Annual Report of Survey Activities on Refuges

National Wildlife Refuge System
Alaska Region
2021

Summary Information

Table 1: Summary of survey activity in 2021 at National Wildlife Refuges in the Alaska Region. Refuges that are not listed here did not update 2021 survey annual activities in PRIMR. Surveys were considered completed if data were collected for 75% or more of the scheduled sample sites in the given calendar year.

Refuge	Surveys completed	Surveys not completed
Alaska Peninsula	3	4
Arctic	2	5
Becharof	5	4
Innoko	5	3
Izembek	11	8
Kanuti	7	12
Kodiak	12	16
Koyukuk	17	3
Nowitna	8	3
Selawik	2	12
Tetlin	10	5
Togiak	10	3
Yukon Flats	14	10

Table 2: Summary of reasons for why surveys in 2021 were not completed at National Wildlife Refuges in the Alaska Region. The Administrative category includes COVID-related restrictions to field activities.

Reason	n
Administrative	47
Lack of refuge staff	28
Weather or disturbance	7
Partner resources	5
Lack of equipment	1

Table 3: Summary of biotic groups (level 1) that are targeted or influenced by surveys completed in 2021 at National Wildlife Refuges in the Alaska Region, 2021. Level 1 is a high level taxonomic category ranging from Class to Kingdom. Unknown values indicate surveys without a biotic group specified in PRIMR.

Biotic group (level 1)	n
Unknown	87
Aves (birds)	56
Mammalia (mammals)	32
Plantae (plants)	13
Fungi (fungi)	2
Osteichthyes (bony fishes)	2
Arthropoda (arthropods)	1

Table 4: Summary of biotic groups (level 2) that are targeted or influenced by surveys completed in 2021 at National Wildlife Refuges in the Alaska Region, 2021. This is a mid-level taxonomic category ranging from Family to Order. Unknown values indicate surveys without a biotic group specified in PRIMR.

Biotic group (level 2)	n
Unknown	95
Anseriformes (waterfowl, swans, geese, screamers, ducks)	32
Charadriiformes (oystercatchers, auks, shore birds, gulls, alcids, plovers)	24
Passeriformes (perching birds)	24
Artiodactyla (cloven-hoofed ungulates, artiodactyls, even-toed ungulates)	17
Accipitriformes (hawks)	16
Carnivora (no common name)	14
Gaviiformes (loons)	14
Suliformes (cormorants)	11
Coraciiformes (todies, rollers, motmots, bee-eaters, kingfishers)	9
Piciformes (woodpeckers)	9
Galliformes (fowls, gallinaceous birds)	8
Gruiformes (rails, cranes)	8
Podicipediformes (grebes)	7
Falconiformes (falconiforms, falcons)	6
Procellariiformes (tube-nosed swimmers)	5
Rodentia (rodents)	5
Salmoniformes (salmons)	4
Asteraceae (sunflowers)	3
Ericaceae (heaths)	3
Lagomorpha (rabbits, hares, lagomorphs, pikas)	3
Poaceae (grasses)	3
Strigiformes (goatsuckers, owls)	3
Fabaceae (legumes, peas)	2
Lecanorales (no common name)	2
Ranunculaceae (buttercups, crowfoot)	2
Achariaceae (no common name)	1
Adoxaceae (adoxas)	1
Apiaceae (no common name)	1
Apodiformes (hummingbirds, swifts)	1
Araliaceae (ginseng)	1
Aulopiformes (aulopiforms, salmons)	1
Cuculiformes (cuckoos)	1
Cypriniformes (suckers, minnows)	1
Esociformes (mudminnows, pikes)	1
Gadiformes (hakes, gadiforms, grenadiers, cods)	1
Gasterosteiformes (sticklebacks, pipefishes)	1
Hydrocharitaceae (waternymphs, frog's bit, tape-grass)	1
Marsileaceae (clover ferns, pepperworts)	1
Orobanchaceae (broomrape)	1
Petromyzontiformes (lampreys)	1
Pinaceae (pines)	1
Polygonaceae (knotweed, buckwheat)	1

Table 4: Summary of biotic groups (level 2) that are targeted or influenced by surveys completed in 2021 at National Wildlife Refuges in the Alaska Region, 2021. This is a mid-level taxonomic category ranging from Family to Order. Unknown values indicate surveys without a biotic group specified in PRIMR. *(continued)*

Biotic group (level 2)	n
Rosaceae (roses)	1
Salicaceae (willows)	1
Scorpaeniformes (scorpion fishes, mail-cheeked fishes, sculpins)	1
Soricomorpha (no common name)	1
Zosteraceae (eel grass, eelgrass)	1

Alaska Maritime

Monitoring Recovery of Ecosystems Following Removal of Invasive Mammals

Survey record: https://ecos.fws.gov/primr/survey/edit/160

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? The Alaska Maritime NWR has undertaken several projects to eradicate invasive mammals from refuge islands. In most cases the only post-eradication monitoring that has been conducted has been for the purposes of determining if the eradication was successful. However, there is a growing management need to determine what the short and long-term effects of eradication are to the island ecosystems. This is particularly true for eradication projects targeting large mammals, which may have a greater landscape-level impact than eradication of rodents and other small mammals.

Annual Seabird Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/238

Products: https://ecos.fws.gov/ServCat/Reference/Profile/76350

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? The refuge is home to 80% of Alaska's seabirds. Additionally, the refuge is well suited for long term ecosystem monitoring. Seabirds and marine mammals as suites of species reflect changes in different portions of the marine food web. For instance the various seabird species include both fish and plankton feeders, some restricted to surface feeding while others are deep divers. Furthermore, some species feed nearshore while others forage far from breeding sites. It is typically difficult and expensive to measure changes in marine food webs directly, so using apex predators such as seabirds and marine mammals as indicators is becoming a well-established approach.

Data being collected by the ongoing seabird monitoring program are being used to evaluate conservation issues for the birds (a refuge need) as well as provide data to test hypotheses about effects of ecosystem changes (e.g., variation in ocean climate). This latter use contributes to the joint objectives of the refuge and its partners (e.g., National Marine Fisheries Service, Alaska Ocean Observing System, North Pacific Research Board, Alaska Department of Fish and Game) which is to understand processes in large marine ecosystems, to separate natural and anthropogenic causes, and to be able to predict effects of future changes. (excerpted from draft AMNWR I&M Plan, 2006).

Seabird Populations Trends at Intermittent Sites

Survey record: https://ecos.fws.gov/primr/survey/edit/3417

Products: https://ecos.fws.gov/ServCat/Reference/Profile/76351

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? The refuge is well suited for long term ecosystem monitoring. Seabirds and marine mammals as suites of species reflect changes in different portions of the marine food web. For instance the various seabird species include both fish and plankton feeders, some

restricted to surface feeding while others are deep divers. Furthermore, some species feed nearshore while others forage far from breeding sites. It is typically difficult and expensive to measure changes in marine food webs directly, so using apex predators such as seabirds and marine mammals as indicators is becoming a well-established approach.

Due to the geographic extent of the Refuge, most sites cannot be annually visited due to the expense and time required. Intermittent monitoring sites were established in each of the 5 Refuge units to add information on Refuge resources beyond the annual monitoring sites. Data being collected by the ongoing seabird monitoring program are being used to evaluate conservation issues for the birds (a refuge need) as well as provide data to test hypotheses about effects of ecosystem changes (e.g., variation in ocean climate). This latter use contributes to the joint objectives of the refuge and its partners (e.g., National Marine Fisheries Service, Alaska Ocean Observing System, North Pacific Research Board, Alaska Department of Fish and Game) which is to understand processes in large marine ecosystems, to separate natural and anthropogenic causes, and to be able to predict effects of future changes.

Beach Wildlife and Oil (COASST)

Survey record: https://ecos.fws.gov/primr/survey/edit/3428

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? The Coastal Observation and Seabird Survey Team (COASST) organizes coastal monitoring of beach-cast seabird carcasses at over 350 sites in California, Oregon, Washington and Alaska. Resulting data advances the science of coastal ecology and contributes to natural resources management. COASST data have a variety of uses including documenting marine die-offs, harmful algal bloom and contributing to many analyses of the potential impacts of resource development on coastal ecosystems in the Pacific Northwest. The Refuge is primarily interested in this survey because it can help assess background bird mortality to prepare for oil spills.

Beach Passerine Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/3429

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? These species may be at risk due to introduced predators, such as rats, so survey provides baseline data. Many refuge islands contain sizeable populations of upland breeding birds, including several endemic subspecies. Line transects along beaches, as well as off-road point count surveys (i.e. survey # FF07RAM000-038) will provide us with baseline passerine population indexes, and allow us to monitor trends or changes in local populations. Point count survey data will be included in a state-wide upland breeding bird monitoring program sponsored by Boreal Partners in Flight. Beach transects will be used for inter-year and inter-site comparisons.

Land Bird Point Count Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/3430

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? Refuge islands contain sizeable populations of upland breeding birds, including several endemic subspecies. Off-road point count surveys will provide us with baseline population indexes, and allow us to monitor trends or changes in local populations. Point count survey data will be included in a state-wide upland breeding bird monitoring program sponsored by Boreal Partners in Flight. Occasionally we are documenting land bird response to removal of invasive mammals.

Migrant Birds and Marine Mammals Timing and Diversity

Survey record: https://ecos.fws.gov/primr/survey/edit/3620

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? Refuge personnel have been conducting opportunistic observations of birds and marine mammals at annual monitoring sites for several decades. These daily observations provide a record of the presence and timing of many species that Refuge personnel do not otherwise conduct any monitoring of.

Auklet Colony Mapping

Survey record: https://ecos.fws.gov/primr/survey/edit/3621

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? Monitoring populations of auklets and other crevice-nesting seabirds remains problematic, although numerous methods have been attempted since the mid-1960s. Anecdotal evidence suggests several large auklet colonies have recently decreased in both abundance and extent, concurrently with vegetation encroachment and succession. Quantifying changes in the geographical extent of auklet colonies may be a useful alternative to monitoring population size directly. Refuge personnel helped develop a standardized method for colony mapping using a randomized systematic grid survey with two components: a simple presence/ absence survey and an auklet evidence density survey (Renner et al. 2006). A quantitative auklet evidence density index was derived from the frequency of droppings and feathers. This method has been used to map several colonies in the Bering Sea and Aleutians. Quantitatively mapping all large auklet colonies is logistically feasible using this method and would provide an important baseline for monitoring colony status. Regularly monitoring select colonies using this method may be the best means of detecting changes in distribution and population size of crevice-nesting seabirds.

Nearshore Marine Water Temperature

Survey record: https://ecos.fws.gov/primr/survey/edit/3622

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? Sea surface temperature can be used as a correlate to the seabird monitoring data we collect and may suggest possible reasons for changes observed in the monitoring data.

Seabird Densities at Sea

Survey record: https://ecos.fws.gov/primr/survey/edit/3865

Products: (No ServCat project record)

Survey Coordinator: Kathy Kuletz (Wildlife Biologist Seabird Specialist)

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Why is it important to conduct this survey? Data on the pelagic distribution and abundance of seabirds are critical for understanding the basic ecology of marine birds, monitoring population trends, assessing impacts of human activities, identifying critical marine habitats, and educating the public about seabird conservation. To address these needs, the U.S. Fish and Wildlife Service and U.S. Geological Survey have undertaken the task of consolidating and providing comprehensive geographic data on the pelagic distribution of seabirds in Alaska and the North Pacific.

Marine Debris Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/6205

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? The NOAA Marine Debris Program (MDP) has developed standardized, statistically valid methodologies for conducting rapid assessments of the debris material type and quantity present in a monitored location. The monitoring guidelines focus on abundance, types, and concentration rather than analyzing by potential source, as in many cases it is very difficult to connect a debris item to a specific debris-generating activity. These techniques are intended to be widely applicable to enable comparisons across regional and global scales.

Monitoring of Range Conditions of Islands with Introduced Ungulates

Survey record: https://ecos.fws.gov/primr/survey/edit/6944

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? Reindeer (Rangifer tarandus) have been introduced to the main islands of the Pribilof Islands (St. Paul and St. George). Previously conducted reindeer utilization surveys show rapid ongoing tundra degradation corresponding to fluctuating herd size. Lichens in particular have been heavily impacted and lichen range conditions had deteriorated over large parts of the islands. Continued degradation could have a number of negative ecological and social impacts on the Islands.

The Alaska Maritime NWR, in partnership with the St. George Traditional Council, the Tribal Government of St. Paul Island and the U.S. Department of Agriculture, Natural Resource Conservation Service need current information on range condition on both islands in order to make informed management decisions, particularly when it comes to management of the size of island reindeer herds.

Aleutian Tern Population Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/6950

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? The Aleutian tern (Onychoprion aleutica) breeds throughout coastal areas of Alaska and the Russian Far East and winters (at least in part) in Southeast Asia. Our understanding of the species is limited primarily to anecdotal observations and there are few known details about its behavior, diet, life history, migration, wintering range, and demographics. Published breeding population estimates for the Aleutian tern originated from sources that are now more than two decades old.

Within the last decade, there have been reports of colony declines and disappearances at individual sites in Alaska. However, a single population-level stressor that could potentially account for a decline in Aleutian tern numbers has not been identified. Although some effort has been made to monitor Aleutian terns in a few discrete locations throughout the state (e.g. Yakutat, Kodiak Island), a coordinated, State-wide monitoring program is needed to track the population and to identify and manage potential threats. Aleutian tern colonies are spread throughout a wide geographic area that contains a broad mix of Federal, State, Native, and private land ownership and wildlife management jurisdictions. A coordinated, State-wide monitoring program is needed to focus the efforts of groups already involved in Aleutian tern management, and to prioritize future efforts.

Endemic Species Studies - Distribution, Abundance and Status

Survey record: https://ecos.fws.gov/primr/survey/edit/6951

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? The Refuge is home to several endemic species that are poorly studied. Basic information on species distribution, abundance, and status is not available for many of these species. Given that many of these species occur on only a single island (e.g. Pribilof shrew, black-footed lemming), they are potentially vulnerable to short-term environmental perturbations or accidental introduction of invasive species. Results of this survey will be used to inform management of these species.

Efficacy of Rat Detection Devices

Survey record: https://ecos.fws.gov/primr/survey/edit/6952

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? Several mixed-ownership islands within the Refuge (including St. Paul and St. George in the Pribilof Islands) are currently free of invasive rats. These islands are at a high risk for rat (and other invasive rodent) introduction because of their human population and the transport of goods to the islands from elsewhere. The Refuge currently maintains a system of rodent detection stations on the Pribilof Islands in order to provide early detection of a potential rodent introduction.

The refuge has to have confidence that biosecurity methods are effective, successful and can detect new rodent invasions while they are at low density. If early detection methods are successful, more response

alternatives are feasible until a new population becomes established. Our current Pribilof rodent detection systems are untested. Shipwreck "rat spill" response methods use the best available strategies, but could be improved by adapting methods adapted from defense of harbors from rodents. It should be possible to maintain islands as rat-free with tested and effective island biosecurity devices even after multiple invasion events.

