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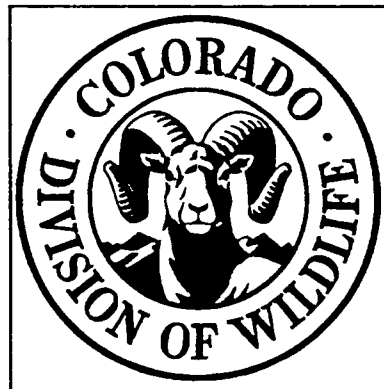
PIPING PLOVER
Charadrius melodus
and
INTERIOR LEAST TERN
Sterna Antillarum

Recovery Plan

September, 1994

Prepared by:

Jennifer Slater
Southeast Region



Colorado Division of Wildlife

6060 Broadway

Denver, Colorado 80216

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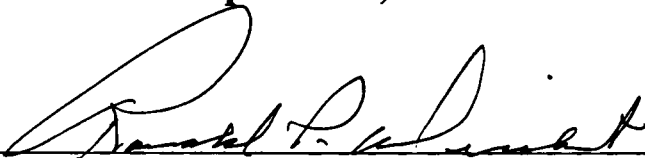
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Approved 
Ronald P. Desilet, Southeast Regional Manager

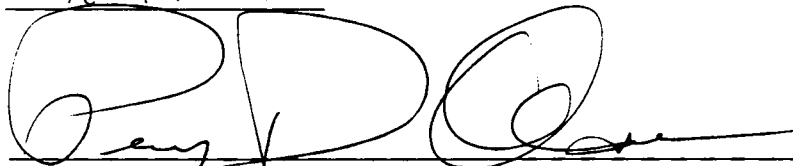
Date 9-28-94

Approved 
Walt D. Graul, Northeast Regional Manager

Date 9/30/94

Approved 
Len Carpenter, State Wildlife Manager - Terrestrial Wildlife

Date 10-17-94

Approved 
Perry D. Olson, Director, Colorado Division of Wildlife

Date 10-21-94

DISCLAIMER

THIS IS THE COMPLETED COLORADO STATE MANAGEMENT PLAN FOR THE INTERIOR LEAST TERN AND PIPING PLOVER. IT WILL BECOME THE COLORADO DIVISION OF WILDLIFE (CDOW) APPROVED PLAN UPON SIGNATURE OF THE CDOW DIRECTOR. IT DOES NOT NECESSARILY REPRESENT THE VIEWS OF ALL INDIVIDUALS WHO PLAYED A ROLE IN PREPARING THIS PLAN. THIS PLAN IS SUBJECT TO MODIFICATION AS DICTATED BY NEW FINDINGS, CHANGES IN SPECIES STATUS, AND COMPLETION OF TASKS DESCRIBED IN THE PLAN. GOALS AND OBJECTIVES WILL BE ATTAINED AND FUNDS EXPENDED CONTINGENT UPON APPROPRIATIONS, PRIORITIES, AND OTHER CONSTRAINTS.

APPROVAL OF THIS PLAN BY COOPERATING AGENCIES WILL BE ACCOMPLISHED THROUGH THE USE OF A MEMORANDUM OF UNDERSTANDING (MOU) BETWEEN ALL GOVERNMENT AND NON-GOVERNMENTAL AGENCIES INVOLVED AND CDOW. ADDITIONS, DELETIONS, OR MODIFICATIONS TO THE APPROVED PLAN WILL BE OUTLINED IN THE MOUs THAT MAY BE APPROVED BY EACH AGENCY. THIS APPROVAL PROCESS ALLOWS FOR A BROAD, COMPREHENSIVE MANAGEMENT PLAN, BUT MAINTAINS MAXIMUM FLEXIBILITY IN ACHIEVING POPULATION GOALS WITH COOPERATING AGENCIES.

* * *

ACKNOWLEDGEMENTS

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The initial field work on this project was made possible through funding provided by CDOW, BLM, and USFWS. (USFWS funding came through a grant under Section 6 of the Endangered Species Act.) Field work was conducted through a contract between CDOW and CBO, and Duane Nelson (formerly of CBO) has worked tirelessly since 1990 on this project. Many volunteers (mostly through CBO) have also put in a lot of time surveying the South Platte and Arkansas River drainages for least terns and piping plovers. Without these birdwatchers' efforts we may have been unaware of breeding populations of these two species occurring in Colorado.

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LEAST TERN & PIPING PLOVER RECOVERY PLAN

INTRODUCTION

The interior least tern (*Sterna antillarum*) and the piping plover (*Charadrius melodus*) are recently-discovered nesting species in southeastern Colorado (pers. comm. Nelson, Chase). Both species are protected under the federal Endangered Species Act. The interior least tern (referred to as "least tern" or "tern" in the remainder of this document) is listed as an endangered species and the piping plover as a threatened species (USFWS, 1988a, 1990). Least terns and piping plovers are similarly listed as endangered and threatened, respectively, in Colorado, by authority of the Colorado Wildlife Commission.

The goal of this plan is to address management needs and activities to protect and enhance current breeding populations of least terns and piping plovers in Colorado, and to assist with federal recovery goals for these two species. Unlike the federal recovery plans for these species, this plan will cover both birds in one document. The birds have very similar nesting and brood-rearing habitat requirements, and are currently found at the same reservoirs, on the same beaches. Management activities for least terns and piping plovers will also benefit other nesting shorebirds.

HISTORY

In North America, least terns and piping plovers were killed during the late 1800s for the use of their feathers in the millinery trade, eggs were gathered from beaches by egg collectors, and habitat disturbance began (Bent, 1962, 1986). All these activities contributed to the rapid decline of several shorebird species, but particularly least terns and piping plovers. Probably the most important causes contributing to the decline of piping plovers and least terns in the North American interior are: 1) Construction and operation of reservoirs and river systems for irrigation, flood control, and recreation; 2) Increased recreational use of beaches, particularly with all-terrain vehicles; and 3) Increased predation due to concentrations of these birds in limited habitat. Currently, there are estimated to be 6,000 interior least terns (USFWS, 1990;

Kirsch and Sidle, in review, 1993) and 2,000 piping plovers in the Great Plains and Canadian prairie (Haig, pers. comm., 1991).

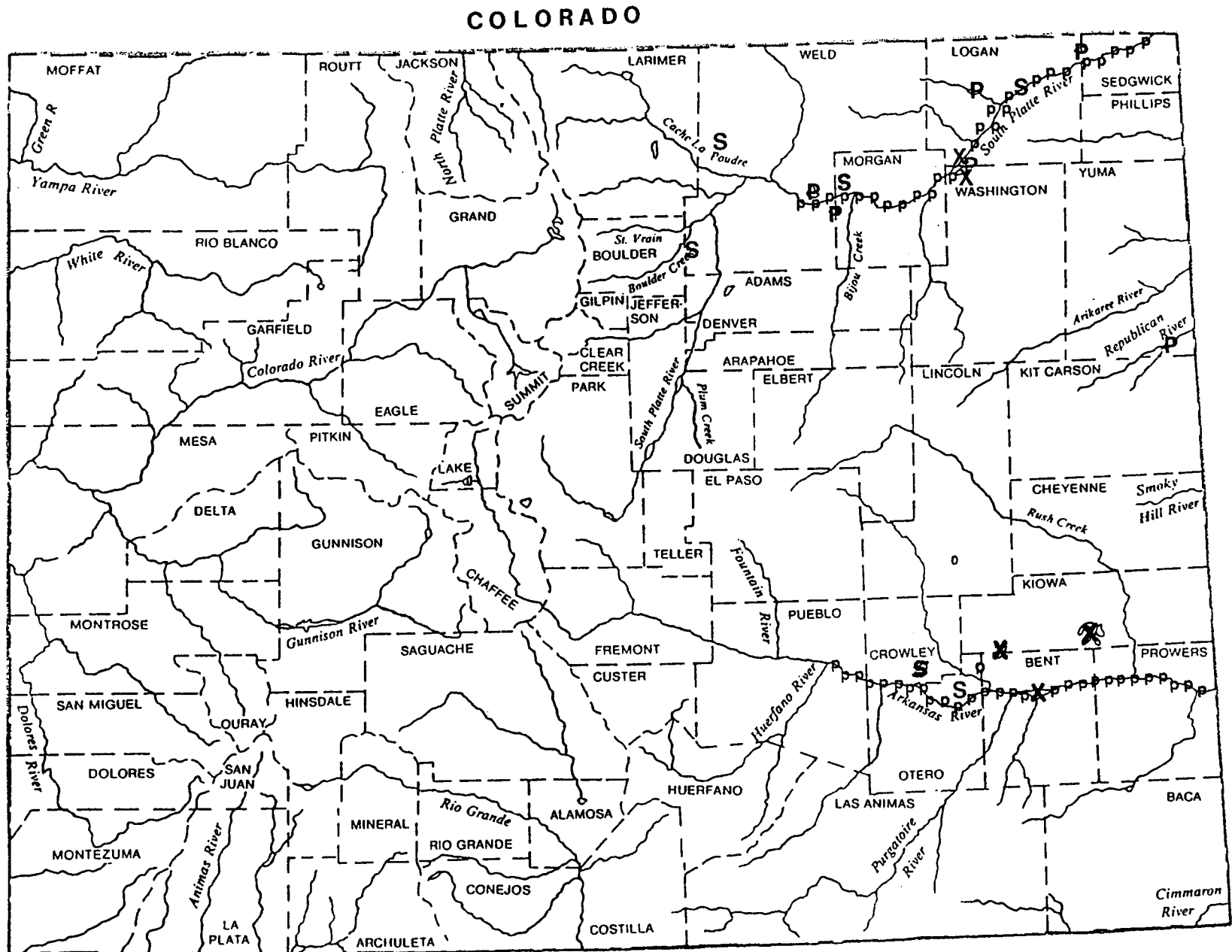
The North American least terns are divided into the following populations: 1) California least terns, which occur on the west coast of North America, primarily in California; 2) coastal least terns, which breed along the east and Gulf coasts of the U.S.; and 3) interior least terns. Interior least terns occur along the Missouri River system in North and South Dakota, Montana, Nebraska, and Iowa; along the Mississippi and Ohio Rivers in Missouri, Kentucky, Tennessee, Arkansas, Mississippi, Louisiana, Illinois, and Indiana; and along the Arkansas River system in Arkansas, Oklahoma, Texas, Kansas, and Colorado (USFWS, 1990).

Piping plovers have a breeding distribution similar to least terns. Plovers are divided into the following populations: 1) Atlantic coast, Newfoundland to North Carolina; 2) Great Lakes, where the only active nesting occurs in Michigan; and 3) Northern Great Plains, including Alberta, Minnesota, Montana, North and South Dakota, Nebraska, Iowa, Kansas, and Colorado (USFWS, 1988a). Piping plovers in the Great Lakes population are listed as endangered, while the other two populations are considered threatened.

