U.S. Fish and Wildlife Service
U.S. Department of the Interior

National Wildlife Refuge System

Alaska Landbird Monitoring Survey

Alaska Regional Protocol Framework for Monitoring Landbirds Using Point Counts

Version 1.1 **May 2021**

ON THE COVER
Orange-crowned Warbler (*Leiothlypis celata*) population size increased by 6% per year from 2003–2015 in the North Pacific Rainforest BCR, Alaska (Handel and Sauer 2017). Photograph by: Zachary Pohlen, USFWS, Migratory Bird Management. Public domain.

NWRS Protocol Signature Page

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<tr><td colspan="2">Protocol Title: Alaska Landbird Monitoring Survey: Alaska Regional Protocol Framework for Monitoring Landbirds Using Point Counts
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<tr><td>Station Name: Alaska IR11, National Wildlife Refuge System, Inventory & Monitoring Program; Migratory Bird Management</td><td>Authors and Affiliations
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Approvals

Action	Appropriate Signature/Name and Date
Survey Coordinator[2] Submitted by:	
Zone I&M[3] or equivalent Approval:	
Regional I&M[4] Approval:	Kristin DuBour, Zone Wildlife Biologist, Alaska Region
National I&M[5] Approval:	

Version[1]	Date	Author	Change Made	Reason for Change
1.0	5/24/2021	S. Matsuoka		
1.1	10/30/2023	S. Matsuoka	Hyperlinks updated	Hyperlinks broken or outdated

[1] Version is a decimal number with the number left of decimal place indicating the number of times this protocol has been approved (e.g., first approved version is 1.0.; prior to first approval all versions are 0.*x*; after first approval, all minor changes are indicated as version 1. *x* until the second approval and signature, which establishes version 2.0, and so on).
[2] Signature of station representative designated lead in development of a site-specific survey protocol.
[3] Signature signifies approval of a site-specific survey protocol.
[4] Signature by Regional I&M Coordinator or Natural Resources Division Chief signifies approval of a protocol framework to be used at multiple stations within a Region.
[5] Signature by National I&M Coordinator signifies approval of a protocol used at multiple stations from two or more Regions.

Survey Protocol Summary

Alaska provides habitat for 143 species of landbirds that occur regularly in the state, about half of which breed predominantly north of the border between the contiguous United States and Canada. The road-based North American Breeding Bird Survey (BBS) provides some data on population trends in Alaska, but most northern populations are inadequately monitored by this program because of a paucity of roads. To remedy this deficiency, Boreal Partners in Flight developed the Alaska Landbird Monitoring Survey (ALMS) to monitor breeding populations of landbirds in off-road areas of Alaska in tandem with data collected from the roadside BBS. The primary objective of ALMS is to monitor long-term population trends of landbirds and other species that can be monitored by diurnal point counts during the breeding season, including many shorebirds and aquatic birds. A secondary objective is to estimate landbird densities by habitat, which can be used to model avian distribution and abundance across Alaska. ALMS is a collaborative program whereby agencies and other entities conduct standardized surveys of breeding birds and their habitats on the lands they manage and then contribute the data to the U.S. Geological Survey Alaska Science Center for storage and analysis.

The short-term implementation goal of ALMS is to monitor birds systematically within each of 100 randomly selected survey blocks, thereby matching the number of BBS surveys conducted in each of Alaska's five Bird Conservation Regions (BCRs). Each block has a mini-grid of 15−25 points that are surveyed biennially, with half of the blocks surveyed in alternating years. Survey blocks are stratified by accessibility and cost-effectiveness. Refuges may opt to limit sites to those accessible by foot, vehicle, boat, or fixed-wing aircraft, as these can be surveyed more inexpensively and reliably over time. Observers survey each point within a survey block for birds using a 10-min point count once per summer on a biennial basis. They collect corresponding habitat data during the first visit and at subsequent 10-year intervals or whenever a disturbance (e.g., fire, wind) has caused a significant change. USGS analyzes ALMS data jointly with BBS data to test for differences between off-road and roadside areas and to increase power to detect statewide trends. Additional blocks can be surveyed in areas that are more difficult and expensive to access as resources become available in the future. Long-term monitoring enables detection of change in bird populations in relation to fire, disease and insect damage, resource development, climate-related change, and other landscape-level disturbances across Alaska. Results from ALMS can also help prioritize conservation and research towards species before they become endangered and require expensive recovery programs.

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Many dedicated biologists have conducted ALMS surveys across the wilds of Alaska, and their efforts and advice have greatly helped us develop and refine these protocols. Biologists shown here include, clockwise from upper left, Jaime Welfelt (Alaska Peninsula/Becharof NWR), Zak Pohlen (FWS Migratory Bird Management), Deb Rudis (FWS Juneau Field Office), Stuart Fety (Alaska Peninsula/Becharof NWR), Callie Gesmundo (FWS Migratory Bird Management), and Gwen Baluss (Tongass National Forest).

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Narrative

Element 1: Introduction

Background

This Regional Protocol Framework (framework) is a standardized tool for monitoring trends in landbird populations breeding across Alaska using point-count surveys conducted as part of the Alaska Landbird Monitoring Survey (ALMS). The prescribed surveys are most appropriate for estimating annual changes in the population sizes of songbirds and other small landbirds (e.g., hummingbirds, woodpeckers) within all ecoregions of Alaska. The surveys also gather valuable data on the abundance, occurrence, and population trends of other species of birds, particularly loons, grebes, shorebirds, jaegers, gulls, and grouse (Handel and Sauer 2017). This framework describes the overall survey design and methods used across National Wildlife Refuges in Alaska (Refuges). Site Specific Protocols (SSP) containing information about local logistics and access can be developed for individual Refuge field stations and added to this framework as appendices. Although ALMS is designed for statewide and regional inference, sampling described in this framework can be intensified at smaller spatial scales to meet the inventory or monitoring goals for an individual Refuge field station (Savage et al. 2018).

Much of the text in this framework was taken verbatim from the initial survey instructions, *Alaska Landbird Monitoring Survey: Protocol for Setting Up and Conducting Point Count Surveys* (Handel and Cady 2004), but we have reorganized and updated some of the information to meet the protocol guidelines of the National Wildlife Refuges System Inventory and Monitoring Program. The survey instructions for ALMS (Handel and Cady 2004) address the substantial challenges of surveying birds across vast, roadless landscapes, and have been used extensively to implement surveys on National Forest, Refuge, and other public lands since the instructions were first tested in 2003. The current framework also draws guidance from the *National Protocol Framework for the Inventory and Monitoring of Breeding Landbirds Using Point Counts* (Knutson et al. 2016), which is a comprehensive guide approved by the National Wildlife Refuge System for designing, conducting, and managing data from local-scale point-count surveys across the U.S.

ALMS is a statewide cooperative monitoring program whereby state and federal agencies conduct standardized surveys of breeding birds in off-road areas on the public lands they manage, and then submit their data to the U.S. Geological Survey (USGS) Alaska Science Center for centralized storage and analysis. This long-term monitoring program has enabled analysis of change in bird populations at the regional level in Alaska (Handel and Sauer 2017) and will allow population trends to be further analyzed relative to fire, forest disease and insect damage, resource development, climate-driven environmental change, and other landscape-level disturbances across the state. The program was developed by the USGS in cooperation with Boreal Partners in Flight to address the large gap in bird surveys that exists throughout Alaska. Northern regions of the continent lack the roads and volunteer observers needed for roadside North American Breeding Bird Surveys (BBS), the continent's most comprehensive survey of breeding birds (Bart et al. 2004, Dunn et al. 2005, Sauer et al. 2013, 2017). ALMS fills this gap in Alaska by surveying birds across the state in the off-road areas that constitute the majority of the state (Figure 1.1). Data from ALMS are analyzed jointly with roadside BBS data to compare regional and statewide trends in off-road versus roadside habitats in Alaska and to increase precision of trends when they are congruent between the two surveys (Handel and Sauer 2017). The program is broadly endorsed through a memorandum of understanding signed in 2010 by the Alaska Department of Fish and Game, Alaska Natural Heritage Program, Audubon Alaska, Bureau of Land Management, National Park Service (NPS), USGS, U.S. Forest Service, and U.S. Fish and Wildlife Service (FWS).

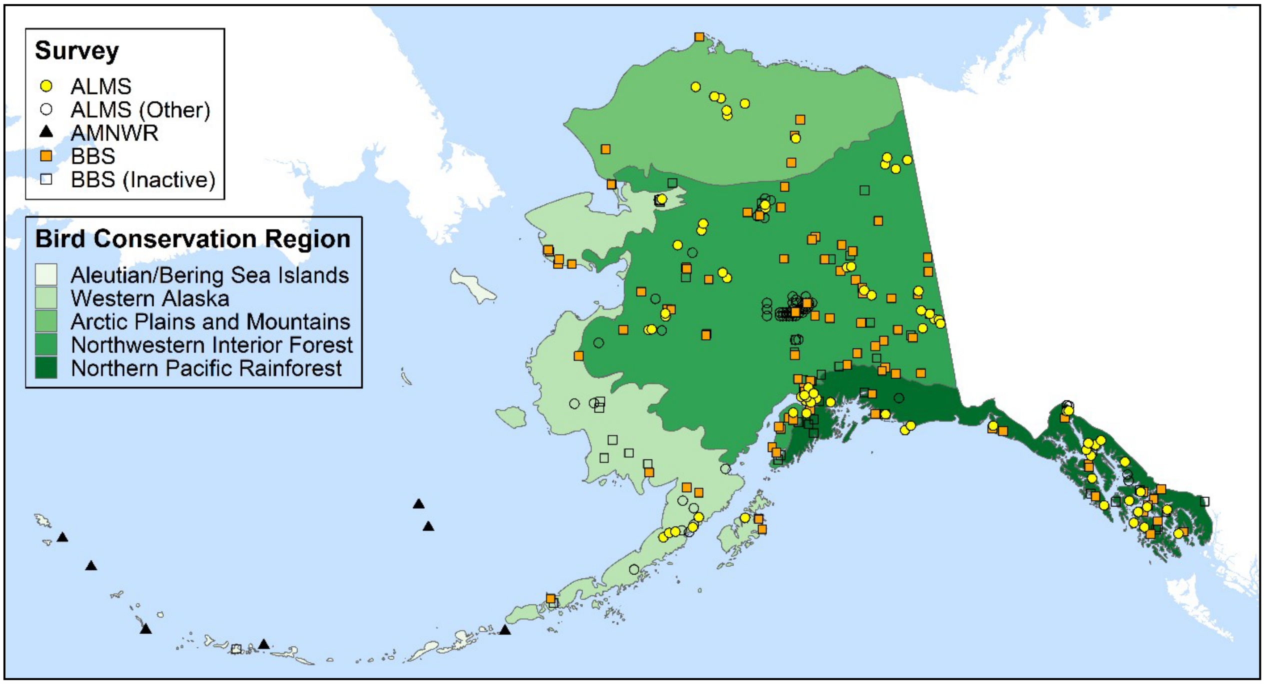

Figure 1.1. Locations of blocks and routes surveyed as part of the Alaska Landbird Monitoring Survey (ALMS), North American Breeding Bird Survey (BBS), and the Alaska Maritime National Wildlife Refuge (AMNWR) monitoring program in relation to Bird Conservation Regions (U.S. NABCI 2000) within Alaska. Solid markers are blocks and routes regularly surveyed for long-term bird population trends. Open markers show blocks and routes that have been surveyed irregularly or dropped (Other, Inactive).

Currently (2020), the ALMS protocol calls for surveying bird populations across a stratified-random sample of off-road sites that can be reliably and affordably accessed within each participating management unit. Additional blocks, however, can be surveyed in areas that are more difficult and expensive to access as resources become available.

Objectives

The primary objective of ALMS is to determine the status and trends of landbird populations across Alaska and in each of the five Bird Conservation Regions (BCR; U.S. NABCI Committee 2000) within the state. The specific management and sampling objectives for ALMS are as follows.

Estimate population change over time—

- Management objective: Estimate annual rates of change in breeding population sizes for landbird species that breed commonly to uncommonly in Alaska.

- Sampling objective: 90% confidence in detecting a 50% decrease in a landbird species' breeding population size over a 25-year period (average of 3% decline per year), with a 10% probability of falsely identifying a population decline.

To meet these objectives, USGS analyzes data from ALMS jointly with BBS data every 5 years to (1) quantify differences in trends between off-road and roadside areas and (2) increase precision in statewide and regional trend estimates (Handel and Sauer 2017). This analysis helps identify declining species most in need of conservation as well as broader ecological issues that may require further investigation. For example, BBS estimates of long-term declines in aerial insectivorous birds (e.g., swallows, swifts, nightjars, and flycatchers) have resulted in several species being listed as Threatened under Canada's Species-at-Risk Act, including Barn Swallow (*Hirundo rustica*), Bank Swallow (*Riparia riparia*), and Olive-sided Flycatcher (*Contopus cooperi*; COSEWIC 2008, 2011, 2013), all of which range into Alaska where they show similar declines (Handel and Sauer 2017, Sauer et al. 2017). These declines point to underlying changes in climate, habitats, or aerial insect prey over large parts of these species' ranges (Nebel et al. 2010, Smith et al. 2015, Michel et al. 2016). Given the large potential for species to shift their ranges northward and higher in elevation with projected changes in future climates (Stralberg et al. 2015b, 2017), broad-scale, long-term monitoring programs like ALMS will be important in tracking how bird populations adapt to climate-mediated landscape changes across Alaska (Mizel et al. 2016, Handel and Sauer 2017).

Develop predictive models of distribution and abundance—

- Management objective: Identify important geographic areas, terrain features, and habitats supporting high breeding densities of landbirds across Alaska.
- Sampling objective: To develop spatial models that predict breeding density of landbirds across Alaska using environmental covariates such as habitat, topography, climatic factors, and disturbance. We will use these models to develop predictive maps of current avian density across Refuges, BCRs, or the state.

To meet these objectives, ALMS data will be analyzed, possibly in conjunction with other point-count datasets collected using similar methods (e.g., NPS inventories, Amundson et al. 2018), to (1) develop spatially explicit models of current avian breeding density and then (2) map the resulting model predictions at BCR or statewide scales. We will use statistical tools such as cross-validation, Akaike's Information Criterion, and area under the receiver-operating characteristic curve to evaluate competing models, with the tool selected based on the primary intent of the model (Mouton et al. 2010, Glisson et al. 2017). In addition to identifying important habitats and geographic areas, these predictive models can be used to address a variety of other management questions. For example, the mapped predictions of landbird abundance can be summed across landscapes to estimate population size by Refuge, agency, or BCR. These can then be used to determine stewardship responsibilities of Refuges relative to other public or private lands (e.g., U.S. NABCI Committee 2011, La Sorte et al. 2015). These predictive models can also be used to (1) monitor shifts in species' distributions over time (Mizel et al. 2016), (2) simulate how bird populations might respond to future scenarios of climate or land use change (Mahon et al. 2014, Stralberg et al. 2015b, 2017, Bateman et al 2020), or (3) identify areas likely to become climate-change refugia and therefore important for species' persistence and adaptive migrations (Stralberg et al. 2015a, 2018, 2020, Morelli et al. 2016).

Element 2: Sampling Design

Sampling frame, sample units, and sample size

The ALMS sampling design estimates long-term mean annual rates of change in population size for landbirds at the state-wide and BCR scales. Landbirds are the target species for monitoring by ALMS. Point-count surveys detect predominantly males giving vocal or non-vocal auditory cues, which typically constitute >90% of the birds recorded (Simons et al. 2007, Sólymos et al. 2013). The protocol is therefore particularly appropriate for songbirds, but many other common species with vocal or non-vocal auditory displays such as grouse, woodpeckers, hummingbirds, and shorebirds are also adequately monitored (Handel and Sauer 2017).

The ALMS sampling frame includes all state and federal lands within Alaska for which there is a mandate to manage wildlife and other natural resources, which together comprise about 70% of the state (Handel 2000). Potential sample units are defined by a grid of 10-km × 10-km blocks aligned with the Alaska−Canada border (141° W) and overlain across the entire state, excluding the Aleutian and Bering Sea islands (BCR 1) because of their remoteness and difficulty of access. Each block has been assigned a unique number and a random order within the sampling frame. A random sample of blocks, stratified by BCR, was selected across state and federal lands to meet the initial goal of establishing surveys on 100 blocks across Alaska with geographical emphasis in BCRs 4 and 5, where landbird communities are most diverse. Allocations to specific land management units were based on relative area within each BCR, and half of the selected blocks are on Refuges (Tables 2.1 and 2.2). Blocks are surveyed in alternating years such that half of the blocks are surveyed during odd years and half during even years (Handel and Cady 2004).

