

RECLAMATION

Managing Water in the West

Interior Least Tern Monitoring Results 2007

Brantley Lake, New Mexico

Carlsbad Project



U.S. Department of the Interior
Bureau of Reclamation
Albuquerque Area Office

December 2007

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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Cover photograph: Adult Least Tern (*Sternula antillarum*).
Photo courtesy Delos McCauley.



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Introduction

The Least Tern (*Sternula antillarum*) is the smallest member of the tern subfamily (Sterninae [Family Laridae]) in North America, with an approximate body length of nine inches and wingspan of 20 inches. The interior population of the Least Tern (*S. a. athalassos*) is recognized as a distinct subspecies (Interior Least Tern) based on studies of vocalizations and behavior (American Ornithologists' Union 1957, 1983; Thompson et al. 1997; Johnson et al. 1998). Three subspecies of Least Tern nest in the United States: the California Least Tern (*S. a. brownii*) nests from Baja California to the San Francisco Bay; the Interior Least Tern nests along the major tributaries throughout the interior U.S. from Montana to Texas and New Mexico to Louisiana (Lott 2006); and the Eastern Least Tern (*S. a. antillarum*) nests along the coast from Texas to Maine.

Breeding plumage of the Least Tern consists of a black cap, white forehead, throat and underside with a pale gray back and wings, and black-tipped yellow-orange bill. In flight, the species is distinguished by the long, black outermost primary feathers and the short, deeply forked tail. First-year birds have a dark bill, a dark gray eye stripe, and a dusky brown cap.

The Least Tern feeds primarily on small fresh- and saltwater fish, but its diet is varied and can include small crustaceans and insects (Thompson et al. 1997). Least Terns nest in shallow scrapes of sand, shell, soil, or other particulate materials throughout their breeding range. Clutches typically are two or three eggs and are incubated for approximately 21 days by both adults. Both adults also care for the young after hatching. Young are semi-precocial and typically take 21 days to become fully-feathered and flight-capable (Thompson et al. 1997).

Least Terns are Nearctic-Neotropical migratory birds that are widely distributed across North America in the breeding season and migrate to marine coastal areas throughout the Pacific coast of southern Mexico and along eastern coasts of Mexico, Central and South America, south to northern Argentina and southern Brazil (Thompson et al. 1997). The timing of arrival of Least Terns to North America varies by latitude. In New Mexico, Interior Least Terns typically begin to arrive in the Pecos River basin in mid-May and are present through August.

The Interior Least Tern was federally-listed as endangered on 27 June 1985 by the U.S. Fish and Wildlife Service (Service) (U.S. Fish and Wildlife Service 1985). This subspecies is also listed as endangered by the State of New Mexico (New Mexico Department of Game and Fish 2006). Within New Mexico, Least Terns primarily occur within the Pecos River basin where a small colony has nested at Bitter Lake National Wildlife Refuge (NWR) for the past 50 years (New Mexico Department of Game and Fish 2006). In 2004, up to seven pairs of Least Terns nested and produced at least six chicks that fledged at Brantley Lake (Fig. 1), the first known breeding in the state away from Bitter Lake NWR. In 2005 up to nine pairs were present at Brantley Lake early in the summer but numbers declined during the breeding season and no successful nesting was documented. This species again attempted to nest at Brantley Lake in 2006 when four possible nests (two confirmed) were located within the reservoir pool. These nests, however, were unsuccessful as they were inundated from rising lake levels.

In view of this recent occurrence of Least Terns at Brantley Lake, Reclamation consulted with the Service, pursuant to the Endangered Species Act (ESA), and was issued a Biological Opinion (BO; consultation #2-22-03-F-171) from the Service on 14 April 2006 for the Pecos River dam operations. Subsequent to this BO, which expired 1 August 2006, Reclamation was issued a second, long-term BO (consultation #22420-2006-F-0096) for Carlsbad Project water operations and water supply conservation and covers the period from 2006 to 2016. In each of these BOs, Reclamation agreed to undertake several Reasonable and Prudent Measures (RPM) to benefit recovery of and avoid impacts or incidental take to Least Terns at Brantley Lake, as follows:

- 1) In cooperation with other willing land managers on the Pecos River and at Brantley Reservoir, Reclamation shall fund, implement and/or assist with enhancement of tern nesting and brood-rearing habitat on the Pecos River and at Brantley Reservoir prior to the arrival of terns in May of each year, in consultation with New Mexico Ecological Services Field Office (NMESFO). This measure will ensure that suitable habitat is available when terns arrive in spring.
- 2) Reclamation shall survey and monitor terns throughout the area of the proposed action and consult with NMESFO if terns are detected at new sites.

