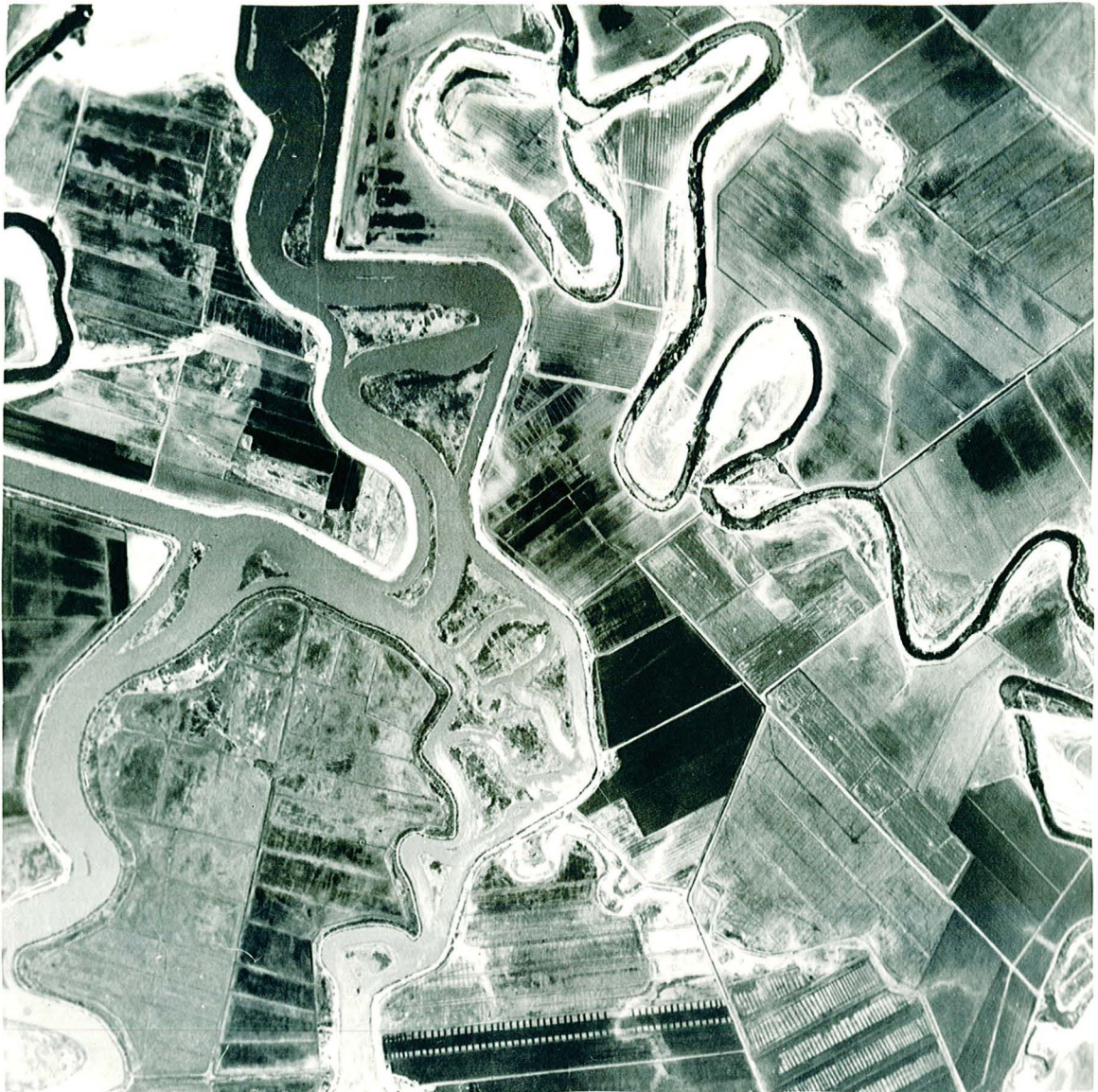


FIGURE 6

Aerial Photograph showing a portion of the study area.
(Photograph by the courtesy of R. Zuckerman, Stockton,
California.)



FIGURE 7

A delta watercourse showing interfluvial berms (in the center of the picture). Levee banks are at the lower right and upper left.

This vegetation consists primarily of willow (Salix), cattail (Typha), common tule (Scirpus), cottonwood (Populus) and dogwood (Cornus). Of the above plants willow, cattail and common tule are the most abundant, their growth apparently limited only by the natural ecological restraints. One exception to this is the case of the willows along the levee banks which are often cut by the land-owners and left lying as an additional protection for the levees against wave and wind action. Dogwood and cottonwood patches are sporadic in their distribution and are generally limited in extent.

The primary sources of water for this region are the Mokelumne River draining the area north and east of Stockton and the San Joaquin River which drains the southern portion of the Central Valley. Tide waters constitute another source of water, although this probably should be considered an indirect source. Irrigation is accomplished on the islands by siphoning water from the channels onto the fields. The salinity of this water is often of sufficient concentration to be a cause of concern with regard to its use on the fields, but it is not known what the effect on the distribution of aquatic mammals is.

The Delta region of San Joaquin County is traversed by the Stockton Deep Water Channel which is a waterway maintained at a depth of 29 feet at mean low tide which is sufficient to enable ocean-going vessels to pass from San

Francisco Bay to the port of the city of Stockton. Some indication of the effect of this commercial water use is to be found in the statement by one trapper, who lives on the shore of the channel, that few beavers are to be found along the channel. Commercial fishing is a relatively unimportant activity in San Joaquin County. Such fishing for catfish, salmon and shad is carried on more intensively in the western portion of Contra Costa County which lies to the west of San Joaquin County.

The delta area is used by large numbers of fishing and boating enthusiasts for recreational purposes. Some indication of their numbers is given by the fact that the city of Stockton has a variety of boating clubs including inboard, outboard and sailboat organizations plus a number of boat rental establishments in the surrounding country. The fishermen who do not use a boat do their fishing from the levee banks and can become so numerous that the writer on one warm spring day had to abandon looking for beaver holes and other indications of beaver activity along Honker Cut because of the constant danger of fouling fishing lines with the motorboat. It must be recognized, however, that the effect of such activity upon beavers is greatly diminished by the fact that the beaver is active mainly at night, a time when boating and fishing activity are practically at a standstill. The impact of this human activity upon wild animals would be difficult to measure at

best; the significant fact is that beavers are able to thrive in such an environment.

HABITAT REQUIREMENTS

The two most important habitat requirements of beavers are a permanent supply of suitable water and a plentiful supply of food in the form of woody and/or herbaceous plants. From the standpoint of both of these requirements, the beavers in the delta seem to be singularly blessed.

Beavers require, normally, water at least two feet in depth in the vicinity of their houses or burrows. This minimum depth must be maintained at all seasons of the year so that the entrances and exits to and from the houses or burrows will not be exposed. In most areas such a supply of water is provided by the beavers themselves by the construction of dams. This type of water impoundment necessitates a considerable amount of activity on the part of the beavers. The situation which prevails in the delta, that is, a permanent and plentiful supply of water of more than sufficient depth, enables the beavers of this area to subsist without the construction of dams. At no time during this study did the writer find any beaver dams or evidence of dam building activity within the study area. None of the long time residents with whom the writer spoke had ever witnessed such activity on the part of beavers in the area.

The problem of water salinity does not appear to be a factor in beaver distribution in the delta area of San Joaquin County. In speaking of the entire delta area, Tappe, (1942, p. 21) states that the greatest concentration

of beavers was in the central portion and the concentration was less dense at the perimeter. If the salinity of the ocean water were a major factor in the distribution of these animals, one would be led to believe that the greater concentration would be at the perimeter. The whole problem of salinity in this area is extremely complex and is constantly changing, a fact which is brought out by the studies of the Bureau of Reclamation in connection with the Central Valley Project.

It seems that at times the tidal fluctuation of the water can be a serious factor in the lives of the beavers in the delta. The land-owners who feel that beavers are doing damage to their levees take advantage of the lowest tides to seek out the entrances to the burrows (See Figure B) which are exposed at such times.

Another environmental requirement of the beaver is an adequate, accessible food supply. This food generally consists of bark of woody plants or the roots and shoots of aquatic or semi-aquatic plants.

