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THE RIVER OTTER (LUTRA CANADENSIS) IN NORTHWEST COLORADO:
HISTORICAL DISTRIBUTION, PRESENT STATUS, AND FUTURE PROSPECTS - 1984

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ABSTRACT

River otter (Lutra canadensis) investigations for the Northwest Region of the Colorado Division of Wildlife continued from June through November 1984 with the following tasks: monitor otters reintroduced into Rocky Mountain National Park, Grand County, via radio telemetry, design a public information brochure on the river otter and the recovery program analyze state trapping restrictions and make recommendations designed to protect otters, research historical distribution, complete habitat evaluations of northwest waterways for otter reintroduction.

Radio-locations for eight otters resulted in data on movements, activity patterns, habitat use, home range, and social interactions. Intensive monitoring of the four females was not able to document reproduction. Six additional females were implanted and reintroduced into the study area in November 1984. All have survived for the first three weeks during which post-release movements from the release site were less than 5 km each for four of these females and 10 and 20 km for the other two females.

An information brochure was developed to increase the public's awareness of otters and to solicit accurate sighting reports. Otter sightings in 1984 occurred throughout the study area and on Frazer and Gore Creeks.

Trapping restrictions can be minimized with increased information education but ranges occupied by instrumented females should be protected until populations become self-sustaining.

Historical references did not elucidate pre-settlement otter numbers but habitat requirements were further defined. The beaver pond complex, vastly altered since the 1800's by trapping, developments appeared to offer high quality, but limited, otter habitat.

Field and literature surveys were conducted on rivers to obtain habitat evaluation ratings. In decreasing order the Green River in Browns Park, the North Fork of the Colorado River in Rocky Mountain National Park, the Yampa River in Dinosaur National Monument and the Williams Fork River above the Colorado River received the highest ratings for otter reintroduction.

INTRODUCTION

The Colorado Division of Wildlife (CDOW) is committed to the preservation and restoration of the state's threatened and endangered wildlife. The river otter (Lutra canadensis) was listed as endangered in Colorado in 1975. River otter recovery was initiated in the mid-1970's with the reintroduction of otters for selected drainages. In 1977, a preliminary otter recovery plan was designed. The establishment of a recovery team composed of individuals from the CDOW, U. S. Fish and Wildlife Service (USFWS) Cooperative Research Unit, U. S. Park Service, and U.S. Forest Service (USFS) resulted in a final version of the plan in summer 1984.

The goal of the recovery program is "to establish two separate self-sustaining populations...in Colorado by 1990" (Goodman 1984:1). Although, "self-sustaining" has not been biologically defined, it is believed that such a population would consist of a minimum of 50 reproductively active river otters of approximately even sex ratios (Goodman 1984). A number of tasks have been identified to realize this goal. This report documents the progress made on six of these crucial tasks: (Goodman 1984:4,5).

- 1.1 Identify two river systems suitable for reintroduction
- 2.1 Transplant river otter
- 2.3 Measure population size and distribution
- 3.2 Evaluate habitat use by otter
- 4.0 Protect otter from illegal capture
- 5.0 Inform and educate the public

The Northwest Region has been actively involved with river Otter reintroduction since 1978. In that year, in cooperation with the U. S. Park Service, otters were released into the North Fork of the Colorado River in Rocky Mountain

National Park. In order to understand the success of these reintroduction efforts, a radio-telemetry program was instigated with seven otters released in 1980. This research was expanded the following year into a graduate study through Colorado State University by Mr. Curt Mack. The specific objectives of Mack's study were to:

- 1) Describe habitats available to otters in the study area.
- 2) Monitor otter response to reintroduction.
- 3) Determine available prey base within the study area.
- 4) Develop energetics model for adult river otter based on the literature.
- 5) From the above, develop an index of release site suitability
(Mack in progress).

Radio telemetry and Mack's research have been significant and essential factors in evaluating the reestablishment of river otter populations. From his research data on survivalship movements, social interacting habitat use and energy requirements has been obtained.

Through fall 1983, a total of 39 animals were released into the study area, subsequently a minimum of seven mortalities were recorded. Due to logistical problems and a predominance of sub-adults, only 23 otters were implanted with radio-transmitters (maximum life of 24 months). Intensive monitoring of these animals has shown that there is habitat in the release area of the quality needed to support otters (Mack in progress).

The success of reintroduction remains in question because of the large number of otters needed to establish a self-sustaining population. The quantity of habitat may not be sufficient for such a population. Otters, in the study area (Mack in progress), and in similar habitat in Idaho (Melquist and Hornacker 1983) occupy extensive ranges and can disperse considerable

distances. It is unknown if habitat will concentrate otters for reproduction to occur at a rate greater than dispersal and mortality. The primary factors are habitat and range selection of females and their subsequent parturition. In 1982, only one yearling female was instrumented. Three females were equipped with radios in 1983. When Mack's study terminated in May 1984, the monitoring of females remained critical. This study continued to monitor instrumented females.

Preservation of threatened and endangered species by reintroduction into historic habitat is a relatively new and unsystematic process. Bump (1951) pointed out that past introduction efforts have failed to establish viable populations due to a lack of consideration of five major variables:

- 1) Life characteristics and behavior of the species
- 2) Climatic and habitat requirements
- 3) Sufficient initial stocking with healthy individuals
- 4) Follow-up methodology to determine success or reasons for failure
- 5) Control measures if the introduced species proves undesirable.

Bump was primarily referring to exotic introductions but the variables he suggests for consideration apply significantly to river otter recovery.

In response to number one, an extensive data base for a broad understanding of otter biology was synthesized by Dronkert (1982). Following this, specific habitat requirements of river otters were determined.

A habitat evaluation form was designed for use in Colorado to prioritize otter release sites. During the 1983 field season, this form was tested on a select sample of waterways. Evaluations included, but were not limited to, rivers that had evidence of wild river otters and rivers where otters had been introduced. In conjunction with the radio-telemetry research in Rocky Mountain National Park, high quality habitat ratings were established.

This provided the basis for the region wide habitat evaluation completed in this study.

HISTORICAL DISTRIBUTION

Early explorers and settlers in the west documented the abundance and occurrence of wildlife that was highly visible, gregarious, and of value to humans such as buffalo (Bison bison), elk (cervus canadensis) and waterfowl. For most animals, information on historic numbers and distribution is very limited. Such is the case with the river otter (Lutra canadensis) in Colorado.

A number of sources were investigated to determine pre-exploitation populations of otters. These included the libraries of the city of Denver, Colorado Historical Society, CU Boulder, C.S.U., and Dinosaur National Monument Records and journals of trappers, scientists, ranchers, and surveyors provided fascinating reading but had little specific reference to secretive animals such as the otter. Even the beaver (Castor canadensis) whose rich pelt was the impetus for the exploration of North America is infrequently mentioned.

It appears that by the late 1800s when the history of the west was being written both beaver and otter populations had been decimated by the fur trade. A number of references described a crash in furbearer populations prior to 1850 (Armstrong 1972) while most settling and scientific investigations occurred thereafter. Goldman (1935:175) states that mustelids have been "somewhat neglected by taxonomists due probably for few complete specimens...skins of all these animals have a very high commercial value as furs and too intensive trapping resulted in their extermination, or reduction to small numbers before museum collectors entered the field" Mattes (1946) noted that in the Jackson Hole area the fur trappers were largely illiterate and did not keep journals. Furthermore, by 1838, 31 years after the first trappers arrived, intense competition had

depleted the rivers of their furbearing inhabitants. This ruthless trapping resulted in the beaver being considered extinct in the Wyoming region from 1860 until the early 1900s. (Grosse and Putnam 1965).

In Colorado, the same abuse of the resource occurred with the resulting in the loss of the beaver from most of its former habitat by 1850 (Rutherford 1964). Although most states have protected beaver populations since the early 1900's, Rutherford (1964) points out that our continued abuse of their habitat does not allow for populations to return to their pre-exploitation size. It is estimated that as many as 400,000,000 beaver may have inhabited North America at one time. Denney (1952) feels this figure is too high and suggests 60,000,000 as more realistic. Even so, beaver populations were decreased radically. In 1948, the number of beaver in North America was estimated at just over one million with populations steadily increasing. (Denney 1952).

Otters have a much greater range with lower densities than the relatively sedentary beaver. (Melquist and Hornocker 1982, Tabor and Towell 1983)² It is interesting to note that between 1700 and 1775, when the majority of fur trapping occurred in the eastern United States, an average of one otter skin for every nine beaver pelts was imported into England (Lawson 1943).³ The greatest numbers in the years documented were 160,466 beaver skins in 1765 and 27,312 otter skins in 1775 (Lawson 1943). By the early 1800's the majority of furs were coming from the western United States. Incredibly, in 1830,

²Laut, writing on the American fur trade, notes "Of all wild creatures none is so crafty in concealing its lairs as the otter." (1921:305)

³Recently, E. Hill wrote that in the 1970's in the U. S. and Canada "beaver trappers usually caught one river otter for every 8 to 10 beaver in addition to other furbearers (1983:267).

713,115 North American river otter skins were imported into England. This number decreased to 494,067 in 1831 and 222,493 in 1832. This intense trapping may have caused the complete destruction of most populations as by 1833 only 23,889 otter pelts were imported. (Bell 1837:136 in Coues 1877). By 1983 otter populations had increased to the point that approximately 50,000 were harvest in the U. S. and Canada. (Deem and Pursley 1983)

In "the fur trade of the American Far West" Wishart (1979) gives further evidence on the effects of the fur trade upon river otter populations. After noting that otters were found throughout the Rocky Mountains and northern great plains but in low densities, he documents how the otter's high fur value and mobility in winter allowed for a winter fur season in the Rocky Mountains. By taking otter in their standard beaver traps, the trappers continued fur production through the usually slack period of winter (Wishart 1979). This practice may have had major effects on otter populations in the higher altitude drainages.

To summarize the status of historic otter populations, Coues perhaps says it best: "The otter is generally distributed over North America, apparently nowhere in great abundance, yet absolutely wanting in few, if any, localities adapted to its habits." (1877:310) On the otter in Colorado he says:

My recent exploration of portions of Colorado did not reveal the presence of the otter, but I do not on this account deny its existence, perhaps in abundance, in the numerous mountain lakes and streams of that state which harbors countless beavers and seem in every way suited to the requirements of the otter" (1877:312).

Other early accounts give some further evidence for the wide and varied distribution of otters in the western U. S. The Lewis and Clark expedition noted that otters were "very plenty" in the vicinity of the Gates of the Rocky Mountains (Burroughs 1961:75) and "tolerably plenty" along the seacoast

of Oregon and on "the small creeks and rivers as high as Grand rapids but are by no means as much so as on the upper part of the Missouri" (Burroughs 1961:76).

In Wyoming, otters appear to have been most abundant in the western mountains (Long 1965) and it is here that remnant populations still exist. (Dale Strickland pers. comm.) Audubon observed "traces" of otters in Yellowstone National Park (Coves 1877). Otters were said to be more common in the larger lakes and streams at elevations between 5500 and 8000 feet, especially in the Yellowstone and Snake River systems but "not the others due to insufficient fish for food" (Skinner 1927:198). Other authors offer evidence that makes one question how prey and altitudes limit the distribution of the wide ranging otter. Otters were said to be in "great abundance" in the high mountain lakes of the Cascade Mountains where they had not experienced much trapping pressure, although their fur was much more in demand than that of beaver. "There they subsist on the western brook-trouts and a *Coregorius* with a crayfish". (Newberry 1857:43) Newberry also notes the otter was common in the Klamath lakes where sucker (*Catostomus occidentalis*) was their predominant prey. In 1938, three otters were observed eating rainbow trout at 9500 feet in Yosemite National Park (Whitney 1939). Cartwright (1875) insisted the otter preferred prey was trout and their range was in clear rapid waterways with occasional travels over headwaters of streams up to three miles apart.

Most research has found salmonids to be less common than other fish in the otter's diet (Tabor and Towell 1983). Reference is made to the opportunistic foraging strategy of the otter which seems to select for the most abundant and easily captured prey. (Ryder 1955) This may be a function of study location. Prey base analysis is meager on otters found primarily in headwater areas where

trout predominate. Small mountain stream/beaver pond complexes may offer compensatory factors to offset the lack of prey i.e. otters may be able to hunt more effectively in the confines of a very small waterway. Winter conditions have also been thought to limit otter populations. (Warren 1942). Historic references minimize these concerns. Gibson (page 318 in Coues 1877) says, "In winter, when the ponds and rivers are frozen over the otters make holes through the ice at which they come up to devour their prey."

Two distinct subspecies of otter were thought to inhabit Utah. Lutia canadensis sonora, found primarily in the streams and rivers of the southwest, extended through most of Utah. It may have interrelated with Lic nexa, the subspecies of the mountain regions from northern Idaho to Colorado, in the Uintah range. (Durrant 1952, Barnes 1927).

Barnes suggests that the number of streams in Utah with the name otter was due to substantial native populations. Although no recent sightings existed in 1927, Barnes stated that "the otter spends its life near clear, cold, trout favored streams" (pg 46) and he made reference to Indians who wore ceremonial skins of otters captured on the headwaters of the Uintah and Duchesne Rivers.

The only specimens noted by Barnes were two otters trapped by Nat Galloway "about six miles above Jensen, Utah near the mouth of Split Mountain Canyon" (1927:46). A photo in the river guide to Dinosaur National Monument (Evans and Belknap 1973) shows Galloway holding two dead otters. This picture taken on a river trip in 1906 or 1909, is considered to be the last documented occurrence of river otters in Colorado, on the Yampa River. It was not determined if this picture was, in fact, taken in Colorado or on the Green River in Utah. In either case, it shows that otters also occurred on large lowland waterways in the west.

In 1909, Julius Store accompanied Galloway on a river trip from Flaming Gorge to Needles, California. He makes no mention of any otters sighted or trapped, until within the Grand Canyon where:

At nearly every camp and at our noon stop today we have seen otter sign, usually quite fresh, but we catch no glimpse of even one. Here, (rapid #138 from Lee's Ferry) as we land, are seen the tracks of two from the water to the rocks that must have been made but a few moments ago, because the sand is still wet with the drippings from their fur.

Through the trip Galloway caught beaver although not in large numbers - perhaps one or two every few days.

Most observers correlated otter habitat with the presence of beaver. In "The romance of the Colorado River" Dellanbaugh laments that in the Green River valley "...once the streams everywhere had thousands of happy beaver...otter, too, were there" (1903:74).

References to otter use of canyonland rivers continues into the mid 1900's E. L. Kolb in the Grand Canyon near Peach Springs in 1937 said

There were occasional otters desporting themselves near our boats, in one instance unafraid, in another raising a gray bearded head near our boat with a startled look in his eyes. Then he turned and began to swim on the surface until our laughter caused him to dive.

The nonmountainous states to the east of Colorado also contained otters at one time. In Kansas, a tributary of the Arkansas River was given the name Otter Creek "on account of the great number of those animals found upon it." (Sage in Hafon and Hafen 1956:296). This creek is described as beginning 150 miles north of the eastern end of the divide of the Smokey Hill branch of the Kansas River, and it is noted for its large quantities and sizes of catfish. Otters were found to be relatively common throughout Iowa (Coues 1877) and had a wide distribution in Nebraska before they were eliminated (Jones 1962 in Long 1965).

