INTERIM REPORT

As Required by

THE ENDANGERED SPECIES PROGRAM

TEXAS

Grant No. TX E-137-R

Endangered and Threatened Species Conservation

Habitat use of North Padre Island and Laguna Madre habitats by Piping Plovers and Red Knots in the vicinity of current and proposed wind energy development

Prepared by:

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31 October 2012

INTERIM REPORT

STATE: ____Texas_____ GRANT NUMBER: ___TX E-137-R-1__

GRANT TITLE: Habitat use of North Padre Island and Laguna Madre habitats by Piping Plovers and Red Knots in the vicinity of current and proposed wind energy development.

REPORTING PERIOD: ____1 Sep 11 to 30 Sep 12_

OBJECTIVE(S). To determine usage of the habitat mosaic of North Padre Island and wind-tidal flats of the Laguna Madre by Piping Plovers and Red Knots.

Segment Objectives:

Task 1. Sept 2011. All permits, bands, radio transmitters received.
Task 2. Sept - Oct 2011. Capture and attachment of radio transmitters on minimum 15 birds of each species.
Task 3. Mid-Sept 2011 - April 2012. Begin ground-based (2-4 days/week) and aerial (1/week) telemetry to relocate birds with radio transmitters; site visits to describe habitat characteristics.
Task 4. Nov 2011. Data entry; accuracy and content review.
Task 5. Mid-Nov 2011. Capture and attachment of radio transmitters to total up to minimum 15 birds of each species (including those that may still be transmitting).
Task 6. Jan 2012. Data entry; accuracy and content review.
Task 7. Mid-Feb 2012. Capture and attachment of radio transmitters to total up to minimum 15 birds of each species (including those that may still be transmitting).
Task 8. Apr 2012. Data entry; accuracy and content review.
Task 9. May 2012. Begin development of GIS and habitat use estimation.
Task 10. Aug-Sept 2012. Capture and attachment of radio transmitters on minimum 15 birds of each species.
Task 11. Sept 2012-Apr 2013. Ground-based and aerial telemetry to relocate birds with radio transmitters; site visits to describe habitat characteristics.
Task 12. Nov 2012. Data entry; accuracy and content review.
Task 13. 15 Nov 2012. Capture and attachment of radio transmitters to total up to minimum 15 birds of each species (including those that may still be transmitting).
Task 14. Jan 2013. Data entry; accuracy and content review.
Task 15. 16 Feb 2013. Capture and attachment of radio transmitters to total up to minimum 15 birds of each species (including those that may still be transmitting).
Task 16. Apr 2013. Data entry; accuracy and content review.
Task 17. May-Sept 2013. Complete development of GIS and habitat use estimation.
Task 18. Sept 2013. Submit GIS information from project to Texas Natural Diversity Database.
Task 19. Sept-Nov 2013. Complete analysis for final report.

Significant Deviations:

None.

Summary Of Progress:

Please see Attachment A.

Location: Nueces, Kleberg, and Kenedy Counties, Texas.

Cost: ___Costs were not available at time of this report, they will be available upon completion of the Final Report and conclusion of the project.__

Prepared by: _Craig Farquhar_____ Date: _31 October 2012

Approved by: _____ Date:_____31 October 2012____
C. Craig Farquhar

ATTACHMENT A

Interim Report

E-137-R "Habitat use of North Padre Island and Laguna Madre habitats by Piping Plovers and Red Knots in the vicinity of current and proposed wind energy development"

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Reporting Period: 1 Oct 2011 – 30 Sep 2012

Summary of Progress

Trapping for year one of the project began on 11 Oct 2011 on Padre Island National Seashore. A total of 14 Red Knots and 5 Piping Plovers were captured in fall 2011.