Typically in North America beavers are situated, for a time at least, in one locality and must obtain their food from a more or less limited area. During the fall of the year, food is cut and stored in the pond for consumption during the winter when the surface of the pond is frozen. Obtaining food for such storage often entails the digging of extensive canal systems to enable the animals to move



FIGURE 8

Underwater beaver house entrance exposed by low tide. One foot rule above and to the left of the hole.

easily and safely get to the food source and return to the site of storage. The beavers of the delta region are, by the nature of their environment, spared the necessity of storing food for winter; nor do they have to dig extensive canals. See Figure 9. The shores and "berms" of the myriad of watercourses abound with choice beaver foods. The levee banks are generally steep enough so that the beavers can cut willow branches without leaving the water.

Concerning the food habits of the beaver in the delta area Tappe (1942, p. 58) states:

In the delta area, tules, supplemented by willow bark, constituted the main diet of golden beavers, and in many parts of this area beavers were abundant where willows were relatively scarce. In such places tules were always abundant, and usually only moderate numbers of the willows growing at these locations had been cut by beavers, indicating that beavers inhabiting the delta prefer tules to willows.

Direct evidence (Figures 10 and 11) of the utilization of willow (Salix) and cottonwood (Populus) by beavers was obtained during this study. In addition, remnants of tule stalks were found in and around the beaver house shown in Figure 12 on May 19, 1960.

Another habitat requirement of beavers is a suitable site for building houses or making burrows. The presence of numbers of berms and many miles of levee banks greatly simplifies the home building problems of beavers in the delta area. Evidence of house building on berms is shown in Figures 13 and 14. The structures shown are conventional in every major respect; however, it appeared that the



FIGURE 9

Portion of a canal made by beavers to provide underwater access to a stick house. One foot rule in center of the picture.



FIGURE 10

Cottonwood tree 12-inches in diameter, felled
by beavers.



FIGURE 11

Partially eaten willow branches taken from inside the house shown in Figure 14.



FIGURE 12

View of a beaver house which was in active use at the time the picture was taken. It has since been abandoned.



FIGURE 13

A large beaver house located on an interfluvial berm. It was not in use by beavers at the time the picture was taken.



FIGURE 14

A beaver house located on an interfluvial berm. This house was in use at the time the picture was taken.

animals made less than normal use of mud for filling in the spaces between the sticks. The house shown in Figure 13 is an old one not currently being occupied; the one in Figure 14 was the home of adult beavers which were trapped during the 1950-51 season and evidence indicated that it was still being used by young beavers. The partially eaten willow sticks shown in Figure 11 were taken from inside this house. Figure 15 shows a plan view of a beaver house located on an interfluvial berm.

Freedom from molestation is generally considered to be a habitat requirement of beavers although many and varied exceptions to this premise can be found. Tentative conclusions that local beavers are desirous of such freedom can be drawn from the fact that they are reported to be more plentiful in the center of the area, where there is less human activity, than at the perimeter where human activity is greater. Also, as will be subsequently shown, it would seem that they prefer to confine their levee activity to those areas where there is limited human disturbance. Trappers concur in the belief that the beavers in this area readily seek a new area when they are unduly disturbed by trapping activities. Except for parental responsibilities it would seem that little or nothing stands in the way of local beavers' moving from place to place as conditions demand.

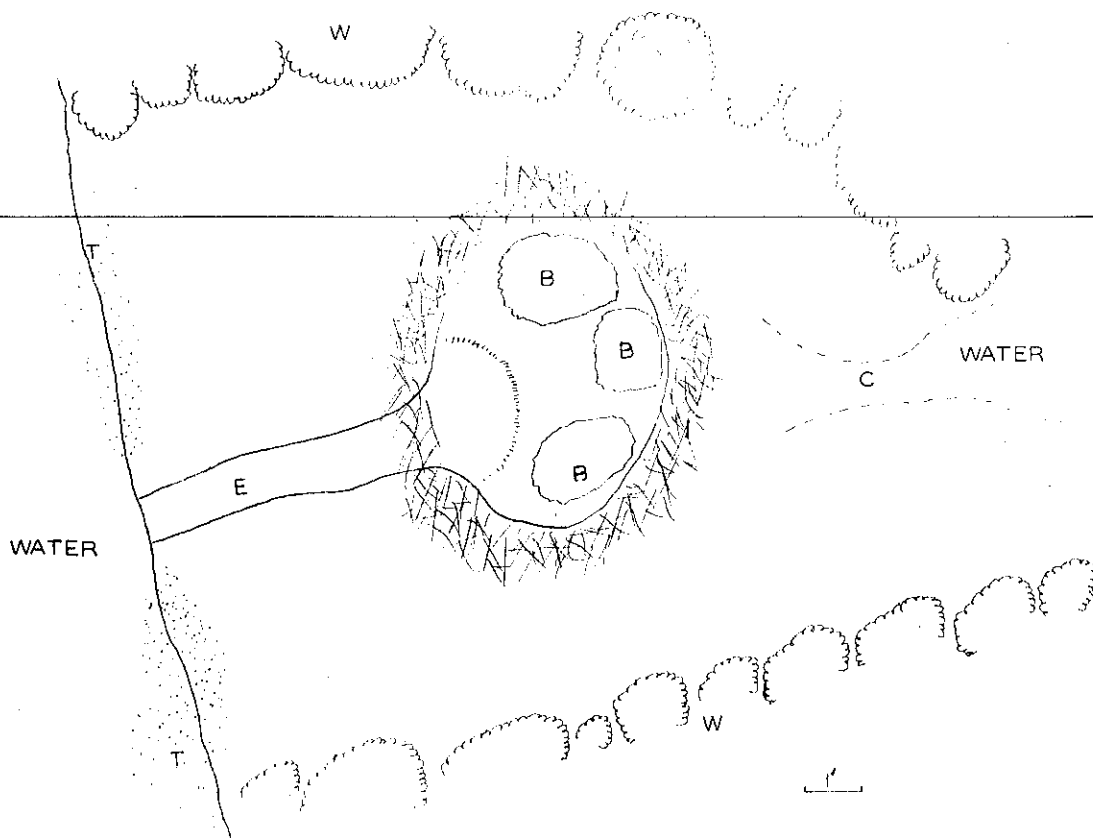


FIGURE 15

Diagram of beaver house.
B - bed; T - tule; C - canal; W - willow;
E - entrance to house.

MANAGEMENT PRACTICES

The two most readily available management devices employed by wildlife managers when dealing with the beaver are the live trapping and transplanting of the animals, and the legal regulation of the trapping seasons and the numbers to be taken. The latter will be discussed first because it is the dominant management factor in the production of beavers in the area being considered.

Portions of the following information concerning laws relating to beavers are reported by Tappe (1942).

Prior to 1911 uncontrolled trapping of beavers was carried on to such an extent that it was feared that the animal would become extinct in California. For this reason the State Legislature, in 1911, passed a law giving complete protection to the beaver. The numbers of beavers increased rapidly until 1917 when the land-owners in the delta area became fearful of the damage being done to the levees surrounding the reclaimed lands. At this time the law was amended to provide for the taking of beavers when they were endangering levees or other reclamation works. This trapping was controlled to the extent that the trapper had to obtain permission from the Division of Fish and Game to trap the animals and dispose of the pelts.

In 1925 the law was again amended to liberalize the trapping of beavers. At this time a technical discrepancy in the law permitted the trapping of beavers at any time of

the year in certain districts. This oversight, which was not corrected until 1927, led to the sharp decline in the numbers of beavers present in the affected areas. This decline continued until 1933 at which time the animal was again given protection by law. However, provision was made to enable the Fish and Game Commission to control again the trapping of beavers by the issuance of permits to trap the animals when satisfactory evidence of damage was submitted.

Under legal protection beavers once again increased in numbers to the point that land-owners, especially those in the Delta area, became concerned over the threatened levee destruction. Consequently the law, in 1939, was again changed to the extent that it required the Fish and Game Commission to set up beaver control areas in regions where it could be shown that beavers were damaging or threatening to damage levees, crop lands or reclamation structures. This law further required that the Commission set up rules and regulations defining the boundaries of such control areas and providing for the trapping of the beavers and marketing of the pelts.