In Colorado, piping plovers were first found nesting at Prewitt Reservoir in 1949 (Andrews and Righter, 1992). No plovers were known to have nested between 1949 and 1989, when they were found nesting by a Denver-area birdwatcher, at Neenoshe Reservoir. In 1978, least terns were first documented nesting at Adobe Creek and Horse Creek Reservoirs (Chase and Loeffler, 1978). Since 1978, Horse Creek Reservoir has gone dry, but terns have continued to nest at Adobe Creek Reservoir when nesting habitat conditions are suitable. Least terns nest primarily at Adobe Creek and Neenoshe Reservoirs, with one nesting record from Upper Queens Reservoir (Nelson and Aid, 1993). Piping plovers have nested at Adobe Creek, John Martin, Neenoshe, Neegronda, and Upper Queens Reservoirs.

During the late 1980s, tern and plover searches were made of any suspected or potential habitat in northeast Colorado along the South Platte River, and in southeast Colorado along the Arkansas River and associated reservoirs. Other than a few lone adults, no birds were found in the northeast (Carter, pers. comm., 1990). An inventory of least terns and piping plovers has been conducted in southeastern Colorado every nesting season since 1990, by personnel from the Colorado Bird Observatory under contract with CDOW (Tables 1 and 2).

Figure 1: Interior least tern and piping plover distribution



- X Known nesting locations
- S Sightings
- P Potential habitat, nesting season

SPECIES DESCRIPTION

Least Tern Identification and Life History

The least tern is the smallest of the North American terns. Adult breeding plumage is the same for both sexes, and features include a black cap and nape, white forehead, and a yellow bill with black tip. Least terns have gray upperparts, white underparts, a black wedge on the outer primaries (conspicuous in flight), a forked tail, and yellow legs and feet. The juvenile tern is brownish gray above, with a white triangle on the trailing edge of the top of the wings, and a dark shoulder bar on the wings.

The main food item of least terns is small minnows. Adequate supplies of these small fish must occur in an area before nesting will be attempted. Terns begin to arrive in southeastern Colorado in mid to late May, and courtship begins immediately if the habitat is found to be acceptable to them. This behavior consists of the male catching a small fish and flying over his territory to present it to a female. Acceptance of the fish by the female forms the pair bond. Preferred nesting habitats in southeastern Colorado are primarily islands, or beaches, when islands are not available, on irrigation reservoirs. (River islands and sandbars do not seem to be chosen by terns in Colorado as they are in other parts of the least terns' range. This is probably a function of availability of riverine islands and sandbars, as water releases from John Martin Reservoir on the Arkansas River often inundate downstream islands either before terns and plovers can establish nests or before they can hatch eggs if they did nest.) Nests are found in shallow, unlined scrapes in the bare sand, rarely lined with pebbles, in very sparsely vegetated areas. Although least terns are territorial, they do nest colonially. Nests can contain one, two, or three eggs, possibly depending on food availability (Nelson, pers. comm., 1992); or population differences (Carter, pers. comm., 1993). Renesting occasionally occurs when the first clutch of eggs is destroyed. Clutch size for renests is one or two eggs, but never three (Nelson, pers. comm., 1993). Incubation usually takes about 19-21 days. Least terns aggressively defend their nests by diving at intruders, often times defecating on the offending individual. Least terns are able to breed their second year after hatching, and usually stay on the wintering grounds until they are ready to breed. Adult least terns will often delay nesting until adequate nesting conditions exist, usually after water levels begin to recede at irrigation

reservoirs. Nest initiation may occur well into July, extending the hatching of young well into August (Nelson and Carter, 1990).

Terns usually leave southeastern Colorado in late summer, or whenever their nesting cycle is complete. Little is known about staging and wintering areas. Least terns are thought to winter along coastal areas of Central and northern South America.

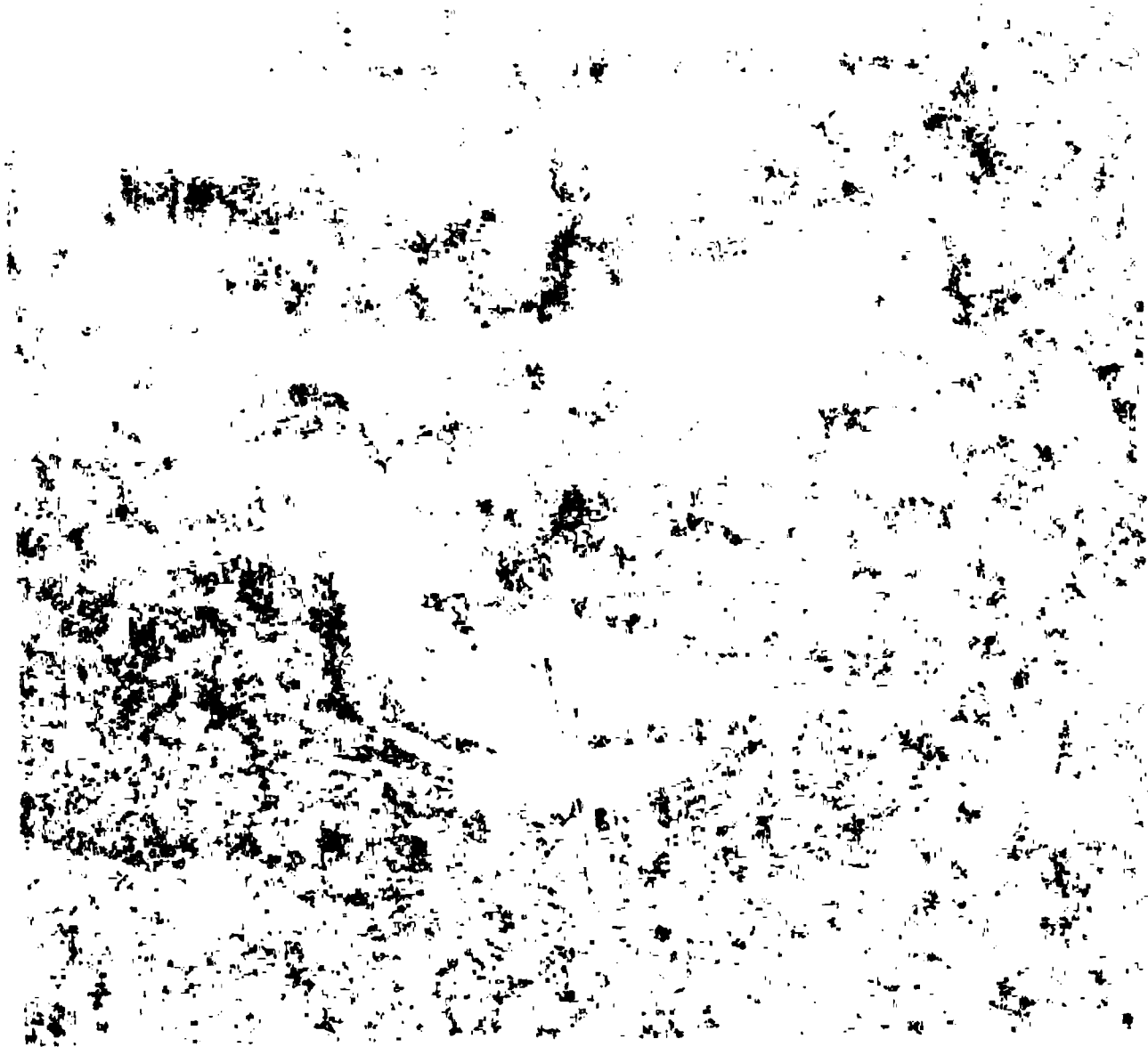
Piping Plover Identification and Life History

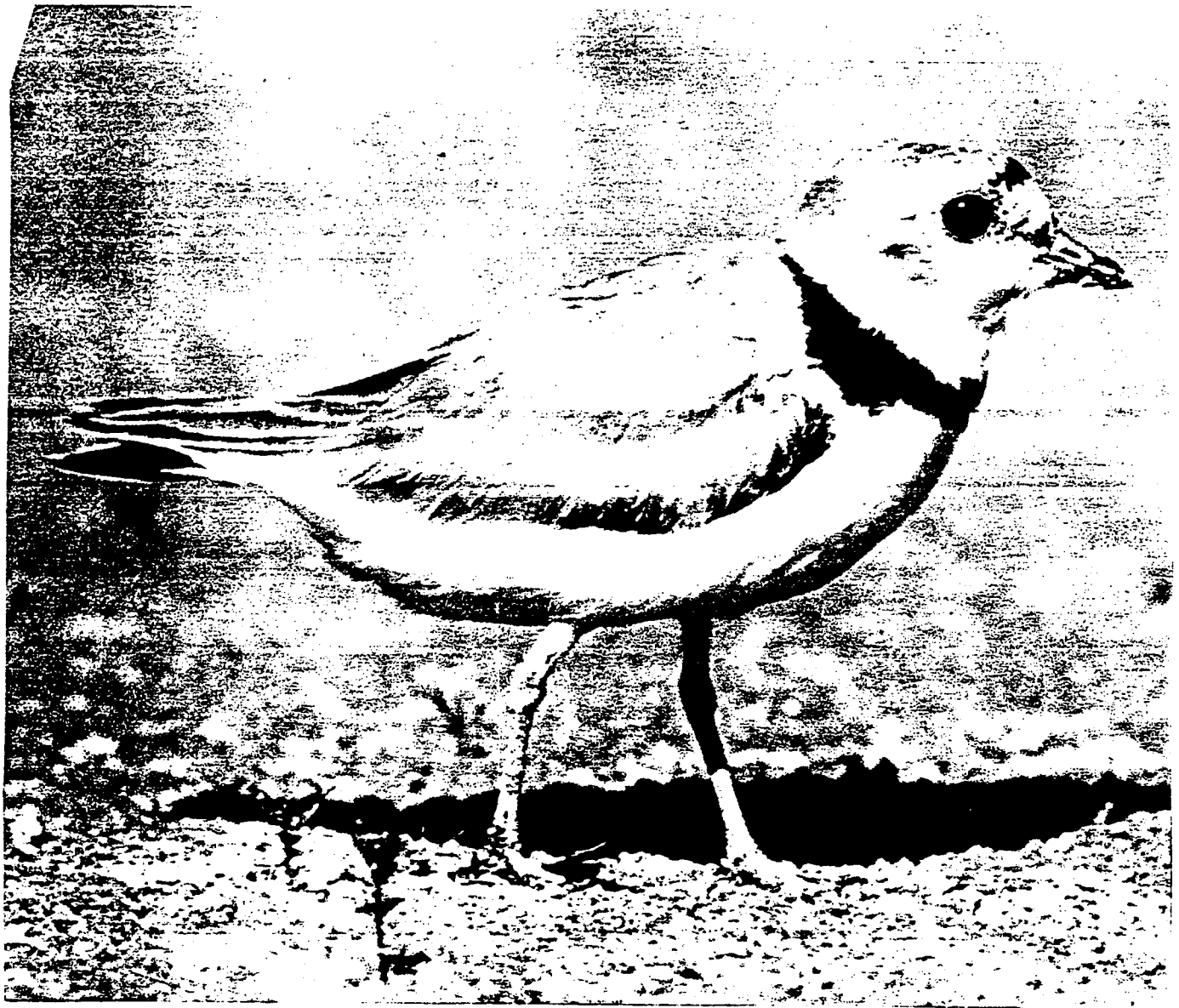
Piping plover plumage is well adapted for camouflaging the bird on beaches. The back of the this medium-sized plover is the color of dry sand, while the underside is white. Piping plovers in breeding plumage, have a black neck band, which is sometimes incomplete, especially in females. There is also a black band across its white forehead during breeding season. It has a somewhat stubby bill which is orange at the base, with a black tip. The legs and feet are also orange. During flight, there is a conspicuous white wingbar and white patch at the base of the tail. Winter plumage lacks the black bands on the neck and forehead, and adults and juveniles are similarly colored during winter. A very similar species is the snowy plover, but it lacks the complete neck band, and has a dark ear patch and darker legs and feet. Both species can be found nesting on the same beaches in southeastern Colorado (Nelson, CDOW report, 1991). Piping plovers have a very distinctive *peep-lo* call, which has a somewhat ventriloquist quality to it. Plovers are found on very sparsely vegetated beaches and sandy areas near water on shores and islands of irrigation reservoirs are preferred.