The above RPMs are to be implemented through a number of terms and conditions. In summary, those terms and conditions include implementation of the following basic measures:

- 1) Enhance and/or maintain habitat for Least Terns each year, at least three times the size of the 28-acre site that terns used for breeding in 2004, equaling 84 or more acres of nesting and brood-rearing habitat by 2007. This includes 56 acres to be created in 2006. These areas of created habitat will be placed adjacent to the area where the terns nested in 2004, north of the South Seven Rivers inlet, and at a third location on the reservoir where human access is limited and predation is minimized. Placement of these sites should be as close as possible to the full conservation pool of the reservoir (elevation 3256 feet). Adaptive management methodology shall be used annually to modify enhancement locations and/or techniques until a stable tern colony is established.
- 2) Work with willing land managers to maintain a buffer zone of one fourth mile or more around areas where terns are exhibiting breeding behavior and where nesting colonies are established.
- 3) Survey and monitor for terns throughout the action area each year.

The methods and results that follow are a summary of the activities undertaken in 2007 to fulfill Reclamation's commitments under the terms and conditions of the above BOs and associated RPMs.



Figure 1. Aerial view of Brantley Lake, located approximately 12 miles north of Carlsbad, Eddy County, New Mexico. Photo date 25 August 2005; water surface elevation 3245.3 feet (MSL).

Methods

Presence/Absence Surveys

Surveys for Least Terns at Brantley Lake were conducted at approximately two-week intervals during the period May through August 2007. All visits included surveys on two days, the first of which occurred between 12:00 and 17:00 MDT and the second between 07:00 and 11:00 MDT. Surveying on two consecutive days and at two different diurnal periods helped increase the likelihood that the maximum number of terns were detected. Complete-count surveys consisted of area searches of all potential nesting, roosting, and foraging sites along the western shoreline of Brantley Lake. Much of the eastern shoreline is not suitable for tern nesting because of the gypsum/limestone uplift at the water's edge. However, from the western side of the lake, the eastern shoreline was monitored for roosting and foraging terns. By using a spotting scope (20-60x), this was possible due to the narrow width (< 0.75 mile) of the lake in most locations. All survey count data were collected to be consistent with the reporting requirements of the Interior Least Tern range-wide survey (Lott 2007) and were subsequently submitted to that program.

Nest Monitoring

Indicators of courtship and nesting activity by Least Terns were watched for concurrently with presence/absence surveys. These indicators included pair associations and Fish Flight Displays (Thompson et al. 1997), appearance of incubation, and fidelity to a potential nest scrape. If a nest was confirmed its contents were noted and its location was mapped using a global positioning system (GPS) receiver (bearing-offset method). Observations were made from a distance (> 300 feet) via spotting scope to help avoid any disturbance to potential nesting terns.

Habitat Creation and Maintenance

Maintenance on one of the two existing created Least Tern nesting and brood-rearing habitat sites, first cleared in 2006 (44.7 ac.), was cleared by New Mexico Department of Game and Fish personnel. This work was accomplished by using a tractor and disks to break down and remove the vegetation growth (primarily kochia [*Kochia scoparia*]) from the previous summer. The second, southern site (11.9 ac.), which is directly upslope of the location where Least Terns nested successfully in 2004, was inaccessible due to high lake levels all spring and was not cleared of vegetation growth from the previous growing season.

Delineation of the final area for creation of nesting and brood-rearing habitat for Least Terns was accomplished using a geographic information system (GIS) and a mapping-grade GPS receiver. In ArcGIS (version 9.2), recent aerial photography of the reservoir was overlain with a topographic contour of the reservoir and adjacent lands to determine the location of the lake's maximum conservation pool elevation, 3256 feet above mean sea level (MSL). Based on this maximum pool elevation, an area was then drawn and the resulting polygon was transferred to a Trimble GeoXT GPS receiver. With the aid of this GPS receiver, an outline of the mapped polygon was then flagged on the ground for vegetation clearing.