The 1939 law remained in force unchanged until 1949 at which time it was amended to read as follows:

Section 1. Section 1252 of the Fish and Game Code is amended to read:

1252. Except as permitted by this code, it is unlawful to take or possess any elk or beaver, or any part thereof; provided, however, that beaver whenever and wherever found within the boundaries of the "Sacramento and San Joaquin Drainage Districts," as the

boundaries of said district are defined in Chapter 170, Statutes and Amendments to the Codes, California, 1913, may at any time by anyone be taken and possessed by any method whatsoever.

THUS, BY LEGISLATIVE ACTION THE BEAVER IN THIS AREA IS ENTIRELY WITHOUT LEGAL PROTECTION.

The general area which is affected by this law is shown in Figure 16. The same area as it pertains to San Joaquin County is shown in Figure 17.

To date, this law has had two effects both of which have been confirmed verbally by personnel of the California Fish and Game Division who are concerned with fur bearers. The first and of more importance locally is the decline in the number of pelts taken by trappers. This is reflected in the figures of a local fur buyer as shown by Table I. The figures in this table are not exact but are accurate enough to indicate the effect of the new law, e.g., a larger number of beavers were trapped during the 1949-50 season (when the law was first in effect) and consequently a larger number of pelts was sold to the buyer. This is due either to the fact that there was an increase in the number of trappers or that the same number of trappers caught more beavers because they were unhindered by the legal permit system. Table IV (p. 53) shows that during the first year of the liberalized law fewer reports were turned in to the Division of Fish and Game than during the 1948-49 season. It is believed that this discrepancy between the few number



FIGURE 16

General area which is open to beaver trapping within the state.

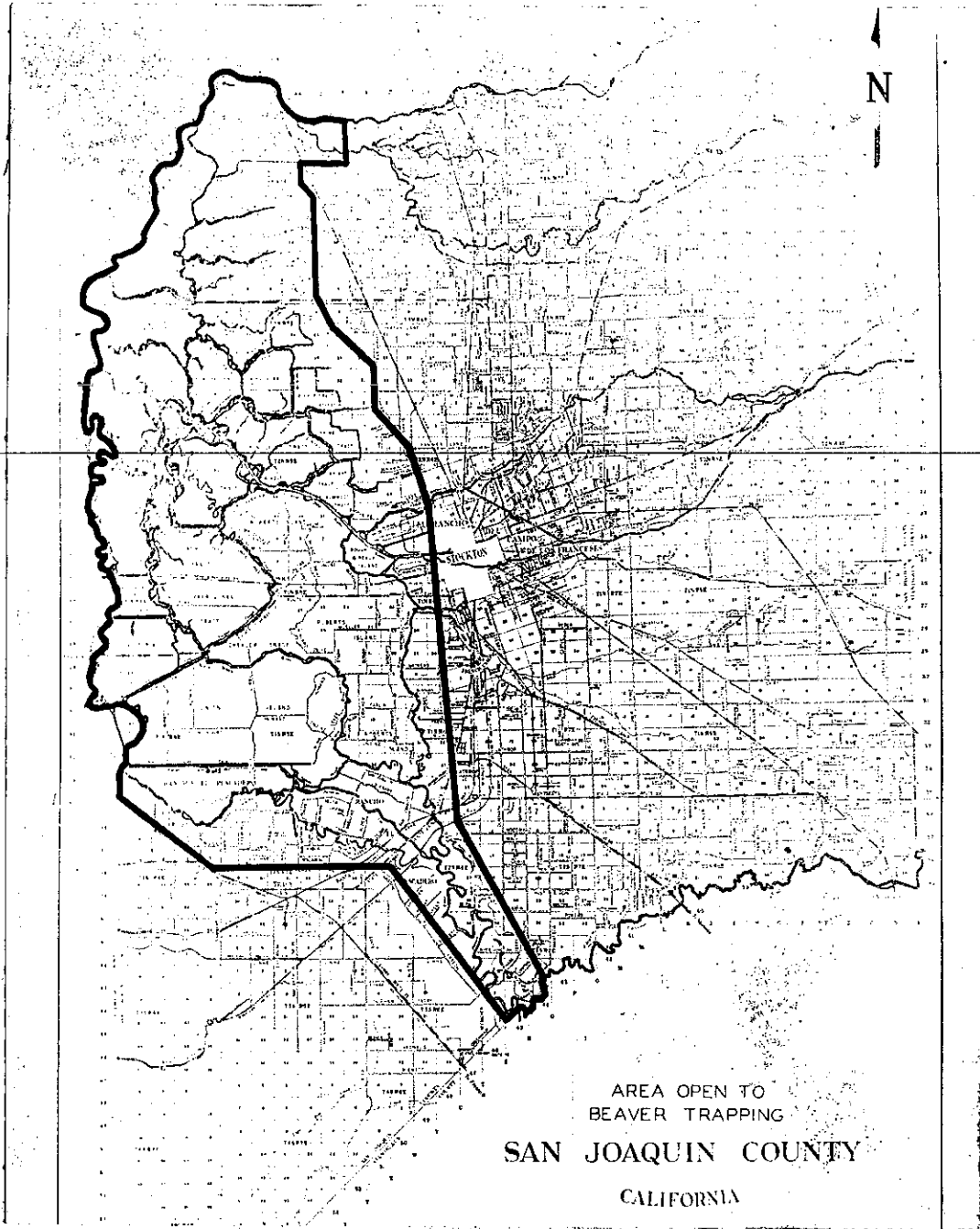


FIGURE 17

Area open to beaver trapping,
San Joaquin County, California.

of trappers reporting and the fact that more beavers were sold is due to the fact that many people trapped exclusively for beavers and did not bother to send in a report. It is believed that the effect of the increased take of the 1949-50 season is reflected in 1950-51 figures.

TABLE I

~~PELTS BOUGHT BY LOCAL FUR BUYER~~

Season	Number
1948-49	600
1949-50	1000
1950-51	310

The reduction of the numbers of beavers in the delta area is the intent of the law and from that standpoint the law appears to be successful, at least up to the present time. The second effect is more subtle and is based upon the fact that beaver pelts in this state require no tag or other identification; therefore, pelts obtained illegally outside of the Sacramento and San Joaquin Drainage District can easily be sold. If any question arises, a poacher can always state that the animals were trapped inside the open area.

Section 1515 of the Fish and Game Code states that, "Every person over the age of 18 years who takes fur-bearing mammals for profit must procure a license." Article 4,

Section 1310 of the same Code does not class the beaver as a fur-bearer. It would appear then, that these three regulations (1252, 1310, 1315) make it possible to obtain beavers within the Sacramento and San Joaquin Drainage Districts and sell them without purchasing a license.

Section 1313 of the Fish and Game Code reads as follows:

Every person to whom a license is issued under the provisions of this article must, before July 1st following the term for which the license is issued, send to the commission a sworn statement showing the number of each kind of fur-bearing mammals taken and the names and addresses of the persons to whom they were shipped or sold. A new license shall not be issued unless this section is complied with.

A copy of the form used for this report is pictured in Figure 21 (p. 51).

The exact legal status of beaver with regard to this report is not known; however, the trappers in the study area invariably trap muskrat, otter and mink in addition to beaver and they are required by law to send in a report for those animals. The writer believes, based upon conversations with trappers, that they generally include beaver in their report.

The fur buyers in California are not required to send a report to the Division of Fish and Game, although this or similar control is exercised by many states. The Division does, on occasion, request and at the discretion of the buyer, receive such information regarding the number of the different types of pelts bought and the prices paid for them.

Some indication of the problems facing the manager of a fur resource can be given by the fact that in compiling the above reports authorities consistently find that a disparity of about 50 per cent exists between the trappers' reports and similar information received from buyers. That is, the trappers report only about half of what the buyers purchase. The reason for this difference is not definitely known. Some people think that the trapper may have an ulterior motive for misrepresenting his catch and others feel that the trapper just cannot be bothered with making out an accurate report, or any report whatsoever.

The current law regarding the taking of beaver (Section 1252) was supported in the state legislature by delta area Reclamation Districts who were represented by attorney J. A. Wilson of Stockton. Mr. Wilson stated that the Reclamation Districts were desirous of obtaining the complete extermination of the beaver in the delta area. He also stated that the bill passed with little opposition because it was a "farmer's law."

