

**FINAL REPORT
of the
RIVER OTTER RESEARCH PROJECT
on the
UPPER COLORADO RIVER BASIN
in and adjacent to
Rocky Mountain National Park, Colorado**

Conducted June, 1992 through June, 1997

**by
Judith K. Berg**



**Presented 23 June 1999
to
Rocky Mountain National Park, West Unit
Grand Lake, Colorado**

INTRODUCTION

The fossil record of the North American river otter, *Lutra canadensis*, or as taxonomic evidence evolves, *Lontra canadensis* (Lariviere and Walton 1998), in our country dates back into the early Irvingtonian age, or about one million years ago (Anderson 1984). The initial evidence comes from discoveries of fossils of river otters found in caves located in Maryland and Pennsylvania. These fossils were dated back to about 750,000 years ago. More recently, and the first documented evidence in the west, comes from Porcupine Cave in Park County, Colorado being explored by the Denver Museum of Natural History. The time period covered in this cave extends from 365,000 to 1.4 million years ago. In 1996 a fossil tooth of a river otter was discovered in this cave which was identified and dated by Dr. Elaine Anderson to be approximately 750,000 plus years ago.

Historically, the North American river otter has lived throughout the provinces in Canada and the states of the United States (Polechla 1990). Their numbers declined in the late 1800's and early 1900's due to pollution and urbanization (Lariviere and Walton 1998). A 1994 survey for North America conducted by Jan Reed-Smith (1994-1995) found the otters' status to be variable and ranged from being extirpated to being harvested. The river otter has been listed as a Colorado state endangered species since 1975.

Colorado Background

In the state of Colorado, some of the earliest published information showing evidence of the existence of river otters comes from the late 19th Century. Although Coues (1877) did not find direct evidence of otters when exploring in Colorado during the late 1800's he also did not deny their existence, due to the suitable habitat he found during his wanderings. He was able to examine a specimen collected from an area of Boulder, Colorado prior to the publishing of his book in 1877. According to Warren when referring to river otters 1910:190 "It is very rare in Colorado" which also means they did occur. Stevens (1989) found information that otters occurred in the Grand River vicinity of Grand Lake in 1908. (Note: During that period of time, the Grand River was named as a fork of the Colorado River.) Armstrong (1972) examined a specimen at the Denver Museum of Natural History which was from Grand County: Grand River. He also found records of occurrences from other drainages in Colorado dating back to the early 1900's.

After the 1908 report, there were only unsubstantiated reports of river otters in Colorado. There were many factors which probably led to their decline such as poor water quality from mine-waste, trapping (direct and indirect), and, more recently habitat destruction from industry and an increase in the human population along the otters' waterways (Mack 1985).

A statewide search was conducted by the Colorado Division of Wildlife in the early 1970's to determine if there were any self-sustaining populations of river otters in Colorado. The results were that there were not. So in 1975 the Colorado

Wildlife Commission declared them an endangered species. In 1974 Rocky Mountain National Park considered the river otter to be extirpated in the Park. State legislation now controlled many of the negatives associated with the decline of the river otter. It was also determined that suitable habitat occurred for their existence, and, if reintroduced, they could eventually become self-sustaining. An otter recovery team was then established. This team included the National Park Service, US Fish and Wildlife Service, US Forest Service, and Colorado Division of Wildlife. Their purpose was to establish a river otter recovery plan. For more information on the plan and its results, please refer to the State's records. Also, a plan for the restoration of river otters in Rocky Mountain National Park was proposed in 1976. Please refer to their records for details on this proposal.

Interagency agreements were established for a reintroduction of river otters in Colorado and the first major release site chosen for this reintroduction was the North Fork of the Colorado River as it flows through the Kawuneeche Valley of Rocky Mountain National Park. This site was determined to have suitable habitat and protection from incidental trapping of other species. The Colorado Division of Wildlife was able to obtain wild caught otters from Washington, Oregon, Wisconsin and Minnesota. Between 1978 and 1984, 41 river otters were released into the River of the Kawuneeche Valley (Stevens 1989). For more information on this reintroduction, please refer to Mack (1985) who, through the use of telemetry, was able to monitor some of those otters that were implanted with radio transmitters. He was able to obtain important information on their behavior and their movements during this reintroduction period.

River Otter Surveys

After Mack's (1985) study was completed, beginning in 1988, David Stevens, then biologist for Rocky Mountain National Park, conducted a limited otter survey of the central portion of the Kawuneeche Valley. His work brought forth the idea of conducting a more thorough survey of the entire area inside the Park during the winter season (Stevens 1989). The first official survey was conducted in the winter of 1989, the second in the winter of 1990, then every two years since. There was an estimate of 11 otters in 1989, 13 otters in 1990, 15 otters in 1992, then 16 or 17 otters during the next three surveys (Stevens 1989, 1990, 1992; Johnson 1994 and 1996; Berg personal communication, 1998). The surveys are usually conducted over a one or two day period on the last week end in February or the first week end in March. Teams of two people consisting of staff personnel from the Division of Wildlife and from Rocky Mountain National Park plus interested volunteers survey contiguous designated areas of the Colorado River and its drainages inside the Park, beginning at the same hour and on the same day. Prior to the beginning of the survey, a slide presentation describing what to look for, and a handout to guide them on their trek, are given to survey participants. The findings of the surveys are based on input from the teams consisting of otter sightings, but more likely, otter signs. The teams are asked to look for tracks, sets of tracks found together, and the direction of the tracks; slides; den sites; holes in the ice with other signs nearby that indicate otters; scat; and the approximate distance between any signs found. This information, along with written details, is indicated on the teams' assigned map location sheets. The information is then studied in detail and the

results, based on David Stevens' methodology, are compiled for the population estimates. Obviously, weather conditions can affect the survey since it can affect the signs. However, snow tracking has been shown to be an accurate method for estimating otter populations (Reid et al 1987) and, especially using David Stevens' methodology.

This researcher believes that 17 otters inside the surveyed areas of the Park are all this habitat can support. There is approximately 45 km of waterway surveyed (Stevens 1992) which would indicate just over one otter per 3 km of waterway. Melquist and Hornocker (1983) in Idaho found that the average population density for otter in their study area was one per 3.9 km of waterway. The findings in the Rocky Mountain National Park surveys are consistent with their results.

Findings from these surveys are not included in this project's results. Please refer to the official individual reports from the Park for the details.

Current Project

This project was not intended to give population estimates of river otters in the Park and surrounds since this has already been done with the winter otter surveys. The main purpose of this project was to contribute information on this state-endangered species which could be used to ensure its survival. To accomplish this purpose, the following goals were set forth:

1. Survey the study site throughout the seasons searching for river otters and their signs;
2. Compile information on sightings and signs taken from the public (visitors to the Park, nearby residents, and Park personnel), by the Park staff, and volunteers, plus that from my own research (Berg 1992, 1993, and 1994);
3. Collect and analyze otter scat to determine the otters' diet (Berg 1998);
4. Educate the public on the natural history of river otters through formal and informal programs inside the Park and other venues in the west (Berg 1994, 1996, and many presentations each year of the project).

STUDY AREA

The area where this study was conducted lies in the west-central part of the United States in the state of Colorado (40 deg 30 min N; 106 deg W). The specific location was on the west side of Rocky Mountain National Park and nearby portions of the Arapaho National Forest. The study area included a 26 km segment of the north fork of the Colorado River as it flows through the Kawuneeche Valley from Lulu City to Shadow Mountain Lake; lower portions of Baker Creek, Bowen Creek, Timber Creek, and Onahu Creek; East Inlet and North Inlet; Grand Lake, Shadow Mountain Lake, the channel between these two lakes, the River from Shadow Mountain Dam to Lake Granby, Lake Granby, Arapaho Creek between Lake Granby and Monarch Lake, and Monarch Lake (Fig. 1). The terrain was mountainous with valley habitat, ranging in elevations from 2530 m to 2750 m. The riparian vegetation along this portion of the Colorado River system is classified as shrub/grass with the main shrub being willows (*Salix* spp.) and lesser amounts of alder (*Alnus tenuifolia*) and dog birch (*Betula glandulosa*) plus many associated grasses (Mack 1985). There were stretches of lodgepole pine (*Pinus contorta*) in the study area, with either sparse or dense understory components. For more details on the physiographic characteristics, habitats, vegetation species, and the most common vertebrate species (except fish species listed below) and invertebrate species for this area, I refer you to Mack (1985). Snow in my study area normally began to accumulate by mid November with the area being snow free generally by the end of May. Snow accumulations and rainfall amounts varied over the course of the study. I refer you to the records of Rocky Mountain National Park for details on these weather elements. The temperatures during my trekking ranged from -25 to +25 deg. C.

The most common fish species in this segment of the Colorado River and its drainages, the recreational lakes, and the portions of Arapaho National Forest waterways are represented by four families (Carlson and Carlson 1982; Mack 1985): the Catostomidae family - white suckers (*Catostomus commersoni*), longnose sucker (*Catostomus catostomus*), and mountain sucker (*Catostomus platyrhynchus*); Salmonidae family - brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), kokanee salmon (*Oncorhynchus nerka*), lake trout (*Salvelinus namaycush*), cutthroat trout (*Salmo clarki*), mountain whitefish (*Prospium williamsoni*) and rainbow trout (*Salmo gairdneri*) - Cyprinidae family: speckled dace (*Rhinichthys osculus*); and Cottidae family - mottled sculpin (*Cottus bairdi*). An important invertebrate found in at least the southern portion of my study area was crayfish (*Orconectes* spp).

MATERIALS AND METHODS

Procedure

The study was conducted employing a naturalistic approach of walking the study site throughout the seasons. Telemetry was not used. A systematic approach to cover all the areas, as much as was humanly possible, was attempted in the beginning of the project. As the study progressed, more time was concentrated in those locations where otters or otter signs had been found. Except for Monarch Lake, the entire perimeter of the lakes was not covered. A total of 1652 field hours was spent in the study area.

My project began on 24 June 1992 and extended through June 1997. When walking the study site, all pertinent information was documented into a daily log. Photographs were taken of signs and of otters (when possible) and the habitat where they were found. The documentation included the date, time, weather conditions, area covered, otter habitat, time spent in the field, and any known extraneous variables. Specific signs documented were otter tracks, slides, scat (more detail in the next section), roll areas, tunnels through the grass (and snow), den sites and, during the winter months, breathe holes in the ice and holes in the ice where otters had come up from or gone into a waterway as indicated by other signs nearby. When signs were found, they were measured as was their distance from a waterway.



When otters were seen, their behavior was documented in addition to all the above information. Playback vocalizations were used on occasion from recordings I made at the Denver Zoo. No 'known' responses came from these playbacks.

Information on sightings and signs were documented by the volunteers and staff of the west unit of Rocky Mountain National Park from the visitors, as well as from their own observations. Some detailed accounts were given to indicate definite otter signs or sightings. The results of this input was checked out by the researcher when possible. The accumulation of this information, along with the details of the observations, is included in this report.

Scat Collection And Analysis

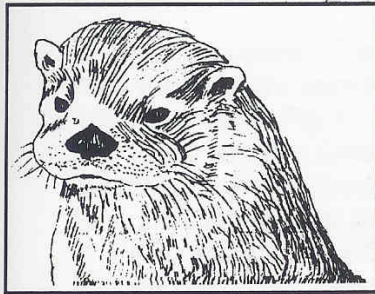
Scat was collected where found during the survey from April into December, 1993 through 1996. The three seasons when scat was collected and analyzed were: spring (21 March-20 June), summer (21 June-20 September) and autumn (21 September-20 December). Scat was rarely found during the winter months of

21 December through 20 March due to snow conditions that increased the difficulty of finding scat and the difficulty for me to get to many of my study site locations. This season, therefore, was underrepresented and is not included in the results. There were two portions of the study site where otters were known to use designated areas for their latrines and where scat was most often found. One location was in the River system, specifically the Shadow Mountain Dam spillway and the other was in the Arapaho National Forest, specifically Monarch Lake and Arapaho Creek (Fig. 1).

When collecting, each scat was individually bagged in pint sized baggies and labeled with information including date, location, scat condition, and substrate where found. Additional pertinent information was documented in the daily log so that all input could be coordinated. The scat was then taken home where it was either air dried for analysis or frozen for future analysis. When cleaning the scats, each individual scat was placed in its own glass jar which contained a solution of water and denture cleaner. This method was learned when visiting otter researcher Paul Yoxon (1996) on the Isle of Skye, Scotland. It worked great! Then the scats were washed through a fine-wired sieve, placed in their own individual containers and air dried for analysis. Fish were classified to family using vertebra, jaws, pharyngeal arch, and scales, which followed information from Conroy et al (1993) and my own fish collection. Crayfish exoskeletons and the general category of insects were easily identified. There were no mammal or bird bones or parts of any other fauna or flora found in the analyzed scat.

When there was evidence of more than one category of prey in an individual scat, all identifiable items from each prey were separated. The relative frequency of each prey category (i.e. the total number of occurrences of all prey items) was compared to the total number of items for all prey categories. The percentages totaled 100%

Representative parts of some of the scats were mounted on a board with labels indicating the date and location of the find for educational presentations.