Using a tractor and bulldozer, personnel with the Carlsbad Irrigation District (CID) began clearing vegetation from the new site on 9 April 2007 and finished on 1 May 2007 (Fig. 2). This third habitat site was placed in a location north of the North Seven Rivers inlet to Brantley Lake and entirely on the Seven Rivers Waterfowl Management Area. This site was located adjacent to and up-slope of the 3256-foot elevation contour so as to be immediately outside of the reservoir's conservation storage pool. This placement will allow for possible nesting areas not subject to flooding due to reservoir operations and away from human disturbance.

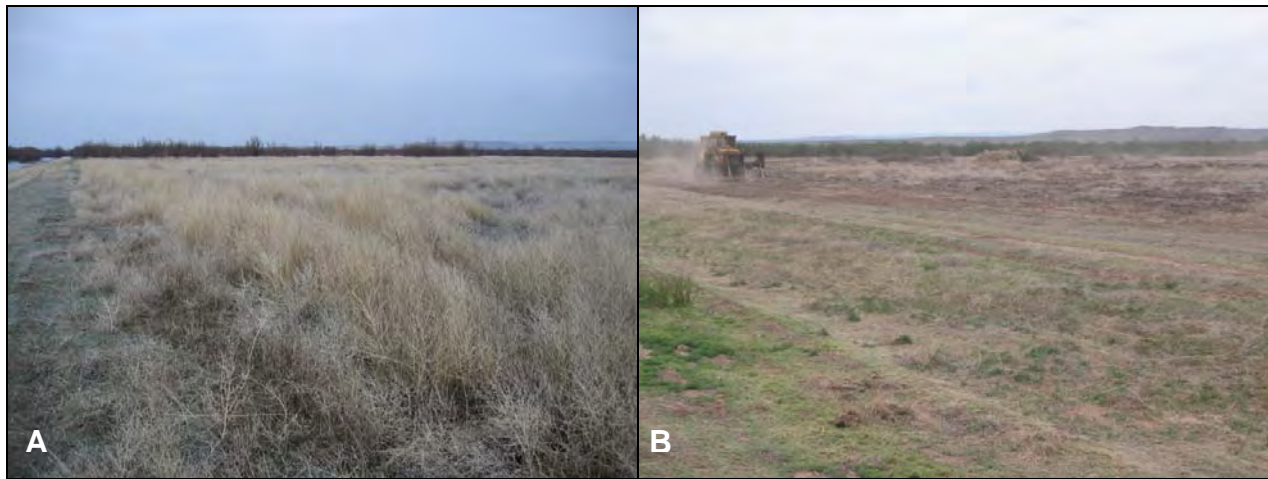


Figure 2. Third site for created Least Tern nesting and brood-rearing habitat located on Seven Rivers Waterfowl Management Area, adjacent to Brantley Lake, New Mexico, as seen before vegetation clearing (A) and during vegetation removal (B).

Vegetation removed from the new Least Tern nesting and brood-rearing site was largely herbaceous plants with some grasses and a small amount of saltcedar (*Tamarix* sp.). Approximately one third of the site was finely raked to produce nesting substrate while the remaining two thirds of the site left with more coarse soil particles, a greater mix of woody debris, and some sparse vegetation so as to serve as brood-rearing habitat.

The location of this third site (Fig. 3) for possible nesting use by Least Terns was largely selected to reduce, or eliminate, problems with human activity. Habitat site selection was influenced by the area's geology. Most locations on the east and south of Brantley Lake are composed of gypsum/limestone outcrops with little or no soil and are unsuitable for establishment of Least Tern nesting habitat. The remaining area adjacent to the lake, where alluvial-type soils exist, included the west shoreline north of the Brantley Lake State Park boundary and the Seven Rivers Waterfowl Management Area. Although frequented by Least Terns in the spring and summer, the area immediately north of the state park boundary was removed from consideration because of the uncontrolled recreation that takes place. Creating additional nesting habitat in this area, beyond that which already exists, could result in nest loss from human activity. The only remaining location for placement of a third nesting habitat site was on the waterfowl management area. Though not ideal because of its distance to perennial water and presence of saltcedar blocking the line-of-sight to this water, this location should still offer a location in which terns could nest.