The state Fish and Game Division, because of the intensive agricultural land use, is not interested in preserving the beaver in the delta area, even though it is a native of that area. Their primary interest in the beavers of that region is as a source of supply for live trapping and transplanting operations. The Fish and Game Division, as stated previously, does recognize the managerial weakness in the

present law and is at present contemplating an attempt to have the law changed to the extent that all beaver pelts will require some identification, preferably a tag, before they can be marketed. They are also contemplating an attempt to revise the existing boundaries of the Sacramento and San Joaquin Drainage District by having it enlarged.

Live trapping and transplanting of beavers is another managerial device used by wildlife managers. This technique has been employed with considerable success by several different states including California. It has been developed to such an extent that the state of Idaho has live trapped the beavers, transported them to the release site by airplane and dropped them to their new location by means of parachute. (Mack, 1951)

Basically, the live trapping and transplanting operation consists of obtaining the live animals, making up an assortment of animals suitable with regard to health, numbers, age and sex ratio, transporting them to and releasing them at a site judged to be suited to the animals' habitat requirements and its compatibility with the prevailing land use. The following remarks refer to California operations as set forth by Hensley. (1946)

In California the beavers are trapped during the warmer part of the year because of the high mortality which occurs when the animals are subjected to prolonged immobility in cold water during cold weather. After

unsuccessful experimentation with a variety of steel traps it was decided that the Bailey live trap (Figure 18) should be used. This type of trap has the advantage that it can be used in a wide variety of settings and injures the animals very little if at all. To remove the animals from the trap a hoop provided with hooks to which a burlap bag can be attached is used. The hoop is also fitted with a four-foot wooden handle. The beaver is removed from the trap by up-ending the trap and slowly opening it while the burlap net is held in position in front of the opening. The animals usually readily crawl from the trap into the darkened tunnel formed by the sack.

To hold the animals during the interval between trapping and shipping a portable, folding pen made of 20-gauge galvanized sheet iron is used. The pen is 4' x 6' x 44" in size. A piece of chicken wire slightly larger than the pen serves as a bottom and prevents the beavers from digging out. A piece of heavy tarpaulin is placed over the top, providing protection against bright light and cold. Transporting of the animals is done in a box made of 20-gauge sheet iron 24" x 44" x 24" in size.

While being held in the holding pen the beavers are provided with the foods they would eat under normal conditions plus a few cut carrots and apples which tend to prevent constipation caused by lack of normal exercise.

After removal from the trap the animals are weighed



FIGURE 18

Beaver in a Bailey live trap.
(Photograph by the courtesy of the
California Division of Fish and Game.)

and the sex determined. The sexes are marked so they can be later identified. It is considered that a well-balanced plant should consist of at least two pairs of beavers. After arrival at the transplanting site and before the animals are liberated they are tagged in the right ear with a metal disc which is serially numbered. The tags also bear the legend "Notify Cal. D. F. and G." A tabular summary is given in Table II to indicate the extent of the trapping and transplanting activity in California.

The figures for live trapping and transplanting in San Joaquin County are given in Table III. These figures include the entire County, but only a small fraction (possibly 1% or less) of the animals were live trapped outside the delta area.

With such a small number of beavers being live trapped in this area it is evident that live trapping as a management device is of relatively small importance.

TABLE II
SUMMARY, BEAVER TRAPPING AND TRANSPLANTING, CALIFORNIA

Year	Species	Male	Female	Unknown	Total	No. of Plantings
1945	All	47	44	13	104	27
1946	All	32	87	--	169	43
1947	All	83	85	--	168	41
1948	All	116	127	--	243	57
1949	All	139	164	--	303	54
Grand Total	All	467	507	13	974	222

TABLE III
BEAVER LIVE TRAPPED IN SAN JOAQUIN COUNTY

Date of Plant	Kind	Number	County Planted
Aug. 29, 1938	Golden	7	Stanislaus
Sept. 15, 1938	Golden	29	Napa
May 13, 1949	Golden	<u>5</u>	Tulare
	Total	41	

ECONOMIC ASPECT

Trappers and Trapping

Prior to the passage of the present law, trapping for beavers in the delta area was carried on by a limited number of individuals who were able to obtain permission from the land-owner to engage in trapping activities. Such permission was not simply a matter of letting the trapper use the land for the setting of traps but involved a transaction in which the land-owner or manager obtained tags from the Division of Fish and Game and gave them to the trapper. Upon the passage of the current law (Section 1252, Fish and Game Code) trapping in the Sacramento-San Joaquin Drainage District, of which the study area is a part, was opened to everyone. Just how many people take advantage of this liberalized law cannot be determined but figures presented (Table I, p. 35) indicate that there probably was an appreciable increase in numbers of trappers new to the area. The writer believes, however, that it is the trappers who operated under the permit system who are at present the most effective in reducing the numbers of beavers.

None of the regular trappers trap exclusively for beaver. Generally they work to obtain mink, muskrat and river otter in addition to beavers. This fact greatly complicates the evaluation, from a human subsistence standpoint, of the value of beavers as a fur resource.

There is (as far as beavers and muskrats in the delta area are concerned) no trapping season legally defined as such. The trapping for beavers begins before the pelts are prime. Because of the openly competitive nature of the occupation, most of the regular trappers begin operations before the pelts are prime in order to "stake a claim" to the best trapping areas and trap sites. The season ends when the unprime condition of the pelts makes them of little value.

The man hours spent by each trapper was not definitely ascertained during this study. Two trappers were known to have spent full time at trapping during the season.

Although the taking of beavers by "any method" is legal inside the delta area, it was found that methods other than the use of steel traps were of little consequence. Basically the trapping of beavers with a steel trap consists of catching the animal by a front or hind foot in such a way that the beaver drowns himself during an attempt to escape to deep water.

The general practice locally is to tour the trap line in a boat powered with an outboard motor, watching all the time for fresh beaver sign, e.g., fresh claw marks at the slides and/or freshly cut willow branches. Figure 19. When such evidence is found, the trap is set in the mud on the slide, Figure 20, and the site anointed with scent or no scent depending upon the preference of the trapper. The recipes for such scent, as well as many other refinements



FIGURE 19

Evidence of beaver activity. The light spot to the left of the center of the picture is the cut surface of a freshly cut willow.



FIGURE 20

A beaver slide. The horizontal root in the center of the picture serves as an anchor for a trap wire.

in trapping technique, are jealously retained by the trappers. Beaver castors usually form the basis for a scent and other ingredients added as deemed suitable by the individual. The trap is fastened by a chain and a ring to a length of heavy wire one end of which is firmly anchored to the bank and to the other end is fastened a heavy weight which is dropped into deep water. A few kinks are twisted into the wire and then bent so that they point toward the weighted end of the wire. When a beaver is caught in the trap he immediately attempts to escape by diving into the water. This dive proves to be the animal's downfall because in diving he causes the trap ring to be pulled down the wire, over the kinks which prevent the ring from being pulled back up the wire if the animal attempts to come to the surface for air.

Locally, the most serious problem in technique that faces trappers is the fluctuation of the tide. This circumstance alone has been enough to discourage all but the most intrepid trappers. In order to be effective, the trap must be set six or eight inches under the water surface so that when a beaver approaches the slide and begins to walk in the shallow water one of his feet will strike the pan of the trap and set it off. Fluctuation of the water level results in the trap being situated too deeply in the water or else entirely exposed to view. Basically, this situation is met by setting the trap so it will be at the proper depth during the period of greatest beaver activity. Thus it can

be seen that successful trapping in the delta area entails a keen judgment and thorough knowledge of the tidal variations.

The above discussion is more or less general for two reasons: (1) it was not a primary aim of this study to investigate specific trapping techniques and (2) the reticence of the trappers to divulge specific information. This Sphinx-like quality on the part of trappers was encountered in each individual and in every area of discussion.

The problem of beaver economics has many facets, one of which is the actual value of the pelts. In an attempt to determine the exact nature of this value locally, three sources of information were investigated: (1) the local fur buyer, (2) the individual trappers and (3) records of the Division of Fish and Game.