While the historic distribution of otters was extensive, abundance and densities are more difficult to determine. Colorado's presettlement populations will probably never be ascertained. Opinions vary from Cockerall (1927) who listed carnivores, including otter, as numerous in Colorado to Cary (1911:182) who stated: "Otters seem to have been always rare in the state, although the reason is not apparent."⁴

Armstrong (1972) lists most of the drainages where otters were sighted. These included the lowland sections of the Yampa in Yampa Canyon, White River, Colorado River at Grand Junction, Gunnison River near Delta, the Dolores River, the South Platte east of Greeley and the Little Snake River.

Other records documented otters in the headwater streams of these major rivers including the North Fork of the Colorado in Grand County (Cary 1911), the Upper Arkansas in Lake County (Armstrong 1972), Clear Creek in Boulder County (Coves 1877) and the Gunnison River in Gunnison County (Warren 1908).

Although only four specimens exist, Armstrong (1972) suggests that five different subspecies may have occurred in Colorado. Hall and Kelson (1983) condensed these to three subspecies; L. c. pacifica of central and northern Colorado, L. c. lataxina of eastern Colorado and L. c. sonora found in the canyon rivers of the western portion of the state. Cary (1911) supports the belief that L. c. sonora, a relatively distinct subspecies, occurred in western Colorado.

In the west, where there is a lack of abundant slow moving waters, otter distribution appears to be most closely correlated with beaver habitat. In

⁴Only very limited figures on otter numbers were found. In 1827, the central rockies for trappers rendezvous at Bear Lake in Utah resulted in 102 otter skins being sold. The next year at the same location 49 otter skins were traded. Each year over 7,000 lbs. of beaver skins were sold. (Hafen 1965)

Colorado, Rutherford (1964) found two distinct beaver habitat types; the plains cottonwood river bottom and the aspen/willow associated with headwater valleys. Rutherford notes that the former is so altered that most of it no longer supports beaver. Much of the quality beaver habitat is now confined for the higher elevation streams. Their presence of beaver continues to be of great importance to the health and numbers of wildlife found in and along these high valley waters. (Rutherford 1955)

Denney (1952) summarized the beneficial effects that beaver exert on an area. By creating dams and slower, deeper waters the growth of riparian vegetation is increased which in turn is utilized by the beaver and other wildlife species. The deeper waters are not as subject to freezing and the slow movement helps keep the temperatures warmer which aids trout growth and the abundance of their prey species. It was noted that some of these benefits may increase to the degree that they become harmful to trout production but overall most studies agree that beaver ponds actually increase the productivity of the trout habitat. (Rasmussen and West 1942).

Otters may have once had an important influence on the condition of trout in beaver ponds. In Wyoming, a study in the 1950's found brook trout reproduction in ponds was so prolific that a reduction in size occurred. (Grasse and Putnam 1955). It is possible that otter populations may have weeded out the super-numerous fish which resulted in lower densities of larger trout. The decline of otters in some high altitude beaver pond complexes may also have been correlated to the decline of native trout populations. Beaver ponds can effect reproduction of fall spawners (such as brook trout Salvelinus fontinalis) but spring spawners such as cutthroat (Salmo clarki) and rainbow trout salmo gardneri) usually can pass over dams during the high water runoff. (Rasmussen

and West 1942). Although native trout never occurred in some headwaters (W. Wiltzius pers. comm.), their populations were destroyed in others due to such effects as mining. (S. Bissell pers. comm.)

Colorado's beaver populations were protected through the first half of the 1900's but government trappers could still harvest considerable numbers. During one month in 1920, 132 beaver were taken from Cochetopa Creek (Holton 1926). This probably put continued pressure on any remnant otter populations.

The major impact of limitless fur trapping and the cumulative effects of beaver management, mining destruction of native fisheries, and settlements and developments along the waterways of Colorado appears to have so depressed otter populations (especially in headwater areas) that they have been unable to recover. As a low density, slow reproducing species, particularly in the West, otter recovery is a very slow process. It was only after 50 years of protection that beaver populations managed to return to harvestable numbers. Otter populations in states adjoining Colorado also remain very depressed.

There is some evidence that an occasional otter dispersed into Colorado or even that small numbers existed in remote areas through the last 70 years. One observation of such an occurrence was on the Green River in Ladore Canyon in 1942 (see accompanying letter). Don Gore, a Division of Wildlife employee, also saw an otter in North Park around this time. This is not unusual, even when populations are healthy, otters are very infrequently observed.

Although, little specific data exists on otter numbers or exact distributions the information supports the inference that otters occurred throughout the west primarily in the slow moving, concentrated waters of the high valleys and lower plateaus. Where the effects of man are not too great, reintroduced otters should be able to once again survive and prosper.

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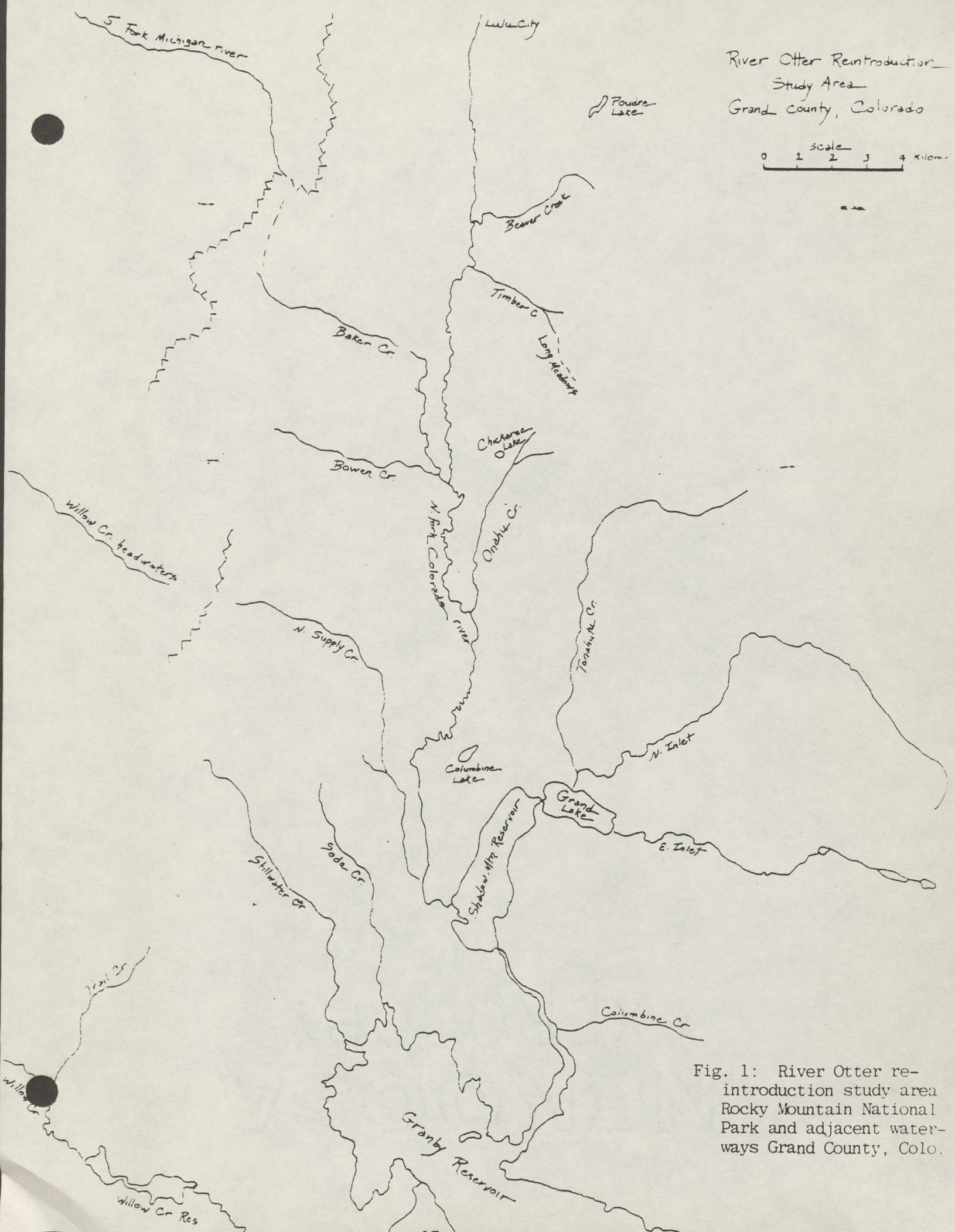
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STUDY AREA

The study area in Grand County, occurs in the Kawuneeche Valley of 2700 to over 3,000 meters in elevation. It encompasses a second order stream; the North Fork of the Colorado River, a series of reservoirs; Long Draw, Shadow Mountain and Granby, and the largest natural lake in Colorado; Grand Lake (Fig. 1). Mountains up to 4,000 meters in elevation run in a north-south direction on either side of the valley. A number of small tributaries drain steep western hillsides while slightly rolling topography allows for small pockets of beaver ponds along streams on the east. Most of the 32 km of the North Fork of the Colorado River meanders through Rocky Mountain National Park and is associated with extensive beaver habitat. Although, ranching and mining occurred in the valley in the past, NPS jurisdiction since the early 1900's, protects most of the riverine area.¹ Long Draw Reservoir, at the headwaters of the Colorado, Grand Lake, and Shadow Mountain and Granby Reservoirs at the southern end of the study area all sustain moderate to high amounts of recreational activity. Developments occur around Grand Lake and along the west sides of Shadow Mountain and Granby Reservoirs.

Typical of Colorado's mountainous regions, the study area experiences a wide range of climatic conditions. Snow settles into the valley from November through April. Minimum temperatures to -26 freeze most of the waterways (Mack in progress). Maximum spring runoff occurs in June and temperatures in the mid to low teens occur through the summer (N.P.S. weather records). Outlying vegetation is that of the montane to subalpine zones and includes lodgepole pine (pinus contorta), aspen (Populus tremuloides), Englemann Spruce (Picea engelmanni) and Subalpine fir (Abies lasiocarpa) Willows (salix spp.) and grasses are

¹Visitor use can be heavy but is confined largely to vehicle traffic along the main road through the valley or to hiking trails to the west and east.



River Otter Reintroduction
Study Area
Grand County, Colorado

Scale
0 1 2 3 4 Kilom.

Fig. 1: River Otter re-introduction study area Rocky Mountain National Park and adjacent waterways Grand County, Colo.

extensive along the riparian zone within the valley but the reservoirs shorelines are largely devoid of understory vegetation. Alder (Alnus tenuifolii) and river birch (Betula glandulosa) occur occasionally.

The fishes of the North Fork of the Colorado River include brook trout (Salvelinus fontinalis), suckers (Catostomus commersoni), sculpin (Cottus bairdi) and brown trout (Salmo trutta). Brook trout is the only species found at the higher elevations. The reservoirs contain kokanee salmon (Oncorhynchus nerka) lake trout (Salvelinus namaycush) rainbow trout (Salmo gairdneri) and suckers.

Furbearing mammals found within the riparian zone include the beaver (Castor canadensis), muskrat (Ondatra zibethicus) mink (Mustela vison).

One amphibian species of note is the state threatened wood frog (Rana sylvatica) which occurs in limited and select pond sites within the study area. (C. Haynes per. comm.)

HABITAT EVALUATION

Twenty-nine waterways in the Northwest Region of Colorado were included in this survey from first order streams along the Continental Divide for Canyon River on the western plateau of Colorado. Specific description of each waterway are included on the Habitat Evaluation forms located at the Grand Junction regional office.

METHODS

Radio-Tracking

Otters obtained from Minnesota and Wisconsin were surgically implanted intraabdominally with Telonics IMP/400/L transmitters. Transmitters measure 9.5 c.m. by 3.5 c.m. and weigh approximately 85 grams. Most transmitters have a life of 18 to 24 months. Three of six transmitters implanted in fall 1984 had a slower pulse rate with an increased life to 36 months. Procedures for acquisition, holding, transporting, surgery and release of reintroduced otters is summarized by Mack (in progress).

Four river otters (1F ; 3M) were instrumented prior to release in 1982. In 1983, nine of the sixteen otters released had radio-transmitters (4F ; 5M). Six more females were implanted in fall of 1984.

During the summer of 1984, the monitoring schedule devised by the initial investigator, C. Mack, was adhered to. This was designed for equal sampling of all animals over the 24 hour period. Four six hour monitor periods were established (0800-1400, 1400-2000, 2000-0200, 0200-0800). Otters were monitored during the same six hour period for three consecutive days. In twelve days, monitoring was completed for the entire 24 hour day. Monitoring was directed primarily towards the documentation of reproduction with elucidation of activity patterns, habitat use, home range and den sites, and social behaviors.

Signals were received with Telonics TS-1 Scanner - Programmer and TR-2 Receiver, an omnidirectional whip antenna and a hand held "H" antenna.

General locations were obtained from vehicle or aircraft searches. Activity was determined based on the constancy of the signal for a minimum of five minutes. Whenever possible, the animal was located from the ground to a den site or habitat category. Habitat was classified as valley beaver pond, valley stream, valley river, valley lake mountain stream, mountain lake or mountain beaver pond (Mack and Lytle 1982).

Monitor periods were terminated if the investigators presence appeared to have disturbed the animal. All sign was noted and scat samples were collected. If a visual observation was obtained it was characterized as foraging, feeding, autogrooming, allogrooming, resting, play, travel, social, undetermined or other. (Mack and Lytle 1982). Locations were plotted on U.S.G.S. 7.S. 1:24000 topographic maps. All field data was entered into Mack's standardized computer form.

This form was modified in fall 1984 to accompany a change in the monitoring program. At this time, the program was revised to concentrate first on post release movements and habitat selection, and foremost on female reproduction. Monitoring to determine otter locations occurred from one to five times a week during the last eight weeks of this study.

Otter movements were measured by straightline kilometer along the waterway resulting in minimum distance estimates. Home range was determined by the two furthest points visited by an otter twice in a month. Activity patterns were based on one location per animal per monitor. Hence, a five minute or a two hour monitor resulted in one location recorded as active or inactive based on which occurred > 50 percent. (Mack pers. comm.)

Associations of otters were recorded when two or more animals were seen traveling together or found inactive in the same den site.

Reproduction was investigated by concentrated monitoring of females. Localized movements, home range reduction, and continuous use of the same den site from March through June would suggest parturition. Confirmation of this would result from sign or visual observations.

HABITAT EVALUATION

The methods used in gathering data for the river otter habitat evaluation are described in the accompanying report on the design and use of a standardized Habitat Evaluation form. Field surveys were conducted in September and October by motor vehicle, fixed wing aircraft and on foot. Generally, a similar amount of field effort was directed toward each waterway but lack of physical access to certain areas may have resulted in some inequality in visual evaluations. The supplemental data, specifically CDOW stream survey reports, was not always complete for all waterways but other sources were consulted when there was insufficient information for a specific section.