Red Knots

Trapping of Red Knots was conducted during the week of 11 Oct 2011 on Padre Island National Seashore. The trapping effort was significantly affected by red tide (see section entitled "Red tide"). One of the birds captured was carrying a geolocator which was part of an associated project tracking large-scale migratory movements and timing. The geolocator was removed and a new one was deployed on that bird. Eight birds were fitted with radio transmitters and released on site. Three birds that were considered perilously weak were taken in for rehabilitation. After several weeks they were deemed recovered to the extent that they were ready for release, and these were also fitted with radio transmitters. A single knot was captured and released with a transmitter on 26 Nov 2011, for a total of 12 transmitters.

Piping Plovers

One Piping Plover was trapped on the week of 11 Oct 2011, and four were captured from 15-30 Nov 2011 on gulf beaches of Padre Island National Seashore. These five birds were fitted with radio transmitters for the telemetry component of the study. One additional bird that had been captured by hand by a beach visitor and taken for rehabilitation, was later released along with the three rehabilitated Red Knots. The plover was uniquely marked (by us) but was not given a radio transmitter.

Radiotelemetry

Radio tracking of birds in the study commenced immediately following radio attachment in October. This consisted of ground-based visits (driving along beach) as well as approximately weekly flights in a fixed-wing aircraft. Piping Plovers are known to be relatively site-faithful during the bulk of the nonbreeding period. Generally, this was the case with the limited number of plovers tracked, though one of the birds showed significant southward movement along the Laguna Madre shoreline of North Padre Island over the course of two months. Dispersal of Red Knots during this time period was hitherto unknown. Initially, flights were centered around the area of initial capture and ranged from the north end of Matagorda Island south to the Mansfield Pass jetties, including habitat considered suitable on the

bay shore of the barrier islands and the mainland. After several flights revealed that no radio-marked birds were found north of Padre Island, the search area was shifted south to encompass as much potential habitat as possible from Port Aransas at the north end of Mustang Island, south to Boca Chica Beach and the international border with Mexico.

Several of the radiotracked birds remained on the gulf beach for several months despite the persistence of red tide conditions and a massive fish kill. On many occasions, knots were observed feeding on carcasses of dead fish. It is not known whether they were feeding on fish flesh or on insect larvae that were growing in the decaying flesh. By late November almost all remaining radio tracked birds had moved from the beach south into the Lower Laguna Madre. Knots used wrack-dominated flats and shorelines on the mainland, exposed lower sandflats along the west side of North and South Padre Islands, and expansive intertidal sandflats, especially in the Rattlesnake Bay area adjacent to Laguna Atascosa National Wildlife Refuge. The last radio relocation of a marked Red Knot was on 29 December 2011. This relocation proved very important though, as the bird was located in a flock estimated at >1200 in a location that had not previously been reported as important for the species.

Following the last radio relocation, we continued weekly flights covering the same area, though the effort was refocused on locating and counting Red Knots in flocks to determine a minimum population size and continue to identify important areas.

Since knots were mostly outside the study area by midwinter, trapping more birds was not logistically feasible. However, by March knots were beginning to form sizeable flocks on the eastern edge of Nine Mile Hole in the Upper Laguna Madre, and on the flats north of Yarborough Pass on Padre Island National Seashore. In addition to weekly aerial surveys, we surveyed and conducted marked-bird resight efforts through March and April on these flats to the extent they were accessible.

Because capture and telemetry on Red Knots was hampered in the first fall and winter of this project by red tide (see following discussion) and the departure of most of the population from the study area, project staff decided that considerable useful information could be gained from conducting telemetry on second-year birds which, based on information from a separate project using geolocators, do not migrate north to the Arctic in the summer. By April, most adult Red Knots have molted into a fairly advanced state of breeding plumage, and juveniles are readily distinguishable by lack of breeding plumage and other characteristics. During capture efforts associated with another project in late April, we attached radiotransmitters to 21 nonbreeding Red Knots and followed them through early July to determine habitat usage of oversummering birds. During ground-based surveys, we detected some birds that showed some sign of breeding plumage amongst definitively plumaged juveniles even into

late June (breeding knots arrive on Arctic breeding grounds by around June 10 on average), indicating that possibly some third year or older birds may also oversummer here.