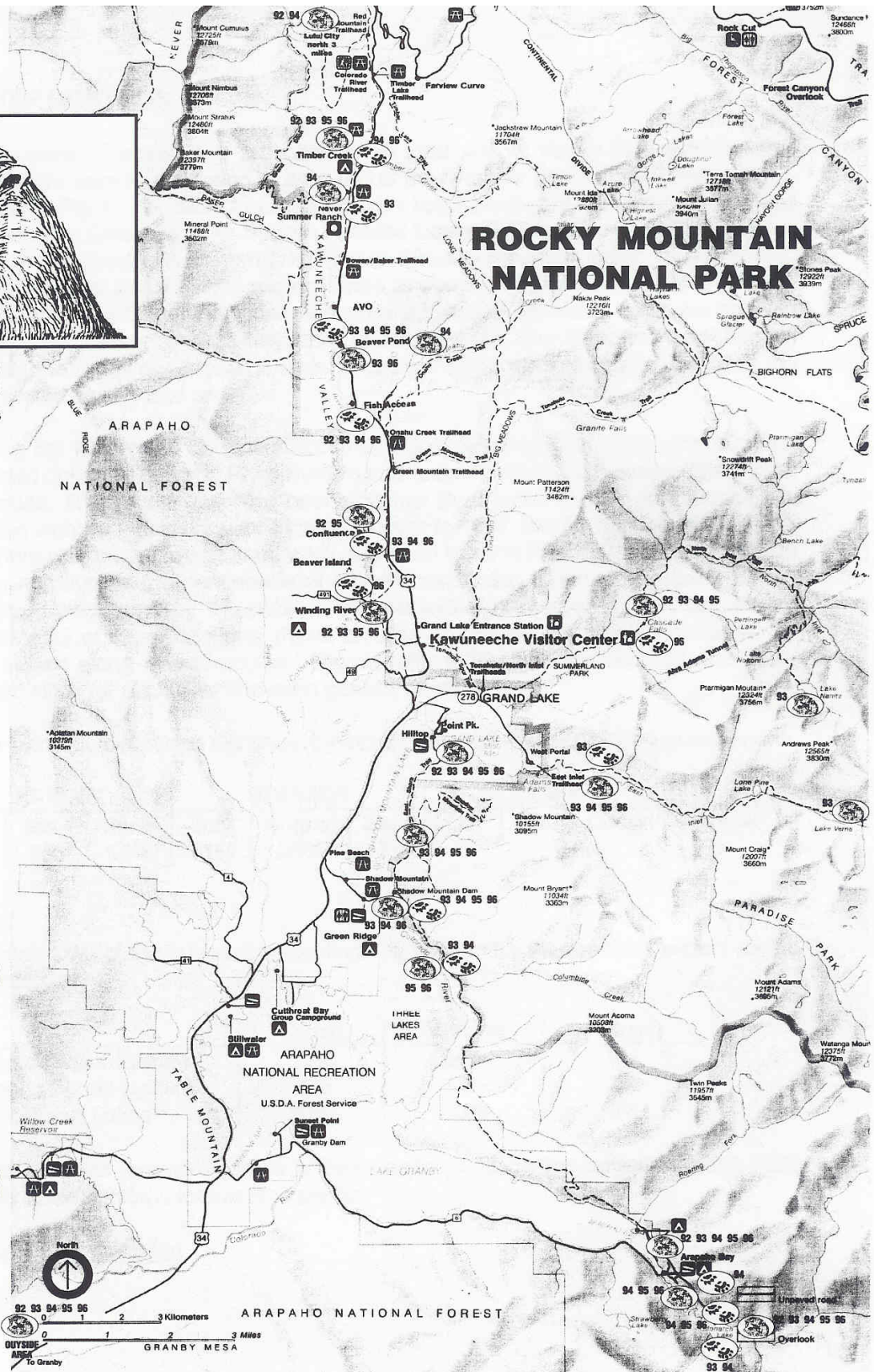
OTTER

Signs and Sightings
Rocky Mountain
National Park
1992-1996

Sightings



Signs



RESULTS

RIVER OTTER SIGHTINGS

There were 17 areas in or adjacent to the west side of Rocky Mountain National Park where otters were found during at least two of the five year periods 1992, 1993, 1994, 1995 and 1996 (Fig.1). For ease in identification, I have summarily collected these areas into "systems". The Colorado River System included locations along the approximate 26 km segment of the Colorado River from Lulu City to Shadow Mountain Lake; Onahu Creek; East Inlet; North Inlet; and the river segment from Shadow Mountain Lake to Lake Granby. The Recreational Lake System included Grand Lake, Shadow Mountain Lake, the channel between these two Lakes, Lake Granby, and Columbine Lake. The Arapaho Forest System included Arapaho Creek and Monarch Lake. There were also random locations outside the study area (noted as only one area).

During the 1994, 1996 and 1998 Rocky Mountain National Park winter otter surveys, which included only the Colorado River System and Arapaho Creek, signs were found in all surveyed areas. There were 120 river otter sightings throughout the five year period. An additional ten sightings from January through August in 1997 can be found in Appendix 1 but are not included on the map. Otters were also seen twice in May 1997 in ponds created from spring runoff near the confluence of Bowen and Baker Creeks. The accumulated sightings came from input by the public, Park personnel and myself. Otter signs were documented in 12 of these locations. (Note: an area or location can encompass a two- to three-mile stretch along a watercourse.) Please refer to Table 1 for the total number of sightings and signs for each year and each general location.

The cumulative reported sightings, by month, for 1992 through 1997, inclusive were:

SPRING			SUMMER			AUTUMN		
Apr 5%	May 9%	June 12%	July 11%	August 35%	Sept 17%	Oct 4%	Nov & Dec 4%	Jan & Mar 3%

A breakdown of the cumulative sightings by season for the research project period for each system is:

	Spring	Summer	Autumn
Colorado River System	13%	24%	6%
Arapaho Forest System	4%	18%	2%
Recreational Lakes	10%	20%	3%

Because there are more people in these systems during the summer months there are naturally more sightings for this time period.

Habitat where Otters Sighted

The accumulated breakdown of the general habitat where the sightings occurred showed that sixty-seven percent of these sightings came from areas where there was limited human access and upon which there were no motorized boats, as compared to 33% of the sightings which came from the recreational lakes. Of the 67%, at least 16% came from the Colorado River in areas in or adjacent to beaver ponds. In the limited-access areas there are beaver dams (and lodges) in portions of at least one of the lakes and in its drainage. Seven percent of these areas are directly affected by beaver activity. An additional 4% are beaver-affected in the other drainages. There may be additional locations which have indirect affects from beaver activity. Beavers create good wetland habitat for various species (Stuebner 1994), including river otters (Reid et al., 1988).

Times of Day when Otters Sighted

River otter sightings were reported from April through December during the 5-year period. River otters were also reported in January and March, 1997. Not all sightings came with a recorded time, but of those that did, they occurred at all hours of the day from 0600 to 2100. The greatest majority of sightings with reported times were between 0600 and 0900. When looking at times in three hour segments, the remainder of the sightings were relatively evenly distributed except for a drop between 1500 and 1800. Please refer to Figure 2 and Appendix 1.

	0600-0900	0900-1200	1200-1500	1500-1800	1800-2100
1992-1996	25	18	17	13	17
1997	2	1	2	0	1

Number of Otters Sighted.

Sightings of more than one otter were reported during April and May in Grand Lake and Shadow Mountain Lake, the channel between these two Lakes, and Arapaho Bay of Lake Granby. Additionally, in 1997, there were multiple-otter sightings in ponds created from spring runoff near Bowen and Baker Creeks (Fig. 1). There were eight sightings of from two to six otters during these two months (Table 2). Melting ice during this time period can influence groupings of otters. This is also the season of mating (one sighting) and the time when young from last season's mating are emerging from their natal den (one sighting). Refer to Appendix 1 for the details of the observations.

Beginning at the end of July through September there were 26 sightings of two to six otters. Seventeen of these sightings occurred in Arapaho Bay, Arapaho Creek and Monarch Lake (refer to Fig 1). Successful breeding had occurred in this general area since 1993, when documenting of this project was underway. It may have also occurred prior to this time period. Four other locations constituted the remainder of the reported 26 sightings: the ponds of Timber Creek Campground, Grand Lake near the East Inlet drainage, Shadow Mountain Lake, the area just below Shadow Mountain Dam, and in 1997, the area where the river enters Lake Granby (Table 2). The remainder of the reported 130 sightings were of one otter.

SIGNS OF RIVER OTTERS

Signs of otters found in the study area were evenly distributed during Spring, Summer and Fall for the four year period of 1993, 1994, 1995, and 1996 (I was still “getting my feet wet” in 1992 (both figuratively and literally)). Fewer signs were found during the winter months because of difficulty for the Researcher to survey areas during extreme cold and when falling snow covered any potential signs. From mid-December through mid-March fewer hours were spent in the field. Neither signs of more than one otter or more than one otter sign in the same immediate area (i.e. separated scats) were considered mutually exclusive for this compiling of data. There were 65 river otter signs documented during the four year period. Refer to Figure 1 for the general location of otter signs for each year and to Appendix 2 for the details of all signs for each location and each year. There were an additional 14 mutually exclusive signs documented in 1997 (Appendix 2) for a total of 79. The breakdown of all signs found for each month and each year can be seen in Table 3. Signs compiled for this documentation were scat, tracks, slides, haul outs (rolling areas), trails and dens. If a sign was not considered to be definitely made by an otter then it was not documented for data analysis. Following is a general breakdown of the number of signs by season for the four years plus 1997, for a total of 79 mutually exclusive signs. Fifty-two of the signs were found in the River system and 27 were found in the system of Monarch Lake and Arapaho Creek.

	1993 through 1996	1997
Winter	7	6
Spring	20	8
Summer	18	
Autumn	20	

There were many good potential den sites found in my study area, but if otter signs were not found near the den site or an otter was not seen going into or coming out from a den site then it was not documented. Otter signs were found at two boulder dens and otters were seen going into one log-jam den. In 1997, a den site was found in early spring in a cavity under two large trees with an opening to the River through a hole in the bank. Documented den sites had scat, tracks, slides, and/or rolling places near by. Only one documented den was in an area of heavy human traffic, especially fishermen. All four den sites were within ten feet from a waterway. Beaver lodges were thought to be used by otters in my study area but, they could not be definitely documented as otter den sites.

Measurements and photographs were taken of all signs. In three areas it was estimated that at least two otters were together, and in one area three otters were together. This determination was based on the differences in the sizes of tracks and differences in the width of slides (where slides occurred). For documentation of signs, each of the above was considered as one sign, even though more than one otter probably made the signs. This was also the case when more than one pile of scat or more than one other sign was found in the same immediate area. This approach to documenting numbers of signs was specifically designed to bias my data on the conservative side.

A Sampling Of Specific Signs Of Interest

19 November 1992	Location - Fish Access (Kawuneeche Curve) and south along River.	Habitat Conditions - There was a pattern of ice and open water on the River. Snow on land.
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There was a pattern of slides and tracks on the ice which began with a slide down an embankment. The slides were about 8" wide; the first slide was approximately 60 feet long followed by variable shorter length slides (50" to 100"). Tracks were 4" long and 2" to 3" wide. Distance between slides was 18" to 20". The signs went around open water which looked shallow. See Photo for pattern. The signs looked fresh. The area was checked on 20 and 21 November but there were no new signs.

23 November 1994	Location - Shadow Mountain Dam spillway and along River	Habitat Conditions - Open water on River from the dam. Snow on land.
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Otter activity was recent from fresh tracks, slides, rolling area and scats. Slides were 8" wide with tracks: one set 3" wide and 3 1/2" long; second set of tracks 2" wide and 2 1/2" long. A sighting of three otters playing in this area was seen on 24 November. This area has a known otter den and I collected scat in this area throughout the project.

30 November 1995	Location - Shadow Mountain Dam spillway and along River	Habitat Conditions - Open water on River from the dam. Snow on land.
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Otter activity was recent with slides and tracks in area. One slide was 6" wide with tracks of 2" wide by 2 1/2" long; one slide was 8" wide with tracks of 3" wide by 3 1/2" long. All five toes were evident in the tracks.

1 December 1995	Location - Shadow Mountain Dam spillway and along River	Habitat Conditions - Open water on River downstream from the dam. Snow on land.
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More activity indicated by signs. There were tracks with tail drag. The tracks were: 1 1/2" wide with 2 1/2" to 3" long; 2" wide and 4" long. There was a 12" long tail drag with 3" at base and 1" at tip. The slides were 6" wide and 7" wide.

7 April 1996	Location - Arapaho Creek upstream from Bay Bridge	Habitat Conditions - Ice on Creek with areas of open water.
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Recent otter activity from fresh signs. Possibly three animals. One slide was 9" wide with tracks of 2 1/2" wide by 3 1/2" to 4" long. This slide was approximately 40 feet

long then a patters of tracks, slide, then tracks. There were shorter length slides of 8" wide with tracks of 2" wide by 3 1/2" long; then another set of shorter length slides of 7" wide with tracks of 2" wide and 3 1/2" long.

I received a call from a person one week after our 24 February winter otter survey that he had seen three otters go into a boulder den site in this area. He said they vocalized at him.



10 August 1996

Location - Arapaho Creek out from dam at Monarch Lake.

Habitat Conditions - Muddy area near water next to old beaver lodge.

There were two sets of fresh tracks with size variation to indicate two different sized otters. One set of tracks was 3" wide by 4" long and 4" wide by 5" long (textbook size). The other set of tracks was 2" wide by 2 1/2" long and 3" wide by 3" long. There was a short slide on the bank leading to tracks in the mud which led into the water. Further along creek was a tunnel through grasses leading up the embankment to scat containing crayfish parts. I continued to follow the creek (where I found fresh bear tracks on a sandy location) to a

wetland area. I walked a short distance into the wetland and on a bank about 2 feet above the water were two otter tracks with matted down grasses (rolling area). This was as far as I could penetrate into this marshy area.

RIVER OTTER DIET

There were 98 otter scats collected and analyzed over the four year period of 1993 through 1996. Twenty-six were collected during the spring, 42 were collected during the summer months, and 30 were collected during the autumn. These scats were collected from eight different locations. Please refer to Figure 1 for the following locations: Beaver Pond (Jennings Bridge) and south along the River; Fish Access (Kawuneeche Curve), and south along River; Onahu Creek; East Inlet; the River at Shadow Mountain Dam; Arapaho Bay; Arapaho Creek; and Monarch Lake. Forty-five percent of the scats were collected from the River system and 55% were collected from Monarch Lake, Arapaho Creek, and Arapaho Bay of Lake Granby. When more than one scat was collected from the same location on the same date,

they were collected from different boulders, or different separated clumps, or different formed piles. Otters were sighted at the same approximate location or within a one to two mile stretch from where the scat was collected.

Substrate Where Found

Fifty percent of the scats were found on small or large boulders either jutting out into the water, or on the shoreline, or up to 30 feet inland from a waterway. Locations where scats were found on this substrate were: Shadow Mountain Dam and along the River; Arapaho Bay; Arapaho Creek between Lake Granby and Monarch Lake; and Monarch Lake. Forty one percent of the scats were found on the ground either next to a waterway (including that frozen in snow) or up to 30 feet inland from a waterway.



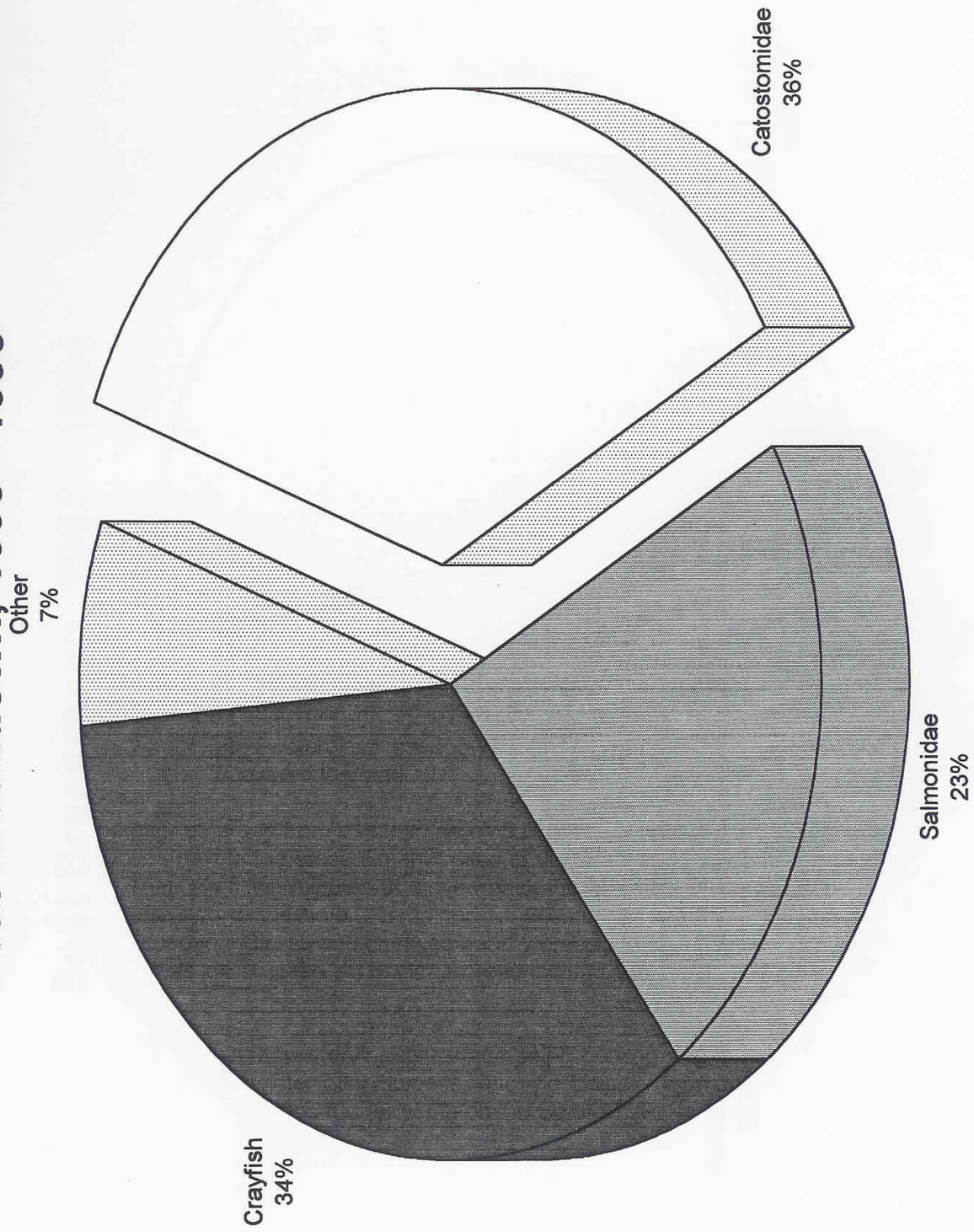
Scat was found on this substrate in all eight locations where collected except Arapaho Bay. Nine percent of the scats came from logs jutting out into a waterway. Even though all logs were checked on my treks, scat was found only in sections of Monarch Lake on this substrate.