Piping plovers usually arrive in southeastern Colorado in late April or early May and begin courtship displays. Males perform an aerial display of slow wingbeats, while calling over feeding and nesting habitat. While on the ground, males chase each other with hunched backs and lowered heads and defend territory borders. Males will make a series of nest scrapes in sparsely vegetated areas of sandy beach. When a female comes to inspect a nest scrape, the male will stand nearby with fanned tail and outstretched wings and toss small pebbles and pieces of beach debris into the nest scrape. Mating generally occurs on the nesting territory and copulation often takes place while the female stands over the nest cup (Nelson, pers. comm., 1993). At nest sites with alkali substrate, small twigs are used as nest lining, apparently to keep the eggs up off of potentially damp ground. This material becomes the nest lining. Southeastern

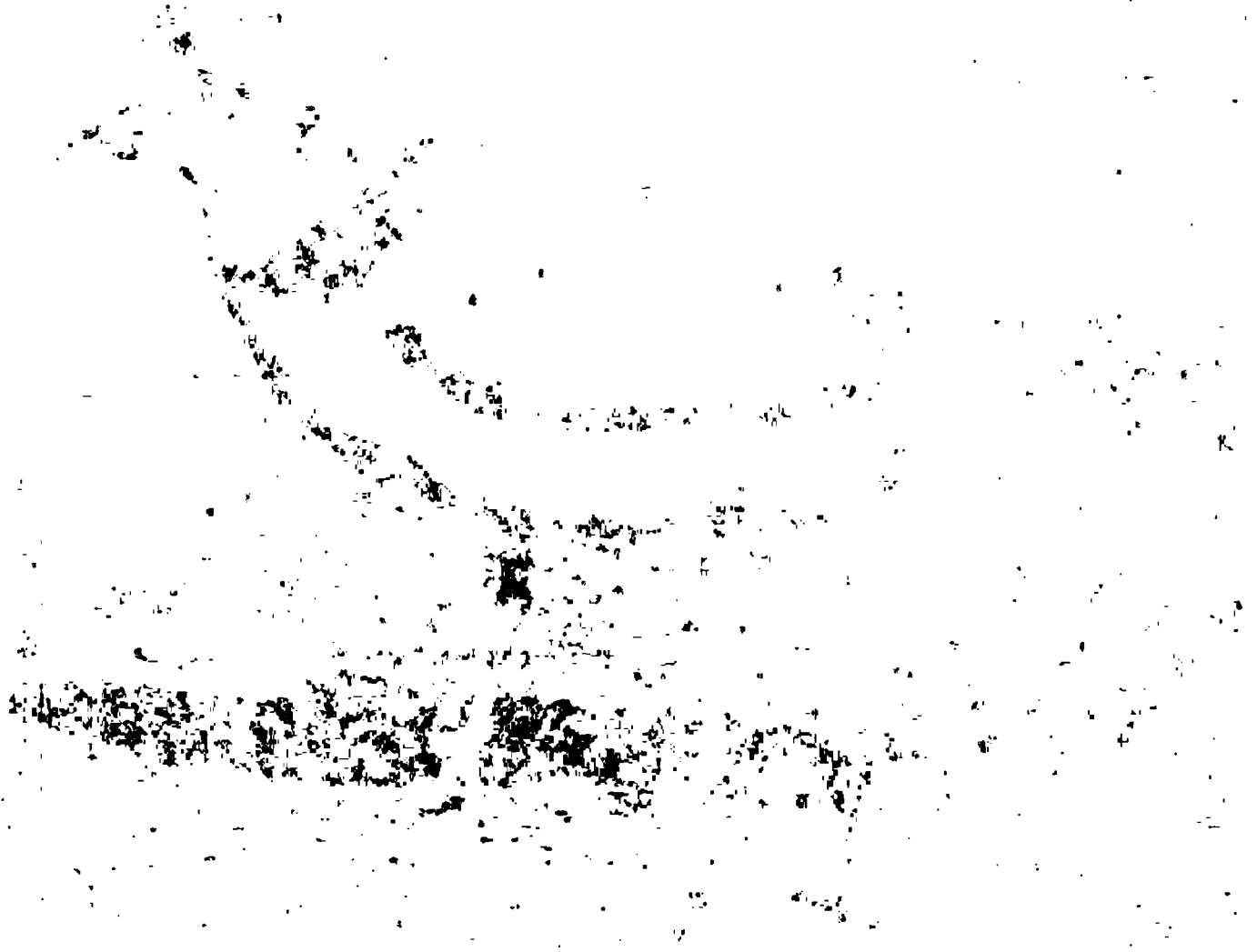


Interior least tern





Piping plover



Colorado may be the only place this occurs, as this behavior has not been found in any of the literature surveyed (Nelson, pers. comm., 1991).

Female piping plovers usually lay four eggs which are buff-colored and speckled with dark brown or black. Renesting is common, but clutches are usually small (Nelson, pers. comm., 1993). Incubation takes approximately 26-28 days. Chicks are precocial, and move out of the nest cup within hours of hatching. Young plovers are very mobile and are able to feed themselves. However, adults carefully guard young from predators and will use the broken-wing distraction display when a threat is perceived. Slightly less than a month after hatching, young plovers are able to fly. Piping plovers are able to breed their first year after hatching, and may have different mates each year.

Food for piping plovers includes insects (particularly fly larvae and beetles), crustaceans, and other small aquatic animals and their eggs. Plovers feed along beaches, especially in the area where waves have washed up debris. During nesting and brood-rearing, most feeding by adults and young occurs near the nest site. Young plovers do not feed near the edge of the water until they are large enough to escape predators on foot. Often piping plovers can be observed with head tilted, looking down at the ground, much as a robin does.

Most piping plovers leave southeastern Colorado when the nesting cycle is complete, or by late August. Staging areas are not known, and most birds winter along southern U.S. and northern Mexico coasts.

REASONS FOR POPULATION DECLINES

Least Terns

Biological

Probably the most important biological threats to least terns are limited minnow/small fish populations, predation, and selenium and pesticide poisonings. Predation on least tern nests is a major concern at all locations where they nest. Predation on reservoir shorelines has been an increasing problem as water levels recede. Early in the nesting cycle, mammalian predators seem to be most common, with gulls becoming an increasing problem as the summer progresses.

With declining water levels, mammalian predators have smaller areas to patrol, thus increasing the likelihood of finding ground nesting birds' nests. This seems to be much less of a problem on the island nesting habitat found at Adobe Creek Reservoir. As the summer progresses, gull predation becomes a problem, both at reservoir shoreline sites and on island habitat. The islands at Adobe Creek Reservoir (Tern Island, and in lower water years, Long Island) are used by several bird species for nesting. The most important for purposes of this management plan are least terns, piping plovers, and California gulls. California gulls are the principal avian predator. While the gulls are incubating their own eggs, they do not represent much of a threat. However, when they are feeding young or when adults are loafing on beaches, they pose a real threat to tern and plover (and other ground nesting birds') nests. Gulls are also becoming more numerous on shorelines of other southeastern Colorado reservoirs (personal observation), perhaps attracted by dead and dying fish as water levels fluctuate. (Another gull attractant is the Las Animas land fill, about 10 miles south of Adobe Creek Reservoir.)

Least terns do not seem to be particularly affected by diseases and parasites. They do, however, have a naturally low reproductive rate, so high quality nesting habitat is absolutely essential. Prey base for an adequate food supply is directly affected by water quality and quantity. So far, in the reservoirs in southeastern Colorado, except Upper Queens Reservoir (Nelson, pers. comm., 1993), prey availability has probably not been a problem. Water quality also has not been a problem to date, although alkalinity and selenium levels could be a concern in extremely low water years. At the main nesting colony at Adobe Creek Reservoir, small fish populations have been sufficient for nesting pairs to use all available nesting habitat. Adobe Creek Reservoir water storage management is such that in most years since terns were discovered nesting there, water levels and quality have remained high enough to produce minnows in abundance. However, in drought years when water levels are very low, fish die-offs could occur as water quality decreases. This could cause least terns to abandon nesting attempts for those particular years. If those water conditions were to persist for several years in a row, least terns could possibly leave the area entirely.

Habitat Alteration or Loss

Water levels have more impact on nesting habitat than any other single factor. No matter what the water level at area reservoirs, there seem to be impacts to nesting terns and plovers. Low water elevations allow land-based predators to have a greater-than-average effect on nests. Low water levels are also often associated with poor water quality, thus affecting the terns' prey. High water levels have the potential to inundate all available nesting and brood-rearing habitat. Stable water levels, no matter what the elevation, would allow vegetation to encroach all sand beach areas, eliminating nesting habitat. Another important effect of water management is in the timing of inflows and releases. The current practice of winter storage of water at Adobe Creek Reservoir is the ideal condition. Water is added in late fall, winter, and very early spring (depending on water availability), and released in the late spring and throughout the summer for irrigation. Timing the raising and lowering of water in this way allows the island vegetation to be flooded, usually helping to control its growth during the time (i.e. spring) when it should be most vigorously growing. Then, when the birds arrive, the water has receded-or soon will be-exposing sand beaches for nesting. Putting water into the reservoir in winter also helps keep the fishery healthy, by providing spawning habitat, phyto- and zooplankton areas in the flooded vegetation, and by oxygenating the water during the critical ice-covered period of the year.