McKay's Bunting Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/6953

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? McKay's Bunting is one of the most poorly studied passerine species in Alaska. This species is endemic to the St. Matthew Islands (St. Matthew, Hall, and Pinnacle) in the remote central Bering Sea. The remote location of their breeding area is certainly one of the primary reasons that this species is so poorly studied. In 2013, Region 7 of the US Fish and Wildlife Service designated McKay's Bunting as a Tier 1 Priority Species. In order to develop conservation objectives for this species, baseline monitoring is required.

Monitoring for Incursions of Non-native Species in Entry Points

Survey record: https://ecos.fws.gov/primr/survey/edit/6954

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? Several of the islands within the Alaska Maritime National Wildlife Refuge are mixed-ownership islands that support small villages (e.g. St. Paul, St. George, Atka). The transport of goods to these islands, through harbors and airports that support the villages, is a potential vector for the introduction of invasive species. Of primary concern to the USFWS is the potential for introduction of invasive rodents (including rats and house mice) to islands that currently do not support populations of them. Monitoring programs to detect the introduction of invasive rodents are in place on some islands (e.g. St. Paul and St. George) but maintaining these programs, including raising adequate funds and nurturing partnerships with local cooperators, is a constant concern.

Red-faced Cormorant Surveys

Survey record: https://ecos.fws.gov/primr/survey/edit/6955

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? Red-faced cormorants have been monitored sporadically in a few locations within the Alaska Maritime NWR. Preliminary results have shown that the species may be experiencing localized declines, but currently the temporal and spatial coverage of the surveys is not great enough to determine the status of the species throughout their range. Red-faced cormorants are believed to have low fidelity to nesting areas. Individuals commonly move their nest site from year to year, and they may even move to neighboring islands within an archipelago, which makes monitoring the species difficult

when time and resources only allow single island monitoring efforts. In order to properly monitor this species and determine its status, systematic surveys of discrete island groups (e.g. Pribilof Islands, Near Islands, Rat Islands, etc.) are necessary. These surveys need to be replicated at intervals appropriate enough to determine the trajectory of each population.

Confirming Success of Invasive Mammal Eradication

Survey record: https://ecos.fws.gov/primr/survey/edit/6997

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? The Alaska Maritime National Wildlife Refuge has conducted several projects designed to eradicate invasive species from Refuge Islands. Post-eradication monitoring is essential to confirm the success of eradication projects and to better inform future porject development.

Inventory of Refuge Vertebrates

Survey record: https://ecos.fws.gov/primr/survey/edit/7008

Products: (No ServCat project record)

Survey Coordinator: Heather Renner (Supervisory Wildlife Biologist)

Email: heather_renner@fws.gov

Why is it important to conduct this survey? While select islands within the Alaska Maritime National Wildlife Refuge have been systematically surveyed to inventory vertebrate species, the vast majority of islands and mainland sites of the Refuge have not. In order to properly manage the vertebrate resources of the Refuge, managers will need to know what species are present, and the extent of each species' distribution.

Alaska Peninsula

Alaska Landbird Monitoring Survey (ALMS)

Survey record: https://ecos.fws.gov/primr/survey/edit/8871

Products: (No ServCat project record)

Survey Coordinator: William Smith (Supervisory Biologist)

Email: william_smith@fws.gov

Why is it important to conduct this survey? This survey is the local component of a statewide survey effort, the Alaska Landbird Monitoring Survey (ALMS), to monitor long-term population trends, determine abundance by habitat type, and model distributions of landbirds across Alaska. ALMS works in conjunction with the Refuge's "Breeding Bird Survey (Road-based)" by providing complimentary data on population trends of Alaskan landbirds that are largely not adjacent to roads. The Refuge submits data to the USGS Alaska Science Center, the agency vested with primary responsibility for data analyses and interpretation of results including thresholds of significance that may warrant consideration of management response.

Breeding Bird Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/8875

Products: (No ServCat project record)

Survey Coordinator: Robin Corcoran (Wildlife Biologist)

Email: robin_corcoran@fws.gov

Why is it important to conduct this survey? This survey is part of a large-scale effort geared to inform biologically sound conservation and management actions based on analysis of trend in bird populations at regional and continental scales. Determining population trends, relative abundance, and distributions of North American avifauna is critical for identifying conservation actions, determining conservation priorities, and evaluating the effect of these actions. The survey program, jointly coordinated by the USGS and Environment Canada's Canadian Wildlife Service, provides the US and Canadian Federal governments, state and provincial agencies, and the general public with science-based avian population trend estimates and other information for regional and national species' population assessments. These agencies have the primary responsibility for data analyses and interpretation of results including thresholds of significance that may warrant consideration of management response. This survey operates in conjunction with the Refuge's Breeding Bird Survey (ALMS – Remote Sites) to provide a more complete understanding of the long-term population trends, abundances by habitat type, and distributions of landbirds across Alaska.

Moored All-season Temperature Arrays

Survey record: https://ecos.fws.gov/primr/survey/edit/9954

Products: https://ecos.fws.gov/ServCat/Reference/Profile/7750

Survey Coordinator: William Smith (Supervisory Biologist)

Email: william_smith@fws.gov

Why is it important to conduct this survey? Changes in terrestrial vegetative components indicate that climate change may be occurring locally but the effects of climate changes on the aquatic resources is unknown. No established management response or thresholds.

Arctic

Demographics and Limiting Factors of Tundra Nesting Birds at the Canning River

Survey record: https://ecos.fws.gov/primr/survey/edit/213

Products: https://ecos.fws.gov/ServCat/Reference/Profile/76353

Survey Coordinator: Christopher Latty (Wildlife Biologist)

Email: christopher_latty@fws.gov

Why is it important to conduct this survey? The Canning bird camp is one of the few examples of long-term avian monitoring on the Refuge with data stretching back to the late-1970s. The study site not only allows comparison to historic data, but also is in close proximity to the production facility at Pt. Thompson, and directly adjacent to State of Alaska property currently leased for future oil and gas exploration. The Canning River Delta also has the highest density of breeding shorebirds within the Refuge. Our work will both inform Refuge and species-level management on tundra nesting birds (including shorebirds, passerines, and waterfowl) and align with priorities prescribed in the Arctic Refuge Comprehensive Conservation Plan (CCP). Further, conservation of migratory birds is specifically listed in Section 303(2)(B) of ANILCA as a purpose of the Arctic Refuge. We concentrate research on Service Priority and pilot Surrogate Species, including Tier 1 priority species (buff-breasted sandpiper, black brant, and dunlin), Tier 2 Priority Species (king eider and long-tailed duck), Flagship pilot Surrogate Species (long-tailed duck), and Environmental Indicator pilot Surrogate Species (dunlin, king eider, pectoral sandpiper, and red phalarope).

Porcupine Caribou Herd Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/10071

Products: (No ServCat project record)

Survey Coordinator: William Leacock (Wildlife Biologist)

Email: william_leacock@fws.gov

Why is it important to conduct this survey? (Not entered)

Becharof

Alaska Landbird Monitoring Survey (ALMS)

Survey record: https://ecos.fws.gov/primr/survey/edit/8872

Products: (No ServCat project record)

Survey Coordinator: Robin Corcoran (Wildlife Biologist)

Email: robin_corcoran@fws.gov

Why is it important to conduct this survey? This survey is the local component of a statewide survey effort, the Alaska Landbird Monitoring Survey (ALMS), to monitor long-term population trends, determine abundance by habitat type, and model distributions of landbirds across Alaska. ALMS works in conjunction with the Refuge's "Breeding Bird Survey (Road-based)" by providing complimentary data on population trends of Alaskan landbirds that are largely not adjacent to roads. The Refuge submits data to the USGS Alaska Science Center, the agency vested with primary responsibility for data analyses and interpretation of results including thresholds of significance that may warrant consideration of management response.

Breeding Bird Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/8876

Products: (No ServCat project record)

Survey Coordinator: Robin Corcoran (Wildlife Biologist)

Email: robin_corcoran@fws.gov

Why is it important to conduct this survey? This survey is part of a large-scale effort geared to inform biologically sound conservation and management actions based on analysis of trend in bird populations at regional and continental scales. Determining population trends, relative abundance, and distributions of North American avifauna is critical for identifying conservation actions, determining conservation priorities, and evaluating the effect of these actions. The survey program, jointly coordinated by the USGS and Environment Canada's Canadian Wildlife Service, provides the US and Canadian Federal governments, state and provincial agencies, and the general public with science-based avian population trend estimates and other information for regional and national species' population assessments. These agencies have the primary responsibility for data analyses and interpretation of results including thresholds of significance that may warrant consideration of management response. This survey operates in conjunction with the Refuge's Breeding Bird Survey (ALMS – Remote Sites) to provide a more complete understanding of the long-term population trends, abundances by habitat type, and distributions of landbirds across Alaska.

International Migratory Bird Day Count (Becharof)

Survey record: https://ecos.fws.gov/primr/survey/edit/8883

Products: (No ServCat project record)

Survey Coordinator: William Smith (Supervisory Biologist)

Email: william_smith@fws.gov

Why is it important to conduct this survey? (Not entered)

Moose Composition

Survey record: https://ecos.fws.gov/primr/survey/edit/8888

Products: (No ServCat project record)

Survey Coordinator: William Smith (Supervisory Biologist)

Email: william_smith@fws.gov

Why is it important to conduct this survey? Information on population composition is fundamental to the management of moose populations and most formal approaches to moose management are founded on these basic population parameters. This information is also important to the management of human harvest and evaluation of the efficacy of different management actions for moose.

Christmas Bird Count

Survey record: https://ecos.fws.gov/primr/survey/edit/8898

Products: (No ServCat project record)

Survey Coordinator: Robin Corcoran (Wildlife Biologist)

Email: robin_corcoran@fws.gov

Why is it important to conduct this survey? The Fish and Wildlife Service has actively supported Christmas Bird Counts (CBC) for many years, especially through establishment, operation, and coordination of CBCs that encompass lands in the National Wildlife Refuge System. Results from the two Kodiak CBCs contribute to survey datasets for Alaska and the US. Time-series data acquired for Kodiak and other North American CBC sites has facilitated analyses of regional and national trends in bird populations during early winter. Additionally, the CBCs in Kodiak, as elsewhere, have attracted interest and direct involvement of the public in a relevant and long-term conservation science study.

Innoko

Moose Composition Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/126

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? See Koyukuk and Nowitna.

Hather Creek Breeding Bird Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/145

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? (Not entered)

Mud River Breeding Bird Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/166

Products: https://ecos.fws.gov/ServCat/Reference/Profile/23618

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? Nongame birds, the majority of which are passerines, are an important component of the ecosystem of the three refuges of the Koyukuk/Nowitna Complex for several reasons. Abundance and species composition of passerine birds are indicative of habitat primary productivity and diversity (MacArthur 1964, Karr and Roth 1971, Terborgh 1977, Pianka 1978, Spindler and Kessel 1980). Consideration of nongame wildlife species is becoming increasingly important in the management of national wildlife refuges because of increased attention to birdwatching nationally and ANILCA mandates to maintain natural diversity. The adults, eggs, and nestlings constitute a seasonally significant portion of the prey used by several furbearer and raptor species.

Snow Depth Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/178

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? (Not entered)

Goose Banding

Survey record: https://ecos.fws.gov/primr/survey/edit/181

Products: (No ServCat project record)

Survey Coordinator: Julian Fischer (Supervisory Wildlife Biologist, Waterfowl)

Email: julian_fischer@fws.gov

Why is it important to conduct this survey? In 2003, the Alaska MBM GWFG banding program was expanded to the Arctic Coastal Plain (ACP). The purpose of this expansion was to examine migration timing and winter distribution (Webb 2006), disease prevalence (Samuel et al. 2005, USFWS/USGS 2010) and annual survival of mid-continent white-fronts in the Alaskan ACP versus interior boreal forests of Alaska. Banding on the ACP has also helped to determine the degree of interchange between boreal and tundra nesting GWFG in Alaska, which appears to occur to only a very small degree. Migratory Bird Management objectives of banding on the ACP were completed in 2011; thus, subsequent banding of GWFG was restricted to interior Alaska. However, banding on the ACP continues through efforts by USGS to examine the physical and biological factors in relation to the population increase in white-fronted geese on the ACP (3,335 birds banded since 2011).

Izembek

Fall migration phenology of Pacific brant at Izembek Lagoon

Survey record: https://ecos.fws.gov/primr/survey/edit/77

Products: (No ServCat project record)

Survey Coordinator: Alison Williams (Wildlife Biologist)

Email: alison_williams@fws.gov

Why is it important to conduct this survey? The survey provides clues to changes in brant phenology relative to ongoing climate change scenarios. It also provides information on how foraging pressure on Izembek Lagoon eelgrass beds may be changing. Data may influence harvest management/ regulations in the future. No threshold value or management response has been set thus far.

Izembek Lagoon and adjacent coastal embayments are important spring and fall staging areas for essentially the entire Pacific Flyway population of brant. Twice each year, approximately 130,000 Pacific brant pause in the Izembek area to rest and fatten before continuing their migrations (Table 12). The brant forage on the extensive eelgrass beds that occur in Izembek Lagoon and other protected coastal areas (Figure 9; USFWS 1998b). The first spring migrants arrive at Izembek Lagoon in April and remain for up to three weeks, replenishing nutrient reserves that will be needed for egg laying.

By mid-May, most brant have departed for northerly breeding grounds in arctic Canada and arctic and sub-arctic areas of Alaska and Russia. In fall, the first birds normally arrive during the third week of August and remain for up to eight weeks, laying on fat reserves that most will need for the long migration to their wintering areas. The concentration of brant peaks in late September and most brant depart abruptly in late October or early November, leaving about 50,000 brant to overwinter along the southern Alaska Peninsula. Since Izembek Lagoon is shallow and often freezes during the winter, wintering brant often shift their distribution to Kinzarof Lagoon and Bechevin Bay.

Pacific brant winter in coastal areas from British Columbia to Mexico. As eelgrass habitats disappeared along the West Coast of North America, increasing numbers of brant overwinter on the west coast of the Baja Peninsula and mainland Mexico. Over 90% of the Pacific Flyway brant population flies about 3,300 miles (5,300 km) nonstop from the Izembek Lagoon area to western Mexico. This transoceanic flight takes approximately 54 hours, and the brant lose more than 30% of their body weight (Dau 1992). Prior to their fall departure from Izembek Lagoon and migration to Mexico, adult brant must recover from the energetic demands of breeding and molting. The fat reserves accumulated are critical for fall migration and underscore the importance of the Izembek Lagoon to this species. Winter inventories have indicated a steady increase in the number of brant wintering within Izembek NWR from less than 3,500 in 1980-81 to over 13,000 in 1996-97 (Dau and Ward 1997) to over 48,000 in 2021 (USFWS, unpublished data). The increase in wintering brant has coincided with increases in average sea surface and air temperatures in the Bering Sea region. The duration and frequency of ice cover in the coastal areas along the Alaska Peninsula has also decreased. The increase in the number of brant wintering at Izembek NWR may represent a shift in winter distribution from more southerly areas. The number of brant wintering in British Columbia has also increased during recent years (Pacific Flyway Council 2003).