Scat Analysis

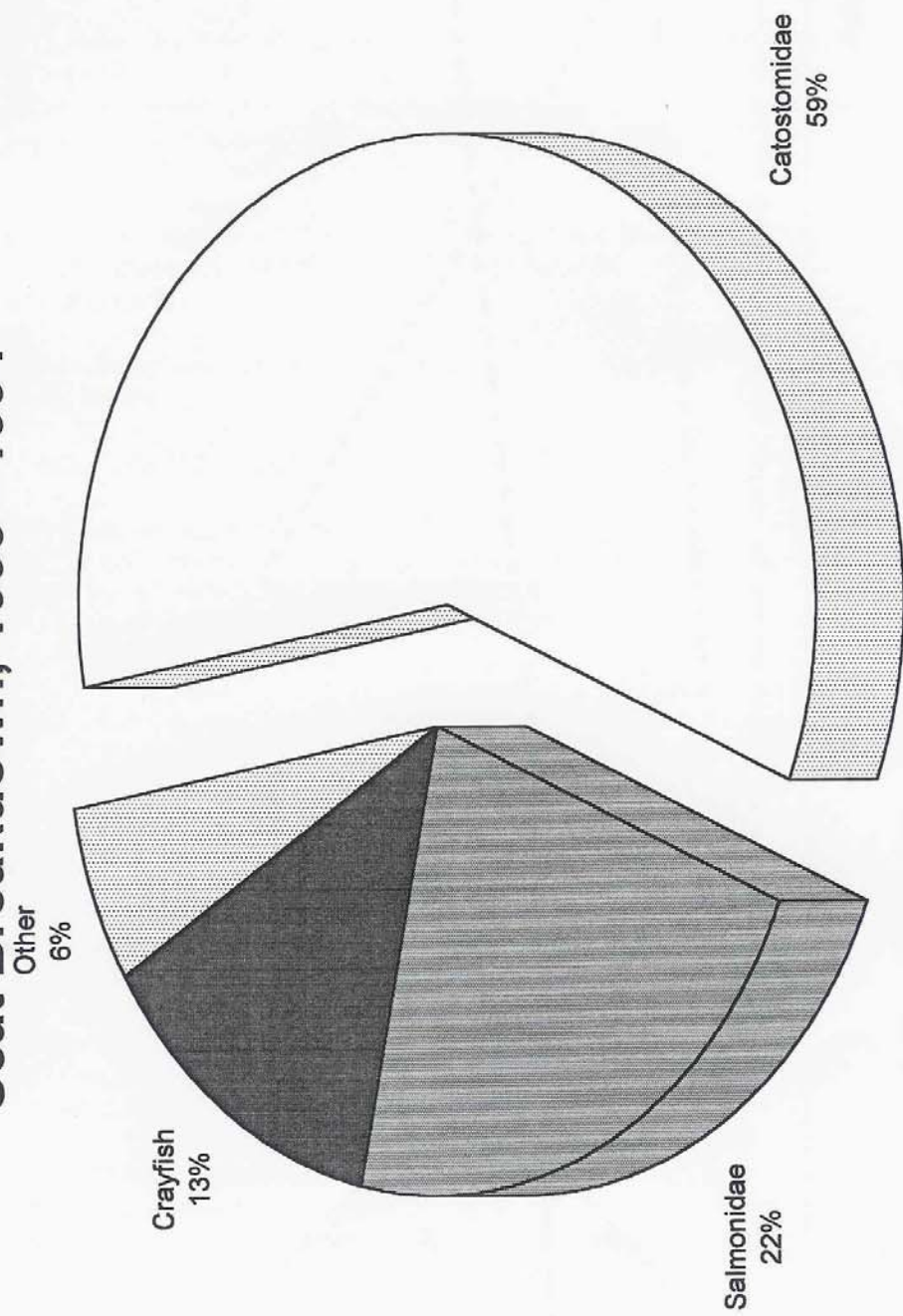
Fish were identified only as to family. Families of fish were identified using vertebra, upper and lower jaws, pharyngeal arch, and scales. This analysis followed Convoy, Watt, Webb and Jones (1993) and the researcher's own fish collection. Invertebrates were primarily crayfish, which were easily identified. Insect parts were rare.

Species from two families of fish dominated the river otter's diet through the four-year period: Catostomidae, represented by three species; and Salmonidae, represented by seven species. The number of fish species in the study area is primarily from Mack (1985). Crustaceans, represented by crayfish, were also a major source of the otter's diet. Rarely were fish families of Cyprinidae and

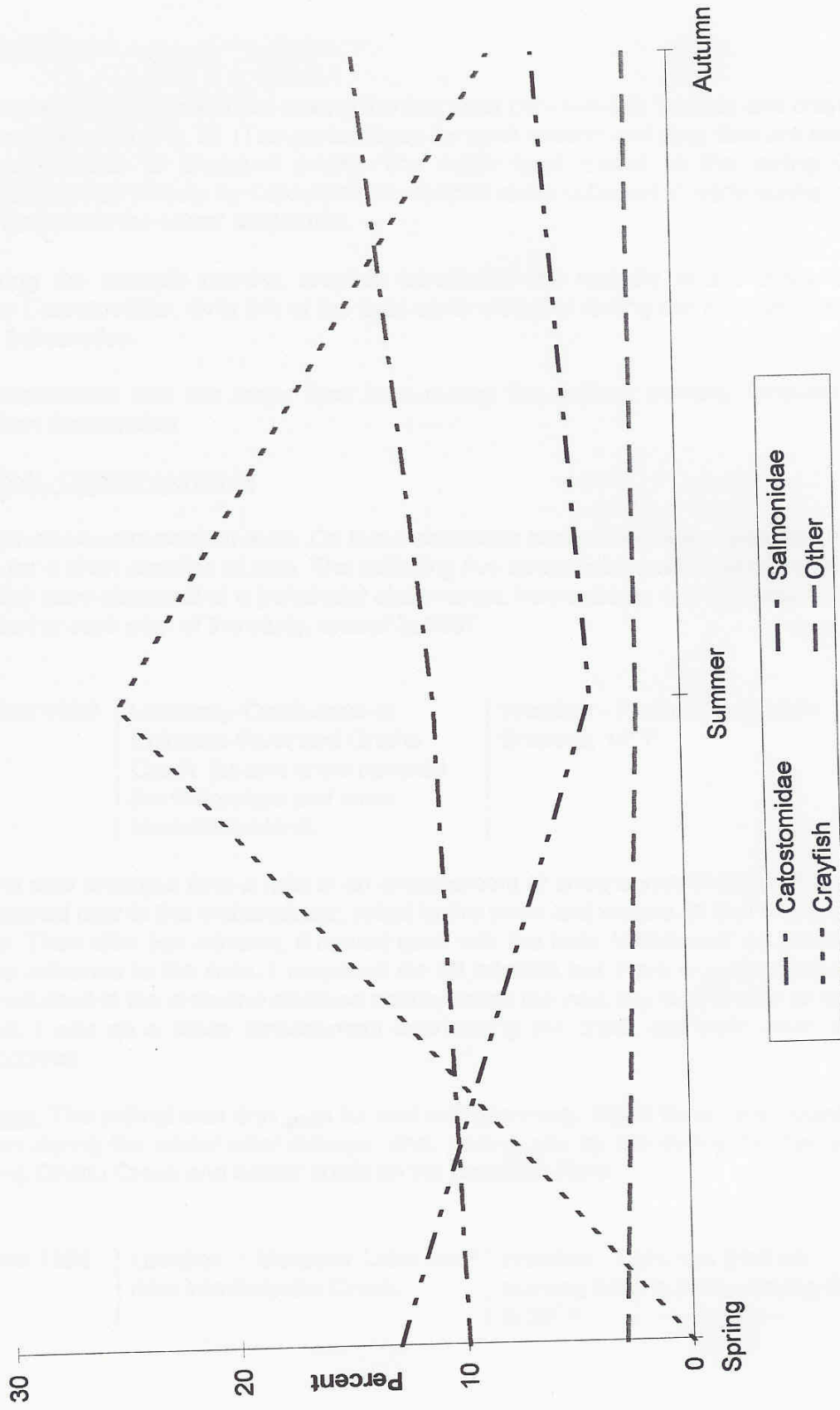
Scat Breakdown, 1993 - 1996



Scat Breakdown, 1993 - 1994



Prey Species by Season



Cottidae and rarely were insects identified in otter scat. No bird or mammal or amphibian bones were found in otter scat.

From an aggregation of all four years, 36% of the prey items found in otter scat were from the Catostomidae (sucker) family; 34% were from the Crustaceans (crayfish); 23% were from the Salmonidae (salmon & trout) family; and 7% were from the two other fish families and insects (Fig. 3). Compare the breakdown for 1993 and 1994 (Fig. 4) with that for 1993 through 1996 (Fig. 3). There may have been an increase in the crayfish population during 1995 and 1996 in the southern portion of the study site or an increase in the otters' taste for crayfish! They are easier to catch.

Seasonal trends

Seasonal trends are evident among the two most common fish families and crayfish found in the otter's diet (Fig. 5). (The percentages for each season and prey item are based on the total number of analyzed scats). The major food source in the spring was Salmonidae, followed closely by Catostomidae. Frozen scats collected in early spring may also have been from the otters' winter diet.

During the summer months, crayfish constituted the majority of the otters diet, followed by Catostomidae. Only 9% of the total scats collected during the summer months contained Salmonidae.

Catostomidae was the major food item during the autumn months, followed by Crayfish, then Salmonidae.

BEHAVIORAL OBSERVATIONS

River otters were seldom seen. On three occasions otters were seen swimming from a distance for a short duration of time. The following five observations were recorded when the animal(s) were observed at a [relatively] close range. Interestingly, one of these events occurred during each year of the study, except in 1997.

14 December 1992	Location - Confluence of Colorado River and Onahu Creek. Ice and snow covered the waterways and snow covered the land.	Weather - Partly cloudy; Light Breezes; 14° F.
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14:45 - One otter emerged from a hole in an embankment of snow about 15 feet in height. The otter moved next to the embankment, rolled in the snow and moved its feet and mouth over its fur. Then after two minutes, it moved back into the hole. Water and ice could be seen in the entrance to the hole. I remained for 90 minutes but there was no additional sighting. I returned to the area and checked nearby

areas the next day but no otter or signs were found. I was on a steep embankment overlooking the creek and river when the sighting occurred.

Interpretation: The animal was drying its fur and self-grooming. Signs have been found at this location during the winter otter surveys, and, periodically by me during the five year period along Onahu Creek and further south on the Colorado River.

2 September 1993	Location - Monarch Lake near dam into Arapaho Creek.	Weather - Light rain (Hail on morning trek) to partly cloudy; 40 to 36° F.
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17:50 - Three otters were seen on one of the logs stretched by chains across this location: one adult and two smaller otters, possibly 1993 offspring. Note: There had been a sighting of an adult with three smaller otters at 15:00 on 24 August in the same location.

Behavior: The three moved very swiftly into and under the water and then onto the log several times. The larger otter had a fish in its mouth and retained it during the entire period. The smaller otters [appeared] to be trying to take it from the larger one.

Interpretation: This may have been a stage where the young were learning to fish.

The three swam a short distance away to an area of the shore jugged into the water and appeared to be eating the fish. Then after about two minutes, they swam to an island in the lake close to the opposite shore with one otter retaining the fish in its mouth. The three disappeared from my view. The otters were in view 10 to 15 minutes. The fish was about 30 cm or one foot in length. Prior to my arrival in the area, I had been walking along the creek; when I came into view and was detected by the otters, one otter came up in the periscope posture and vocalized a snort sound. When the three were swimming they swam in an undulating or porpoise type movement.

I found two small pieces of fish flesh in area to which they had first swum; I assumed it was from the fish they had been eating. The next day I walked to the island, accessible at this time across some rocks, and found a boulder with fish bones which I later analyzed to be from Catostomidae (suckers).

I checked the general areas the next three days; there were no additional signs or sightings. Appendix 1 and 2 will show otters have been seen in Monarch Lake and Arapaho Creek throughout my study and by several people.

2 September 1994	Location - Arapaho Creek out from Monarch Lake	Weather. Clear; Light winds; 60's° F.
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10:05 - I walked on the WNW side of the Creek; as I began to approach a log jam next to a small island, I saw five river otters! Their sizes were two large, two small, and one in between. One otter came into the periscope posture and made airy,

snorty type sounds when I was first detected. The others were alerted but I remained very still and they soon continued their behaviors.

During the time they were in view, they were in the water, up on the logs, and up on the island. They were all active, but particularly so the two smaller otters. At one point when in the water, the two smaller otters looked like they were rolling together in a ball almost like a Ferris wheel. One otter moved onto the island and positioned itself on a log in the marking-eliminating postures. The two smaller otters moved onto logs next to the island, self-groomed, rolled on logs, and took a short rest.

10:30 - The group swam under the log jam and out of view. I sat for about 20 minutes with no further indication of the otters. I walked to the other side of the creek, then crossed the logs and onto the island. I thought they might be in an underground den location. I found tunnels through the grass and areas which looked like rolling places. I found one set of tracks in the mud which were 3 1/2" wide by 3" long. One tunnel in the grass led to a grass slide and then into the water.

11:20 - The otters again appeared near an old beaver lodge. They started swimming towards the island where I was now located, so I crouched down; they turned back to the lodge. They swam under water in the area of the lodge and then reappeared.