Table 2.1. Target number of survey blocks for the Alaska Landbird Monitoring Survey by Bird Conservation Region (BCR), including the number of selected blocks for National Wildlife Refuges. Each block is scheduled to be surveyed biennially, with half of the blocks surveyed during alternating years.

		# of Survey Blocks	
BCR	**BCR Name**	**Target**	**Refuges**
1	Aleutian/Bering Sea Islands	7	7
2	Western Alaska	17	14
3	Arctic Plains and Mountains	6	1
4	Northwestern Interior Forest	45	28
5	Northern Pacific Rainforest	25	0
	Total	100	50

The target sample size of 100 blocks roughly matches the survey effort by the BBS in Alaska and was chosen based on an analysis of pilot data, which suggested that 45 species, including many species of concern, would be encountered on ≥14 blocks (C. M. Handel, unpublished data). This target of 14 blocks with a species' occurrence is the threshold for achieving 90% power to detect a 3% mean annual decline over 25 years (C. M. Handel, unpublished data), and 14 routes is generally considered the minimum sample size for estimating BBS trends with acceptable precision (Sauer et al. 2003). With samples of 100 BBS routes and 100 ALMS blocks, species coverage may be even greater. In a recent analysis, 69 species in BCR 4 and 51 species in BCR 5 (84 species combined) were encountered on at least 14 BBS survey routes from 1993–2015, and regional population trends could be estimated from the ALMS surveys for 31 species over only a 13-year period with a total of 44 blocks in BCR 4 and 28 blocks in BCR 5 (Handel and Sauer 2017).

The ALMS sampling frame has been divided into two strata—accessible and difficult—and initial surveys have been confined to the first stratum. The accessible stratum is defined as those survey blocks with at least 1 of the 25 survey points located within 1 km of an area accessible by foot, vehicle, boat, fixed-wing aircraft, or other access (such as helicopter) deemed acceptable for long-term use by the management agency (Figure Standard Operating Procedure [SOP]-1.1). Field station staff should work with the USGS to identify accessible survey blocks that can be surveyed reliably and less expensively than those requiring helicopter charters (see SOP 1). Survey coverage and inference are therefore currently limited to accessible areas (Handel and Sauer 2017). Additional periodic sampling in the difficult stratum will help test whether estimates of density and population trends are different between accessible and difficult strata. The difficult stratum may be sampled at a lower intensity than the accessible stratum in the future as funds become available.

Table 2.2. Proposed sample allocation by Bird Conservation Region (BCR) and National Wildlife Refuge (NWR) for the Alaska Landbird Monitoring Survey.

BCR / Land Management Unit	Number of Blocks	BCR / Land Management Unit	Number of Blocks
BCR 1: Aleutian/Bering Sea Islands		*BCR 4: Northwestern Interior Forest*	
Alaska Maritime NWR	7	Arctic NWR	5
BCR 2: Western Alaska		Innoko NWR	4
Alaska Peninsula NWR	3	Kanuti NWR	2
Becharof NWR	1	Kenai NWR	2
Izembek NWR	1	Koyukuk NWR	3
Kodiak NWR	1	Nowitna NWR	2
Selawik NWR	1	Selawik NWR	1
Togiak NWR	3	Tetlin NWR	1
Yukon Delta NWR	4	Yukon Delta NWR	2
BCR 3: Arctic Plains and Mountains		Yukon Flats NWR	6
Arctic NWR	1		

Currently (2020), ALMS surveys have not yet been established in all BCRs in Alaska and additional survey blocks in unsampled BCRs will be added to the program as funding and willing participants allow. BCR 4 (Northwestern Interior Forest) and BCR 5 (Northern Pacific Rainforest) were initially targeted for sampling because landbird abundance and species richness are highest in these regions. Establishing ALMS surveys in BCR 2 (Western Alaska) and BCR 3 (Arctic Plains and Mountains) is of primary interest because of the large predicted climate-mediated changes to landscapes and avifauna in these regions (Liebezeit et al. 2012, Reynolds and Wiggins 2012, Marcot et al. 2015). Surveys within the boreal−Arctic transition zones of BCRs 2 and 3 would be particularly useful for monitoring boreal species as they expand their ranges in concert with the advancement of tall shrubs and forests into the Arctic with continued warming (Thompson et al. 2016). In BCR 1 (Aleutian and Bering Sea Islands), 7 nonrandomly selected point-count routes (each with 12 points) have been surveyed in the past (2003−2010) as time and expertise allowed near seabird colonies regularly monitored by the Alaska Maritime National Wildlife Refuge. Replicating these established surveys and/or adding surveys in BCR 1 would facilitate monitoring of the many endemic subspecies of landbirds breeding in the region (Alaska Department of Fish and Game 2015, Aleutian and Bering Sea Islands Landscape Conservation Cooperative 2016).

Individual Refuges may also wish to undertake additional surveys to address Refuge-specific inventory or monitoring objectives (Knutson et al. 2016:29–36, Savage et al. 2018) and are encouraged to consult with USGS Alaska Science Center scientists for guidance on developing a sampling design. Such undertakings are supported and can contribute to the regional and statewide assessments of avian distribution, habitat associations, and population trends. The objectives for these Refuge-specific monitoring efforts should be documented and added to the Appendix of this protocol framework if compatible sampling designs and survey methods are adopted in consultation with USGS. If such inventory surveys are replicated, even at irregular and long time-intervals, they can be incorporated into regional and statewide analyses of population trends, thereby increasing the geographic scope of inference and the precision of estimated trends.

Survey locations within selected sample units

Within each 10-km × 10-km block, birds are surveyed on a 5 × 5 mini-grid of 25 point-count stations. The southwestern-most point-count station is the starting point for the mini-grid and has been offset from the corner of the block by a random distance and bearing (Handel and Sauer 2017). This starting point is in the same relative position within every block, resulting in a randomly shifted mini-grid of survey points (Figure SOP-1.2). Within each mini-grid, sampling points are spaced 250 m apart in closed, forested habitats (mostly in BCR 5) and 500 m apart in more open habitats to minimize travel distance between points while also minimizing double-counting of individual birds (Handel and Cady 2004, Handel and Sauer 2017). Within the sampling frame, blocks are considered suitable candidates for surveying only if at least 15 of the 25 points occur in breeding bird habitats that are safe to survey. To define this, points within the candidate blocks are compared against GIS data on glaciers, waterbodies, and topography. Points that fall in the ocean, in the middle of large lakes or rivers, or on glaciers or icefields are not considered breeding bird habitat and are therefore not surveyed. Points on cliffs, extremely steep slopes, or other areas are considered unsafe to survey, but these points are considered breeding bird habitat for analytical purposes (Handel and Cady 2004).

Survey timing and schedule

Each mini-grid is surveyed for breeding birds on a single occasion on a biennial basis. Habitat data are collected during the first year surveyed and then every 10 years, or when significant habitat change has been observed. Habitat data are collected on the same trip as the bird surveys. Most surveys are conducted between 10 June and 30 June to ensure that all migrant species have arrived and to optimize detectability among the community of landbirds breeding at high latitudes (Handel and Sauer 2017). Surveys can be conducted as early as 25 May in the Aleutian Islands, Prince William Sound, and southeastern Alaska. Early July corresponds with the fledgling period for most species in Alaska and should be avoided as a survey period. The ideal survey period is when detection of breeding birds is consistent across years and when resident and late-arriving migrant species can be readily detected on breeding territories. A date as near as possible to the previous survey's date is preferable to minimize nuisance variation in detection probability due to changes in the dates of the surveys. While the peak singing periods can change each year and might advance in response to climate warming (Mizel et al. 2017), such changes in the timing of singing can be accounted for with a time-removal model of the singing rate and appropriate temporal covariates (Amundson et al. 2014, Thompson et al. 2017, Sólymos et al. 2018). To accommodate logistical challenges in remote field settings, analytical methods can be used to account for sampling variation when points within a block are subdivided and then surveyed by different observers during a given year (Handel and Sauer 2017).

Sources of bias and error

The sampling design, methods, and observer requirements of ALMS were selected to minimize several sources of uncertainty in estimates of avian abundance and population trends, which include incomplete coverage, sampling birds outside of the breeding season, bias from incomplete detection probabilities, and errors in collecting or managing field data (Johnson 2008, Nichols et al. 2009, Simons et al. 2009). Survey coverage is currently limited to areas that are reasonably accessible, primarily by foot, fixed-wing aircraft, vehicle, or boat. This bias in coverage likely leads to (1) good survey coverage of low-lying riparian areas, which are often used as access points and have high songbird abundance and diversity; and (2) poor survey coverage of high elevation areas, which often require helicopter access and have low songbird abundance and diversity (Handel et al. 2009). Survey blocks with access from roads or trails may also have higher levels of human disturbance such as oil and gas development or timber harvest. To the extent that these or other similar factors influence annual changes in population size, estimates of population trends from this reduced sampling frame could be biased.

ALMS protocols limit the dates, times of day, weather conditions, and levels of background noise when surveys are conducted to minimize sampling birds when detectability is low or during migration. Despite these protocol controls, detection probabilities can still vary considerably among species, observers, and survey conditions. ALMS therefore addresses three of the following four probabilities whose product defines the probability of detecting a given bird in some large area of interest during a survey: (1) the sample unit overlaps the bird's territory (sampling), (2) the bird is present in the portion of its territory exposed to sampling (presence), (3) the bird is giving cues and therefore available for detection given its presence (availability), and (4) the bird is detected by the observer during the survey given its presence and availability (perceptibility; Nichols et al. 2009). By addressing probabilities for sampling, availability, and perceptibility and meeting assumptions of the analytical models, analysis of ALMS data can provide unbiased estimates of breeding density, population size, and population trend within the sampling frame, thus accomplishing the stated objectives of the program.

The ALMS sampling design addresses the probability of sampling through the random selection of blocks, the primary sampling units, and the random location of points within blocks, the secondary sampling units. The ALMS protocol also includes the collection of ancillary data on the time and distance intervals in which each bird is first detected during surveys to address the probability of availability and perceptibility, respectively. The time-to-detection data are analyzed with a time-removal model (Farnsworth et al. 2002, Alldredge et al. 2007a, Amundson et al. 2014) to estimate the singing rate for each species, which is then used to calculate the probability of availability, given presence. Covariates for time of day and day of year are included to control for temporal variability in singing rates. The distance data are analyzed using distance sampling methods (Buckland et al. 2001) to estimate probability of perception, which defines the effective area sampled and thereby links the survey counts to estimates of breeding density. Covariates for weather, observer, and habitat can be included in the distance models to control for these important influences on perceptibility (Amundson et al. 2014, Handel and Sauer 2017).

The probability of presence is not estimated using ALMS data and thus the current analyses assume the population is closed (Amundson et al. 2014, Handel and Sauer 2017). Multiple visits to points within a given temporal period of interest (e.g., the breeding season) are traditionally required to estimate this probability of presence using an N-mixture model of the superpopulation size (Royle 2004, Schmidt et al. 2013), an occupancy model of site occupancy (McKenzie et al. 2006), or an open population model of population size that relaxes the closure assumptions of removal and distance sampling models (Chandler et al. 2011). The single-visit design was chosen for ALMS because it provides estimates of seasonal density across the sampled landscape and is a less expensive and a more statistically efficient design for sampling remote areas than a multiple-visit design. If desired, however, occupancy probability can be estimated from ALMS surveys with only a single visit because ALMS data meet the following conditions (Lele et al. 2012, Sólymos and Lele 2016, Peach et al. 2017): (1) there is at least one numeric covariate that affects probability of detection and probability of occupancy (e.g., habitat data, weather, time of day, day of year) and (2) the sets of covariates explaining detection and occupancy differ by at least one covariate (e.g., distance explains detection but not occupancy).

Errors can also occur in both the collection and management of survey data, including misidentifying species, double-counting birds, recording two birds as one, recording birds in the wrong time or distance intervals, and making mistakes while entering data into computers (Simons et al. 2009). The ALMS protocol recommends hiring highly skilled observers, training them in data collection protocols, and providing them periodic feedback (see Element 6), all of which have been found to reduce errors when conducting point counts (Simons et al. 2009). Estimating distances to aurally detected birds can be particularly challenging, especially beyond 50 m and in densely vegetated habitats (Alldredge et al. 2007b). In addition to training, the ALMS protocol aims to reduce these errors by recording bird locations in binned distance bands rather than as exact distances, using laser range-finders to estimate distances to birds, and further binning distance bands and truncating distant observations during analyses (Amundson et al. 2014, 2018).

Element 3: Data Collection and Processing

Pre-survey logistics and preparation

Planning for field work should begin at least 6 months in advance of conducting the surveys. The earliest priorities will be to identify survey blocks to be sampled (joint FWS and USGS responsibility) and to hire temporary staff (FWS responsibility, Table 7.3).

A survey coordinator with FWS Migratory Bird Management (MBM) leads all aspects of the surveys conducted by roving crews visiting multiple Refuge field stations across the state. The survey coordinator is supervised by the MBM Landbird Coordinator. If an individual Refuge field station or group of stations is conducting the surveys independently of MBM (e.g., Alaska

Peninsula NWR, Kenai NWR), then that field station will need a separate survey coordinator to lead the surveys. Technicians and volunteers are recruited, with the hiring process started at least six months prior to the field season to help recruit the best qualified candidates (see Element 7). Safety and scientific training should begin at least one-month prior to data collection (see Element 6). Equipment and supplies will need to be purchased and checked for operability prior to field work. Permits for access on or through private, tribal, or public lands need to be obtained well in advance of surveys. Flight scheduling and contracts need to be initiated by spring as well. A safety plan must be filed with the station and other offices involved (e.g., Migratory Birds or Refuge Inventory and Monitoring (I&M) Regional Office). See the Supplemental Materials (SM) for an equipment list (SM 3) and template safety plan (SM 4).

Establishment of sampling units

SOP 1 and 2 provide complete instructions on numbering, establishing, and relocating survey points. GPS coordinates for preselected points are provided by the USGS, but the locations should be checked for feasibility of sampling (1) prior to going in the field using a GIS and then (2) in the field by visiting the points prior to conducting the surveys, if possible. Before going to the field, the points should be plotted in a GIS against high resolution aerial or satellite imagery, such as ESRI World Imagery (ESRI 2020). The goal of the office and field feasibility assessments is to identify barriers to travel (e.g., creeks, sloughs, cliffs, dense shrubs or regenerating trees), points that may need to be relocated (e.g., those located in waterbodies), and an efficient route between survey points given the terrain (e.g., use of beaver dams for creek crossings).

Table 3.1. Forms to be completed for each block, day, or point while conducting Alaska Landbird Monitoring Surveys. The Standard Operating Procedures (SOP) referenced provides the instructions for completing each form.

Form	SOP	Each Block	Each Day	Each Point
Location Data	1, 2	X		
Survey Details, Daily Weather and Route	3, 4		X	
Bird, Mammal, and Amphibian Checklist	3, 5	X	X	
Map and List of Birds Detected During Survey	3, 6			X
Habitat Block Data	7, 8	X		
Habitat Point Data	7, 9			X
Habitat Description	7, 10			X

Data collection procedures

The surveys include counting the numbers of individual birds detected by species in time and distance intervals (SOP 3 and 6) and collecting additional information on the point location (SOP 1 and 2), habitat (SOP 7–10), and a checklist of all birds, mammals, and amphibians observed at and between point-count locations within the survey block (SOP 3 and 5); the latter is used to document evidence of breeding by each bird species encountered and to provide a complete checklist of all taxa observed. Table 3.1 provides the name of each data form to be completed and the corresponding SOP with the instructions for filling out the form. Electronic versions of the data forms are available for printing in SM 1 or can be downloaded online (USGS 2020). Field data are recorded on paper data forms, but we will consider recording data into electronic devices in the future.

End-of-season procedures

Observers should clean, inventory, and neatly store field equipment at the end of the field season. All damaged equipment should be repaired, replaced, or properly labeled to describe any problems. A list should be compiled of the equipment and supplies that need to be purchased, repaired, or replaced before the beginning of the next field season.

The survey coordinator sends completed data forms and electronic data files as soon as possible after the field season to:

- Alaska Landbird Monitoring Survey, USGS Alaska Science Center, Attn: Steve Matsuoka, 4210 University Drive, Anchorage, AK 99508; smatsuoka@usgs.gov.

