National Park Service
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Inventory & Monitoring Program, Alaska Region
Anchorage, Alaska

Landbird monitoring along the Noatak River in Gates of the Arctic National Park and Preserve and Noatak National Preserve, Arctic Network Inventory and Monitoring Program: 2010 Study Plan

Study Plan

Alaska Region Inventory & Monitoring Program

Melanie Flamme
National Park Service
Gates of the Arctic National Park and Preserve
4175 Geist Road
Fairbanks, AK 99709

Jennifer Mitchell
National Park Service
Gates of the Arctic National Park and Preserve
4175 Geist Road
Fairbanks, AK 99709
907-455-0656

Josh Schmidt
National Park Service
Gates of the Arctic National Park and Preserve
4175 Geist Road
Fairbanks, AK 99709
907-455-0661

Jennifer Barnes
National Park Service
Gates of the Arctic National Park and Preserve
4175 Geist Road
Fairbanks, AK 99709

907-455-0606

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Investigators

Melanie Flamme
National Park Service
Gates of the Arctic National Park and Preserve
4175 Geist Road, Fairbanks, AK 99709
907-455-0627

Jennifer Mitchell
National Park Service
Gates of the Arctic National Park and Preserve
4175 Geist Road
Fairbanks, AK 99709
907-455-0656

Josh Schmidt
National Park Service
Gates of the Arctic National Park and Preserve 4175 Geist Road
Fairbanks, AK 99709
907-455-0661

Jennifer Barnes
National Park Service
Gates of the Arctic National Park and Preserve
4175 Geist Road
Fairbanks, AK 99709
907-455-0606

Abstract

The Arctic Network Inventory and Monitoring program (ARCN) encompasses five park units including Gates of the Arctic National Park and Preserve (GAAR) and Noatak National Preserve (NOAT). The landbirds assemblage (passerines, near-passerines, raptors and galliformes) was chosen by the ARCN for long-term monitoring because it includes many species that spend the majority of their lives in terrestrial environments. Passerine birds comprise more than 50% of the bird species in ARCN. All ARCN park units are mandated under the Alaska National Interest Lands Conservation Act (ANILCA) to protect habitat for and various assemblages of avian species (U. S. Congress 1980). Under ANILCA [Section 201(8)], protection of populations of and habitat for waterfowl, raptors and other species of birds is specifically mandated in NOAT. In GAAR, the NPS is directed to protect habitat for and populations of raptorial birds. 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, and North American Bird Conservation Initiative).

Landbirds were selected by ARCN as a vital sign because they are easily detected and are well studied across North America. Standardized methods for monitoring landbirds are well established and currently utilized by several networks across the country. Landbirds are an important component of park ecosystems, and their high body temperature, rapid metabolism, and high ecological position in most food webs make them good indicators of the effects of local and regional changes in ecosystems (Fancy and Sauer 2000). Changes in landbird ecology and demography have been demonstrated to be useful as indicators of global climate change (Sillett et al. 2000).

Specific objectives of the ARCN landbird monitoring program are to: 1) determine annual long-term trends in density and frequency of occurrence of 5-10 of the most commonly detected landbird species along selected river corridors across ARCN during the breeding season (June); 2) determine annual long-term trends in landbird species composition and distribution in selected sites across ARCN during the breeding season (June); and 3) improve understanding of breeding bird-habitat relationships and the effects of invasive plants and climatic changes on bird populations. These objectives will be met by correlating the population density of 5-10 of the most commonly detected landbird species with habitat composition and availability. Future changes in the population density of these species may correlate with changes in specific habitat variables.

The general sampling procedures for conducting these surveys will follow those established for the National Breeding Bird Survey (BBS) (Sauer et al. 2008), which is a roadside survey that we have adapted for river corridors in ARCN. Landbird surveys conducted by ARCN in June of 2010 along the Noatak River from GAAR into NOAT will serve to supplement protocol development, staff training and refinement of methods. Survey methodology utilized by the BBS, Alaska Landbird Monitoring survey (ALMS), Guldager (2004) and Mitchell et al. (2009) will be adopted and refined by ARCN and continued annually for the long-term monitoring program.

Problem Statement

The Arctic Network Inventory and Monitoring program (ARCN) encompasses five park units including Gates of the Arctic National Park and Preserve (GAAR) and Noatak National Preserve (NOAT). The landbirds assemblage (passerines, near-passerines, raptors and galliformes) was chosen by the ARCN for long-term monitoring because it includes many species that spend the majority of their lives in terrestrial environments. Passerine birds comprise more than 50% of the bird species in ARCN.