11:40 - The group swam to a large boulder nearby just out from the shore. When swimming they were in a line. One of the larger otters climbed onto the boulder first and positioned itself into the elimination-marking postures. The other otters followed and positioned their noses to the location of the first otter's elimination site, then each moved into the elimination-marking postures. The first otter then slid into the water; the other four followed in a line, with each sliding into the water one at a time. As they swam from the area, the two larger otters swam side by side followed by the other three swimming side by side. They remained in close proximity to each other. When swimming, their heads were above water most of the time, but they also made some porpoising movements.

11:50 - All the otters disappeared from my view as they rounded the curve in Arapaho Creek.

12:45 - When the otters did not return, I checked the boulder onto which they had moved and found five fresh (45 minutes old) otter scats plus some small fish bones, scales, and crayfish parts. When analyzed, the composition of the combined scat was: 60% Catostomidae; 30% Salmonidae; and 10% insect exoskeletons.

Interpretation: The otters were not seen fishing or eating food items during the time they were in view. When I discovered them they were in a period of activity. When they were out of view they could have been resting and/or foraging. The two smaller otters appeared to be the most active and engaged in play-type behaviors together. The "scenting" of the area on the boulder after the first otter's elimination behavior was a good indication of the lead otters activity.

Following is a general description of the reported sightings (and signs) for Arapaho Bay, Arapaho Creek, and Monarch Lake in 1994 prior to the above observation. For details see Appendix 1.

16 July - Two otters seen in Monarch Lake.

24 July - Two individual scats were found near the above sighting. Analysis: one was Castomidae; one was 65% Castomidae and 35% Crayfish.

24 July - Four or five otters were seen in Arapaho Bay.

26 July - Six individual scats were collected from a large boulder in Arapaho Bay. They were compact. Analysis: five were Crayfish parts; one was 65% Crayfish parts and 35% Castomidae.

1 August - Three otters (one adult and 2 young) were seen in Arapaho Creek near the log jam at about 08:30.

15 August - Three otters (one adult and 2 young) were seen in Arapaho Bay and in the area of the 24 July sighting.

22 August - Three otters (one adult and 2 young) were seen in Arapaho Creek below the Monarch Lake bridge-dam at 16:00.

2 September - Five otters (three adults and 2 young) were seen in Arapaho Creek at the log jam at 10:00. (See my above observation details.)

27 June 1995

Location - Arapaho Creek out
from the dam at Monarch Lake

Weather - Scattered high clouds;
Calm; Low 40's to 50°F

07:50 - I walked along the WNW side of the creek and saw one otter in the water near the old beaver lodge. The otter moved up onto a large boulder, self-groomed, assumed elimination-marking postures, and then returned to the water.

07:55 - The otter swam under water 17 seconds, emerged, swam under water another 15 seconds, and then came onto land. The otter rolled in vegetation on the shore near the water. Then it moved further up onto land and out of my view at 08:00.

08:10 - The otter returned into view and swam back to the same large boulder, onto which it climbed. It self-groomed with its mouth. It then went back into the water and swam towards the beaver lodge and out of view.

08:28 - The otter reappeared at the lodge and climbed up onto same boulder with a fish in its mouth that it ate.

08:43 - After eating the fish for 15 minutes, the otter returned to the water and swam to the beaver lodge. Again it disappeared from my view.

09:08 - The otter swam back into my view with its head above water. It again swam to and climbed up onto the boulder, rolling on its back. Then while moving about, it self groomed with its feet and mouth to its fur. It scratched and continued to groom with its feet.

09:19 - The otter laid down on the boulder in the sun.

09:29 - The otter was alerted and brought its head up, and then laid back down again.

09:40 - The otter again was alerted with its head up, and then laid back down again.

09:45 - The otter moved out of my view to the back side of the boulder. The otter did not reappear.

10:15 - I returned to the bridge and to the other side of the creek and sat behind the beaver lodge. No otter was seen.

11:47 - One muskrat swam to the other side of the beaver lodge from me then disappeared.

12:45 - I walked to areas of land where the otter had been seen rolling, but there were no visible signs. I continued to the nearby boulder where the otter had laid down, but the water was too deep to walk out to it.

I returned the next day after it had rained and checked areas of the creek for otters and signs but neither were seen.

Interpretation: The otter was in and out of my view for a two hour period. Below is a synopsis of the behaviors I observed.

- It rolled in the vegetation to dry its fur (Toweill and Tabor 1982).
- It self-groomed on the boulder by pulling its hairs through its teeth and digits/claws of its feet (IUCN/World Conservation Union 1992).
- It ate a fish of about 30 cm (12") in length on the boulder. Small fish are eaten in the water and larger fish are eaten on land (Kruuk 1995).
- It rested on the boulder but was alert. From this particular boulder, the otter could see all approaches by water and surrounding land.
- The short durations the otter was under water was an indication of the otter fishing. This has often been observed when otters hunt (Beckel 1990).

5 May 1996

Location: Monarch Lake and
Arapaho Creek out from the
dam.

Weather: Clear; Sunny; Light
breezes; 54° F.

11:25 - I was sitting near some otter tracks on WNW side of the creek. One otter swam in the creek near the log jam towards my location. It swam in porpoising postures, then smoothly with its head above water. It saw me and came up into the periscope posture (photo) and dove. I remained and sat quietly.

11:45 - One otter was again seen swimming in the creek on the opposite side from my location. It came up again in the periscope posture, looked towards me, then dove and was not seen again. I remained and sat quietly further back from water but the otter did not return.

I got a good photo of the periscope posture and the tracks which will be included in this report. The tracks measured 3" by 3". Their pattern was 4 tracks separated by 8", then 4 tracks. Some tracks came up from the water with the most distant set being 5 feet from the water.

That morning, I walked from the Arapaho campground to Monarch Lake and was the only human about. I did see bear tracks on road the lake.

7 May - I saw a beaver swimming in the same area where I had seen the otter. I did find some otter scat and three otter tracks in the same location near a tree. The tracks were 3" by 3". A rolling area with some fur-body marks appeared on land near the tracks. Also, I found some dried otter scat near the tree up to 10 feet from the water.

9 May - I again found new tracks of 3" by 3". This was an active area of at least one river otter. The ice was melting on the lake and areas of snow were also melting on land.

Note: I would have spent more time in this location but my husband and I were heading to the Isle of Skye in Scotland where I saw an otter, otter tracks, and otter scat, although from a different species. Also, I was able to converse with fellow otter researchers.

DISCUSSION

SIGHTINGS

River otters were seen on the west side of Rocky Mountain National Park and adjacent areas of Arapaho National Forest throughout the duration of the study. Sightings of animals by the public and the researcher, and discovery of signs primarily by the researcher, showed that otters were continuing to use their reintroduction site and had dispersed from the area (Fig 1). Although not all the public sightings may have truly been otters, detailed descriptions of the animal(s) in good view or for a duration of time or by experienced observers leads to an educated conclusion that most sightings were river otters. Descriptions of the habitat where the animals were seen reinforced the sightings. The use of otter sighting reports taken from the public is prevalent in a number of locations in our country. An advantage of taking reports from the public is its educational value. For Rocky Mountain National Park, it may create in people more of an awareness to the wildlife they are seeing and contribute to their involvement in the environment they are visiting. In turn, their input provides information to the Park on where and when wildlife are seen, and, in the current project, they can provide input on a state endangered species. I, along with people working at the information desk at the Visitors Center, provided flyers on the desk to alert people to the river otter project and thus encourage them to report their sightings. This flyer was also distributed to nearby businesses for the same purpose. In fact, various forms of education on river otters became an important part of this project. Education ranged from obtaining input from the flyers to impromptu meetings with people in the study area to informal and formal presentations to residents and visitors to the Park. Education is a key component in preserving our wildlife heritage.

The North Fork of the Colorado River runs through the Kawuneeche Valley in a winding pattern with mini-habitats having been carved out over time from the waterflow and beaver engineering. I discovered some of these mini-habitats or marshy locations particularly following years of heavy snow and during the spring runoff.

Marshy habitats connected with meandering streams provide good food-rich environments for otters, particularly those with minimal human disturbance (Melquist and Hornocker 1983). Most of the areas I found would not be accessed



by visitors to the Park, except fishermen, because they were not on marked trails. The areas where people most often reported sightings of otters were places to which they made short walks along marked trails to a waterway. Exceptions occurred in Lulu City, East Inlet, North Inlet, and the three wilderness lakes, travel to which takes some extended hiking, but along marked trails. River otters have a large home range dependent on the drainage system for the area (Melquist and Hornocker 1983). The length of the home range of 13 instrumented reintroduced otters in the Colorado River headwaters extended from three to 35 miles, dependent on the animal's sex and age and the season of the year (Mack, 1985). Otters are also very mobile and can travel from 1.7 to 6 miles per day (Melquist and Hornocker 1983). Thus, the chance of seeing an otter anywhere in its range is possible. To gain information on this elusive species, the more human eyes looking for them the better.

Habitat Selection

The habitat of the River system as it flows through the Kawuneeche Valley is primarily grass and/or shrub, mainly willow; stretches of lodgepole pine, some with dense and some with sparse understory components, are contained along the waterway. Most locations where I trekked along this water course provided good cover for otter movement across land bridges between waterways, rest, and other activities.

According to Melquist and Hornocker (1983), key components to habitat use by otters are related to their provision of shelter, food and water. This species feeds primarily on aquatic prey (see diet section), but because they are a semi-aquatic animal, they need good land habitat with appropriate cover for resting, shelter, movements across land, and various other behaviors. Riparian vegetation adjacent to waterways is a major component for good otter habitat (Melquist and Dronkert 1987). What species enriches these riparian habitats? Beavers. According to Melquist and Dronkert 1987:631 " ... several states have correlated good river otter habitat with the activities of beaver." This is also the case in sections of Canada (Reid et al 1988). Beavers create good foraging and denning sites for otters (Melquist and Hornocker 1983). In fact, beavers create

good habitat for a variety of species (Stuebner 1994) and are an important component for healthy willow growth (Singer et al 1998).



The Colorado River headwaters, as it flows through the Kawuneeche Valley, fluctuates in depth with some areas being too shallow for efficient foraging by otters. However, beaver activity enhances the River system for otters by providing ponds of depth backed up behind their dams; these,

in turn, enhance fish populations for foraging, and surrounding ground cover of tall grasses and dense willows for good refuge and resting sites (Mack and Lytle 1982; Dubuc et al 1990; and Reid et al 1994). In some locations along the River and its drainages beavers have created an extensive system of channels, with good water depth, interspersed with islands of land. This system makes it impossible for many non-aquatic species to reach and penetrate the land habitat. (I can attest to this!)

One location outside the Park where I had most of my otter sightings and found signs throughout my study seemed to provide all the otters' necessary living components. This stretch of five to six miles of waterway - Arapaho Bay, Arapaho Creek and Monarch Lake - provided land with portions of riparian habitat and portions of pine overstory with dense understory components (the latter except Arapaho Bay) for good cover. These waterways also contained diverse food sources. My otter sightings were most often in Arapaho Creek, in the vicinity of a log jam and an old beaver lodge (still active) with its associated water depth; and at a nearby land bridge between two portions of the creek interspersed with wetland areas. Latrines were found in this area up from the waterway, either on large boulders or on land with tunnels through the grass leading to them. The creek habitat in particular provided isolated areas for otters. There was a decrease in reported sightings of otters in this water system in 1996 compared to 1995, which may correspond with an increase in human activity on Monarch Lake during this summer tourist season. However, I did find more otter signs along the creek during 1996 than all other years combined. These otters may have adapted by becoming more elusive and/or more nocturnal as more people have discovered this sensually appealing location. Otters prefer drainages with minimal human impact (Melquist and Dronkert 1987). Young have been sighted in this system each year during the study. I hope the increase in popularity of this location won't have a negative impact on these otters' breeding success. Young in this climate would be born in April and early May after an approximate 12 month gestation. This long gestation period is due to an approximate 10 month delay of implantation following copulation (Liers 1951; Hamilton and Eadie 1964). They would begin emerging from their natal den six to eight weeks after birth (Liers 1951; Melquist and Hornocker 1983). This time period would correspond to the beginning of the tourist season for this location, but, because there are isolated areas along the creek combined with wetlands impenetrable to humans, this may insure their survivability for this water drainage. This area should continue to be monitored.

The climatic conditions during winter in Colorado, and other cold climates, can provide challenges for the otter. During this season otters have a preference to forage in open water. There are minimal open-water sites in most locations of my study site during winter. In the boreal system of Alberta Canada, Reid et al (1994) found that due to virtually no permanently open waters in the winter season, what became important to otters was the shoreline substrate, with its structure providing areas for dens above water levels where they would have access to air; and openings to water under the ice. In fact, otters may not even need to come above ground (Reid et al 1994). Shelves formed between the surface ice and water level make good travel corridors and resting sites. I think this might be the case in the lakes of my study area when the water levels drop during this season. The den sites I found seemed to fulfill the winter requirements. As for prey availability, I

have no concrete information. I can only assume this was not a problem. The scats I collected in early spring may have been from the winter diet. The analysis showed they consisted of Salmonidae followed by Castomidae. Mack and Lytles' study (1982) in the Colorado River headwaters and Melquist and Hornockers' study (1983) in Idaho found that Salmonids predominated in the winter otter diet.

Times of Day When Otters Were Sighted

The river otters in the current project were sighted at all hours of the day from 0600 to 2100. Although otters in many areas of the country are said to be most active at night and around dusk, diurnal activity can occur in undisturbed areas (Melquist and Dronkert 1987). During the spring and summer months in my study area, peak sightings were reported between 0600 and 0900. Recording of otter activity through the use of telemetry in Idaho showed a similar peak during these hours, in addition to night time activity, during these seasons (Melquist and Hornocker 1983). These findings were similar for the Colorado River headwaters during the summer and fall months following reintroduction of the instrumented otters (Mack and Lytle 1982). Later documentation by Mack (1985) showed more variance in active hours throughout the seasons. Otters' prey is available to them 24 hours a day, with some seasonal variations, so their active hours may relate more to various disturbances, such as those of man (Melquist and Hornocker 1983). During winter months in colder climates, otters are most active during daylight hours (Beckel-Kratz 1979; Melquist and Hornocker 1983; Mack 1985). This may relate not only to the colder temperatures but also to the fact there are fewer people in the otters' environment to disturb them at this time of year.

I also believe that an increase in human disturbance can create an increase in elusiveness by otters. They can, however, adapt to humans by finding undisturbed areas away from them in which to retreat. My study area provided many such areas where there was little human traffic even during the summer tourist season.

Number of Otters Sighted

River otters have been found to be more social than most other species of the Mustelidae family (Melquist and Hornocker 1983). Groupings of otters have been seen throughout the country, including in my study area. Particularly with the use of telemetry, the social composition of these otter groups can be determined. During the open water seasons in Canada, Reid et al (1994) found the two most frequent groupings of otters to be adult females with juveniles and adult males together. Males became more solitary during winter and throughout the breeding season. Melquist and Hornocker (1983) found that the basic social grouping of otters in Idaho was adult females with their juvenile offspring. They also found other groupings of otters that consisted primarily of related juveniles after separating from their mothers. In various sections of the country, there have been reports of up to seven unidentified adult size otters seen together; their sex or relatedness was not determined (Melquist and Dronkert 1987).