Staple all data forms for a particular survey block together. Make sure all forms have been filled out completely and proof all data for errors, paying particular attention to species codes. Also note any exceptional conditions during surveys or failure to conduct counts at all survey points within the block. Make a hard copy of the data sheets, an electronic copy of the digital photographs of the points, and an electronic copy of data files. Participants should keep a copy of their data in case there are problems with the mail.

All field equipment supplied by MBM should be returned after the field season to:

- Alaska Landbird Monitoring Survey, USFWS Migratory Bird Management, Attn: Jim Johnson, 1011 E. Tudor Road MS 201, Anchorage, AK, 99503; jim_a_johnson@fws.gov.

Element 4: Data Management and Analysis

Data entry, verification, and editing

FWS personnel collecting the data are responsible for checking the list of bird observations detected on the point counts against the circular maps recorded on their field data forms. FWS is encouraged to enter the point-count data electronically and provide the USGS with both the original data sheets and electronic copies of the data. This will save the USGS considerable time in compiling the annual survey data from all data contributors. USGS is responsible for quality control by running the data through multiple computerized quality assurance and quality control routines to check for species that are potentially out of range, for counts that are high for the species in question, and for other data that are out of the range of expected values. Potential errors raised during this process are manually reviewed by USGS staff for accuracy and are corrected appropriately in consultation with the observers, references, and local experts.

Metadata

The USGS submits ALMS datasets and accompanying metadata for preservation or public release in concert with all USGS authored publications using ALMS data. Metadata conform to the Content Standard for Digital Geospatial Metadata (CSDGM) version 2.0 and are formatted as an XML file. The Federal Geographic Data Committee (FGDC) has authored and endorsed this metadata standard. USGS Data Management staff review, approve, and then preserve and disseminate data and metadata through the USGS Alaska Science Center data repository. USGS Data Management staff also post metadata on the USGS Science Data Catalog (https://data.usgs.gov/datacatalog).

Data security and archiving

USGS archives the raw bird and habitat data collected each year on an internal, secure server and provides electronic copies of scanned data sheets or raw digital data to contributors upon request. Digital images of habitat are also stored on the internal USGS server and the associated information on image ID, ALMS block and point number, and date of photo are stored in a digital database. Digital images are available to data contributors upon request. Data are managed according to the guidelines of the USGS (2018), which emphasize data management, documentation, preservation, and sharing with the public. USGS may also periodically submit data (every 3–5 years) to the Boreal Avian Modelling (BAM) Project, which compiles and analyzes point-count data from across northern North America (Cumming et al. 2010, Barker et al. 2015).

Analysis methods

ALMS data are primarily used to estimate long-term mean annual population trends and secondarily to estimate spatial variation in the distribution and breeding density relative to habitat and other environmental covariates.

Population trends—Every 5 years, the USGS analyzes survey data from off-road areas sampled by ALMS and from roadsides sampled by the BBS for long-term mean annual population trends using Bayesian hierarchical models. These models, described in detail by Handel and Sauer (2017), were initially used to estimate trends by BCR for 86 species using BBS data (1993–2015, $n = 81$ routes) and 31 species using ALMS data (2003–2015, $n = 72$ blocks). The ALMS and BBS survey data are fit to a series of log-linear mixed models that predict avian abundance by BCR, point (ALMS) or route (BBS), and year, with the model predictions then used to estimate BCR-specific population trends for each survey separately. The ALMS data are fit to a hierarchical model with two levels: (1) a state model of spatial and temporal variability in avian abundance and (2) an observation model of the detection probability using a combination of removal and distance sampling models (Amundson et al. 2014). The BBS data are analyzed using the standard BBS hierarchical model with two levels (Sauer and Link 2011): (1) a state model of spatial and temporal variability in the counts and (2) an observation model that accounts for changes in the counts due to changes in observers over time within routes, and for the observer's first time surveying a route. Unlike ALMS, the BBS observation model does not estimate detection probabilities of the surveys.

In the independent approach to analyzing the survey data, the ALMS and BBS models are run separately with the estimated trends compared. In the joint model, the two hierarchical models are analyzed in a common framework and an additive term is included to allow trends to vary between BBS and ALMS surveys. The trend estimates from the joint model are similar to the trend estimates from the independent approach but are more precise because the temporal parameters are shared. While the ALMS and BBS data were originally envisioned to be used to estimate a single combined population trend estimate, species' trends within a BCR were significantly different between ALMS and BBS surveys in 16 of 43 comparisons (37%). This indicates that species' trends should be estimated separately for the strata sampled by the two surveys unless they are weighted appropriately for the sampling frames. Differences and concordances in survey-specific trends can provide insights about demographic processes and environmental factors that may be driving population trends in the roadside and off-road strata (Handel and Sauer 2017)

Spatial models of distribution and abundance—Data collected following the ALMS protocol can be used to map the relative abundance of birds across a target landscape. This is an approach that is increasingly being used by ecologists to identify areas supporting high species' abundance or diversity (Kéry and Royle 2016). The analytical approach involves fitting a hierarchical model to the survey data with (1) a state model predicting avian abundance using environmental covariates for terrain, habitat, climate, and hydrology as predictors, and (2) an observation model that controls for incomplete avian detectability and adjusts the raw survey counts to estimates of breeding density (Amundson et al. 2014, 2018). ALMS data may also be analyzed in this manner in combination with other point-count datasets, such as the BBS and inventories with compatible point-count protocols, to increase sampling coverage of environmental covariates. Analyzing data compiled across different types of point-count surveys is often complicated because point-count protocols often vary in the length of the counting time, the maximum distance from the point at which birds are counted, and whether detection times and distances are recorded in multiple subintervals (Matsuoka et al. 2014). For example, the counting time is 3 min for the BBS and 10 min for ALMS. These differences in protocol can be accounted for through a combination of time-removal and distance-sampling models of the detection process (Sólymos et al. 2013).

When the environmental covariates in the fitted abundance model are spatially referenced across a landscape of interest (e.g., Refuge, BCR, state), then the model can, in a second stage, be used to generate spatial predictions of avian abundance across the landscape. This is done in combination with a GIS by (1) overlaying the landscape with a systematic grid of cells (spatial units), (2) extracting the environmental predictors for each spatial unit, and (3) inputting the predictor values into the model to predict avian densities for each spatial unit. The resulting spatial predictions can be mapped across the landscape to display a species' predicted distribution and density. The spatial predictions can also be summed to estimate the core area occupied or the population size. This can be done for a landscape characterized at a single point in time (Amundson et al. 2018) or for each snapshot in a longitudinal time series. The latter approach can be useful for predicting species' responses to observed or projected landscape changes (Mahon et al. 2014, Stralberg et al. 2015b, Mizel et al. 2016). This spatial modeling approach has been applied to data collected following the ALMS protocol in Alaska using generalized linear mixed models (GLMM, Amundson et al. 2014, 2018) and machine learning methods (ML; Magness et al. 2008, Stralberg et al. 2015b, Bateman et al. 2020). The two modeling approaches are slightly different. GLMM typically uses a single parsimonious model to emphasize ecological understanding in the predictions (Kéry and Royle 2016), while ML combines predictions from a large number of recursively fit models to optimize prediction performance (Elith et al. 2008, 2011). Prediction accuracy of either modeling approach may be assessed by withholding a subset of the survey data for validation and then comparing predicted versus observed values by measuring the area under the receiver operating characteristics curve (Ball et al. 2016).

Element 5: Reporting

Annual meetings

The principal staff working on ALMS within Refuges (I&M, MBM, and USGS) will meet in the fall or early winter of each year if needed after the ALMS data from the summer field season have been submitted and electronically compiled. The purposes of the meeting are to maintain good communication among principal staff and to gauge progress and address challenges with meeting sampling goals, analytical objectives, and information needs of Alaska Refuges. Specific purposes of the meeting are to:

- Review the year's completed field effort, highlighting success or challenges encountered in following protocols or meeting sampling goals.
- Review any issues with data quality encountered while error-checking, compiling, or analyzing data.
- Identify ways to address the challenges encountered, such as modifying field planning, training, survey designs, survey protocols, data forms, data-checking routines, or analytical methods.
- Review the ALMS blocks to be surveyed during the next field season and determine levels of support needed and available for completing the targeted surveys.
- Review any feedback received from field stations or regional supervisors with Refuges on how well ALMS is meeting their information needs.
- Schedule presentations or briefings that update Refuge supervisors and biologists on the key findings from ALMS.
- Define action items that will need to be addressed before the start of the next field season. Identify who will address each action item and include an expected timeline for completing each task.

A written summary of the annual meeting will be prepared and pertinent items included with the annual progress report for the larger statewide ALMS program.

Annual summary

Each year an informational annual summary will be prepared by the USGS and FWS and distributed prior to the field season (April) to the individuals and agencies contributing data or funds for ALMS. The summary will also be included as part of Boreal Partners in Flight's Annual Summary of Landbird Projects, which is made available each year online at https://www.usgs.gov/centers/alaska-science-center/science/boreal-partners-flight. The purpose of the annual report is to communicate to data contributors:

- A basic summary of the annual level and geographic distribution of sampling effort for the ALMS program across Alaska relative to long-term goals.
- Important changes to sampling goals, survey design, or survey protocols with reference to pertinent published literature.
- Highlights from recent publications using ALMS data as well as plans for upcoming analyses in the future.

Synthesis reports and scientific journal articles

USGS staff, often in collaboration with others, will produce peer-reviewed synthesis reports or journal articles every 3–5 years. These should summarize the methods and results relevant to the primary objectives of the ALMS program to (1) estimate landbird population trends and (2) develop predictive models of avian distribution and abundance. Examples include: Handel et al. (2009, 2017), Amundson et al. (2014, 2018), Stralberg et al. (2015b, 2017), Thompson et al. (2017), Sólymos et al. (2018), and Bateman et al. (2020). The purposes of these publications are to:

- Document and update knowledge on the distribution and trends of Alaskan birds.
- Identify for land and resource managers the declining species and their associated habitats and geographic areas that could be prioritized for conservation measures to mitigate avian declines.
- Advance methods of data collection or analysis.

Synthesis reports and journal articles will be reviewed and approved by USGS under the Fundamental Science Practices policy (http://www.usgs.gov/fsp).

Element 6: Personnel Requirements and Training

Roles and responsibilities

The principal participants in the ALMS program on Alaska Refuges include staff from Refuge I&M and field stations, MBM, and the USGS. Their responsibilities are as follows.

- USGS coordinates the full survey with all partners across Alaska, selects the survey blocks to be sampled each year on Refuges (with input from FWS on accessibility), and is responsible for data management, analysis, and reporting.
- Refuge I&M coordinates with field stations, MBM, and USGS regarding the availability of resources and staff to conduct surveys across all field stations and supplements funding to field stations or MBM for qualified observers and field costs.
- MBM coordinates surveys conducted by roving crews of observers. This includes hiring a survey coordinator; coordinating logistics with field stations; hiring seasonal staff or volunteers; packing gear and supplies for each crew; and overseeing pre-season training and post-season debriefing and data entry.
- Refuge field stations arrange local logistics for MBM roving crews conducting surveys on their refuge lands. This may include arranging temporary lodging, transportation to and from field sites, selecting reliable landing and camping locations, obtaining necessary permits, or accompanying an MBM observer in the field. In some cases, field stations may choose to arrange and conduct the surveys on their own (e.g., Alaska Peninsula NWR, Kenai NWR). Field stations should enter ALMS survey information into the Planning and Review of Inventory and Monitoring Activities on Refuges database (PRIMR; https://ecos.fws.gov/primr/ SOP 11) and update the survey activity annually.

Qualifications

A competent observer is essential for collecting credible, high-quality survey data on birds (Knutson et al. 2016). Observers should be able to identify all species likely to be encountered by sight, song, and call. Additionally, observers must be proficient at estimating abundances of birds encountered as well as their distances and time intervals of detection. Observers must also be physically capable of navigating to the survey points across rugged terrain without trails and beginning the surveys at approximately 0300–0500 h. Good hearing ability is essential because many birds, particularly in forested habitats, are detected by sound only. Observers setting up new plots should also be able to identify common trees and shrubs in Alaska.

Every effort is made to hire highly skilled and experienced observers, particularly those that (1) have completed ALMS or similar point-count surveys in Alaska, (2) have shown high levels of proficiency in species identification by sight and sound, (3) have a strong understanding of ALMS protocol, and (4) possess backcountry and survival skills as well as good physical fitness.

Training

Safety training—All field personnel undergo required FWS safety training, the amount of which depends on the mode of transportation during the surveys (Table 6.1). The MBM survey coordinators will need to remain apprised of changes to these requirements, when recertification is required, and when trainings are available each year so that field staff are properly trained.

Table 6.1. Safety training requirements for ALMS surveys.

Course	Recurrence	Required for
Wilderness First Aid and CPR	Every 2−3 years	All field personnel
Safety Awareness in Bear Country and Deterrents	Every 3 years	All field personnel
Firearms Training	Annually	All field personnel
Basic Aviation Safety (A-100)	Every 2 years	Those traveling by FWS or chartered aircraft
Overview of Aircraft Capabilities (A-104)	Every 3 years	Those traveling by FWS or chartered aircraft
Mishap Review (A-200)	Every 3 years	Those traveling by FWS or chartered aircraft
Water Ditching and Survival (A-312)	One time	Those traveling by FWS or chartered aircraft
Water Ditching and Survival Refresher (A-325R)	Every 2 years after completion of A-312	Those traveling by FWS or chartered aircraft
Motorboat Operator Certification Course	One time	Those operating a motorboat

Bird survey training—Practice improves observers' abilities to detect, correctly identify, and accurately estimate distances to birds (Kepler and Scott 1981, McLaren and Cadman 1999, Alldredge et al. 2007b). Knutson et al. (2016:20–22) provide excellent suggestions for practicing the skills necessary for conducting avian point counts. All observers should practice, be proficient at, and be approved by the survey coordinator for the following skills before conducting surveys:

- Safely conducting surveys in remote areas of Alaska.
- Identifying by sight and sound all species that are likely to be detected on their surveys. Regional audio recordings (songs, calls, drumming, booming), field guides, and computerized training programs are all available to help observers practice and test their identification skills.
- Measuring and estimating distances to birds in the habitats in which they will be conducting surveys. Laser rangefinders are particularly helpful for accurately measuring distances, often to ≥450 m in open habitats, depending on rangefinder model, topography, and amount of tall woody vegetation. An observer should also practice measuring his or her pace so that it can be used to estimate distances accurately to birds that are closer to the point than range finders will measure (<20 m).
- Recording the time interval in which individual birds are first detected. This should be done independently of species, their distance from the point, and the volume of their vocalizations to avoid bias.

- Accurately tracking the location and movement of individual birds over the course of the point-count surveys. This skill helps minimize errors in double-counting birds within and among count stations.
- Recording the age, sex, and behavior codes. This is important when the target population is adult singing males, or when particular classes of observations are to be excluded (e.g., juveniles, flyovers).
- Understanding all ALM protocols. All observers should review this entire protocol, including all SOPs prior to the field season.
- Collecting habitat data within a 50-m radius when establishing new survey blocks or resampling habitat within blocks after 10 years or whenever a major disturbance has occurred.

Element 7: Operational Requirements

Budget

The costs estimated in Table 7.1 are for conducting surveys by roving crews of observers managed by MBM. Costs are broken down by category and are based on effort to survey 8 blocks (2018 effort). Costs in future years can be estimated by adjusting for the number of 2-person crews needed and by adding 2−4% per year to adjust costs for inflation (Knutson et al. 2016).

Table 7.1. Estimated costs for conducting ALMS surveys in 8 blocks on 5 refuges by roving crews of observers managed by MBM. MBM typically manages 2–3 crews per year. All estimates are based on 2018 levels of effort and 2020 salary costs. While field crews always include 2 people, MBM may hire an odd number of ALMS personnel when Refuges offer up their staff to help MBM personnel with the surveys on their lands.

