

Arctic Network
Inventory and Monitoring Program

National Park Service
U.S. Department of the Interior

Inventory & Monitoring Program, Alaska Region
Anchorage, Alaska



Aerial monitoring of Yellow-billed loons in Cape Krusenstern National Monument and Bering Land Bridge National Preserve, Arctic Network of Alaska Parklands: 2009 Study Plan

Study Plan

Alaska Region Inventory & Monitoring Program

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Mar 2, 2009

ARCN

Project ID

CAKR, BELA

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Abstract

The Yellow-billed Loon (*Gavia adamsii*) is a species of concern with a global population estimated at 16, 650-21,000 (Fair 2002, Earnst 2004). In Alaska, the total population estimate is between 3,700 and 4,900 (USFWS 2007). The breeding range in Alaska is restricted to large, freshwater, fish-bearing lakes (>13.4 hectares) (North and Ryan 1989) in tundra habitats of the Arctic Coastal Plain of Alaska north of the Brooks Range, in western Alaska on the Seward Peninsula including Bering Land Bridge National Preserve (BELA), and in Cape Krusenstern National Monument (CAKR) (USFWS 2007). Prior to 2005, distribution and population estimates of Yellow-billed loons were poorly documented in these parklands and population estimates in these areas represent a small percentage of the global population. The Alaska National Interest Lands Conservation Act (U.S. Congress 1980) and other legal mandates provide protections and stewardship responsibility for these loon and other species of birds occurring in these parklands. In 2005, results from aerial surveys conducted in and around BELA and CAKR generated population estimates for Yellow-billed loons and nests of 418 (90% confidence range = 314-521) and 85 (90% confidence range = 56-115), respectively (Mallek et al. 2005). Data is collected also for all other loon species encountered during the surveys. The portions of the northern and central Seward Peninsula strata including BELA accounted for 76% (319) of the total Yellow-billed loon population estimate and 76% (65) of the total nest estimate. In CAKR, the Yellow-billed loon population and nest estimates accounted for 5% (22) and 4% (4) of the total, respectively. Results from surveys conducted in the same area in 2007 with similar effort yielded similar populations estimates (Bollinger et al. 2007). Due to the small population size and restricted distribution of the Yellow-billed loon, the U. S. Fish and Wildlife Service is currently evaluating a petition to list this species as Threatened or Endangered under the Endangered Species Act (USFWS 2007). Yellow-billed loons are large-bodied, long-lived and piscivorous, characteristics that predispose them and other species of loons to bioaccumulate contaminants (Trust et al. 2007 in prep, Matz et al. 2006). Their slow rate of sexual maturity (3-7 years) and their low reproductive success requires high annual adult survival to maintain populations (Evers 2004). For these reasons, the Arctic Network of Alaska Parklands (ARCN) has selected the Yellow-billed loon as a vital sign for long-term monitoring. Aerial surveys of the loons conducted by NPS in June of 2009 will serve to supplement protocol development, NPS staff training and refinement of methods. Aerial survey methodology utilized and refined by USFWS will be adopted by ARCN and continued biennially for the long-term monitoring program.

Problem Statement

In Alaska, the total population estimate of Yellow-billed loons is between 3,700 and 4,900 (Fair 2002). Within Alaska, its range includes portions of BELA, CAKR and the Seward Peninsula adjacent to the ARCN. Approximately 20% of the U.S. breeding population occurs in these parklands (Schmutz pers. comm.). Due to its small population size, low reproductive success (Evers 2004) and restricted distribution in AK, the U. S. Fish and Wildlife Service is currently evaluating a petition to list this species as Threatened or Endangered under the Endangered Species Act (USFWS 2007). The enabling legislation for all 5 ARCN parklands specifies