Flexibility in groupings of otters may have survival benefits (Melquist and Dronkert 1987). Groups of otters will travel and rest together (Lariviere and Walton 1998). Otters have been reported hunting in pairs (Sheldon and Toll 1964; Beckel 1990). Serfass (1995) observed four otters foraging together in an apparent cooperative fishing effort. Reid et al (1994) hypothesized from his adult male groupings that because they foraged together they may have enhanced their ability to capture prey. Sometimes the composition of groups of otters may be no more



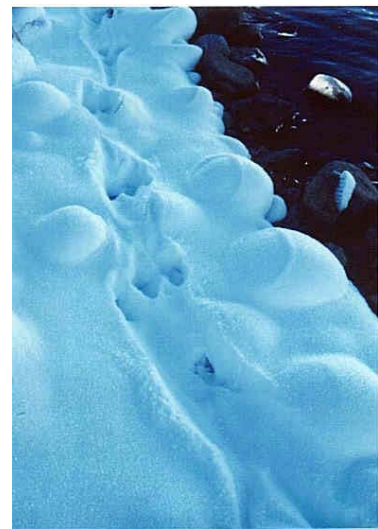
than the choice of the individuals in the groups (Shannon 1998). The habitat where the animal lives also plays a major role in their social structure. There is much variability and much about their behavior in the wild that we don't know.

OTTER SIGNS

Studying otters through their signs occurs throughout the world (IUCN Otter Specialist Group 1998)! In North America, river otter home ranges follow drainages (Melquist and Hornocker 1983), so Dubuc et al (1990) devised a habitat model, based on signs they found in a watershed, that provided evidence that otters were using the area. Much information can be obtained by finding the signs left by this elusive animal. Throughout my project I found enough signs left by (an) otter(s) to at least let me know they existed, tell me something about the habitat they were using, and reveal components of their behavior. Actually seeing an otter was an added bonus.

Sign: Slides

When an otter slides down an embankment of snow or mud or across the ice on a waterway, it holds its front feet back along its sides with its hind feet out behind in a "streamline arrangement" (Murie 1974). Tracks will be found at the beginning and end of a slide, unless it leads into the water. When an otter traverses level ground through heavy snow, it moves itself by pushing with its feet held underneath its body, so tracks will be found in this trough of snow. Otters will slide on snow and ice but also on slick mud embankments. (I inadvertently tried one of their slick mud slides. Splash!) Sliding can occur at any time of the year and has been considered a "favorite amusement" (Coues 1877). In his book published in 1909, Seton wrote several accounts of otters being observed



sliding down an embankment of snow and ice or mud. He stated that the sport was pursued by using the same slide more than once and with more than one otter engaging in the activity. John James Audubon, in the mid-1800s, wrote an account of such activities where he observed a pair of otters sliding down a "soap-like" muddy surface of an embankment 22 times each, stopping only when they detected their human observer. This sliding behavior was written from accounts in the eastern sections of North America and southern United States (Seton 1909). There also have been some later accounts of this behavior in these same areas, and in the mid-sections of the United States (Liers 1951 and 1953; Murie 1974). Liers, in his book *An Otter's Story* (1953), described a family of otters in Michigan sliding over and over again down a mud-slick embankment. He stated that they would slide down the embankment and into the water, then swim to the bank, run up to the top of the embankment, and slide down again. He said that the more they slid the wetter and slicker the slide became. (Sounds like fun!) Seton, when discussing otters and their slides, stated that 1909:834 "...this is the only case I know of among American quadrupeds where the entire race, young and old, unite to keep up an institution that is not connected in any way with the instincts of feeding, fighting, or multiplying, but is simply maintained as an amusement." However, even in this time period, the 'otter toboggan' behavior was not observed, or at least not reported, in western North America. In more recent literature, this behavior continues to be rare for this part of the country (Melquist and Hornocker 1983).



I was never fortunate to observe otters making a slide but did find evidence following the event. In most cases only one slide was detected in an area - across ice on the river, through snow on land, or on a muddy embankment - and was moving in one direction as determined from the direction of the tracks found in combination with the slide. The documented slides either led to water or appeared to be a method of movement across the ice and snow. Sliding across ice and snow in the colder climates is a means of travel (Melquist and Hornocker 1983). On two occasions I did find indications of more than one otter making a slide. In one location I found two slides together of different widths containing tracks of different dimensions indicating two otters. In another location I found three slides together, each of a different width, indicating three otters. In both cases the slides led down an embankment and to open water. I can't state from the results of what I saw that it was the 'fun' behavior that others had observed in the above reports, but I can certainly conjecture that the otters enjoyed their adventure.

Sign: Tracks



River otters have five toes on both the forefeet and the hindfeet with partial webbing between their digits (Nowak and Paradiso 1983). Their movements on land consist of walking, running, bounding, or sliding (Lariviere and Walton 1998). When walking or running there is an alternating movement of the opposite forelimbs and hind limbs (Toweill and Tabor 1982). The track pattern during this is either a 3-4 pattern or a 4-4 pattern (Rezendes 1992). When bounding, the animal hits the ground first with its front feet, with the hind feet lifted, then landing its hind feet where the front feet had first touched the ground, thus leaving a two-two pattern (Rezendes 1992; Lariviere and Walton 1998).



The size of the tracks are variable; a good general rule for an otter is the front feet 2-3 inches wide and 3-4 inches long, and the hind feet 3- 4 inches wide and 4-5 inches long (Forrest 1988). Webbing may or may not be apparent in a track, depending on the movement pattern and the substrate.

Most often from my experience, all five toes showed in a track (see photos). Please see Appendix 2 for details from my project.

Sign: Dens And Resting Sites

River otters do not excavate their own dens (Toweill and Tabor 1982), but an important aspect of the dens they choose is what is best for resting and denning (Melquist and Dronkert 1987). They particularly choose sites which are sheltered,



thus providing protection and seclusion (Melquist and Hornocker 1983). In Idaho, instrumented otters collectively used 15 different kinds of resting and denning sites (Melquist and Hornocker 1983). Denning and resting sites used by otters include log jams, hollow trees or logs, rock formations, and other natural areas; man made structures, such as boat houses and boat docks; and dens dug by

other species (Toweill and Tabor 1982; Melquist and Hornocker 1983; Melquist and Dronkert 1987). Although they don't dig their own dens, in Idaho, where an otter used an existing den that had been created by another species, over a period of time the otter enlarged it (Melquist and Hornocker 1983).

One species whose dens were used most often by otters was beavers. Mack and Lytle (1982) found that the instrumented reintroduced otters in the Colorado River headwaters primarily used beaver-constructed dens, which included lodges and bank dens. Melquist and Hornocker (1983) found that in Idaho, their instrumented otters used beaver bank dens and lodges more often than any other site.

I did not actually see otters using beaver den sites, but there was an indication of an old beaver lodge being used as a resting site near my five otter observation. Otters spent time in the area of the lodge and disappeared from my view in that location. I did find signs near den sites at two different rock formations, at a log jam, and at a cavity under two large trees with a nearby hole in the bank leading to the waterway. My findings were consistent with the above mentioned references.



DIET

A chapter on the North American river otter for the IUCN Otter Action Plan will be published in the year 2000. This chapter will include a section on otter diet (Berg 2000). Applicable information from this work will be incorporated into this discussion.

The diet of river otters in North America has been aptly reviewed by Toweill and Tabor (1982) and later by Melquist and Dronkert (1987). These authors reviewed published data covering North America from the east coast to the west coast. Since the above reviews, more recent data has been published by Manning (1990), Serfass et al (1990), Mack (1994), Reid et al (1994) and Berg (1998). The results of research conducted in North America have shown that the river otter diet is composed primarily of fish. There are seasonal variations.

Although all authors agree that river otters are opportunistic feeders, according to Melquist and Dronkert 1987:633 "River otters consume prey that provide adequate caloric benefits from a minimal amount of energy expenditure." This corroborates Toweill and Tabor 1983:695, who stated that "...abundant



slow-swimming fish species will be selected as food by otters more often than their abundance in the water would indicate." Slow-moving fish include the forage or non game families such as Catostomidae and Cyprinidae. This is further substantiated by Melquist and Dronkert's review and by studies subsequently published: Manning 1990; Serfass et al 1990; Mack 1994; Reid et al 1994; and

Berg 1998. Game fish such as the Salmonidae family comprise a smaller portion of the otters' diet and are taken in lesser numbers than their abundance in the waters (Toweill and Tabor 1982; Melquist and Dronkert 1987).

Other prey consumed by otters include crustaceans, mollusks, amphibians, insects, birds, and small mammals. Only crustaceans, crayfish, and insects were analyzed in scat from my project. Across North America where and when crustaceans are locally abundant, especially crayfish, otters may consume them to a greater degree. Crayfish are an important part of their diet during the summer months in the interior regions and western coast (Manning 1990; Serfass et al 1990; Mack 1994; and Berg 1998), and during the winter months in northeastern Alberta, Canada (Reid et al 1994) and in the southeastern United States (Chabreck

et al 1982; Cooley 1987). In the beaver swamps of Arkansas, crayfish dominate their diet in both winter and spring (Tumlison and Karnes 1987). That crayfish is a prominent seasonal part of the otters' diet in the current project is not unusual. Why there was an increase of crayfish found in analyzed scat during the last two years of the project (1995 and 1996) is unknown. One possibility is that there was an increase in the crayfish population in the southern portion of my study site, which is where crayfish parts were most often found in the analyzed scat.

Otters feed on insects as both primary prey and secondary prey from consumed fish. Although insects constituted a very small portion of the analyzed scat in the current project, this is not always the case. Reid et al (1994), studying otter diet in northeastern Alberta Canada, found insects to be the second most heavily eaten prey group behind fish, especially during the summer months. Most insects were from the families Odonata followed by Coleoptera (Reid et al 1994). Families of insects were not identified in the current project.

Neither amphibians or birds or mammals were found in the scat analysis of my project. However, amphibians, particularly frogs, have been identified in otter scat, especially in the eastern half of the United states (Toweill and Tabor 1983; Melquist and Dronkert 1987). Avian species are a food item in some of the coastal regions of the United States and portions of Canada. These include waterfowl and some colonial nesting birds (Toweill and Tabor 1982; Quinlan 1983; Melquist and Dronkert 1987; and Reid et al 1994). This may be a seasonal preference when particular species are available. Mammals have been reported infrequently in otters' diet and are not a major food source (Melquist and Dronkert 1987; Serfass et al 1990; and Reid et al 1994). They most often include small mammals or riparian species.

According to Serfass et al (1990), adult otters can consume 1 - 1.5 kg of fish per day. In the inland areas of the United States, otters consumed various aquatic prey ranging from 2 - 50cm in length with prey from the major fish families being larger than 30cm (Melquist and Hornocker 1983). Unfortunately, I do not have information on size of fish taken during my project. On the two occasions when I saw an adult otter with a fish, it appeared to be around 30cm (12"). Otters are known to take larger fish on land to eat whereas smaller fish are eaten in the water (). There are ways to determine fish size from parts found in scat but, I did not have the time for this analysis. This could be an interesting project for a researcher along with determining the seasonal variation in the size of prey taken.

The non game fish species from the Catostomidae family dominated the otter's diet in the current project. In fact, game fish populations (i.e. Salmonidae) may actually benefit from the otters' predation on the slower moving non game forage species (Serfass et al 1990).

The findings on otter diet in my study site are consistent with projects conducted in other portions of North America (Toweill and Tabor 1982; Melquist and Dronkert 1987; Manning 1990; Serfass 1990; Mack 1994; Reid et al 1994).

BEHAVIOR

River otters are known to communicate primarily through auditory (vocalizations), olfactory (scent-marking), and tactile (physical contact) signals. Their vision is not acute but is adapted for vision in water, at least when the water is clear and on a sunny day (Chanin 1993). On land, they are thought to detect movement at a 'considerable' distance (Toweill and Tabor 1983). Their visual signals, at least facial expressions, are said to be very limited (Beckel-Kratz 1977; Toweill and Tabor 1983).

The pelage on the ventral surface of the otter is lighter than that found dorsally and can be a very distinct different color. The pelage varies from light brown to black, with lighter color particularly on the throat, chin and lips (Lariviere and Walton 1998). In fact, the lower jaw and throat may be whitish in color (Nowak and Paradiso 1983). When in the water, the



animals I saw come up into the periscope posture in response to my presence, displayed this visual signal in combination with a vocal signal. Could this posture and contrast in color of the animals pelage on the head and throat be a visual signal to other otters? A slight movement of the head enhances this display. I am particularly curious about this; it parallels a species of ungulate, on which I conducted prior work, whose lighter-colored throat patch became prominent during a 'nose-up display' and head movement, thus flashing its signal. This was determined to serve an expressive function (Berg 1990). In other species of ungulates with lighter colored throat patches, this display was determined to be a part of their threat, dominance and courtship behaviors (Walther 1984). Could this possibly be the case for the otter? Many unanswered questions remain!

Vocalizations

River otters are known to make a variety of sounds, primarily grunts, chirps, snorts, moans and screams (Beckel-Kratz 1977). I attempted to play back some recordings of a variety of these sounds made at the Denver Zoo to the otters in my study area, but did not 'see or hear' any response. This use of sounds was intended initiate a curiosity response and bring an otter 'out of hiding' to check on the vocalizing animal. This did not happen, and, of course, there may not have been any otters within range of the sounds, or, I may not have used the right sounds! Playbacks are known to work well with avian species (Lehner 1979). From my prior research on mammals residing in large enclosures in an atypical captive state, I found that individuals of a species would initially respond to playbacks, then, within a short duration of sounds - break - sounds, the individuals would

habituate and make no observable response. However, according to Gnoli and Prigioni (1995), playbacks have been successful in the Indian smooth otter (*Lutra perspicillata*). They further suggested that by knowing the details of a species vocal communication the pertinent sounds could be used for field surveys. This suggests another interesting research project for river otters.

The only sound I heard during the current project was the snort. It was heard on three separate occasions when I first entered an area of otters and was apparently initially seen. The snort has been described for the European otter (*Lutra lutra*) as a 'blow', which is a noisy sound whose frequency ranges from 0 to 10 kHz or higher (Gnoli and Prigioni 1995). Other species are known to make 'blow' or snort sounds, including the African elephants, in which Berg (1983) described this sound as a noise whose dominant frequency ranged throughout the sound. One behavioral context of this sound was alerting to external stimuli. In the river otter it was emitted in response to human disturbance (Beckel-Kratz 1977); in the European otter it was also a response to seeing a human (Gnoli and Prigioni 1995). Humans could be considered an external stimuli. This sound shouldn't be used in playbacks for otters!

When in the water, the European otter comes up into a periscope position and makes the blow or snort sound (Gnoli and Prigioni 1995). This was the posture (see visual signal paragraph) and the sound I also observed in North American river otters.

Grooming

This behavior occurs in a variety of species, including the river otter (Beckel-Kratz 1977; Melquist and Hornocker 1983), either as mutual grooming, sometimes called allogrooming, or as self-grooming, sometimes called autogrooming (Wilson 1977; Walther 1984; Berg 1992). In captive otters, both types of grooming occur. In the free living otters in my study area, I observed only self-grooming. This was the case also in Idaho (Melquist and Hornocker 1983). This doesn't mean that mutual grooming doesn't occur; it would be expected, particularly among a female and her young.