The ARCN has stewardship responsibilities to monitor landbird species; all ARCN park units are mandated under ANILCA to protect habitat for and various assemblages of avian species (U. S. Congress 1980). In NOAT, ANILCA [Section 201(8)] specifies protection of populations of and habitat for waterfowl, raptors and other species of birds is specifically mandated . In GAAR, the NPS is directed to protect habitat for and populations of raptorial birds. 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, and North American Bird Conservation Initiative).

Landbirds were selected by ARCN as a vital sign because they are easily detected and are well-studied across North America. Standardized methods for monitoring landbirds are well-established and currently utilized by several networks across the country. Landbirds are an important component of park ecosystems, and their high body temperature, rapid metabolism, and high ecological position in most food webs make them good indicators of the effects of local and regional changes in ecosystems (Fancy and Sauer 2000). Changes in landbird ecology and demography have been demonstrated to be useful as indicators of global climate change (Sillett et al. 2000).

The ecology of species of landbirds occurring in ARCN is variable and the arctic parklands are massive and remote (19.3 million acres representing roughly 25% of the NPS-managed lands in the United States). The extensive landscape of the Brooks Range is a road-less area dominated by mountains and intermountain valleys that provide breeding habitat for many species of migratory birds. These lands are largely un-surveyed for landbirds, leaving a gap in our knowledge of the breeding distribution and habitat of many species. Application of a single method cannot appropriately allow for monitoring all landbirds across this enormous landscape. Therefore, pilot studies are necessary to determine monitoring methods for landbirds that are fungible, affordable and reliable in meeting the monitoring objectives over the long term.

An additional factor which plays into the development of appropriate landbird monitoring methods is that large portions of GAAR and NOAT are designated wilderness and NOAT is a biosphere reserve. Conducting monitoring in designated wilderness requires higher standards for minimizing the disruption of wilderness character. Consequently, methods for monitoring landbirds in GAAR and NOAT must adhere to “Director’s Order #41: Wilderness Preservation and Management" which specifies use of "minimum requirement" in NPS management decisions and explicitly states that:

> *"All management decisions affecting wilderness must be consistent with a minimum requirement concept…. When determining minimum requirement, the potential disruption of wilderness character and resources will be considered before, and given significantly more weight than economic efficiency and convenience. If a compromise of wilderness resource or character is unavoidable, only those actions that preserve wilderness character and/or have localized, short-term adverse impacts will be acceptable."* (NPS Management Policies: 6.3.5 Minimum Requirement).

As a result of thispolicy , use of motorized equipment (e.g., helicopters) over the long term for the ARCN landbird monitoring program does not uphold the minimum requirement standards. Use of helicopters is also cost prohibitive. Therefore, the scope of the ARCN landbird monitoring program is spatially limited to more easily accessible areas (i.e. river corridors).

Current "multiple-species techniques" for generating population estimates of landbirds may fall short of reaching monitoring objectives in ARCN. Insufficient numbers of detections per species obtained during the survey can result in poor population estimates. Reasons for insufficient numbers of detections within ARCN include: 1) some landbird species are at the extreme edges of their ranges; 2) some species may be passing through while migrating to more northern breeding grounds; and 3) some species are less vocal and may sing less frequently than others and/or have less audible vocalizations. As a result, certain species may not be detected as frequently during landbird monitoring efforts in ARCN. Long-term trends and population estimates (such as for density) cannot be determined if insufficient numbers of detections are obtained for a species (Buckland et al.2003, Hoekman et al. 2010; Schmidt et al. in review).

Currently applied distance-estimation methods may prove ineffective for generating density estimates if one or more modeling assumptions are violated. The landbird survey techniques commonly implemented across Alaska are based on distance estimation. Specifically, the Alaska Landbird Monitoring Survey (ALMS, Handel and Cady 2004) program was developed by USGS and USFWS to standardize landbird data collection techniques across Alaska using aural and ocular distance estimation methods. ALMS uses this data and the program DISTANCE (Buckland et al. 1993) to calculate density estimates for landbird species based on detection probabilities.