Budget Item	Unit	# Units	Per Unit Costs (Range)	Estimated Costs
Salary[1]				
Survey coordinator	per person	1	14,900	14,900
Technicians 1 & 2	per person	2	8,900	17,800
Technicians 3 & 4	per person	2	5,800	11,600
Travel[2]				
Commercial flight to field station	per person	5	500 (250–900)	2,500
FWS/charter flight to survey blocks	per crew	3	4,000 (2,000–6,000)	12,000
Per diem	per person	5	250	1,250
Equipment and supplies[3]				
Bird surveys	per crew	3		
Camping equipment and food	per crew	3		
Safety and communications	per crew	3		
Total				60,050

[1] See Table 7.2 for estimated staff time and salaries.
[2] Travel estimates include median airfare (range of fares) and Alaska locality and field per diem rates from GSA. Notes: M&IE per diem is $88 per day Alaska (other), field rate per diem assumed $7.50 per day (2018 rates). Per diem calculated as 1.5 x M&IE (travel days) = $132, 15 days at field rate = $112.50.
[3] See the Equipment List (SM-3) for the gear and supplies required for conducting ALMS surveys. We did not include costs of equipment and supplies as many field stations and programs will already have much of the required survey, camping, and safety gear and new costs will therefore vary considerably.

One of the largest field expenses will be transportation to the study sites. This typically involves (1) a commercial flight from Anchorage to the field station headquarters or visitor center and then (2) fixed-wing aircraft and/or boat transport from field station headquarters to remote survey locations. Transport costs vary depending on the location of the field station, whether FWS or chartered flights are used, the number of blocks at a field station that require air transport, and often across years for a given site. Initial costs for equipment and supplies will be modest for the first year (unless gear from previous projects can be used) but reoccurring annual costs for supplies and to replace broken equipment will be less.

Staff time

MBM—Staff time will vary with the number of blocks to be established and surveyed. Table 7.2 includes the average annual staff time and salaries managed by MBM needed to survey 8 blocks (2018 effort). This includes one survey coordinator for 3.5 months, two technicians for 2.5 months each, and two technicians for 1.5 months each. More staff and roving crews may be needed when all field stations are fully participating in ALMS.

The first and very important step for establishing ALMS surveys on a Refuge is for MBM in concert with Refuge staff to identify areas within the land unit that will likely be accessible for surveying regularly during June over long periods of time (e.g., 25 years). These areas will constitute the initial sampling frame for the Refuge. Modes of access can be defined by each Refuge, but suitable areas will generally include those accessible by foot, road, boat, or fixed-winged aircraft (wheels or floats); thus, accessible areas can include small airstrips, gravel bars in rivers, and lakeshores that permit safe landing and will depend upon equipment (e.g., 4-wheelers, trucks, boats, aircraft) available for use during June. A GIS layer of accessible areas should be prepared by MBM in consultation with Refuge staff, contract pilots, and local residents familiar with conditions on the Refuge. This GIS layer should be submitted to the USGS ALMS coordinator to identify which randomized ALMS blocks are candidates for surveying, based on prescribed criteria (at least one point of ALMS mini-grid within 1 km of accessible area; mini-grid with a minimum of 15 of 25 points in suitable habitat and safe to survey). Selected blocks, along with a set of randomized alternates in case suitability or access has been misjudged, will be provided to MBM and Refuge staff for surveys.

Once candidate and alternate survey blocks have been selected, the initial survey of each new block requires the most staff time as the following tasks are to be completed (average days per block).

- The points must be evaluated for feasible access, number of points to be surveyed and survey days determined, and an efficient route between points identified (1 day in office, Element 3, SOP 1).
- Time must accommodate travel to and from field station to survey site and possible weather days (1–2 days in field).
- Bird surveys must be conducted at each point (2–3 days in field, SOP 3–6).
- Habitat data must be collected at each point (1 day in field, SOP 7–10).

Actual time needed to complete these tasks may vary with staff experience, habitat complexity, terrain, and weather. After a survey block has been established and surveyed the first time, staff time in the field is only needed to conduct the bird surveys every other year and to resample habitat data every 10 years or after large disturbances (e.g., wildfire). At the 10-year mark, time may be saved in resampling habitat data by bringing copies of the previously completed habitat forms into the field and only updating the values in the attribute fields that have since changed.

USGS—The USGS has invested substantial staff time developing, adapting, and managing ALMS for all partners involved, including Refuges. USGS currently manages and analyzes data and prepares reports (e.g., Handel and Sauer 2017). This is necessary because ALMS is regional in scope and a complete analysis generally requires the inclusion of data beyond refuge boundaries. Refuges that survey additional blocks to answer local questions may conduct their own analyses.

Refuges I&M—Refuges in Alaska started a renewed effort in 2014 to implement the survey across the state with the support of Refuge I&M. In 2013–2014, Refuge I&M gauged refuge interest and resources available to establish or reestablish ALMS surveys across Alaska Refuges. Refuge I&M and MBM jointly developed start up plans in 2014 and expect to fully implement ALMS surveys in all refuges by 2022.

Refuge field stations—Refuge staff time will be needed to determine the sampling frame of accessible areas (see above). Additional Refuge staff time will depend on whether the surveys are conducted by field station staff or by MBM roving crews. If the field station conducts the surveys, then staff time required will be similar to that outlined for MBM in Table 7.2, minus travel time to and from Anchorage. If MBM conducts the surveys, then field station staff time will be required for organizing local field logistics and possibly assisting with the surveys (see Element 6).

Table 7.2. Estimated staff time (weeks) and annual salary expenses (2020 rates) for level of effort required for ALMS surveys by roving crews managed by MBM (adapted from Knutson et al. 2016).

Staff	Planning	Training	Data Collection	Catalogue Gear	Data Entry	Report	Total Weeks	Total FTE	Salary & Benefits[1]
Coordinator	3	2	5.0	0.5	1	2	13.5	0.26	15,300
Technician 1		2	4.5	0.5	3		10.0	0.19	9,200
Technician 2		2	4.5	0.5	3		10.0	0.19	9,200
Technician 3		2	4.5				6.5	0.12	5,900
Technician 4		2	4.5				6.5	0.12	5,900
Total							46.5	0.88	45,500

[1] Salary and benefits are based on GS-7 step 1 (term) for Coordinator and GS-5 step 1 (seasonal) for Technicians. Full-time equivalents (FTE) and salary include accrued annual leave (4 h per pay period) plus overtime when in field. Annual salaries, including benefits, for 2020: GS-7, step 1 ~$59,000; GS-5, step 1 ~$48,000.

Schedule

Data collection takes place primarily in June but may begin as early as late May in southeastern Alaska and Prince William Sound. However, there are numerous activities that must be completed both before and after the survey period. The following table provides the approximate timing of the major activities and the responsible agency.

Table 7.3. Estimated annual work schedule for U.S. Fish and Wildlife Service, Migratory Bird Management and Refuge Field Stations (FWS), and U.S. Geological Survey, Alaska Science Center (GS; adapted from Knutson et al. 2016).

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hiring	FWS	FWS							FWS	FWS	FWS	FWS
Planning	FWS	FWS	FWS	FWS	FWS						GS	FWS
Training				FWS	FWS							
Data collection					FWS	FWS						
Data preparation							FWS					
Data entry								FWS	FWS			
Analysis										GS	GS	
Reporting	GS	GS									GS	GS

Coordination

Because ALMS is a regional survey that entails several agencies and FWS programs, coordination is paramount to its success. An MOU to implement the survey cooperatively was signed in 2005 and renewed in 2010 by the Alaska Department of Fish and Game, Alaska Natural Heritage Program, Bureau of Land Management, National Audubon Society, National Park Service, U.S. Fish and Wildlife Service, U.S. Forest Service, and U.S. Geological Survey. USGS will continue to act as the lead for the survey as a whole, while MBM and Refuge I&M will provide coordination among Refuge field stations. Field stations have the responsibility to provide an assessment of their ability to either undertake the surveys themselves, with potential financial support from Refuge I&M, or to request MBM or I&M staff to conduct the survey while the station provides logistical support for field activities (e.g., bunkhouse, field transport arrangements, field staff).

Element 8: References

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Standard Operating Procedures (SOP)

For each survey block, the observers should fill out each of the data forms listed below following the detailed instructions outlined in the SOPs. The forms are available online (https://www.usgs.gov/centers/alaska-science-center/science/alaska-landbird-monitoring-survey) and in the Supplemental Materials (SM 1). Data forms should be copied onto waterproof paper for use in the field. Use dark pencil to record.

- Location Data: one form per survey block, when point-count mini-grid initially set up (SOP 1 and 2).
- Map and List of Birds Detected During Survey: one form per point per observer, completed during each survey at a point (SOP 3 and 6).
- Bird, Mammal, and Amphibian Checklist: one form per survey block, compiled at the end of each survey day (SOP 3 and 5).
- Survey Details: one form per survey block (per observer, if more than one is counting birds), filled out at beginning and end of each survey day (SOP 3 and 4).
- Habitat Block Data: one form per survey block, first when mini-grid initially surveyed and periodically in subsequent years (SOP 7 and 8).
- Habitat Point Data: one form per point per habitat type, first when mini-grid initially surveyed and periodically in subsequent years (SOP 7 and 9).
- Habitat Description: one form per point per habitat type, first when mini-grid initially surveyed and periodically in subsequent years (SOP 7 and 10).

SOP 1: Selecting Survey Blocks and Setting Up Point-count Mini-grids

Overview

This SOP provides instructions for selecting ALMS blocks for surveys, and for establishing, labeling, and marking point-count locations within the selected blocks. These instructions were adapted from the section in Handel and Cady (2004) entitled "Setting up Point Count Grids within Selected Sampling Blocks" but add new instructions for identifying and selecting accessible blocks for surveys.

Data forms

For the location data you will need to fill out the following form, which includes an SOP that explains each of the data fields.

- Location Data Form (SOP 2): one form per survey block.

Identifying and selecting accessible blocks for surveys

MBM and Refuge field stations should work closely with the USGS to identify ALMS blocks that can be safely and reliably accessed by fixed-wing aircraft, boat, vehicle, or foot. The criteria used for defining readily accessible areas for surveys on a Refuge field station need to be carefully documented. This helps the USGS to estimate the proportion of the field station that is available for sampling, which defines the sampling frame. Given the size and remote location of most Refuges in Alaska, accessibility is primarily defined by safe landing areas for fixed-wing aircraft (gravel bars, landing strips, lakes) and by rivers and lakes that can be safely navigated by motorboat or paddled by inflatable canoe, raft, or kayak. A refuge pilot will need to be consulted to identify safe landing areas.

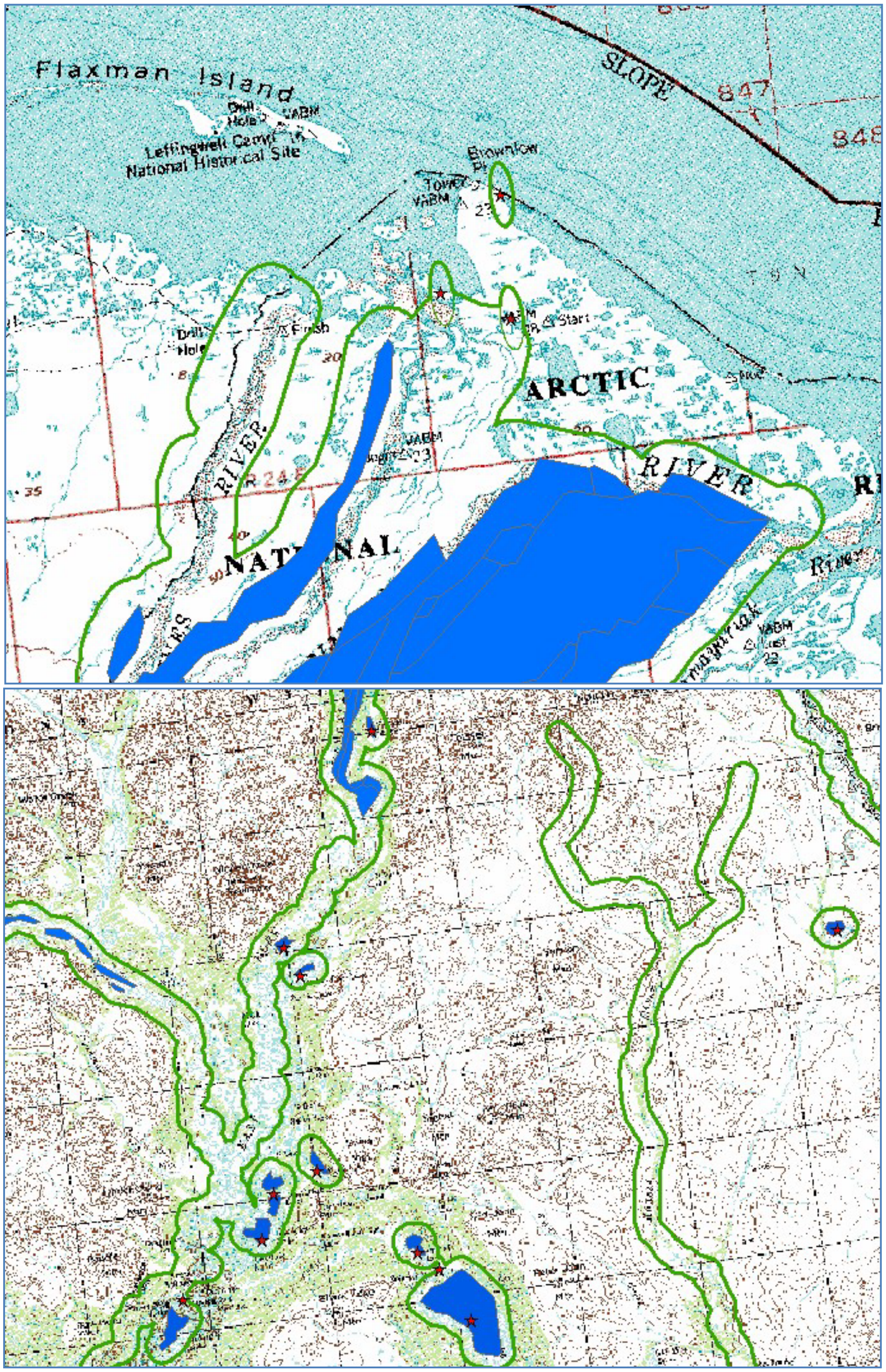

Figure SOP-1.1. Examples of accessible areas on the Arctic National Wildlife Refuge that were identified based on (1) gravel bars and large waterbodies that could be safely landed upon with fixed-wing aircraft, and (2) rivers that could be safely navigated by inflatable canoe or motorboat (provided by Steve Kendall, USFWS).

The selection method involves GIS as follows:

- Refuge field station staff identify accessible areas on their lands, with a 1-km buffer drawn around each point, linear feature, or area of access. These access areas and buffers (access polygons) are mapped in a GIS (Figure SOP-1.1) and provided to the USGS as a polygon shapefile with a detailed description of the criteria used to identify polygons. Refuges I&M is available to help Refuge field stations with the necessary GIS work.
- The USGS identifies accessible ALMS blocks, defined as those with at least one survey point within an access polygon and with a minimum of 15 of the 25 points in suitable terrestrial habitat (i.e., not on large bodies of water, glaciers, etc.). A random sample of accessible blocks is drawn for surveys.
- This random sample includes the (1) target sample size of blocks for the Refuge field station and (2) alternative blocks that can be surveyed in the event the target blocks are found to be inaccessible upon initial field inspection.
- This method explicitly delineates the sampling frame, which can then be evaluated for bias in sampling coverage relative to terrain, habitat, and other environmental features.

Point-count mini-grid

The 25 points within each selected block are arranged in a 5 × 5 mini-grid numbered in a standard way, with numbering beginning at the southwestern corner, proceeding west to east along each row and then northward through the rows (Figure SOP-1.2). Each point, whether surveyed or not, should be numbered in its correct relative position.

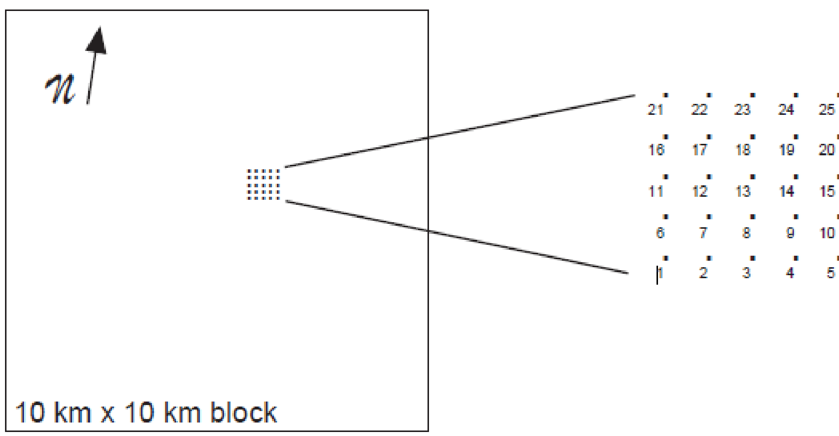

Figure SOP-1.2. The correct numbering systems for a mini-grid of 25 survey points within a 10-km by 10-km survey block.