Since these birds were trapped in April prior to knots departing for northward migration, this study also allowed us to survey the population during a period of critical importance – mass gain for multi-day flights to northbound stopovers and breeding grounds. During this time period, knots amassed into large flocks on the flats north of Yarborough Pass, both sides (east and west) of Nine Mile Hole, along the western edge of the Land Cut, and an expansive sand/algal flat west of the Gulf Intracoastal Waterway at the southern end of the Land Cut known locally as Pintail Lake. This site regularly held up to 350 Red Knots among many other Calidridine sandpipers just prior to dates of known migratory departure.

Following departure of breeding Red Knots, oversummering birds used the same habitats used during the fall through spring periods, though generally they made more extensive use of the west side of flats on the northern end of South Padre Island, as well as flats north and south of State Highway 4 to Boca Chica Beach and the Vadia Ancha basin of the Bahia Grande complex of Laguna Atascosa National Wildlife Refuge.

Three of the five Piping Plovers captured in fall and early winter were never detected in locations other than the gulf beach, generally within a few hundred meters of their initial capture location. One bird was depredated or scavenged, and the remains were found in the coastal prairie adjacent to a sandflat on the Laguna Madre not far from the location of initial capture. Based on the location and disposition of remains, it is suspected that the bird was depredated by an avian predator (but see "Red tide event" for further discussion). One other bird captured on the gulf beach was subsequently tracked over the course of the following two months of winter on the algal flats of the Upper Laguna Madre, across the island and south from its location of initial capture. Rather than making one large jump, the bird moved only several kilometers between detections until its final detection in the algal flats at the north end of Nine Mile Hole on the western edge of Padre Island National Seashore.

Proximity to current wind energy installations

A large wind farm installation lies directly to the north of Pintail Lake and the adjacent flat in Kenedy County, with the closest turbine at present approximately 11 km from the nearest relocation of a radiomarked bird (at that specific site). Flocks of knots were also regularly encountered on flats along the western edge of the Land Cut, in some locations less than 2.5 km from the nearest wind turbine. Geolocator data from another project indicates that knots have a specific flight vector upon departure towards a northbound stopover. The level of risk from collision impact from wind turbines would

depend on a number of factors – in particular, whether birds attain sufficient altitude and to what extent they are capable of avoiding moving blades (assuming clear weather conditions). Though we were not able to visit the Pintail Lake flat by land or water, observations during several of these flights indicated that considerable numbers of *Charadrius* (most likely Piping and/or Snowy) plovers were also present on this flat, though these are more difficult to confidently identify from aircraft at altitude.

Red tide

A red tide bloom (*Karenia brevis*) began affecting the mid and south Texas coasts beginning in late September, and by the time of trapping large quantities of fish began washing up along the gulf beaches of the entire study area. This situation worsened throughout the coming weeks which made trapping conditions very uncomfortable due to respiratory difficulties from the aerosols as well as the stench of rotting fish. Weights of captured Red Knots were very low, in some cases 30% lower than normal fat-free weight. In addition to low weights of captured birds, we encountered one fresh dead knot and two so weakened that they could not stand or fly. Two of the birds captured in nets were considered to be in such poor condition that they, along with the other two captured by hand, were taken for rehabilitation at the Animal Rehabilitation Keep at University of Texas Marine Science Institute in Port Aransas, along with a Piping Plover that had been captured by hand by a beach visitor. One of the knots died in transit. Two knot carcasses were taken to Dr Paul Zimba of the Center for Coastal Studies at Texas A&M University-Corpus Christi who was testing tissue samples of deceased organisms for brevetoxin concentrations. "Three subsamples were analyzed: GI tract, liver, and muscle. Liver samples in both cases exceeded 2400 ng PbTX-3/gram tissue (wet weight). Muscle and GI samples were also positive, but at least an order of magnitude lower. These levels are extremely high and surely accounted for bird mortalities" (P Zimba, pers. comm.).