A major assumption of distance estimation is that the greatest number of detections will occur at the closest point to the observer (point 0) and that the number of detections will decrease as distance from the observer increases. However, recent analyses of a large landbird dataset from Denali National Park and Preserve collected using ALMS and distance estimation methods demonstrate that some species of birds flush from observers and violate this assumption (thrush flush; Buckland et al. 1993, Hoekman et al. 2010; Schmidt et al. in review). In addition, problems with observers' ability to accurately estimate distances aurally and visually have been documented. Innacurate estimation of distances violates another fundamental assumption of the distance estimation method (Buckland et al. 1993, Hoekman et al. 2010; Schmidt et al. in review).

In ARCN long-term landbird monitoring methods must be established which 1) comply with NPS wilderness minimum requirement standards, 2) focus on common species, 3) are fungible, 4) are affordable, and 5) are reliable in producing the targeted metrics. Here, we propose to test methods for landbird monitoring methods that will address these requirements and issues.. Landbird surveys conducted by ARCN in June of 2010 along the Noatak River from GAAR into NOAT will serve to supplement protocol development, staff training and refinement of methods. Survey methodology utilized by the BBS, Alaska Landbird Monitoring survey (ALMS, Handel and Cady 2004), and by the NPS in GAAR (Guldager 2004, Mitchell et al. 2009) will be adopted and refined by ARCN and continued annually for the long-term monitoring program. The ARCN is working with the Central Alaska Network so that landbird monitoring methods used by both networks are comparable.

Background

It is estimated that approximately 150 avian species are found within the diverse habitats of GAAR and NOAT (Tibbitts et al. 2006; Guldager 2004), most of which are neotropical migrants that winter in the southern United States, Mexico, Central and South America, Asia and North Africa (Ehrlich et al. 1988). Migrating birds are facing widespread loss of habitat in critical feeding and staging areas along migration routes and in wintering areas. Pesticides and herbicides constitute additional threats to migrating birds. Impacts of these threats on neotropical migrant bird populations may be detected first through changes in bird abundance and distribution on the breeding grounds. Obtaining information on migratory species on the breeding grounds in these areas is critical to landbird conservation throughout the globe. Riparian corridors, rich with willow and alder shrub habitat, are expected to have high species diversity of nesting landbirds (Boreal Partners if Flight 1999).

Past studies in these areas have generated limited information on avian species diversity, distribution and habitat use across a large spatial extent. From 1993-2002, GAAR was part of a pilot study initiated by Boreal Partners in Flight that tested the use of off-road point count surveys to monitor trends in landbird species across Alaska. However, these surveys occurred annually at just 3 locations within GAAR and small sample size limited the ability to document species diversity and distribution throughout the park. Raptor surveys were also conducted between 1985 and 1989 within selected areas of GAAR with various survey methods (foot, boat, small plane; see Garber (1988) for review of raptor surveys conducted), therefore limiting comparisons among areas and years.

An extensive shorebird inventory across ARCN occurred in May-June 2003, during which these park units were randomly sampled and ARCN-wide density estimates and species habitat maps were generated (Tibbitts et al. 2006). However, this survey was designed to capture breeding shorebirds, and therefore was conducted prior to the arrival of many breeding landbirds. Consequently, limited data on landbirds were collected.

Guldager (2004) conducted landbird surveys along all major riparian corridors within GAAR from 2002-2005. These surveys included the Noatak, Kobuk, Alatna, John, North Fork of the

Koyukuk, Middle Fork of the Koyukuk and Itkillik Rivers. These riparian corridors are dispersed across the spatial extent of the park and represent habitat variability associated with latitudinal and elevational gradients occurring within the Park. The study area included the area within these riparian corridors, which were determined based on natural features defining their extent (i.e., change in vegetation, slope and elevation due to transition out of riparian corridor). Modified ALMS (Handel and Cady 2004) and distance estimation methods were used to collect landbird data. The study was designed to survey riparian corridors with 12-15 transects placed perpendicularly to the river corridors. Each transect was composed of 8-12 points spaced 500 m apart. While the survey was designed to address population estimates such as abundance and density, it also included data collection of habitat parameters and species composition data off of the river corridor. If all selected points were surveyed, a total of 96-144 possible points would be sampled across a variety of habitats. However, since the points were spaced only 500 m apart, there was some level of autocorrelation among adjacent points (Schmidt pers. comm.). As a consequence, there was some proportion of points that were not independent of one another and the number of independent points sampled was smaller than the number actually sampled in the field. In addition, the points occurred in a variety of habitats which may support different bird species. While this is useful for species composition and habitat-use information, it may result in insufficient numbers of detections for generating density estimates for various species using distance estimation methods (Schmidt pers. comm.). Generating density estimates using distance estimation and detection probabilities requires 75-100 independent detections per species (Buckland et al. 2003).