Figure 3. Locations of Least Tern nesting and brood-rearing habitat sites created and maintained at Brantley Lake, New Mexico. Red polygons indicate areas where habitat was created in April and May 2006; yellow polygons mark habitat sites cleared in April 2007.

Decoy Use

Life-sized Least Tern decoys were obtained (Mad River Decoy, Waitsfield, VT) for use as social attractants (Fancher 1984, Kotliar and Burger 1984, Burger 1988) in an attempt to establish a breeding colony outside of the Brantley Lake conservation pool (above 3256 feet elevation). Sixteen decoys were placed in pairs near the lake's shoreline in the middle created habitat site in early May 2007 and monitored throughout the spring and summer.

Results

Presence/Absence Surveys

All observations of Least Terns at Brantley Lake in the spring and summer of 2007 are presented below (Table 1). Least Terns were first detected at Brantley Lake on 22 May with five adults observed. Numbers of Least Terns detected declined after this apparent peak in late May. Throughout the remainder of the summer, only one to two adult Least Terns were seen at the lake. No behavior suggestive of courtship or breeding was observed between these two adult birds throughout the summer, signifying that these birds were not paired.

Table 1. Summary of 2007 Least Tern observations at Brantley Lake, New Mexico.

2007 Date	Adult	Sub-adult	Immature	Nests [eggs]
3 May	0	0	0	-
4 May	0	0	0	-
22 May	5	0	0	-
23 May	5	0	0	-
7 June	2	0	0	-
8 June	2	0	0	-
20 June	2	0	0	-
21 June	1	0	0	-
10 July	1	0	0	-
11 July	0	0	0	-
25 July	0	0	0	-
26 July	1	0	0	-
15 August	2	0	0	-
16 August	0	0	0	-
28 August	1	0	0	-
29 August	0	0	1	-

On 29 August one immature Least Tern was observed foraging along the western shoreline of Brantley Lake. This bird was likely a passage migrant originating from a breeding site elsewhere within the subspecies' range.

Nest Monitoring

No courtship or breeding activity by Least Terns was observed in the vicinity of Brantley Lake in spring and summer of 2007. Therefore, no nests were located to monitor.

Habitat Creation and Maintenance

As agreed to in the BOs described above, a third area of nesting and brood-rearing habitat was created for Least Terns near Brantley Lake. This third created habitat site totaled 27.4 acres in area (Fig. 3). The clearing of vegetation on this site was completed by CID personnel on 1 May 2007. This site is located on the Seven Rivers Waterfowl Management Area, immediately north of Brantley Lake, and is actually divided into two adjacent areas bisected by an unused, concrete irrigation ditch. It was decided not to remove the irrigation ditch because the work to remove the concrete and level the surrounding ground would prove too costly and time consumptive.

Of the two areas cleared of vegetation for nesting and brood-rearing habitat in spring 2006 (totaling 56.6 acres) only one was maintained in 2007. The middle site, which is 44.7 acres in area, was cleared of vegetation while the southern area, 11.9 acres in size, was not cleared. Because of a combination of high water levels in Brantley Lake during spring and higher than average spring rainfall (which subsequently sustained the high lake levels) this southern site was made inaccessible to heavy equipment that would be needed to remove vegetative growth. The access to this site from two roads was blocked by high water and muddy conditions until mid-June.

Both of the recently-cleared created habitat sites became completely re-vegetated by late August 2007 due largely to above-average summer rainfall that promoted plant growth. The primary pioneer plant to cover most of the created habitat sites was kochia with some saltcedar re-sprouts.

Decoy Use

Use of decoys (Fig. 4A) to attract Least Terns to the middle created nesting habitat site proved unsuccessful in summer 2007. One reason for this failure was the rapid growth of kochia (Fig. 4B) over all of the cleared ground that later covered the decoys. After the initial clearing of the annual vegetative growth from this site, as well as the other site, kochia emerged almost immediately following ample spring and early summer rainfall (National Oceanic and Atmospheric Administration 2007). By late July, the height of kochia in these areas exceeded four feet.