River nesting and brood-rearing habitat downstream from John Martin dam on the Arkansas River, is almost nonexistent due to water releases. About the time terns might be establishing nests on what few sandbars there are, water is released for irrigation purposes, or as part of the interstate water compact with Kansas. There is very little that can be done about the timing of these releases, as it must be done when the water is available (early to mid-summer), and when irrigators and Kansas make calls for their water. Due to high water from spring run-off, there is also no adequate sandbar habitat downstream from Pueblo Reservoir to John Martin Reservoir. Due to highly regulated and controlled operation of the Arkansas River, floods no longer scour riparian vegetation out of the river bottom, and tamarisk and cottonwoods have further reduced habitat that may have existed historically.

Another activity affecting nesting and brood-rearing is human recreation. Humans are attracted to the same beach areas that appeal to terns and plovers. Activities with the greatest

impact to habitat include use of all-terrain vehicles, beach campsites, and driving and walking to those campsites.

Piping Plovers

Although their food requirements differ, piping plovers and least terns share very similar nesting and brood-rearing habitats. Most of the discussion about least tern population declines also applies to effects on piping plovers. In addition to factors listed for least terns, piping plovers have the following impacts affecting them:

Predation

Nest losses to predation are greater for piping plovers than for least terns in southeastern Colorado (Nelson and Carter, 1990). This is probably because plover nest defense behavior is not as aggressive as that of least terns. Nest predators include long-tailed weasels, California gulls, magpies, skunks, foxes, coyotes, raccoons, great blue herons, and possibly snakes (Nelson, pers. comm., 1993). Predator exclosures have been used on most piping plover nests found at Neenoshe, Neegronda, and Upper Queens Reservoirs in 1992 and 1993 with some success. However, for predators as small as weasels, any mesh size sufficient to keep them out will also prevent adult plovers from getting to the nest. Also, exclosures may even attract predators. (As we have used exclosures, for only one nesting season, more time is needed to evaluate the benefits of nest cages.)

CURRENT MANAGEMENT

Since least terns and piping plovers are fairly recently documented nesting species in Colorado, all management activities for these two species have been instituted within the past five years. Much of the work done has been a cooperative effort between Colorado Division of Wildlife (CDOW), Colorado Bird Observatory (CBO), U.S. Fish and Wildlife Service (USFWS), and Bureau of Land Management (BLM).

Census

In 1990, the CDOW contracted with CBO to do tern and plover inventory on the eastern plains of Colorado. (Contracting was used for two reasons: lack of available personnel time within CDOW, and availability of personnel within CBO with shorebird expertise.) This activity was prompted by the confirmed nesting by piping plovers at Neenoshe Reservoir in 1989. In this initial year, in addition to nest searches and monitoring in southeast Colorado, extensive searches were made in any areas considered as potential habitat. This included the South Platte River drainage in northeast Colorado, and the Arkansas River drainage in southeast Colorado. The only nesting activity in Colorado was found in the southeast. All search efforts were conducted by CDOW, CBO personnel, and CBO volunteer birders.

In 1991, a nation-wide piping plover and least tern census was conducted. The northeast and southeast portions of Colorado were again searched, with the only known nesting still in the southeast. Since that national census, northeast Colorado has not been searched intensively for terns or plovers. All census, nest monitoring, and management has taken place at reservoirs in the lower Arkansas River valley in southeastern Colorado (Adobe Creek, John Martin, Neegronda, Neenoshe, and Upper Queens Reservoirs).

Nesting activities for both species have been monitored since 1990, by visiting reservoirs and looking for pairs of adults. Reservoirs with past confirmed nesting are concentrated on most intensively. However, several times in the beginning of the nesting season, all local reservoirs and other areas, such as gravel pit ponds with potential habitat, are searched for adult birds. All adults are counted. When adults are observed establishing nesting territories, nest scrapes are monitored to determine use. Locating active nests and determining when the nest was initiated (whether or not a complete clutch was in the nest scrape), and back-dating to estimate hatching date is the next step.

Most piping plover nests since 1992 have been caged to reduce nest predation. Determining which nests to enclose depends on the nest location. Those nests that would become obvious to human beachgoers, possibly inviting nest tampering, are not caged. The type of enclosure used consisted of 2x4-inch welded wire 30 feet long and 3 feet wide, shaped into a circle and held in place by 4-foot pieces of 1/2-inch re-enforcement bar, driven into the sand. Monofilament fishing line is zigzagged across the top of the enclosure to prevent avian predators

from landing inside. Enclosures in 1992 allowed piping plovers to successfully hatch a clutch of eggs, as they nested adjacent to a California gull roosting location. Nesting enclosures erected in 1993 at Neenoshe Reservoir have not been as successful, as the main predators have been mammalian (probably long-tailed weasel). Enclosures can be erected by two people in about five minutes, and the bird returns to the nest within 5-10 minutes.

Nests are observed throughout incubation and progress is recorded at each visit. Hatching rates for successful nests are determined. Pairs that have had a nest destroyed are observed to determine if they attempt renesting. Such efforts are compared to initial nesting attempts to determine if there are differences in numbers of eggs, and hatching and fledging rates. Fledged young from all nests are counted, and fledged young per breeding pair is the ultimate measure of reproductive success. Inventory activities are conducted in a manner which will disturb nesting adults and hatchlings as little as possible. Nests and young were observed from a distance whenever possible, and were visited just long enough to determine the status of the eggs and nest.

Habitat Management

Habitat management, until 1993 had been minimal. During early summer, 1992, a 4-H group helped for half a day with the removal of vegetation encroaching on nesting habitat on Tern Island at Adobe Creek Reservoir. This activity helped produce some improved nesting habitat. However, due to the ages of the volunteers, it was difficult to keep them involved in the activity at hand. In future years, if volunteers of this type are used, it would be best if they are at least in their teens, and are accompanied by sufficient numbers of adults to keep them motivated.

In 1993, habitat improvement efforts were increased, mostly in response to higher-than-average water levels at Adobe Creek Reservoir. All nesting habitat on Tern Island that had been available in previous years was under water when terns and plovers arrived. Due to water levels in recent years, cottonwoods (some up to 3-4 inches in diameter) and yellow sweet clover had covered the more upland portion of the island. Cockleburs and other annual forbs were found in sandy areas that in previous years had been the high water mark. Trees and forbs were removed from approximately 1,000 yards of beach on the sandiest portion of the island shore.

Flooded trees in front of the beach were also removed. All vegetation was removed manually by CBO and CDOW personnel, including a Youth in Natural Resources (YNR) employee. Approximately 12 person-days were used to accomplish the beach clearing.

Due to an abundant mountain snow fall in the winter of 1992/1993, excess water was available for purchase. CDOW purchased water from the city of Colorado Springs to be stored in Neenoshe Reservoir. Neenoshe was chosen due to its very low water level in an effort to maintain the fishery there and to improve long-term habitat for plovers and terns. Because of some water management constraints, this water was to be temporarily stored in Adobe Creek Reservoir. With already-high water at Adobe Creek, more water jeopardized least tern nests. As water levels rose, more beach area was cleared of vegetation at slightly higher elevations. The maximum water level occurred in mid-July, which not only threatened nests being incubated, but probably inhibited re-nesting and late-nesting efforts. As a contingency plan, a permit was obtained from the U.S. Fish and Wildlife Service to move least tern and piping plover nests that were in danger of being flooded. No nests had to be moved; however in future years, this option may need to be considered again. If possible, winter water storage is the best option to avoid threats to nests and nesting and brood-rearing habitat.

With the availability of additional water, CDOW and CBO personnel determined that an island at Neenoshe Reservoir could greatly increase reproductive success. Since CDOW earthmoving equipment was in the area, work was able to start immediately on a 150 by 250-foot island. A channel was dug deep enough so that the zero-gauge water level would be five to six feet deep, and approximately 100 feet wide. (Zero-gauge is the water elevation when water can no longer be released out the canal. This is basically the elevation of the bottom of the outlet canal.) A bulldozer and front-end loader were used in constructing this island, and took two people approximately two weeks to accomplish. All vegetation was scraped from the site prior to construction. This allowed dirt to be compacted as much as possible to reduce the erosion caused by wave action. The finishing touch was to place sand on the surface of the island to provide nesting substrate for plovers and terns.

Recreation Management

Since discovery of nesting plovers and terns in 1989, beaches where nests occur have

been closed to all recreational activities. These closures have met with varying success over the intervening years. Each year signs stating that the area is a nesting area for both species have been erected. Also in each year, *"No Vehicles Beyond This Point"* signs have been employed. Neither of these two signs have been particularly effective by themselves or together. In 1992, we started to use signs stating *"Area Closed to All Human Activity Behind This Sign"* along with the plover/tern nesting area signs. This was more effective in keeping people out of the nesting areas.

In 1993, efforts to protect nesting areas were increased. Large (4 by 8 feet) informational signs were erected at roads leading to nesting beaches. These signs explain and have artwork about what birds to look for, why they are endangered, and why areas were closed to protect them. At the actual area where we wanted to restrict access, the small plover/tern nesting area and "No Human Activity" signs were erected. To further delineate closed areas we wanted people to stay out of, orange twine was strung between short posts as "psychological" fencing. This seemed to be much more effective than past years' efforts to restrict beach activities.

At John Martin Reservoir, where recreation pressure is greater, more drastic measures were taken by the U.S. Army Corps of Engineers (USACE). Besides the signs that were used at Neenoshe and Upper Queens Reservoirs, a trench was scraped around the closed area, preventing vehicles from entering nesting habitat. Also, to prevent boats from approaching from the lakeside and landing on the beach, buoys were placed offshore from the nesting area.

Although people crossed the boundary at all locations, there were fewer encroachments than in past summers. Besides signs, CDOW personnel increased their law enforcement efforts. Once several tickets were written, people got the idea that the signs meant what they said, and after the first couple of weeks almost no more nesting area entries occurred.

Prior to erecting signs in 1993, articles were published in local newspapers describing what the CDOW was going to do and why. It was also stated that as soon as the birds completed their nesting activities, closures would be removed and recreationists could resume use of the beaches.