The sampling design of Guldager (2004) was attractive because it balanced feasibility with the goal of validly samplingthe large spatial extent of GAAR. Restricting the study area to riparian corridors allowed for easier and less expensive access via floatplane and boat and which also complied with NPS wilderness minimum requirement standards. The riparian corridor was also where the highest species diversity was expected to occur (Boreal Partners in Flight 1999). This design did, however, limit the inference space to these corridors, and large mountainous areas remained un-sampled. Sampling of montane areas for long-term landbird monitoring is less feasible because it would require use of a helicopter which is both cost prohibitive and undesirable in light of the minimum requirement standards in wilderness areas.

In 2009, a pilot study was conducted to see if occupancy methods and transect replicates could replace distance estimation methods using the study design of Guldager (2004) across river corridors in ARCN (Mitchell et al. 2009). Four transects of 12 points from Guldager (2004) along the Kobuk River in GAAR were revisited up to three times in successive days to generate replicates. Distance estimates also were simultaneously collected for comparison. The extensive hiking (10-12 km/day) and challenging terrain (wetlands, tussocks, stream crossings) and poor weather hindered navigation to and relocation of point transects for conducting replicates. In addition, the short daily (02:00 to 09:00) and seasonal (June 10-30) sampling windows impeded the completion of sufficient numbers of 1) points on transects (*n*= 31 2) transects along the river corridor (*n*= 4) and 3) replicates of each transect (*n*= 3). Consequently, this sampling design did not generate enough points and bird detections for calculation of density estimates using occupancy methods (Schmidt pers. comm.). However, there were 136 detections of gray-cheeked thrushes, which is a sufficient number to calculate density for this species using distance estimation methods (Buckland et al. 2003,). An additional limitation of this pilot study was that a smaller portion of the entire river corridor was sampled and inference space was limited to the four transects sampled.

To maximize the number of detections of common species and to increase the length of the river corridor sampled, methods of Guldager (2004) and Mitchell et al. (2009) need to be modified. Restricting sampling to the river corridor will increase the number of detections of riparian species, increase spatial coverage along the river corridor, and should provide adequate sample sizes to meet the project objective for common bird species (Schmidt pers. comm.). In addition, reducing the amount of walking between points and increasing the time surveying points will also increase the number of detections overall.

Landbird monitoring methods for the long term must be established that: 1) comply with NPS minimum requirement standards; 2) focus on common species to generate sufficient numbers of detections for population estimates; 3) are fungible; 4) are affordable, and; 5) are reliable in producing the targeted metrics. Here, we propose to test methods for landbird monitoring that will address these issues. Landbird surveys conducted by ARCN in June of 2010 along the Noatak River from GAAR into NOAT will serve to supplement protocol development, staff training and refinement of methods. Survey methodology utilized by the Breeding Bird Survey (BBS, Sauer), ALMS (Handel and Cady 2004), Guldager (2004), Mitchell et al. (2009) and occupancy methods will be adopted and refined by ARCN and continued annually for the long-term monitoring program.

Objectives

Specific objectives are to:

1. Determine annual long-term trends in density and frequency of occurrence of 5-10 of the most commonly detected landbird species along selected river corridors across ARCN during the breeding season (June)
2. Determine annual long-term trends in riparian landbird species composition and distribution in selected sites across ARCN during the breeding season (June)
3. Improve understanding of breeding bird-habitat relationships and the effects of invasive plants and climatic changes on bird populations by correlating changes in abundance and composition of 5-10 of the most commonly detected riparian landbird species with changes in compositionof vegetation and specific habitat variables.

Methods

Study Design

The general sampling procedures for conducting these surveys follow those established for the National Breeding Bird Survey, a roadside survey that we have adapted for river corridors, and modified methods developed by ALMS (Handel and Cady 2004), Guldager (2004) and Mitchell et al. (2009). Landbird monitoring will occur along riparian corridors to target the areas of greatest species diversity and abundance (Boreal Partners in Flight 1999), simplify access to sites and uphold NPS minimum requirement standards for wilderness. Annual landbird monitoring in ARCN will occur using modified ALMS protocols with limited inference space along riparian corridors as per Guldager (2004). Landbirds detections will be aural and visual using variable circular plot methods (Reynolds 1980). Vegetation and environmental data also will be collected during the survey per ALMS (Handel and Cady 2004, Guldager 2004, and Mitchell et al. 2009).