Choice of spacing between points within mini-grid

Within a given block, points will be spaced uniformly either 250 m or 500 m apart. In areas dominated by open habitat, such as tundra, spacing should be 500 m. Spacing between points should also be 500 m in Interior Alaska boreal forests with frequent wildlife because these areas will become open when they burn. In areas dominated by tall, closed habitat, such as closed forest, spacing should be 250 m. If the area is a mosaic of open and closed habitats, then the spacing should correspond to whichever type of habitat dominates (>50%) across the area covered by the mini-grid of points. Appropriate spacing will be designated by USGS and should not be changed after the block has been established and the first surveys have been conducted.

Order of survey points

Points may be surveyed in whatever order is deemed most practical. Once the initial order has been determined, it is highly recommended but not mandatory that this order be repeated in subsequent years for monitoring. The entire mini-grid of points should be surveyed within 2–3 mornings if possible. If surveying the entire mini-grid would require too many additional days, then the number of points can be reduced, but to no fewer than 15. Daily routes should be planned (1) to accommodate travel time from camp to the first survey point of the day and (2) to have the last count of the day completed within 5 h of the start.

Coordinates of survey points

Coordinates for each sample point will be provided by USGS in decimal-degree format of latitude–longitude using the NAD 83 datum and either the 250-m or 500-m spacing (250-m for closed forest or tall shrub habitats, 500-m for open habitats). These coordinates should be loaded into a GPS unit to navigate to the points. Waypoints can be uniquely identified using a user-defined alphanumeric code for the sample block followed by the survey point number (1–25). Points should also be mapped on the most detailed scale map available for the area in case GPS satellites do not provide satisfactory signals for navigating to the coordinates.

When first visiting a newly established point, record the field-averaged GPS location of the point, the location error, and the elevation of the point plus its error. Points may be marked with permanent or semi-permanent markers (see below). Re-record the GPS location on subsequent visits to the point when you cannot relocate the point marker. If you cannot receive a suitable reading from the GPS at the actual survey point, move to a more open location, measure the bearing and distance TO the survey point, and use the bearing-distance function of the GPS to calculate the coordinates of the actual survey point.

Use these settings for your GPS unit:

Position format:	Decimal degrees (hddd.ddddd)
Map datum:	NAD 83
Units:	Metric
Heading:	True north

Planning survey route

Observers may choose to visit and mark sites before the official survey if time allows. Marking points in advance can help observers select the most efficient route between points. Scouting ahead of time will also allow alternate points to be designated for those that occur in unsafe locations or areas with excessive stream noise (see below). An accurate GPS pre-programmed with the locations of the points in the proper order is essential for assuring correct locations.

Points in unsafe terrain or unsuitable habitats

Each mini-grid selected for sampling should have a minimum of 15 of the 25 points in suitable, accessible habitats based on GIS data on glaciers, large waterbodies, and topography. If a block does not meet this minimum, then the next randomized alternate block should be selected for sampling.

Points that fall in the ocean, in the middle of large lakes or rivers, or on glaciers or icefields should be considered real "zeroes" as breeding bird habitat and not surveyed. Points that fall on cliffs, steep slopes, or other inaccessible terrestrial habitats should not be considered "zeroes" as breeding bird habitat, even if they cannot be surveyed due to inaccessibility or for safety reasons.

Points that fall within ponds or small lakes, in creeks, next to loud rivers or creeks (where hearing is noticeably impaired), or in the middle of a dense brush thicket should also be considered as samples of suitable habitat. For practical purposes, these habitats can be sampled from slightly modified locations.

If the point falls within suitable breeding bird habitat but is in an inaccessible or unsafe location, and if a suitable survey location falls within a 50-m radius of the original sampling point, then use the following protocol to select an alternate sampling point.

- First, determine all directions from the original sampling point in which suitable sampling locations occur somewhere within 50 m of the original point.
- Select a random bearing (i.e., 0–359°) from the original point generated from a random number table or by spinning and dropping a compass.
- Walk along the selected bearing to the location closest to the original point that is in habitat appropriate for sampling (safe, accessible, no excessive stream noise).
- Record the new coordinates as well as the distance and bearing FROM the original point. Note on the Location Data Form why the point was moved. If a small number of points lie across a major barrier (e.g., uncrossable river), note why these points were inaccessible and survey the remaining accessible points.

Photographing and marking points

Points should be photographed when first established and whenever habitat data are subsequently recorded to reference the location and to help document changes in habitat. Photographs can also be taken annually to verify accuracy of location and track more subtle changes in habitat. Use a digital camera with a standard or slightly wide-angle lens and a minimum resolution of 8 megapixels. For each survey point, take four photographs of the center point and the background habitat, one towards each true cardinal direction and from about 5 m away from the point. It can be helpful to include a paper in the frame that indicates the block number, point number, and direction. Note the photo number and direction towards which each photograph is taken on the Location Data Form.

Points may be marked with permanent or semipermanent markers, such as rebar, pvc, metal tags, or flagging or a combination of these. Metal markers, such as rebar, should be used in areas that frequently burn. Any markers placed in federally designated wilderness will need justification in a Minimum Requirements Analysis. The point identification number should be the AKgrid_ID (Alaska grid identification number for the survey block from GIS file) followed by the point number (1–25), separated by a dash. Note on the Location Data Form the type and placement of any markers used.

References

Handel, CM, and Cady MN. 2004. Alaska Landbird Monitoring Survey: Protocol for setting up and conducting point count surveys. USGS Alaska Science Center, Anchorage, AK. https://www.usgs.gov/media/files/protocol-setting-and-conducting-alms-surveys (accessed 30 October 2023).

SOP 2: Filling Out the Form—Location Data Form

Overview

This SOP explains in detail each data field on the form entitled "Location Data Form" as outlined by Handel and Cady (2004). Complete one form for each survey block when the mini-grid is initially setup. Follow the instructions in SOP 1: Selecting Survey Blocks and Setting Up Point-count Mini-grids.

Header information

GPS type and number—Assign each GPS unit for your land management area a unique identification number for storage and retrieval of waypoints, if multiple units are being used. Record the type (model) and number of the GPS unit used for each sample block.

GPS datum—Coordinate locations (latitude–longitude) for the sample points are all given in the NAD 83 datum.

Land unit—Identifiable name or abbreviation of your land management unit (e.g., Tongass NF-HRD, Kenai NWR, WRST).

Dates—Dates the survey point locations were recorded (set-up date or actual survey date, whenever GPS locations were recorded).

Block number—Alaska grid identification number for the survey block (AKgrid_ID from GIS file).

Block name—User-assigned name for the block, noting some recognizable geographic feature (e.g., Kejulik River).

Survey point information

Waypt #—Waypoint number of actual survey point location stored in GPS unit. Use this as reference for downloading data to computer.

Pt—Number of survey point within 25-point mini-grid according to standard numbering protocol. Point 1 is at southwestern corner of mini-grid; points are numbered sequentially from west to east along each row and then northward through the rows. See Figure SOP 1.2 in this protocol for setting up point count mini-grids. In many blocks some points will not be surveyed because they do not fall in breeding bird habitat (e.g., ocean, river, icefield) or are in unsafe habitat (e.g., steep cliffs). In these cases, leave data fields blank and put reason for not surveying in notes column.

Latitude and longitude—Record field-averaged coordinates of the ACTUAL SURVEY POINT in decimal degrees from GPS unit in whatever datum is listed in header (in most cases, NAD 83). Be sure to circle E longitude for Aleutian Islands west of the international dateline. Note that the ACTUAL survey point is where the observer stands during the survey. This location might not be exactly the same as that designated as original survey point, if special conditions require it to be moved (e.g., to avoid obstruction at original point, to move from unsafe terrain, to stand on shore of pond instead of in middle of it).

If it is not possible to get suitable coordinates from the actual survey point (e.g., you cannot obtain suitable satellite signal because of dense canopy or other obstruction), attempt to obtain them from a location within 50 m of the point. Obtain the azimuth (bearing) and horizontal distance from the "offset" location to the point. Some GPS units have a built-in function to compute the coordinates of the survey point using this information. If another type of GPS unit is used, record the azimuth and horizontal distance TO the actual survey point in the notes.

Coordinates may be collected farther than 50 m away from the actual survey point if a laser measuring device is used to determine the horizontal distance from the "offset" location to point. Again, if available, use the built-in function in the GPS to compute the coordinates of the point. If another type of GPS unit is used, record the azimuth and horizontal distance TO the actual survey point in the notes.

Location error (m)—Record error in meters listed on GPS unit for field-averaged coordinates. Try to reduce error to less than 5 m if possible.

Elevation (m)—Record estimated elevation (in meters) at actual survey point from barometric-pressure-corrected altimeter, GPS, or topographic map. Record code for method used (A, G, or M, respectively).

Moved FROM original point—Use this field ONLY if actual survey point was moved away from original assigned location for reasons of safety, accessibility, or stream noise. Record distance (in meters) and bearing FROM original assigned point to the actual survey point. In Alaska, the magnetic declination (the angle between magnetic north and true north) can be significant and is always east (negative); this difference should be accounted for in the field before bearings are taken. Please consult the ALMS reference sheet "Adjusting Compass for Magnetic Declination" for detailed instructions.

Photo—Record the photo number(s) and true cardinal direction(s) in which photos were taken from the survey point. Reference SD card and frame number for digital cameras. Ensure that your compass has been adjusted for magnetic declination before photos are taken. Please consult the ALMS reference sheet "Adjusting Compass for Magnetic Declination" for detailed instructions.

References

Handel, CM, and Cady MN. 2004. Alaska Landbird Monitoring Survey: Protocol for setting up and conducting point count surveys. USGS Alaska Science Center, Anchorage, AK. https://www.usgs.gov/media/files/protocol-setting-and-conducting-alms-surveys (accessed 30 October 2023).

SOP 3: Conducting the Point-count Survey

Overview

This SOP provides step by step instructions for conducting 10-min point counts for breeding landbirds as specified in the section by Handel and Cady (2004) entitled "Conducting the Point Count Survey." The protocol is designed for one or two observers as part of a two-person survey crew. The entire mini-grid of points should be surveyed within 2–3 mornings if possible.

Data forms

For the survey data, you will need to fill out one set of survey forms for each survey block. This includes the following data forms, which each have an SOP explaining the data fields.

- Survey Details (SOP 4): one form per block and observer.
- Bird, Mammal, and Amphibian Checklist (SOP 5): one form per survey block.
- Map and List of Birds Detected at Point (SOP 6): one form per point and observer.

Number of observers

The standard protocol is for each point to be surveyed by a single observer. If more than one trained observer is available for a mini-grid, observers should be rotated randomly among the points. Different sections of a mini-grid may be surveyed simultaneously by different observers.

Only birds detected by the official observer for a given point count should be recorded. A second person may be present but must not interfere by asserting his or her own detections. However, the companion MAY help with species identification if the observer has detected a bird but needs help identifying it. It is best for the observer to record his or her own observations on the forms, since relaying the information to another person could result in making transcription errors or missing other birds during the conversation.

An alternative protocol that can be used if two trained observers are available is the double-observer method. In this protocol, two observers conduct point counts simultaneously on separate data sheets. If the double-observer method is used, it is important that detections of birds be independent, i.e., that one observer does not influence which birds are detected by the second observer. Observers should not discuss any sightings until the count has been completed. After the count, birds detected by both observers should be circled. No additions or deletions should be made to the data sheets after the count. It is expected that all observers will miss some birds; how many are missed is immaterial as long as we can estimate the proportion being detected. Having both observers count simultaneously will allow us to estimate detection functions and also determine for each species the outermost distance within which most observers detect a large proportion of the individuals.

Time of season

Surveys in most areas of Alaska should be conducted between 10 June and 30 June to ensure that all migrant species have arrived and to optimize detectability among the community of landbirds breeding at high latitudes. Surveys can be conducted as early as 25 May in the Aleutian Islands, Prince William Sound, and southeastern Alaska. Early July corresponds with the fledgling period for most species in the state and should be avoided. The most suitable survey period is that which will be most stable from year to year in detections of breeding birds and during which both resident species and late migrants can be readily detected on breeding territories. In addition, a date as near as possible to the previous survey's date is preferable.

Time of day

The first count of the day should be started no earlier than 0300 Alaska Daylight Time in the Arctic and within 30 min after sunrise, if possible, elsewhere in the state. A later start time may be necessary if the terrain cannot be traversed safely before sunrise because of darkness or poor weather. The last count of the day should be completed no later than 5 h after the first count began or 1100, since bird activity declines markedly after that time for most species (Thompson et al. 2017).

Acceptable weather

Routes must be run only under conditions of good visibility, little or no precipitation, and light winds. Occasional light drizzle or a very brief shower may not affect bird activity, but fog, steady drizzle, or prolonged rain should be avoided. See the data sheets for weather codes. Remember to record weather data (1) at the beginning and end of the count each day and (2) at any points where detectability of birds seemed to be affected by weather (e.g., high winds, precipitation).

Duration of count and time intervals

Standard counts are to be precisely 10 min long. Please denote the time interval in which each bird is first detected: 0–3 min, 3–5 min, 5–8 min, or 8–10 min. This will allow us to compare detection rates with roadside BBS surveys, which are 3-min counts, and with our previous 5- and 8-min off-road counts. It will also allow us to estimate detection probabilities based on time of detection.

Conducting the point count

The survey point should be approached with as little disturbance to the birds as possible. Immediately upon arriving at the survey point the observer should take a true compass bearing, denote it at the top of the circular map on the data sheet, and use this bearing to orient and map the approximate locations of birds and their movements on the circular map. Doing this will help minimize double-counting individuals that move during the count. It is helpful to use a laser rangefinder to measure distances to a few notable landmarks as a reference for distance estimates. Then, start a stopwatch and begin the count. The observer and accompanying technician should remain relatively still and quiet throughout the count to avoid affecting bird behavior. A stopwatch with interval alarms is helpful. A second person can also be the timekeeper. Use a dark pencil to record the data on the forms.

Observations of birds should be recorded as soon as they are detected; do not wait until survey interval is complete. Birds occurring in obvious associations (flocks, pairs, family groups) within the same distance interval should be recorded as a single observation. Record the species, time interval, behavior code, and distance interval as soon as possible. It may help to map the approximate locations of counter-singing males first and then determine distance interval of each.

Distance estimation

For each observation, measure or estimate the HORIZONTAL distance to the bird when it was first detected. Note that this is NOT the angular distance to the bird itself, which can be much greater than the horizontal distance if the bird is at the top of a tall tree or on a steep slope. The rangefinder you use should have the capability of recording horizontal distance. If a bird is flushed by the observer, either when the observer arrives or during the count, distance should be recorded according to its take-off position relative to the survey point at the center of the circle.

Denote distances in 10-m bands out to 100 m from the survey point, in 25-m bands from 101–150 m, and in 50-m bands from 151–400 m; birds detected at farther distances can be denoted as >400 m. In areas with closed habitats or very high densities of birds, the same initial distance bands will be used out to 150 m. Then, birds from 151– 400 m will be lumped as >150 m and those beyond 400 m will be listed as >400 m.

The most important observations are those closest to the observer; effort should not be wasted trying to identify or measure distance to individuals far away if it means that closer individuals are being missed. Most observations at greater distances will be truncated during analysis.

Birds that are not actively using the survey area but are only flying over should also be recorded. The horizontal distance to the point at which they were first detected should be estimated if possible.

Distances can be determined by using a rangefinder focused on the bird, a reference tree, a shrub, or a hummock.

Which birds to count

Count all individuals of all species seen or heard at any time during the survey period. Do not attempt to guess what species or numbers you may be missing. Be careful to keep track of any individuals known or strongly suspected to have been previously counted at another survey point. Please mark birds that have been previously counted as "P" on both the map and the list. Birds detected at more than one point can be used in distance analysis without biasing estimates of density or trend (Buckland et al. 2001:176). Denoting which individuals have been detected at previous points will be particularly helpful when analyzing habitat associations for uncommon species that can be detected at large distances, such as Olive-sided Flycatchers, to avoid issues associated with non-independence.

A bird that is detected during the count but not identified may be identified after the count if more careful observation is required, the bird is still present, and the extra observation time will not add extra survey days to the block A flock that is present at some time during the count may also be followed after the count to determine its species composition and size. Visual identifications should be made whenever possible and are always preferable to identification by song or call alone. Absolutely no method of attracting birds should be used during the count.