protection for bird habitats and populations. Under ANILCA [Section 201(8)], BELA must protect habitat for internationally significant populations of migratory birds and CAKR must provide specific protections for bird habitat and populations. In addition, several international treaties, federal laws and initiatives provide protections for migratory birds and require action by NPS (Migratory Bird Treaty Act, Endangered Species Act, North American Bird Conservation Initiative). Large portions of the breeding range of Yellow-billed loons in Northern Alaska fall within boundaries of the National Petroleum Reserve Alaska (NPRA) with ongoing oil development. However, within CAKR and BELA protections for the Yellow-billed loon will continue and provide an area of relatively undisturbed nesting habitat. In addition, the species is large, long-lived and piscivorous, predisposing it to bioaccumulation of contaminants and causing concerns for subsistence users (Trust et al. in prep, Matz et al. 2006). In addition, they may be indicators of water quality and provide insight into the movement of marine-derived nutrients and shifts in riparian or coastal communities in BELA and CAKR.

The ARCN has stewardship responsibilities to monitor this and other species of loons occurring in their parklands. Methods for aerial surveys of loons are well-established and have been refined by USFWS (Mallek et al. 2005, Bollinger et al. 2007). Aerial surveys of loons conducted by NPS in June of 2009 will serve to supplement protocol development, NPS staff training and refinement of methods for the long-term monitoring protocol. Aerial survey methodology utilized and refined by USFWS will be adopted by ARCN and continued biennially (every odd year) for the long-term monitoring program. In addition, presence/absence data on all loon species detected will be collected by the large and small lake vital sign investigators so that fish, vegetation and contaminants data and other water-quality parameters relevant to loon biology can be utilized to assess habitat selection and status of this species.

Background

The Yellow-billed loon (*Gavia adamsii*) is a species of concern with a global population estimated at 16, 650-21,000 (Fair 2002, Earnst 2004). The breeding range in Alaska is restricted to large (>13.4 hectares), clear, freshwater, fish-bearing lakes of greater than 2 m in depth in the tundra of the Arctic Coastal Plain of Alaska north of the Brooks Range (North and Ryan 1989), in western Alaska on the Seward Peninsula including Bering Land Bridge National Preserve (BELA), and in Cape Krusenstern National Monument (CAKR) (Mallek et al. 2005). Yellow-billed loons are poorly documented in these parklands and population estimates in these areas represent a small percentage of the worldwide population. In 2005, results from aerial surveys conducted in and around BELA and CAKR generated population estimates for Yellow-billed loons and nests of 418 (90% confidence range = 314-521) and 85 (90% confidence range = 56-115), respectively (Mallek et al. 2005). The portions of the northern and central Seward Peninsula strata including BELA accounted for 76% (319) of the total Yellow-billed Loon population estimate and 76% (65) of the total nest estimate. In CAKR, the Yellow-billed Loon population and nest estimates accounted for 5% (22) and 4% (4) of the total, respectively. Due to its small population size and restricted distribution, the U. S. Fish and Wildlife Service is currently evaluating a petition to list this species as Threatened or Endangered under the Endangered Species Act (USFWS 2007). Results from surveys conducted in the same area in 2007 with similar effort yielded similar populations estimates (Bollinger et al. 2007). The Yellow-billed loon is a K-selected species with a low reproductive rate and a slow rate of sexual

maturity to reproduction (3-7 years, Evers 2004). The low reproductive success of this species requires high annual adult survival to maintain population levels (Evers 2004). For these reasons, ARCEN has selected the Yellow-billed loon as a vital sign for long-term monitoring.

Objectives

Our specific objectives are to:

1. Determine biennial trends in occupancy of Yellow-billed Loons in selected sites of BELA and CAKR during the breeding season (June).
2. Determine biennial status and trends in density estimates of Yellow-billed Loons in selected sites of BELA and CAKR during the breeding season (June).

