Alaska Department of Fish and Game
State Wildlife Grant
ANNUAL INTERIM PERFORMANCE REPORT

Grant Number: **T-1** **Segment Number:** **16**
Project Number: **2**
Project Title: Monitoring Shorebirds on Barrier Island Beaches: Copper River Delta
Project Duration: 20 May 2005 – 31 March 2007
Report Period: 20 May 2005 – May 20, 2006
Report Due Date: August 20, 2006

Objectives 1. Determine the phenology, relative abundance, and species composition of shorebirds using the outer beaches and spits of the Copper River Delta during spring and fall migration.
2. Examine spatial and temporal distribution of shorebirds on outer beaches.
3. Investigate the relationship between shorebirds and marine invertebrate densities on the outer beaches.
4. Estimate the physiological state of migrant Western Sandpiper and Short-billed Dowitcher using blood plasma metabolites.
    a) Examine the relationship between blood plasma triglyceride levels and habitat quality.
    b) Determine fattening rates during spring.
5. Monitor stopover use on barrier islands by individual, radio-tagged Western Sandpipers and Short-billed Dowitchers during spring migration.
    c) Examine movements between barrier islands and other delta habitats.
    d) Determine length of stay.
6. Monitor breeding phenology, nesting habitat, and movements by shorebird species breeding on and immediately adjacent to outer beaches.

Summary of Accomplishments

Objective 1.

During the 2005 field season, two staff members established and conducted ground transects in a variety of barrier island outer beach habitats on Egg Island including 53 beach, 26 estuary and 31 upland transects from 24 July – 15 October. Between 23 July and 15 October 2005 one staff member flew a total of 11 low-altitude aerial surveys (~80 km each survey) along the barrier island outer beaches from Softuk to Egg Island. In 2006, 3 staff members and one volunteer conducted 50 beach, 18 estuary and 36 upland transects from 23 April to 30 June. From 27 April to 6 June one staff member flew 10 low-altitude aerial surveys (~80 km each survey) along the barrier island outer beaches from Softuk to Egg Island. An Alaska Department of Fish and Game employee flew one low-altitude aerial survey for the project on 26 June 2006 for a total of 11 aerial surveys to date for 2006.

Objective 2.

In April 2006, ground transects were subdivided into 250 meter linear sub-plots within the previously established permanent transects. Birds observed during transects were recorded in their respective sub-plots to examine the spatial distribution of shorebirds. Locations of all shorebirds were noted during the 11 aerial surveys in 2005 and 11 aerial surveys in 2006.

Objective 3.
Outer beach marine invertebrate densities were sampled on 3 May 2006 at the high and mid tide levels on Egg Island. Each cylindrical core sample was 15cm diameter by 15cm high. Six cores were taken from each site and cores were paired so that two cores equal 1 replicate. All cores were sieved on site and processed in the lab upon return from the field. Collected individuals were identified and weighed.

Objective 4.
Spring 2006 was characterized by cold and wet weather. As a result, no shorebirds were captured at Egg Island as originally planned for. At Hartney Bay, we captured 81 Western Sandpipers and took blood samples from 56 birds. Blood samples will be analyzed in August 2006 at Simon Fraser University.

Objective 5.
High-altitude aerial telemetry surveys were conducted from Controller Bay to Hartney Bay on 26 days (29 April, and 1-25 May) across the Copper River Delta. A total of 27 radiotagged Western Sandpipers and 7 radiotagged Long-billed Dowitcher were detected. A general location (barrier island side or shoreward side) were noted for all detected birds for each day detected.

Objective 6.
Three staff & 1 volunteer spent ~850 hours conducting nest searches, nest monitoring, and trapping breeding shorebirds and their newly-hatched broods. A total of 47 shorebird nests were located in a 120 ha study plot located between the primary & secondary dune system including 31 Semipalmated Plover, 13 Least Sandpiper, and 3 Red-necked Phalarope nests. Nests were monitored every 2-3 days and their fates determined. We captured 21 adult Semipalmated Plovers (10 males, 11 females) and marked them with unique color band combinations. We attached a 1g, glue-on radio transmitter to the 10 male Semipalmated Plovers and monitored their movements. A total of 13 adult Least Sandpiper (5 male, 4 female, 4 unknown sex) were captured, marked with unique color band combinations and released for further monitoring. We banded broods from 9 Semipalmated Plover nests (total = 34 chicks) and 7 Least Sandpiper nests (total =25 chicks) broods (total = 34 chicks) with unique color band combinations. Spatial use by marked adult Least Sandpiper and Semipalmated Plovers was determined by resighting individuals and using radio-telemetry triangulation every 2 days. A total of 133 relocations were accomplished. In all, 0 adult and 2 chick mortalities resulted from our trapping and marking efforts.