Avian Influenza Virus Surveillance at Izembek National Wildlife Refuge and Viral Genomic Reserach

Survey record: https://ecos.fws.gov/primr/survey/edit/133

Products: (No ServCat project record)

Survey Coordinator: Alison Williams (Wildlife Biologist)

Email: alison_williams@fws.gov

Why is it important to conduct this survey? Since 2010 the USGS has conducted collaborative surveillance sampling for influenza A viruses in wild birds at Izembek NWR. USGS scientists at the Alaska Science Center and Ntional Wildlife Heath Center continue to proivde important informaiton on viral prevalence at an area demonstrated to have a high rate of intercontinental mixing of viruses. This project amples selected species at an intercontinental crossroads for migratory waterfowl. Genetic sequencing of low pathogenic avian influenza viruses obtained through this surveillance provides information on subtype diversity, patterns of interspecies transmission, and the evolution and persistence of Eurasian origin viral genes in western Alaska. Finding will be used to inform future surveillance activities for foreign origin influenza viruses in Alaska and elsewhere in North America.

Eelgrass Survey (Distribution and Abundance)

Survey record: https://ecos.fws.gov/primr/survey/edit/276

Products: (No ServCat project record)

Survey Coordinator: Alison Williams (Wildlife Biologist)

Email: alison_williams@fws.gov

Why is it important to conduct this survey? From 2004 biollgical review document: Izembek Lagoon includes one of the largest eelgrass beds in the world and is a logical site to institute a long-term eelgrass monitoring program. Potential parameters include stem and rhizome density, biomass, distribution, and collection of samples to assess contaminants and genetics. A power analysis should be conducted on biomass data collected by USGS-BRD ASC and UAF-IMS to determine appropriate sample sizes for the program.

Tundra Swan: Population survey of breeding tundra swans on the lower Alaska Peninsula

Survey record: https://ecos.fws.gov/primr/survey/edit/6743

Products: (No ServCat project record)

Survey Coordinator: Alison Williams (Wildlife Biologist)

Email: alison_williams@fws.gov

Why is it important to conduct this survey? The objectives of the procedure are to sue aerial surveys to estimate annual population size, breeding distribution, and breeding pair density in at least 95% of the tundra swan breeding habitat of othe lower AK Peninsula. This data will be sued to mointor population trends of swans breeding on both the Izembek and Pavlof Units. Management decisions affecting the Pacific Flwasy tundra swans, of which the Izembek NWR and AK Peninsula NWR are a part, follow guidelines extablished by the Pacific Flyway Council. Uthe unique Izembek population has been recognized, but no breeding or wintering thresholds have been identified. The Izembek swans are the only known wild, non-migratory population of tundra swans in North America.
Because even limited human harvest could exceed annual recruitment, the Izembek population has been excluded form sport harvest for over 30 years. In 2005, tundra swans on the lower AK Peninsula and Unimak Isalnd were also excluded from spring and summer subsistence migratroy bird harvest.

Pacific Brant and emperor geese fall production estimates at Izembek NWR

Survey record: https://ecos.fws.gov/primr/survey/edit/6903

Products: (No ServCat project record)

Survey Coordinator: Alison Williams (Wildlife Biologist)

Email: alison_williams@fws.gov

Why is it important to conduct this survey? The entire population of Pacific Black brant, numbering approximately 150,000 birds states in the Izembek Lagoon Complex for up to eight weeks each fall. Additionally approximately 15% of the total population overwinters at Izembek. It is difficult to monitor annual productivity of these widely-dispersed populations during the breeding season, but considerably easier in the fall when brant from all breeding areas mingle at Izembek. Purpose of survey is: The pacific Flyway council has establihsed a population threshold of 120,000 birds, based on a 3-year average of mid-winter aerial surveys of both Mexican and Alaskan wintering birds, to authorize sport hunting for brant. This procedure, coupled with fall staging aerial surveys, provides an accurage estimate of the age composition of the entire artic and subarctic breeding population and an index of fall flight size.

The majority of the world population of emperor gesse passe thourgh Izembek during spring and fall migrations between breeding areas in western Alaska and the Russian Far East adn wintering areas in the Aleutians. Emperor goose numbers have remained stable or declined over the last 3 decades; the May, 1998 annual census of Alaska Peninsula documented 39, 749 birds, the lowest number since spring counts were initiated in 1981. The Yukon Delta Goose Management Plan population objective for emperors is 150,000; the pacific Flyway Council has establihsed an 80,000 bird population threshold for huning to be authorized. The Emperor goose harvest has been closed since 1986. Purpose of Survey: This survey assesses annual productivity (both adlut:juvenile age rations and family group size) for the population during fall staging along the lower Alaska Peninsula. Becuase birds arrive from widely-distributed nesting poulations, this procedure provides an index of productivitiy in combined artic and subartic breeding areas.

Productivity and family group data are provided to Migratory Bird Managment each winter for inclusion in the annual Alaska productivity surveys of geese, swans, and brant report. Field data summaries , along with historical productivity summaries are stored in the refuge files. Data is also used to produce the Productivity surveys of geese, swans and brant wintering in North America (annual Mig Bird Mgt report). Data is also used to create Refuge specific reports that assist to identify and understand overall use and distribution of these species that intensively utilize the Izembek NWR.

Mid-Winter count of pacific brant at Izembek NWR

Survey record: https://ecos.fws.gov/primr/survey/edit/6904

Products: (No ServCat project record)

Survey Coordinator: Alison Williams (Wildlife Biologist)

Email: alison_williams@fws.gov

Why is it important to conduct this survey? Data included in the pacific Flyway population index to derive the ttoal population estimate; summery table of annual winter counts supplied to refuge for long term trend monitoring.

Izembek Lagoon and adjacent coastal embayments are important spring and fall staging areas for essentially the entire Pacific Flyway population of brant. Twice each year, approximately 130,000 Pacific brant pause in the Izembek area to rest and fatten before continuing their migrations (Table 12). The brant forage on the extensive eelgrass beds that occur in Izembek Lagoon and other protected coastal areas (Figure 9; USFWS 1998b). The first spring migrants arrive at Izembek Lagoon in April and remain for up to three weeks, replenishing nutrient reserves that will be needed for egg laying.

By mid-May, most brant have departed for northerly breeding grounds in arctic Canada and arctic and sub-arctic areas of Alaska and Russia. In fall, the first birds normally arrive during the third week of August and remain for up to eight weeks, laying on fat reserves that most will need for the long migration to their wintering areas. The concentration of brant peaks in late September and most brant depart abruptly in late October or early November, leaving about 8,000-10,000 brant to overwinter along the southern Alaska Peninsula. Since Izembek Lagoon is shallow and often freezes during the winter, wintering brant often shift their distribution to Kinzarof Lagoon and Bechevin Bay.

Pacific brant winter in coastal areas from British Columbia to Mexico. As eelgrass habitats disappeared along the West Coast of North America, increasing numbers of brant overwinter on the west coast of the Baja Peninsula and mainland Mexico. Over 90% of the Pacific Flyway brant population flies about 3,300 miles (5,300 km) nonstop from the Izembek Lagoon area to western Mexico. This transoceanic flight takes approximately 54 hours, and the brant lose more than 30% of their body weight (Dau 1992). Prior to their fall departure from Izembek Lagoon and migration to Mexico, adult brant must recover from the energetic demands of breeding and molting. The fat reserves accumulated are critical for fall migration and underscore the importance of the Izembek Lagoon to this species. Winter inventories have indicated a steady increase in the number of brant wintering within Izembek NWR from less than 3,500 in 1980-81 to over 13,000 in 1996-97 (Dau and Ward 1997) to over 17,000 in 2004-05 (USFWS, unpublished data). The increase in wintering brant has coincided with increases in average sea surface and air temperatures in the Bering Sea region. The duration and frequency of ice cover in the coastal areas along the Alaska Peninsula has also decreased. The increase in the number of brant wintering at Izembek NWR may represent a shift in winter distribution from more southerly areas. The number of brant wintering in British Columbia has also increased during recent years (Pacific Flyway Council 2003).Black brant are of special concern to wildlife managers because of the decline in population size in the late 1960s and 1970s and dramatic decreases in the number and size of major nesting colonies on the Yukon-Kuskokwim Delta during the 1980s (King and Derksen 1986, Lensink 1987). During the last decade (1998-07), the 3-year running average varied from 104,837 to 135,331 and has remained below the management goal of 150,000 birds (Trost 2006). Poor reproductive success and subsistence harvest on breeding and molting areas (Raveling 1984, King and Derksen 1986, Lensink 1987, Anthony and Sedinger 1987, and Sedinger et al. 1993) and degradation of nonbreeding habitats through loss of submerged aquatic vegetation and increased human disturbance along the West Coast of the continental United States (Reed et al. 1998) have contributed to the slow recovery of the population.The extensive eelgrass beds in Izembek, Kinzarof and Big Lagoons, St. Catherine's Cove, and Hook Bay provide essential staging and wintering habitat for brant (Figure 9). Of these areas, only Izembek Lagoon receives special protection as Izembek State Game Refuge. The reliance of brant on eelgrass habitat makes them highly vulnerable to fluctuations in the quality of this habitat due to pollution, oil spills, recreation and coastal development, and other human disturbances. For this reason, Izembek NWR and Izembek SGR are critically important for Pacific brant and the eelgrass ecosystem.

Breeding Bird Survey (BBS) at Cold Bay, AK

Survey record: https://ecos.fws.gov/primr/survey/edit/6925

Products: (No ServCat project record)

Survey Coordinator: Alison Williams (Wildlife Biologist)

Email: alison_williams@fws.gov

Why is it important to conduct this survey? Part of long term National Survey: Purpose
Populations of many neotropical migrant bird species that breed in the forests of the eastern United States declined in abundance during 1978-1987 (Robbins et al. 1989). In most cases, the reasons for these declines are unknown. Alaska has a large portion of, or in some cases all of, the breeding population of many northern species, so it is important to monitor these populations. In addition, Alaska populations of more widespread species tend to inhabit relatively undisturbed habitats. Because population declines of these species may result from problems on the wintering grounds, Alaska's breeding landbird populations can be used as a control for studies of declining Lower 48 populations.

The North American Breeding Bird Survey (BBS), a large_scale avian survey program initiated in 1966 by Chandler Robbins and his colleagues at the USGS Patuxent Wildlife Research Center, monitors the status and trends of breeding bird populations across North America. The BBS is jointly coordinated by the USGS Patuxent Wildlife Research Center and the Canadian Wildlife Service. Breeding Bird Surveys have been conducted at Izembek since 1982.

The BBS is a roadside survey program, with more than 4100 permanent active routes of which approximately 3000 are surveyed annually in early spring. Each route is 24.5 miles (39.4 km) long, with 3_minute point

counts conducted at 0.5 mile (0.8 km) intervals for a total of 50 point count stops. All birds heard or seen within a 0.25 mile (0.4 km) radius of each stop are recorded. These surveys begin 30 minutes before sunrise and normally require 4 _ 5 hours for completion. Sky condition, wind speed, and temperature are also recorded at the beginning and end of each survey. Over 2500 skilled amateur birders and professional biologists participate in the program each year.

The BBS has accumulated over 30 years of data on the abundance, distribution, and population trends of more than 400 bird species. These data permit detailed computer mapping of relative abundance of each species, either year by year, to show changes in distribution and relative abundance, or averaged over a period of years. These data are widely used by researchers, federal and state (and provincial/territorial) agencies, non_governmental organizations, and the general public for various management and research purposes. For example, these data can reveal whether major population changes of a species in certain states are related to a continental decline or merely represent population shifts within their breeding range. The BBS also provides base_line data with which more intensive local studies can be compared.

Population trends, age and sex composition, and productivity of brown bears on Izembek NWR

Survey record: https://ecos.fws.gov/primr/survey/edit/6956

Products: (No ServCat project record)

Survey Coordinator: Alison Williams (Wildlife Biologist)

Email: alison_williams@fws.gov

Why is it important to conduct this survey? From 1989 WL Inventory and Monitoring Plan:
The brown bear (Ursus arctos) is the most visible large predator on the lower Alaska Peninsula. Populations in the region are high and believed to be stable. Based on a 1989 census at Black Lake, Sellers and Miller (1995) placed total bear populations in Game Management Unit 9 at a minimum of 7,700. The subpopulation within Subunit 9D , which includes Izembek Refuge and the Pavlof and North Creek Units of Alaska Peninsula Refuge, was placed at 900. Similar intensive censuses have not been completed on Unimak Island (GMU 10). However, Sellers (1995) estimated the population on Unimak at 200 individuals. Brown bear movements, habitat use, and home range characteristics on Izembek Refuge and adjacent lands were examined in telemetry studies in the late 1980s (Dau 1989; 1990). General information on U. arctos can be found in USFWS 1993 and NWF 1987.