Habitat parameters for each river were entered into the standard Habitat Evaluation form, rated and tabulated. (Appendix 1). Stream profiles were drawn to obtain relative concentrations of waterways in an area.

RESULTS

Radio-telemetry Monitoring Program

7
Three male and four female river otters reintroduced into Rocky Mountain National Park, Grand County were monitored by radio-telemetry from 5 June to 30 November, 1984. Intensive monitoring to document reproduction, home range, habitat use, activity patterns, and social interactions concluded on 31 August. Thereafter, locational data was obtained on six animals with operational transmitters. An additional six females were released in November and post release movements recorded. A total of 213 locations were obtained in 62 days of monitoring in June, July and August.

6
Movement patterns and habitat selection during this study can be compared broadly with those found during past studies in the same area (Mack and Lytle 1982, Mack and Grode 1983) but no specific correlations can be made until all the data is analyzed from the entire monitor program (June 1981-April 1984) (Mack in progress). Results should be interpreted with caution due to small sample size and difficulties in obtaining equal sampling. For this reason, only general trends will be reported and discussed.

Of the seven animals with transmitting radios at the start of the study, one (F21) was implanted in fall 1982 and the rest in fall 1983. (F28, F29, F35, M31, M33, M38) Two additional males (M19-1982, M39-1983) transmitted through winter 1984 but were found inoperable after 4 June. Radio failure is suspected for M19. M39 was found deceased in Granby Reservoir on 12 June. (Table 1).

Table 1. Instrumented river otters in Rocky Mountain National Park, Grand County, Colorado. Summer and fall 1984.

Animal I.D.	Age of Release	Sex	Source	Release Year	Status
F21	Yearling	Female	Minnesota	1982	No radio contact July 1984
M19	Adult	Male	Minnesota	1982	No radio contact June 1984
M311	Adult	Male	Wisconsin	1982	No radio contact Fall 1983
M23	Juvenile	Male	Minnesota	1982	No radio contact Fall 1983
M32	Adult	Male	Wisconsin	1983	Deceased RMNP
M31	Yearling	Male	Minnesota	1983	Transmitting RMNP
M33	Yearling	Male	Minnesota	1983	Transmitting Willow Creek headwaters
M38	Yearling	Male	Wisconsin	1983	Transmitting Willow Creek
M39	Yearling	Male	Wisconsin	1983	Deceased Lake Granby
F28	Adult	Female	Wisconsin	1983	Transmitting RMNP
F29	Adult	Female	Minnesota	1983	Transmitting East Inlet Creek
F35	Adult	Female	Minnesota	1983	Transmitting Michigan River
F360	Yearling	Female	Minnesota	1983	No Radio Contact Fall 1983
F40	Adult	Female	Minnesota	1984	Transmitting Shadow Mtn Reservoir Dam
F42	Adult	Female	Minnesota	1984	Transmitting RMNP
F43	Adult	Female	Minnesota	1984	Transmitting RMNP
F44	Adult	Female	Minnesota	1984	Transmitting Grand Lake
F45	Juvenile	Female	Minnesota	1984	Transmitting RMNP
F46	Juvenile	Female	Minnesota	1984	Transmitting RMNP

6 37
33
2 32

First-year Movements

Females 21 and 28 were the only instrumented otters to remain in the primary study area in the Kawauneeche Valley. Their summer ranges included the initial release site with furthest locations from this site of 19 and 17 km, respectively. Conversely, F29 and F35 traveled the greatest distance by crossing a 3300 m pass and occupying the headwaters of the Michigan River, 30 km from the point of release. This movement occurred immediately after reintroduction. F35 localized on the South Fork of the Michigan through summer 1984. F29 returned to the study area in late spring or early summer, continued through Shadow Mountain Reservoir and Grand Lake onto E. Inlet Creek for a minimum travel distance of 100 km. (Fig. 2)

Male river otters M31, 33, 38 stayed in the Kawauneeche Valley through winter 1984 but ranged into the reservoirs in spring. By summer they had localized in outlying areas. M31 was found up feeder creeks, Onahu, Tonahutu and N. Inlet, with only two locations on the North Fork of the Colorado River for a minimum of 58 km of post release movements. M33 moved over 50 kilometers from release to Willow Creek above Willow Creek Reservoir. M38 was the only instrumented male to use the North Fork of the Colorado River in summer but this was infrequently. His furthest locations from the release site was between the headwaters of N. Supply and Willow Creek (35 km). Post release movement data is summarized in Table 2. Locations of male river otters are plotted on Figure 3.

Home Range

Home range data for the entire season was obtained for female 28 and monthly ranges for F21 and F29 (Table 3). Female 21 had a range of 15 km on the North Fork of the Colorado from the Beaver Creek beaver ponds south to

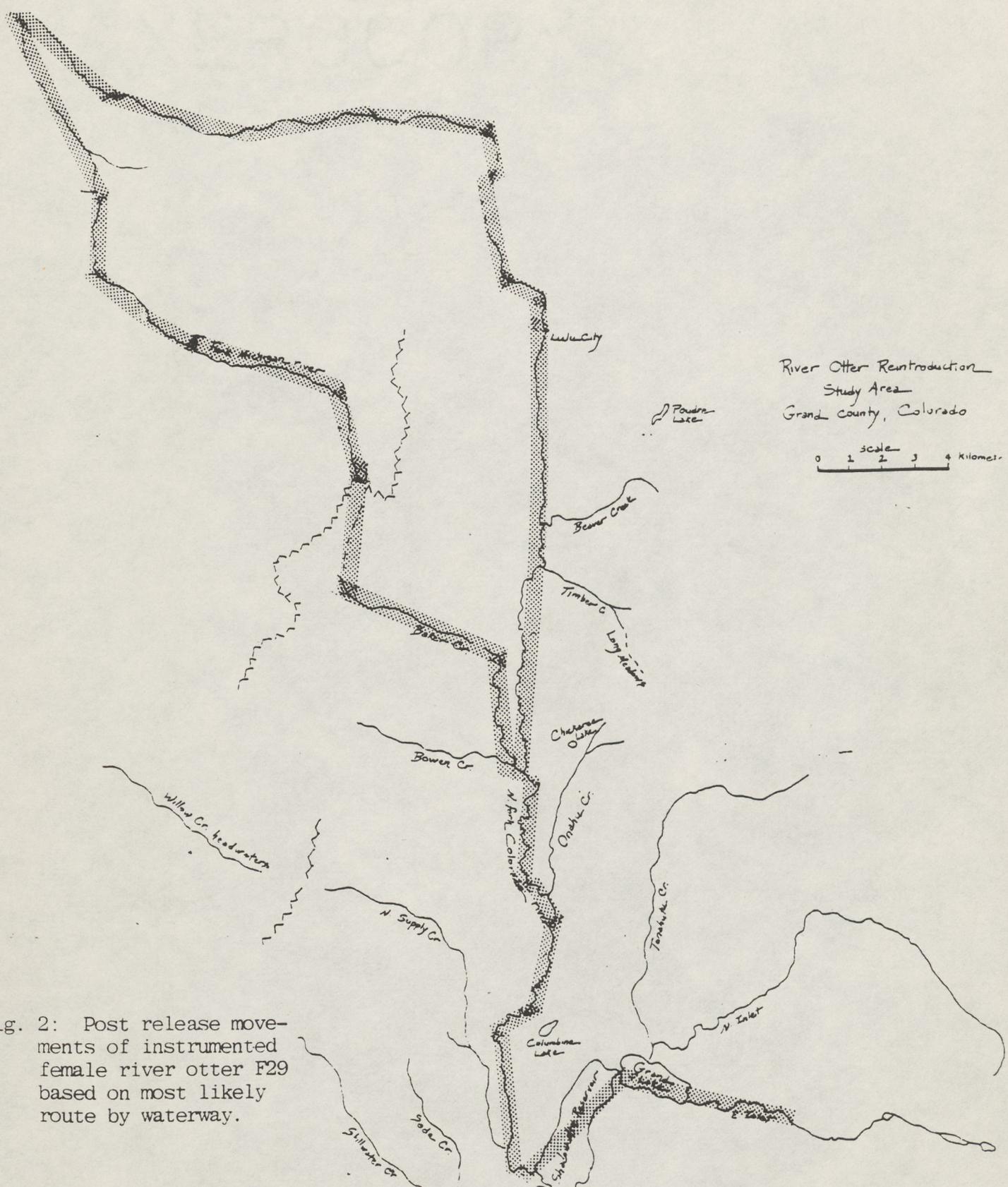


Fig. 2: Post release movements of instrumented female river otter F29 based on most likely route by waterway.

Table 2. Post-release movements (km) of instrumented otters over a one year period (November 1983–November 1984)

Animal I.D.	Sex	Class	Furthest Location from Release Site	Last Location Distance from Release Site	Minimum Length of Movements since Release ¹
21	Female	Subadult	19	1	20
28	Female	Adult	17	1	20
29	Female	Adult	45	29	106
35	Female	Adult	45	45	52
31	Male	Subadult	44	44	58
33	Male	Subadult	58	51	62
38	Male	Subadult	35	35	43

¹Minimum length of Movements was calculated by connecting furthest locations by most plausible travel route via waterway. Back travel was not included.

River Otter Reintroduction
Study Area
Grand County, Colorado

scale
0 1 2 3 4 kilometers

- M33 - ∅
- M38 - XX
- M31 - Z

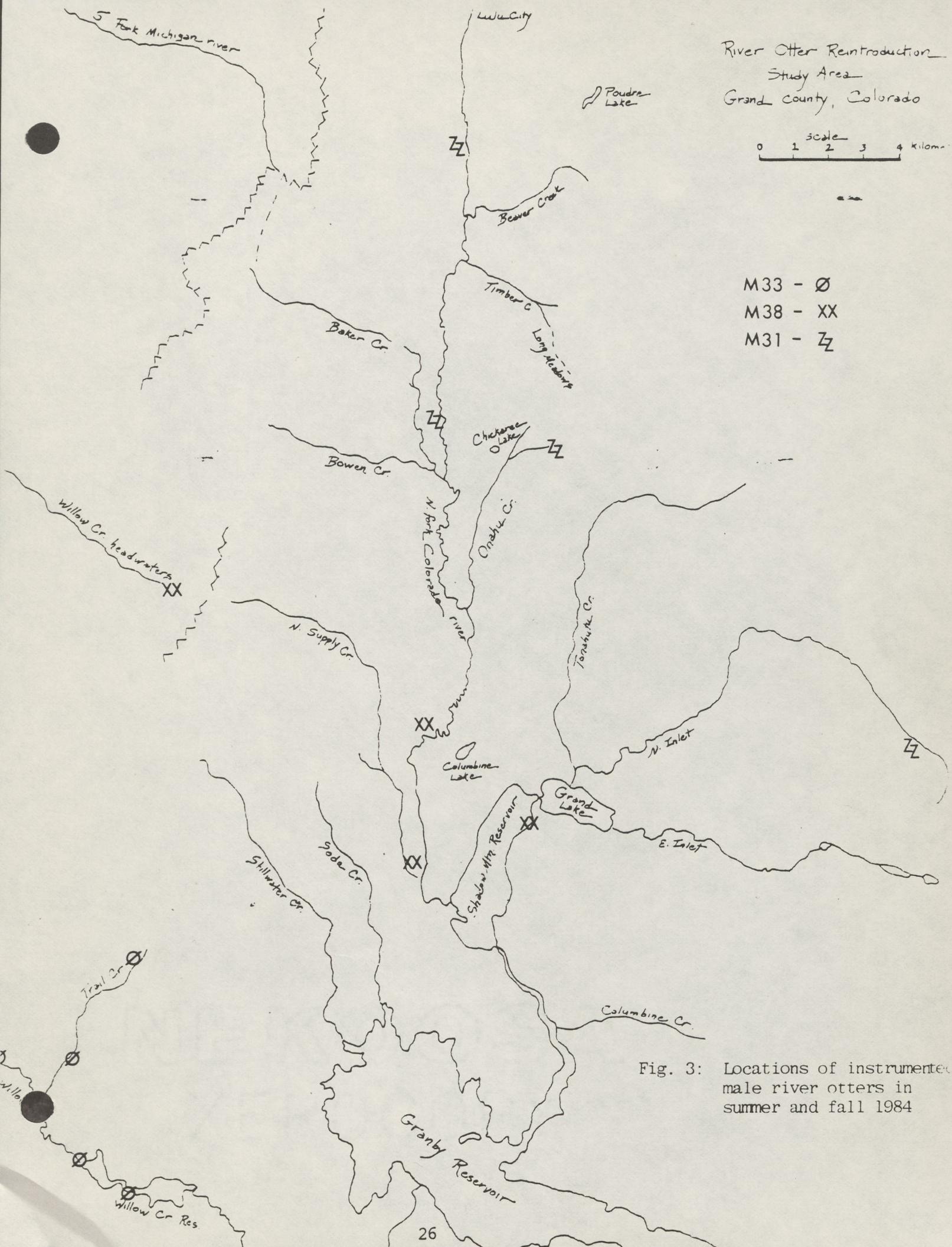


Fig. 3: Locations of instrumented male river otters in summer and fall 1984

Table 3. Summer 1984 home range and distance to the center of this range from the release site of instrumented otters based on length (km) of waterway used more than once.

Animal I.D.	Sex	Class	Status ¹	Summer Length	Locations	Approximate Distance from Release Site
21	Female	Subadult	Solitary	13	20	4
28	Female	Adult	Solitary	17	35	5
29	Female	Adult	Solitary	16	32	27 ²

¹Unconfirmed but suspected.

²This direct distance does not include 100 km of post-release movements to another drainage and back.

Green Mountain ranch and up Onahu Creek to Highway 34. (Fig. 4) Radio contact was lost on 12 July and radio failure is suspected. F28 utilized essentially the same section of the Colorado River but concentrated her activities near Mineral Creek on Baker Creek rather than on Onahu Creek. With a southernmost location near Sun Valley ranch, her range was 17 km. (Fig. 5) F29 used North and East Inlet Creeks above Grand Lake, and the islands on Shadow Mountain. (Fig. 6) Her minimum range was 16 kilometers but was probably greater as these drainages required intensive hiking to survey adequately. The male otter's use of similar headwater streams prevented the definition of home ranges.

Habitat Use

Predominant use of valley beaver pond habitat during the summer months parallels findings by Mack and Lytle (1982) and Mack and Grode (1983) and Melquist and Hornocker (1983) in Idaho. Forty-two percent of 107 habitat locations were in beaver pond complexes. These ponds adjoin valley streams which had 20 percent of the locations followed by valley river with 11 percent. In July through November, 1981 Mack (1982) found 100 percent use of valley habitat (n=193) compared to 73 percent for this summer.

In July and August of 1983, two of four instrumented otters used valley lake habitat (Mack 1983). Only one otter was occasionally located in the reservoir/lake system during this study (six percent of all habitat locations).