Significant Deviations
Objective 4: Long-billed Dowitcher, but not Short-billed Dowitcher, were captured and radio-tagged in California by our US Geological Survey & PRBO Conservation Science collaborators. In addition, spring 2006 was characterized by cold, wet, and windy weather. As a result, we were unable to mist net shorebirds at Egg Island. At Hartney Bay, a small number of Dowitchers were observed, and none were captured in the mist nets.

Actual Costs during this Report Period *(personnel plus all operating expense totals)*:

Federal (from ADF&G):	Partner (nonfederal share):	Total:
$ 41,358	$ 13,786	$ 55,144

Project Leader *(or Report Contact Person)*: Mary Anne Bishop, Ph.D., Research Ecologist, Prince William Sound Science Center, Cordova, Alaska

Additional Information:

1. Is this project contributing samples to the Alaska Avian Influenza detection effort?
A subsample of Western Sandpipers captured at Hartney Bay in spring was sampled for avian influenza in cooperation with the US Geological Survey San Francisco Bay Estuary Field Station. US Geological Survey has these samples and is working with the University of California at Davis to have them analyzed.
2. Do you anticipate having any unspent funds at the end of the project? No

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
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Alaska Department of Fish and Game
State Wildlife Grant

Grant Number: T-1 **Segment Number:** 16

Project Number: 2

Project Title: Monitoring Shorebirds on Barrier Island Beaches: Copper River Delta

Project Duration: 20 May 2005 – 31 March 2007

Report Period: 21 May 2006 – March 31, 2007

Report Due Date: June 30, 2007

Project Objectives

Determine the phenology, relative abundance, and species composition of shorebirds using the outer beaches and spits of the Copper River Delta during spring and fall migration.

1. Examine spatial and temporal distribution of shorebirds on outer beaches.
2. Investigate the relationship between shorebirds and marine invertebrate densities on the outer beaches.
3. Estimate the physiological state of migrant Western Sandpiper and Short-billed Dowitcher using blood plasma metabolites.
    a) Examine the relationship between blood plasma triglyceride levels and habitat quality.
    b) Determine fattening rates during spring.
4. Monitor stopover use on barrier islands by individual, radio-tagged Western Sandpipers and Short-billed Dowitchers during spring migration.
    c) Examine movements between barrier islands and other delta habitats.
    d) Determine length of stay.
5. Monitor breeding phenology, nesting habitat, and movements by shorebird species breeding on and immediately adjacent to outer beaches.

Summary of Project Accomplishments for entire project

Objective 1: We established and conducted ground transects at Egg Island in three habitats: outer beach, between the primary and secondary dunes (hereafter referred to as upland), and in a small estuary on the east side of the Island. Table 1 is a summary of each season's effort, total shorebird numbers, and total number of species.

In spring, the most numerous shorebird by habitat included: Sanderling (a migrant) on the outer beach; Least Sandpiper (a local breeder and migrant) in the uplands, and Western Sandpiper (a migrant) in the estuary. In fall, the five most abundant species included Least

Sandpiper and Semipalmated Plover (both local breeders and migrants) and three migrants: Pectoral Sandpiper, Western Sandpiper and Long-billed Dowitcher.
Each spring and fall season, I flew a series of low-altitude aerial surveys along the barrier island outer beaches from Softuk west to Egg Island (~80 km across). Fall aerial surveys counted 5,644 shorebirds (n = 11 flights) in 2005 and 4,490 shorebirds in 2006 (n = 11 flights). Spring 2006 aerial surveys (n = 10 flights) yielded 32,675 shorebirds.

Table 1. Survey effort, total number of shorebirds and shorebird species by season and year.

Season/Yr/Dates	Habitat	Survey Days	Total Transects	Total Birds	Total Species
Fall 2005	Beach	28	53	3,889	23
27 Jul – 15 Oct	Upland	20	31	1,169	16
	Estuary	22	27	8,618	23
Spring 2006	Beach	22	44	15,358	21
23 Apr – 1 Jun	Upland	18	36	3,816	20
	Estuary	11	19	13,405	21
Breeding 2006	Beach	5	10	64	6
3 – 27 Jun	Upland	2	4	92	5
	Estuary	1	2	10	4
Fall 2006	Beach	30	60	3,810	25
30 Jun – 13 Oct	Upland	29	58	3,138	18
	Estuary	22	43	10,694	22

Objective 2: Spatial distribution of shorebirds was determined from aerial surveys of the outer beaches and ground transects at Egg Island (see table 1 above). All three seasons, the outer beaches at Copper Sands recorded the highest number of shorebirds. A relatively large flock of Calidrids ranging from 250 -700 birds and believed to be Sanderling appeared both years during mid-August and inhabited the western edge of Copper Sands. These birds may be spending the winter on the barrier islands.