River otters have very densely packed fur consisting of outer guard hairs (average 23.8mm in length) and finer hairs of underfur. The fur in the mid-back section is ca. 57,833 hairs/cm² or approximately 373,115 hairs/in² (Laviviere and Walton 1998). Otters lack a layer of fat, unlike some mammals who spend time in the water (Vaughan 1972). Therefore, they need to maintain the insulating and waterproofing quality of their fur (Melquist and Dronkert 1987). Otters accomplish this through grooming their fur and by rubbing and rolling on land or logs, which I observed in four otters.

The otter grooms its fur by pulling it's fur through its mouth, particularly its incisors, or through the claws of its digits (IUCN/World Conservation Union 1992). Before they are worn, the otter's incisors have a slight notch in them assists with the grooming process. This behavior, in combination with rolling and rubbing their bodies in the snow (one observation) or in the vegetation (one observation) or on

logs (one observation), helps keep the animal clean, warm, and dry. Sometimes rolling areas were located near a latrine, as was also the case in Idaho (Melquist and Hornocker 1983). Another aid to an otter keeping warm is its high metabolic rate which, according to Chanin (1993), is 20% higher than animals of a similar size that do not forage in the water. He further states that otters still can't stay in the water for too long, but must come out and perform the above behaviors.

FIVE OTTER OBSERVATION

The composition of this group I observed will never be known. From information included in the Results Section based on sightings in this area, I would say the two smaller otters were the offspring of 1994 and were with their mother. The other two otters appeared larger than the former three, so they may have been males. Male otters average 5% larger than females (Lariviere and Walton 1998) and are up to 17% heavier (Melquist and Hornocker 1983). This combination may not be typical in the otter society, but flexibility in grouping behavior may have survival benefits (Melquist and Dronkert 1987). The activity and play-type behaviors of the two smaller otters were observed on occasion by Melquist and Hornocker (1983). A line of otters moving onto and off from a large boulder was seen in the wild by Beckel-Krats 1977:29 and, as she stated "as soon as one enters the water, all others follow." The other behavior of this group I observed on the boulder, eliminating and/or scent-marking by the lead otter followed by the other otters, was observed by Beckel-Kratz (1977) in captivity. The behavior prior to elimination and/or scent-marking was called the 'dance'; it was aptly named because it looked like an otter dance. Beckel-Kratz referred to this behavior as a visual signal in which 1977:31 "an individual investigates the latrine, then turns around and alternately 'treds' both back feet for about 10 steps, holding the tail high and then defecates, urinates, and/or scent-marks on the latrine." This behavior, which appeared to attract other otters as a visual signal, was the case in my observation.

THREE OTTER OBSERVATION

In the coastal areas of Shetland, Scotland, research conducted by Hans Kruuk (1995) found many variations in the otters' family life, particularly their foraging behaviors. Basically, the mother brings fish to her cubs during the early months of life. The fish she brings to them are larger than those she catches for herself. The cubs follow and dive with her when they are about four or five months of age. They may learn how to fish by following and observing her behavior. They may also learn how to forage by the 'trial and error' learning method as suggested by Scot Shannon (personal communication) from his fifteen years of research conducted in a western coastal area of the United States. Play-type behavior by young otters with a prey may also assist in the proficiency of catching prey (Kruuk 1995). In fact, the long period of time young otters remain dependent on their mothers (10 to 16 months) may correspond to the long learning period for them to become proficient in the difficult task of catching fish (Kruuk 1995).

The adult otter with two young I observed may have been at the stage where the young were following and diving with the adult, who had caught a large fish prior to my arrival. The young would have been four to five months of age at this time. The playful type of behavior of chasing, diving and attempting to take the fish from the adult would have been an important stage of their learning process.

CONCLUSIONS

1. The results of my project conducted in the upper Colorado River basin of Rocky Mountain National Park and surrounding areas of Arapaho National Forest showed that river otters are continuing to use their reintroduction site and have dispersed into neighboring drainages (Fig. 1). Winter otter surveys conducted by the Park every two years continue to show a stable population estimated at 16 or 17 otters inside the Park boundaries. Based on my accumulated information, I conclude that this reintroduction continues to show successful results.
2. The sightings of juvenile otters with an adult during 1993, 1994, 1995 and 1996 are a good indication that successful breeding has occurred in my study area during each of those years. Two young otters with an adult(s) were sighted by me in 1993 and 1994. Signs indicating one larger and one or two smaller otters were also seen by me in 1995 and 1996 which further substantiates sightings by the public.
3. Otters can be sighted at anytime during the day. Sightings with a reported time occurred from 0600 to 2100. When looking at the reported times in three hour segments, the greatest majority occurred between 0600 and 0900. The remainder of the sightings were relatively evenly distributed, with a decrease between 1500 to 1800.
4. Two thirds of the river otter sightings came from areas where there was limited human access and upon which there were no motorized boats; the remainder came from the recreational lakes. Of the two thirds, 40% of the areas were directly affected by beaver activity. The results show that habitat use by otters in my study location is consistent with other otter habitat studies.
5. Fish were the major portion of the river otter's diet with crayfish being dominant during the summer months. These findings are consistent with other otter food habit studies conducted in North America. The non-game fish species from the Catostomidae family dominated the otter's diet. This is also in keeping with the findings from other areas of the country that otters take primarily the slower moving forage fish species, such as Catostomidae, compared to the faster moving game species, such as Salmonidae. (Reviews from Toweill and Tabor 1982; and Melquist and Dronkert 1987; and more recent published data from Manning 1990; Serfass et al 1990; Mack 1994; and Reid et al 1994. I now add the upper Colorado River System (Berg 1998).
6. The few times I was actually able to observe river otters behaving was very special to me since animal behavior is my professional expertise. The behaviors I saw were consistent with findings from other free living river otter studies.

CONCLUDING REMARKS

The time I spent in my study location was time that is irreplaceable. I was allowed to enter the natural world of not only the river otter but also so many other

special species of wildlife. The riparian and aquatic ecosystems in which I trekked must be some of the most beautiful environments in the world. More important than their sensual beauty is that they support such a great diversity of plant and animal life. This precious biotic segment provides food, shelter and water to so many species of flora and fauna. It must be treated with respect and tread upon very lightly by we humans. It must be preserved. I hope only that in some small way I have contributed to not only the river otter but to their natural world which also supports so many other species. I hope only that in some small way I have made a difference.

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DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
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Rocky Mountain National Park / Colorado River Watershed
River Otter Behavioral Research Project
Field Sightings

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
06/01/1992	08:15	Clear	Timbercreek Camp-ground at the Beaver Pond.	Yes	"The animal was very playful, jumping in the water about two to three feet. It was seen for 10 minutes in the water than onto the shore." By Michael Isenberg of Portland, Oregon.
06/23/1992			Winding River Campgd. to So. of the bridge.		One animal was seen for a short duration of time. (On August 5, one of the Park people saw potential otter tracks about 100 yards past the first cabin No. of the bridge.)
07/28/1992	15:00		Hwy 6 near Arapohoe Bay.		"One animal was seen moving into a burrow on the non-lake side of the road."
07/31/1992	18:30	Clear	Ponds south of Timbercreek Campgd. mid-way to Never Summer Ranch	Yes	"One otter was swimming in pond. When he saw us he stopped swimming and didn't move for several minutes. We were able to see his head through binoculars." The Ryersons of Tucson, Arizona. (One of the Conservation Class people checked this area and No. & So. on the River four days later but she found no otter signs.)
08/06/1992	06:00	Clear	Point Park at the Channel between Grand and Shadow Mtn. Lakes		A fisherman who often fishes in this location stated that he had seen one or sometimes two otter swim channel from auto bridge towards foot bridge then disappear out of his view. These sightings occurred at around sunrise and during the summer months. There have been other sightings in this area. (I checked for otter and signs but neither were found.)
08/09/1992	15:00		Monarch Lake		A family of three otter were sited near the bridge and floating logs feeding on fish. Last year two adult otters with two young were sited on several occasions at various places on the Lake.
08/12/1992	17:00		Lulu City Trail in Beaver Pond 1&1/2 miles from trail-head.		An otter sighted.

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
08/13/1992	11:30		Grand Lake		An otter was sighted 10 feet from the dock in front of Prisser Lodge. One or two otters have been spotted at (and on) the dock at the Spirit Lake Marina on Grand Lake. Droppings were seen on the dock in the past but nothing recent so I couldn't collect them. New loud video games in the Marina may have frightened the otter(s) away.
08/15/1992	11:30		Co. River off Hwy 40 West of Granby below the dam - South Fork.		Two otters were seen swimming in this location.
08/20/1992	10:00		Monarch Lake		"Three little ones in River below Monarch Lake playing for about one hour." Cecil Brooks the host of the Big Rock Campgd. in the area.
08/23/1992	10:00		Monarch Lake	no	Four otter were sighted by the Lake's Hostess. The larger adult otter was alone in Lake across trail from the smaller adult otter swimming in a pond along with two young otter. Vocalizing and playing were observed. The vocalizations were snorts which the hostess assumed to be in response to her presence. (Sounds may have also been contact sounds since otters couldn't see each other.)
08/27/1992	13:00		Monarch Lake		Otter sighted by a tourist in the Lake at the spillway which is the bridge between the Lake and the creek. The area where they have been seen on other occasions.
08/27/1992	17:30	Sunny/Calm	North Inlet Trail		"Above Cascade Falls where smooth meadow water starts breaking into faster stream - trail side of River. Otter was all wet playing around in the rocks and bushes of stream. Observed for about one minute. Otter disappeared when I went to get my wife." Rob Leib of Cedar Rapids, Iowa.
09/09/1992	14:00	Clear/Windy Low 60's.	Monarch Lake		Researcher spent 7 hours looking for otter and otter signs in areas where otter have been seen in the past. 1/2 hour after she left, the Host of Monarch Lake called in to report an otter sighting. The otter was seen east of the bridge in the Lake which was Researcher's last area of concentration!
09/14/1992	08:15		Onahu Lodge		The animal crossed a driveway heading east to the

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
					River. It moved past the bridge to a gate near the River.
09/22/1992	07:00		Grand Lake- the channel between Grand and Shadow Mtn. Lakes.		An otter was seen swimming along the west side of the shore and "didn't appear to be afraid of people watching it". It swam for about 100 yards then out of sight. (There have been sightings in this area before.)
09/26/1992	12:30		Beaver Ponds Picnic Area.		An otter was sighted.
09/26/1992	13:00	Partly cloudy to cloudy/50's to 60's F.	Monarch Lake	no	Otter Researcher walked trail around Monarch Lake, and, about 1/4 mile from Host Station, two river otter were sighted. Both were a distance away but definitely otter. One otter was in & out of the water for about 5 minutes. When out of water it moved onto a rocky outcropping. It was joined by a 2nd otter; both engaged in play-type behavior for almost 5 minutes then both out of view.
09/30/1992			WindyGap Reservoir Flatlands - River between Frazer & Tabernash River off from Fall River Rd.		Through discussions with different fishermen, they reported seeing river otters in each of these three locations during this past summer.
12/14/1992	14:45	Clear & Sunny/ 20F.	Confluence of Onahu Creek and Colorado River.	yes	One live River Otter slide out of a hole in the ice and onto near embankment surrounding ice hole. It rolled in the snow for almost two minutes then back into ice hole (water) and out of view. It did not reappear during time observer was there (2 hours). Observer returned the next day and waited for four hours but otter did not reappear. Photo (small lens) of otter and habitat. JKB.
05/06/1993	12:30		Cascade Falls Trail on one-way loop trail.	yes	"One otter in water stayed and watched us for awhile."
06/02/1993	10:00		Columbine Lake	no	One otter was swimming in the Lake.
06/11/1993	07:00	Sunny/Cool/40F	1/2 mile north of Winding River Campground.	yes	One otter moving quickly along River bank.
06/14/1993	11:00	Mostly Cloudy/ Breezy/ Mid to	Chickeree Lake	no	One otter stayed for awhile in area. Alerted to humans but continued moving around in area. Out

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
		Upper 60's.			on log at west end of Lake. Stood on hind legs & looked at people. (Gail Spinden, Seasonal Ranger). Collected scat at a drainage off Onahu Creek near old beaver lodge. (Researcher: No fish bones found in scat; may have been some insect exoskeletons.)
06/21/1993	19:00		Monarch Lake	yes	Brook's watched an otter fish then crawl up on a floating log at dam and eat. Prior, other people had also watched an otter mid-afternoon. Sighting of otters occurred during other June dates by Jack Sutton at various times of the day at the Lake.
07/04/1993	14:00	Cool/Drizzle	Monarch Lake	yes	One otter seen in creek near dam.
07/17/1993	11:30		Lower end of Lake Granby - Rainbow Bay area.		Possible otter. Ran from Lake across road to the dry side of road.
07/19/1993			Lake Nanita	no	One otter sighted.
07/27/1993	20:00		Monarch Lake	yes	Three adult otters swam close to where man was fishing.
07/29/1993	08:00		Timber Creek Camp-ground.	yes	One otter seen in River out from campground.
08/10/1993	15:00		Point Park Bridge	yes	One river otter seen. First saw an otter in this location three years ago.
08/22/1993	11:30	Cloudy	East Inlet - 3rd meadow.	no	One otter seen and "chattering". (I collected scat in 1st meadow during May.)
08/24/1993	15:00		Monarch Lake	yes	"Mother and three babies sunning on the rocks by the old bridge."
08/27/1993	23:00		Shadow Mountain Lake-Harbor Area.		Fisherman described an animal that sounded like an otter who came up to him while he was fishing. Animal got close so man backed up the stairway then left! (Aggressive otter or....)
09/02/1993	17:50	Clear	Monarch Lake	yes	Adult otter with two smaller otters at area of floating log near dam. Adult with fish in mouth and two young 'appeared' to try and take it.