Methods

The USFWS, Migratory Bird Division, has developed and refined techniques for conducting aerial surveys of breeding Yellow-billed loons in northern Alaska. In 2005, Mallek of USFWS performed the surveys in areas of BELA and CAKR where the loons breed. These surveys were repeated in 2007 (Bollinger 2007). The ARCEN will utilize the aerial survey methodology optimized by the USFWS during their 2005 and 2007 surveys to continue biennial, long-term monitoring of Yellow-billed loons in BELA and CAKR. Joel Schmutz (pers. comm.), a USGS research biologist studying Yellow-billed loons in Alaska, believes biennial sampling frequency is sufficient to detect population trends while economizing on the great expense of aerial surveys in remote areas.

The survey area will include approximately 18,819.6 km² of potential Yellow-billed loon habitat in BELA and CAKR and the Seward Peninsula as surveyed by Mallek et al. 2005 and Bollinger et al. 2007.

Study Design

Aerial breeding loon surveys will be conducted around June 14-21 in the 3 strata of the Central and Northern Seward Peninsula in and around BELA and CAKR following methods of Mallek et al. (2005) and Bollinger et al. (2007). Stratum boundaries include all wetland areas and exclude mountainous habitats. In the 2005 survey, Mallek et al. surveyed a total of 31, 12 km x 12 km randomly selected plots including all lakes greater than 7 hectares. The minimum size of 7 hectares was based on data from North and Ryan (1989) which found that the smallest yellow-billed loon-rearing lake on the Colville Delta was 13.4 hectares. Additionally, Yellow-billed loon surveys on the Arctic Coastal Plain (Mallek et al. 2003, 2004) indicate that out of 479 yellow-billed loon observations, 98% were on lakes larger than 10 hectares (2% were on lakes 7-10 hectares). All loon species observed and their nests will be recorded but the survey will focus on Yellow-billed loons, determined to be a species global of concern

The same methodology and pool of potential sampling units was utilized by Bollinger et al. when they performed the survey in 2007. Similarly, the amount of survey effort in the Cape Espenberg and CAKR regions of the Seward Peninsula was the same as put forth in 2005; i.e. 24 randomly selected units were surveyed in both 2005 and in 2007. Of these units, only 4 overlapped and

were sampled in both 2005 and 2007. However, in 2007, Bollinger et al. did not survey the 7 units in the interior region of the Seward Peninsula that Mallek et al. surveyed in 2005 because only 1 Yellow-billed loon was detected here. However, for long-term monitoring by ARCN, these 7 units will be included in the long-term monitoring surveys.

The 2009 survey will consist of repeating the 31 total sampling plots surveyed by Mallek et al. in 2005 (see Figure 1 in the Appendix from Mallek et al. 2005, which demonstrates the sampling units to be surveyed in 2009). Joel Schmutz (pers. comm.) ran a power analysis on the loon aerial survey data from the Arctic Coastal Plain (Mallek et al 2003, 2004). He compared repeating the same units each survey year versus randomizing among the total population of units each survey year and found that repeating the same units was more useful for occupancy modeling and long-term monitoring of population trends.

Maps of sampling plots and GPS coordinates used for the USFWS surveys (Mallek et al. 2005, Bollinger et al. 2007) were provided to NPS by R. Platte so that Arctic Network can replicate their previous efforts in the same sampling area.

Sampling Methods

Ed Mallek (USFWS) will train Brad Shults (pilot) and Melanie Flamme (observer) (May 2009) in aerial observation, equipment use and data recording techniques utilized to conduct these aerial surveys on loons prior to the actual survey dates (June 2009). Additional NPS pilots and observers also may be trained during this time to increase in-house institutional knowledge and ensure data parity by using the same pool of trained observers and pilots for the long-term.

Surveys will be based out of Kotzebue, Alaska and will be flown with a pilot (NPS-Brad Shults) and an observer (NPS-Melanie Flamme) in a Cessna 206 on floats (or a Supercub) at 150-200 ft above ground level at airspeeds of 174 km/hr (80-95 knots) per the methods of Mallek et al 2005 and Bollinger et al. 2007. Aircraft navigation to sampling plots will be accomplished using the aircraft's Global Positioning System (GPS) and a book of laminated, spiral-bound maps of each sampling plot. The contours of the lakeshores will be traced with low-level flight at approximately 50 m shoreward of the lake edge to provide clear and unobstructed views of the shoreline for nesting loon observations. Depending on the size of the lake and the contours of the shoreline, one to several straight-line sweeps across the center of the lake or over tight turns in the shoreline will be flown to ensure thorough coverage of the lake surface.