Excluding species from count or restricting radius

In some areas of the state, certain non-landbird species (e.g., geese on the Yukon–Kuskokwim Delta or seabirds on nesting cliffs) may be so abundant that to count them completely would lead to inadequate surveys of landbirds. In such cases you may choose one of three alternatives:

- Count the abundant non-landbird species only within a restricted radius (e.g., those present within a 50-m radius at the start of the count) and ignore those beyond that distance;

- Exclude the abundant species completely from the point count surveys; or
- Count the abundant species in a separate survey after the landbird survey has been completed.

If one of these alternatives is used, it should be noted on the Survey Details Form and the entire block should be surveyed the same way. The first alternative is preferable, since we can still estimate densities of these species. If a species is excluded from the survey completely, at a minimum please note whether it is present or absent at each point in the notes section.

Species detected only between survey points

Any species that are detected only BETWEEN the survey periods should be listed in the notes section underneath the circular map. At the end of each day, include these observations on the summary checklist. This way we will have a complete list of species observed within the mini-grid.

Using the circular map

Use the circular map and the list of symbols provided to minimize the probability of counting the same bird twice during a count. The center of the circle is the position of the observer (the survey "point"). Concentric circles represent distances of 50, 100 and 150 m around the observer. As soon as you arrive at the survey point you should take a true compass bearing and record it in the box at the top of the circular map. (An alternative is to note the direction of north and always orient your map with north at the top of the circle.) Record the start time for each survey point. Then immediately set a stopwatch and begin recording the birds detected, sketching the position of individuals on the circular map. Write the 4-letter species code with the appropriate behavior code or symbol at the approximate position of the bird.

Please use the 4-letter codes provided on the checklist form; if the species is not listed, spell out the name completely. You may identify subspecies that are easily distinguished by plumage, such as Slate-colored and Oregon Juncos, and Myrtle and Audubon's Warblers. If a bird is unidentified to species, spell out the closest identification, e.g., unidentified sparrow, and USGS will assign the appropriate 'unidentified' taxonomic code. If you are fairly certain but not positive about a species' identification, place a question mark after the species code.

Next to each species' alpha-code, indicate the time interval and the distance band in which it was first detected. Time intervals should be denoted with a superscript of 3, 5, 8 or 10 for the 0–3, 3–5, 5–8, and 8–10 min intervals, respectively. Distance should be denoted by the OUTER distance of the band in which it was first detected. For example, if you see a Varied Thrush at 4:05 min at a distance of 24 m, it should be denoted as $\text{VATH}^{5\text{–}30}$, since it was heard in the 3–5 min interval and within the 21–30 m distance band.

Please use the behavior codes provided. These are simple characters that help us determine the age and sex of each bird detected. If an individual exhibits several behaviors during the count period, you may record the behaviors in the order observed. In the final tally, please record the behavior that best indicates the age and sex of the bird (e.g., singing rather than calling).

In the final data compilation, the only important position factor is the actual distance band; however, sketching within the four quadrants of the map is helpful when high numbers of birds are present. Recording movements can also be helpful, but be very careful to only COUNT one time a bird that has moved. You should familiarize yourself with the 4-letter species and detection codes before the actual survey.

Transferring observations to list

Shortly after the daily route has been completed, the species, time interval, number of individuals, behavior code, and distance interval (outer band) should be transcribed from the map to the list. You should tally the position and time interval of each bird when it was first detected, regardless of its subsequent movements during the survey. For cases where a bird is mapped exhibiting several behaviors, please list the behavior that best indicates the age and sex of the bird. For example, if you first detect a Yellow Warbler calling and later hear it sing, you would record it as singing since this behavior allows us to classify this individual with high probability as an adult male (in some passerines, females also have songs). Keeping track of the type of detection will help us monitor the number of breeding pairs better.

Each bird, pair, or flock detected should be recorded on a separate line. Take care to ensure individuals are not recorded more than once if they have moved during the count period.

Species' codes should be verified for accuracy against the list; several species have codes similar to each other and could cause confusion. Write the entire name of any species (or unidentified bird) for which you are uncertain about the code.

References

Handel, CM, and Cady MN. 2004. Alaska Landbird Monitoring Survey: Protocol for setting up and conducting point count surveys. USGS Alaska Science Center, Anchorage, AK. https://www.usgs.gov/media/files/protocol-setting-and-conducting-alms-surveys (accessed 30 October 2023).

Thompson, SJ, Handel CM, and McNew LB. 2017. Autonomous acoustic recorders reveal complex patterns in avian detection probability. Journal of Wildlife Management 81:1228–1241.

SOP 4: Filling out the Form—Survey Details

Overview

This SOP explains in detail each data field on the form entitled "Survey Details" as outlined by Handel and Cady (2004). Complete one form for each block of 25 points surveyed per observer. Fill out appropriate sections of the form at the beginning and end of each survey day. Follow the instructions included here and in SOP 3: Conducting the Point-count Survey.

Survey details

Length of count (min)—Circle the total duration of each point count (in minutes). The standard length will be 10 min.

Spacing between pts (m)—Record the spacing between survey points in the mini-grid for that sample block. Spacing should be the same within a block, 250 m in predominantly closed habitats and 500 m in predominantly open habitats.

Observers rotated among points—If more than one trained observer surveys different points in this block, circle yes. Fill out a separate form for each observer. Weather information may differ and daily routes will differ for the separate observers.

Double observer method used—If two observers conduct counts simultaneously at the same points on this mini-grid, circle yes. Fill out a separate form for each observer. Weather information and daily routes should be identical.

Species counted within restricted radius—List non-landbird species or groups that are counted only within a restricted radius because they are too numerous to allow adequate count of landbird species (e.g., geese on Yukon–Kuskokwim Delta or seabirds nesting on cliff). Record distance of outermost distance band used in meters.

Species excluded from survey—List non-landbird species or groups that are completely excluded from point counts because they are too numerous to allow adequate count of landbird species, even with a restricted-radius count. In the notes section on the map form for each point, record presence of each species that is detected at that point.

Observer information

Give full name, affiliation, mailing address, telephone number, and email address of the observer conducting this survey.

Survey experience—Record the number of years of experience this observer has conducting point-count surveys (including BBS), using distance-estimation techniques, and birding in Alaska (i.e., familiar with birds in area being surveyed).

Contact information—Give full name, affiliation, mailing address, telephone number, and email address of the person responsible for long-term management of data for the land management unit or study area (e.g., biologist or manager). If same as observer, write 'same.'

Daily weather and route

Land unit—Identifiable name or abbreviation of your land management unit (e.g., Tongass NF-HRD, Kenai NWR, WRST).

Block number—Alaska grid identification number for the survey block (AKgrid_ID from GIS file).

Block name—User-assigned name for the block, noting some recognizable geographic feature (e.g., Kejulik River).

Date—Record date for each day points on mini-grid were surveyed (in month-day-year format).

Time—Record in 24-h format the start time of the first point count and the end time of the last point count conducted each day.

Temp—Record the ambient air temperature at the start and end of point counts each day. Circle whether recorded in degrees Celsius or Fahrenheit.

Wind—Record Beaufort code for wind speed at the start and end of point counts each day. See Bird Survey Codes (SM 1).

Sky—Record code for sky condition at start and end of point counts each day. See Bird Survey Codes (SM 1).

Daily route—Draw a line with arrows showing path traveled between survey points each day. This will indicate order in which points were surveyed and can illustrate approximate distance and path taken from camp and around any obstacles. Thus, it can provide an estimate of effort and distance traveled for recording species between points. If trained observers travel together but rotate as counters among points, show common route traversed but circle which points were surveyed by each observer on the individual observers' separate sheets.

References

Handel, CM, and Cady MN. 2004. Alaska Landbird Monitoring Survey: Protocol for setting up and conducting point count surveys. USGS Alaska Science Center, Anchorage, AK. https://www.usgs.gov/media/files/protocol-setting-and-conducting-alms-surveys (accessed 30 October 2023).

SOP 5: Filling Out the Form—Bird, Mammal, and Amphibian Checklist

This SOP explains in detail each data field on the revised form entitled "Bird, Mammal, Amphibian Checklist" as initially described by Handel and Cady (2004). Each form has individual columns for three days. Complete a minimum of one form for each block surveyed. Follow the instructions included here and in SOP 3: Conducting the Point-count Survey.

Include observations of all species of birds, mammals, and amphibians from all team members during their stay within the 10-km × 10-km survey block. This checklist will provide the basis for an atlas. At the end of each day, compile information on all birds, mammals, and amphibians detected within the survey block during point-count surveys; while traveling to, from, and between points; and during time at camp. For each species that has been positively identified by sight or sound, use the list of codes to describe evidence of occurrence and possible or confirmed breeding.

Observers might also record their daily observations as an eBird checklist using the eBird Mobile App on their cell phone and then transcribe their eBird checklist onto the form at the end of each day. If you do not have cell phone reception, complete your eBird checklist and then press "Close" instead of "Submit" to store your checklist on your phone. Once you have reception again you can access and then submit the stored checklist under the "Not Submitted" tab of the Checklists screen.

Land unit—Record identifiable name or abbreviation of your land management unit (e.g., Tongass NF-HRD, Kenai NWR, WRST).

Block number—Record Alaska grid identification number for the survey block (AKgrid_ID from GIS file).

Block name—Record your user-assigned name for the block, noting some recognizable geographic feature (e.g., Kejulik River).

Observers—List all observers who contributed to checklist.

Total effort—Record estimated number of party-hours actually observing birds during and between counts (including time at camp) and total linear distance traveled (km) by all parties within the survey block. Record total effort only on first data form if multiple pages are needed for daily observations.

Year—Record year of observations.

Dates—List month/day above each column for daily observations of birds, mammals, and amphibians recorded within the block; include official survey days and camp set-up and take-down days. Use multiple pages if >3 days.

References

Handel, CM, and Cady MN. 2004. Alaska Landbird Monitoring Survey: Protocol for setting up and conducting point count surveys. USGS Alaska Science Center, Anchorage, AK. https://www.usgs.gov/media/files/protocol-setting-and-conducting-alms-surveys (accessed 30 October 2023).

SOP 6: Filling Out the Form—Map and List of Birds Detected at Point

Overview

This SOP explains in detail each data field on the form entitled "Map and List of Birds Detected at Point" as outlined by Handel and Cady (2004). Complete one form for each point surveyed per observer. Follow the instructions included here and in SOP 3: Conducting the Point-count Survey.

Map of birds detected during survey

Block #—Record the Alaska grid identification number for the survey block (AKgrid_ID from GIS file).

Point #—Record the number (1–25) of the point being surveyed.

Observer—Give name or initials of observer conducting survey. Make sure complete name and contact information are given on the Survey Details form.

Date—Record the survey date for each point.

Time start—Record the start time of the survey at that point to nearest minute in 24-h format.

Direction—Record a compass bearing (degrees from true north) from the point and use it to orient approximate locations of birds and their movements. Be sure to first adjust your compass for what can be significant east (negative) magnetic declination in Alaska by following the instructions on the ALMS reference sheet "Adjusting Compass for Magnetic Declination."

Circular map—Map the approximate locations of all birds detected using 4-letter species codes and behavior symbols provided on code sheets. The center of the circle is the position of the observer (survey point). Distance bands are shown for 50, 100, and 150 m. Note distance and time interval for first detection of each bird. See Bird Survey Codes (SM 1) for behavior, distance-interval, and time-interval codes.

Species between this and previous point—List species observed between this and previous point that have not yet been detected during a point count.

Non-landbird species present but not counted—Note the presence of any non-landbird species detected during the count that are not being enumerated during the standard count because their extreme abundance precludes adequate landbird counts (see Survey Details form).

Mammals/Amphibians—Note any mammals and amphibians detected during counts or between points as well as type of detection (visual, tracks, sign, dam, call).

Notes—Record any information pertinent to the bird survey, such as inclement weather, wind, stream noise, or other factors that may affect behavior of the birds or the observer's ability to detect them. Note any nests, downy or newly volant young, mate-feeding, adults carrying food or fecal sacs, or any other behavior that confirms or suggests breeding of birds in the area.

List of birds detected during survey

Complete one entry for each individual, pair, or flock of birds detected during count.

Species—Record 4-letter code of species detected. You may identify birds to subspecies if they are easily distinguished by plumage (e.g., Slate-colored Junco or Myrtle Warbler) and visually confirmed. If a bird is not identified to species, spell out the closest identification you can make, such as unidentified dabbler, unidentified thrush, or unidentified woodpecker. Do not make up your own codes, since there are many confusing possible combinations. If you are fairly certain but not positive about a species' identification, place a question mark after the species code.

Time—Record time interval during which bird was first detected. See Bird Survey Codes (SM 1).

#—Record number of individuals detected.

Beh—Use behavior codes to note how bird was detected. If bird is detected by more than one method, use the code that gives the best information about the age and sex of the bird (e.g., a male that calls and then sings should be listed as singing). Birds flying on a direct heading high over the survey area that are not actively using or associated with the habitat near the point should be listed as flyovers. If bird is known or suspected to have been counted from a previous point based on its position, record it on the map and the list with the detection code of "P" for previous point. Detections of the same individuals from multiple points can be used in distance analysis without biasing estimates of density or trend. See Bird Survey Codes (SM 1).

Dist—Record distance interval in which bird was first detected during count (see Bird Survey Codes, SM 1). If bird was flushed from point as observer approached, record the distance between the survey point and the original position of the bird. Note that the intervals are designated as the outermost bound of the interval (e.g., 0–10 m is recorded as 10).

For closed habitats or very common species in open habitats, record distance interval for each individual detected within 150 m and use ">150" for those observed from 151–400 m. For open habitats or rare species in closed habitats, try to record distance interval for each individual detected within 400 m. Use ">400" for any birds detected beyond 400 m.

References

Handel, CM, and Cady MN. 2004. Alaska Landbird Monitoring Survey: Protocol for setting up and conducting point count surveys. USGS Alaska Science Center, Anchorage, AK. https://www.usgs.gov/media/files/protocol-setting-and-conducting-alms-surveys (accessed 30 October 2023).

SOP 7: Collecting Habitat Data

Overview

This SOP provides the instructions as outlined by Handel and Cady (2004) for collecting habitat data at each point-count survey location. Habitat data should be collected during June or early July. This information can be collected on the same day that the bird survey is conducted, but habitat data collection should not interfere with the bird survey. For example, the mini-grid can be surveyed for birds in one direction and habitat data can be collected on the return hike. A second observer can also record habitat data as the pair approaches the point and while the primary observer is conducting the point count, as long as no disturbance is caused by collecting habitat data.

The information collected on the data forms will enable us to characterize habitat according to classifications outlined by Cowardin et al. (1979), Kessel (1979), and Viereck et al. (1992). We will use data collected by cooperators across the state to analyze patterns of bird distribution.

Data forms

For the habitat data, fill out one set of habitat data forms for each mini-grid of survey points. This includes the following forms, each of which each has an SOP explaining the data fields.

- Habitat Block Data (SOP 8): one form per survey block.
- Habitat Point Data (SOP 9): one form per survey point.
- Habitat Description (SOP 10): one form per habitat type per point.

Georeferenced photographs

For each survey point, take four photographs of the center point and the background habitat, one towards each true cardinal direction and from about 5 m away from the point. One set of photos should be taken each time habitat is measured at the point. Your field partner may stand at the survey point for a scale of reference. To reduce mislabeling of photographs, it may be useful to have that person hold a clipboard or dry-erase board at the center point with the block number, point number, direction towards which the photo is taken, and date clearly labeled. It is helpful to photograph each direction in the same order at each point (e.g., clockwise N, E, S, W) to help keep photos in order in case of mislabeling. Use a digital camera with a slightly wide-angle lens (e.g., ~35−28 mm on full-frame 35-mm camera) and at a minimum resolution of 8 megapixels. Set digital cameras to date- and time-stamp each photograph. If you mark the waypoints using a GPS at your survey locations close to the time when photos are taken and set your GPS to record the date and time that waypoints are marked, photos can easily be georeferenced later. Alternatively, photos may be taken and linked with GPS coordinates using a mobile phone app such as Gaia GPS. The resulting waypoints and linked photographs can be exported as a KMZ file.

Determining the number of habitats to describe at a point

Record habitat data within a 50-m radius circle centered on each survey point (Figure SOP-7.1). Be sure to walk around the circle to get an unbiased view of the habitat that it contains.