Using the Egg Island ground transect data for spring and fall 2006, we used Bayesian hierarchical models to model weekly counts of major shorebirds species (or species groups) and to identify areas of shorebird concentration. In particular, the far west end of Egg Island is an important shorebird concentration area.

Objective 3: Benthic cores from the beach yielded few invertebrates: relatively low densities of beach fleas (an amphipod) in samples from high tide elevations and blood worms in samples from mid-tide elevations. Surface-active invertebrates appear to be a plentiful food resource for shorebirds. Pit-fall traps on the outer beach yielded beach fleas both at high and mid-tide sites, and in higher densities (30- 40x) than benthic cores. Insects, especially rove beetles and midge (chironomid) flies were also well represented. In the estuary, corophids, were the dominant invertebrate with average densities exceeding 10,000/m^2. Bivalves *Macoma balthica* and *Mya arenaria* were found in relatively high densities in core samples

from the head of the main channel. Both corophids and Macoma have been documented in previous Delta mudflat studies as important food resources for shorebirds.

Objective 4: Spring 2006 was characterized by cold and wet weather. As a result, no shorebirds were captured at Egg Island as originally planned, however, we did capture 81 Western Sandpipers and took blood samples from 56 birds at Hartney Bay, an important shorebird area north of Egg Island. Triglycerides were analyzed at Simon Fraser University. Along with investigators from PRBO Conservation Science, USGS and Simon Fraser University, we measured triglycerides of 301 Western Sandpipers at various sites from Pt. Mugu California to the Copper River Delta. We were able to confirm that for Western Sandpiper, plasma triglyceride levels are positively related to body mass and that plasma glycerol is negatively related to body mass. Mean triglyceride levels of male and female Western Sandpipers generally increased from Pt. Mugu to British Columbia and then dropped at the Copper River Delta. Except for Pt. Mugu, we were unable to catch Long-billed Dowitcher at other sites, including the Copper River Delta.

Objective 5: I flew 23 telemetry surveys (29 April, 1-22 May 2006) and monitored for 56 Western Sandpiper and 35 Long-billed Dowitcher previously radio-tagged at Pt. Mugu and San Francisco Bay California. Aerial surveys covered the Copper and Bering River Deltas. Seven of the 35 (20%) Long-billed Dowitcher were detected including three around the barrier islands: two birds at Egg Island, and a third bird first heard at Grass Island and later by Egg Island. A total of 26 of the 56 Western Sandpiper were detected. Of these, 5 of the 26 (19%) were heard around barrier islands including: three birds by Okalee Spit (a large barrier spit in Controller Bay), one bird in the vicinity of Grass Island, and one on or around Egg Island. Mean length of stay for Western Sandpiper was 3.2 ± 1.5 d ($n = 26$) and for Long-billed Dowitcher was 2.1 ± 0.5 ($n = 7$).

Objective 6: Average hatch date was 20 June for nests of both Semipalmated Plover ($n = 20$) and Least Sandpiper ($n = 10$). For Semipalmated Plover, we estimated the probability of survival for an average nest from the onset of incubation until hatch (24 days) at 0.67 (95% CI: 0.36-0.85). For Least Sandpiper, although 3 nests had an unknown fate, there were no known nests lost. Therefore, because the data was for 10 successful nests, we could only determine the probability of survival for an average nest at 1.0.

Spatial use by marked adult Least Sandpiper and Semipalmated Plovers was determined by resighting color-banded individuals. Of the adult Semipalmated Plover, we resighted 19 of 21 birds (90%) a total of 242 times after the nest hatched, including 194 prefledge and 48 post-fledge observations. Our resightings showed that the male Semipalmated Plover keep the chicks well hidden and close to where they hatched for the first 3 weeks - usually within 600 feet of the nest. Only 3% of our sightings were >1 km from the nest. We were able to determine a minimum convex home range for 10 males, 7 females and 6 chick broods. Least Sandpipers were much more secretive and difficult to relocate ($n = 33$ relocations). Only 3 birds had sufficient relocations to calculate a home range. Least Sandpiper also migrated much earlier than the Semipalmated Plover. The latest resighting of a Least Sandpiper banded female was 5 July, for banded male was 9 July, and for a banded chick was 18 July. In contrast, the latest date for resighting of Semipalmated Plover females was 21 July, and for males was 29 July, and for a banded chick was 13 August.