Grazing by Domestic Livestock

Grazing by cattle occurs around Neenoshe, Upper Queens, and Adobe Creek Reservoirs. Grazing on private land at Neenoshe Reservoir includes an agreement with the BLM allowing livestock access to the reservoir for water, via a water gap. Prior to the summer of 1991, grazing was allowed to occur over all the north shore of the reservoir. This posed a possible threat to young shorebirds. When cattle went to the water to drink, they left very deep (sometimes exceeding 12 inches) hoofprints. Since young birds feed along the shoreline, they run the risk of falling into one of these hoofprints and not being able to get out. Since 1991, the BLM has requested that the landowner with the water gap agreement maintain fencing to allow cattle access to the water, but not to the entire north shore.

Grazing at Upper Queens Reservoir is controlled by private landowners, but cattle are not usually on the area until mid to late summer. In future years, if nesting activities increase at Upper Queens, fencing of some type (probably electric) may need to be erected to protect nestlings.

At Adobe Creek Reservoir, grazing by cattle usually occurs from November through the winter. In years when water levels are low enough, cattle graze on Tern Island. It is felt that this improves shorebird nesting habitat, as the animals browse on perennial vegetation, especially cottonwood sprouts, grass, and clover. However, due to winter storage of water in Adobe Creek, this is not possible every year; and in years when it is, conditions usually only allow cattle access to Tern Island for a few weeks.

* * *

MANAGEMENT PLAN

The objective of management activities for least terns and piping plovers is to ensure their continued existence as a breeding species in Colorado; and to assist in the national goals and objectives of removing them from the threatened and endangered species lists.

The primary threats to piping plovers and least terns are habitat loss and alteration; and human disturbances of breeding adults, nests, and young. This management plan addresses techniques and strategies to reduce or eliminate these threats, and to provide nesting colonies in three, separate locations, for both species. By providing three nesting areas, all production for a single year may not be destroyed if some unforeseen weather event destroys nests at one location.

Population objectives for downlisting (least terns) and delisting (piping plovers) in Colorado, will be as follows:

PIPING PLOVER- Delist from threatened status when a minimum average of 25 breeding pairs, with a productivity rate of at least 1.2 fledglings per breeding pair (Ryan, et al, 1993) has been sustained for at least five consecutive years. Such population must consist of at least three separate and distinct breeding areas (i.e. Neenoshe, Upper Queens, Adobe Creek and John Martin Reservoirs), and each such breeding area must support three or more successful breeding pairs each year for the five consecutive years.

LEAST TERN- Downlist from endangered to threatened status when a minimum average of 25 breeding pairs, with a productivity rate of at least 0.7 fledglings per breeding pair (Sidle, pers. comm., 1993), has been sustained for at least five consecutive years. Such population must consist of at least two separate and distinct breeding areas (i.e. Adobe Creek, Neenoshe, and John Martin Reservoirs), and each such breeding area must support five or more successful breeding pairs each year for the five consecutive years.

Delist from threatened status when a minimum average of 50 breeding pairs, with a productivity rate of at least 0.7 fledglings per breeding pair (Sidle, pers. comm., 1993), has been sustained for at least five consecutive years. Such population must consist of at least two separate and distinct breeding areas (i.e. Adobe Creek, John Martin, and Neenoshe Reservoirs),

and each such breeding area must support ten or more successful breeding pairs each year for the five consecutive years.

1. Management and acquisition of habitat

- 1.1 Least tern and piping plover habitat acquisition includes improving administrative and legal control over existing suitable habitat and improving potential habitat. Acquisition will be through fee title, leases, memoranda of understanding, or conservation easements. Acquisition must be flexible to respond to changing biological, social, and technological conditions.
 - 1.11 Continue acquisition of water and water rights to ensure adequate lake levels, providing shoreline nesting and feeding habitat, and prey (for least terns). Water currently needs to be acquired for John Martin and Neenoshe Reservoirs. If water storage practices change at Adobe Creek Reservoir (i.e. winter storage discontinued), water needs to be acquired for this reservoir also.
 - 1.12 Establish long-term control for the purpose of habitat management on Tern Island at Adobe Creek Reservoir via a memorandum of understanding or easement with the State Board of Land Commissioners.
- 1.2 Piping plover and least tern habitat management includes maintenance of existing suitable habitat and improving potential habitat. Management must be flexible to respond to changing biological, social, and technological conditions; and will be done in cooperation with BLM and other area landowners and administrators.
 - 1.21 Continue vegetation control.
 - 1.211 Manual control methods: Continue manual removal of vegetation on small areas of sand, especially during high water years, on islands at Adobe Creek and Neenoshe Reservoirs (see Appendix A), and on the shoreline at John Martin Reservoir. When water levels are high and islands exist, manual removal will be necessary because equipment for mechanical control cannot be transported to the islands.

- 1.212 **Burning:** Burning will be used in coordination with chemical control and/or weed barrier. Burning alone, however, is not effective over the long term. (It may be a useful technique for one growing season at a time.) Burning will probably be most cost effective on the islands at Adobe Creek and Neenoshe Reservoirs, as fire containment is not the problem it would be on shoreline areas. If fire is used on reservoir shorelines, fire breaks and more personnel for fire control and suppression would be needed. On the islands, personnel needs would be much less, and no fire breaks would be needed.
- 1.213 **Mechanical vegetation control:** Mechanical vegetation control and manipulation will be used on larger, onshore areas (often instead of fire) to expose sandy substrate. This may include mowing, discing and/or plowing, and cutting trees and shrubs with a chainsaw. After mowing, weed barrier will be put down, with a covering of sand and small pebbles. These activities will be used primarily at Neenoshe and Upper Queens Reservoirs. (John Martin Reservoir would be a good location for mechanical control also, but water levels fluctuate so much there that very large areas would have to be altered, probably to the point of being cost prohibitive.)
- 1.214 **Chemical vegetation control methods:** Herbicides may be used to control large areas of vegetation. Only EPA approved chemicals for areas on or near water, and with no harmful effects to wildlife, fish, and invertebrates will be used (Rodeo^R by Monsanto is recommended). Pre-emergent herbicides are preferable so that bare sandy areas are available throughout the nesting season. Herbicide use will be approved by the Ft. Lyon and Amity Irrigation Companies, BLM, and State Land Board. Herbicides will be applied to various locations (including islands)

at Adobe Creek, Neenoshe, and Upper Queens Reservoirs. Depending on the herbicide used and its longevity, weed barrier may be put down and covered with sand/pebble mixture for long-term vegetation control.

- 1.215 Water level manipulation: If water storage rights are acquired by CDOW, and when water is available, water levels can be manipulated to help control vegetation. If vegetation can be flooded late in the growing season (after the terns and plovers have finished their breeding activities) and remain submerged through the winter and early spring, water levels can be lowered just prior to the birds' arrival, exposing sandy areas for nesting. Opportunities to use this method of vegetation control will occur primarily at Neenoshe Reservoir, but possibly also at Adobe Creek and John Martin Reservoirs.
- 1.22 Provide nesting substrate, as needed, on the island at Neenoshe Reservoir. As this is a newly-constructed island, in its initial years sand may be needed to encourage terns and plovers to nest. This activity can only be accomplished when water is at a low enough level to get earth-moving equipment on the island.
- 1.23 To protect the newly constructed island at Neenoshe Reservoir from erosion from wave action, Geo-Web will be placed around the shoreline at approximately 0-gauge, and filled with small gravel.
- 1.24 Maintain Tern Island at Adobe Creek Reservoir by keeping channels open between the lake shore and the island. Due to water flow patterns within the reservoir, mud and sand builds up between the west part of the island and the west shore of the reservoir, creating a land bridge at lower water levels. This could allow mammalian predators easy access to nesting colonies on the island.
- 1.25 Work with water users to continue water level management to protect nesting and foraging habitats. Winter storage of water is most

advantageous for breeding plovers and terns, as it helps control shoreline vegetation, improves water quality for maintaining the fisheries, and recedes at the most opportune time for nesting. When winter storage is not possible, alternate reservoirs without nesting terns and plovers could be used for water management and storage until young birds have fledged.

1.251 When water levels jeopardize individual nests, obtain a permit from the USFWS to move nests. This should be used strictly as a last resort, as moving nests is still speculative, and only slightly better than losing them.

1.252 Work with USACE personnel at John Martin Reservoir and with the Colorado State Engineer to make releases of water from John Martin dam either prior to or after least tern and piping plover nesting season. (The timing of these releases will be somewhat dictated by calls for water by irrigators downstream from John Martin and by the interstate compact with Kansas.) This will reduce chances of inundating any nests which may occur on sand bars and instream islands in the Arkansas River below John Martin dam.

1.26 Cooperate with and advise gravel mining operators in potential habitat areas about habitat development for nesting least terns and piping plovers. Provide information about island construction specifications and development, vegetation management, and recreation management for post gravel mining reclamation or development. (Two large gravel mining operations are being proposed along the Arkansas River, one approximately 8 miles west of Lamar; and another in the Holly area.)

2. Recreation management.

2.1 Continue erecting informational signs at entrances to plover and tern habitat areas. These signs help inform the public as to why beach use restrictions are needed.

- 2.2 Continue closing breeding areas to human use. As nesting habitat is developed, areas for closure to human activities will be easier to delineate. These areas will continue to be closed with signs prohibiting any entry, and with "psychological" fencing (i.e. twine).
- 2.21 Continue beach closures at John Martin Reservoir, with the assistance of USACE personnel. These areas will vary as water level fluctuates. Also continue the buoy line offshore to prevent boats from landing on the nesting habitat.
- 2.22 Continue prohibiting human use of Tern Island at Adobe Creek Reservoir during nesting season, by the use of signs and/or buoys.
- 2.23 Establish a seasonal closure on the entire island and adjacent shoreline at Neenoshe Reservoir.
- 2.3 Continue law enforcement effort to ensure compliance with beach closures. Law enforcement assistance may be required from the USFWS and Colorado Department of Parks and Outdoor Recreation (CDPOR) as recreational use increases with establishment of a state park at the Great Plains Reservoirs, and if needed at John Martin Reservoir.
- 2.4 Assist CDPOR with recreation planning to protect piping plovers, least terns, and other nesting shorebirds, in preparation for state park facilities and activities. Many restrictions on human use will only be seasonal and/or of limited areas of the future park. Input from CDOW during initial park planning efforts will reduce or eliminate later conflicts and misunderstandings.
- 2.5 When appropriate (i.e. no harm and/or disturbance to plovers and terns), provide opportunities for interested members of the public to see and observe these birds. These visits should be conducted by a biologist (either temporary or permanent employee) to prevent disturbance of displaying adults, nests, or young. Viewing blinds may also be constructed so that birds can be viewed with minimum disturbance. (Viewing towers were considered, but discarded, as it was felt they would provide additional raptor perches.)