The local buyer did not feel that he should divulge information regarding the number of beavers each trapper caught and the price paid for them. However, he did give the figures in Table I, p. 35, which shows the number of pelts bought during the last three seasons. It is believed by the writer and personnel of the Division of Fish and Game that the local fur buyers constitute the most accurate and complete source of information regarding trapper returns. It is estimated by the Division of Fish and Game that two buyers, one in Stockton and one in Sacramento, purchase 80% of the furs taken in the delta area. The

percentage of pelts bought by the Stockton dealer is not known but it is believed that the share purchased by him is great enough to provide a sound basis for judging population trends. All of the trappers contacted in the study area sold their pelts to the Stockton buyer.

Individual trappers, while willing to indicate that they trapped more beavers during the 1949-50 season than they did during the 1950-51 season would not divulge the number they trapped or the price received for them. This information is regarded by the trappers as highly confidential probably because it would, if released, give a clue to the productivity of the area in which they were operating, a fact which would be of value to their competitors. The writer felt that any information from this source was usually intentionally vague and often appeared deliberately misleading. For this reason such information was discarded unless it concurred with other sources known to be reliable.

The final source of information consulted regarding trapper returns was the file of trapper reports, Figure 21, sent to the Division of Fish and Game. These reports, as indicated previously, are judged to be about 50% accurate. This figure applies to the total picture but the figures reported by some individuals are fairly accurate. Two such trappers were working within the study area and both appeared to be sincere in their compliance with state laws even though they conveyed misleading or vague information to the writer.

LICENSED TRAPPER'S REPORT -- 1949-1950

DIVISION OF FISH AND GAME
SAN FRANCISCO, CALIFORNIA

TO COMPLY WITH SECTION 9 OF THE FUR TRAPPING REGULATIONS, I SUBMIT THE FOLLOWING REPORT OF FUR-BEARING ANIMALS TAKEN, CAUGHT, OR KILLED BY ME!

No. CAUGHT	KIND OF ANIMALS CAUGHT	AMOUNT		ADDRESS
		RECEIVED	TO WHOM SOLD	
_____	STRIPED SKUNK	\$ _____	_____	_____
_____	CIVET	\$ _____	_____	_____
_____	COYOTES	\$ _____	_____	_____
_____	WILDCAT	\$ _____	_____	_____
_____	RACCOON	\$ _____	_____	_____
_____	BADGER	\$ _____	_____	_____
_____	GREY FOX	\$ _____	_____	_____
_____	SWIFT OR	_____	_____	_____
_____	KIT FOX	\$ _____	_____	_____
_____	CROSS, RED, &	_____	_____	_____
_____	SILVER FOX	\$ _____	_____	_____
_____	RING-TAILED CAT	\$ _____	_____	_____
_____	WEASEL	\$ _____	_____	_____
_____	MINK	\$ _____	_____	_____
_____	HARTEN	\$ _____	_____	_____
_____	RIVER OTTER	\$ _____	_____	_____
_____	OPOSSUM	\$ _____	_____	_____
_____	HOUSE CAT	\$ _____	_____	_____
_____	MUSKRAT	\$ _____	_____	_____
_____	SANDRAT	\$ _____	_____	_____
_____		\$ _____	_____	_____

COUNTY WHERE FURS WERE TRAPPED _____

GENERAL LOCALITY OF TRAPLINE _____

I HEREBY CERTIFY THAT THE ABOVE IS A TRUE AND ACCURATE STATEMENT OF THE FUR-BEARING ANIMALS TAKEN, CAUGHT, OR KILLED BY ME DURING THE SEASON OF 1949-1950. (Do NOT HAVE NOTARIZED.)

Signed _____

P.O. Address _____ CITY _____

COUNTY OF RESIDENCE _____ TRAPPING LICENSE No. _____

IMPORTANT: EVERY LICENSED TRAPPER IS REQUIRED BY LAW TO FURNISH A TRAPPING REPORT. A LICENSE CANNOT BE ISSUED TO YOU UNLESS THE REQUIRED REPORT IS FILED BEFORE JULY 1, 1950. IF YOU DID NOT TRAP, SEND IN A REPORT STATING SO.
1500/2/15/50

FIGURE 21

Copy of the Report required of Trappers.

Such respect for the law arises partially from the fact that if a report is not sent in they are not sold a license for the next season. Such a license is not necessary for beaver trapping, but it is needed to trap mink, the only animal whose pelt value has remained relatively high during the current slump in the fur market. The report also, according to law, must be "a sworn report" and for this reason it is considered in some instances to be accurate.

Table IV presents the beaver trapping returns for the seasons of 1947-48 and 1948-50. A compilation for the 1947-48 season is available because at that time a special season was held to relieve the alleged damage to reclamation systems. Although the figures are given under the heading "San Joaquin County" they refer in effect only to the delta area since that is the only portion open to trapping of beaver. The other counties, Solano, Sacramento and Contra Costa share the delta region with San Joaquin County.

Figures of the type shown in Figure IV are not yet available for the 1950-51 season because the individual reports are not due until July 1, of the current year. However, some reports had been received at the time of this writing and are shown in Table V.

A well defined picture of what the beavers mean financially on an hourly basis is almost impossible to obtain because the trappers, as stated previously, also trap for other animals. Trapper "D" in Table V is known to have

TABLE IV
 NUMBER OF BEAVERS REPORTED
 AND AVERAGE PRICE PAID PER FELT

County	No. of Trappers	No. Beavers Trapped	Avg. Price Per Felt
<u>1947-48</u>			
Contra Costa	15	80	\$ 20.28
Sacramento	50	273	18.03
San Joaquin	39	379	15.44
Solano	22	43	20.35
Yolo	18	68	20.95
<u>1949-50</u>			
Contra Costa	13	60	12.97
Sacramento	31	210	10.03
San Joaquin	17	372	8.10
Solano	12	12	6.10
Yolo	18	10	6.20

TABLE V

BEAVER REPORTED TRAPPED, SAN JOAQUIN COUNTY, 1950-51

Trapper	No. Beaver Reported	Amount Received	Average Per Felt
A	8	\$ 85.00	\$ 10.62
B	1	14.00	14.00
C	55	509.00	9.25
D	23	162.50	7.06
E	3	34.00	11.33
F	3 (2 sold)	14.00	7.00
G	48	405.50	8.45
H	6	78.00	13.00
TOTALS	125	\$1102.00	
TOTAL SOLD	124	\$1102.00	\$ 8.88

worked at trapping only half of each day, the rest of the day being spent operating a ferry. Generally the trappers have a concurrent occupation. Those who trap full time during the season, covering 40-50 miles of trap line each day (Figure 22) always have to do other work during the off season. Only one man, Trapper "C" in Table V, was known to work exclusively at trapping and that was because of an ailment which prevented him from doing anything more strenuous. He stated that returns from all furs caught did not provide a sufficient annual income and that he was forced to rely partially upon his savings.

A former trapper told the writer that in his experience trapping in the delta area was a luxury! Trapping, he stated, holds a certain fascination for some people but the pelts of this region are of such poor quality and the animals so scarce that trappers have to work at another job during the off season in order to be able to afford to go trapping. In no case was trapping for furs found to be the sole means of income for any individual. It may be generally considered that trapping for furs, and particularly beaver, serves only as a financial supplement.