The observer will watch for loons from one side of the aircraft and the pilot from the other. The pilot will instruct the observer as to which side of the aircraft to look for loons to ensure the pilot has the option to watch out of the side of the aircraft necessary to safely navigate the aircraft. Visibility correction factors will not be included in the population estimates as near 100% detectability will be assumed, due to the large size of the loons and the low level of flight. Forty-four hours of flight time were required to complete the 31 plots surveyed in 2005 (Mallek et al. 2005) and it will be assumed a similar number of hours will be required to complete the work in 2009. All loon species observed and their nests will be recorded but the survey will focus on Yellow-billed loons. Loons will be identified to species and group sizes of singles, pairs, flocks, and nests will be recorded. Diving loons that are difficult to identify will be circled at greater

altitude (100-150 m) to provide less disturbance and a better opportunity to identify the loon species. If a loon cannot be identified to species, it will be recorded as an unidentified loon.

A GPS coordinate will be taken by the pilot on the aircraft's GPS system while flying over each loon or nest detected. A hand-held digital voice recorder and paper maps will be used to record all observations of loon species and nests detected. Data and GPS coordinates will be transcribed to data sheets while flying between lakes (if possible) or after the daily flights have concluded each day. Every evening, data will be entered into a database on a laptop computer. A final copy of the dataset will be archived with the ARCN data manager

Data Deliverables

A report will be produced after each survey following the Natural Resource Technical Report format and submitted for a number, archiving and dissemination through this process. The report also will be submitted the ARCN data manager for archiving.

Product	Description	Anticipated Delivery Date	File Format
Natural Resource Technical Report	<i>Aerial monitoring of Yellow-billed loons in Cape Krusenstern National Monument and Bering Land Bridge National Preserve, Arctic Network of Alaska Parks: 2009 Report</i>	March 1, 2010	PDF

Data Ownership

“As the performing organization of this agreement, the National Park Service, Arctic Network of Alaska Parklands shall follow the procedures and policies set forth in OMB Circular A-110.”

Data Collection and Reduction

A GPS coordinate will be taken by the pilot on the aircraft's GPS system while flying over each loon or nest detected. A hand-held digital voice recorder and paper maps will be used to record all observations of loon species and nests detected. Data and GPS coordinates will be transcribed to data sheets while flying between lakes (if possible) or after the daily flights have concluded each day. Every evening, data will be entered into a database on a laptop computer. A final copy of the dataset will be archived with the ARCN data manager.

Data Analysis

Data will be analyzed using the methods of Mallek et al. 2005 and Bollinger et al. 2007. Population estimates and variances will be based on expanded density estimates from the sample plots using standard statistical techniques for strip/plot survey analysis (Cochran 1977, Smith 1995). Only the portion of a plot within the stratum or area of interest

(political boundary) will be included in the density estimate. Similarly, observations will be included in the density estimate if the centroid of the lake was within the stratum or area of interest. Visibility correction factors will not be included in the population estimates as we assumed near 100% detection.

Compliance

PEPC process through Western Arctic Parklands.

Schedule and Timeline

Training with USFWS pilot Ed Mallek, May 5-7, 2009 (Brad Shults, Melanie Flamme; maybe also some or all of the following will also be trained: Seth McMillan [NPS pilot]; Tara Whitesell [NPS observer]; Eric Sees [USFWS pilot].

Aerial Surveys with NPS pilot Brad Shults and NPS observer Melanie Flamme, June 14-21, 2009 based out of Kotzebue.

Project Deliverables/Products

A report will be produced after each survey following the Natural Resource Technical Report formatting guidelines and will be submitted for a number and archiving through this process. A copy of the report will also be submitted to the ARCN data manager for archiving.