Landbird surveys will occur during the breeding season (June) when birds are most active and as early as river access allows (June 10). Two-person crews will put in at the upper reaches of each river corridor via float plane. Crews will float in canoes and sample points along river corridors in ARCN on a rotating annual schedule including: Noatak, Kobuk, Itkillik, John and Nimiuktuk. Up to three replicates of the same points sampled along the river corridor will be conducted each season. Replicates of the points will be completed by a second (and third crew if funding allows) to collect occupancy data for density estimates of each species with sufficient numbers of detections and address seasonal and observer effects. Points will be spaced every ½ mile along the length of the river corridor and sampled in succession each day. As many points as possible will be completed along each river corridor to maximize the number of detections and the length of the river corridor surveyed. Points will be placed 100 m off the river corridor to minimize ambient noise from ephemeral streams and run-off. To increase detection of all individuals present and species that vocalize less frequently, points will be conducted for 10 min. The first crew will mark the points surveyed with temporary biodegradable flagging to minimize relocation efforts and errors in finding the points for the subsequent crews. The last crew will remove all flagging immediately after each point in the replicate survey is completed. In 2010, the Noatak River will be sampled by 3 crews at 3 days apart. Crews will camp on the rivers using Leave-No-Trace methods. Crews will put in at Nelson Walker Lake in GAAR via float plane and sample along the Noatak River into NOAT until June 30.

Sampling Methods

For this study we will: 1) conduct standardized surveys on each route at least three times over the breeding season (June); 2) collect time of detection and detection type for each bird, and; 3) collect additional data on a series of environmental variables to help assess variation in count results. Landbird monitoring methods in ARCN for abundance and density metrics will focus on commonly detected species using occupancy methods and replicate sampling (not distance estimation). However, where habitats (i.e. tundra) are adequately open enough to provide excellent long-range (500 m) visibility, visual distance estimation data will continue to be collected using laser rangefinders to contribute to the ALMS program (Handel and Cady 2004). Also, data for less-abundant species observations (rare species or species of concern) will be collected and contribute to presence/absence, species composition and distribution information.

Surveys will be conducted using variable circular plot methods (Reynolds 1989) with unlimited distance estimation (for ALMS). All aural and visual detections for all bird species will be recorded during the points. Also, all detections of species occurring off points will be recorded for the duration of the survey period for species composition and distribution information. Crews will navigate to points using handheld GPS units. Data collected will include: time of detection, species identification, type (aural, visual, song, call, etc.) of detection, azimuth of detection, as well as a suite of habitat (cover, dominant species, browse, phenology) and weather variables (Viereck et al. 1992, Guldager 2004, Mitchell et al. 2009). Habitat variables will be collected within a 100 m radius of the point. Prior to conducting points, observers will allow the birds to settle for 1-2 min and will use laser range finders to locate field landmarks that establish the 100 m radius in the field. Coordinates on GPS units will be taken at each point and averaged for 1 minute to reduce error estimates. Points will be conducted for a period of 10 min (Handel and Cady 2004, Guldager 2004). Immediately after the point, all data for the point will be quickly proofed for omissions and errors.

Surveys will be conducted in June only under satisfactory weather conditions that include good visibility, little or no precipitation, and light winds (Handel and Cady 2004). All surveys will be conducted by observers who are proficient at identifying all birds expected to occur in ARCN. Based on previous surveys, the species which will likely accumulate sufficient detections for generating density estimates include: Savannah Sparrow, *Passerculus sandwichensis* (SAVS); White-crowned Sparrow, *Zonotrichia leucophrys* (WCSP); American Tree Sparrow *Spizella arborea* (ATSP); and Gray-cheeked Thrush, *Catharus minimus*, (GCTH) (Guldager 2004; Guldager unpublished data, Tibbitts et al. 2006, Flamme unpublished data, Mitchell et al. 2009). Some landbirds in ARCN also have been identified as species of concern due to general lack of biological information, remote and/or limited distributions, and/or declines in numbers across North America. These include: Gray-cheeked Thrush, *Catharus minimus* (GCTH); Varied Thrush, *Ixoreus naevius* (VATH); Golden-crowned Sparrow, *Zonotricha atricapilla* (GCSP), Gray-headed Chickadee, *Poecile cinctus* (GHCH), Smith's Longspur, *Calcarius pictus* (SMLO), Gyrfalcon, *Falco rusticolus* (GYRF), American Dipper, *Cinclus mexicanus* (AMDI) and Rusty Blackbird, *Euphagus carolinus* (RUBL) (Boreal Partners in Flight 1999). Methods will include collection of distance data for these species and other species to contribute to ALMS for generation of state-wide density estimates.