3. Depredation control.

- 3.1 Continue to place nest enclosures around all piping plover nests to provide protection from predation, unless the enclosure would attract humans (such as a highly visible nest site near recreation areas). Continue to string the tops of the enclosures with monofilament line to exclude avian predators.
- 3.2 Identify which predators are causing losses. (The following techniques would continue only until least tern and piping plover numbers stabilized at recovery objectives.
 - 3.21 If numerous mammals are depredating, erect electric fencing around the nesting colony or area; or use taste aversion with similarly sized eggs, such as quail eggs in artificial nests.
 - 3.22 If there seem to be only a few or one mammalian predator causing the damage, remove that individual.
 - 3.23 For avian predators, nest enclosures should be effective for piping plover nests. As least terns are more aggressive nest defenders, no enclosures should be needed for them. For protection of young of both species, vegetation should be maintained above the nesting area for escape cover. If this vegetation does not exist, pieces of drainage tile, painted the same color as the beach soil, can be used by young terns and plovers for escape cover and shade.
 - 3.231 If California gulls, particularly nesting colonies, become a threat to nesting plovers and terns, control may be necessary. The suggested method would be to cover gull eggs with white mineral oil. This will keep adult gulls incubating, thus not searching for food, but will not allow the eggs to hatch. Eventually, this should help reduce the number of nesting gulls that would return in future years. A USFWS permit would be required prior to using this technique.

4. Population monitoring.

- 4.1 Use USFWS guidelines (see Appendix B) for censusing of least terns and piping plovers (USFWS permit required). This work will be accomplished primarily through the employment of a summer seasonal worker (Wildlife Technician I level, CDOW), or via a qualified contractor.
- 4.2 Band nestling least terns to determine return rates to the area where they fledged.

5. Domestic livestock management.

- 5.1 Whether or not CDOW acquires Tern Island at Adobe Creek Reservoir, continue to allow fall and winter grazing, when water levels allow, to help control permanent vegetation. If wave action does not fill in cattle foot prints, it will be done manually.
- 5.2 In cooperation with the BLM, continue breeding season beach restrictions to cattle at Neenoshe Reservoir.
- 5.3 At all other reservoirs where breeding and nesting plovers and terns occur, monitor beaches for grazing livestock. If any occur, beach areas should be surrounded with electric fencing to prevent cattle from using the whole nesting area. Walkways to the water for cattle to drink should be developed to avoid brood-rearing and brood-feeding areas.

6. Bird decoys.

- 6.1 Decoys of piping plovers and least terns would be used in combination with recordings of vocalizations at the islands at Adobe Creek and Neenoshe Reservoirs to attract adults to developed nesting habitat. (Island management will be emphasized, as mammalian predation will be less.)

7. Information and education.

- 7.1 Provide eastern Colorado media with information on beach restrictions and closures, and the reasons for them.
- 7.2 Assist CDOW media staff with development of a video about nesting shore-birds in Colorado, for release to Colorado television stations, and use by CDOW employees for educational presentations.

MANAGEMENT PLAN SCHEDULE AND COSTS^a

ACTIVITY	YEAR 1	YEAR 2	YEAR 3
4. Temporary (6 months) employee or personal services contract	\$15,500 ^b	\$15,500 ^b	\$15,500 ^b
1.11 Water acquisition			
1.12 Mgmt. Control of Tern Island	Possibly no cost if MOU with SLB		
1.211 Manual vegetation removal	Temporary & permanent employees	Temporary & permanent employees	Temporary & permanent employees & volunteers
1.212 Burning to remove vegetation			\$500
1.213 Mechanical vegetation control		\$500	
1.214 Chemical vegetation control			\$1,000
1.215 Weed barrier			\$2,000
1.23 Island erosion control (Geo-Web)	\$10,000		
2.1, 2.2 Signs	\$300	\$200	\$200
3.1 Nest exclosures	\$150	\$200	\$100
5.3 Electric fencing	\$1,000	\$200	\$100
6.1 Decoys	\$50	\$50	\$50
7.2 Video production	\$1,000		

^a Does not include permanent CDOW salaries or ongoing activities.

^b Includes \$5,000 from BLM to CDOW under a cooperative agreement for piping plover and least tern census. Any activities listed in the Management Plan section, but not listed here are either covered by existing personnel time/dollars, or are management activities that may not be necessary, depending on conditions and circumstances.

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APPENDIX A

**MANAGEMENT PLAN FOR NESTING ISLANDS
AT
ADOBE CREEK AND NEENOSHE RESERVOIRS**

NESTING ISLAND MANAGEMENT FOR LEAST TERNS AND PIPING PLOVERS AT ADOBE CREEK AND NEENOSHE RESERVOIRS

Irrigation reservoir island habitat for interior least terns and piping plovers can be some of the most productive nesting habitat in southeastern Colorado. When prime habitat conditions exist, these birds will nest in colonies (least terns) of fairly high densities or loose colonies (piping plovers). Habitat management on islands allows optimum use of personnel, equipment, and funds as management activities can be concentrated in a smaller area. This plan addresses habitat management on islands at Adobe Creek and Neenoshe Reservoirs. It is a part of the overall least tern and piping plover management plan, and it includes strategies involved in reaching management plan population objectives.

Islands exist at two reservoirs in southeastern Colorado--Adobe Creek (Blue Lake) and Neenoshe. Depending on water level, there are two naturally occurring islands in the middle of Adobe Creek Reservoir--Tern Island and Long Island. Tern Island is an island at high to mid-range water levels, and a peninsula when the water is low. Long Island occurs at moderate water depth, and becomes attached to Tern Island at low levels. Also depending on water depth, there are two islands at Neenoshe Reservoir. Both islands are on the south side of the reservoir. One occurs naturally at mid to low levels, and the other was constructed by Colorado Division of Wildlife (CDOW) personnel during the summer of 1993. The constructed island was built near the zero-gauge water level so there would be an island CDOW could manage with water level manipulation.

As habitat management on these islands will be intensive, it was determined that this more detailed plan be developed in addition to the overall recovery/mgmt. plan. Any permanent structures, any use of chemicals (i.e. herbicides), and any water level manipulations will be discussed with and agreed upon (through memoranda of understanding) by the landowners of the islands, the irrigation companies operating the respective reservoirs, and CDOW prior to any of these management activities taking place.

Adobe Creek Reservoir Islands

The Adobe Creek islands are owned and administered by the State Board of Land Commissioners, with grazing rights for Tern Island leased to a local rancher. Adobe Creek Reservoir is operated by Fort Lyon Irrigation Company. Most habitat developments will occur on Tern Island (the large permanent island which appears at most water levels). Long Island (only appearing during low water levels) is only used by least terns and piping plovers when the opportunity exists. Since it is emergent very seldom, little, if any, time and effort will be spent developing habitat.

To better facilitate long-term habitat management, the CDOW will develop a memoranda of understanding or cooperative agreement with the SBLC for control of the islands. Livestock grazing should not be impacted, and may actually aid in vegetation control. However, there may be some reduced forage after vegetation removal occurs. (Livestock grazing is very limited at

present because cattle can rarely get to Tern Island - and usually only for short periods of time - due to water levels.)

Parts of Tern Island will be developed to provide sandy beaches, which is preferred nesting habitat of least terns and piping plovers. Vegetation will be removed to expose sand. This will be done on an experimental basis to determine which removal method is most effective. These activities can only be accomplished when it is possible to get personnel, supplies, and equipment on Tern Island. Some control methods can be accomplished with very little equipment or materials. However, methods that need large equipment, such as mowing or discing, would have to be done at low water levels, or during winter, when such equipment can be transported to the island.

The following vegetation control methods will be used on experimental plots along Tern Island shoreline:

- 1) **Manual control methods:** Removal of trees, brush, and herbaceous vegetation can be done with chainsaws, hand mowers, etc. This method will be especially important at high water levels.
- 2) **Burning:** Burning may be used on a more widespread basis than experimental plots, and will be used in conjunction with other vegetation control methods listed here. (Burning by itself is not effective over the long term.) Burning will be conducted at times when fire containment will be most easily accomplished (i.e. when there is water completely surrounding the island and no peninsula exists to the reservoir shoreline). Burning will be most effective when the vegetation is dry, usually during late summer through early spring.
- 3) **Mechanical vegetation control:** When large equipment (especially tractors and implements) can be transported to the island, mowing, discing, and/or plowing will be done. This method will probably have very limited use due to usually high water levels.
- 4) **Chemical vegetation control methods:** Only Environmental Protection Agency (EPA) approved herbicides for areas on, in, or near water, which have no harmful effects on wildlife, fish, and invertebrates will be used. Prior to application of any herbicides, approval will be requested from Fort Lyon Irrigation Company and SBLC.
- 5) **Weed barrier:** Weed barrier may be used in combination with some of the listed vegetation control methods. This will extend the longevity of vegetation control treatments. Sand and small gravel will be applied over the weed barrier to provide nesting substrate.
- 6) **Water level manipulation:** Winter storage of water, as has occurred in recent years, is ideal, as water levels rise after the tern and plover nesting season is over, and winter water storage will kill submerged vegetation. It is best if water levels recede in spring prior to arrival of least terns and piping plovers (before mid-May). Cooperative water management efforts with Ft. Lyon Irrigation Company will be pursued in order to maximize habitat benefits of water level fluctuations.

Other island management considerations include:

- 1) Maintenance of Tern Island by keeping channels open between the east and west lake shores and the island. This will help reduce mammalian predators gaining access to the island.
- 2) Continued closure of Tern Island (and Long Island when it appears) to human activity, by the use of signs and/or buoys.
- 3) If California gulls, in nesting colonies, become a threat to nesting terns and plovers, gull control may be necessary. This would require a U.S. Fish and Wildlife Service (USFWS) permit.
- 4) Population monitoring and census will be done as per USFWS guidelines by a summer seasonal worker. Banding of least tern chicks will also be done.
- 5) Decoys of piping plovers and least terns will be used in combination with recordings of vocalizations to attract terns and plovers to developed habitat areas.
- 6) Some nesting enclosures may be erected around piping plover nests to protect them from some nest predators (particularly avian predators).
- 7) Designation of Tern Island as a "Natural Area" via the Colorado Natural Areas Program will be pursued. This designation involves a cooperative agreement with the landowner (SBLC) to facilitate protection and management of the area. There are no permanent commitments required from the landowner, and designation as a Natural Area mostly serves to create a statewide list of important ecological areas. This will in no way affect operation of the reservoir for irrigation purposes, and will not affect grazing by livestock.

There will be no permanent, capital improvements to Tern or Long Island. The only semi-permanent effects to the island will be removal of some vegetation, and maintaining channels between east and west shores of the reservoir. None of these activities will effect operation of the reservoir for irrigators. Memoranda of understanding developed as a result of this plan can be cancelled at any time by any of the parties involved.