Project Accomplishments during last segment period only (May 21, 2006 – March 31, 2007)

Objective 1: At Egg Island, spring ground transects, initially begun on 23 April, were completed on 1 June 2006. Breeding season transects (3 – 27 June) and southbound migration transects (30 June – 14 October) were also conducted. Effort and numbers of shorebirds observed are summarized above in Table 1. Spring aerial surveys, begun on 27 April ended on 6 June 2006 for a total of 10 flights. Fall migration surveys began 27 June and ended 14 October 2006 for a total of 11 flights. Aerial data was transcribed from recordings and both aerial and ground transect data was entered, proofed, and analyzed.

Objective 2: Distribution of shorebirds on the Egg Island outer beach and interdune area has been analyzed using Bayesian hierarchical models.

Objectives 3 & 5: Blood samples were shipped to Simon Fraser University for analyses. The project collaborators on the telemetry project went over data from all the stopover sites via a teleconference in June 2006. A preliminary draft final report for this specific research project, "2006 Spring Migration of Western Sandpipers and Long-billed Dowitchers: Pt. Mugu, California, to Copper River Delta, Alaska" was written by the four principal collaborators and is currently in the USGS manuscript review system.

Objective 4: In August and September 2006, I took benthic cores to sample benthic macrofauna in Egg Island's estuary and used pit-fall traps to sample surface-active invertebrates on the outer beach. All benthic cores, including outer beach samples collect during May 2006, and pit-fall trap samples have been identified and enumerated to the lowest practical taxon (usually family) or in the case of bivalves, to species.

Objective 4: From 15 May – 4 July 2006 three staff & 1 volunteer spent ~850 hours conducting nest searches, nest monitoring, and trapping breeding shorebirds and their newly-hatched broods. A total of 47 shorebird nests were located in a 120 ha study plot located between the primary & secondary dune system including 31 Semipalmated Plover, 13 Least Sandpiper, and 3 Red-necked Phalarope nests. Nests were monitored every 2-3 days and their fates determined. Between 10 June and 4 July 2006, we captured, marked with unique color band combinations and released: 21 adult Semipalmated Plovers (10 males, 11 females), 13 adult Least Sandpiper (5 male, 4 female, 4 unknown sex), and broods from 9 Semipalmated Plover nests (total = 34 chicks) and 7 Least Sandpiper nests (total =25 chicks). We searched for marked birds every 2 days.

Significant Deviations

Objective 4: Long-billed Dowitcher, but not Short-billed Dowitcher, were captured and radio-tagged in California by our US Geological Survey & PRBO Conservation Science collaborators. In addition, spring 2006 was characterized by cold, wet, and windy weather. As a result, we were unable to mist net shorebirds at Egg Island. At Hartney Bay, a small number of Dowitchers were observed, and none were captured in the mist nets.

Project Leader: Mary Anne Bishop, Ph.D., Research Ecologist, Prince William Sound Science Center, P.O Box 705, Cordova, Alaska

Additional Information:

Published Abstracts

Bishop, M.A., and H.R. Gates. 2006. Southbound migration of juvenile shorebirds on barrier islands of the Copper River Delta, Alaska. Shorebird Science in the Western Hemisphere. 27 February – 2 March 2006. Boulder Colorado. Pg. 63.

Bishop, M.A. and H.R. Gates. 2006. Southbound migration of juvenile shorebirds on barrier islands of the Copper River Delta, Alaska. Alaska Bird Conference and Workshops, February 7-9, 2006, Juneau, Alaska. Pg. 35.

Bishop, M.A. and H.R. Gates. 2005. Monitoring shorebird on barrier islands of the Copper River Delta. Summaries of ongoing or new studies of Alaska shorebirds during 2005. Alaska Shorebird Group 4:30-31.

Popular Science

Prince William Sound Science Center's Newsletter *The Breakwater*

Anon. 2006. Five months camping on a sand bar? New field camp survival record set. The Breakwater. Fall: 6.

Bishop, M.A. 2007. All in a summer's work: fledging a plover at Egg Island. The Breakwater Feb: 1,4.

Bishop, M.A. 2006. Monitoring shorebirds on barrier islands of the Copper River Delta! The Breakwater. Jan: 1,3.

Professional Meetings: Presentations & Posters

2006 Alaska Shorebird Group 12th Annual Meeting, Anchorage, Alaska

Monitoring shorebird migration on barrier islands of the Copper River Delta. Bishop.