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Sport hunting seasons for brown bear alternate on a biennial basis; during even-numbered years a spring
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II. Purpose This procedure does not provide either a total population estimate or a statistically rigorous trend estimate. Rather, it provides a minimum population count in each survey area as well as data useful in assessment of trends in brown bear total numbers, age composition, and productivity on Refuge lands. These data are evaluated over time to provide an index of breeding sows and inter-annual survival of juvenile cohorts. Given the inherent difficulty of monitoring bear populations across broad expanses of wilderness lands, these data should be used conservatively. In particular, harvest increases should not be based solely on these data but on more intensive local studies. From Wildlife Review (2004) : Brown bears are widespread throughout the entire Alaska Peninsula. Areas of the Peninsula contain some of the highest population densities of bears in Alaska (USFWS 1985a, b). Brown bears use a wide variety of habitats, including shoreline, lowland meadows and tundra, streams, midland tall shrub, and alpine zones (Glen and Miller 1980, Dau 1990). During spring and early summer, bears are widely dispersed, looking for opportunistic food sources such as beached marine mammal carcasses, caribou and moose calves, ground squirrels, or newly sprouted sedges. By mid-July, bears concentrate on salmon streams where they may feed on salmon until late fall. Bears also visit the tundra uplands to supplement their salmon diet with berries. By mid-November, many bears have moved to their den sites in subalpine and alpine areas. Denning areas typically occur in mountainous

areas greater than 1,000 ft. (305 m) in elevation, but occasional den sites have been observed at lower elevations. Brown bears occur on all four Refuge units, and the refuge purposes for each unit, as designated by ANILCA, specify conservation and protection of brown bears and their habitats. Areas that support high densities of bears include the Joshua Green River watershed and the streams on the north side of Frosty Peak in the Izembek NWR Unit; the Urilia Bay watershed on the Unimak Island Unit; the Canoe Bay watershed on the east side of Pavlof Bay; Cape Aliaksin; the area between Volcano and Belkofski Bays; and the Cathedral River Valley on the Pavlof Unit (Figure 12, USFWS 1998b). Quality denning areas include Frosty Peak, Mt. Dutton, and the Aghileen Pinnacles on the Izembek NWR Unit; the mountainous slopes of Isanotski Peak, Roundtop Mountain, and the Fisher Caldera on the Unimak Island Unit; and Pavlof volcano and other mountainous areas throughout the Pavlof Unit. In 2002, the density of brown bears on the lower Alaska Peninsula between Port Moller-American Bay and Isanotski Strait was estimatedto be 43.8 bears/100 mi2 (169 bears/1,000 km2). On Unimak Island, the bear density was 26.5 bears/100 mi2 (102 bears/1,000 km2; unpublished data, ADFG). The Joshua Green River watershed on the northeast side of Cold Bay supports the highest density of brown bears on Izembek NWR and is considered to be the most important habitat for brown bears year-round on Izembek NWR. The surrounding hills and mountains, including the Right and Left Hand Valleys, are high density denning areas (USFWS 1996b). Lowland habitat provides important foraging areas during much of the summer. The abundance of salmon spawning in this region attracts an average density of 0.75 bears/mi2 (0.29 bears/km2) in late August compared to a spring density of 0.44 bears/mi2 (0.17 bears/km2) for the entire southern Alaska Peninsula (Sowl 2003). The Joshua Green region is also a key natal area. Young bears produced in this area disperse throughout the southern Alaska Peninsula (Dau 1990). On average, 25% of the adult bears observed during August surveys in this area are maternal sows (Sowl 2003). Brown bears in this portion of the Peninsula have very small home ranges (3.5-7.3 mi2 or 9-19 km2; Dau 1990) compared to other areas on the Alaska Peninsula (over 96.5 mi2 or 250 km2; Glen and Miller 1980). The small home ranges and high productivity of the Joshua Green watershed result from a combination of high quality habitat, abundant food, and low levels of human disturbance. For this reason, Izembek NWR cooperated with ADFG to establish the Joshua Green as a Controlled Use Area in 1993 (Figure 13). This area is closed to the use of any motorized vehicle, except for outboard motor-powered boats for the purposes of sport hunting. Findings and Recommendations The Izembek NWR Biological Program Review Panel recognized the unique importance of the Izembek NWR for conservation and protection of brown bears and highly recommended continuing two projects and implementing a new study. Izembek NWR staff should continue to collaborate with the ADFG to monitor the abundance, density, and composition of brown bears on the lower Alaska Peninsula and Unimak Island. The Refuge should also continue to estimate population trends, age and sex composition, and productivity of brown bears on Izembek NWR. However, the proposed modification of this survey to include potential effects of weather and salmon escapement on bear detectability was ranked of medium importance. In collaboration with the ADFG, USGS Alaska Science Center, and the University of Alaska Fairbanks, Izembek NWR staff should develop an international research program to address populations, habitat use, productivity, behavior, and survival of brown bears on the Refuge. Estimated home ranges of brown bears in the Joshua Green River watershed are 4-7 mi2 compared to greater than 97 mi2 elsewhere on the Alaska Peninsula. Small home ranges and apparent high productivity of brown bears on Izembek NWR are likely the result of habitat quality, abundant food resources, and low levels of human disturbance compared to the rest of the Peninsula. The density of bears and wilderness characteristics of the Joshua Green watershed provide an ideal area to support an international program on coastal brown bear ecology.

Incidental wildlife observations on Izembek NWR

Survey record: https://ecos.fws.gov/primr/survey/edit/7001

Products: (No ServCat project record)

Survey Coordinator: Alison Williams (Wildlife Biologist)

Email: alison_williams@fws.gov

Why is it important to conduct this survey? Not directly related to immediate management. May provide evidence in future of changes in spp. occurrence, etc. There is some minor documentation continuing and biologist enters data into access database. This may assist with development of species lists if done correctly. Currently observations are written a notebook that is left on the administrative officers desk.

Inventory and assessment of freshwater lakes and streams on Izembek NWR: potential changes in water quality, hydrology and fish

Survey record: https://ecos.fws.gov/primr/survey/edit/7069

Products: (No ServCat project record)

Survey Coordinator: Alison Williams (Wildlife Biologist)

Email: alison_williams@fws.gov

Why is it important to conduct this survey? To create a baseline inventory of these lake and river systems.

Potential options include repeating study methods and design or sample new wetlands using the same or different study methods

This survey had a Medium Priority rank in the Wildlife Review 2004

Inventory and control of invasive plants on Izembek NWR

Survey record: https://ecos.fws.gov/primr/survey/edit/7159

Products: (No ServCat project record)

Survey Coordinator: Alison Williams (Wildlife Biologist)

Email: alison_williams@fws.gov

Why is it important to conduct this survey? Talbot et al. (2000) identified 11 introduced plant species on or adjacent to Izembek NWR. Currently, Canadian thistle (Cirsium arvense) occurs on several private lots and city property in Cold Bay and on an island (Banding island) west of Grant Point in Izembek Lagoon (D. Ward, pers. comm.).

Kanuti

Molting Geese Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/179

Products: (No ServCat project record)

Survey Coordinator: Christopher Harwood (Fish and Wildlife Biologist)

Email: christopher_harwood@fws.gov

Why is it important to conduct this survey? The refuge's local importance as a nesting, brood-rearing, and molting area for white-fronts was recognized when the refuge was created under ANILCA, and conservation of this species and its habitats was explicitly noted as a purpose for establishment, as were migratory birds in general (e.g., Canada Geese). While this survey's results suggest that the population of molting white-fronts on the Refuge is relatively small (a few hundred birds), white-fronts (and Canada Geese) are a highly regarded and popularly hunted species by local village residents. Also, the two species contribute to ecosystem function as riparian herbivores and as prey for avian and mammalian predators.

This aerial molting goose survey was instituted largely in response to the decline of boreal-nesting white-fronts in Alaska in the 1990s. The original objective of the survey was to monitor white-front distribution and abundance on the refuge and contribute to the regional picture, but difficulties in interpreting survey results have been noted (e.g., local breeders versus molt migrants). Nevertheless, the survey presently represents the best option for annually monitoring 1) goose (primarily white-front) abundance and distribution on/near the refuge during the most conspicuous period (molt) of their seasonal stay, and 2) goose molting habitats. Results remain a desired element of MBM's annual status report for midcontinent white-fronts. Recent modifications have made it more efficient without sacrificing usable estimates of molting white-front abundance and distribution on and near the refuge. A more extensive, less frequent effort should allow adequate monitoring of historical distribution and possible colonization of generally unused areas. We are planning a full-effort survey in 2016 (last done in 2008) to assess potential changes in goose distribution outside our targeted hot-spots. If the Kanuti survey specifically, or regional surveys generally, showed a marked decline in birds observed again, the refuge would likely increase the annual effort level to look for possible shifts in distribution, especially that may relate to habitat changes. Local declines would likely lead to greater outreach in the villages to assess if local harvest pressure has increased.

Snow Marker Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/194

Products: (No ServCat project record)

Survey Coordinator: Christopher Harwood (Fish and Wildlife Biologist)

Email: christopher_harwood@fws.gov

Why is it important to conduct this survey? Snow is the most salient feature of the landscape in Interior Alaska for up to 8 months of the year. Snow markers provide information on winter severity that is necessary to understand wildlife population trends and habitat use. Information is also valuable for monitoring long-term weather trends and hydrology that may be affected by climate change, as well as for predicting severity of fire seasons. Snow data are baseline information that aids in understanding ecosystem processes (e.g., forecasts for spring run-off and flooding), contributing at local, regional, and statewide scales.

No thresholds have been established for snow depth on Kanuti Refuge that would trigger a management response. Data generated by this project are used in concert with data collected watershed-wide to help managers make decisions at a large scale.

Moose Population Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/250

Products: (No ServCat project record)

Survey Coordinator: Christopher Harwood (Fish and Wildlife Biologist)

Email: christopher_harwood@fws.gov

Why is it important to conduct this survey? Moose are a high priority for Refuge management because they are an important component of Kanuti Refuge's biological diversity and are specifically mentioned in the first of the Refuge's establishment purposes ANILCA. These large herbivores influence habitat structure and composition and are prey for the Refuge's top-level predators. Moose are also an important subsistence species for local residents, and therefore are a component of the Refuge's third ANILCA purpose which concerns providing subsistence opportunities. Lastly, moose attract non-local hunters, defined as a priority activity on refuges in the Refuge Improvement Act of 1997.

An early spring subsistence hunt can be opened upon approval by the Refuge manager, depending on population and harvest statistics; if the moose population is <0.5 moose/mile2, harvest of cows is prohibited. If a spring hunt is allowed, a harvest quota may be set based on population survey data. Bull-to-cow ratios obtained during population surveys must be adequate to support bull harvest after the normal fall season. The Koyukuk River Moose Management Plan (KRMMP) recommends a bull-to-cow ratio of 30–40 bulls per 100 cows to ensure adequate breeding in low density areas like Kanuti (ADF&G and Koyukuk River Moose Hunters' Working Group 2001). Calf-to-cow ratios are also examined as the KRMMP recommends rates in excess of 30–40 calves per100 cows for a population to grow. Finally, the ratio of yearling bulls-to-cows provides an indication of calf survival over the previous winter, even though recommended minimum ratios have not been specified.

Currently there are no predetermined thresholds for moose abundance, composition, or detected recent population trends that trigger or deny the March antlerless moose subsistence hunt. As noted above, the decision is made based on moose population status and social factors such as fall moose harvest success, and caribou availability near affected villages. Nonetheless, survey results are a primary consideration in deciding whether to offer the hunt and in setting quotas. Other uses of the moose survey data include informing Refuge responses to state proposed harvest regulations, addressing concerns regarding moose population size, and informing permits for air-taxi operators.

Riparian Invasive Weeds Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/261

Products: (No ServCat project record)

Survey Coordinator: Christopher Harwood (Fish and Wildlife Biologist)

Email: christopher_harwood@fws.gov

Why is it important to conduct this survey? At its nearest point, the Kanuti Refuge lies just 13 km miles west of the DHUC (BLM lands). At least six Koyukuk River tributaries cross this highway and later enter the Refuge. Kanuti Refuge is increasingly concerned that the waterways listed above could become routes for dispersal of invasive plants like white sweetclover (Melilotus alba) and bird vetch (Vicia cracca) onto the Refuge. White sweetclover readily invades open and disturbed areas, and has become established along rivers on open gravel bars in interior, south-central, and southeast Alaska in recent years. It has also rapidly colonized the DHUC near the Refuge, moving >120 miles northward between 2000 and 2010. In addition, bird vetch has been identified both within the DHUC and downriver on the Koyukuk River in recent years. The populations of these invasive plants are expanding.

The purpose of this monitoring project is to determine if any invasive species move down waterways near, or on to, the Refuge. If any invasive plants are found on the Refuge, or the waterways leading to the

Refuge, their locations will be will be recorded via GPS, the plants pulled up by their roots and the material transported off Refuge for disposal. If an infestation is found that is too large to manually pull, a control plan will be developed to contain or eradicate the infestation.

Kanuti River Breeding Bird Surveys

Survey record: https://ecos.fws.gov/primr/survey/edit/3427

Products: (No ServCat project record)

Survey Coordinator: Christopher Harwood (Fish and Wildlife Biologist)

Email: christopher_harwood@fws.gov

Why is it important to conduct this survey? The data from the two routes are used in continental and Alaska landbird monitoring efforts. Refuge-specific ornithological benefits currently are largely confined to the refuge bird checklist program. Still, given that a) migratory birds are Trust species, b) comprehensive refuge-specific monitoring of landbirds would be prohibitively expensive, and c) Alaska's BBS program is the State's primary tool for landbird monitoring (i.e., the Alaska Landbird Monitoring Survey is a more recent complement to the BBS), participation in regional monitoring efforts is warranted.

Stream Gage Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/7885

Products: (No ServCat project record)

Survey Coordinator: Christopher Harwood (Fish and Wildlife Biologist)

Email: christopher_harwood@fws.gov

Why is it important to conduct this survey? The gage provides a measure of flow volume (derived from water height) on a portion of the Koyukuk River that is commonly used for transportation between the villages of Bettles and Allakaket. This portion of the river is also used to access many tributaries leading into the Kanuti Refuge. The gage measures flow at a point upstream of the Refuge and will be used to document hydrological events that that impact the Refuge.

To date, the gage has captured five years of continuous flow record for the Koyukuk River and the Refuge. Continued operation will provide an extended stream flow record useful for monitoring changes in river phenology patterns (changes timing and magnitude of flow events over time), water temperature, and hydrologic response in a changing environment. Hydrologic datasets of >10 years are needed for statistically viable analysis due to the variability of flow over time. Such a dataset would provide the Refuge with a valuable tool monitoring change in streamflow that reflects the behavior of the Refuge's other stream systems. It would also contribute to long-term monitoring efforts within the Yukon River Drainage.

Scoter/Scaup Breeding Pair Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/8645

Products: (No ServCat project record)

Survey Coordinator: Christopher Harwood (Fish and Wildlife Biologist)

Email: christopher_harwood@fws.gov

Why is it important to conduct this survey? Scoters and scaup species are declining in North America. Traditional surveys to monitor ducks (e.g., Continental Breeding Pair Survey) have proven to be mistimed for these two taxa because they nest later than dabblers and other divers/seaducks. In order to better monitor

them, a targeted survey timed for later in summer is required. Given the general declines exhibited and the enthusiasm expressed by Interior subsistence hunters for targeting these species, it is important to better monitor their trends. Kanuti NWR may even be important from a strategic point of view as its location may represent a transition in breeding grounds from eastern interior (e.g., Yukon Flats NWR) for Lesser Scaup to Greater Scaup and from White-winged Scoters to Surf Scoters. Any demonstrated declines in scoters and scaup on Kanuti NWR would be conveyed to Migratory Bird Management and the Alaska Migratory Bird Co-management Council for regulatory considerations. Declines would likely encourage greater outreach in the local villages to advocate for residents harvesting more abundant species (e.g., dabblers).

Kodiak

Invasive Plant Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/155

Products: https://ecos.fws.gov/ServCat/Reference/Profile/143492

Survey Coordinator: Bill Pyle (Supervisory Wildlife Biologist)

Email: bill_pyle@fws.gov

Why is it important to conduct this survey? Data collected in this survey provides the primary basis for targeting restoration of areas infested by highly invasive plants in and adjacent to Refuge lands, as well as critical control points in Kodiak and outlying communities. Surveys supported by the Refuge since 2003 have documented numerous infestations of highly invasive plants, which are disallowed on Refuge lands (USFWS 2010a), and which have triggered integrated pest management (IPM) to control and eradicate infestations via mechanical and chemical methods. Additionally, we routinely provided outreach and thereby informed public and residents of threats and management options regarding highly invasive plants. Success of Service-supported control actions is evaluated by a companion survey (invasive plant monitoring), and by the combination of results from monitoring of control actions as well as follow-up extensive surveys. This survey tied for fifth highest SMART tool score.