A report will be produced after each survey following the Natural Resource Technical Report   or Data 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 Data Report	***Landbird monitoring along the Noatak River in Gates of the Arctic National Park and Preserve and Noatak National Preserve, Arctic Network of Alaska Parklands: 2010 Report***	March 1, 2011	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 each crew at each point that is visited during all replicates. Data and GPS coordinates will be transcribed to data sheets during the point counts. Each day after the survey, all data will be proofed for errors in the field. Throughout the day, all detections of bird off points will be recorded on paper data sheets. Upon return to the office, data will be entered into an Access landbird database. Once entered, all data will be proofed by the PI. All corrections will be made and documented in the metadata for the database. A final copy of the dataset will be archived with the ARCN data manager.

Data Analysis

Species-specific abundance estimates (average number of singing males/point) with measures of precision will be calculated using occupancy-abundance methods (Schmidt et al. *In review)* for species with sufficient sample sizes. Monitoring of less common species will be accomplished through the use of occupancy models (MacKenzie et al. 2006). `Species composition and distribution will be compared among riparian corridors across ARCN and species lists will be generated for each survey unit. The analysis will use established Bayesian methods (i.e. Royle and Dorazio 2008, Schmidt et al. *In Review*) to estimate occupancy, abundance, and species richness for each river surveyed. As data are collected over time, estimates of trend in each of these metrics will also become possible. These analyses may also be combined with those from other units within ARCN and the Central Alaska Network (CAKN) to provide additional information on the detection process. By combining data from riparian areas throughout NPS units, more precise estimates of detection probability should be possible. This will in turn improve estimates of occupancy and abundance at individual sample units. After pilot data have been collected, simulations may also be used to estimate the power to detect trends in occupancy, abundance, and/or richness. This can then be used to assess whether the objectives of the project are likely to be met.

Compliance

A compliance review will occur via the internal PEPC process through Western Arctic Parklands and Gates of the Arctic National Park and Preserve.

Schedule and Timeline

Training:	January-May 2010 Aural and visual bird identification using MP3 players of bird vocalizations and software including Birds Songs of Alaska (Peyton 1999), Bird Song Master (Micro Wizard 2006) and Thayer's Guide to Birds of North America (2009) May 1-15, 2010; June 1-7, 2010

	Aural and visual bird identification (in the field) and practice of bird point counts May17-28 NPS seasonal training June 6, 2010 Float and GPS training on Chena River
Landbird Surveys:	June 10-30, 2010 Noatak River from Nelson Walker Lake to confluence with Culter River; based out of Bettles (Brooks Range Aviation)

Project Deliverables/Products

A report will be produced after each survey following the Natural Resource Technical Report or National Resource Data Report formatting guidelines and will 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

Several landbird species of special concern in Alaska have been identified by Boreal Partners in Flight (1999). These species are of concern because they may lack general biological information due to a remote and limited distribution or their numbers may be declining across North America (BBS, Sauer et al. 2008). Reasons for population declines include loss of wintering ground habitat, toxicity from pollution and pesticides, and disease (i.e. avian influenza) (Boreal Partners in Flight, 1999). The GAAR Education Specialist, Tracie Pendergrast and YUGA Biologist, Melanie Flamme, developed an outreach program in 2009 to heighten awareness of 12 of these avian species of concern that occur in the Brooks Range of Alaska. The focus of this Jr. High School biology lesson was to help students understand the process and the reasons for current research on these 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.

The GAAR Education Specialist developed the curriculum and tested it in the Jr. High classroom in Anuktuvuk Pass, Alaska in 2009. The program will be repeated in Anuktuvuk Pass in 2010 with some modifications and will be used to train other NPS education staff from Kotzebue, Gina Hernandez, and Fairbanks, Stacia Backensto. 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 Taxonomy
B. Identifying Avian Species by Sight and Sound
C. Defining Species of Concern
D. Using Tools to Study Birds in the Field (Binoculars, GPS, Laser Rangefinder, Compass)
E. Conducting Avian Point Counts

Interpretation staff from NPS offices in Nome, Fairbanks, Bettles, Kotzebue and Eagle plus teachers in all the associated school districts will be encouraged to borrow the curriculm 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.