Neenoshe Reservoir Islands

The naturally occurring island at Neenoshe Reservoir will be managed much as Tern Island at Adobe Creek Reservoir. It is a large island, and only available at low water levels. At very low water, it is easily accessible across a land bridge, so there will be opportunities to get equipment to the island for vegetation control. This work may need to be done prior to CDOW acquisition of water rights. After water rights are obtained and additional water is stored water levels should remain a few feet above or below zero-gauge, thus keeping the land bridge covered with water.

The constructed island is small enough to allow it to be kept mostly devoid of vegetation. Methods listed for Tern Island at Adobe Creek Reservoir will be used to control vegetation. Additionally, Geo-Web filled with gravel will be applied to the island shoreline, where needed,

to reduce wind and water erosion.

Water level manipulation, when CDOW acquires water rights, can be an effective vegetation management method, and will be applied as much as possible, and as water storage priorities allow. From August through April water will cover the constructed island. From April through mid-May water will be drawn down, exposing nesting habitat for least terns and piping plovers. From mid-May through July, water level will be maintained so as not to flood nests and brood-rearing habitat.

Nesting habitat areas developed on the naturally occurring island at Neenoshe Reservoir will be closed to human activity. All of the constructed island will be closed to human activity during nesting season. These closures will usually include adjacent areas of the reservoir shoreline.

All other management activities listed for Tern Island at Adobe Creek Reservoir will be used with the exception of designation as a Natural Area. This may occur at a later date, but since terns and plovers have not used the constructed island yet, it is premature to designate it. As plovers and terns have only used the natural island sporadically, designation there, too, is not warranted at this time.

There will be no permanent, capital improvements to either island at Neenoshe Reservoir, except for Geo-Web applied to the constructed island. A memorandum of understanding will need to be negotiated between the Amity Irrigation Company, CDOW, and Bureau of Land Management (BLM) for management of both islands at Neenoshe Reservoir. (Amity Irrigation operates the reservoir and the BLM is the owner of the surface which includes the islands.) Until CDOW obtains water rights at Neenoshe Reservoir, there will be no effects of habitat management to operation of the reservoir for irrigation purposes.

* * *

APPENDIX B

CENSUS & SURVEY GUIDELINES

GUIDELINES FOR CONDUCTING PIPING PLOVER CENSUSES AND SURVEYS (Adopted from Dyer et al., 1987)

Recently, many surveys and intensive studies have been conducted on Piping Plovers. Concerns have been raised that such studies may affect productivity of breeding birds by disrupting incubation and brooding efforts, and by rendering nests and chicks more susceptible to predators. While it is recognized that such work is necessary to establish baseline data on population size and trends, it is hoped that research personnel will attempt to reduce stress to nesting birds and focus research efforts only on critical needs.

In order to analyze population size and trends, it is important that state surveys be conducted in a consistent manner, with standardized results. Currently, some states record nesting pairs while others tabulate only adult birds seen. For a one-time census, number of breeding pairs would be the most valuable data to record. Examples of "breeding pairs" would be a pair together on territory, a nest seen with either bird incubating, or adult(s) seen with young. A courting male should not be taken as *prima facie* evidence of nesting, as males may be unmated and still displaying, or a member of the nonbreeding cohort. If a male is seen directing courting activity at a nearby female, a breeding pair should be recorded. All other adults, whether nonbreeders or transients, should be recorded but included separately from breeding pairs. If it is possible to make a follow-up census to count fledged young, productivity information should be recorded as the number of fledged young/breeding pair. Ideally, "fledged young" should have acquired first juvenile plumage. However, if the young are nearly at that stage (20+ days old), it is safe to assume that they will eventually fledge, and so can be included as fledged young.

General Survey Guidelines

For general censuses (for example: how many pairs of Piping Plovers nest in Nebraska?), observers should visit sites when plovers are on territory and visible, but when nesting birds are the least sensitive to disturbance. The best "window" is probably early in the morning during a two-week period from the middle to the end of incubation. Total incubation requires 25 to 30 days after the clutch of eggs ($n=4$) is complete. Towards the end of incubation, adult birds exhibit great fidelity to the nest and are not as inclined to desert as at the beginning of incubation.

In a follow-up census to count young, the best period will occur when the young are able to fly and capable of leaving the nest area. From observations made from the initial survey, predict peak hatching dates and allow 20 days so that young will be nearly mature and less sensitive to disturbance and predation. Young chicks are often lead into the dunes by adults, making them impossible to find. Renesting attempts should be documented for accurate productivity estimates.

Survey Conditions

Early morning is the best time to survey nesting Piping Plovers. Adults and young are generally more active and feeding in the morning before beach use increases. While adults are incubating, excessive heat, as well as cold, can be damaging to eggs. Disturbance should be minimized during the heat of mid-day when eggs need to be shaded by adult birds. If an early morning time frame is not practical, late afternoon is the second choice. Periods of rain or other inclement weather (very hot or cold days) should be avoided, since it is critical that adults be able to incubate or brood young without disturbance during such conditions.

Survey Methods

Recognizing that every site is unique in beach width, topography, etc., the following general suggestions are offered: Two observers are ideal to efficiently conduct a census in a given area: one person monitors the nest and birds from a distance (100 yards), while the other approaches more closely.

Equipment: In most cases, a pair of binoculars (7x+) will be sufficient, although a spotting scope (of 20x+) will insure proper identification of color bands. The scope can be used by one observer to maintain visual contact with a potential nest site at a distance (100 yards), while another observer approaches the site more closely with binoculars. A field notebook is necessary to record observations, habitat parameters, etc.

Route: For a typical beach situation, most nests will be located near the vegetation line. Walk a route parallel to the shoreline, but not so far up the beach that nests are accidentally disturbed. Walk slowly and listen for birds that might not yet be visible to the eye. For wide areas of habitat, additional parallel transects may be necessary to get accurate results.

Locating Territories and Nests: As a nest is approached, adult birds will usually be vocal (loud, two-note "peep-lo"), particularly later in incubation. During egg-laying, adults often leave the nest site silently, making it difficult to confirm nesting. After aggressive or vocal adults are located, both observers should continue past the nest site, with one observer maintaining visual contact with the birds. Once far enough past to calm adult birds (distance varies, depending on individual pairs), both observers should crouch to diminish their profile, and continue to observe the birds. Once the incubating bird returns to the nest, one observer should use the spotting scope to watch the nest site, while the other approaches to get a closer look. The approaching observer should maintain vision on the exact spot that the bird was sitting. It should be possible to see the nest through binoculars at a distance of 30+ feet, and further approach is discouraged. Human scent around nests may draw in predators. Since it is well documented that Piping Plovers' nests usually have a clutch of four eggs, the only reason for a close approach is to determine the exact stage of nesting. Observation of a four egg clutch does not allow prediction of hatching times, since the last egg could have been laid 1 or 30 days ago. Observed clutches of 1-3 eggs, however, are probable indications that incubation is about to begin, or that a re-nesting is occurring.

"Broken Wing" Display: This activity, described by several authors, indicates that an observer is very close to a nest or young. It is usually performed when small chicks are present or when the nest is nearing the end of incubation. Observers encountering this display should immediately leave the area until the bird is calm, and then crouch to observe further activity through optics.

Non-Nesting/Transient Birds: With some practice, it is usually possible to delineate non-nesting birds from those actively defending territories. Transients, as well as pre- and post-nesting birds, are generally not very vocal and occupy mud flats or other neutral areas distinct from beach nesting habitat. Any suspected non-breeder should be watched carefully, as it may be a member of a breeding pair temporarily feeding away from the nest site.

Marking the Nest: Nest marking is not recommended during a general census. Instead, natural landmarks or photographs should be used. If two surveys are done during the season (one to count nesting attempts and the other to gather productivity data), they should be done in exactly the same manner, so that all territories located on the initial trip will be encountered again later, making marking unnecessary. If markers are deemed necessary due to beach dynamics and conditions, they should be innocuous, such as dull wooden stakes or objects already present on the beach (e.g. driftwood). Markers should be placed well away from the nest (at least 30 feet) with the relationship to the nest duly recorded. Avoid using markers which might attract visitation or which might be moved by beach-goers.

* * *

APPENDIX C

**LETTERS REQUESTING COMMENTS
AND COMMENTS RECEIVED**

The following two letters were sent out with copies of the first two drafts of the Least Tern and Piping Plover Recovery Plan for comment by any interested parties (see the Acknowledgements page for the list of reviewers). In addition to letters received (copies of which appear in this appendix), many of the reviewers wrote their comments directly on the draft copies they received, and returned the whole document to the author. All comments were incorporated into the final document, where relevant and appropriate.

STATE OF COLORADO
Roy Romer, Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE

AN EQUAL OPPORTUNITY EMPLOYER

Perry D. Olson, Director
6060 Broadway
Denver, Colorado 80216
Telephone: (303) 297-1192

REFER TO



*For Wildlife—
For People*

24, July, 1993
1204 E. Olive
Lamar, CO 81052

Dear Least Tern and Piping Plover Fans,

FINALLY!!! And you thought it would never happen....

Enclosed you will find a copy of the long-awaited Least Tern and Piping Plover Management Plan for review. We have been in such a crisis mode trying to help the little rascals this summer that I thought this might be a very timely document.

If you could please look this plan over and give me your thoughts, I would appreciate it. No editorial corrections are too trivial--everything's open for comment (content, spelling, grammar, whatever). I would like to have your comments back by mid- to late October, just in case we have a winter like the last one. That way I'll have something to work on while snowbound.

Should you have a burning question or aren't clear about something in the plan, let me know. I won't be back in the office until the 1st of September, but you can call after that. Please return your comments to:

Jennifer Slater
Wildlife Biologist
Colorado Division of Wildlife
1204 E. Olive Street
Lamar, Colorado 81052
(719)336-4852

I look forward to hearing from you.

Thank you,

STATE OF COLORADO
Roy Romer, Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE

AN EQUAL OPPORTUNITY EMPLOYER

Perry D. Olson, Director
6060 Broadway
Denver, Colorado 80216
Telephone: (303) 297-1192

REFER TO



*For Wildlife—
For People*

18, January, 1994
1204 E. Olive
Lamar, CO 81052

Dear Least Tern and Piping Plover Fans,

Enclosed you will find a copy of the second draft of the Least Tern and Piping Plover Management Plan for review. I've been having to count big game (UGH!), but I finally had time to put everyone's comments from the first draft together.

I appreciated all the thought that went into the comments I received on the first draft. I think this will ultimately be a very useful and worthwhile document when it's finally finished. There are a few more things that will be included in the final plan that are not in this draft, but that several of you mentioned as being important. The final plan will include a map of Colorado and the local area with least tern and piping plover distribution shown (to be inserted after page 1). A photograph of a least tern will follow page 2, and one of a piping plover after page 3.