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
					Active-in & out of water and onto log. Three to rocky area near by and ate fish. Then swam to a peninsula near island about middle of Lake. (Seen by Researcher.)
09/06/1993	11:00		Beaver Pond Sign-out from Parking Lot. (Jennings Bridge).	yes	One otter playing on bank across from the Parking Lot. A Park employee had also seen an otter in this location during late August or early Sept.
09/13/1993	07:00		Grand Lake near Lemmon Lodge.		One otter seen swimming past area.
09/16/1993	12:15		Monarch Lake	yes	Three otters seen swimming out from a wetlands on south side of Lake. Possibly the same ones seen on Sept. 2 also by the Researcher. (Later collected some scat on a log near location where otter were seen.) Otter seen only about 2 minutes then they disappeared in the wetlands.
10/10/1993			Monarch Lake	yes	One otter seen in the inlet to Monarch Lake. Possibly heard a second otter at the same time. Observation occurred in the afternoon.
10/23/1993	16:00		Shadow Mountain Dam-below the spillway.		One river otter on a rock. Ducked into a crevice upon seeing person. Peaked out of crevice once. 10 minutes later, emerged and swam off. (Researcher has collected scat in area and also a known den in this location.)
11/01/1993			Grand Lake-North Inlet.		One otter was seen in the morning and came out on land for awhile.
12/22/1993	07:30	Cold with Lite snow.	Shadow Mountain Dam - Spillway		One otter seen swimming and 'on and off' a patch of ice.
05/22/1994	19:00	Clear/Sunny/Calm/70F	Road leading to East Inlet Trail-head.	Yes	One Otter was basking in the sun. Then it ran off the road towards Grand Lake.
06/01/1994	09:15	Cloudy	Shadow Mountail Lake off from East Shore Trail.	No	Six Otters. They were active and curious and appeared to follow the two hikers that were on the trail with the otters in the water. NOTE: about two weeks prior to this siting, a fisherman said

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
					he had spotted Five Otters out from Arapoho Bay.
06/28/1994	00:00		Commanche Peaks/ Cirque Lake	No	One Otter seen.
07/13/1994	07:45		Before bridge at 8 mile marker on Hwy 6 near Arapaho Bay.	Yes	One otter crossed the road then stopped on the side of the road and looked at observer's vehicle then down to and into water.
07/16/1994			Monarch Lake	Yes	Two Otters seen out from a boulder area in Lake on north side of Lake. One week later Researcher found fresh otter scat about 1/2 mile from siting location.
07/24/1994			Arapaho Bay:Roar- ing Fork Campgd. 1/2 mile from " on north shore of Lake Granby.	Yes	Four or Five Otters seen in area. Researcher found compact formed scat of primarily crayfish parts in same area.
07/26/1994	11:00	Clear /Sunny	Dry creek bed between Shipler Cabin and Lulu City.	Yes	One animal larger than mink or weasel with heavy long tail, long body and short legs. Otter or marten.
07/27/1994			East Inlet	Yes	One Otter at lower part of East Inlet near a camp site in the evening.
08/01/1994	09:00		Arapaho Creek out from Monarch Lake.	Yes	One adult and two young Otters swam into the log jam area. Earlier saw one adult with the two young following. The same log jam where a USFS person had seen otters swimming last October.
08/01/1994	11:00	Cold/Rainy	Colorado River off from Hwy 49 on private land.	No	One Otter was swimming then dove when saw the ob- server. He saw him twice.
08/02/1994	11:30	Stormy	River at Never Summer Ranch. Seen from the bridge upstream.	Yes	One Otter swam along bank for about 20 yards. Then ducked under bridge. It reappeared, continued downstream few feet, turned into a canal, came out of water then disappeared into some reeds.
08/08/1994	08:00	Fair/Warm	Lake Verna	No	One Otter swam up to the person. Person walked from a rock slide over to a sandbar and otter swam to person, played around then disappeared near the rock slide. "Didn't appear affraid".

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
08/10/1994	08:00	Clear	Shadow Mountain Lake between Islands 6 & 7.	No	Two Adult Otters. Near an old beaver lodge and playing in the water. USFS person.
08/10/1994	19:00		Never Summer Ranch	Yes	One Otter with a fish in its mouth of about 1 and 1/2 feet.
08/15/1994			Arapaho Bay near July 24 siting.		One adult and two younger Otters.
08/22/1994	08:00	Overcast	EastInlet-Grand Lake.	Yes	Four River Otters swimming around the boathouse.
08/23/1994	07:50	Clear/Calm/Upper 40's	Shadow Mountain Lake between the two islands.	No	One Otter swimming then dove near the old beaver lodge. Short spance of time but color of head and movement in water looked like an otter. Two days later saw a beaver in area but distinct difference when comparing two observations. JKB.
09/02/1994	10:00	Clear/Light breezes/60's	Arapaho Creek from bridge at Monarch Lake. Log Jam		Five Otters. Observed animals in and out of view over a two hour period. Three animals close in size and most active two were smaller. Photographed and recorded behaviors; the details will occur in a section of report of Researcher's Sightings. Also collected 'nice fresh scat'.
10/18/1994	15:00		Shadow Mountain Lake-1 1/2 miles from Trailhead.		One otter swimming along shoreline. Also seen was a Bald Eagle and bear tracks.
11/23/1994	00:00		Shadow Mountain Dam Spillway		Three Otters seen playing in area at around dusk.
12/29/1994	07:00	Clear/Very Cold	Cty Rd 83 30 feet downstream from bridge over Frazer River.	No	One Otter sliding down snow bank and into the Fraser River. Seen for 10 minutes. Lots of other animal tracks at the River.
04/01/1995	16:00		Southeast end of Shadow Mtn. Lake near Spillway.	Yes	Although not a sighting, there were recent slide and tract to open water then a return. Slide was 8" to 10" wide with length around 10 feet. People who had seen my slide presentation in 1994.
05/14/1995	13:00	Clear & 60 F.	East Inlet Trail-East Meadow over-look.	Yes	One Otter swam out of creek and up onto bank, sat on edge of creek, looked around then people left after 10 minutes.
05/14/1995	15:30	Clear and windy	Big Meadow along Tonahutu Creek.		One Otter. Dark, slick, smooth movement. Went to creek and looked like it got a fish. It cross-

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
					ed the creek then moved back towards the people.
05/14/1995	20:00	Clear	Shadow Mountain Lake off Lake Cove Drive.		Dar Spearing watched Three Otters for over a half hour period. They were hunting/fishing from edge of ice about 100 yards offshore. Each caught and ate 2 to 3 fish over that 1/2 hour period. Note: Three reported sightings on one day. Otters active as ice melting on Lakes.
05/17/1995	12:00		Stevens Ponds towards Columbine Lake.		One Otter swimming down Stevens Ponds towards Columbine Lake.
05/27/1995	06:00	Cold and Rainy	Back side of Winding River Camp-ground.		One Otter swimming in thickets near edge of a small lake.
06/07/1995	20:20		Shadow Mountain Lake - 300 yards southwest of blue condo.		One Otter feeding along shoreline.
06/13/1995	13:30		Monarch Lake		One Large Otter swam out from swampy area and towards bridge (spillway) and creek.
06/19/1995			Arapaho Bay - Marine Loop Camp-ground.		One Otter swimming in area.
06/23/1995	16:00	Clear & 80 F.	Lake Granby Canal US34 at Mile #10 marker.		One Otter seen
06/27/1995	07:50		Arapaho Creek - several yards from bridge of Monarch Lake.	Yes	One Otter behaved on and off for two hours -swam caught and ate fish, self-groomed, rested. Detail will occur in section of report of Researchers Sightings. Exciting!
07/07/1995	16:30		Tonahutu Trailhead and North Inlet.		One Otter seen.
07/20/1995	18:00		Grand Lake near fire lane by Cairnes Ave.		One Otter swimming in water then came twice to shore. It appeared to be fishing.
08/03/1995	19:00		Tonahutu Trail near falls and River.		One Otter appeared curious and onto a boulder then moved away

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
08/06/1995	01:00	Clear & Stars	Grand Lake where East Inlet empties into Lake.		Three Otters seen in beams of flashlights and were hissing at people.
08/10/1995	11:00		Stream below Monarch Lake in Meadow Pond area.		One Otter seen.
08/16/1995			Grand Lake		One Otter swimming along the shore in front of Davis house.
08/21/1995	09:00		North Inlet stream		One Otter seen.
08/21/1995	15:00		Grand Lake		One Otter seen in an inlet stream near Lemmon Lodge.
08/24/1995	08:30		Shadow Mountain Lake.		One Otter seen.
08/24/1995	20:00		Arapaho Creek near Monarch Lake.		Four to Six Otters swimming in Creek.
08/26/1995			Arapaho Creek		Four Adults Otters seen.
08/26/1995	14:00		Stillwater Pass on Route 40.		One Otter crossed the road.
08/26/1995	20:00		Monarch Lake		Otters seen near islands in Lake.
08/29/1995	13:30		Arapaho Creek		Two Adult Otters with Two Smaller Otters near bridge-spillway of Monarch Lake and Arapaho Creek.
08/31/1995	06:00	Overcast	Arapaho Bay of Lake Granby.		Two Adult and Two Smaller Otters swimming in a porpoise style in the Bay. Then up and onto land for a short distance.
09/07/1995	18:00		River out from Timbercreek Camp-ground.		One Otter swimming or possible a mink.
09/10/1995	19:45		Timbercreek Camp-ground Ponds.		Three Otters seen in the pond out from Dogwood Loop area of #79 campsite as it was getting dark.
09/14/1995			Grand Lake		Two Otters eating crayfish out from "a house".
10/17/1995	16:00		Arapaho Creek near Monarch Lake.		Three Otters seen.

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
10/26/1995	13:00		Onahu Creek near bridge.		Possible Otter (4 to 5 times larger than a squirrel). It was a dark color and it was running in area.
12/05/1995			Near Phillips House?		One Otter seen on a hill plus otter slides near Phillips house.
03/15/1996	15:30		Below Shodow Mountain Dam	Yes	One Otter seen swimming, diving and fishing for about 30 minutes. Then up onto south bank and played for 5 minutes.
04/03/1996			Channel between Grand and Shadow Mountain Lakes.	Yes	Six (plus) Otters seen in area of James Boathouse. See next siting.
04/11/1996	18:30		Below Shadow Mtn Dam Spillway.	Yes	Two Otters seen in area two nights in a row.
04/12/1996			Channel between Grand and Shadow Mountain Lakes.	Yes	Six (plus) Otters seen near boathouse of James'. Lots of vocalizing running and sliding on the ice. Then two otters appeared and were chasing, cavorting and apparently mating. Photo gotten of a mounting. Ann and Jim Feucht. It appeared there had also been some fighting since lots of activity of group plus some trails of blood seen by observers.
05/05/1996	11:25	Clear & Breezy 50 F.	Arapaho Creek below Monarch Lake.	Yes	One Otter swam towards Researcher than up so about 1/3 of length out of water (photo), dove and not seen again. Details in Researchers Sightings.
05/05/1996	11:25	Clear & Breezy/ 50 F.	Arapaho Creek below Monarch Lake.	Yes	One Otter swam towards Researcher, up so about 1/3 rd of length in view (photo), dove and not seen again.
05/26/1996			Channel between Grand and Shadow Mountain Lakes.	Yes	Four Otters - two adults and two small otters-cavorting in open water just east of the Grand Lake foot bridge. Possibly the young from last years successful mating. Same area where mating seen on May 12, 1996. The female does come back into oestrous after having her young. Good Info.
06/01/1996	11:00		East Inlet above Adams Falls in	Yes	One Otter swimming on its back with paws over its stomach. This posture has been noted in river

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
			meadow.		otters similar to sea otters.
06/11/1996	09:00		River out from Timpercreek camp- ground.	Yes	One Otter seen swimming through area.
07/23/1996	06:30		Columbine Lake		Four to Six Otters seen fishing in the lake. Irate fisherman called Park to complain about our otters eating his fish. Recently (1998) Reseacher learned more about this man who complains about everything! DOW did go out and talk to him after his complaint and let him know otters primarily take rough fish.
08/03/1996	12:00		Chickeree Lake		One Otter seen in Lake. It dove but Sam at Park sure it was an otter.
08/03/1996	18:30		Arapaho Bay of Lake Granby	Yes	Three Otters seen moving from forest into water.
08/05/1996	12:00		East Inlet	Yes	One Otter seen at about three miles into trail.
08/17/1996	10:30		Pond above River Bowen-Baker Creeks		One Otter in the Beaver Pond just beyond Dicks property.
08/21/1996	08:00		Monarch Lake near Bridge/Dam.	Yes	Two or Three Otters on logs near dam and appeared curious.
08/22/1996			North Inlet in area of Cascade Falls.	Yes	One Otter in River system at Cascade Falls area.
08/24/1996			Monarch Lake near Dam/Bridge.	Yes	Three Otters seen around dam area by a night fisherman. Large Otter caught a fish about 2ft.
08/27/1996	07:00	Cloud Cover & 15 C.	River out from Winding River Campground.	Yes	One Otter observed for about 1/2 hour by a visit- ing wildlife biologist from France. Otter dove often and swam along the side of the River. Caught one fish and ate it atop of a dead timber. Dis- appeared in the grasses. Observer watched it at less than 20m away. Animal did not appear afraid but did shriek sometimes when looking towards the observer.
09/03/1996	07:00	Clear/ 35 F.	River at Bridge	No	One Otter seen and reported sighter said the

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
			area of US34.		animal "lives there".
09/10/1996	13:00		Below Lone Pine Lake.	No	One Otter seen in small pool of water near trail. Pool not connected to stream. 30 to 45 minutes south of Lone Pine Lake.
09/20/1996	09:00		Monarch Lake at Dam/Bridge.	Yes	Two Otters swimming to the west. Tracks on wet soil on the bridge. I found some fresh scat when to area 09/22/1996.
09/21/1996	19:00		Shadow Mountain Dam Spillway.	Yes	Four Otters - two adults and two juveniles. They seemed unconcerned according to fisherman and were eating fish.
09/29/1996	17:30		Poudre Lake	No	One Otter playing and person watched it for about 20 minutes.
10/05/1996	15:30		Shadow Mountain Dam spillway. 125 yards below dam.	Yes	One Otter up onto bank then out of view. It appeared "cautious and elusive".
01/11/1997			Grand Lake Touring Center Trail with River at bridge.		One Otter moved back into woods.
01/24/1997	08:00		Channel between Grand and Shadow Mountain Lakes.	Yes	One Otter swimming in channel near "arch bridge."
01/25/1997	09:00		Ponds before Columbine Lake.		One Otter seen north of western road by ponds.
01/25/1997	09:00		Ponds before Columbine Lake.		One Otter seen north of Western Road by ponds.
03/09/1997	12:30		River near Cty Rd 491.	Yes	One Otter on bank beside River behind a home on Cty Rd. 491.
05/15/1997			Channel between Grand and Shadow Mountain Lakes.		Four Otters were seen on occassion in Channel during May and June by person who lives on Channel She said she usually saw them in the evenings between 1930 and 2000.
05/17/1997	10:45		River out from Timbercreek Camp-ground.	Yes	One Otter swimming in River.
05/19/1997			Ponds towards the		One Otter seen in the new quiet ponds.

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
			road from River south of Bowen- Baker P.L.		
05/25/1997			Ponds near River south of Bowen Baker P.L.		Three Otters seen by same person in the new ponds of area. Runoff ponds.
08/04/1997	15:30		Lake Granby		Six Otters in rocky area north of Grand Bay. All around same size and ate about a 2lb fish. Person said you could only get there by boat.
08/24/1997	18:00		North Inlet	Yes	Two Otters seen just above private property and below Summerland Park.
04/03/1998	07:30		Shadow Mountain Lake in Channel leading to Grand Lake.	Yes	Person fishing from bridge on Lake side saw one otter swim under bridge and up channel eastward towards Grand Lake.