Invasive Plant Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/177

Products: https://ecos.fws.gov/ServCat/Reference/Profile/140550

Survey Coordinator: Bill Pyle (Supervisory Wildlife Biologist)

Email: bill_pyle@fws.gov

Why is it important to conduct this survey? This survey determines the response of highly invasive plant species to integrated pest management (IPM) where IPM actions involve herbicide use. IPM methods are adjusted, as appropriate, where monitoring results suggest that modification of IPM methods could increase effectiveness (e.g., adaptive management framework). Monitoring methods and thresholds differ among infestation areas subject to IPM including herbicide use. On sites where response to treatment is quantified, the threshold for management response (i.e., adjustment of IPM methods) is dually based on evaluation of response trends of the invasive plant and herbicide usage. On sites where response to treatment is subjectively assessed (photopoints), the threshold for management response is based primarily on the trend in herbicide usage. Highly invasive species, such as orange hawkweed, are considered a primary impediment to meeting this goal. The importance and role of monitoring response of invasive plants to IPM actions are specifically addressed in an Environmental Assessment (USFWS 2010a). Results of this survey work, in conjunction with the Refuge's "Invasive Plant Survey", provide primary bases for identification and effective management of infestations of highly invasive plants. This survey tied for the fifth highest SMART tool score.

Monitoring Avian Productivity and Survivorship (MAPS)

Survey record: https://ecos.fws.gov/primr/survey/edit/185

Products: https://ecos.fws.gov/ServCat/Reference/Profile/143495

Survey Coordinator: Robin Corcoran (Wildlife Biologist)

Email: robin_corcoran@fws.gov

Why is it important to conduct this survey? This survey is a locally-operated component of a national program for monitoring spatial and temporal patterns of productivity and adult survival rates of migratory and resident landbirds while communicating science and conservation to the public through bird banding. The Monitoring Avian Productivity and Survivorship (MAPS) Program currently consists of nearly 500 monitoring stations sampled annually and provides estimates of adult apparent survival and recruitment rates and indices of productivity for about 150 landbird species. The Institute for Bird Populations, the program leader, has primary responsibility for data analyses and interpretation of results including thresholds of significance that may warrant consideration of management response.

Nearshore Marine Bird Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/251

Products: https://ecos.fws.gov/ServCat/Reference/Profile/36456

Survey Coordinator: Robin Corcoran (Wildlife Biologist)

Email: robin_corcoran@fws.gov

Why is it important to conduct this survey? Migratory bird conservation is a primary goal of the Kodiak Refuge (RCCP Goal 5), and goals of the state of Alaska and the Service's Division of Migratory Bird Management. Results of this survey provide Refuge and migratory bird managers with an understanding of trends in coastal bird population abundances and distributions, including species subject to Kodiak-based subsistence and recreational sport harvests, and others whose populations have been locally impacted by commercial fisheries and silviculture operations. Many of the species targeted in the survey rely on terrestrial nesting habitats administered by Kodiak Refuge and Alaska Maritime Refuge. Assessment of breeding populations and productivity for these species provides bases for habitat management and understanding factors that may influence the quality and availability of these habitats. Seabird mortality related to fishing gear is a globally recognized conservation issue that is believed to be responsible for declines in many populations. The Kodiak Archipelago is home to one of the largest commercial fisheries in the world and bycatch has been documented within the survey area of several species targeted in this survey. Results of this survey also can provide essential bases for estimation of mitigation costs and restoration needs following oil-spill incidents, as demonstrated in the aftermath of the 1989 Exxon Valdez incident. Results from this survey work in conjunction with the Refuge's "Seabird Colony Survey" and the "Migratory Subsistence Harvest Survey" to provide a more complete picture of the status of seabird population in the Kodiak area. This survey received the highest prioritization score using the SMART tool.

Breeding Bird Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/274

Products: https://ecos.fws.gov/ServCat/Reference/Profile/143490

Survey Coordinator: Robin Corcoran (Wildlife Biologist)

Email: robin_corcoran@fws.gov

Why is it important to conduct this survey? This survey is part of a large-scale effort geared to inform biologically sound conservation and management actions based on analysis of trend in bird populations at regional and continental scales. Determining population trends, relative abundance, and distributions of North American avifauna is critical for identifying conservation actions, determining conservation priorities, and evaluating the effect of these actions. The survey program, jointly coordinated by the USGS and Environment Canada's Canadian Wildlife Service, provides the US and Canadian Federal governments, state and provincial agencies, and the general public with science-based avian population trend estimates and other information for regional and national species' population assessments. These agencies have the primary responsibility for data analyses and interpretation of results including thresholds of significance that

may warrant consideration of management response. This survey operates in conjunction with the Refuge's Breeding Bird Survey (ALMS – Remote Sites) to provide a more complete understanding of the long-term population trends, abundances by habitat type, and distributions of landbirds across Alaska.

Bear Abundance Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/3394

Products: https://ecos.fws.gov/ServCat/Reference/Profile/143381

Survey Coordinator: Joy Erlenbach (Wildlife Biologist)

Email: joy_erlenbach@fws.gov

Why is it important to conduct this survey? ADF&G, in cooperation with the Refuge, has established objectives for management of brown bear subpopulations on Kodiak Island (e.g., 175 – 263 independent bears/1,000 km2 for southwest Kodiak Island). Results are used to evaluate whether these objectives are being met. Increases and decreases ($P > 0.05$) as estimated by this survey, usually trigger management action. This may include expansion of allowable harvest, if a sub-population increases. Alternatively, it may include a combination of actions if a sub-population decreases such as re-survey (to confirm result), contraction of allowable harvest, and research to assess causes for population change. This survey received a relatively high SMART-tool prioritization score, but was deemed more important than other higher scoring surveys because maintaining a viable population of brown bears is the founding purpose of Kodiak Refuge and a primary goal identified in the RCCP (Goal 2). This survey is required by, and works in conjunction with, two other selected surveys ("Bear Mortality Assessment" and "Bear Composition Monitoring") and two selected research projects ("Bear-salmon Interactions" and "Bear Contaminant Assessment") to provide a more complete picture of the overall health of the bear population on Kodiak.

Moored All-season Temperature Arrays

Survey record: https://ecos.fws.gov/primr/survey/edit/3484

Products: https://ecos.fws.gov/ServCat/Reference/Profile/143418

Survey Coordinator: Bill Pyle (Supervisory Wildlife Biologist)

Email: bill_pyle@fws.gov

Why is it important to conduct this survey? Results from this survey work in conjunction with concurrent monitoring performed by Togiak Refuge, Alaska Peninsula/Becharof Refuges, and the National Park Service's Southwest Alaska Network (SWAN) to provide a comprehensive basis for anticipating and managing impacts of global warming on the quality of sockeye salmon (Oncorhynchus nerka) nursery habitat in southwest Alaska. Karluk and Red Lakes support the largest, most productive stocks of sockeye salmon in the Kodiak Archipelago, and salmon initially reared in these lakes provide subsistence to village communities and support a multi-million dollar commercial harvest. Evaluation of trend in lake temperature variation is important because projected warming of air and water may eventually compromise fitness and performance of juvenile sockeye salmon, which, if it occurred, could reduce abundance and lead to collateral impacts to the ecosystem and economy. The comparative nature of the survey will facilitate interpretation of trend, which may be used to forecast future climate-driven impacts to salmon habitat, and which can facilitate development of mitigation strategy in the event of impact forecast. A newly released 2013 initiative of the Western Alaska Land Conservation Cooperative seeks to identify existing knowledge and gaps pertaining to temperature thresholds of salmon. Pending funding availability, a companion survey will assess trend in temperature of river mainstems and tributaries in the Karluk and Ayakulik River Basins.

River Temperature Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/5947

Products: https://ecos.fws.gov/ServCat/Reference/Profile/143417

Survey Coordinator: Bill Pyle (Supervisory Wildlife Biologist)

Email: bill_pyle@fws.gov

Why is it important to conduct this survey? Kodiak Refuge supports exceptional salmonid fisheries that serve as a primary source of subsistence to rural residents, attract anglers from around the world, and provide for a multi-million dollar commercial harvest. Results of this survey will provide a basis for anticipating and managing impacts of global warming on quality of riverine habitat used by salmon at different stages of the freshwater life cycle (e.g., migration, spawning, egg-development, juvenile rearing). Our approach will involve networking with local and regional partners who share concerns about the need to monitor potential thermal influences of climate change on salmon habitat. In the Kodiak area, we propose to establish paired monitoring sites (mainstem and headwater tributaries) in each of three watersheds collectively regarded as most important to salmonid management. Implementation of this study is supported by the Refuge's RCCP (2007), as well as recommendations of a regional interagency workshop on stream and lake temperature (USFWS 2012) and a Kodiak-based climate change workshop (Beever 2012). Establishment of a network of river temperature monitoring sites is a focal topic of the Service's Water Resource Program, I&M Initiative, and Western Alaska LCC.

Berry Production Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/5959

Products: https://ecos.fws.gov/ServCat/Reference/Profile/143473

Survey Coordinator: Bill Pyle (Supervisory Wildlife Biologist)

Email: bill_pyle@fws.gov

Why is it important to conduct this survey? The Refuge needs to routinely monitor berry availability in selected areas to systematically account for their influence on the composition and size of the Kodiak brown bear population, as described in the Refuge's Revised CCP. Results of this survey will be used retroactively to support explanation of trend in the bear population. Additionally, acquisition of a sufficient time-series berry production, berry phenology, and bear population data will support evaluation of the magnitude of association, as well as the interaction with other similarly quantified habitat factors such as air temperature and soil temperature This latter application would be especially important given the potential for climate change and non-native species, such as Sitka black-tailed deer and dusky slug, to adversely affect the availability of multiple species of berries to brown bear.

Salmonberry and red elderberry are considered primary foods of Kodiak brown bear on Kodiak Island. The consensus perspective of of wildlife biologists who have researched Kodiak brown bear is that interannual variation in production of berries can influence seasonal bear distribution, physical condition, reproductive fitness, cub survival, and recruitment. A trend of decline in the bear population may be associated with consistent, limited multi-year berry production and availability, especially when concurrently coupled with limited availability of salmon, another primary food. Conversely, a trend of consistent interannual production and availability berries and salmon may confer population stability or increase.

Presently (2019) no FWS survey protocol exists. The official protocol is presently (4/2020) targeted for completion in fy 2021. In the meantime, excellent survey instructions are available (Pyle and Hernandez 2017).

Bear-Salmon Interactions

Survey record: https://ecos.fws.gov/primr/survey/edit/5963

Products: https://ecos.fws.gov/ServCat/Reference/Profile/36454

Survey Coordinator: Joy Erlenbach (Wildlife Biologist)

Email: joy_erlenbach@fws.gov

Why is it important to conduct this survey? Maintaining a viable population of coastal brown bears is the primary founding purpose of Kodiak Refuge and a central Refuge goal (USFWS 2007). Coastal brown bear and sockeye salmon are designated "priority species" by the Service's Alaska Region in the region encompassed by the Western Alaska LCC. The long-term viability of the Refuge's bear population hinges upon its ability to consistently meet its requirements for primary food sources such as sockeye salmon. Wildlife managers affiliated with the Refuge and ADF&G have concluded that the recent declines in bear densities and productivity around Karluk Lake by up to 48% since 2003 were related mainly to the concurrent declines in escapement of sockeye salmon and production of elderberry and salmonberry. Results from this study will be used to assess the bear-sockeye salmon relationship, and to model the sockeye salmon requirement of the brown bear subpopulation that utilizes river basins of southwestern Kodiak Island.

Christmas Bird Count

Survey record: https://ecos.fws.gov/primr/survey/edit/5975

Products: https://ecos.fws.gov/ServCat/Reference/Profile/143491

Survey Coordinator: Robin Corcoran (Wildlife Biologist)

Email: robin_corcoran@fws.gov

Why is it important to conduct this survey? The Fish and Wildlife Service has actively supported Christmas Bird Counts (CBC) for many years, especially through establishment, operation, and coordination of CBCs that encompass lands in the National Wildlife Refuge System. Results from the two Kodiak CBCs contribute to survey datasets for Alaska and the US. Time-series data acquired for Kodiak and other North American CBC sites has facilitated analyses of regional and national trends in bird populations during early winter. Additionally, the CBCs in Kodiak, as elsewhere, have attracted interest and direct involvement of the public in a relevant and long-term conservation science study.

Estimating Sockeye Salmon into Akalura Lake

Survey record: https://ecos.fws.gov/primr/survey/edit/10961

Products: https://ecos.fws.gov/ServCat/Reference/Profile/140695

Survey Coordinator: Kevin Van Hatten (Fish Biologist Airplane Pilot)

Email: kevin_vanhatten@fws.gov

Why is it important to conduct this survey? The results from this study will be used gain better understanding of models which use estimators for salmon abundance. The data will also provide insight to salmon abundance within Olga Bay for ADF&G biologists.

Koyukuk

Aerial Goose Molting Surveys

Survey record: https://ecos.fws.gov/primr/survey/edit/8690

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? The purpose of this inventory plan is to monitor trends in the refuge breeding population of Canada geese and Greater White-fronted geese and to better assess the impact of flooding on the goose population and provide specific recommendations for management.

Aerial Moose Trend counts and Population estimates

Survey record: https://ecos.fws.gov/primr/survey/edit/8951

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? Moose are the single most important game species in the refuge complex. It is the mainstay of subsistence and as an important sport hunting quarry. Moose are the most important prey base for wolves and scavengers. This procedure will provide baseline data and current information on the status of moose populations on the three units of the Refuge Complex. This information will be used to monitor the health of the populations and make management and public use decisions.

Aerial Swan Production Surveys

Survey record: https://ecos.fws.gov/primr/survey/edit/8953

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? Swans are considered a key indicator species since their production trends tend to correlate well with that of other waterfowl species (King 1973), they are sensitive to nest disturbance (Timm and Wojeck 1978), and sightability is high during aerial surveys (Lensink 1973). Much of the Koyukuk NWR (including Kaiyuh Flats) is located on the transition between taiga and tundra, and both Trumpeter and Tundra Swans nest on the refuge.

Breeding Bird Surveys

Survey record: https://ecos.fws.gov/primr/survey/edit/8955

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? Nongame birds, the majority of which are passerines, are an important component of the ecosystem of the three refuges of the Koyukuk/Nowitna Complex for several reasons. Abundance and species composition of passerine birds are indicative of habitat primary productivity and diversity (MacArthur 1964, Karr and Roth 1971, Terborgh 1977, Pianka 1978, Spindler and Kessel 1980). Consideration of nongame wildlife species is becoming increasingly important in the management of national wildlife refuges because of increased attention to birdwatching nationally and ANILCA mandates to maintain natural diversity. The adults, eggs, and nestlings constitute a seasonally significant portion of the prey used by several furbearer and raptor species.

Caribou Veg Plots in 3 lakes burn

Survey record: https://ecos.fws.gov/primr/survey/edit/8957

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? Understanding the patterns of succession in burns such as at Two-Lakes can contribute to fire management decisions that may be increasingly important if climate-change predictions are correct. An increase in fire frequency and size can have significant impacts on a landscape scale, particularly for species such as caribou that are strongly impacted by fire. Monitoring of the Two-Lakes transects is particularly valuable at this time when climatic factors are considered to be changing and potentially impacting successional patterns.