Reproductive ecology of Semipalmated Plover & Least Sandpiper on the Copper River Delta. Gates & Bishop (Presentation by Gates)

2006 Shorebird Science in the Western Hemisphere, Boulder, Colorado

Southbound migration of juvenile shorebirds on barrier islands of the Copper River Delta, Alaska. Bishop & Gates (Poster)

2006 Alaska Bird Conference, Juneau, Alaska (poster)

Southbound migration of juvenile shorebirds on barrier islands of the Copper River Delta, Alaska. Bishop & Gates (Poster)

2005 Alaska Shorebird Group 11th Annual Meeting, Anchorage, Alaska

Monitoring shorebirds on the barrier islands of the Copper River Delta. Preliminary results of the fall 2005 field season. Bishop, Gates, & Lamarre (Presentation by Bishop)

Public Outreach

Feb. 2007 Presentation. Shorebird Migration and Breeding Ecology on the Copper River Delta Barrier Islands 2006. Bishop & Gates. Joint meeting of Prince William Sound Science Center Community Education Program & Prince William Sound Audubon Society. Cordova, Alaska

Sept. 2006 Presentation. Shorebird research on the Copper River Delta. Bishop. Video for USDA Forest Service website, "Migration Science and Mystery: A Distance Learning Adventure. http://migration.pwnet.org/stopovers/cordova_videos.php

July 2006 Presentation. The Ecology of the Copper River delta and its barrier islands. Bishop and Gates. Barrier Island Ecology Workshop. Cordova, Alaska.

Nov 2005 Presentation. A Season in the wind: shorebird monitoring on a barrier island of the Copper River delta. Presentation by Gates. Prince William Sound Science Center Community Education Program.

Cordova School District Presentations

May 2006 Shorebird Trapping Demonstration (my field project) for Cordova High School. (presentor: A. Taylor)

Student Interns

Kelly Jacobson of Prescott University assisted with all aspects of the Egg Island study during May 2006 as part of a school project.

Other Activities:

❖ Egg Island salvaged specimens or scientific information provided:

- Seabirds: US Fish & Wildlife Service (salvaged marbled murrelet and cassin's auklet)
- Sea ducks: Alaska Department of Fish and Game (Wildlife Conservation; salvaged white-winged & surf scoters)
- Passerine: Alaska State Museum, University of Alaska, Fairbanks (salvaged Savannah sparrow).
- Semipalmated plover feathers: Professor Erica Nol, Trent University, Canada. (stable isotope analyses)
- Sea otters: US Fish and Wildlife Service (salvaged juveniles for necropsy)
- Coastal survey data (dead birds, marine mammals, marine debris): COASST, University of Washington
- Stranded marine mammals infomation: NOAA, Juneau
- Red knot migration data: US Fish & Wildlife Service, Migratory Bird Management

- Spring 2006 Bishop applied for and received a Master Station Permit from the US Fish and Wildlife Service's National Bird Banding Lab.
- July 2006 Bishop was the workshop instructor for the Copper River Barrier Island Ecology Workshop. Gates led field trips and gave a talk on the Egg Island research out at Egg Island. The workshop was sponsored by the US Forest Service and the Prince William Sound Science Center's Environmental Education program. Ten people, including 6 from the local community attended the 2-day workshop that included an overnight at Egg Island. This course was offered through the University of Alaska Anchorage, and teachers that attended this workshop received credit.

ALASKA DEPARTMENT OF FISH AND GAME
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Alaska Department of Fish and Game
State Wildlife Grant

Grant Number: T-3 **Segment Number:** 1

Project Number: 2.12

Project Title: Demography of Aleutian Terns at Blacksand Spit, Yakutat, Alaska

Project Duration: July 1, 2007 – June 30, 2008

Report Period: July 1, 2007 – June 30, 2008

Report Due Date: September 30, 2008

Principal Investigator: Matt Kirchhoff, Alaska Department of Fish and Game

I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

The Aleutian Tern (*Onychoprion aleutica*) is a species of high conservation concern. Global populations are small (20,000), with Alaska supporting about half that number (USFWS 2006). The largest reported colony of Aleutian Terns in the world is accessible by road and skiff on Blacksand spit in Yakutat, Alaska. Therefore, these birds are vulnerable to a number of human threats including four-wheeler traffic, human visitation, pets, and oil pollution. We had little or no data on important demographic parameters for ht species at this globally important site, including population trend, productivity (nesting and fledging), and mortality.

II. REVIEW OF PRIOR RESEARCH AND STUDIES IN PROGRESS ON THE PROBLEM OR NEED.

The Aleutian Tern is a colonial nesting seabird of coastal Alaska that is very poorly understood. The global population of approximately 32,000 individuals is believed to breed exclusively in Alaska and eastern Siberia. The Alaska population has been estimated at 9,500 or 1/3rd of the global population estimate (North 1997). Although colonies of a few to many hundred individuals appear to be broadly distributed along the coasts of the Chukchi Sea, Seward Peninsula, the Yukon-Kuskokwim River delta, the Alaska Peninsula, the Aleutian Islands, Kodiak Archipelago, and Kenai Peninsula (USFWS 2006), most individuals can be found in just a few large colonies of several thousand individuals, namely on the Copper River Delta and in the Yakutat area of northern Southeast Alaska.