Tracie Pendergrast will test and refine the curriculum by teaching it to the Anaktuvuk Pass Jr. high and High-school students. She will also travel to the school at Anaktuvuk Pass with Melanie Flamme (YUGA Biologist) and Gina Hernandez (WEAR Interpretation Ranger) and Stacia Backensto (ARCN Biologist) to teach the Avian Species of Concern 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 avian 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.

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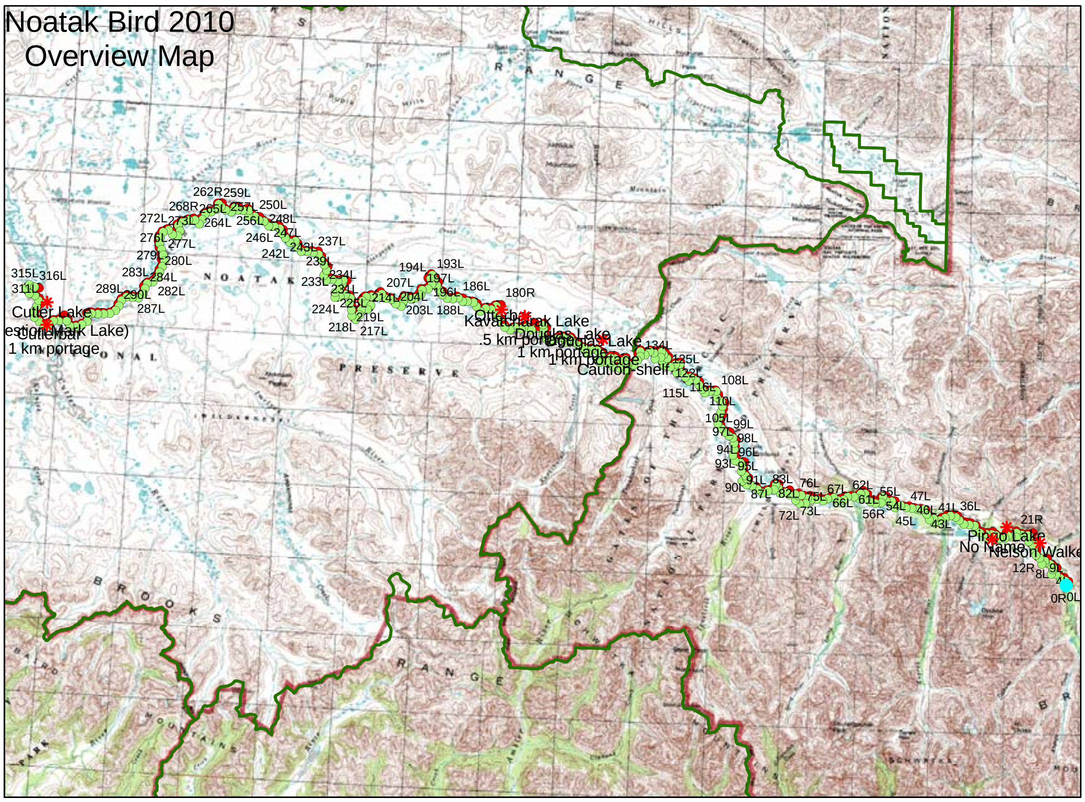
Appendices

Fig. 1. Overview map of landbird survey points along the Noatak River in Gates of the Arctic National Park and Preserve and Noatak National Preserve, Alaska. Surveys will be conducted from June 10-30, 2010.



Project Budget

FY2010_ Budget Summary Table

FIS 2010_-_ _ _: Project Title: Landbird monitoring along the Noatak River in Gates of the Arctic National Park and Preserve and Noatak National Preserve, Arctic Network of Alaska Parklands: 2010 Study Plan

Investigator: Melanie Flamme

Category	FY2010_
Direct Costs:	
Personnel	$19,383.80
Travel	$22,700.00
Contractual	N/A
Materials and Supplies	$1600
Equipment	$250
Total Direct Costs (a)	
Indirect Costs:	
Percent of Direct Costs	
Total Indirect Costs (b)	N/A
Overhead:	
_2_% (c) N/A	
Project Total (a + b + c)	$43,933.80

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