Education/Outreach

Yellow-billed Loons are a species of special concern in Alaska and may be placed on the threatened/endangered species list. The ARCN staff and the biologist at YUGA recently acquired a yellow-billed loon skin that they will have mounted and placed in a viewing case. This taxidermy specimen will be the focus of a High School biology lesson created to help students understand the process and the reasons for current research on this species. The curriculum will marry critical Alaska performance standards (PSGLEs) in science with a conservation message and an illustration of research methods.

This project supports two critical needs in Alaska: 1) the need for the public to understand and conserve their local natural resources and 2) the need for students to learn critical thinking skills in science and math.

A contract educator (Meghan Nedwick of Arctic Science Logistics) will be hired through the AK Geographic Association to produce the curriculum and test it in two schools: Kotzebue and Anaktuvuk Pass. Meghan is a high school biology teacher in Kotzebue with a background in science research and an M.S. in education. The lesson can be taught in one class period, or the extensions can be used for a second class period. The curriculum will address these primary topics:

- A. Avian physiology
- B. Interpreting raw data from current research

- C. Use of scientific data for management actions
- D. Local subsistence uses and values
- E. Creation of a mock research study plan.

Students will have access to satellite telemetry data in Google Earth files provided by Joel Schmutz of USGS. They will use this raw data to produce graphs and charts related to bird locations, eating patterns, and prey location/behavior. The lesson will be posted on the WEAR website along with detailed photos of the Yellow-billed Loon mount so that teachers and students in distant locations can also use the curriculum.

The ARCN and GAAR staff will finance the taxidermy of both a Yellow-billed Loon for display and a study skin of a Common Loon that students can touch as part of their physiology investigation. Both the study skin and the mounted bird will travel with the educator to classrooms. Interpretation staff from NPS offices in Nome, Fairbanks, Bettles, and Eagle plus teachers in all the associated school districts will be encouraged to borrow the Loon specimens and teach the lessons in their high school science classes. The materials and lesson will be advertised in the yearly WEAR Education Opportunities catalog and special flyers will be distributed to NPS staff to share with their teachers in their districts.

Meghan Nedwick will test and refine the curriculum by teaching it to Kotzebue High School Biology students. She will also travel to the school at Anaktuvuk Pass with Melanie Flamme (YUGA Biologist) and Tracie Pendergrast (GAAR Interpretation Ranger) to teach the new Loon lessons to students. This will be one part of a long-term bird monitoring project that Tracie and Melanie are setting up with the school. The lesson on Loon research will add value to the planned trip by reaching a second age group and demonstrating the lesson directly to the high school teacher for better retention and future use.

In addition, a web page on loons is being developed by Liz MacKenzie and Richard Nelson for Gates of the Arctic National Park and Preserve. A link to this page will be designated for discussion of Yellow-billed loons, their ongoing research and monitoring programs in the Arctic Network of Parks and the outreach programs being developed.