Christmas Bird Count

Survey record: https://ecos.fws.gov/primr/survey/edit/8958

Products: (No ServCat project record)

Survey Coordinator: Jenny Bryant (Wildlife Biologist)

Email: jenny_bryant@fws.gov

Why is it important to conduct this survey? The Audubon Christmas Bird Count (CBC) is the oldest and largest wildlife survey in the world and has numerous continent-wide values for environmental monitoring (Drennan 1981, Butcher 1990). Although counts occur in Central and South America, most CBCs occur in North America (Figure 4). The sample area for a count is a circle that is 15 miles in diameter, and varying numbers of volunteers count all birds they see or hear in the circle during a single day, which is within two weeks of December 25. The survey was coordinated and compiled locally by the ADFG area game biologist until 1995, when the Complex staff took over organizing the annual one-day survey.

Eagle/Raptor nest Inventory

Survey record: https://ecos.fws.gov/primr/survey/edit/8959

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? Bald eagles are a highly visible species in early spring, are found mainly in association with riparian habitats, and the size of their nests makes them more obvious than other raptor species. Prior to this project, no previous efforts have been made to locate or map bald eagle nests on the Complex.

Flood Event Monitoring/Climate Change

Survey record: https://ecos.fws.gov/primr/survey/edit/8962

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? It is valuable to monitor arrival chronology and spring breakup conditions because these factors greatly influence waterfowl productivity.

Galena Mountain Caribou productivity and Movement

Survey record: https://ecos.fws.gov/primr/survey/edit/8964

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? Procedures in this plan will help maintain a historical baseline of caribou distribution during migration and wintering and estimates of the relative numbers of caribou wintering each year on the refuge. Additionally, distribution and abundance information may be useful in evaluating effects of recent wildfires on caribou.

Objectives of this caribou inventory procedure on Koyukuk NWR are:

1. In order of priority, to monitor distribution, abundance, and movements of the two herds using the Koyukuk NWR, at least three times per year, and more often when the herds overlap.
2. Monitor productivity of the GMH at least once per year.
3. To cooperate with ADFG, BLM, and other agencies in the study and management of the GMH, WMH, and WAH by gathering and providing information, attending meetings, and formulating appropriate regulations and policies.

Goose Production Float Surveys

Survey record: https://ecos.fws.gov/primr/survey/edit/8965

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? Greater white-fronted geese and a moderate number of Canada geese use the Complex for brood rearing and molting. The greatest concentrations of geese occur along the rivers during the spring and fall migrations. On the Koyukuk Refuge principal drainages utilized by geese are the Dulbi River, Dulbi Slough, and Huslia River (Figure1).

Moose Twinning Surveys

Survey record: https://ecos.fws.gov/primr/survey/edit/8968

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? This procedure will provide baseline data and current information on the status of moose populations on the three units of the Refuge Complex. This information will be used to monitor the health of the populations and make management and public use decisions.

Off Road Point Count Surveys

Survey record: https://ecos.fws.gov/primr/survey/edit/8971

Products: (No ServCat project record)

Survey Coordinator: Karin Bodony (Park Ranger)

Email: karin_bodony@fws.gov

Why is it important to conduct this survey? The major goal of the Alaska Off-road Breeding Bird Survey is to monitor long-term trends in landbird populations. This information can be used to guide decisions about management of the species and the habitats upon which they rely.

Peregrine Nest/productivity survey

Survey record: https://ecos.fws.gov/primr/survey/edit/8972

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? The purpose of this survey is to ascertain general trends in certain raptor population numbers. Specific emphasis will be placed on confirming reports of breeding peregrine falcons and bald eagles, species with regional priority (Schempf 1988). This survey will allow refuge staff to become more knowledgeable of important raptor nesting, feeding, and roosting areas in or near the Complex. In addition, nest site location data will help assure protection when developing refuge management and public use programs.

Snow Marker Surveys

Survey record: https://ecos.fws.gov/primr/survey/edit/8974

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? Snow accumulation has an affect on animals that reside year around on the refuge as well as those that migrate back in the spring. Snow accumulation can reduce available forage and increase energy required to access suitable foraging habitat for herbivores, which may potentially be one of the most important factors affecting animals over the winter (Coady 1974, Nordengren et al. 2003). Snow depth can negatively affect female moose influencing reproduction and calf survival

(Messier 1995). Previous studies have shown that snow depths exceeding 40 to 50 cm impede movements of moose and wolves (Kelsall 1969, Mech 1970, Kelsall and Prescott 1971). Huggard (1993) found a switch in wolf predation from moose calves in moderately deep snow to adults in very deep snow. The kill rates for wolves were also related to snow depths (Huggard 1993).

Spring Phenology Flights/River monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/8976

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? (Not entered)

Wolf Abundance Estimation/distribution

Survey record: https://ecos.fws.gov/primr/survey/edit/8979

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? In planning a wolf inventory effort the refuge staff must decide on the objective, time horizon, and area of interest or concern.

The time period to be considered may range from a single point in time to a recurring inventory that is planned to be conducted periodically for the foreseeable future. The area of interest may range from a specific tributary or drainage in which an intensive study is proposed to an extensive area such as an entire refuge or game management unit.

Canada Lynx Dispersal, Space and Habitat Use Patterns During a Snowshoe Hare Population Cycle

Survey record: https://ecos.fws.gov/primr/survey/edit/11042

Products: https://ecos.fws.gov/ServCat/Reference/Profile/98708

Survey Coordinator: Mark Bertram (Wildlife Biologist)

Email: mark_bertram@fws.gov

Why is it important to conduct this survey? Collaborative research efforts among Alaska refuges, federal and state agencies, university researchers, and Canadian researchers should enable this study to reach a spatial scale large enough to determine whether lynx move in from Canada and across Alaska in a concerted pattern during the course of a snowshoe hare population cycle. Data from this project will help inform management decisions regarding habitat and space use, movement corridors, and connectivity of lynx populations throughout Alaska. This information may prove useful in the management of threatened lynx populations in the contiguous United States.

Nowitna

Aerial Moose Trend counts and Population estimates

Survey record: https://ecos.fws.gov/primr/survey/edit/8952

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? (Not entered)

Aerial Swan Production Surveys

Survey record: https://ecos.fws.gov/primr/survey/edit/8954

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? (Not entered)

Eagle/Raptor nest Inventory

Survey record: https://ecos.fws.gov/primr/survey/edit/8961

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? (Not entered)

Goose Production Float Surveys

Survey record: https://ecos.fws.gov/primr/survey/edit/8966

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? The purpose of this inventory plan is to monitor trends in goose populations and production within the Complex and to improve our knowledge of habitat use. The goal of this procedure is to obtain the best possible annually repeatable goose production trend data given the size of the refuge, and the manpower and funding available. This plan is designed to collect trend information with a degree of precision sufficient to detect significant annual changes of the number of adults returning and young produced on the Complex.

Nowitna Moose Checkstation

Survey record: https://ecos.fws.gov/primr/survey/edit/8970

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? (Not entered)

Snow Marker Surveys

Survey record: https://ecos.fws.gov/primr/survey/edit/8975

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? Snow accumulation has an affect on animals that reside year around on the refuge as well as those that migrate back in the spring. Snow accumulation can reduce available forage and increase energy required to access suitable foraging habitat for herbivores, which may potentially be one of the most important factors affecting animals over the winter (Coady 1974, Nordengren et al. 2003). Snow depth can negatively affect female moose influencing reproduction and calf survival (Messier 1995). Previous studies have shown that snow depths exceeding 40 to 50 cm impede movements of moose and wolves (Kelsall 1969, Mech 1970, Kelsall and Prescott 1971). Huggard (1993) found a switch in wolf predation from moose calves in moderately deep snow to adults in very deep snow. The kill rates for wolves were also related to snow depths (Huggard 1993).

Spring Phenology Flights/River monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/8977

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? (Not entered)

Aerial Goose Molting Surveys

Survey record: https://ecos.fws.gov/primr/survey/edit/8981

Products: (No ServCat project record)

Survey Coordinator: Brad Scotton (Sup Wildlife Biologist Airplane Pilot)

Email: brad_scotton@fws.gov

Why is it important to conduct this survey? The purpose of this inventory plan is to monitor trends in the refuge breeding population of Canada geese and Greater White-fronted geese and to better assess the impact of flooding on the goose population and provide specific recommendations for management.

Selawik

Kotzebue Breeding Bird Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/3595

Products: (No ServCat project record)

Survey Coordinator: Bill Carter (Fish Biologist)

Email: bill_carter@fws.gov

Why is it important to conduct this survey? The BBS is a long-term, continental avian monitoring program designed to track the status and trends of North American birds. BBS data provide an index of population abundance that can be used to estimate population trends and relative abundances at various geographic scales. The refuge has conducted the established route in Kotzebue to contribute to this database.

Water Temperature Monitoring of Streams, year round

Survey record: https://ecos.fws.gov/primr/survey/edit/10084

Products: (No ServCat project record)

Survey Coordinator: Bill Carter (Fish Biologist)

Email: bill_carter@fws.gov

Why is it important to conduct this survey? Water temperature is one of the most significant physical factors in the health of a stream ecosystem. Depending on the type of stream and its location, the natural flora and fauna often establish themselves in ranges delineated by temperature. The entire temperature regime includes absolute levels, seasonal and diel ranges, rate functions, and timing and duration of thermal events. Other resent water quality studies have shown that permafrost is the driver of instream water temperature throughout the summer. This project seeks to record year round water temperatures.

Tetlin

Christmas Bird Count

Survey record: https://ecos.fws.gov/primr/survey/edit/111

Products: (No ServCat project record)

Survey Coordinator: Travis David (Environmental Educator)

Email: travis_david@fws.gov

Why is it important to conduct this survey? With the impacts of ongoing climate change, it is imperative to conduct long-term monitoring of abundance and distribution of birds throughout the year, however, most surveys are conducted for breeding birds (e.g., BBS and ALMS). Christmas Bird Count data are used to monitor changes in trend and distribution of wintering birds. Results from the Tok CBC contribute to survey datasets for Alaska and combined with other other North American CBC sites, have identified trends in bird populations during early winter. In addition, recent data analyses have shown a clear connection between a warming climate and northern shifts in the winter distribution of many species. Additionally, the CBC in Tok, as elsewhere, encourages participation from local volunteers and provides an opportunity to inform the public about landbird conservation.

Snowshoe Hare Population Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/153

Products: (No ServCat project record)

Survey Coordinator: Brent Jamison (Wildlife Biologist)

Email: brent_jamison@fws.gov

Why is it important to conduct this survey? Snowshoe hare is a keystone herbivore for the boreal forest. Hare population densities are cyclical across boreal North America over an 8-11 year period and have been largely synchronous across Canada and Alaska over the last four decades. Because hares are an essential food item for a variety of terrestrial and avian predators, they can greatly influence predator production and recruitment of a variety of species. Hares can also have significant impacts on vegetation during phases of their cycle and may affect plant survival and composition on a local level. The close correlation between population densities of hares and other boreal forest fauna, and the predictable hare cycle, suggests that monitoring hare populations can provide predictive information for other species. Lynx specifically rely heavily on snowshoe hares for food and their populations cycle along with those of their cyclic prey. Data regarding hare phases will assist managers in interpreting changes in predator populations.

Tetlin NWR is currently studying changes in lynx movement and survival as populations of lynx fluctuate in response to cyclic changes in snowshoe hare abundance. Monitoring trends in snowshoe hare populations in and around the refuge is critically important to understanding the changes in lynx behavior during this long-term study.

Snowpack Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/247

Products: (No ServCat project record)

Survey Coordinator: Brent Jamison (Wildlife Biologist)

Email: brent_jamison@fws.gov

Why is it important to conduct this survey? Understanding and monitoring snowpack, as a portion of the hydrological component of Tetlin NWR, is mandated by both ANILCA and the National Wildlife Refuge System Improvement Act. Coordinated statewide snow survey measurements are used each winter by NRCS to estimate snowpack and water content and to make streamflow forecasts for all major drainages across Alaska and the Yukon Territory. Snowpack data combined with weather and climate data are especially useful in studies of fire effects, winter habitat use, and seasonal effects on productivity and/or abundance of waterfowl, swans, shorebirds, raptors, moose, furbearers, small mammals, and terrestrial vegetation.

Water Quantity & Quality Monitoring at Scottie Creek and Nabesna River

Survey record: https://ecos.fws.gov/primr/survey/edit/3489

Products: (No ServCat project record)

Survey Coordinator: Timothy Lorenzini (Supervisory Park Ranger)

Email: timothy_lorenzini@fws.gov

Why is it important to conduct this survey? Section 302(8)B of ANILCA and the National Wildlife Refuge System Improvement Act (NWRSIA) mandate that Tetlin NWR maintain sufficient water quality and quantity to meet both the mandates of the refuge and the mission of the National Wildlife Refuge System. The goal of this monitoring survey is to document the occurrence, quantity, distribution and movement of surface water to serve as a basis for quantification of water rights for the refuge and to meet the requirements under ANILCA and NWRSIA. Six streams were monitored on the refuge between 2005-2010 (see survey "Water Quantity & Quality Baseline Monitoring"). All gages were removed in 2012, with the exception of Scottie Creek and the Nabesna River, which were selected for long-term stream flow monitoring and will be maintained by the refuge. This survey is part of a larger effort to monitor critical source streams for refuges throughout Alaska.

Invasive Plant Occurrence along the Tetlin NWR/Alaska Highway Corridor

Survey record: https://ecos.fws.gov/primr/survey/edit/3490

Products: (No ServCat project record)

Survey Coordinator: Brent Jamison (Wildlife Biologist)

Email: brent_jamison@fws.gov

Why is it important to conduct this survey? Invasive, non-native plants are recognized as one of the greatest threats to ecological integrity in North America. This study will catalog the presence of invasive plant species along the Alaska Highway paralleling, and in close proximity to, the northern border of Tetlin Refuge. Summer vehicular traffic at the Canadian border on the Alaska Highway averages over 32,000 vehicles annually and each vehicle is a possible vector for the dispersal of invasive plants. Identifying factors that influence invasive plant distribution will help land managers identify possible control efforts.

Water Temperature Monitoring of Streams

Survey record: https://ecos.fws.gov/primr/survey/edit/3499

Products: (No ServCat project record)

Survey Coordinator: Margaret Perdue (Water Quality Specialist)

Email: margaret_perdue@fws.gov

Why is it important to conduct this survey? Water temperature is one of the most significant physical factors in the health of a stream ecosystem. Depending on the type of stream and its location, the natural flora

and fauna often establish themselves in ranges delineated by temperature. The entire temperature regime includes absolute levels, seasonal and diel ranges, rate functions, and timing and duration of thermal events. Stream temperature can have detrimental effects on various species populations by influencing physical, chemical, and biological water properties. National Weather Service Northway weather data along with Refuge stream temperatures could be used for predictive modeling based on generally linear relationships between air and water temperature. The model would provide a tool in management decisions based on possible future habitat conditions. Water quality assessments support management mandates stated in the Refuge's establishing language, specifically, to ensure water quantity and quality, to conserve fish and wildlife populations and habitat in their natural diversity, and to provide opportunity for continued subsistence use by local residents. Further, understanding and monitoring the hydrological component of the Tetlin Refuge is mandated by the National Wildlife Refuge System Improvement Act. Monitoring the water resource component of the ecosystem helps achieve the primary biological goal that is to maintain the Refuge's existing ecological condition and to assure its continuing health. Habitat and biological projects on Tetlin NWR could be enhanced with available water temperature data.