The known mortality of the Piping Plover occurred within a week of its initial capture in a severely red tide-affected area of the beach. Since the carcass was mostly consumed, no tissues were available to be tested for brevetoxin concentrations, but the circumstances surrounding the mortality suggest the bird may have been significantly weakened or poisoned by the red tide event which led to its predation.

The impacts of red tide and other harmful algal blooms on shorebirds is largely unknown but potentially significant since they can occur on almost any shoreline used by shorebirds. The results of the lab analyses prove that red tide toxin is easily capable of accruing to lethal concentrations at least in Red Knots, and probably via the alimentary canal – either from consumption of affected prey or passive uptake of toxin in the swash zone where they feed. However, the total number of knots seen on the gulf beaches during the fall was by far the lowest in recent years. Though it is unknown how many knots

may have died as a result of red tide, evidence from resighting of marked individuals later in the winter and following spring indicate that many birds simply avoided the area during the red tide. For this reason, it is yet unclear whether the patterns of habitat usage seen in year one can be considered "normal." If there is no red tide outbreak in year two, it may be possible to make some limited conclusions about differences in habitat usage in red tide vs non-red tide years.

The mortalities we were able to document and have analyzed outside the scope of this project provide strong evidence that harmful algal blooms are capable of killing Red Knots and probably at least significantly weakening Piping Plovers. Previously this has been a matter of some uncertainty as there had been no testing of carcasses of these species. Though we cannot quantify the impact at a population level, the results of these investigations warrant further study since harmful algal blooms occur throughout much of the known wintering range of the species including remote parts of South America.

Previously the wintering areas of Red Knots seen on south Texas beaches was not known (hence this project), and the original proposed study area we found to be too small for this species. Areas where large concentrations of Red Knots occurred in parts of the Lower Laguna Madre of south Texas last year are geologically and hydrologically closely related with the proposed study area. Expansion of the study area to include the entire Texas portion of the Laguna Madre will allow a better utilization of relocation effort and midwinter trapping effort.

The continuation of flights even after failure of the last radiotransmitter allowed additional data to be collected which will be helpful in determining a minimum size of the wintering population in south Texas.

Fieldwork on year two of this project commenced with trapping efforts beginning in September, though survey efforts in order to determine presence and distribution began prior to that. So far there has been no major red tide outbreak along the Texas coast, and through the end of the reporting period 10 Red Knots and 11 Piping Plovers have been radiomarked for this project and are currently being tracked via aerial and ground-based telemetry.

In Spring 2012, the project benefitted from a volunteer intern who was able to add water level data from multiple coastal water gauges (Texas Coastal Ocean Observation Network) to relocation data, which will facilitate a more thorough analysis of overall movements and habitat usage since water level appears to be a primary driver of habitat suitability.

Significant Deviations

As discussed, the number of birds fitted with radiotransmitters was lower than projected (Tasks 1, 3, 4). Red tide was a significant factor in limiting further trapping as the aerosolized toxins made beach visits hazardous for project staff and volunteers, and it became more apparent that that red tide was weakening birds. Trapping methods and effort also proved to be inadequate in year one. The project PI has since been authorized for use of cannon nets for the capture of shorebirds, and new equipment is proving to be far more effective than methods used in year one so that more birds can be trapped for the study and more time can be spent tracking a larger number of birds rather than trapping.

Fig. 1. South Texas coast including original proposed study area, with major features labeled: 1) Upper Laguna Madre; 2) Baffin Bay; 3) North Padre Island, including Padre Island National Seashore; 4) the Land Cut; 5) Lower Laguna Madre; 6) South Padre Island; and, 7) South Bay.