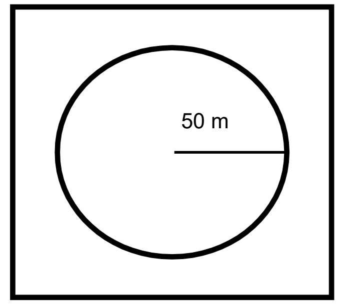

Figure SOP-7.1. Diagram of 50-m radius circle in which habitat is to be characterized.

The HABITAT QUESTIONNAIRE on the Habitat Point Data form will help determine whether the habitat within the circle should be classified as one or more types. It will help you distinguish among unvegetated, wetland, and different upland habitats. Based on your answers, follow the instructions provided, which will indicate how many Habitat Description Forms are required (usually only one per point). Each distinct habitat type should be described on a separate Habitat Description Form. Each habitat should be numbered and the percent of the 50-m radius circle occupied by that habitat should be estimated.

The first step in determining the number of habitats within the survey circle is to view the area in the context of the surrounding landscape. Look at the size of each "patch" of habitat that occurs at least partly within the circle. The minimum patch size to be considered a separate habitat will depend on several factors: (1) whether or not it is a wetland, (2) whether it can be considered an understory of a higher canopy layer, and (3) whether or not it is part of a larger, regularly occurring mosaic.

- Any wetland at least 10 m wide in any dimension should be considered a separate habitat.
- A non-wetland patch must be at least 400 m^2 in size (circle of 11-m radius; 0.1 acre) before it should be described as a separate habitat.
- Shrub or herb layers under sparse tree canopy layers should NOT be described as separate habitats. If woody plants are present, the habitat should generally be named by the tallest canopy of woody plants present.
- A habitat "mosaic" is a fairly regular pattern of two or more cover types interspersed together at a fine scale. Such a mosaic should be classified as a single habitat and named by the highest canopy layer that meets the minimum percent cover criterion for each classification system.
- When there is a clear boundary between two habitat patches that are large relative to the survey circle and large enough to host a different bird community, these should be described as separate habitats.

Identifying wetland habitats

Habitats will be classified as wetlands according to criteria of the National Wetland Inventory (NWI) Classification (Cowardin et al. 1979, FGDC 2013). Use the separate NWI Key provided on the NWI Reference Sheet to determine the wetland classification. Wetland presence is determined by frequent or persistent saturation or inundation with water. In the absence of visible bodies of water, wetland status will be determined by the presence or lack of obligate and/or facultative wetland indicator plant species.

As defined by NWI (FGDC 2013), obligate wetland indicator plant species (hydrophytes) almost always occur in wetlands (estimated probability >99%). If there is no other evidence of wetland habitat, an NWI designation can be made based on the presence of obligate wetland indicator plants alone. Facultative wetland indicator plants usually occur in wetlands (67−99% estimated probability) but are occasionally found in non-wetland areas. Presence of a few facultative wetland indicator plants alone is not enough to warrant wetland designation. If facultative wetland plants are very abundant, or if there are several facultative wetland species occurring together, then it is likely, but not certain, that a wetland is present.

Observers will have to use their best judgment in the field to determine whether or not wetland habitats are present. The obligate and facultative wetland indicator plant lists provided on the NWI Reference Sheet are in no way comprehensive lists but provide the most common species likely to be encountered in Alaska (Lichvar et al. 2016).

Habitat mosaics vs. distinct habitats

The following figures illustrate various distributions of two different vegetation types. These should be used as a guide to determine when to lump versus when to split vegetation types into different habitats. The larger circle outlined in black represents the 50-m radius circle inside which habitat data are collected. The white background represents meadow habitat in these examples. The grey circles in these figures represent patches of trees. The grey circles are proportional to the minimum patch size that can constitute a separate habitat, and these figures are drawn to scale.

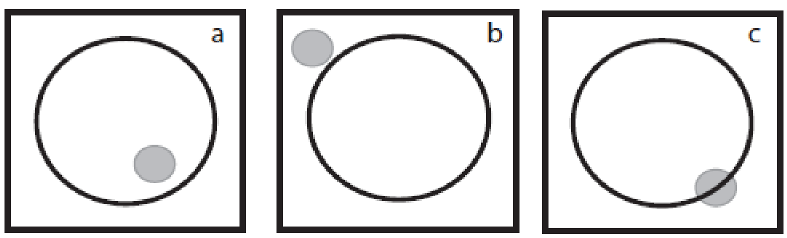

Figure SOP-7.2. Examples of discrete patches of forest in large tract of meadow in relation to 50-m survey circle. See text for which should be characterized as separate habitats.

The 50-m radius circle depicted in Figure SOP-7.2a should be described as two separate habitats because the patch of trees meets the minimum patch size requirement for terrestrial habitats, falls at least partly inside the circle, and is not part of a larger landscape mosaic of interdigitated habitats. While the forest habitat type in Figure SOP-7.2b meets the minimum patch size requirement, none of it falls within the 50-m radius circle, so only the meadow habitat represented in white inside the circle should be described. Similar to Figure SOP-7.2a, the grey forest habitat in Figure SOP-7.2c meets the minimum patch size, and part of it falls within the circle, so this circle should be described as two separate habitat types. The percent of the 50-m radius circle occupied by the forest habitat will be very small, since only a tiny portion of it falls inside the circle where habitat is to be described.

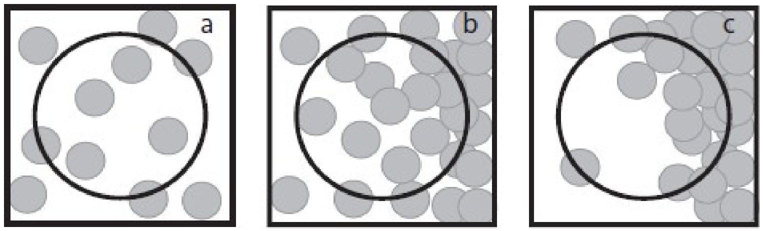

Figure SOP-7.3. Examples of two vegetation types forming a single habitat mosaic (a-b) or an edge between two separate habitat types (c), shown in relation to 50-m survey circle.

Figure SOP-7.3 depicts different configurations of two vegetation types. Fig. SOP 7.3a in a habitat mosaic, where two vegetation types are interdigitated at a fine scale to form a mosaic across the landscape. Such mosaics should be described as one habitat. Figure SOP 7.3b represents a similar situation where two vegetation types (e.g., patches of trees and meadow) are heterogeneously distributed along a gradient between two different habitat types (forest and meadow). Because there is no clear boundary between the two types inside the 50-m radius circle, this mosaic should be described as one habitat type. Figure SOP-7.3c depicts a clearer boundary between forest and meadow and should be described as two separate habitats. When in doubt, combine for fewer habitats.

Some wetland habitats and disturbed areas pose particular problems when designating separate habitats within a circle. Wide shorelines (such as large tidal flats or lakes with marshy edges) should be classified as separate habitats if they are at least 10 m wide. A disturbed area (such as road margin, logged forest, or area affected by a fire) should be classified as a separate habitat if it is at least 400 m^2 in size (circle of 11-m radius; 0.1 acre). Several examples are given below.

Figure SOP-7.4 depicts water bodies that fall within the 50-m radius circle. If a water body comprises two distinctly different wetland types that are >10 m wide, then the parts should be described separately. Therefore, Figure SOP-7.4a would be assigned three different habitats (the water itself, its vegetated margin, and the surrounding non-wetland habitat). Figure SOP-7.4b would be assigned only two habitat types because the vegetated wetland associated with the water body is <10 m wide.

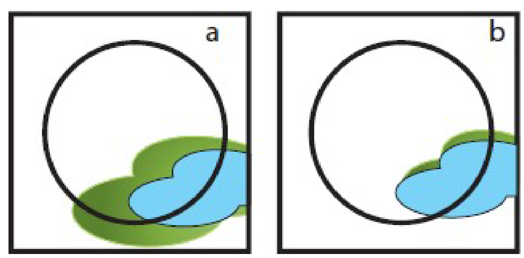

Figure SOP-7.4. Examples of water bodies with vegetated margins of varying widths in 50-m survey circle.

Figure SOP-7.5 depicts a similar situation in which a stream with associated wetlands runs through a 50-m radius circle. The associated wetland in Figure SOP-7.5a is >10 m wide in some areas and should be described separately, leading to three habitat descriptions for this circle (water, streamside vegetation, surrounding non-wetland vegetation). The wetlands along the stream in Figure SOP-7.5b are less than 10 m wide, so should be lumped in with the riverine habitat description, resulting in two habitats for this circle.

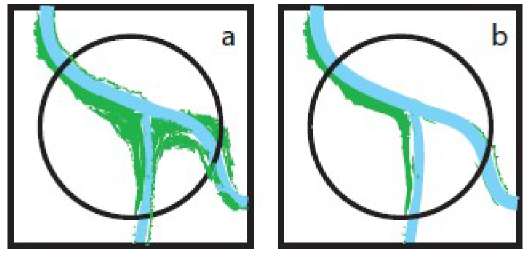

Figure SOP-7.5. Examples of streams with vegetated wetlands along banks crossing 50-m survey circle.

Figure SOP-7.6 depicts a road crossing the 50-m radius circle. The disturbed area associated with the road on either side has markedly different vegetation and meets the minimum patch size requirement (>400 m^2) for non-wetlands, so should therefore be described separately from the surrounding habitat. If the canopy is broken, the road itself will be one habitat (unvegetated bare soil), the roadside vegetation will be a second, and the remaining vegetation will be a third. A small trail cutting through the circle should NOT be described as a separate habitat.

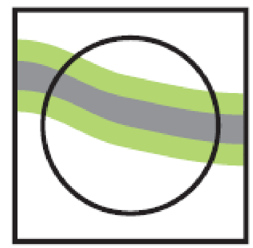

Figure SOP-7.6. Example of roadside with disturbed vegetation crossing 50-m survey circle.

Only in instances when there are distinctly different vegetation types, when there are large unvegetated surfaces, or when a wetland is present, should more than one habitat be described. When in doubt, lump rather than split and describe as few habitats as possible. If you are consistently recording more than one habitat per point, and are not in a disturbed or wetland area, then you are probably assessing habitat at a finer scale than we intended. Step back and try to assess the habitat at a grosser scale.

References

Cowardin, LM, Carter V, Golet FC, and LaRoe ET. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Department of Interior, Fish and Wildlife Service. FWS/OBS-79/31.

Federal Geographic Data Committee [FGDC]. 2013. Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC. https://www.fws.gov/wetlands/documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States-2013.pdf (accessed 22 September 2020).

Handel, CM, and Cady MN. 2004. Alaska Landbird Monitoring Survey: Protocol for setting up and conducting point count surveys. USGS Alaska Science Center, Anchorage, AK. https://www.usgs.gov/media/files/protocol-setting-and-conducting-alms-surveys (accessed 30 October 2023).

Kessel, B. 1979. Avian habitat classification for Alaska. Murrelet 60:86–94.

Lichvar, RW, Banks DL, Kirchner WN, and Melvin NC. 2016. The national wetland plant list: 2016 wetland ratings. Phytoneuron 2016-30:1−17. http://wetland-plants.usace.army.mil/nwpl_static/data/DOC/lists_2016/National/National_2016v2.pdf (accessed 22 September 2020).

Viereck, LA, Dyrness CT, Batten AR, and Wenzlick KJ. 1992. The Alaska vegetation classification. General Technical Report PNW-GTR-286. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

SOP 8: Filling Out the Form—Habitat Block Data

This SOP explains in detail each data field on the form entitled "Habitat Block Data" as outlined by Handel and Cady (2004). Complete one form per block of 25 points during the first visit to the block and subsequently every 10 years or after a major disturbance. Follow the instructions included here and in SOP 7: Collecting Habitat Data.

Header information

Land unit—Identifiable name or abbreviation of your land management unit (e.g., Tongass NF-HRD, Kenai NWR, WRST).

Dates—Dates of habitat data collection.

Block #—Alaska grid identification number for the survey block (AKgrid_ID from GIS file).

Block name—User-assigned name for block, noting a recognizable geographic feature (e.g., Kejulik River).

Topo map quad—Name of the 1:250,000 scale topographic map on which the mini-grid of points occurs, if map was used. If the points fall on more than one map, choose the quadrangle that contains the southwest corner of the mini-grid.

Photos

Indicate if digital photographs were taken at each point and if locations were interfaced with GPS using date–time stamp.

Observer information

Give name, affiliation, mailing address, telephone number and email address of primary observer collecting the habitat data. List names of additional observers.

Contact information

Give name, affiliation, mailing address, telephone number, and email address of person at land management unit responsible for maintaining data long-term (e.g., biologist or manager), if different from observer.

Exotic plants

Note the presence of any exotic plant species found at or between points on the block.

Miscellaneous field notes

Note any pertinent information about points, including how points have been marked, specific types of disturbance, or other data that may be important to bird distribution.

References

Handel, CM, and Cady MN. 2004. Alaska Landbird Monitoring Survey: Protocol for setting up and conducting point count surveys. USGS Alaska Science Center, Anchorage, AK. https://www.usgs.gov/media/files/protocol-setting-and-conducting-alms-surveys (accessed 30 October 2023).

SOP 9: Filling Out the Form—Habitat Point Data

This SOP explains in detail each data field on the form entitled "Habitat Point Data" as outlined by Handel and Cady (2004). Complete one form for each point surveyed. Follow the instructions included here and in SOP 7: Collecting Habitat Data.

Header information

Fill out this information on every sheet.

Land unit—Identifiable name or abbreviation of your land management unit (e.g., Tongass NF-HRD, Kenai NWR, WRST).

Date—Date of habitat data collection.

Observers—Names or initials of those collecting habitat data. Make sure full name of each observer is listed on the form for the block.

Block #—Alaska grid identification number for the survey block (AKgrid_ID from GIS file).

Point #—Survey point number (1–25, in standard order; see SOP 1).

Topography

Elevation—List the elevation in meters, at the survey point itself. This can be measured with an altimeter or GPS or estimated from a topographic map. You can record elevation in feet and convert later but be sure to LABEL units.

Aspect—List the direction in degrees from true north that the slope at the survey point is facing. If it is flat, write NA. Do not leave blank.

Slope—Estimate or measure with a clinometer or a compass the slope in degrees at the survey point. You should estimate slope over a distance of about 20 m. Some laser hypsometers are also equipped with a slope function. If it is flat, slope = 0; do not leave blank.

Topographic position—Record the position of your point relative to the largest topographic features in your area. Features should be recorded at a scale such that they will be recognized on a topographic map with 200-ft contour intervals. See Topography Reference Sheet (SM 2) for details.

Local features—Record notable local topographic features within the 50-m radius circle you consider important enough to affect bird occurrence. See Topography Reference Sheet (SM 2) for definitions.

Photo

Digital ID #—Record SD card and digital photo reference numbers for all photos taken at the point. See SOP 7 for more information on providing georeferenced digital photographs.

Disturbance

Note the type and severity of any disturbances detected in the 50-m radius circle that meet the minimum patch size requirement of 400 m^2 (or a circle of 11-m radius or 0.1 acre) if any part of the disturbed area falls in the 50-m radius circle. Use the disturbance severity codes provided to distinguish between mild and severe disturbances. If no disturbance is detected in a plot, be sure to mark "NONE." You may record more detailed notes about disturbances and their history in the miscellaneous notes for the block. If an area has been logged, describe the stage of regrowth that has occurred. If you know the year the area was logged, list that in space provided. Mark a time category (greater or less than two years) for the estimated time since any specific disturbance occurred. If the exact year of a major disturbance is known, record the years since the disturbance occurred in the blank provided; otherwise, leave blank. If any part of a road passes through the circle, the roadbed and right-of-way where road-associated disturbance is evident should be classified as one or more separate habitats, depending on how large of an area each covers. Minimum patch size for a separate habitat is 400 m^2 (circle of 11-m radius; 0.1 acre). Other types of disturbance need not be described as a separate habitat type unless they have significantly altered the vegetation.

Coarse woody debris

Check the boxes that indicate the numbers of coniferous and deciduous snags in the 50-m radius circle. Also check the box that indicates the percent cover of downed logs inside the circle. A snag is defined as any tree, dead or alive, having >1.5-m (5-ft) length of dead wood >10 cm (4 in) diameter at breast height (1.37 m or 4.5 ft; Husch et al. 2003). Logs are defined as dead downed wood, >1.5 m (5 ft) long and >10 cm (4 in) in diameter. All dead wood meeting minimum size requirements, including snags leaning at less than 45 degrees from horizontal, should be counted as downed logs (Husch et al. 2003). This includes large exposed root disks of uprooted trees. Logs should not be counted if they are (1) completely in contact with the ground AND (2) decayed to the degree of crumbling or covered with moss.