Canada Lynx Dispersal, Space and Habitat Use Patterns During a Snowshoe Hare Population Cycle

Survey record: https://ecos.fws.gov/primr/survey/edit/8643

Products: https://ecos.fws.gov/ServCat/Reference/Profile/76371

Survey Coordinator: Brent Jamison (Wildlife Biologist)

Email: brent_jamison@fws.gov

Why is it important to conduct this survey? Collaborative research efforts among Alaska refuges, federal and state agencies, university researchers, and Canadian researchers should enable this study to reach a spatial scale large enough to determine whether lynx move in from Canada and across Alaska in a concerted pattern during the course of a snowshoe hare population cycle. Data from this project will help inform management decisions regarding habitat and space use, movement corridors, and connectivity of lynx populations throughout Alaska. This information may prove useful in the management of threatened lynx populations in the contiguous United States.

Moose Twinning Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/12552

Products: (No ServCat project record)

Survey Coordinator: Brent Jamison (Wildlife Biologist)

Email: brent_jamison@fws.gov

Why is it important to conduct this survey? The twinning rates of a moose population are used as an index of nutritional status of the cow moose. This in turn can be used to gain a better understanding of where the moose population is relative to the carrying capacity of the landscape. With this information, hunting regulations are adjusted to promote the health of the moose population on Tetlin NWR.

Waterfowl Banding - dabblers

Survey record: https://ecos.fws.gov/primr/survey/edit/12921

Products: (No ServCat project record)

Survey Coordinator: Brent Jamison (Wildlife Biologist)

Email: brent_jamison@fws.gov

Why is it important to conduct this survey? Adequate sample sizes are critical to the implementation of Adaptive Harvest Management. The Service and State of Alaska did not band an adequate number of mallards in 2014, which caused some challenges in using the AHM protocol to inform decisions about harvest regulations in 2015. The primary banding station in Alaska was at Minto Flats, which was flooded in 2014. This highlights the need to diversify and expand the banding effort across the landscape and among the States and Service and the importance of meeting minimum banding quotas annually. A review of recent (last 5 years) banding efforts indicate that minimum banding quotas have been met annually for each banding reference area, except Alaska. However, the number of mallards banded annually by Service-operated banding stations (i.e., under Service permits, but other cooperative partnerships to support banding may exist) has decreased to about 45 in Alaska (primarily Yukon Delta and Koyukuk NWRs). Banding data demonstrate the contribution of Tetlin to fall flight and the value of Tetlin as both breeding habitat and migration stopover. Birds are banded during August.

Wetland Mapping and Remote Sensing Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/12966

Products: (No ServCat project record)

Survey Coordinator: Brent Jamison (Wildlife Biologist)

Email: brent_jamison@fws.gov

Why is it important to conduct this survey? The status of wetland habitat on Tetlin NWR is critical to nearly all existing species assemblages on Tetlin NWR. High-quality wetland habitats support selected priority Resources of Concern (e.g., scaup and scoters). This survey will monitor changes in wetland size and type by analyzing time series of aerial imagery. These data will provide information on wetland health, serve as an indicator of changes in permafrost, and contribute to better understanding of system responses to climate change, thus guiding future-oriented management strategies.

Togiak

Monitoring river water temperature

Survey record: https://ecos.fws.gov/primr/survey/edit/371

Products: (No ServCat project record)

Survey Coordinator: Patrick Walsh (Supervisory Fish and Wildlife Biologist)

Email: patrick_walsh@fws.gov

Why is it important to conduct this survey? As stated in ANILCA, one purpose for which the Togiak National Wildlife Refuge was established and should be managed is to ensure water quality. Water quality, as defined by the Alaska Water Quality Standards 18AAC 70 includes temperature as a standard.

Monitoring walrus haulout use

Survey record: https://ecos.fws.gov/primr/survey/edit/377

Products: (No ServCat project record)

Survey Coordinator: Patrick Walsh (Supervisory Fish and Wildlife Biologist)

Email: patrick_walsh@fws.gov

Why is it important to conduct this survey? Pacific walrus were designated as a trust species under the management of the FWS in 1979. The FWS charged with maintaining a healthy population. This monitoring program addresses two objectives from the Pacific Walrus Conservation Plan: Determine and monitor the status and trends of the Pacific walrus population, and; Identify, protect, and monitor essential habitat of the Pacific walrus. Data from monitored haulouts on Togiak Refuge provide managers with information on a portion of the walrus population's use of the Bristol Bay area. Furthermore, monitoring walrus using Togiak Refuge haulouts relates directly to two of the Refuges' purposes: conserving fish and wildlife populations and habitats in their natural diversity; and providing the opportunity for continued subsistence uses by local residents.

Monitoring status of seabirds

Survey record: https://ecos.fws.gov/primr/survey/edit/381

Products: (No ServCat project record)

Survey Coordinator: Jannelle Trowbridge (Wildlife Biologist)

Email: jannelle_trowbridge@fws.gov

Why is it important to conduct this survey? Data are being collected annually for selected species of marine birds at breeding colonies in Alaska to monitor the condition of the marine ecosystem and to evaluate the conservation status of species under the trust of the U.S. Fish and Wildlife Service. Black-legged kittiwakes, common murres, and pelagic cormorants are long-lived species that serve as indicators of fluctuations in the marine environment. Kittiwakes feed on prey near the ocean surface, while murres and cormorants dive for prey. If adequate prey is not available either before or during the breeding season, breeding performance can be low. Because of their respective feeding strategies, kittiwakes are probably more sensitive than murres and cormorants to fluctuations in surface prey availability. Climatological factors and predation can also affect breeding performance. Additionally, human-induced disturbances can affect productivity and are especially critical during times of egg-laying, incubation, and chick rearing. At these times, disturbances may cause flushed adults to dislodge eggs or chicks and cause them to fall to their demise. As such, the Togiak Refuge has monitored the population and breeding performance of black-legged

kittiwakes, common murres, and pelagic cormorants from shore-based plots at Cape Peirce annually since 1984. Additionally, in 1990 and 2007, boat-based population surveys have been completed for the entire Cape Peirce area, including Shaiak Ilsland and Bird Rock.

Monitoring lichen status on Nushagak Peninsula

Survey record: https://ecos.fws.gov/primr/survey/edit/384

Products: (No ServCat project record)

Survey Coordinator: Andy Aderman (Wildlife Biologist)

Email: andy_aderman@fws.gov

Why is it important to conduct this survey? Continued monitoring of range conditions is essential in determining the number of caribou the Nushagak Peninsula is able to support. Maintaining a healthy and viable caribou population relates directly to two of the purposes for which Togiak Refuge was created; restoring large mammal populations and providing opportunities for continued subsistence uses by local residents. Title VIII of ANILCA §812 // 16 USC 3122 // provides "The Secretary, in cooperation with the State and other appropriate Federal agencies, shall undertake research on fish and wildlife and subsistence uses on the public lands; seek data from…" Furthermore, monitoring is critical to accomplishing the goals and objectives of the approved Nushagak Peninsula Caribou Management Plan (NPCMP 1994), a joint effort among the Service, ADF&G, and Nushagak Peninsula Caribou Planning Committee.

Monitoring lichen recovery on Hagemeister Island

Survey record: https://ecos.fws.gov/primr/survey/edit/390

Products: (No ServCat project record)

Survey Coordinator: Patrick Walsh (Supervisory Fish and Wildlife Biologist)

Email: patrick_walsh@fws.gov

Why is it important to conduct this survey? Hagemeister Island, managed by the U.S. Fish and Wildlife Service, is located in the southeastern Bering Sea. The predominant communities are shrub and tundra types, including tall shrub, low shrub tundra, lichen tundra, and low shrub meadow. These communities developed in the absence of ungulate grazers until 1965, at which time reindeer were introduced under a Bureau of Land Management grazing permit. The reindeer population grew from an initial introduction of 71 animals to over 1,000. Overgrazing was evident by 1973. A 1987 survey found damage to lichen sites but little impact to vascular plant-dominated sites. A 1992 survey measuring lichen utilization at 23 sampling sites found the virtual depletion of lichens on the primary lichen-dominated sites (which total approximately 57% of the island) and significant ecological damage on the remaining vascular-plant dominated sites. A dieoff of approximately 300 animals occurred in 1992 and the remaining animals were removed in 1992-1993.

There are over 14,000 lichen species described world-wide, and 3,600 species occur in North America. In a four-day survey, Talbot et. al. identified 63 lichen taxa on Hagemeister Island. Lichens are important in caribou and reindeer diets, particularly during wintertime. A number of lichen taxa that have been determined to be particularly important to reindeer and caribou include members of the principally ground-dwelling genera Cladonia, Cladina, Cetraria and Stereocaulon and the arboreal genera Alectoria, Evernia, and Usnea.

Relative to the majority of vascular plants, lichens are characterized by extremely low rates of growth. Swanson estimated that it would take 75-100 years for the depleted lichen communities on Hagemeister Island to recover in the complete absence of reindeer grazing. Other investigators have estimated that lichen community recovery in northern Alaska and Canada requires 120 - 250 years. As such, efforts to measure change in lichen communities at sampling intervals meaningful for vascular plants are unlikely to detect differences. Relatively long sampling intervals are necessary.

The Alaska Department of Fish and Game has monitored lichens in the Talkeetna Mountains of Alaska since 1955. This study used a combination of grazing exclosures and associated grazed plots to monitor percent cover of lichen taxa, lichen height, and range condition using categorical condition classes. Over a 27-year period, Lieb reported that preferred lichen species (Cladonia stellaris, C. arbuscula, C. rangiferina) protected from grazing increased from 8-24% in cover. All lichens, including the preferred species, increased from 8-30% in cover during the same period.

The only other long-term monitoring investigation which we are aware was the Klein study of lichen community recovery on St. Matthew Island, Alaska following destructive grazing by reindeer. Klein established a monitoring program for vegetation through a combination of point-intercept transects and meter-square quadrats. Lichens and other vegetation were measured in 1963 (at the time of the reindeer dieoff) and in 1985 after 22 years of virtually no grazing. He used a total of 12 point-intercept transects 100' long with measures made every 1 foot. The quadrats consisted of three groups of four 1 m square plots. Two plots in each group were grazing exclosures. Ground cover was mapped by species for cover and height. Twenty-two years after the die-off mosses had invaded large portions of the ground area denuded of lichens, and lichens had recovered to only 10% of the standing crop of living lichen biomass occurring on adjacent Hall Island where there was no grazing. Total lichen biomass averaged 35 g/m square.

There is a general lack of information in the technical literature on lichen community recovery rates after destructive grazing events. Thus, continuation of this habitat restoration project remains important. Monitoring the results of the reindeer removal will provide valuable information for land managers not just in the U.S. Fish and Wildlife Service, but throughout the tundra regions of the northern hemisphere.

Monitoring Mulchatna caribou

Survey record: https://ecos.fws.gov/primr/survey/edit/394

Products: (No ServCat project record)

Survey Coordinator: Andy Aderman (Wildlife Biologist)

Email: andy_aderman@fws.gov

Why is it important to conduct this survey? The monitoring program on and adjacent to Togiak Refuge is designed to detect changes in numbers, distribution and reproductive parameters of Mulchatna caribou. Continued monitoring of this herd is essential in developing regulatory proposals and recommendations to the Federal Subsistence Board and Board of Game and relates directly to two of the purposes for which Togiak Refuge was created; restoring large mammal populations and providing opportunities for continued subsistence uses by local residents.

Monitoring moose demographics and distribution

Survey record: https://ecos.fws.gov/primr/survey/edit/397

Products: (No ServCat project record)

Survey Coordinator: Andy Aderman (Wildlife Biologist)

Email: andy_aderman@fws.gov

Why is it important to conduct this survey? Continued monitoring of moose is essential in developing regulatory proposals and recommendations to the Federal Subsistence Board/Alaska Board of Game and relates directly to two of the purposes for which Togiak Refuge was created; restoring large mammal populations and providing opportunities for continued subsistence uses by local residents. Title VIII of ANILCA §812 // 16 USC 3122 // provides "The Secretary, in cooperation with the State and other appropriate Federal agencies, shall undertake research on fish and wildlife and subsistence uses on the public lands; seek data from, consult with and make use of, the special knowledge of local residents engaged in subsistence

uses; and make the results of such research available to the State, local and regional councils established by the Secretary or State pursuant to section 805, and appropriate persons or organizations". This study received a "High Priority" recommendation during the Togiak Refuge Biological Program Review in 2002 (Heglund and Taylor 2005). Monitoring moose population size (objective 1) is an ongoing effort that began in 1981 and is expected to continue indefinitely. The other objectives of this study are envisioned to occur until population growth stabilizes.

Monitoring Nushagak Peninsula caribou

Survey record: https://ecos.fws.gov/primr/survey/edit/398

Products: (No ServCat project record)

Survey Coordinator: Andy Aderman (Wildlife Biologist)

Email: andy_aderman@fws.gov

Why is it important to conduct this survey? Continued monitoring of caribou is essential in developing regulatory proposals and recommendations to the Federal Subsistence Board, as well as, the Alaska Board of Game and relates directly to two of the purposes for which Togiak NWR was created; 1) restoring large mammal populations and 2) providing opportunities for continued subsistence uses by local residents. Title VIII of ANILCA §812 // 16 USC 3122 // provides "The Secretary, in cooperation with the State and other appropriate Federal agencies, shall undertake research on fish and wildlife and subsistence uses on the public lands; seek data from, consult with and make use of, the special knowledge of local residents engaged in subsistence uses; and make the results of such research available to the State, local and regional councils established by the Secretary or State pursuant to section 805, and appropriate persons or organizations". This study received a "High Priority" recommendation during the Togiak NWR Biological Program Review in 2002 (Heglund and Taylor 2005).

The relationship of wolf and brown bear predation with moose population density and growth at Togiak National Wildlife Refuge and BLM Goodnews Block, Alaska

Survey record: https://ecos.fws.gov/primr/survey/edit/10338

Products: https://ecos.fws.gov/ServCat/Reference/Profile/130564

Survey Coordinator: Patrick Walsh (Supervisory Fish and Wildlife Biologist)

Email: patrick_walsh@fws.gov

Why is it important to conduct this survey? Concern that wolf and bear predation is negatively affecting the Togiak Refuge area moose population is regularly voiced during public meetings by Federal Subsistence Regional Advisory Councils, state Fish and Game State Advisory Committees, and members of local communities. These concerns periodically result in requests for predator control. In recent years, there has been an increasing reliance on predator control programs by the Alaska Board of Game in order to increase ungulate abundance. 2 This has increased the pressure on federal land managers to implement predator control, even though there are significant differences in management mandates between state and federal agencies. Regardless, information on predator/ungulate ecology becomes increasingly important for both state and federal land managers in order to support decisions on predator and ungulate management. This is particularly relevant in the case of Togiak Refuge and BLM Goodnews Block, where the moose population is growing, brown bears are moderately abundant, and the wolf population is probably growing.