Concern about the conservation status of this species exists for at least 3 reasons. First, within Alaska, colony distribution makes the species potentially vulnerable: in particular, perhaps the largest and most accessible breeding colony of Aleutian Terns in the world nests on the Black Sand Spit area, where colony size historically has been approximated as high as 3000 individuals (Oehlers 2007), representing 10 and 30 % of the global and Alaskan populations (North 1997). Second, although there are no long term data sets of accurate population sizes, anecdotal evidence is consistent with the possibility that colony

sizes have undergone slight to severe declines in Southcentral and Southeast Alaska (Table 1).

Table 1.

Colony location	Historical Observation	Recent Observations	Sources
SE Kodiak Island	1559 (1979)	2 (2002)	FWS, Alaska Seabird Information Series (FWS 2006c)
Prince William Sound	Declines of a min. of 50% (1972-2007)		Agler et al. 1999; D. Irons, *pers. comm*.
Black Sand Spit	3000 (1980)	513-2700 (2001-2007)	IBA
Riou Spit, Icy Bay	515 (1995)	0-40 (2004-2007)	FWS, unpublished data

Third, in comparison to many migratory seabirds breeding in Alaska, essentially nothing is known about the overwintering distribution of Aleutian terns, except anecdotal evidence that the species has been observed only in Southeast Asia during the overwintering phase. The prevalence of the Avian Influenza A (H5N1) in Southeast Asia, coupled with potential impact of human activities in near-shore waters and coastal areas in this region, are potential risks to Aleutian Terns.

Collectively, these 3 observations – the significant contribution of large, potentially vulnerable Alaska colonies to the global population, the possibility of declines colonies, and the nearly complete lack of information outside of the 6-8 week breeding period in Alaska – underscore the need to derive an accurate population estimate for Alaska populations.

III. APPROACHES USED AND FINDINGS RELATED TO THE OBJECTIVES AND TO PROBLEM OR NEED

OBJECTIVE 1: Develop a comprehensive study plan for gathering vital demographic data for terns using this important colony.

The requisite first step in evaluating population trends is developing a robust method to survey Aleutian Terns, something that has not yet been adequately explored. For Aleutian Terns, however, significant challenges must be overcome before an accurate population estimate can be derived. These challenges include: (1) Detection error. In Alaska, Aleutian terns frequently associate with morphologically similar Arctic Terns (North 1997). Distinguishing respective colony nesting locations and composition in mixed species aggregations will be important preliminary steps to assessing population size. (2) Observer Bias. The tolerance of Aleutian terns to human observers at colonies is unknown but several sources report that Aleutian terns can be moderately sensitive to disturbance (Buckley and Buckley 1979; North 1997). Therefore, development of survey methods and parameters that are minimally invasive will be important. (3) Counting Bias. Terns are also highly dispersive at the nest site, so designing effective ground-based counting procedures will be important. Nonetheless, the facts that the species occupies large, ground nesting colonies in relatively accessible and highly visible coastal terrain of Alaska, and has a reasonable level of general site fidelity on a year-to-year basis, lend

themselves to deriving a minimally-invasive, cost-effective, and repeatable survey method that can be deployed across Alaska.

In the initial phase of this study we identified a set of survey methods to evaluate at the Black Sand Spit colony. Evaluation of these methods during the breeding season n 2008 will allow us to develop a survey protocol that can then be applied to other colonies over the breeding range by our cooperators.

IV. MANAGEMENT IMPLICATIONS

This project will support the State of Alaska in its mission to advance the conservation of a high priority non-game species, the monitoring of Aleutian Terns. In terms of methodology, quantitative rigor, and practicality, the project will serve as a model to address a fundamental need for many other potential non-game species that require a science-driven, cost effective, survey protocol. By enabling collaboration among the Alaska Department of Fish and Game, the two Forest Service Alaska Region National Forests, the U.S. Fish and Wildlife Service, the University of Alaska, local Alaskan native communities, and conservation organizations (e.g. Audubon, Yakutat Salmon Board), the project will serve as a prelude to a monitoring network by demonstrating the level of multi-stakeholder collaboration necessary for statewide monitoring of population trends.

The initial stages of this project completed before June 30 2008 focused on initial study plan development, communication between collaborators and local stakeholders, and logistical evaluation. We also developed a photogrammetry system that can be utilized by a local air charter.