Marketing of Pelts

Most of the furs taken from the study area were sold to the Stockton buyer. Of the 124 pelts shown in Table V only six were reported as sold to a firm outside the city

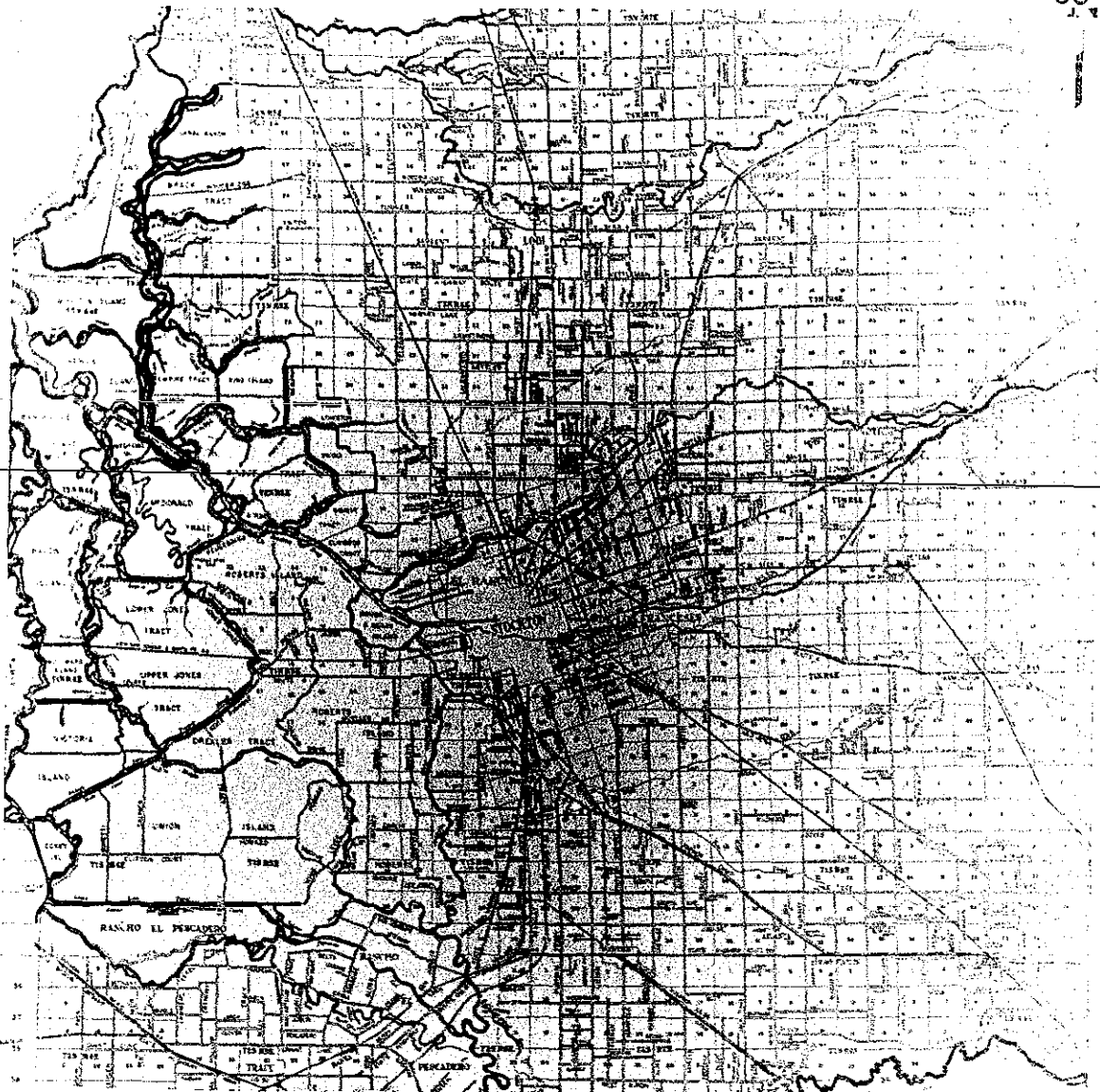


FIGURE 22

A trap line which was in use during the 1950-51 season.

of Stockton.

Based upon the standard criteria for evaluating pelts, e.g., length, thickness and color of the undercoat, length of guard hairs, and condition of hide, the value of pelts taken in the delta area runs about half that of pelts from a cold climate. Table VI shows a comparison of prices paid at Seattle, Washington and the comparable price quoted for the same period by the local buyer.

The local fur buyer sends his pelts to a fur broker in New York City where they are sold at auction. Unless the demand is strong, difficulty is encountered in disposing of the delta area furs because of their poor quality.

Damage By Beavers

Of the many types of damage that beavers are known to do, i.e., flooding land and roads, destruction of trees, and damming of irrigation gates, the damage to levees is the cause for greatest concern in the delta area. Every law (but the first) giving protection to beavers in California has had incorporated in it some provision the intent of which is to alleviate any destruction to irrigation and reclamation structures.

An explanation of the evolution of the levees will help to understand why beavers' use of such levees is said to be harmful. Originally, tracts at the perimeter of the delta area were reclaimed by building dikes to hold out the

TABLE VI

PRICE PAID FOR BEAVER FELTS-MARCH, 1951
(LOCAL QUOTATION AND NORTHWESTERN QUOTATION)

Pelt Size	Local Price Paid	Idaho - Pale	Montana Dark	Oregon- Washington
Blankets	\$ 22.00	\$30.00	\$35.00	\$ 40.00
Extra Large	17.00	25.00	30.00	35.00
Large	12.00	20.00	25.00	30.00
Medium	7.00	15.00	17.00	19.00
Small	4.00	10.00	11.00	12.00

tides. These first levees were often built by Chinese coolie laborers, using wheelbarrows. Gradually these reclaiming operations moved to the center of the delta region and the wheelbarrow gave way to the horse-drawn scraper which in turn was replaced by the clamshell dredger. Near the periphery of the area inorganic earth could be used for levees but similar operations near the center had to rely upon dredged material, a great part of which was organic. As the dredging continued, the machines finally reached the inorganic materials in the bottom of the waterways. This situation resulted in a high levee being built of relatively heavy material upon a rather shaky foundation of somewhat buoyant peat. Under these conditions it can be seen why the levees often tilted and gave way, resulting in flooding of the reclaimed land. In levees of this type which were high and rather narrow, one beaver burrow could conceivably be a serious menace.

The width of the early levees was limited by the length of the boom of the dredger. As larger dredgers with longer booms were developed, the widening of the levees became possible, resulting in a much more stable levee with a broad base. Evidently, beavers' use of such a levee would have to be very extensive in order to be noticed or to be destructive.

Wherever levees have been built, the protected land surface lies below that of the water. For instance, on

Staten Island, the level of the land is 15 to 20 feet below the top of the levee and the water surface is about 6 to 8 feet below the top of the levee. See Figure 23. Levee height, width and composition vary throughout the delta region depending upon the demands of the prevailing conditions. An occurrence on Manleville Island brought to the writer's attention an indication of the unstable nature of some of the levee foundations. While this observer was waiting beside the road several large but unloaded trucks drove by at a moderate speed. The trucks caused a gentle bouncing of the levee which gave a very noticeable sensation of floating.

The nature of the damage to levees by beaver consists primarily of a caving in of the levee on the waterside. This caving in is caused by the beaver burrows of the type shown in Figure 24. These burrows become flooded during high water and the result is a loosening of the soil around them and subsequent caving in of that portion of the levee. It has been the experience of at least one careful observer of this type of damage that the animals will often have two or three such holes in close proximity to each other. The resulting cave-in can be of great length but not of alarming breadth although it may be of sufficient width to impede the passage of vehicles on a narrow levee.

Another type of caving in resulting from a beaver burrow is the sloughing off of the levee material on the

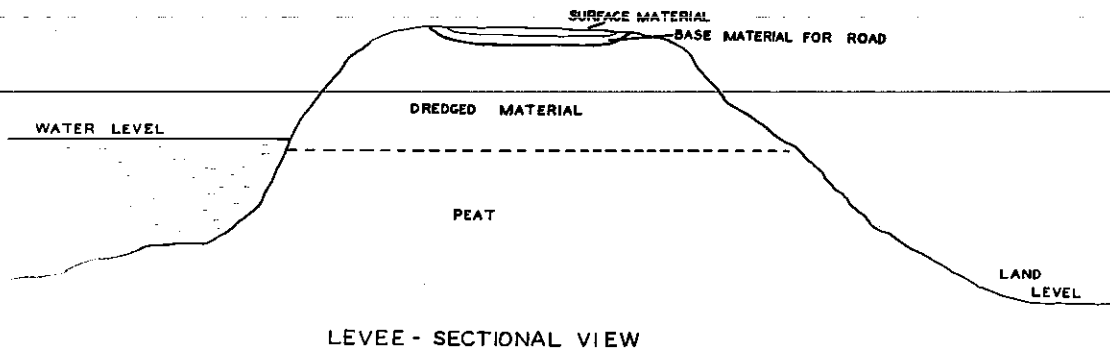


FIGURE 23

Diagrammatic sketch to show the material composing a levee which supports a surfaced road.