Monitoring lake water temperature

Survey record: https://ecos.fws.gov/primr/survey/edit/12858

Products: https://ecos.fws.gov/ServCat/Reference/Profile/131389

Survey Coordinator: Patrick Walsh (Supervisory Fish and Wildlife Biologist)

Email: patrick_walsh@fws.gov

Why is it important to conduct this survey? (Not entered)

Yukon Flats

Waterbird - Correlation of bird presence with habitat covariates using occupancy models

Survey record: https://ecos.fws.gov/primr/survey/edit/82

Products: (No ServCat project record)

Survey Coordinator: Bryce Lake (Wildlife Biologist)

Email: bryce_lake@fws.gov

Why is it important to conduct this survey? Establishment of the Yukon Flats National Wildlife Refuge was based on the recognition that the tens of thousands of wetlands that occur across this broad, flat region of the Yukon River are critically important to a diversity of waterbirds (James G. King, pers. comm.). Recently, attention has been devoted to better understanding the hydrology of wetlands on the Refuge, providing the opportunity to link waterbird presence with wetland habitat, characterized by water chemistry. Such an effort is a priority of the recently completed Yukon Flats NWR biological review. Previously, Heglund (1992) and Heglund et al (1994) assessed relationships between habitat and waterbird counts, however sampling was spatially restricted and analyses did not account for inadequate detection of waterbirds. Relating habitat characteristics to species survey data is biased by the inability to always detect a species when present. Advances in models of species occupancy (MacKenzie et al. 2002), which explicitly account for inadequate species detection by using replicate surveys of sites, provide the opportunity to conduct a more rigorous and unbiased assessment of wetland and waterbird habitat relationships. Additionally, random sampling design on the landscape will allow for extrapolation of results in space and time, making the data applicable to management issues as they arise, such as exchanges of land.

Habitat - Wetland Inventory and Classification

Survey record: https://ecos.fws.gov/primr/survey/edit/218

Products: (No ServCat project record)

Survey Coordinator: Nikki Guldager (Wildlife Biologist (Airplane Pilot))

Email: nikki_guldager@fws.gov

Why is it important to conduct this survey? Yukon Flats is a uniquely diverse wetland system relative to other areas in interior Alaska. Previous work has identified a wide range of wetland conditions from freshwater herb bogs (ombrotrophic, low nutrient concentrations, few aquatic plants, and narrow littoral zones with a quick transition to terrestrial forest communities) to brackish sedge marshes (high nutrient concentrations, extensive aquatic plant communities, extensive littoral zones with gradual transitions to sweeping meadows), to the unique "trona" alkali wetlands (milky white, highly eutrophic and brackish wetlands void of aquatic vegetation, with adjacent deposits of sodium bicarbonate and meadow vegetation dominated by species adapted to such conditions) (Heglund 1992). This range of wetland conditions provides diverse habitats with varying importance to different species at different times of year.

Documenting and mapping these different wetland types is critical to identifying biologically important, rare, or threatened habitats. This inventory and mapping project is the first step in landscape scale waterbird habitat work and in defining the ecological roles of these wetlands. Wetlands inventory and mapping products will be used to determine bird habitat associations and to extrapolate wetland bird habitat information to the Refuge scale.

Knowledge of the distribution of these habitats and their ecological roles will be critical to making informed management decisions, such as realty transactions, land trades, access requests, fire management decisions, etc. Information will also be used as a baseline for detecting and documenting future wetland change.

Climate - Monitor snow depth on Yukon Flats using aerial markers

Survey record: https://ecos.fws.gov/primr/survey/edit/279

Products: (No ServCat project record)

Survey Coordinator: Nikki Guldager (Wildlife Biologist (Airplane Pilot))

Email: nikki_guldager@fws.gov

Why is it important to conduct this survey? Snow markers provide information on winter severity that is necessary to understand wildlife population trends and habitat use. Information is also valuable for monitoring long-term weather trends and hydrology that may be affected by climate change, as well as for predicting severity of fire seasons. Snow data are baseline information that aids in understanding ecosystem processes and contributes at both a local and statewide understanding.

Waterbird - Scoter/Scaup Population Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/292

Products: (No ServCat project record)

Survey Coordinator: Nikki Guldager (Wildlife Biologist (Airplane Pilot))

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Why is it important to conduct this survey? Scoters are the least studied of North American waterfowl, and little is known of their life history, ecology, and distribution. Additionally, a gradual decline in scoter populations has been documented (Mallek and Groves 2007). An annual scoter survey was initiated by Migratory Bird Management in 2000, with initial efforts (2000 – 2002) including within year replicates to assess temporal variability in estimates and distribution, and to identify optimum survey timing (Mallek 2002).

Scaup are of interest to the Refuge because of their declining population trends, coupled with the importance of Yukon Flats as breeding grounds for the population. Diving duck populations are not well estimated with the Continental waterfowl surveys (Mallek and Groves 2007) because it is timed to maximize detection of dabbling ducks. Beginning in 2002, scaup were included in annual scoter surveys. By including scaup in the Scoter survey we are able to monitor scaup populations at the appropriate time at no added cost or effort.

Surveys indicate that Yukon Flats is an important breeding area for Pacific loons (Gavia pacifica) (Groves et al. 1996, Lanctot and Quang 1992). Statewide aerial surveys indicate that Yukon Flats provides habitat for approximately 75% of boreal forest nesting Pacific Loons, and 8% of the Pacific Loons detected statewide. High densities of Pacific Loons on the Yukon Flats are more comparable to coastal tundra ecosystems than to other lower density boreal habitats (Groves et al. 1996). Yukon Flats may also be an important breeding area for common loons (G. immer) (Lanctot and Quang 1992), where approximately 18% of the estimated total number of common loons within a statewide study area occurred in Yukon Flats (Groves et al. 1996). Red-throated loons (G. stellata) also use the Refuge, but at very low densities.

Annual surveys provide species population estimates, and information on species distribution across the landscape of Yukon Flats. Additionally, location information can be analyzed relative to habitat characteristics and wetland type to understand habitat relationships and better predict distribution across the landscape. Population monitoring allows us to detect declines in trust species. Habitat information helps us to understand the value of our different wetlands to trust species, which aids in making informed management decisions, especially those related to realty transactions, access requests, and climate change. The Refuge is enormous, and future management issues are unpredictable in where and how big their footprint of impact will be on the landscape. This underlines the importance of having landscape scale information so as to provide us with maximum flexibility for response to future unforeseen issues.

Waterbird - Brood Production (targeting Lesser Scaup) Occupancy Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/2447

Products: (No ServCat project record)

Survey Coordinator: Bryce Lake (Wildlife Biologist)

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Why is it important to conduct this survey? Yukon Flats National Wildlife Refuge (YFNWR) encompasses approximately 36,400 km2 of boreal forest habitat in central Alaska. This habitat is interspersed with numerous wetlands that provide important habitat for breeding ducks including species of concern like Northern pintail (Anas acuta), lesser scaup (Aythya affinis), and black scoter (Melanitta nigra). These species have experienced substantial population declines over the last 30 years and represent a broad cross-section of life-history strategies. The United States Fish and Wildlife Service (FWS) is responsible for management of these species and YFNWR. Inventory and monitoring efforts are necessary for FWS to fulfill these commitments.
Although knowledge of the distribution and abundance of breeding duck pairs is a useful metric of population status, reproduction and survival rates ultimately determine the sustainability of populations. Reproductive success is highly important to duck populations and is often related to spatial and temporal variation in habitat conditions (Johnson 1992, Hoekman 2002). For managing these populations, a rigorous understanding of relationships between reproductive success and habitat is therefore valuable. Count surveys of broods (i.e., groups of flightless, young-of-the-year ducks) late in the breeding season can provide useful information about relationships between reproductive success and habitat conditions (Cowardin and Blohm 1992). Broods are difficult to detect, however, and detection rate of broods is often low and variable, which leads to problems with confounding between detection rate and abundance of broods in single-visit count surveys. Data collected under repeat-visit count survey designs can be used to separate detection rate from abundance, and using data from repeat-visit survey designs for learning about habitat relationships and abundance of broods has been made practical by recent developments in statistical software (MacKenzie et al. 2006, Royle and Dorazio 2008). These designs show considerable promise for resolving the primary challenge associated with assessment of brood abundance. Assessment and monitoring of the abundance of duck broods relative to habitat conditions among years has been identified as a priority information need by biologists at YFNWR. Although single-visit brood surveys have been conducted at YFNWR in the past, there is currently no operational monitoring of brood abundance on the refuge that allows annual estimation of abundance corrected for detection rate. We developed a survey protocol, sampling design, and analysis approach based on aerial, repeat-visit count surveys to waterbodies across the western Yukon Flats. Our primary objective was to define the survey parameters and then identify a sampling approach, sample size, and analysis that would lead to the best estimates of brood abundance.

Habitat - Non-native Invasive Plant Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/6453

Products: (No ServCat project record)

Survey Coordinator: Delia Vargas Kretsinger (Wildlife Biologist)

Email: delia_vargas_kretsinger@fws.gov

Why is it important to conduct this survey? Conducting non-native invasive plant surveys fulfills multiple policies and regulations of the National Wildlife Refuge System mission, the Service Mission and the refuge purposes stated above. Furthermore, the Refuge Improvement Act of 1997 (Public Law 105-57) directs the Service to (a) conserve plants and their habitats on National Wildlife Refuges and (b) to maintain biological diversity and integrity of plant communities. Among other purposes, the Service's Biological Integrity Policy (601 FW 3) also directs Refuges to assess biological diversity and integrity through baseline vegetation surveys and studies and this includes non-native invasive plants as well.

Water - Data log collection at 12 mile lake

Survey record: https://ecos.fws.gov/primr/survey/edit/6456

Products: (No ServCat project record)

Survey Coordinator: Mark Bertram (Wildlife Biologist)

Email: mark_bertram@fws.gov

Why is it important to conduct this survey? (Not entered)

Raptor - Bald Eagle Nest Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/6462

Products: (No ServCat project record)

Survey Coordinator: Nikki Guldager (Wildlife Biologist (Airplane Pilot))

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Why is it important to conduct this survey? Federal law (Federal Register: 50 Part 22) requires permits to disturb bald eagles. As management activities arise, such as requests for right-of-ways, special use permits, mining activities, land exchanges, etc., we are required to protect nests (active and inactive) and foraging sites. Currently, we do not have data to properly support such actions. Acquiring a database of active and inactive nests, and foraging sites, will allow us to mitigate impacts from requested management activities.

Furbearers and Snow - Monitoring using trail cams

Survey record: https://ecos.fws.gov/primr/survey/edit/6563

Products: https://ecos.fws.gov/ServCat/Reference/Profile/76431

Survey Coordinator: Bryce Lake (Wildlife Biologist)

Email: bryce_lake@fws.gov

Why is it important to conduct this survey? Local residents of the Yukon Flats NWR continue to rely on furbearer trapping as a source of income. Additional trapping occurs by residents of communities outside of the Refuge, such as Fairbanks. Currently, no monitoring of furbearers (except sporadic monitoring of wolves) occurs on the Yukon Flats to inform management. This survey would document the population fluctuations of furbearers (rise and fall) and this information could be used to inform the subsequent season's trapping regulations, such as season length and bag limit. In addition, relationships between habitat and furbearers could be established. Such relationships are lacking at present.

Movement patterns and dispersal behavior of lynx in relation to snowshoe hare abundance in Interior Alaska

Survey record: https://ecos.fws.gov/primr/survey/edit/7219

Products: https://ecos.fws.gov/ServCat/Reference/Profile/96062

Survey Coordinator: Mark Bertram (Wildlife Biologist)

Email: mark_bertram@fws.gov

Why is it important to conduct this survey? Snowshoe hares are keystone species in the boreal forest upon which many species, such as lynx, are reliant. Since lynx are heavily sought after by subsistence users

and their populations in the lower 48 states are threatened, lynx are one of the most important furbearers to monitor in Alaska and North America. An understanding of hare/lynx relationships will offer managers a better understanding of how to manage both lynx and hare and their habitat at the local, national, and continental scale.

Getting the most value from our existing arctic snow measurement networks (SnowNet-III)

Survey record: https://ecos.fws.gov/primr/survey/edit/7220

Products: (No ServCat project record)

Survey Coordinator: Mark Bertram (Wildlife Biologist)

Email: mark_bertram@fws.gov

Why is it important to conduct this survey? Snow has a profound impact on human and natural ecosystems in the North. This proposed work is part of a snow monitoring network that extends across northern Alaska and into Canada. It is also supportive of ongoing refuge snow monitoring.

Assessing LandCarbon in the Yukon Flats Basin

Survey record: https://ecos.fws.gov/primr/survey/edit/7221

Products: (No ServCat project record)

Survey Coordinator: Mark Bertram (Wildlife Biologist)

Email: mark_bertram@fws.gov

Why is it important to conduct this survey? Public lands in Alaska have not identified carbon sequestration as a priority ecosystem service. Maintaining carbon sequestration in boreal vegetation and soils complements key Refuge management objectives and can inform decision making on Refuge lands, including future land trades, managing habitat for subsistence and trust species and fire management.

Non-native Invasive Plant Control and Monitoring

Survey record: https://ecos.fws.gov/primr/survey/edit/7424

Products: (No ServCat project record)

Survey Coordinator: Delia Vargas Kretsinger (Wildlife Biologist)

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Why is it important to conduct this survey? Monitoring non-native invasive plant populations fulfills multiple policies and regulations of the National Wildlife Refuge System mission, the Service Mission and the refuge purposes stated above. Furthermore, the Refuge Improvement Act of 1997 (Public Law 105-57) directs the Service to (a) conserve plants and their habitats on National Wildlife Refuges and (b) to maintain biological diversity and integrity of plant communities. Among other purposes, the Service's Biological Integrity Policy (601 FW 3) also directs Refuges to assess biological diversity and integrity through baseline vegetation surveys and studies and this includes non-native invasive plants as well.

Native Plant Survey

Survey record: https://ecos.fws.gov/primr/survey/edit/7425

Products: (No ServCat project record)

Survey Coordinator: Delia Vargas Kretsinger (Wildlife Biologist)

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Why is it important to conduct this survey? Conducting native plant surveys fulfills multiple mandates of the National Wildlife Refuge System mission, the Service Mission and the refuge purposes stated above. Furthermore, the Refuge Improvement Act of 1997 (Public Law 105-57) directs the Service to (a) conserve plants and their habitats on National Wildlife Refuges and (b) to maintain biological diversity and integrity of plant communities. Among other purposes, the Service's Biological Integrity Policy (601 FW 3) also directs Refuges to assess biological diversity and integrity through baseline vegetation surveys and studies.

Session Info

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