If you could please look this plan over and give me your thoughts, I would appreciate it. No editorial corrections are too trivial--everything's open for comment (content, spelling, grammar, whatever). I would like to have your comments back by March 1, 1994, so we have a plan for this coming field season.

Should you have a burning question or aren't clear about something in the plan, let me know.

Please return your comments to:

Jennifer Slater
Wildlife Biologist
Colorado Division of Wildlife
1204 E. Olive Street
Lamar, Colorado 81052
(719)336-4852

I look forward to hearing from you.

Thank you,

DEPARTMENT OF NATURAL RESOURCES, Kenneth Salazar, Executive Director

WILDLIFE COMMISSION, William R. Hegberg, Member • Eldon W. Cooper, Chairman • Felix Chavez, Member • Rebecca L. Frank, Member
Louis F. Swift, Secretary • George VanDenBerg, Chairman • Arnold Salazar, Member • Thomas M. Eve, Vice Chairman

OFFICE MEMO
DIVISION OF WILDLIFE

To Jennifer Slatov

Date 8-2-93

From Ron Desilet

Action:

<input type="checkbox"/>	Handle
<input type="checkbox"/>	Answer your signature
<input type="checkbox"/>	Answer my signature
<input type="checkbox"/>	See me
<input type="checkbox"/>	Refer to _____

For:

<input type="checkbox"/>	Your signature
<input type="checkbox"/>	Your comments
<input type="checkbox"/>	Your approval
<input type="checkbox"/>	Your information
<input type="checkbox"/>	Initial and return
<input type="checkbox"/>	Your file

NOTES

My comments are contained in the
text. Please call if you have questions. You
could be more definitive in how Great Plains
Reservoirs should be operated to accommodate
Pipe LT's w/o jeopardizing recreation plans.
This would then serve as guide to future
development.

Thanks!

Ron



Date 9/2/93

ROUTING AND TRANSMITTAL SLIP

TO: (Name, office symbol, room number, building, Agency/Post)	Initials	Date
1. <u>Jennifer Slater CDOW</u>		
2.		
3.		
4.		
5.		

Action	File	Note and Return
Approval	For Clearance	Per Conversation
As Requested	For Correction	Prepare Reply
Circulate	For Your Information	See Me
Comment	Investigate	Signature
Coordination	Justify	

REMARKS

Jennifer --- Both Bob Leachman and myself scanned over your management plan. Basically, it looks really good --- we are delighted these birds in Colorado are finally being managed. Bob's main concern is that your plan is complementary to the Natl. Recovery Plan. My main concern is that we may need to include gravel pit ponds as sites as well as reservoirs. Call us if you have any questions.

DO NOT use this form as a RECORD of approvals, concurrences, disposals, clearances, and similar actions

FROM: (Name, org. symbol, Agency/Post)	Room No.—Bldg.
<u>Barb Osmondson USFWS</u>	Phone No. <u>303-243-2778</u>

5041-102 Grand Junction, CO

OPTIONAL FORM 41 (Rev. 7-76)
Prescribed by GSA
FPMR (41 CFR) 101-11.206

August 31, 1996

Jennie.

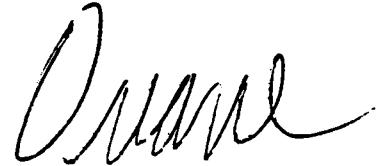
Here are my comments on the Management Plan. Overall, I would call it thorough, concise, and would be good as is. My comments are not, for the most part, about contents or format. I felt that one more year of field work helped clarify some previously murky points. Our understanding of predation, for example, is much greater than it used to be.

I tried to clarify the 2 tables. As usual, things are never cut and dried. We need to make sure that we only count pairs and individuals once.

Cruck mentioned something about getting together in September to look at habitat and try to figure out what are our next moves as far as habitat improvement goes. I hope we can do that.

I look forward to hearing from you in the near future. I saw Judy in the office yesterday.

Eye.

A handwritten signature in cursive script, appearing to read "Anne".



United States Department of the Interior



BUREAU OF LAND MANAGEMENT

Royal Gorge Resource Area
P.O. Box 2200
Canon City, Colorado 81215-2200

6500
(CO-057)

August 12, 1993

Jenny Slater
Wildlife Biologist
Colorado Division of Wildlife
1204 E. Olive Street
Lamar, CO 81052

Dear Ms. Slater:

We recently reviewed the Least Tern and Piping Plover Management Plan. Thank you for the opportunity to comment and be a part of the process. We found only one small item that should be clarified. For your information page 7 was missing from the document so it was not reviewed. On page 8 and in section 1.214 you refer to the BLM grazing lessee or permittee. Wollerts do not have a grazing lease or permit with BLM. This was unnecessary when BLM was under water and one was not issued when the water levels dropped. Livestock that graze on public lands are technically in trespass. BLM has an agreement with Wollerts for a water gap allowing livestock access to the reservoir for water. I hope this clears up the situation as far as livestock are concerned.

Thank you for allowing us to comment and please keep us informed as to the progress of the plan and subsequent management actions that affect the public lands.

Sincerely yours,

Acting Area Manager

Jenny,

Thought I'd pass on a few extra comments on the plover\tern plan. Some of these are rather trivial but do with them what you want.

- 1) spelling of Neegronda? Some DOW publications, the BLM maps and USGS maps spell it with an "a", ie Neegronda. I noticed other places where it is spelled as you have it. Your Call on this.
- 2) Page 3, 2nd paragraph, "terns winter along coastal areas.." Would this be atlantic coasts or the pacific side.
- 3) Page 4, 3rd para, half-way-down ..."With declining water levels, mammalian predators have smaller areas to patrol..." As water goes down wouldn't they actually have more beach to patrol? Do you mean smaller beach perimeters?
- 4) Page 5, 2nd para, ...effect of water management is in the timing of inflows and releases. "of" is omitted in the draft.
- 5) Management Plan 1.23 : Nee Noshe or Neenoshe?
- 6) My last comment deals with land closures. When we close public lands the Bureau is required to publish a Federal Register Notice. This can be a seasonal closure or permanent. I know you've had a firing line closure for years and I don't think we did one then and maybe didn't need to. With T&E species it may be a good idea to do one for this plan. It would protect DOW and BLM in case it came up sometime. It is not a tough process and I can do it for you if you want. I would need good maps with the closure drawn (we need to be able to legally describe it) and a few paragraphs justifying the closure. Let me know what you think. This would only apply to federal lands.

Thanks for the opportunity to comment. The plan looks great. Erik Brekke



P.S. will work with Chuck L. and get an additional \$5000 to DOW for 1994 work.



United States Department of the Interior



FISH AND WILDLIFE SERVICE

Fish and Wildlife Enhancement
Nebraska/Kansas Field Office
203 West Second Street
Grand Island, Nebraska 68801

September 2, 1993

Ms. Jennifer Slater
Colorado Division of Wildlife
1204 E. Olive Street
Lamar, CO 81052

Dear Ms. Slater:

Enclosed is a marked copy of the draft *Least Tern and Piping Plover Management Plan* for Colorado. Aside from my editorial comments on the draft, I also recommend that the plan include maps of the various breeding sites and photographs of current management activities. Moreover, the inclusion of historical data on lake levels behind reservoirs would allow some assessment of the habitat changes frequently affecting the least tern and piping plover at reservoirs.

Lastly, I commend your conservation efforts for these two species. It is evident from the plan that much work is being done and that it is action-oriented for recovery purposes.

I look forward to seeing the final version. If I can be of further assistance, please contact me at (308) 382-6468.

Yours truly,

John G. Sidle
Acting State Supervisor

Enclosure



DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
JOHN MARTIN RESIDENT OFFICE
STAR ROUTE, HASTY, COLORADO 81004

REPLY TO
ATTENTION OF

Park Ranger

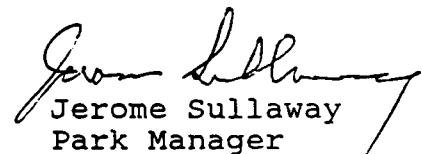
31 January 1994

Ms. Jennifer Slater
Colorado Division of Wildlife
1204 E. Olive Street
Lamar, Colorado 81052

Dear Ms. Slater:

In review of the Division of Wildlife Management Plan For Piping Plover and Least Tern, the following factors might be considered. The control of water releases by Corps of Engineer personnel at John Martin Dam, as mentioned in 1.242, requires proper correspondence and approval with the Colorado State Engineer. This correspondence and approval should be coordinated between the Division of Wildlife and the State Engineer as appropriate to complete this action. Furthermore, the law enforcement required for the closure of beach areas for the protection of Piping Plover and Least Tern at John Martin Reservoir will also require visitor assistance and public cooperation with the aid of the Rangers at John Martin Reservoir.

Finally, the Corps of Engineers continues to support the Division of Wildlife in the protection of endangered species on Federal lands managed by the Corps of Engineers. As money and personnel become available, Corps of Engineer personnel will undertake a mission to protect endangered species by assisting the Division of Wildlife in the construction of barricades and the use of signage to prohibit public access to valuable habitat for the Piping Plover and Least Tern. In retrospect, the managers and ranger staff at John Martin Reservoir support the expertise and knowledge of the Division of Wildlife as the genuine authorities in conducting studies and promoting the protection of endangered species in the state. If you have any questions or comments, contact Ranger Vergial Harp at the John Martin Reservoir Office. The telephone number is 336-3476.


Jerome Sullaway
Park Manager

COLORADO NATURAL HERITAGE PROGRAM

University of Colorado Museum
Hunter 115, Campus Box 315
Boulder, Colorado 80309-0315
(303) 492-4719 • Fax (303) 492-5105



April 9, 1994

Jennifer Slater
Colorado Division of Wildlife
1204 E. Olive Street
Lamar, CO 81052

Dear Jennifer:

Enclosed are some quite late comments on the recovery/management plan for the least terns and piping plover. Perhaps these comments will still be useful. Most of my comments are editorial, but there are several areas that I believe need correction or clarification:

1. The document seems to interchange the names of interior least tern and least tern, both in the latinized and English forms. This is misleading since all subspecies are not listed.
2. The section on population declines should be documented with citations. Many of the statements made are broad and sweeping without such documentation.
3. It would be helpful if the target numbers of breeding pairs were justified with a discussion. Certainly these numbers are at best minimally defensible from a conservation biology perspective. Perhaps there are circumstances that the reader is not aware of.

Certainly, the document is thorough and in most cases well written and convincing. Please don't take my comments as negative--this is a good plan. Don't we only wish that the birds could be found to survive under more natural conditions.

Sincerely,

A handwritten signature in cursive script, appearing to read "C. Pague".

Christopher A. Pague
Director/Zoologist

cc: Chuck Loeffler