V. SUMMARY OF WORK COMPLETED ON JOBS FOR LAST SEGMENT PERIOD ONLY (July 1, 2007 – June 30, 2008)

JOB/ACTIVITY 1A: Host a planning meeting (or meetings) with potential partners, including USFS, USFWS, City of Yakutat and Audubon Alaska to determine their desired level of involvement in the project.

We hosted planning meetings including representatives from the USFWS, USFS, ADF&G, City and Borough of Yakutat, and Yakutat Tlingit Tribe. In addition to these planning meetings, we conducted field visits with representatives from Yakutat Tlingit Tribe and the City and Borough of Yakutat to the colony. We also coordinated a field visit to a USFWS field camp in Icy Bay to recon Point Riou for potential Aleutian tern colony study sites.

JOB/ACTIVITY 1B: Visit the study site during the breeding season to evaluate potential for building off-site observation towers or on-site blinds that could be accessed by covered crawlways (minimizing disturbance). Evaluate logistics associated with transportation, on- and off-site housing, needed permits, and supplies (food, fuel, tech support) needed for field work.

We made multiple visits to the field site before the onset of breeding season to evaluate logistics and monitor phrenology. Several potential campsites and anchorages were identified. We made contact with commercial fishing permit holders occupying cabins in and near the colony and discussed our field plans and their historic observations of the

colony. Options for blinds were evaluated, but ultimately because of the large area of the Spit and uncertainty regarding where exactly on Black Sand Spit Aleutian terns would choose to nest in the given breeding season, permanent blinds and tunnels were not adopted. Several abandoned cabins and elevated knolls were identified as potential temporary blind sites.

JOB/ACTIVITY 1C: Draft a study plan and budget for the project in cooperation with partners. If an NGO or University can secure the necessary 1:1 non-federal match, they will be encouraged to apply for State Wildlife Grant funds to carry out the proposed work.

We initiated a partnership with the University of Alaska Southeast, the Yakutat Tlingit Tribe and the City and Borough of Yakutat. A study plan utilizing a graduate student was completed with a budget. We applied for a State Wildlife Grant.

ADDITIONAL ACTIVITY: Construct and test an aircraft camera mount. Modify a Cessna 185 Aircraft to be fitted with the constructed mount and test aerial photography at the study site.

We fabricated a camera mount that would allow us to utilize a local air charter service for photogrammetry surveys to be used in a proposed SWG partner project in FY2009. Utilization of a local operator vastly improves our safety and flexibility in Southeast Alaska weather conditions and significantly decreases our costs.

VI. PUBLICATIONS

None.

Literature Cited

Agler, B.A., S. Kendall, D. Irons, and S.P. Klosiewski. 1999. Declines in marine bird populations in Prince William Sound, Alaska voincident with a climatic regime shift. The International Journal of Waterbird Biology 22:98-103.

Alaska Department of Fish and Game (ADFG). 2006. Our wealth maintained: A strategy for conserving Alaska's diverse wildlife and fish resources. Alaska Department of Fish and Game, Juneau, Alaska. 824 pp. See: http://www.sf.adfg.state.ak.us/statewide/ngplan/ NG_outline.cfm.

Buckley, F.G., and P.A. Buckley. 1979. Do Aleutian terns exhibit extraordinary anti-predator adaptations? Proc. Colonial Waterbird Group Vol. 3:99-107.

North, M.R. 1997. Aleutian Tern (*Sterna aleutica*). In The Birds of North America, No. 291 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and the American Ornithologists' Union, Washington, D.C.

Oehlers, S. 2007. *Unpublished Report.* Aleutian and Artic Tern Analysis Supplement to the to ATM Wildlife Specialist Report. USDA Forest Service Yakutat Ranger District.

U.S. Fish and Wildlife Service. 2006. Alaska seabird information series: Aleutian tern. http://alaska.fws.gov/mbsp/mbm/seabirds/pdf/alte.pdf.

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Alaska Department of Fish and Game
State Wildlife Grant

Grant Number: **T-9** **Segment Number: 1**

Project Number: **3.0**

Project Title: Evaluation of survey methods to assess Aleutian tern population status

Project Duration: 1 July 2008 – 30 June 2010

Report Period: 1 July 2008 – 30 June 2009

Report Due Date: September 30, 2009

Partner: University of Alaska Southeast

Project Objectives:

OBJECTIVE 1: Design and implement a series of sampling methods near Yakutat.

JOB/ACTIVITY 1A: Survey each colony using strip, line, and variable area transects.

JOB/ACTIVITY 1B: Complete colony-wide aerial photography.

JOB/ACTIVITY 1C: Use counts of birds from aerial photographs to derive a "quasitrue" population estimate.