The theory that the available habitat in the valley is saturated may be supported by increased use of headwater drainages. First order streams, in association with small beaver pond complexes, accounted for ten percent of the locations. Mountain Lake use resulted in another ten percent. All locations of one animal (M31) in Mountain Lake habitat were in association with non-instrumented. M34 which was not included in the results.

GRAND COUNTY

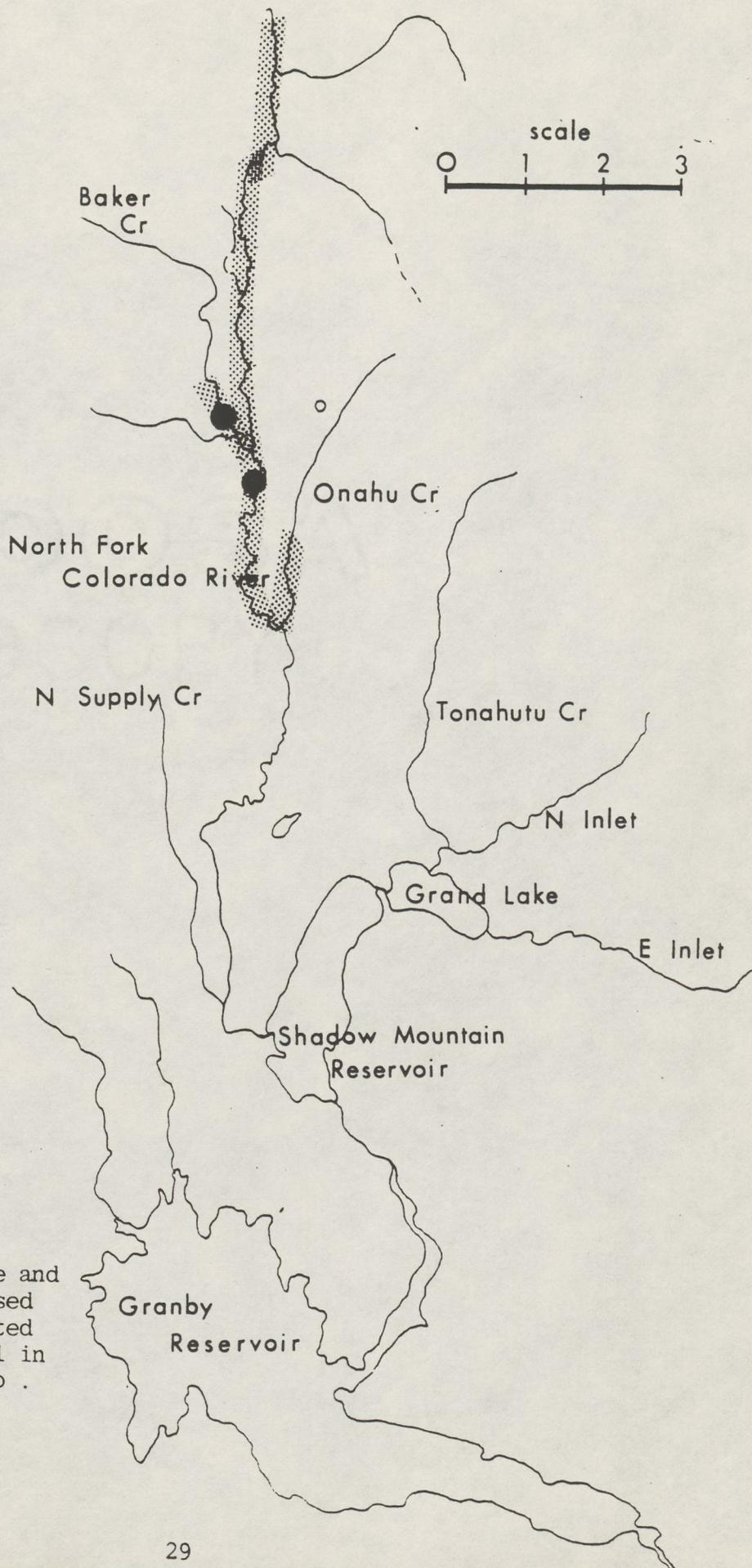


Fig. 4: Summer 1984 home range and activity centers (closed circles) of instrumented female river otter F21 in Grand County, Colorado .

GRAND COUNTY

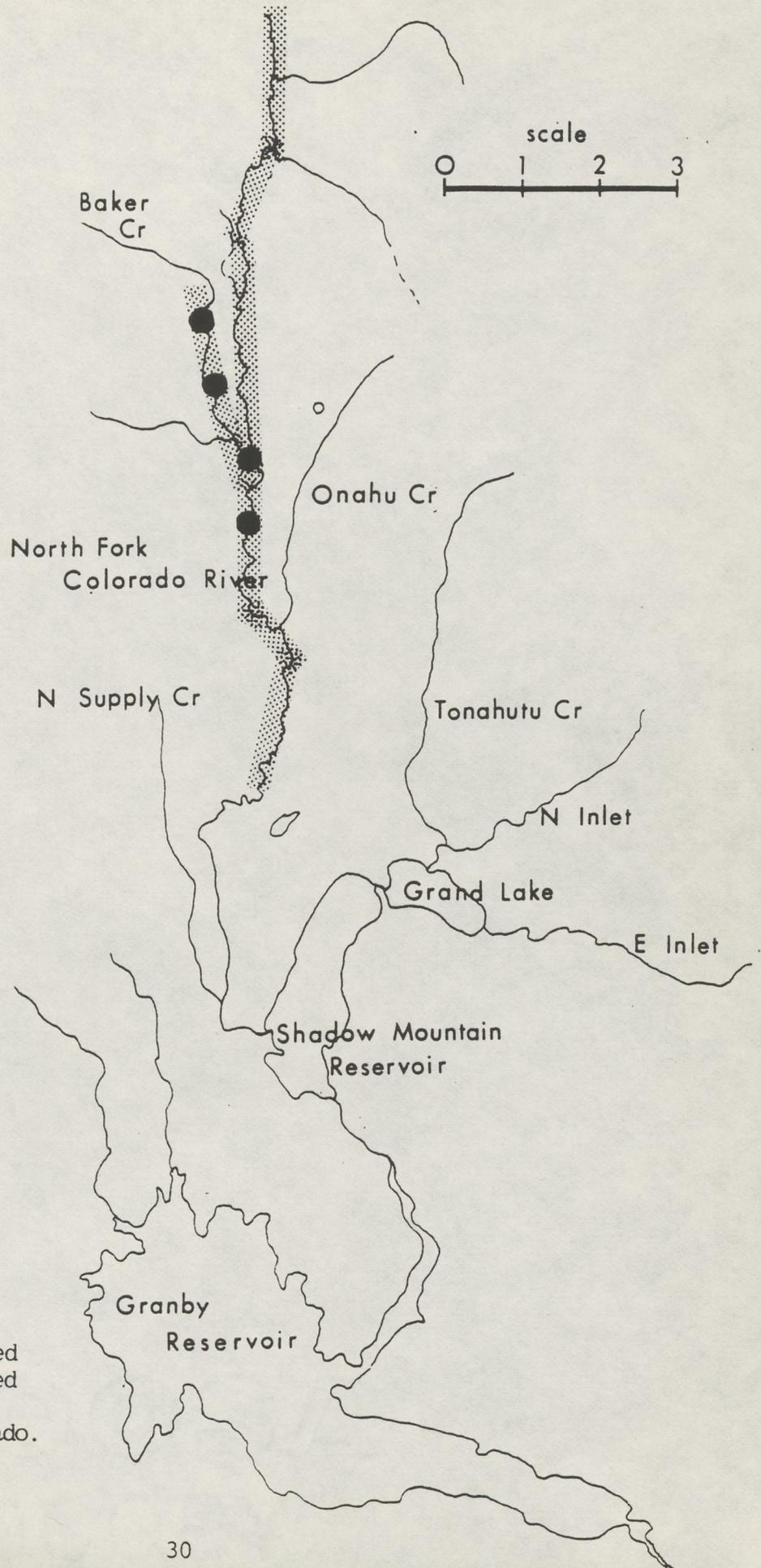


Fig 5: Summer 1984 home range activity centers (closed circles) of instrumented female river otter F28 in Grand County, Colorado.

GRAND COUNTY

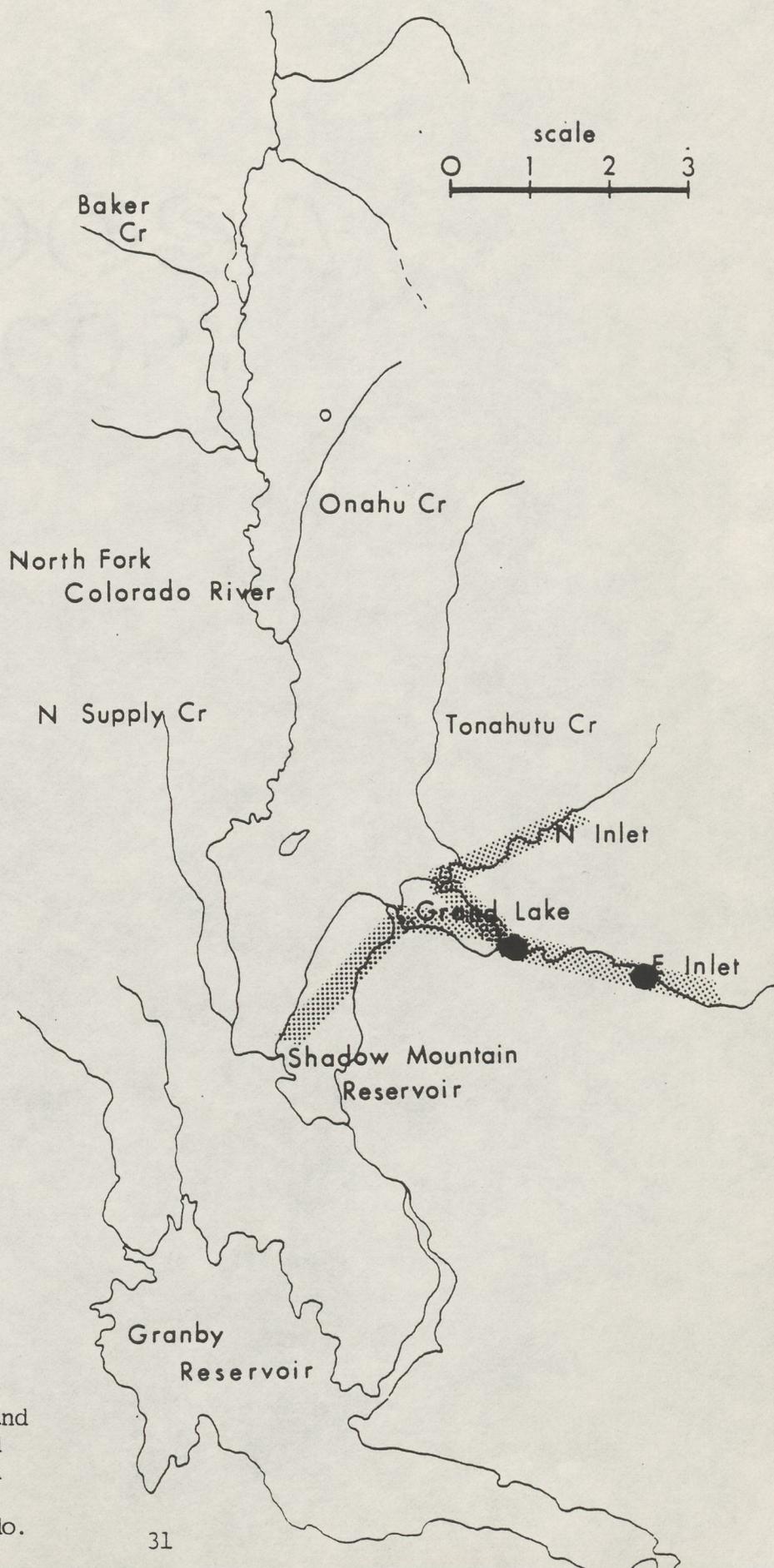


Fig. 6: Summer 1984 home range and activity centers (closed circles) of instrumented female river otter F29 in Grand County, Colorado.

From January through March, 1983, in valley beaver ponds averaged less than ten percent while those in valley river were over 66 percent. (Mack and Czerniakowski 1984)

Activity Patterns

In the summer season, the instrumented otters were slightly more active during the night than the day. Expressing this activity by locations (Mack pers. comm.) resulted in 43 percent active day and 49 percent active night. Converting locations to total monitor time resulted in activity during 36 percent of the 117 day hours and 42 percent of 56 night hours. The general trend of greater night activity during the summer compares with Melquist and Hornocker's (1983) results. In west central Idaho, instrumented otters were active 37 percent of the summer day hours and 63 percent of summer night hours. Melquist and Hornocker (1983) also documented greater activity during the day in winter. This increase in diurnal activity was found in our study area in winter 1984. From January through March, otters were active an average of 68 percent of the day locations and only 25 percent of the night. (Mack and Czerniakowski 1984)

Two 24 hour monitors of instrumented female otter F21 and F29 in early July recorded very different activity patterns for the 24 hour period. F21 exhibited two large blocks of activity and inactivity, with activity occurring throughout the night hours. Conversely, F29 was inactive for the greater part of the night. (2400-0530) Activity occurred in small (one to two hour) blocks in the first evening and next day (1800-2020, 2110-2400, 0530-0630, 0730-9000, 1010-1210). She then was inactive for the afternoon hours.

This variation is not surprising. Melquist and Hornocker (1983:35) note "The activity patterns of individual otters often differed... ..The 24-hour activity cycle usually was composed of several active and inactive (rest) periods."

In their study, nine of ten 24-hour monitors of a female showed greater periods of inactivity from 1000 to 2000 hours. Both F21 and F29 were inactive for most of these hours.

Social Interactions

Few interactions between otters were documented but those that occurred were quite social. F21 and F28 used the same den, concurrently, on three occasions. They were located traveling together two times. Frequent visual observations of M31 in July found him in company with noninstrumented M34. Behaviors viewed included allo- and auto-grooming, rolling, resting, foraging and travel. Public reports and personal observations (#5) noted these males in close proximity (<5 m) for the majority of the time. Activity that could be classified as play was not observed.

Reproduction

Normal patterns of reproduction would result in young leaving the natal den between the end of May and the end of July. Monitoring information for March and April does not document behavior indicative of a natal den site. Use of one specific den or area to the exclusion of others was not recorded in June or July for F21 or F28. A visual of F21 and F28 leaving a den below Timber Creek campground on 18 June found no evidence of pups. F29's great movements during late spring argues against her having young. The location of F35 has not allowed for sufficient monitoring to determine reproduction. Only pups from F21 would be the result of breeding within Colorado.