Figure 4. Least Tern decoys (A) used to attract birds to the middle habitat creation site (44.7 ac.) by Brantley Lake were overgrown with kochia (B) by late July 2007.

Discussion

Over the past four years the Least Tern population at Brantley Lake has been largely affected by lake levels which, in turn, influence available nesting habitat. Least Terns nested at Brantley Lake in 2004 because a unique set of conditions prevailed to provide suitable nesting habitat. After satlcedar was cleared from the reservoir's northwest shoreline in early 2004, high water levels during spring kept this freshly-disturbed ground covered and free of new plant growth. As water levels receded in May, large expanses of drying mudflats were exposed and provided ideal nest locations that attracted Least Terns migrating north through the Pecos River valley. After terns successfully fledged young in this area in summer 2004, herbaceous vegetation covered the site making it less suitable for future nesting use. In 2005 high water levels throughout the spring and early summer at Brantley Lake prevented the exposure of suitable shoreline or lake bottom nesting habitat. However, in spring 2006 low water levels in Brantley Lake again exposed large expanses of lake bottom where Least Terns attempted to nest. This nesting attempt failed as rising water inundated as many as four nests that were under incubation. The rise and fall of reservoir levels, sometimes by more than 20 feet, is common in summer at Brantley Lake as water is released for irrigation use downstream and then replaced by water in storage at reservoirs upstream.

Numbers of Least Terns observed at Brantley Lake during the 2007 spring migration and breeding season was lower than what was encountered in the previous three years when monitoring for this species began. The peak in tern numbers, only five adults, was observed on 22 and 23 May. These birds were likely stop-over migrants passing to points elsewhere within this subspecies' breeding range. After a peak of five birds in late May, the largest number of adult Least Terns observed at any time during the remainder of the breeding season was two. Only a single immature Least Tern was observed on 29 August. It is unlikely that this bird originated from Brantley Lake, rather it probably dispersed from nesting locations elsewhere in the region, such as Bitter Lake NWR. In 2008 presence/absence surveys for terns will begin in early May and continue through August at approximately bi-weekly intervals.

Of the three created nesting and brood-rearing habitat sites now available, only two were able to be cleared in spring 2007 and none were utilized by Least Terns for their intended purpose. The southern-most site (11.9 ac.), which has the greatest potential for use by terns because of its location and past use as a nesting area, was not cleared of vegetative growth from the 2006 growing season because of high lake levels. Throughout spring and summer the site was inaccessible by heavy ground-clearing equipment due to water-wicking from the adjacent reservoir. The remaining two sites were not used for nesting by terns, certainly because of the rapid kochia growth that covered each site soon after they were cleared of vegetation. This rapid re-growth of vegetation was likely the result of a wetter-than-normal spring and summer (National Oceanic and Atmospheric Administration 2007). Maintenance of these three habitat areas, all totaling 84 acres in area, will take place during early 2008. This work will again involve removing the new vegetation that grew during spring and summer of 2007.

The use of decoys to help establish nesting sites in the created habitat areas in 2007 likely failed because the decoys were rapidly overgrown with kochia when above-average rainfall stimulated vigorous kochia growth. The use of decoys will continue in 2008 and may have to be used in conjunction with a pre-emergent herbicide treatment of cleared ground to help prevent kochia growth. It is apparent that kochia will be a persistent problem that will need to be managed for if Least Tern nesting habitat is to be maintained. Herbicides such as pendimethalin (brand name: PENDULUM AquaCap) will be investigated for use on these areas to suppress plant growth during the tern's breeding season. Pendimethalin appears to be suitable for suppression of kochia and will stay active in the soil for four to five months, depending on the amount of application. Prior to any herbicide use in this area, appropriate ESA and National Environmental Policy Act (NEPA) clearances will need to be obtained.

To ensure the created habitat sites are utilized by Least Terns, flexible water management in Brantley Lake should be considered where possible. Management of lake levels so that the water surface is high, and thus close to the managed habitat during the onset of Least Tern nesting (late May to early June), would likely increase the potential that the created/managed habitat areas will be utilized by the birds. This species prefers its nest habitat areas be in close proximity to open water (Thompson et al. 1997). While this field condition did occur in 2007, better coordination is needed to learn the needs of downstream water users and project water delivery schedules to better plan the timing of nest site preparation in future years.

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