JOB/ACTIVITY 1D: Develop an aerial-ground sampling ratio for future assessments.

OBJECTIVE 2: Conduct a comparative population assessment.

JOB/ACTIVITY 2A: Predict sizes of Aleutian Tern colonies using data from the sampling methods.

JOB/ACTIVITY 2B: Evaluate the methods for statistical rigor, cost effectiveness, and disturbance impact.

JOB/ACTIVITY 2C: Produce a robust survey protocol for statewide application.

OBJECTIVE 3: Apply the survey protocol to other regions.

JOB/ACTIVITY 3A: Coordinate with other agencies.

JOB/ACTIVITY 3B: Survey Aleutian Tern colonies in Yakutat, Icy Bay, and Cordova.

JOB/ACTIVITY 3C: Derive accurate population estimates.

JOB/ACTIVITY 3D: Refine the protocol as needed.

Summary of Project Accomplishments:

OBJECTIVE 1:

JOB/ACTIVITY 1A: We designed a single-pass transect methodology that encompassed a combination of variable area, strip and distance-sampling survey techniques. We implemented the survey four times to estimate Arctic and Aleutian Tern nesting density at Black Sand Spit, Yakutat (3 times during the 2008 summer breeding season, and once during the earlier part of the 2009 summer breeding season). We also applied the survey technique to another mixed Arctic and Aleutian tern colony at the mouth of the Italio River once during each season. We also estimated ratio of Arctic to Aleutian Tern adults at the Black Sand Spit Colony along our transect route.

JOB/ACTIVITY 1B: We modified a Cessna 185 and fitted it with a custom designed camera mount. We flew three survey flights over the Black Sand Spit Colony during summer 2008. Using two cameras, we took photos at different combinations of altitude, focal length, and air speed. During our last survey flight, we placed observers on the ground to evaluate disturbance to the colony from the airplane as well as deployed "dummy" nesting birds to evaluate detectability of known objects using aerial photogrammetry.

JOB/ACTIVITY 1C: We attempted to estimate the number of birds in photos using 2 techniques: (1) we systematically searched for nesting birds using a grid superimposed on the image; and (2) used the Feature Analyst extension of a GIS program to perform automated counts of birds. Neither technique proved very satisfactory: the manual technique grossly underestimates nesting occurrence because counts were very low, even in situations when known objects were placed on the ground; and the automated technique grossly overestimates counts because other features (e.g. tree limbs, etc) on Black Sand Spit resemble terns in size and spectral characteristics.

JOB/ACTIVITY 1D: This activity was not pursued given outcome described in 1C.

OBJECTIVE 2:

JOB/ACTIVITY 2A AND 2B: In the winter of 2008, we analyzed data and derived nesting density estimates using the 3 ground-based survey techniques: variable area, strip and distance-sampling. Distance sampling yielded the more statistically robust density estimates of nesting birds than the other 2 techniques. All 3 techniques were comparable from the standpoint of cost-effectiveness and disturbance.

JOB/ACTIVITY 2C: In progress.

OBJECTIVE 3:

JOB/ACTIVITY 3A: We coordinated efforts with several other partners including USFWS (Juneau and Anchorage), USFS Cordova Ranger District, University of Hawaii, University of Alaska Fairbanks, Yakutat Tribe, National Park Service, and Alaska Department of Fish and Game Nongame program biologists.

JOB/ACTIVITY 3B: We conducted outreach in 2008 and 2009 to jumpstart statewide survey efforts. We visited Icy Bay in cooperation with the USFWS in the 2008 breeding season where we identified two Aleutian Tern colonies. In 2009 we again coordinated with USFWS this time the goal was to identify ALTE colonies while we surveyed for Kittlitz's murrelets in Russel Fiord and Yakutat Bay. We located one ALTE colony at Orange Glacier in Russel Fiord and another ALTE colony near Esker Creek on the west side of Yakutat Bay. In 2009 we coordinated with ADFG and NPS to locate another large colony on gravel islands of the Alsek River area. In 2009 we visited the Copper River Delta in coordination with the Cordova Ranger District. Our goal was to re visit the sites studied by in Lars Holtan in the late 1970's. We flew an aerial reconnaisance survey over the East Delta and visited most of the historic colony sites on foot. We found significantly fewer ALTE then recorded by Holtan on the East Copper River Delta.

JOB/ACTIVITY 3C & 3D: In progress.

Significant Deviations: None noted at this time.

Prepared By: Sanjay Pyare (Co-PI), University of Alaska Southeast

Date: 08/20/2009

ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
Juneau, AK 99811-5526

Alaska Department of Fish and Game
State Wildlife Grant

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