Post-release Movements of Otters Reintroduced in November 1984

Six instrumented female river otters were released in Grand County during the month of November. (Table 4) The first, F40, was released at the southern edge of Rocky Mountain National Park on the North Fork of the Colorado River near

Sun Valley ranch. F40 moved upstream approximately 1.5 kilometers within the first 24 hours. The following day she moved up another 2 km to Green Mountain Ranch. On November 14 she was found 10 km downstream from the release site in Shadow Mountain Reservoir. In the next two weeks she was located denned below the dam on Shadow Mountain Reservoir. Two sign surveys on November 30 and December 4 in this area did not find scat or tracks but F40 is believed to be utilizing the readily available spawning kokanee salmon. Females F42, F43, F45 and F46 were released on 12 November at Lower Holzworth in Rocky Mountain National Park. Much of the North Fork of the Colorado River was iced over by this date but running water sections resulted in open water at the release site. The next day F45 and F46 had traveled upstream to Beaver Creek Beaver Ponds, a distance of 3 km. F43 was still at the initial release site and F42 was not received but she was found the next day in the release site area. For the next two weeks F42 and F45 stayed within Rocky Mountain National Park. Last location for F42 was at Hausemans, and for F45 was at P.D.T., 4 and 5 km from release, respectively. On 16 November, F46 moved 12 km downstream to the area of Sun Valley Ranch. She stayed in the section until November 20. She was missing on November 29 and an extensive aerial survey of the valley and associated drainages failed to receive her. On December 4 she was found near the release site. F43 was the only female besides F40 to leave the Park in the three weeks following release. On November 20 she was located 14 km downstream at Winding River Ranch. On November 30 an aerial survey found her in a small area of open water in beaver ponds associated with Soda Creek between Stillwater and North Supply Creeks, 20 km from release. The sixth and final release was on 27 November. F44 had been held in captivity an additional two weeks due to a severe leghold capture injury that resulted in a crushed

fore foot. The little open water in the Park and her injury made it seem advisable to release her in a waterway that was not yet iced over and the east shore of Grand Lake near the East Inlet Creek was chosen. F44 moved west about 1 kilometer along the shore and was using this area close to summer homes and boat docks at the last location of 4 December. Tracks and a hole in the ice were discovered here on November 29. Post release movement data is summarized in Table 4.

Habitat Evaluation Results

Habitat value ratings were obtained for 29 rivers or river sections in northwest Colorado. (Table 5) The complete Habitat Evaluation forms are provided in Appendix 1. Ratings ranged from a high of 86 for the Green River in Browns Park to 55 for the Elkhead River above the Yampa at Craig. No lower limit for river otter habitat is set by this study on these waterways.

The highest rated waterways exhibited characteristics of undisturbed high mountain valley or low plateau rivers. These characteristics included a great amount of meanders and associated backwaters, dense riparian vegetation and organic bunk and bottom substrates.

DISCUSSION

Radio Telemetry

The radio-telemetry monitoring program documents the survival of river otters reintroduced into Grand County and the potential for reestablishment of otter populations in Colorado. Our initial successes provide a firm basis for continued efforts to obtain self-sustaining populations. We must remain aware that the biological characteristics of river otters (low reproductive potential, high energy requirements, large home ranges and wide dispersal) combine to make this a slow process. River otter populations are endangered or depressed in

Table 4. Physical condition, measurements, radio-frequencies, and release data of six female river otters reintroduced into Rocky Mountain National Park in November 1984.

Animal I.D.	Date Received Condition	Age	Weight (cm)	Length (cm)	Chest Circum (cm)	Date Implanted	Radio Frequency Operational Life	Date Released Location	Last Location Date	Distance Moved (km) Comments
F40	10/23 trap puncture- right front foot good body fat	Adult	7.3	113.5	40	10/24	148-260 24 months	10/29 Sun Valley Ranch RMNP	Shadow Mtn Res. dam 12/4	10 appears to be utilizing spawning kokanee-no sign found
F42	10/29 No trap injury Good condi- tion	Adult	6.1	112.2	34.5	11/7	148-740 36 months	11/12 Lower Holzworth RMNP	Hausemans RMNP 12/4	4
F43	10/19 trap injury 2 toes missing left hand foot good body fat	Adult	6.7	113	36	11/7	148-820 24 months	11/12 Lower Holzworth RMNP	Soda Creek between Stillwater & N. Supply Creeks 11/30	20
F44	10/19 Severe trap injury-bones broken, right front wrist. Sutured 10/29 Bandaged 11/7	Adult	6.6	115	34.5	11/7	148-670 36 months	11/28 E. Shore Grand Lake RMNP	Grand Lake between N&E Inlets 12/4	1
F45	10/26 No trap injury Good condition	Sub- adult	5.7	111	32.6	11/8	148-790 36 months	11/12 Lower Holzworth RMNP	P.D.T. RMNP 12/4	5
F46	10/31 Trap injury-2 toes broken on left rear foot	Sub- adult	5.9	108	32.0	11/8	148-860 36 months	11/12 Lower Holzworth RMNP	Lower Holzworth RMNP 12/4	0 frequency not received 11/30 aerial survey of park

Table 5: River otter habitat value ratings for Northwest Region waterways.

<u>Habitat Value Rating</u>	<u>Waterway</u>	<u>Number Miles</u>
86	Gran River #1	20
81	N. Fork Colorado	20
79(0)=0	Yampa #4	46
77	Piney	27
75	Williams Fork (Colorado)	24
74	Colorado #2	22
73	Green #2	24
73	S. Fork White	22
72	Roaring Fork #2	28
72	Blue	34
72	Yampa #2	32
71.5	Yampa #3	114
71	Colorado #4	55
70	Eagle	43
70	N. Fork White	57
70	Frazer	22
68	Williams Fork (Yampa)	47
67.5	Colorado #3	33
65(0)=0	White #2	105
64	Marvine Creek (E&N Forks)	23
63.5	Elk	39
63.5	Troublesome	20
62	Colorado #5	92
61	Yampa #1	44
60	Crystal	30
60	Roaring Fork #1	28
59	Roan Creek	44
57.5	Little Snake	35
55	Elkhead	40

all surrounding states (New Mexico, Arizona, Utah, Kansas, Nebraska, and Wyoming) so there is little chance Colorado's new populations will be bolstered from outside. Habitat selection (including prey requirements) post-release movements and reproduction appear to be the most important factors to overall success. The telemetry research, to date, in Rocky Mountain National Park (Mack in progress) should be considered a pilot study with significant findings applicable to continued research in this area and other areas of the state.

Habitat selection indicates that river otter will occupy disjunct headwater stream areas. Post release movements and home ranges show a selection for beaver pond complexes in small valleys. The quality habitat factors appear to be concentrated slow moving waters, dense cover and confined prey.

Two females exhibited the largest post release movements (>100 km) when they traveled over a 3300 m pass into this type of habitat at the headwaters of the Michigan River. While seemingly widespread, these and other post-release movements are excessive when compared to others in similar habitat. In Idaho, Melquist and Hornocker (1983) recorded travel by a yearling male of about 104 km and by a yearling female of approximately 192 km. These dispersal movements, result in expansion of a populations' range. Although this generally occurs via subadult members (Melquist and Hornocker 1983) it does not appear to be limited to this age class in relocated animals. In our study, yearling males M31, M33 and M38 "dispersed" in spring 1984 but otters aged as adults (F29, F35) had even more lengthy "post-release movements" in fall 1983.

Other translocation efforts have recorded extensive post-release movements. See otters (Enhydra lutris) traveled up to 290 km leading Jameson et al. (1982) to speculate that an affinity for a specific home range or habitat in mature animals results in an attempt to locate the original site. Jameson et al.

(1982:106) hypothesized that "the natural dispersers' may more readily accept new environs and, therefore, be less likely to leave an unfamiliar location."

Even animals noted for small home ranges and more sedentary foraging strategies have moved substantial distances when relocated. Two raccoons moved 240 and 288 km from their introduction site (Kaufman 1982).

Proximate and ultimate factors in dispersal of native and relocated animals are unclear and complex but could have a major effect on the size and status of or transplanted otter populations. Over 30 percent of a newly established sea otter population dispersed 72 km to the initial capture area (Jameson et al. 1982). These researchers point out that small populations have a greater potential for extinction as reproduction rates cannot overcome dispersal and mortality. An assessment of furbearer reintroduction programs attributed failure largely to small numbers of animals (less than 30), inadequate niche assessment, and stress or injury during trapping and transport (Berg 1982).

Although there is no evidence that concentrated high quality otter habitat will reduce dispersal distance it should not increase the length of emigration. Furthermore, concentrated habitat may minimize home range which can be quite extensive. States with a preponderance of wetlands (Texas, Louisiana) appear to support denser otter populations (M. Foy pers. comm., G. Linscombe pers. comm.). Increased prey base may be the most significant factor here.

In Idaho, the otter home range was believed to function to link areas with an abundance of food and adequate shelter called "activity centers" (Melquist and Hornocker 1983). Ranges were as large as 78 km and as small as 8 km in a season with an overall average of 40 km. In summer 1984, all instrumented otters occupied ranges with high quality waters or activity center. The

limited home range data from the Kawuneeche Valley shows these ranges are not unusual in size. Colorado introduced otter ranges differ from Idaho otters in the use of the reservoir system at the south end of the Kawuneeche Valley (Mack and Grode 1983). Movements down to those waters (Grand Lake, Shadow Mountain Reservoir, Granby Reservoir) to utilize the accessible forage fish populations are not excessive.

No otter has been found to inhabit only the reservoirs. It is unknown if these movements reflect the positive factor of a concentrated food base or are a result of a negative factor within the initial release area such as limited food resources.

In summer 1984, only two instrumented otters used the lake or reservoirs on a few occasions.⁶ Instead a greater amount of use of headwater beaver pond/stream complexes was documented. Furthermore, a minimum of five otters remained within the Kawuneeche Valley for over nine months. This indicates that the study area contains high quality habitat to support these otters but the quantity of such habitat may be the crucial factor in the establishment of a viable population.

It is not unusual that the study failed to find evidence of reproduction. Of the small number of instrumented females (4) only one (F21) was in her second year in Colorado. This animal was aged as a yearling in fall 1982 and would probably not breed until spring of 1984. The other three (28, 29, 35) were aged as adults at release in fall 1983 but because otters exhibit delayed implantation reproduction would not be a result of a breeding within Colorado. It is possible that the stress of capture, handling, transport and release

⁶However, public sightings documented two to seven otters on Grand Lake and Shadow Mountain Reservoir (Appendix 4b) and a sign survey in September found concentrations of scat on an island in Shadow Mountain.

results in the reabsorption of the blastocyst in the winter following reintroduction. A number of studies (W. Melquist pers.comm.) verify that female otters can give birth successfully with implanted transmitters but research on otter reproduction has not found a method to determine pregnancy prior to implantation of the blastocyst in early winter. (G. Stenson pers.comm.) Generally, adult female otters breed each year (Tabor and Towell 1983) so one could expect but not test for pregnancy in the adult females one receives for reintroduction.

Monitoring of movements and den site use to help indicate reproduction was only sufficient on F28 and F29. F35, located in North Park, may have given birth. It would be unlikely that F29 gave birth based on her extensive travels in spring from North Park to Grand Lake. (>50 km). In July, she was observed alone on two occasions. Through spring and summer, F28 did not localize in any section of her range. Two visuals in July found her alone and in company with F21. Three sets of tracks were found in her range in late August. Although two of these differed significantly in size they could be attributed to a large adult male and small adult female rather than a female with young.

The release of six females in November is of fundamental importance to the river otter program. Out of the 39 releases previous to these, eight known mortalities occurred. Of these remaining 31 animals, twelve were sexed as females and sixteen as males, with three of unknown sexes. The addition of six females brings us closer to our self-sustaining population goal of "50 reproductively active animals with a 50/50 sex ratio" (Goodman 1984). For otter populations to become self-sustaining precautions must be taken to guard against discontinuous, widespread post release movements and ranges that would hinder interactions and reproduction. Continued monitoring of the population in Rocky Mountain National Park for habitat selection and reproduction will help document this success.

Habitat Evaluation

Waterways evaluated by the Habitat Evaluation form ranged from headwater drainages along the Continental Divide to deep canyon rivers of the western plateau. Although, riverine areas varied widely, the highest values (>80) were associated with a concentration of slow moving waters and undisturbed riparian vegetation. The two river sections that obtained the highest ratings are notable because while providing similar high quality otter habitat they differ maximally in stream order. This may seem surprising but both these rivers, the North Fork of the Colorado River (81) and the Green River in Browns Park (86) are low gradient, valley streams with protected backwaters. Historically, these rivers also represented prime beaver habitat (Rutherford 1964). They retain their quality characteristics due largely to protection afforded by their status as National Park or National refuge lands.

The North Fork of the Colorado is a river otter reintroduction site and the habitat value rating supports its quality. Unfortunately, undisturbed headwater drainages such as this one are too infrequent in Colorado.¹ The Piney River (77) and Williams Fork (75) have similar quality characteristics but their lower reaches are steeper, and associated with increased rock substrate and reduced riparian vegetation with generally greater disturbance or some developments. These factors put them at the high end of a second class of streams (habitat value range of approximately 68-78). Each of these rivers have less desirable factors for river otter establishment but which of these is a limiting factor is unknown. Generally, these waterways are found in the mid-altitudes such as the Eagle River.

¹North Park, in the Northeast Region, is one area that still contains waterways of this type (Table 6).

Table 6. River otter habitat value ratings for Colorado Northwest Region waterways.

Habitat Value Rating	Waterway	# Miles
86	Michigan River (North Park)	57
83.5	Illinois River (North Park)	50
81	North Platte River (North Park)	32
76	Laramie River	28
75	Big Grizzly Creek (North Park)	30
65.5	North Fork Cache La Poudre River	38
65	Cache La Poudre River	45
65	Canadian River (North Park)	24

+ = sections of a longer waterway

Rivers that fell in the third class of habitat value ratings (< 68) were either lowland or second and third order waterways that had undergone significant alterations (the Colorado #5 and the upper Yampa, respectively), or due to geologic location had little cover or low rocky flows, (the Little Snake and Elk Rivers). Havens for otters still exist on these waterways but a more disjunct otter population would inhibit the potential for reestablishment.

Data on densities of otters in western mountain habitat is limited but Melquist and Hornocker (1983) found in Idaho that two adult females usually occupied a similar range, with mutual avoidance, and they were encompassed within the range of one adult male. Recruitment was estimated at 2.4 pup per breeding female with an overall density of one otter for every 3.9 km of waterway. This, in conjunction with a goal of 50 reproductively active animals in a population, requires an extensive system of waterways. In order to concentrate animals and minimize post release movements a spatial, rather than linear, arrangement of waterways appears preferable.

Grouping the higher value noted rivers according to confluences (Table 7) resulted in a continued high rating for the North Fork of the Colorado River #2. The average value rating for these waterways was 75 over a minimum of 94 km. Expansion of the populations could occur via dispersal over headwaters (documented) or downriver to the Colorado and Frazer Rivers. The continuing radio-telemetry research should help define if the initial release site is saturated and if otters will expand into lower quality habitat (such as the lower Colorado River) or if they will disperse greater distances to higher quality habitat as evidenced by the movement of F35 and F29 to the Michigan River.

It is recommended that until we obtain this data and document reproduction within the study area that we continue directing our reintroduction efforts in the higher altitudes towards this site. Further dispersal into North Park would

Table 7. River otter habitat area averages for the highest rated Colorado Northwest Region waterways.