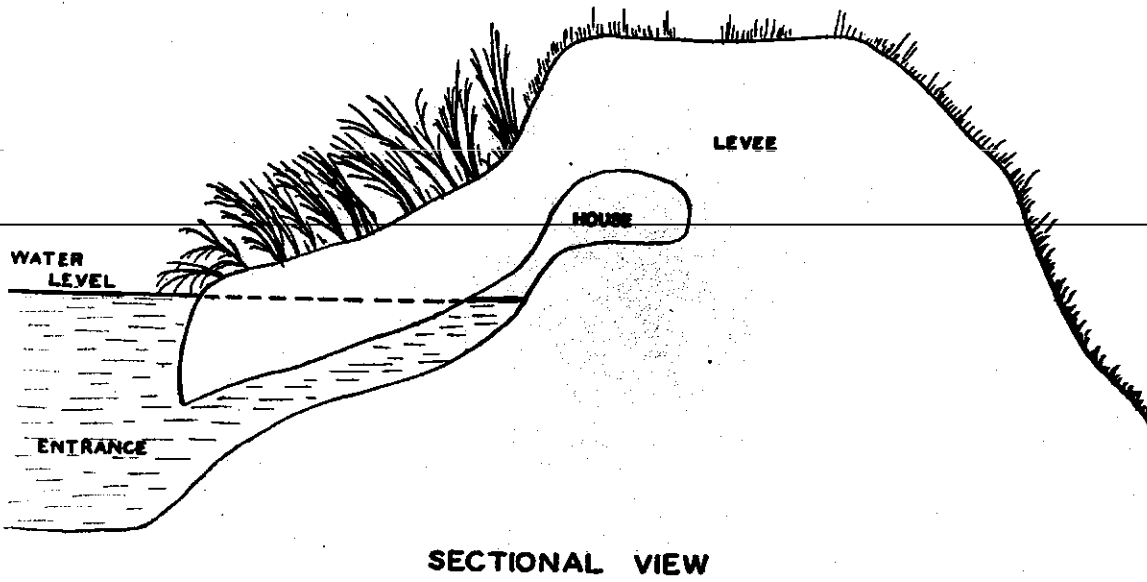


FIGURE 24

Diagrammatic representation of a beaver house or burrow in a levee.

landward side. This occurrence was not observed during the study but was reported by one of the land-owners who was interviewed. An inspection of Figure 24 will show that if a beaver burrow which is situated above the level of the floor of an island is flooded during high tides, the surrounding soil may become saturated with water and if the soil is loose, it may slough toward the center of the island. Fortunately, this occurrence appears to be relatively rare.

During this study an attempt was made, by personally interviewing responsible land-owners or land managers, to determine the exact extent of damage done to levees by the beavers in the study area. All of the land within this area is organized into economic units known as Reclamation Districts. The primary function of these districts is to maintain the levees. When it was possible, officials of these districts were contacted for the desired information. An attempt was made to ascertain the exact number of holes found and filled in within the past year on the levees of each tract or island with the following results:

Staten Island: No holes were found. The levees on this island are relatively large. No patrolling is done for the purpose of finding beaver holes but the managers rely upon the observations of the workers to detect any spots that need filling.

Reclamation District #348: Eleven holes were found

along Beaver Slough and six along a portion of the South Fork of the Mokelumne River. The personnel of the district patrol by boat twice each year for beaver holes.

Brack Tract: Twenty-four holes were found along Sycamore Slough and a portion of the South Fork of the Mokelumne River. Regular patrolling of the levees is done using two men in a boat and one or two men on the levee.

Bouldin Island: Two or three holes were filled in but none of them were large. No formal patrolling is done, but personnel make casual checks in conjunction with their other duties. Holes are filled in by trucks hauling dirt and bulldozers scraping it into the holes.

King Island: Several holes have been filled in during an indefinite recent period. Employees are relied upon to report any holes. Trappers are also consulted for any information they might have regarding holes in the levees.

Empire Tract: "A few" holes have been filled in recently. Rely upon employees and trappers to detect holes in the levees.

White Slough: No holes have been detected; in fact, the land-owner who was interviewed was hardly aware that beavers existed along White Slough.

Cohn Tract and Bishop Tract: No holes have been

filled recently. Rely upon casual observations to detect holes.

Shina Tract: Two or three holes have been filled in recently. Rely mainly upon trappers for information regarding holes.

Medford Island: A few holes have been filled in recently by using a bulldozer. The entire island is owned by a cannery and they rely upon the land manager and other employees to detect holes in the levees.

Mandeville Island: Fifteen holes at the northern tip of the island have been filled in. Rely upon a trapper and employees to detect holes in the levees.

Bacon Island: No holes detected recently. Rely upon employees to discover any holes in the levees.

Victoria Island: No holes filled in recently. They have had to fill in some "weak spots" at different times in the past. Rely upon employees to detect holes in the levees.

Mr. L. B. Raab, a civil engineer residing in Stockton, and a man of extensive experience in the maintenance and construction of levees, stated that the levees along the north banks of Sycamore Slough have suffered more extensive damage from beaver activity than any other area known to him. The pictures shown in Figures 25, 26, 27, 28 were taken at this locality. This levee is patrolled regularly by boat at low

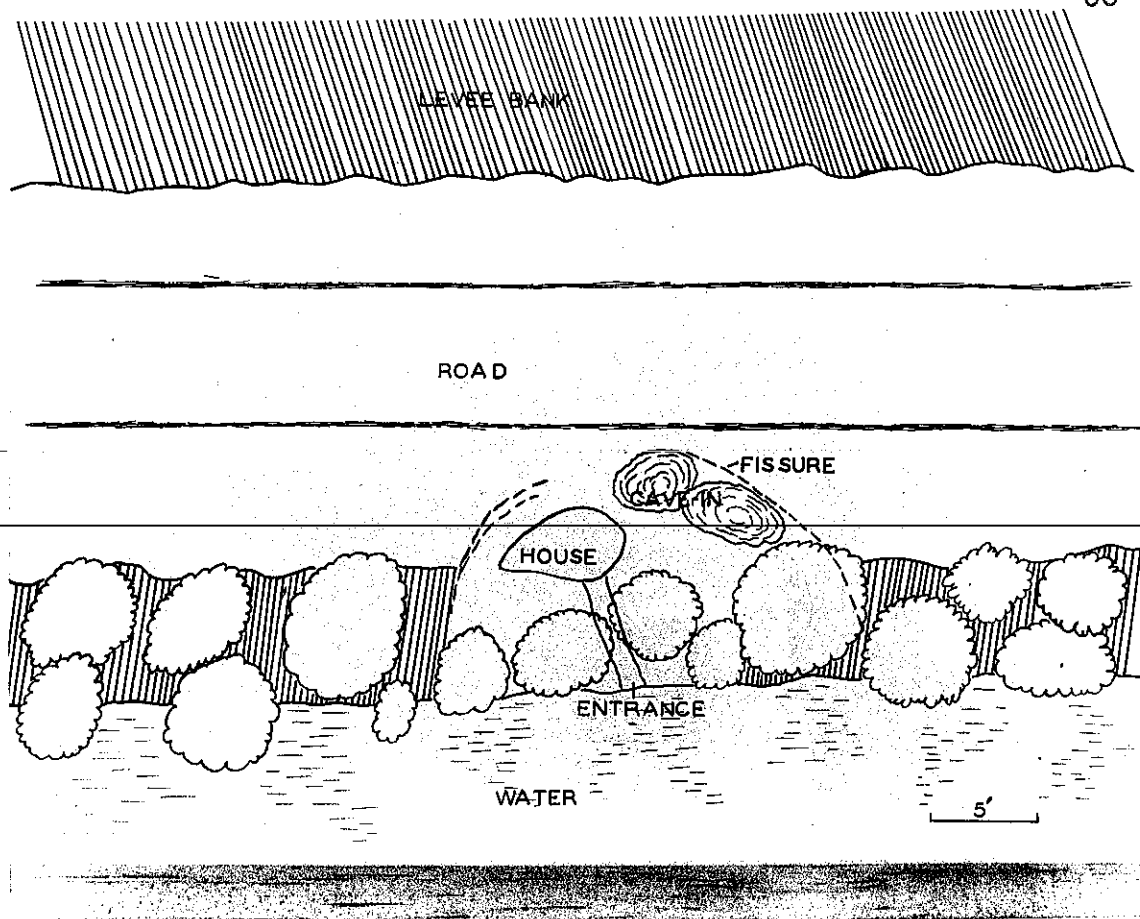


FIGURE 25

Excavated beaver house in a levee bank. The road on top of the levee passes close to the caved in area. Willows cover the water side of the levee.