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Appendices

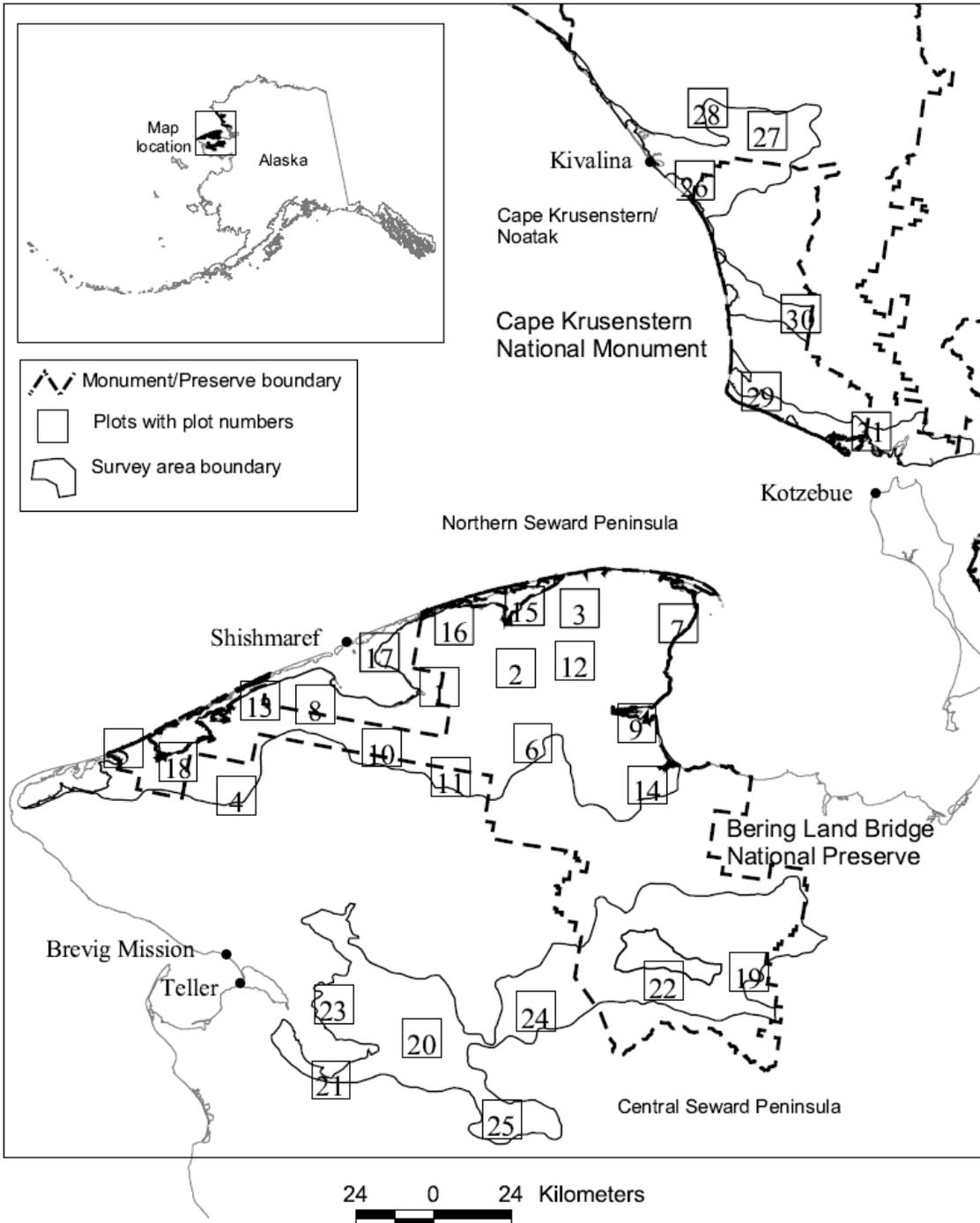


Fig. 1. Plots containing lakes aerially searched for loons from June 14-21, 2005 on 3 survey areas in the vicinity of Bering Land Bridge National Preserve and Cape Krusenstern National Monument, Alaska (from Mallek et al. 2005).

Project Budget

FY2009_ Budget Summary Table

FIS 2009_ _ _ _: Project Title: Aerial monitoring of Yellow-billed loon in Cape Krusenstern
National Monument and Bering Land Bridge National Preserve, Arctic Network of Alaska
Parklands: 2009 Study Plan
Investigator: Melanie Flamme

Category	FY2009_
<u>Direct Costs:</u>	
Personnel	\$8,000
Travel	\$16,000
Contractual	N/A
Materials and Supplies	\$500
Equipment	\$250
Total Direct Costs (a)	
<u>Indirect Costs:</u>	
Percent of Direct Costs	
Total Indirect Costs (b)	
<u>Overhead:</u>	
2% (c)	\$700
Project Total (a + b + c)	\$25,450