Habitat Area Average	Waterways	# Kilometers
79:	Green River #1 Green River #2 (Yampa River #4)	: 90
75:	North Fork of the Colorado River Frazer River Colorado River #2	: 64
73.5	Williams Fork River Blue River Colorado River #2	: 80
69:	South Fork White River North Fork White River Marvine Creek	: 102
69:	Eagle River Colorado River #3 Colorado River #4	: 131

argue for a release in this area. Movements of otters downstream on the Colorado River would help define lower levels of habitat quality.

Averaging the Green River in Browns Park with the Green River in Dinosaur National Monument and upstream on the Yampa River given an initial area value rating of 79 over 90 km. The presence of the endangered Colorado squawfish (Ptychocheilus lucius) and humpback chub (Gila cypha) on the lower Yampa results in an actual habitat value rating of zero. Although an otter is more likely to prey upon the abundant exotic fishes in this area the remote possibility of predation on an endangered fish makes a release on the Yampa less than satisfactory.

A radio-telemetry reintroduction effort in Browns Park could yield some essential information on otter population and habitat dynamics in large Plateau and Canyon Rivers. Individuals associated with Utah Division of Wildlife and Resources and the U. S. Park Service in Dinosaur National Monument have expressed interest in a release on the Green River. Despite the high rating of the Green in Browns Park, it is doubtful it could support a viable otter population as the very few feeder creeks would limit spatial expansion. Instead, otters would probably move up and downstream. The survivalship of otters in fluctuating waters in a confined canyon such as Ladore is unknown. Upstream habitat in Utah appears quite good. A proposed otter reintroduction in this area should be carefully reviewed by all agencies concerned. It would provide an exciting opportunity for otter research in an area that rates as high quality but very different habitat from our current release site in Rocky Mountain National Park.

The decline of wildlife habitat associated with the riparian zone has been well documented (Crumpacker 1981). In Colorado, mining, agriculture, livestock, urbanization, dam construction, and water diversion projects have been factors in the destruction of riparian areas. Certain of these factors still render

sections of waterways less than optimal for otters. Alternately, some of man's influences may increase the potential for otters such as reservoirs (when they do not inundate beaver pond complexes) and fish-stocking of less productive waterways and alpine lakes.

Until home range size, habitat selection, and reproduction of reintroduced river otter is defined the reestablishment of the species to Colorado cannot be verified. However, the information gathered to date supports the possibility of reaching this goal.

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APPENDIX 1

HABITAT EVALUATION FORM
RIVER OTTER RECOVERY -- PART 1

86

Surveyed by: A.E. Drankert Date: Oct 84

*Region: Northwest

*Waterway: Green River #1

*Primary Drainage: Green River

*Upper Location: Utah State Line T10N R104W S13

*Lower Location: SE of original Fur-fort Crockett sealed
5 miles of access ~2 miles up Vermillion Creek
above confluence w/ Green river

*Elevation Range: 5000 to 5300 ft

*Gradient:

*Total Length: 20 miles

Nearest Town (distance & population):

*Land Ownership (type and length):

USFS - 10
Natl. Wildlife Refuge - 7

Stream Characteristics

General Description of Physical Stream Features:

Stream is generally straight with some oxbow bends and some pools

*Average Width:

300 ft

Average Depth:

Pool/Riffle ratio:

30 10 60

Flow (high, low, mean):

1000 cfs average

Feeder creeks (length):

Beaver Creek (1 mile below State line) 2.5 cfs. 14 mile average width 8 ft

*Meander factor:

Vermillion Creek (enters ~3 miles above Lower ranger station)

Associated wetlands (beaver ponds, oxbows, lakes and % of increase over main waterway):

4-5 large marshy lakes, some oxbows increase area by 20%

*Water Quality - Assess game and forage fishery, stream clarity, agricultural and industrial impacts. List potential pollutants. If no or poor fishery, obtain chemical analysis

Release of 400 lbs Fluor. Gorge reservoir - cold water fish
good quality

(*Starred parameters are available from D.O.W. Stream Survey forms on file in Ecological

HABITAT EVALUATION FORM
RIVER OTTER RECOVERY -- PART I

FOOD BASE

*Fishery Value: *Fishes of Dinosaur Natl Monument Xerox*
↓

*Fish Sampling Method:

*% Salmonidae: *mountain whitefish, rainbow trout, brown trout - rare*

*% Forage Fish: *carp, redshiner, speckled dace, flannelmouth sucker, channel catfish - all abundant*

*# of Salmonidae \geq 6" per mile: *fathead minnow, bluehead sucker, - common*

Other available prey species:

Presence of conflict species:
Colorado squawfish - rare
Humpback chub - rare on Yampa river
Razorback sucker - rare on lower Green
Endangered fish species

COVER

General description of topography and vegetation:
*Upper end of river flows through area with rolling hills on either side
Cottonwood stands along river banks - some are very old and large
River on western side of low grass, sedge, willow area to the east*

Vegetation cover (% per mile along bank):
50% *cottonwoods*

% of vegetation in trees, shrub, grass:
5% 50% 30%

Rock cover (% per mile along bank):

Densite Potential (# of sites per mile):
4

DISTURBANCE

*Physical stream damage (type and % of section affected):
—

*Accessibility (mode and # of miles):
—

Land Use (type and # of miles):
—

Potential Developments:
None

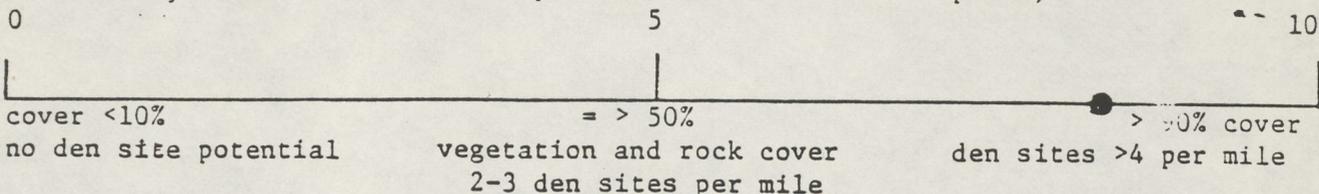
Trapping; Pressure (# beaver trapped per year):
None

Recreation (type and # of user days):

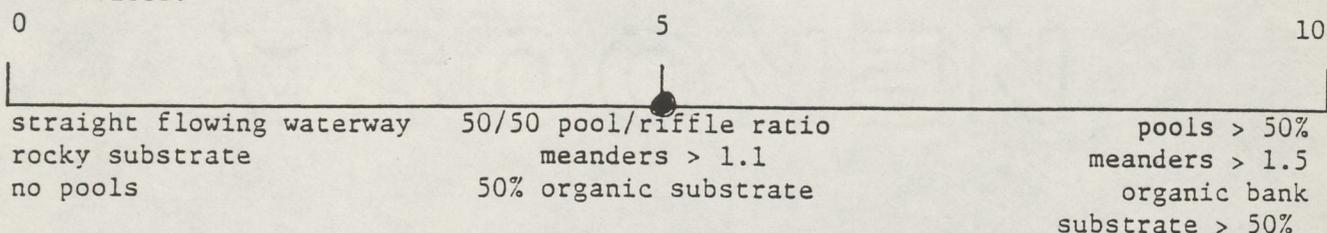
non-motorized fishing

HABITAT EVALUATION FORM
RIVER OTTER RECOVERY - PART II

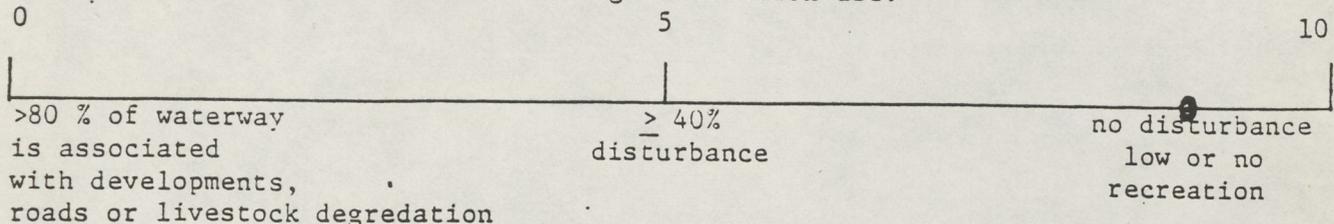
6. Cover - Assess from transects along the water's edge both vegetation and rock cover. Increase rating when den site potential is noted and when cover extends inland away from the main waterway (i.e. associated beaver ponds).



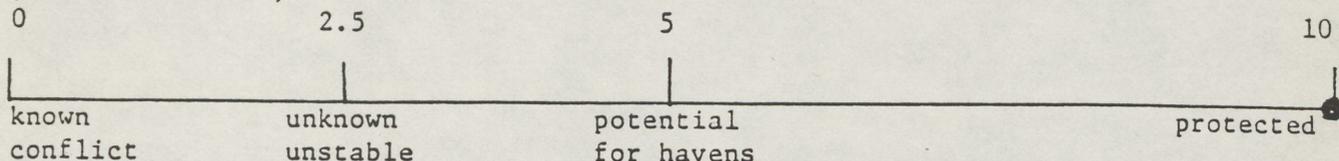
7. Stream Features - Assess pool/riffle ratio, meander factor, bank and bottom substrates.



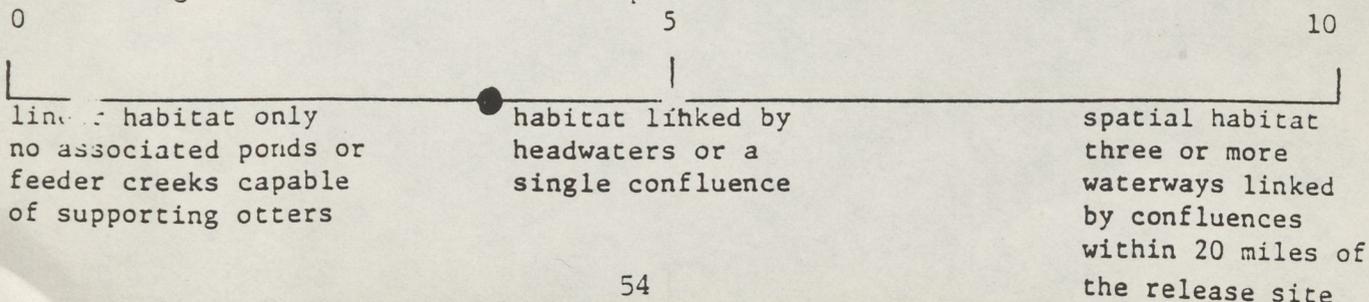
8. Disturbance - Assess the number of miles of developments, mining, agriculture, roads and livestock degradation adjoining the waterway. Increase rating with low recreation use in area and decrease with high recreation use.



9. Future Conflicts - Determine the likelihood of habitat alteration changing the rating of this area. If habitat quality will be changed to the extent that one of the preceding factors becomes zero than give a zero rating here. If the area is legally protected, rate a 10. If the area has good potential for establishment of protected havens, rate a 5.



10. Habitat and Population Structure - Assess by drawing a profile map of all waterways, in the area capable of supporting otters. Refer to the section on home range and population dynamics. Consider whether an otter population could expand linearly or spatially. Spatial habitat should result in greater concentrations of otter in a smaller area, allowing for more viable (reproductive) interactions while linear habitat might result in too wide a dispersal of reintroduced otters.



Green River #1

HABITAT EVALUATION FORM
RIVER OTTER RECOVERY
PART II

FACTOR	SCALE	RATING
ESSENTIAL		
Total Dispersal Area	0-10	10
Open Water in Winter	0-10	8
Water Quality	0-10	9
Prey Base	0-10	6
Water Quantity	0-10	2
Cover	0-10	8
Stream Features	0-10	4
Disturbance	0-10	9
Future Conflicts	0-10	10
Habitat/Population Structure	0-10	5
PREFERRED		
Land Ownership	1-5	5
Beaver Trapping Pressure	1-5	5
Prey Availability	1-5	5

TOTAL

86

LIMITING ESSENTIAL FACTORS

(If any essential factors have a zero rating, enter zero. If no zero ratings exist, enter nothing.)

HABITAT VALUE RATING
(total x limiting factor)

DRAFT

SOME THINGS YOU OTTER KNOW ABOUT THE COLORADO DIVISION OF WILDLIFE RIVER OTTER RECOVERY PROGRAM

The Program

The Colorado Division of Wildlife (CDOW) is involved in the preservation of certain animals that were once a part of our State's wildlife and are now in danger of extinction. Threatened or endangered: the peregrine falcon, cutthroat trout, prairie chicken, and river otter, are species that could be lost forever from Colorado without our aid. Funding from a special check-off option on the State income tax form allows the Colorado Division of Wildlife nongame program to reintroduce these animals into their native habitat where they help to restore the balance of nature.

The Otter Returns

The river otter (Lutra canadensis) is one of the most appealing of Colorado's native mammals. As the name indicates, otters live in rivers and streams, but they also can be found in lakes, reservoirs, beaver ponds, and even irrigation ditches. Otter habitat includes a concentration of water and vegetation for cover, fish and invertebrates for food, and den sites for resting and rearing young.

Up until a few years ago, residents and visitors to Colorado would probably not have had a chance to see an otter. A combination of trapping, pollution, reduction of native fisheries and habitat destruction decreased river otter populations so drastically that no verified sighting had occurred since 1906. Beginning in 1976, otters captured in states still having substantial otter populations were relocated into historic ranges in Colorado. Through dedicated effort and with your support, our State now is on its way to reestablishing the river otter.

Otter Facts

Otters are sometimes confused with beaver, mink, muskrat or marten, but if one knows what to look for, the reward could be a sighting of this rare animal. In structure, the otter is a unique combination of strength and grace.

It has a streamlined body which is about 40 inches or one meter long from a short snout to a round tapered tail. Thick brown fur often makes the otter look larger than the average weight of 15 to 25 pounds (7 to 11 kg). The beautiful coat provides important protection from a cold aquatic environment and the otter spends much time grooming and rolling to keep itself clean. Short powerful legs and webbed feet account for an excellent swimming ability and aid in capturing prey. The feet leave a rounded, five-toed imprint which can be found on sand bars or along the muddy banks of streams.

Other adaptations for a watery existence include a flattened head with tiny ears, and heavy whiskers used for foraging in muddy, shallow areas. There an otter is most likely to encounter the more easily captured fish prey, such as suckers and other nongame fish. The opportunistic otter will also consume insects, crustaceans and trout, when it can catch them. Rather than depleting game fish populations, it appears that otters may help to maintain a healthy balance of fish species.

In Colorado's rivers and lakes, look for an animal swimming with a dolphin-like motion. An otter will make frequent dives and may raise its head high out of the water until it discovers you. Then, it usually slips quickly and quietly out of sight. Occasionally, a warning "huh" sound can be heard. In contrast, a beaver cruises slowly on the water's surface, slapping its flat tail loudly when alarmed. The small muskrat has a tiny whiplike tail and is usually found close to shore.