FIGURE 28

Excavated beaver house in levee. The water filled tunnel entrance is just to the right of the shovel.



FIGURE 27

Top view of the caved in area shown in Fig. 25



FIGURE 28

Area of cave-in caused by the presence of beaver houses in a levee. The distance from the peeled willow to the shovel is 16 feet. The lath indicates the inside edge of the caved-in area.

tides to detect entrances to beaver dens. When a suspected hole is found it is probed with an ear or long stick and a marker placed on the levee if the hole proves to be large enough and long enough to support the contention that it is a beaver hole. The road on top of the levee is also traversed by automobile, a procedure which often reveals holes when the wheels of the vehicle break through the surface and drop into the hole. Based upon the size and the fact that a hole of suitable size led out to the channel, it was determined that the burrow shown in Figure 26 was that of a beaver. At the time it was found it was partially caved in and not in active use but careful excavation established its former extent. The dimensions of this burrow are: length, 26"; width, 24"; depth, 13"; diameter of tunnel, 15"; distance from top of the levee to the bottom of the burrow, 3'. Surrounding this burrow and paralleling the road an area 16 feet in length was caving in. The northern edge of this greater area was only 16 inches from the outside track of the road.

The exact use that beavers make of bank burrows was not ascertained. Trappers were generally of the opinion that the beavers would use them just as they would a stick lodge or house. It is conceivable, however, that such holes might be used only as places of escape during a time when the beavers are being pursued.

Most of the people who were interviewed expressed the

opinion that it was very difficult, if not impossible, to definitely determine if a hole was made by beavers. It is entirely possible that many of the caved-in areas attributed to the work of beavers were simply weak areas in the levee possibly caused by the washing away of loose material which had been deposited by the dredger.

No one, during the period of this study, could cite a recent instance of flooding which was due to the work of beavers. During the winter of 1950 a severe flood occurred in the delta area as a result of a combination of high tide and heavy stream flow. This high water resulted in the flooding of Venice Island and Paye Island. The writer questioned many people regarding the flooding of these islands and no one was of the opinion that any type of beaver activity caused the levees to give way. The inundation of these two islands was the result of water flowing over the top of the levees.

The cost of filling the caved-in areas on a levee is considered by the owners to be negligible. Filling in of many of the holes is accomplished by using a drag line. The bucket of such a machine is used to cave in the hole and then earth is scooped up from the landward side of the levee and dropped into the hole. The cost of employing a machine of this type is about seven dollars an hour; thus the cost per hole depends upon the number of holes and their proximity to each other. Another method of filling consists of hauling

dirt by truck to the site, dumping it near the hole and then levelling the dirt with a bulldozer. Quite often this type of repair work is carried on during the routine accomplishment of other work so that the cost cannot be ascertained but is obviously of little significance.

The evidence obtained during this study indicates that there may be a close correlation between beavers' use of the levees and human use of the levees, especially as vehicular rights of way. This is shown by the fact that the greatest number of beaver holes were found along levees (north side of Sycamore and Beaver Sloughs and the northern tip of Mandeville Island) the roads of which are excluded to general vehicular traffic. However, this evidence is not considered immutable, for the following reasons. The levee along the north side of Sycamore Slough is relatively narrow (only 18 feet wide at the top) with a sharp declivity on the water side. These conditions make the beaver burrows subject to frequent caving in, a condition which makes them easily noticeable. The broader levees could conceivably contain just as many burrows but conditions of greater levee width and less steep banks on the water side would serve to conceal burrows in such a levee. In reinforcing the levees a floating dredger moves along close to the levee continuously dumping buckets full of dredged material on top of the levee close to the water side. Bulldozers are then used to level the added material pushing it toward the water side of the

levee. This procedure could possibly cave in and fill beaver burrows without the operators being aware of what was happening. Thus it can be seen that at least two factors complicate the acquisition of accurate information with regard to the prevalence and distribution of beaver burrows in the levees. It can be stated, however, that today, just as in the past, beaver burrows in the high, narrow levees constitute a threat to the security of the land contained within such levees. Also under such conditions beaver burrows can also be a menace to vehicular traffic, particularly heavy agricultural equipment. It must be recognized that the presence of beaver burrows in levees is more of a potential threat than it is a pressing danger requiring immediate correction. The latter contention is supported by the fact that the individuals responsible for the maintenance of the levee on the north bank of Sycamore Slough (where levee damage is greatest) do not feel that immediate action must be taken to correct the damage.

In some instances the Reclamation Districts have extended their levee maintaining activities to include control of the beaver population which is considered to be threatening the levees. Such a procedure has been used in and around Union Island since 1938. The officials of the district have annually entered into an agreement with one or two trappers to reimburse them for the beavers they trap along the district's levees. For a time the agreement

stipulated that the trapper was to be paid a pre-determined price or bounty for each pelt and he was permitted to keep the pelt. This arrangement proved to be unsatisfactory because it did not provide sufficient remuneration for the trapper. Currently the district is paying the trapper a definite sum for each pelt regardless of size and quality, and the pelt is given to the district manager for him to sell. Under this arrangement two trappers, during the calendar year of 1949, caught 64 beavers. Other Reclamation Districts have entered into similar agreements with trappers, the primary objective being to keep the trapper active in their district by paying him enough to make trapping profitable to him.

Other types of damage caused by beavers in the delta area do not constitute a serious threat to the land but are more of the nature of a nuisance. Such damage is the occasional chewing of pilings and the damming of irrigation gates. On one occasion on Staten Island a beaver was caught in an irrigation siphon and had to be removed by means of a cutting torch.

Aesthetics

The aesthetic value of beavers depends mainly upon evidence of their presence since relatively few people see the animals themselves. Such evidence of dams, canals, houses and felled trees with dams constituting the major

source for aesthetic appreciation. In the delta area the beavers do not build dams; their houses are small and generally concealed on the berms as are any canals that they might see fit to construct. Thus, the aesthetic value of beavers in the delta area is insignificant. The writer has encountered many residents of this locality who were genuinely surprised when they learned that beavers existed nearby.

CONCLUSIONS

1. The golden beaver, Castor canadensis subauratus Taylor played a role of considerable importance in the early exploration and development of the area studied.

2. Currently the beavers in the area are completely without legal protection even though they are a native race.

3. Legislation which is now in effect is aimed at the complete extermination of the beavers in the area studied, which area is only a small portion of a larger region affected by the same legislation.

4. Based upon the report of a local fur buyer, it appears that the existing law, aimed at the extermination of the beaver in the delta area, is beginning to produce the desired effect.

5. The habitat conditions in the study area are extremely favorable for the production of beavers, a fact which is evidenced by the legal stipulations necessitated by the overproduction of the animals when they were given complete protection by law.

6. From the standpoint of the individual trappers the beaver pelts taken from this area do not constitute a sole, sustaining source of income.

7. Based upon the standard criteria of evaluation, the market value of a local beaver pelt is only about half that of a pelt taken in an area of cold climate.

8. Under certain conditions beavers can be a potential menace to land because of their propensity for digging houses or burrows in the levees which secure large areas of valuable agricultural land against inundation by high tide water or high river water.

9. During the period of this study the region experienced one of the worst floods in its history. In spite of this occurrence no instances of flooding of an island or tract was attributed to the activity of beavers.

10. Other types of damage done by beavers are of little consequence in the area studied.

11. Because evidence of beavers' presence is not readily discernible, their aesthetic value in the study area is considered to be of little significance.

12. To this writer there appears to be a serious inconsistency between the current, severe law aimed at extermination of a native animal and the amount of actual damage that that animal causes. Passage of such a law seems to indicate a laxity on the part of duly constituted conservation organizations whose primary responsibility is the control of the animals under their jurisdiction. Such jurisdiction is the historic legal foundation upon which animal conservation agencies function.

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