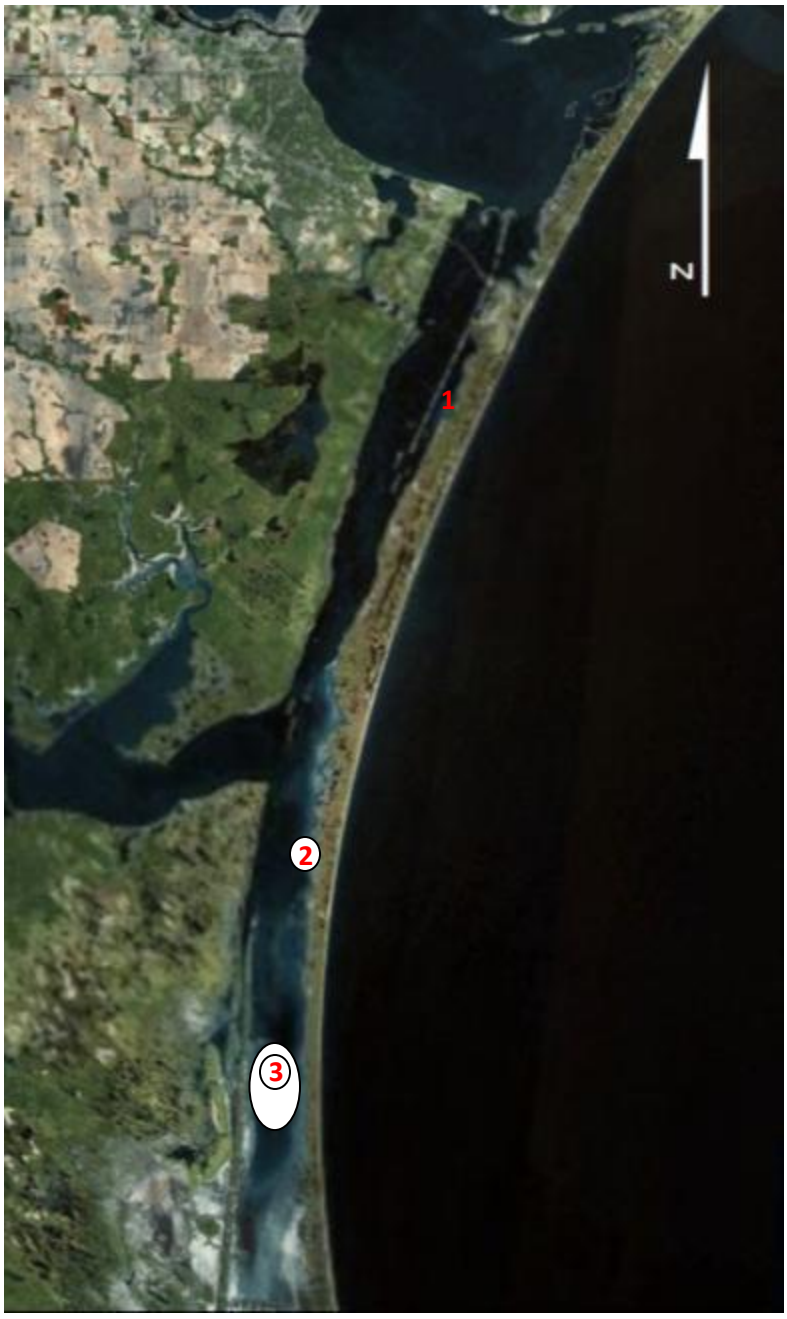

Fig. 2. Northern half of study area, with major Laguna Madre features of importance to shorebirds in this study labeled: 1) Nighthawk Bay and flats; 2) Yarborough Pass and flats; and, 3) Nine Mile Hole.

Fig. 3. Lower Laguna Madre habitats, including some outside original study area, labeled with major features of importance to shorebirds in this study: 1) Pintail Lake; 2) Rattlesnake Bay and flats; 3) Vadia Ancha in the Bahia Grande complex of Laguna Atascosa NWR; and, 4) Boca Chica flats.