On land, the otter appears less graceful, moving with a hump-backed run or a slow waddle. Occasionally it will "slide" down a snow, or grass covered bank for easier traveling. Members of the same family, the mink and marten are similar in shape, but are half an otter's size. The shy, forest dwelling marten can be distinguished by its longer fur and fox-shaped ears and tail.

Although the otter is generally regarded as a playful and social animal, it is more often found alone. The female and male will associate in early spring for breeding. One year later 2 to 4 cubs are born. Young otters do not leave the protection of the den site before they are about three months of age. Then, they accompany their mother on her daily travels until as yearlings they wander out on their own to establish a new home range.

Home range size varies with sex and age. An adult male may range up to 50 miles (80 km). Young females may use only 7 or 8 miles (12 km) of waterway.

Otters travel widely for reasons we have not yet been able to fully discern. They will cross over high mountain passes, down canyons and through lands occasionally far from water, but if you are fortunate enough to see an otter it will most likely be while sitting silently by the water's edge.

Otter Assistance

The Colorado Division of Wildlife needs your assistance in documenting the survival of our renewed otter populations. To be an effective naturalist, evaluate any suspected sightings carefully. Note the time of day, habitat and exact location. Notice the animal's behavior, and physical characteristics. Look for otter sign; rolling areas and lying-up sites, scat and tracks. Rolling areas are flattened spots in the grass or sand where the otter dries itself when it leaves the water. Lying-up or den sites are generally more protected; beneath thick vegetation, in beaver lodges, or within rock and bank caves. Tracks vary in size and pattern due to the substrate and gait. An average track, 3 inches (7.6 cm) in diameter, may appear slightly wider than long as the entire heel may not regis-

ter. The sharp, triangular claw marks are usually quite definite. The scat is composed of fish bones, crustacean and insect shells covered with a dark mucous substance. The multi-segmented scat averages 2.5 inches (6.4 cm) in length and less than 1 inch (2 cm) in width. With a good sense of smell you may notice the musky odor an otter leaves in the home range. This communicates territory and sexual status.

Use the accompanying mail form or call the Colorado Division of Wildlife in Denver at 297-1192, or Grand Junction at 248-7175. State that you wish to report an otter sighting. Join in documenting the successful return of the Colorado river otter.

RIVER OTTER OBSERVATION CARD

DATE: _____ TIME: _____

LOCATION: _____

HABITAT: _____

WEATHER: _____

DISTANCE FROM OBSERVER: _____

NUMBER OF OTTER OBSERVED: _____

LENGTH OF OBSERVATION: _____

DESCRIPTION - Size, shape of body and tail, color: _____

ACTIVITIES - In water/on land, specific behaviors, movements, vocalizations:

SIGN SEEN - Tracks, scat, rolling or lying-up areas: _____

FAMILIARITY WITH OTTERS: _____

OBSERVER'S NAME: _____

ADDRESS: _____

PHONE: _____

APPENDIX 3

STATE OF COLORADO
DIVISION OF WILDLIFE
DEPARTMENT OF NATURAL RESOURCES

DATE: October 15, 1984

TO: Mike Grode

FROM: Ana Dronkert

SUBJECT: Protection of River Otters: Education and Special Trapping Restrictions

Research into trapping journals and histories, and discussions with Colorado and out-of-state trappers and wildlife personnel concludes that a beaver set can and will trap river otter. While there are some experienced otter trappers, it appears that the majority of otters are trapped incidentally to beaver trapping. Estimates of accidental otter captures range as high as 90 percent in Virginia (Kindervater 1983) while 75 percent of 416 otters trapped in Montana were taken in beaver sets (Zackheim 1982).

Conibear 330's, 220's and #3 and larger legholds are the traps utilized by the serious otter trapper (Kindervater 1983, Shumaker 1983). #1.1, 1, and 2 legholds can hold a smaller otter (Shumaker 1983, Goodart 1983, W. Melquist pers. comm.). Otters trapped in Louisiana for sale to zoos and for reintroduction efforts are most often taken in #1.1 legholds. Colorado has received otters from Minnesota that were trapped in similar traps with resulting foot injuries. Experienced otter trappers attest to the ferocity of an otter in a trap (W. Melquist pers. comm., Shumaker 1983, Goodart 1983). Otters are difficult to trap as evidenced by trap nights per capture statistics. When live trapping otters, Melquist and Hornocker (1983) had 419 trap nights per capture in legholds and 123 trap nights per capture in modified Hancocks.

Colorado's current trapping regulations (C.R.S. 33-1-111 - #402) designed to protect river otters, prohibit "the use of sets with number three (#3) leghold or larger steel traps and snares or 220, 330 and larger conibear type traps" within 400 yards of the high water line in otter release sites. Information indicates that these regulations are necessary with the exception of prohibiting snares. It is important that we protect the initial release drainage, even though otters can and do disperse widely, because future releases should be in the areas of highest quality habitat. Although these size traps are also primary beaver traps, until such time as we have a "self-sustaining" otter population some regulations are incumbent.

Body snares with swivels and lock nuts can be quite selective; while an otter snare is usually five to six inches in diameter a beaver snare is closer to ten. Skilled trappers have indicated a preference for snare trapping for beaver. (G. Stewart pers. comm.). Many trappers do not use snares due to lack of experience. Dr. Major Boddicker and state trapper Mr. Jerry Brinker have indicated a willingness to conduct trapper workshops on the use of snares.

The use of smaller legholds is allowed in otter release areas, presumably with the expectation that an otter will pull-out or can be released unharmed. This may be a more common occurrence than not based on conversations with various researchers. Until such time as we gather more evidence on possible negative effects of smaller legholds on otters, it is recommended that only minimal restrictions be instigated against their use in otter release sites. These include no drowning sets (W. Melquist pers. comm.), firm staking (M. Boddicker enclosed), and the employment of an adequate method for releasing accidentally captured otters. Lee Roy Sevin, experienced Louisiana otter trapper suggests using a plywood board with a small segment cut out of one side. This can fit over the trapped leg allowing the removal of the trap while the otter (and his teeth) remain on the other side of the board (pers. comm.). Injured otters should be delivered to the C.D.O.W. alive.

As Colorado's otter populations expand, we will need to continually balance their adequate protection with effective beaver management. Otters will inhabit a variety of waterways but areas with beaver activity seems to offer high quality otter habitat (W. Melquist pers. comm.). The preliminary results of the otter radio-tracking program in Rocky Mtn. National Park show a large amount of use of beaver ponds and lodges. At some point, it seems advisable to reassess the degree of beaver trapping allowed on public lands but restrictions can be retrogressive. Excessive regulations may alienate and close-off an important source of information and protection. Private landowners and trappers have said that fear of restrictions can influence the reporting of a threatened or endangered species. Widespread movements of otters could require that areas of restricted trapping be quite substantial. At this time it appears more beneficial to limit the special trapping restrictions to the immediate drainage of otter reintroduction and to those areas where concentrated otter activity is documented such as natal den sites and fish spawning areas. It is imperative that we attempt to identify areas inhabited by otters through winter sign surveys, kayak transects in summer, and solicitation of sighting reports from the public. Direct contact with trappers in drainages where otter presence is suspected or documented appears to be the primary method for safeguarding otter populations.

Although, some trappers state that it is very difficult to avoid capturing otters in beaver sets (Kindervater 1983), others maintain that with care and a knowledge of river otter sign and habits they can avoid trapping otters (G. Stewart pers. comm., M. Boddicker enclosed). The C.D.O.W. could further awareness of otter populations and mitigate the effects of beaver trapping through an education program. A workshop could be offered to trappers on otter sign identification and the use of appropriate snares and live traps and other techniques (i.e. Leaving some human scent around the set could warn the more wary otter away while not severely affecting the beaver catch.). Dr. Boddicker and Mr. Brinker have expressed interest in this kind of program. Variations of this seminar could be given to D.W.M.s to aid in sign surveys and for the general public as a nonconsumptive use program.

While trappers in Colorado are a small constituency, they can contribute significantly to our understanding of the status of T/E species such as the lynx and otter, and secretive furbearers like the mink and ringtailed cat. Their cooperation should be encouraged.

Goodart, B. 1983. An introduction to otter. The Trapper. August 1983: 114-118.

Kindervater, B. 1983. Dixie otter. The Trapper. Dec. 1983: 50-51.

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_____. and M. Hornocker. 1983. Ecology of river otters in west central Idaho. Wildl. Monogr. #83 April 1983. 60 pp.

Sevin, L. R. 158 Beatous Rd., Theriot, Louisiana 70395.

Shumaker, D. 1983. Fur catching crossovers. The Trapper. Aug. 1983: 80-82.

Zackheim, H.S. 1982. Ecology and population status of the river otter in Southwestern Montana. U.S. Fish and Wildl. Ref. Ser. 95 pp.

Important Information for the Trapper:

The CDOW is committed to effective management of the fur resource. Aquatic furbearers: beaver, muskrat and mink inhabit the same waterways as the endangered river otter. Colorado's otter populations are not well enough established to withstand trapping pressure. Current protective regulations are essential for the future benefit of the resource. Check with the District Wildlife Manager for the status of otters in your area. Waterways near the otter release site and where natal dens occur will have the following restrictions. The use of sets with number 3 (#3) leghold or larger steel traps and 220, 330 and larger conibear type traps and the use of snares without ^{a relaxing} lock and with less than a 10 inch diameter is prohibited.

With your cooperation, restricted areas will be as minimal as possible. In most waterways, the only requirement will be that the trapper take extra precautions.

- The most important procedure is to search your area thoroughly for otter sign. If otters are suspected, the following precautions are highly recommended to avoid trapping an otter.

Place

- Sets away from any area of otter activity.

Place

- Sets away from lodges, dam slides and channels.

- Bait sets near feed beds and castor sets away from dams and lodges are preferable.

- Snares can be very selective. A 10 inch beaver snare with ^{a relaxing lock} ~~stop~~ and swivel is recommended.

- Drowning sets are discouraged. Sets in water should have enough wire for the animal to get on to land.
- Live traps are encouraged.

- #2 and smaller legholds, staked firmly, improve the chances of releasing an otter unharmed. An injured animal will be cared for by the CDOW.

- CDOW offers workshops on identification of otter sign and habits and the use of snares and live traps.

? **☎ Contact 248-715075**

- There is a \$1,000 fine for the illegal taking and possession of a river otter. You will receive amnesty for accidentally trapped otter by delivering it to the CDOW. Any information is strictly confidential and you may remain anonymous.

The accompanying memorandum written in 1976 by Dr. Major L. Boddicker (a professor at CSU and an avid trapper) reiterates some of my findings. I enclose another memorandum, from DWM Dan Miller, written the same year. I think it makes some good points particularly #2d.

Cooperative Extension Service

Department of Fishery
and Wildlife Biology
230 Forestry Building

Colorado State University
Fort Collins, Colorado
80523

April 8, 1976

TO: CTA Officers, Board of Directors, Education, Legislative and
Ethics Committees

FROM: Major L. Boddicker *MB*

SUBJECT: Otter Introduction

The following letter contains a review of the answers I received from 19 states and 10 Canadian Provinces about otter. Comments and recommendations were so variable it is hard to generalize on them. Some comments directly contradicted those by other states, sometimes between people from the same state.

Here are major points regarding otter management:

- A. Travel widely - estimates up to 30 mile range in marginal habitat, some up to 100 miles.
- B. Low reproductive potential - can sustain 25-30% harvest.
- C. Low density tolerance - need lots of space, never abundant.
- D. Fish eaters - some predation on beaver and muskrat particularly when fish are scarce. Complaints from trout fisherman fairly common.
- E. Some tolerance to humans when left undisturbed.
- F. Little digging - little potential harm to irrigation and impoundments.
- G. Occasionally do enter beaver ponds through dams resulting in pond drainage.
- H. Not considered serious problem for muskrat and beaver. Use beaver ponds, dams and lodges.
- I. Require access to open waters, year around.
- J. Do not tolerate poor water quality.
- K. Few transplants have been made, little known of success potential. Best chance is to release otter family units, at least pairs and 4-6 at each release site. Prognosis - only fair chance of success under most optimistic assessment.

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- L. Fur value up to \$60.00 but very difficult to handle, skin like a beaver or worse, fur singes early.

The following recommendations can be made regarding trapping and otter management:

- A. Muskrat trapping with #2, 1½, 1, 0 longspring, jump stop loss and #110 Conibear offer miniscule threat to otter. Otter feet are too big and/or they are strong enough to pull out of a well staked trap. Recommend muskrat trapping not be curtailed anywhere but require firm staking.
- B. Beaver trapping with #3 and larger legholds and #220 and #330 Conibears does offer considerable risk if precautions are not taken.
1. Lodge entrance, lodge rests, dam slide sets and channel sets with large leghold traps and Conibears definitely catch otter.
 2. Bait sets between the feed beds and the lodge, castor sets away from dams and lodges and under ice bait sets significantly reduce chances for otter catches. Fish baits and lures should not be used in otter areas.
 3. Beaver trapping by experienced and trained trappers does not offer significant threat to otter. Beaver trappers who learn to read otter sign and habits can avoid trapping them.
 4. Since cost of introduction of otter is so high and trappers support this introduction CTA recommends the following:
 - a. An effort be made by CSU Extension, DOW and CTA to train beaver trappers to recognize otter and otter signs, and train them in effective "otter proof" beaver sets.
 - b. That if beaver trapping is restricted in otter release areas, that the restrictions be limited to beaver trapping and water sets with #220, #330 and #3 or larger traps and snares.
 - c. That the restricted area be not more than 50 air miles radius from the release sites and established otter territories and for not more than 4 seasons.
 - d. That the DOW establish objectives for otter populations so that progress of the effort can be evaluated at 2 year intervals and trapping regulations be adjusted accordingly.
 - e. When and if the otter population density reaches one otter per 20 stream miles or over 50% of a major drainage, that restrictions on beaver trapping be lifted and provisions made that a (a) limited otter trapping season be established, or (b) accidental catches of otter be tolerated to the limit of up to 20% of the population of that drainage before restrictions on beaver trapping be re-established, or (c) both.

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f. An effort should be made by DOW to provide water trapping territory to trappers displaced by the otter reintroduction plan by re-apportioning public land beaver tags for the trapper and/or assisting in introducing him to private lands for taking beaver in the closest proximate areas possible.

C. CTA strongly supports this effort and feel their membership and other Colorado trappers can assist DOW with this effort. The CTA recommends the following actions be considered:

1. An educational pamphlet be prepared and distributed to CTA and other trappers on reading otter sign, identifying their tracks, dens, feeding sign, scats, etc.

2. Provide an address and telephone number of the DOW personnel to contact when an otter sighting is made or significant otter activity is located. A confidential intermediary person might be identified in case of accidental catch and surrender is desired.

3. That by careful placement of beaver sets, the threat to otter is minimized to the point that the benefit of the assistance trappers can give to the DOW effort may out-weigh the liabilities and that beaver trapping in release drainage areas should be restricted only as to the types and placement of sets. *

That accidental catches either inside or outside otter inhabited areas be handled discretely and without publicity.