DATE	HABITAT	LOCATION	COMMENTS
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Rocky Mountain National Park / Colorado River Watershed
River Otter Behavioral Research Project
River Otter Signs

DATE	HABITAT	LOCATION	COMMENTS
01/03/1993	Snow Cover	CO. River in Columbine Bay	Tracks seen on River in January. Again in March, a former otter researcher found tracks and collected some older otter scat in same general location.
05/01/1993	Snow Cover	Never Summer Ranch between bridge and buildings.	A visitor in the Park found otter tracks with heavy tail drag in above location.
05/07/1993	Snow Cover	Fish Access and south along Co. River.	Otter tracks near River to an area of disturbed snow (possible rolling place). Otter track pattern and tracks measured 3" wide and 4" long. (Tracks and slides were found in this same location last November).
05/08/1993	Ground clear of snow.	East Inlet - 1st meadow up from Adams Falls.	Scat was found next to the River. The scat and habitat were photographed. Scat was black in color and had a musty-fishy odor. The scat consisted of fish bones, fish scales and mucus.
05/10/1993	Snow Cover	Beaver Pond - (Jennings Bridge)	Rolling place and tracks next to River out from the parking lot. A few gray hairs were collected from the rolling place. Photos taken. An otter was sighted in this location in September, 1993 on two different dates.
05/11/1993	Snow Cover	Along Onahu Creek towards CO.River	There were tracks, tail drags and slides of otter found in various areas along the creek. Last December, an otter was seen at the Confluence of Onahu Creek and the CO. River. (Photographs).
05/13/1993	Snow Cover mixed with exposed ground.	AVO and no. on the CO. River.	An older otter slide was seen across from a hole in the ice on River. Near the first Beaver area.
06/09/1993	Water channels & tunnels with good cover.	Beaver Pond (Jennings Bridge). So. along the River.	Fresh otter scat was found. A combination of fish bones and 'slimy parts'.

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
06/14/1993		Swampy Meadow	Meadow out from Onahu Creek and northeast of main road.		A Ranger saw an otter at Chickeree Lake, then, later collected some scat on an old Beaver Dam. (No fish bones found in the scat but there were insect exoskeletons.)
06/30/1993		Water channels and tunnels.	Beaver Pond - Jennings Bridge and so. along River.		Collected some fresh otter scat in the same location as June 14. I thoroughly checked this area and further south along River, but no other otter signs nor definite dens were found. Scat was near a hole which came up from the River. Lots of photos of this location. South along the River are beaver dams and a large beaver lodge.
08/09/1993		Water channels and tunnels.	Beaver Pond - Jennings Bridge & south along River.		A very small portion of otter scat found in the same locations as 9 and 30 June. (I used my sense of smell to find this one.)
09/16/1993		Wetlands next to the Lake.	Monarch Lake on the south side.		Three otters were seen in Lake out from the wetlands. Later, scat was found on a log which jutted out into the Lake. Fish bones were found next to a boulder in same wetlands habitat. Photos taken of scat, fish bones, and habitat.
09/17/1993		River habitat and on sandy embankment.	River out from the Timbercreek Camp-ground.		Potential tracks of otter but not definite. Made some casts, but still not really clear.
09/21/1993		Wetlands	Monarch Lake - south side.		I checked same location as on 16 September. There wasn't any new scat but there were some fish scales on the log. Further along in the wetlands I found more fish bones and scales. All was photographed.
10/01/1993		Rocky next to the River.	Shadow Mountain Dam-spillway.		Scat was collected from some boulders near the spillway.
10/04/1993		Wetlands	Monarch Lake - south side.		Otter scat found and collected from the same log of 16 and 21 September. Photographed. The highest section of this log is about 2 feet above the water level of the lake.
10/06/1993		Rocky	Shadow Mountain Dam - spillway.		Collected otter scat in same location as 1 Oct. I also checked this area inbetween two dates and no otter scat was found. (Otters are known to leave areas for a few days at a time.)
03/04/1994		River frozen &	Timbercreek Camp-		Otter slides, tracks and tail drag. An otter was

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
		Snow.	gd and north on River.		seen the next day further north of area during the River Otter Survey.
03/05/1994		River frozen & Snow.	Bowen Baker to Beaver Pond-Jennings Bridge.		We saw all all signs of river otters. Details recorded on survey sheets.
03/08/1994		Open River & Snow.	Shadow Mountain Dam		Otter Den in boulders with tracks and scat on a boulder up from River.
03/21/1994		Frozen Water cover & Snow	Onahu Creek to Colorado River.		Holes in ice plus otter slide and tracks.
03/24/1994		Open River & Snow.	Shadow Mountain Dam		Otter tracks, slide and mashed down snow but no scat found.
05/16/1994		Open river and no snow.	Beaver Pond (Jennings Bridge) & south on River.		Scat. Small amount found in same area as last year. Also, some fish bones in older scat just south of the parking lot.
07/24/1994		Shore of Lake near pines on boulders & gras	Monarch Lake - north side.		Scat - collected scat from boulder and alongside and nearby in the grasses (slimy). Photo. Also, few yards away found fresh water clams.
07/26/1994		Boulder juttet out into water from sand shore	Arapaho Bay near Campgd when otter seen on 7/24.		Scat - collected from large boulder primarily of crayfish parts. Formed Scat.
09/02/1994		Boulder juttet into water from bank.	Arapaho Creek from Monarch Lake Log Jam.		Scat- fresh and had seen 5 otters eliminate. Also, two drier scats plus fish bones in crevices of boulder.
10/10/1994		Boulders on shore at Lake's edge.	Monarch Lake-small boulders near the bridge.		Scat - fresh scat located on two small boulders about four feet from water.
10/13/1994		Boulders	Shadow Mountain Dam at spillway near den site.		Both fresh and dried scat found in and on the boulders.
10/19/1994		Old beaver lodge on grasses up from water.	Fish Access and south on River. Kauwaneche Curve.		Location where tracks and slides in winter of 1992. A tunnel thru grass of 6inch wide. Dried Scat.
11/25/1994		Snow near water and up on bank.	Shadow Mountain Dam spillway.		Scat, tracks and slides. Scat found near slides on ground and also on boulders. Measurements

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
					taken. At least two otters due to two different sized tracks and not from difference in front and rear feet. Details in Report.
11/28/1994		Snow near water and up on bank.	Shadow Mountain Dam Spillway.		Scat and tracks. Photos. Details in Report.
06/13/1995		River Habitat	Beaver Pond/Jennings Bridge and south on River		Scat - in same location as found last years in bend of River near small channel. Two sets of dried scat. One was 5ft from River and one was 10 feet.
09/07/1995		Riparian	Arapaho Creek from Bride of Monarch Lake.		Scat - fresh found on boulder juttet into waterway I call Scat Rock.
09/11/1995		River - Boulder next to water.	Shadow Mountain Dam Spillway.		Scat - Older scat I couldn't reach before near den area.
10/11/1995		Riparian	Arapaho Creek from Monarch Lake Bridg		Scat - dried scat found on Boulder - Scat Rock.
10/12/1995		Bolders next to River.	Shadow Mountain Dam Spillway.		Scales and Fish Bones in area near den in boulders No fresh scat.
11/28/1995		Bouders next to River.	Shadow Mountain Dam Spillway.		Scat - Chipped scat from bouldes near den.
02/24/1996		Snow with ice covering River.	Beaver Pond/Jennings Bridge to Fish Access or Kauwaneeche Curve.		River Otter Survey with separate details. Slides and hole in ice than further alon more slides.
04/06/1996		Snow and Ice cover on River.	River out from Timbercreek Camp-ground.		Older otter slide of 7" to 8" wide. Also a small slide of 2" wide with feet drag - possibly mink.
04/07/1996		Snow and Ice on Waterway.	Arapaho Creek from Bridge at Arapaho Bay-Lake Granby.		Signs of Three Otters. Slide of 9" wide with tracks of 2 1/2" by 4" long. Slide of 8" wide with tracks of 2" by 3 1/2"long (all 5 toes seen). Slide of 7" wide with same track measurement as above. Obviously melting will affect measurement. One slide of 96" length and one of 40 ft (approx) down embankment. Person had seen 1 large and 2 smaller otters in area going into den site-1995.
04/08/1996		Ice on River with melting occurring.	Beaver Pond/Jennings Bridge and So on River.		Hole in ice on River with recent disturbance around it.

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
04/09/1996		River	River Trail from P.L. at River.		Hole in bank with slide and tracks to River near Creek and River Confluence. Ice too thin to walk across for Researcher.
04/10/1996		River with open water and snow on shore.	Shadow Mountain Dam Spillway.		Scat - lots of scat. Otter siting March 15. Slides and tracks near den site.
05/05/1996		Open water with some ice on water & snow.	Monarch Lake and Arapaho Creek.		Tracks on sandy shore of Arapaho Creek. Tracks of 3" by 3" and pattern of 4 then 4 5 ft from water and 8" between two sets. ONE OTTER swam into scene at 11:25 swimming toward me and track location. Photo.
05/07/1996		Area as above.	Monarch Lake and Arapaho Bay		Scat in area of above tracks. Tracks of 3" by 3". Rolling Area, Tracks and Scat. Also a beaver seen swimming where I had seen otter on May 5.
05/08/1996		Open Water at Boulders.	Shadow Mountain Dam Spillway.		Scat - near den site.
05/09/1996		Creek	Monarch Lake & Arapaho Creek.		More new TRACKS. Tracks of 3" by 3" and Tracks of 2 1/2" by 3".
05/24/1996		Creek	Monarch Lake and Arapaho Creek		No new signs in area of above. To old beaver lodge and Scat about 5 ft from lodge up from waterway.
06/15/1996		Marine Rocky Coastline.	Isle of Skye in Scotland.		Tracks, Scat and One Otter seen while with other otter 'people' on the Isle of Skye Scotland. This is a very beautiful world.
07/19/1996		Riparian	Fish Access - No and So on River.		Potential Rolling area near old beaver lodge. So from lodge and bank mud slide down from fresh scat Scat clung to grasses with two different scats withing a few feet of each other.
07/22/1996		Creek	River Trail to Onahu Creek then River.		Tracks on creek shore near water's edge. Looks like otter.
08/10/1996		Riparian at Creek.	Arapaho Creek from Bridge at Monarch Lake.		Tracks just beyond beaver lodge and looked fresh. 3" by 4" with 4" by 5" and one set of 2" by 2 1/2" with 3" by 3". There was a slide down to tracks then tracks and into water. Adult with young?

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
08/10/1996		Creek.	Arapaho Creek from Monarch Lake.		Walked beyond Scat Rock and rocky outcropping to new area. Tunnel through grass of matted down vegetation leading up bank and to Scat. Scat was on small boulders and on ground. Some with crayfish parts.
09/06/1996		First meadow of trail.	North Inlet Trail		Scat next to waterway.
09/09/1996		Creek	Arapaho Creek from Monarch Lake.		Scat in same area as August 10. Crayfish parts plus scat with large scales. Good area for otter to see waterway. Three paths leading to this area from waterway. Good area to move across land to a wetland then pick up the waterway again.
09/22/1996		Creek	Arapaho Creek from Monarch Lake.		Scat - on scat rock. Checked two weeks ago and there was none. Scat in newer location of Aug 10 and Sept. 9--Lots...
09/24/1996		Riverway	Shadow Mountain Dam Spillway.		Scat on boulders and on ground. Some with crayfish parts and some with fish parts.
10/06/1996		Creek to Monarch Lake. Riparian.	Arapaho Creek from bridge at Arapaho Bay and along ck to Monarch Lake.		Scat - Collected from a boulder up from water and approx. 300 feet from bridge. During winter there have been slides and tracks seen in general area.
10/06/1996		Creek	Arapaho Creek near Monarch Lake.		Scat - found in areas of Sept. 22.
11/12/1996		Boulders up from River.	Shadow Mountain Dam Spillway.		Scat - on boulders near den site.
11/29/1996		River areas	Shadow Mountain Dam below Spillway.		Scat plus slides and tracks.
11/30/1996		Nest to River on snow & ice.	Shadow Mountain Dam Spillway.		Lots of otter activity found in snow. Tracks were 2 1/2 by 3 and 3 by 3 plus 2 by 2 and 2 by 2 1/2. Slides 6" wide and slides 8" wide of various length. Salmon milked in area two days prior. Scat - fresh.
11/30/1996		Snow and Ice Cover.	Arapaho Creek from bridge at Arapaho Bay.		Slide and tracks to open water from a large boulder where there may be a den site. Otter pattern but can't get to it too measure. Tail drag seen also.

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
12/01/1996		Next to River in snow.	Shadow Mountain Dam Spillway.		Lots of new activity. Tracks of 2"by2 1/2" and 3" by 3" and one set were 2" by 4". 12" tail drag. Slides of 6" wide and 7" wide. Scat - 3 ft from water.
12/07/1996		River and some ice cover.	Bridge near W.R. on River.		Tracks of two otters moving together and south on River.
02/12/1997		Along Trail and on Ice covered River.	Northwest of Loop trail-River Valley Trail.		Otter slides and tracks seen "everywhere" D.C.
02/15/1997		Snow cover with ice on creek; areas open H2O.	Arapaho Creek from Bridge at Lake Granby.		One definite slide and another older potential slide near large boulder where signs seen last winter.
02/16/1997		Thick ice & 3ft of snow.	Never Summer Ranch River and North.		One long otter slide of approx. 100 feet. Other potential slides along route but recent snow would have covered signs. A group of five of us covered areas north and south of NSR bridge.
03/28/1997		River with open waters.	Shadow Mountain Dam Spillway.		Otter scat found by a temporary researcher - our dog Rusty. He scented than rolled in it and definitely from otter.
03/29/1997		Creek and banks	Arapaho Creek from bridge at Lake Granby.		Slide down embankment and further along Creek. Tracks plus another short slide.
03/31/1997		Snow cover plus some ice on River.	South along River from Timbercreek Campground.		Slide Tracks Scat and Den Site. Slide of 9"wide with tracks of 3" by 3" and 3" by 5". Scat next to a mound up from River. Den Site in area under Large trees plus a hole in bank of River. This area was checked next couple days after new snow fall and no new signs. Checked later in year also but no otters nor signs. An Otter Motel!
04/03/1997		Waterway of ice cover and snow.	Dicks Access area of Park on Creek.		Slide of 8" wide and Tracks of 3" by 3" down an embankment to waterway.
04/04/1997		River system	Shadow Mountain Dam Spillway.		Scat south of den site plus scat seen at den site.
05/07/1997		Creek system	Arapaho Creek from bridge at Lake Granby.		Scat found across from the potential Boulder Den site. Tracks and slides have been found in area during the winter months.
05/08/1997		River system	Shadow Mountain Dam Spillway.		Scat - lots of scat at den site and along River bank. Most was dried but some kept fresh in the

DATE	TIME	WEATHER	LOCATION	SVY LOC	COMMENTS
					snow.
05/22/1997		Waterway	Dicks Access in Park and Bowen or Baker.		Scat near water and down from an old beaver lodge under large pine. Fresh.
05/23/1997		Creek System.	Arapaho Creek from Monarch Lake.		Scat - same area near pines where I had collected scat last year and where I had found and photo- graphed tracks plus had seen an otter.
05/25/1997		Waterway system	Dicks Access in Park on Creek.		Scat - near area where I had found on 22 May. Approx two feet from waterway. Grasses mated down in area for elimination and rolling area.
05/26/1997		Creek system.	Arapaho Creek from Monarch Lake.		Tracks of 3" to 3 1/2" by 4" near area of 23 May. Older scat but no new scat found.
06/30/1997		River, Lakes and Creeks.	Study Area		My study has officially ended after five years. I continued checking study area through August prior to our move out of state but found no new signs - just older dried scat. I hope this infor- mation on otters will benefit the species since that is what it is all about too me!