That the CTA members cooperate with DOW in reporting violations of restrictions and illegal take or transport of otter. That trappers intentionally taking otter be prosecuted to the fullest extent of the law. A #330 Conibear baited with fish is a good indication of that.

CTA would invite a joint effort with the DOW to accomplish the following:

Improvement of furbearer management.

Changes in some season lengths and adjustment of opening dates.

Identification system for traps and an improved effort for catching and prosecuting trap thieves and people harassing traplines, setting traps and releasing catches.

Adjustment on the 48 hour trap check law in some areas.

A zone of the populated strip from Pueblo north to Fort Collins with a 24 hour check law.

Retain the 48 hour check law for the remainder of the state.

Under water or ice sets for beaver and muskrats with drowning devices or Conibear traps be lengthened to 5 days.

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5. Allowing the carcasses of varmints and furbearers taken previously for their fur to be utilized as bait, providing no chemical toxicants are used in conjunction with them. Inedible portions of small game taken legally should also be allowed as bait ie. cottontail skin and viscera.
6. Trapper success reporting system be refined.
7. Transportation and possession tags and permit system be adjusted, revised, or dropped, they may be unenforceable and/or obsolete.
8. Improve trapper education programs to improve efficiency, selectivity, and reduce trapping abuses.

The CTA looks forward to an amiable and cooperative effort with the DOW in the management of Colorado furbearers and varmints.

These are notes and proposed positions indicated by the CTA at the annual meeting. I hope we can support these and work out some clear understandings with DOW in this regard. I expect this meeting to be a real cordial one where we will learn a bunch. John Torres and Dick Denny are excellent and experienced biologists and will probably be the spokesmen for the Division.

Please read this over carefully and write out your suggestions, corrections and objectives and bring them with you April 14th or send them to Marion or myself.

The proposed agenda may or may not be the way things work out. I plan to send a copy to John Torres and if he approves it we will probably attempt to stick to it.

Best wishes,

Major L. Boddicker

Major L. Boddicker
Extension Wildlife Specialist
Animal Damage Control

MLB:deb

STATE OF COLORADO
DIVISION OF WILDLIFE
DEPARTMENT OF NATURAL RESOURCES

DATE: December 3, 1976

TO: Steve Bissell

FROM: Dan Miller, WCO, Hotchkiss *DM*

SUBJECT: River Otter introduction - Trapping restriction recommendations.

In consideration of our otter transplant on the Gunnison River this past August, I should like to offer the following thoughts and recommendations:

1. Regulations should be passed and added to the present trapping regulations to afford some protection for the otters.
2. Without the above there exists substantial risk that one or more otter will be accidentally or deliberately caught in conjunction with beaver and/or raccoon trapping within a 15 mile radius of the release site. (Note that within one week of the release several otter were observed moving down stream approx. 4 miles from the release site.)
 - a. There are approx. 10 known trappers who presently trap in the recommended restriction area for beaver, raccoon, and muskrats. Some of these trappers are presently using methods and traps which will catch and kill otters. The total number of trappers who use the above area may be as many as 30 trappers.
 - b. Most trappers I have contacted are willing to cooperate with any protective regulations we should pass.
 - c. Law enforcement would not be a problem as far as protective regulations are concerned and would emphasize and support our concern for re-establishment of endangered species. It would also allow some sort of recourse against those persons who may intentionally try to trap an otter.
 - d. As a thought, I wonder how it looks to have protective regulations against fishing in spawning areas for kokanee of which we have millions and on the other hand to have no protective regulations for the only nine (9) otters we have in the entire state. I'm surprised the public hasn't ask!
3. I therefore recommend that the wildlife commission pass the recommended trapping restrictions as specified in correspondence from Steve Bissell to Bob Tully dated August 16, 1976. These regulations should be passed as soon as possible and run for a period of two (2) years at which time these regulations and the otter situation can be evaluated. These restrictions are more than substantiated by the information which Dr. Major L. Boddicker researched and reported to the Colorado Trapping Association in a letter dated April 8, 1976.

cc: C.E. Till

APPENDIX 4_a

Public sightings of river otters in Northwest Colorado, 1972-1984.

DATE	LOCATION	# OF OTTERS	DESCRIPTION	BEHAVIOR	OBSERVER	SIGHTING EVALUATION
Summer 1983	Dillon Reservoir-Summit Co.T5SR77W	1	NA	NA	NA-info relayed by P.Goodman	NA
August 1983	Green Mtn Reservoir-Summit Co.T2SR79W	1	NA	NA	NA-info relayed by P.Goodman	NA
1982,1983	Williams Fork River, Grand Co near Henderson mill	NA	Tracks & associated sign	NA	Major Boddicker CSU Dept of Fishery & Wildlife,Ft.Collins CO 80523	Highly probable sighting. Observer is an experienced trapper who traps beaver in area.
1981	1 mile S of Eagle in beaver ponds T5SR84WS5	3	NA	NA	Trapper in area informed prospective property owner, who spoke to P.Goodman	NA
April 1980	Kremmling area-along the Colorado River-Grand CO T1NR80W	1	NA	Playing on ice	Lee Rottman DWM Kremmling-724-9367	NA
August 21,1976	Steamboat Lake vicinity, about 2 mi N W of Hahns Peak settlement-Routt Co T10NR85WS19	1	Doglike head, pug-rose, 30" long, slender	Observer was fly-fishing, watched animal for about 5 min from 100 yds	Joe Rohlas 2871 S Joy St Denver, CO 985-1145	Observer has failing eye sight and was unsure of identification
August 1975	Colorado River between Deep Creek and Sweetwater Creek (above Dotsero)-Eagle Co. T4SR86W	2	NA	NA	William B Colburn,3269 Swadley Wheat Ridge,CO	NA

DATE	LOCATION	# OF OTTERS	DESCRIPTION	BEHAVIOR	OBSERVER	SIGHTING EVALUATION
May 1985	Vermillion Creek, N of Yampa River & Dinosaur Nat'l Monument	1	NA	NA	Dan Bircco Craig CO 824-3289	NA
October 1974	Bear River Canyon, 3 mi E of Hayden, CO T6NR87W?	1	Animal was 75 ft away, healthy, fast in H ₂ O. Observer has seen tracks in snow on several trips to area.	Cautious but curious. Observed for 10 min	Arthur A. Valora 839 Colorado St Craig CO 81625	Possible, could be mink also.
August 1974	Blue River at Eagle Pass ranch, 5-8 mi S of Kremmling T1SR80W	4	Animals all the same size	Animals played and swam in river, ran along bank and jumped into water.	Lorie Roe, Denver Co, 355- 1150 (foreman on ranch: Bill Jones has seen otter several times)	Possible
July 11, 1974	Turrett Creek, N W of Dotsero T2SR87W?	1	Dark brown body 14" long with long round tail	Slid into beaver pond, caught large trout and climbed out of pond then slid down over beaver dam.	Tom Courier, Bill Mills Gypsum, CO 524-2601	Small size description= possible mink
July 1974	Blue River, 1 mi S of Breckenridge- Summit Co T7SR77W56	1	Seal-like face, dark tan body, round black eyes, total length 2 ft, 30 to 35 lbs.	Surfaced in pool behind boulder at observer's feet. Animal was curious & un- afraid. Sank into pool, swam underwater against current.	Donald L Duly Box 36, Masonville, CO 80541, 667- 2308	Probable river otter sighting

DATE	LOCATION	# OF OTTERS	DESCRIPTION	BEHAVIOR	OBSERVER	SIGHTING EVALUATION
June 21, 1974	Yellow Jacket Pass, N of Meeker	1	30" long	Crossed road in front of car, raised up on hind legs then went in brush	Waldo Lysek 8081 Ivanhoe Dupont, CO 80024	Unlikely
Early Spring 1974	Vaughn and Sable Lakes, White River area T2NR88WS22	NA	NA	NA	Cliff Schultz, Vern Upahr Craig, CO-824- 6073 or 3891	NA
October 1973	Rock Creek-E of Shoe & Stocking campground, W of Kremmling T2SR83WS6	1	NA	Playing along bank	Marvin Miller 7824 Reed St Arvada, CO 423-1577	NA
1973	3/4 mi S of junction of Bobtail & Steelman Creeks at 10,400 ft 15 mi S E of Parshall Williams Fork head- waters T3SR76W20	2	NA	Playing out of water among fallen trees about 25 ft away	David A Leach (guide/outfitter) P O Box 111 Empire, CO 80438 569-2308	NA
Summer 1973	Middle Fork Derby Creek at 10,000 ft near Benton's irri- gation ditch, W of Burns-Eagle Co T1SR86W?	1	NA	Larger than muskrat, smaller than beaver, was standing on bank- playing & darting around, unconcerned.	Maron Moser 229 S Lafayette 777-0809 -388-0907	
Spring 1973	Colorado River, 5 mi E of Hot Sulphur Springs T1NR77WS32	1	NA	60 ft away- on rock seen from Hwy 40, animal spooked, ran ft then dove into river & swam	Raymond M LeRoy Box 424 Hayden, CO 30 879-4637	

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DATE	LOCATION	# OF OTTERS	DESCRIPTION	BEHAVIOR	OBSERVER	SIGHTING EVALUATION
August 1972	E Fork Troublesome Creek 3 mi from Nat'l Forest boundary at 8500 ft T3NR79W27	2	NA	Pair in meadow went into water then onto bank and back in water	Richard R Davis 790 Mohawk Dr Boulder CO 494-2119	
Early Summer 1972	Meadow Creek, 8 to 10 mi above Tabernash T1NR75	2	Animals "fit description in Colorado Outdoors"	One hopped onto log then other did the same then went down into grass field filled with beaver dams. Observer was fishing beaver ponds (site of Meadow Creek reservoir now)	Ed Cline 891 Oakwood Ct Littleton, CO 80121	
April 1984	Yampa River near Yampa	2	Large, brown not beaver, muskrat or mink		Vema Schmitte Yampa, CO	Photos of tracks hard to identify-Possible
May 1984	Frazer River at Winter Park ski area parking lot	1	Large streamlined animal-otter ran up over bridge from Frazer River at ski area. Went back into water		Employee of Bill Wolvin-maintenance supervisor Winter Park ski area, CO	Both men are trappers-Probable

APPENDIX 4b

Public sightings of river otters in Grand County, Colorado in summer and fall 1984.

OTTER SIGHTINGS

SUMMER 1984

DATE	LOCATION	#OTTER IN GROUP	DESCRIPTION OF ACTIVITIES	OBSERVER INFORMATION			LOCAL?
				NAME	ADDRESS	AND PHONE NUMBER	
6/1/84	Winter Park parking lot-Frazer River culvert	2	Bounded up over bridge crossing river into river	Bill Wolvin-Maintenance Supervisor (report was given to him by employee = ex-trapper), Box 36, Winter Park Ski Area, Winter Park, CO 80482			Seems reliable report
6/11/84	Onahu Creek & RMNP road Grand Co, CO	2	In Beaver ponds	Employee of road crew.			Yes
6/10/84	Lake Shore Marina Lake Granby Grand Co, CO	2	Crippled foot hides under marina not much fear seen often	Manager (?) Lake Shore Marina			Yes
6/10/84	Lake Shore Marina Lake Granby Grand Co, CO	2		Jerry Berg-creel census, CDOW saw one on dock			yes
6/22/84	East Meadow of east inlet, 1.5m Grand Lake Grand Co, CO	4	Playing in meadow next to river	Visitors to RMNP told Rick Spitzer of USPS that they had seen animals playing-tails round and long, tapered -not muskrat or beaver. In East Meadow.			One confirmed by A.Dronkert 6/20/84
6/26/84	Tonahutu Creek W.Side RMNP, Grand 4 miles trail	2	Walking/waddling along trail next to river, seal-like body & round tail- looked like r.o. but had bulging stomach Ran down to H ₂ O	Robert Bryan-USPS Rocky Mountain Nat'l Park back-country ranger. --has seen otter sliding in winter --not muskrat or beaver, when saw people-sat on rock dove H ₂ O			Probable

OTTER SIGHTINGS

SUMMER 1984

DATE	LOCATION	#OTTER IN GROUP	DESCRIPTION OF ACTIVITIES	OBSERVER INFORMATION				LOCAL?
				NAME	ADDRESS	AND	PHONE NUMBER	
7/7/84	Chickaree Lake up Onahu Creek trail & to N	1	--12 noon-watched otters for 20-30 min. Sunning on log -lethargic-one put head on other swam across lake. Both seemed adults -but one slightly larger	Kent Schwarzkopf U.S.P.S. Rocky Mtn Nat'l Park Tail was long & cylindrical-not beaver				Yes M31 found 2 day later 1.5 m Onahu Creek
7/9/84 6:55 am	1/2 m. N of back rd turn-off for Granby from Hiway 34	5-6	One ran across rd east to west w/ characteristic humpbacked mvmt 4-5 followed.All similar size-not raccoons-larger than mink	Frank Drum	Grand Lake		627-8400	Epoke w/Mr Drum Probable
7/14/84	Chickaree Lake up Onahu trail RMNP West	2	Scratching, rolling, swimming-growling at observers	Kent Schmorzkopf Dave Jaspers	USPS CDOW		RMNP-Naturalist	yes
7/10/84	2/3 m Stillwater creek from Lake Granby-near barn /J/ ranch	+2- 4?	at night-playing in water of creek 2 feet long, not well seen	Chuck Alexander relayed to Gerry Claassen DWM	Slash J Slash Ranch Stillwater Creek- Lake Granby, Grand Co			?
7/20/84	Shadow Mtn Marina -cafe & islands	(6-)7	playing in water & on islands near boat	relayed to G.Claassen by manager S.M.C.				probable (Gclaassen)

OTTER SIGHTINGS

SUMMER 1984

DATE	LOCATION	#OTTER IN GROUP	DESCRIPTION OF ACTIVITIES	OBSERVER INFORMATION			LOCAL?
				NAME	ADDRESS	AND PHONE NUMBER	
7/18/84	Big Meadows RMNP	1	--- Scat & track along Tonahutu Creek in Big Meadow	Ana Dronkert			
Mid July 1984	Gore Pass road at Rock Creek & Lynx pass campground Rd. Sighting on S. Side at Gore pass road in beaver ponds	1	Swam in beaver ponds	Rose Morrison (father = trapper in B.C.-she knows otter)			
hunting season 1983	Same vicinity	1	slipped into rock creek & swam downstream	Rose Morrison (father = trapper in B.C.-she knows otter)			
Early August 1984	Shadow Mtn Res	6-7	swam around boat near east shore in early morning	Manager of Shadow Mtn Cafe			
August 1-14 1984	Big Meadows RMNP west side	1	numerous (6 to 10) reports of sight- ings by fishermen 1 observation by USPS ranger				M31 received in Big Meadows 9/9/84
Mid July to mid August 1984	Poudre Lake	1	running along bank swimming	seen by USPS employee 2-3 times			possible --could also be mink
Nov 16	Grand Lake	2	near diversion tunnel on east side swimming	Local trapper - positive of sighting			

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