Habitat questionnaire

Complete this questionnaire to determine the number and types of habitats present within the 50-m radius circle. See SOP 7: Collecting Habitat Data for more details regarding the use of this questionnaire.

References

Handel, CM, and Cady MN. 2004. Alaska Landbird Monitoring Survey: Protocol for setting up and conducting point count surveys. USGS Alaska Science Center, Anchorage, AK. https://www.usgs.gov/media/files/protocol-setting-and-conducting-alms-surveys (accessed 30 October 2023).

Husch, B, Beers TW, and Kershaw JA, Jr. 2003. Forest mensuration. 4th edition. John Wiley and Sons, Inc. Hoboken, NJ.

SOP 10: Filling Out the Form—Habitat Description

This SOP explains in detail each data field on the form entitled "Habitat Description" as outlined by Handel and Cady (2004). Complete one form for each unique habitat type described within the 50-m radius circle. Follow the instructions included here and in SOP 7: Collecting Habitat Data.

Header information

Fill out this information on every sheet.

Land unit—Identifiable name or abbreviation of your land management unit (e.g., Tongass NF-HRD, Kenai NWR, WRST).

Block #—Alaska grid identification number for the survey block (AKgrid_ID from GIS file).

Date—Date of habitat data collection.

Observers—Names or initials of persons collecting habitat data. Make sure full names are listed on the form for the block.

Point #—Survey point number (1–25, in standard order; see set-up instructions, SOP 1).

Habitat #—If you are describing more than one major type of habitat for the 50-m survey circle, indicate which one you are describing here among the total number of habitats described for this circle.

% of circle—Record the percent of the 50-m radius circle occupied by this habitat. If there is only one habitat present, record 100%. If more than one habitat is present in the circle, the percent recorded at each habitat should sum to 100% for all of the different habitats at the point.

Classification

Indicate which one of the five categories best fits the habitat being described on this sheet. Collect data on vegetation layers before completing this section. If you are unfamiliar with the classification systems, you may leave these blank and USGS staff will derive them based on the detailed vegetation data.

NWI—If this is a wetland habitat, provide National Wetlands Inventory (NWI) classification code based on the NWI key provided (SM 2).

Kessel—Indicate the alphanumeric code for Kessel's (1979) habitat classification based on key provided (SM 2).

Viereck—Provide the alphanumeric code down to the lowest level possible for the Viereck et al. (1992) classification system.

Vegetation

Complete this section for a habitat if the vegetation cover is $\geq$2%. List species in descending order of dominance. Use scientific names where possible to indicate species. If you abbreviate, use the first three letters of the genus and the species name; give a master list of species in the notes.

Note that some variables require that you estimate the % cover to the nearest 5% whereas others request the cover class codes from the scale provided on the data sheet. This scale (Table SOP-10.1) is modified from the Braun-Blanquet cover-abundance scale and fits the National Vegetation Classification guidelines (Jennings et al. 2004).

Table SOP-10.1. Modified Braun-Blanquet cover-abundance scale used to describe cover of vegetation within each layer.

Cover Class Code	Cover Abundance
0	None
1	Rare, one or few individuals. <<1% cover
2	More than a few individuals, <1%
3	1–5% cover
4	6–25% cover
5	26–50% cover
6	51–75% cover
7	76–100% cover

Single-stemmed trees >3 m—In this section, record information about trees >3 m tall that are primarily single-stemmed in growth form (e.g., include birches but exclude most species of alders and willows).

% tree canopy cover: Estimate canopy cover for all single-stemmed trees greater than 3 m in height. Canopy cover is defined as the vertical projection of the perimeter of a tree canopy to the ground, ignoring small gaps between foliage on each tree. This can be measured with a densiometer and should be expressed as a percentage. If cover is >5%, round to the nearest 5%. If none, indicate 0%.

% coniferous: Estimate the proportion of the canopy cover above 3 m that is coniferous (needleleaf), rounding to the nearest 5%. Note that this is the relative percent, not absolute percent, of the canopy cover. For example, total canopy cover could be 25%, and 90% of this might be coniferous.

Tree layer species: List, in descending order of percent canopy cover, up to four species of single-stemmed trees taller than 3 m that dominate the tree canopy layer. Trees are defined here as woody plants that generally grow from a single stem, have a more or less definitely formed crown of foliage, and have a height of at least 3 m (Viereck and Little 1972, Viereck et al. 1992). Willows or alders of tree size but with multiple trunks should be described below in the Shrubs section.

For each tree species record the following information:

% cover: Estimate tree canopy cover to the nearest 5%. Note that if a forest canopy consists of multiple, distinct tree layers of different average heights, then the % cover across layers can sum to >100%, but this is not common in Alaska.

Avg. ht. (m): Check the box showing the average height of the canopy layer. If a single species forms two distinct sublayers, list it twice, with that contributing the greater canopy cover listed first. Tree layer height may be estimated using a clinometer or hypsometer.

DBH class & cover class: Record the tree size class (diameter at breast height, DBH Code) into which the largest tree of each species falls. Also record the Cover Class Code to describe the percent cover of the largest trees within this habitat.

Single-stemmed saplings, seedlings or dwarf trees <3 m—Mature trees with a single stem but less than 3 m in height are considered dwarf trees (e.g., black spruce in a bog or mountain hemlock at timberline). Saplings are defined as young woody plants with a single stem <13 cm in DBH. Check box if total cover of saplings, seedlings, and dwarf trees is <10%. For up to two distinct layers, in descending order of height, list the following:

Species: Dominant species in each layer.

% cover: Estimate the percent cover of the layer to the nearest 5%.

Avg. ht. (m): Estimate the average height of the layer to nearest 0.1 m.

Avg. DBH class: Record the average size class of the layer (DBH Code).

Shrubs (multiple-stemmed, woody plants)—Shrubs are defined as woody plants with multiple stems. Several species of dwarf shrubs have multiple growth forms across their range and thus may be difficult to categorize as shrubs or herbs. Please consult Table SOP 10.2 to determine under which growth form to categorize some of the more common Alaska species (following Viereck et al. 1992). Check box if total cover of shrubs is <25%. For each shrub layer in descending order of height record the following information:

Avg. ht. (m): Estimate the average height to 0.1 m.

Cover class: Record the appropriate Cover Class Code.

Species: Record the dominant species in the layer.

Non-woody plants—Record the following information for graminoids, herbs, ferns, and horsetails.

Cover class: Record the appropriate Cover Class Code to indicate the percent ground cover for each non-woody plant group.

Species: List up to three dominant species for each non-woody plant group, if known.

Ground Cover—Record the following information for mosses and hepatics, lichens, litter, bare (unvegetated) ground, and ephemeral snow, ice, or water.

Cover class: Record the appropriate Cover Class Code to indicate the percent ground cover of each type of ground cover. As indicated in the Habitat Questionnaire, any patch of unvegetated substrate >400 m^2 in size should be recorded and described as a separate habitat.

Species: List dominant species of mosses, hepatics, and lichens, if known. If vegetation is covered by ice or snow, please note on the description line if it is persistent (will likely stay in place for many years) or ephemeral and not likely to be present year-round. Similarly, please describe the occurrence of seasonally ephemeral water, such as that due to snow melt or spring riverine or coastal flooding.

Table SOP-10.2. Default growth form to record for species with multiple growth forms.

Scientific Name	Common Names	Growth Form
Artemisia tilesii	Tilesius' wormwood	Herb
Cornus canadensis	bunchberry dogwood	Herb
Dasiphora fruticosa	shrubby cinquefoil	Shrub
Dryas octopetala	eightpetal mountain-avens	Shrub
Linnaea borealis	twinflower	Shrub
Lycopodium sp.	clubmoss	Herb
Rubus arcticus	arctic blackberry	Herb
Rubus chamaemorus	cloudberry	Herb
Rubus pedatus	strawberryleaf raspberry	Herb

References

Jennings, M, Loucks O, Peet R, Faber-Langendoen D, Damman A, Barbour M, Glen-Lewin D, Grossman D, Pfister R, Talbot S, Walker J, Hartshorn G, Waggoner G, Abrams M, Hill A, Roberts D, Tart D, Rejmanek M, and Walker M. 2004. Guidelines for describing associations and alliances of the U.S. National Vegetation Classification. The Ecological Society of America Vegetation Classification Panel. Version 4.0, July 2004. http://vegbank.org/vegdocs/panel/NVC_guidelines_v4.pdf (accessed 22 September 2020).

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Viereck, LA, and Little EL, Jr. 1972. Alaska trees and shrubs. Agriculture Handbook No. 410. USDA Forest Service, Washington, DC.

SOP 11: ALMS project and product description archiving

Overview

The USFWS Planning and Review of Inventory and Monitoring activities on Refuges (PRIMR) database (https://ecos.fws.gov/primr/#) is a tool to document and retrieve information about surveys conducted on National Wildlife Refuge System (NWRS) lands. ServCat is an on-line library for archiving data, reports, and other products from USFWS projects. Detailed instructions in the use of PRIMR and ServCat are beyond the scope of this SOP. Detailed information on creating and maintaining a survey record is provided in the PRIMR Help. Detailed information on ServCat is found in the ServCat Help.

The ALMS PRIMR Record

Refuge staff should use this guidance for entering ALMS into the PRIMR database. Entries in brackets are refuge specific. See Figures SOP-11.1 - 11.8 for screen shots of the ALMS record for Tetlin NWR.

Table SOP 11-1. Field Entries for ALMS record in the Planning and Review of Inventory and Monitoring activities on Refuges (PRIMR) database.

Details Tab	
Station:	[NAME] National Wildlife Refuge
Survey Name:	Alaska Landbird Monitoring Survey (ALMS)
Description	ALMS is an off-road, grid-based, point-count survey for landbirds. The primary objective is to monitor long-term population trends of landbirds and other species that can be monitored by diurnal point counts during the breeding season. A secondary objective is to estimate landbird densities by habitat, which can be used to model avian distribution and abundance across Alaska. ALMS is a collaborative program whereby agencies and other entities contribute data to the U.S. Geological Survey Alaska Science Center for storage and analysis.
Record Visibility:	Accessible to Anyone
Survey Type:	Coop Baseline Monitoring (CB)
Start Year:	[First year of survey]
End Year:	Indefinite
Survey is dependent on additional capacity:	[Check box if reliant on MBM or other support to conduct the survey. Leave blank if refuge conducts the survey without additional support.]
Survey Status:	[Autogenerated based on Start and End Year]
Frequency of Survey:	If the refuge has one plot [Recurring -- every two years] If the refuge has >1 plot [Recurring – every year]
Survey Timing:	June
Environment:	[Optional – this is to be dropped in future versions of PRIMR]
Survey Area:	Statewide
Management Units:	(box disabled)
Keywords:	population trend, migratory birds, landbirds, point-count survey
Objectives Tab	
Primary Goal Source:	[Select CCP or Other]
Objectives:	[Select from CCP or Other source]
Resources and Species Tab	
Resource Theme Level 1:	Biological Integrity
Resource Theme Level 2:	Other Biota
T or E Species targeted?	No

Search for all species	(Leave blank)
Federal ESA species	(Leave blank)
Non-listed Species:	(Leave blank)
Biotic Groups Level 1:	Aves (Birds)
Biotic Groups Level 2:	Passeriformes (Perching Birds)
Contacts & Partners Tab	
Partners Level 1:	DOI - agencies Other Federal Agencies Mixed Agencies/Partnerships State Government
Partners Level 2:	U.S. Geological Survey, Alaska Science Center
Survey Coordinator Information	
Search Active directory	[Enter the primary contact at the station; remaining fields will auto-populate]
Other contact name	Steve Matsuoka, Jim Johnson, Zak Pohlen
Other contact title	Statewide Survey Coordinator, USGS; Landbird Coordinator, USFWS; Biological Technician, USFWS
Costs Tab (Note – this is for REFUGE costs only! Use the worksheet to help guide costs.)	
Avg Annual Staff Time FWS FTE:	[Enter number of FWS hours for training, field prep, survey time, etc. that the refuge incurs]
Avg FWS FTE Cost:	[Annual salary of FWS personnel]
Avg Annual Staff Time Other FTE:	[Enter number of hours non-FWS for training, field prep, survey time, etc. that the refuge supports]
Avg Other FTE Cost:	[Annual salary of other staff time]
Avg Annual Cost (OPR):	[Other costs – e.g., fuel, camp per diem, etc.]
Total Avg Annual Operation Cost:	[PRIMR will calculate total annual cost based on user input]
Uploaded Spreadsheet:	[You may download a fillable spreadsheet to help you estimate costs, e.g., PRIMR_Survey_Costs_Worksheet _ALMS.xlsx]
Rationale Tab	
1. Which station management objective does the survey support? Is the objective derived from the CCP, interim objectives, HMP, or other?	
[PRIMR will auto-populate from Objective tab – Objective source (e.g., CCP, NRMP) and short name]	
[Enter any additional objectives for the refuge that the survey informs that are not specifically identified in conservation plans, e.g., understanding statewide and regional population trends enables better understanding of the refuge's contribution to statewide populations of landbird species, distribution data can inform future change on the refuge.]	
2. Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.	
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 road-based Breeding Bird Survey (BBS) to randomly sample large roadless portions of the state excluded from BBS. The USGS Alaska Science Center developed the sampling scheme and protocols and is responsible for data management and analysis. The purpose of ALMS is to monitor long-term trends in breeding populations of landbirds (and other species) within all ecoregions of Alaska. Data collected at [Name] Refuge, when combined with data from across the state, will increase our ability to detect long-term trends of landbirds at the ecosystem (Bird Conservation Region) and state level (Handel and Sauer 2017). Long-term monitoring will enable analysis of change in bird populations in relation to fire, disease and insect damage, resource development, climate-related change, and other landscape-level disturbances. This information can be used to trigger research to examine potential mechanisms of observed changes in bird populations.	
3. What is the population or attribute of interest, what will be measured, and when?	

Biological Integrity; Other Biota; Aves (Birds); Passeriformes (Perching Birds); Recurring -- every two years; 10-30 June (auto-populated from Resources & Species tab)	
The population of interest is breeding landbirds in remote, roadless areas throughout Alaska. ALMS was designed primarily to monitor passerines during the breeding season; however, these surveys also gather valuable data for other bird species such as woodpeckers, waterbirds, cranes and gallinaceous birds. ALMS surveys measure density of birds along established survey routes, corrected for detection probability. Surveys are conducted during the peak singing period of male birds, between June 10-30. Observers record all birds seen and heard and estimate distance to each individual during a 10-minute count window. [Briefly describe what is surveyed on your refuge, e.g.,: Tetlin operates seven plots surveyed biennially: plots Mount Fairplay, Chisana, Hidden Lake and Deeper Lake are surveyed in even years; Northway, Fish Camp Lake and Ten Mile Hill are surveyed in odd years.]	
4. Is this a cooperative survey? If so, what partners are involved in the survey?	
Coop Baseline Monitoring; U.S. Geological Survey, Alaska Science Center (auto-populated from Contacts & Partners tab)	
This is a cooperative statewide survey promoted by Boreal Partners in Flight, with major partners being USGS, USFWS, BLM, NPS, USFS, DoD, and State of Alaska. The USGS-Alaska Science Center (ASC) is responsible for the sampling design, field methods, analysis, and products. Contributing land management partners (e.g., refuges, forests, parks) often collect and enter data. [Briefly describe unique circumstances at the Refuge, e.g., At Tetlin, data collection has been a collaboration between the Refuge, Alaska Region Migratory Bird Management and Alaska Region Inventory and Monitoring Initiative. Data are reported to the USGS Alaska Science Center, where it is housed and analyzed.]	
Protocols & Products	
Protocol Used?	yes
Protocol Used	Select: Alaska Landbird Monitoring Survey: Alaska Regional Protocol Framework for Monitoring Landbirds Using Point Counts
URL to Initial Survey Instructions	[leave blank]
Survey Products	[if applicable, select a product related to the survey. This field is autopopulated from ServCat; products must be assigned to your station, e.g., an annual report]
Products Description	[If applicable, describe other relevant products.]

Archiving Data and Reports in ServCat

Reports or other products resulting from a refuge ALMS survey should be archived in ServCat. Data will be archived by USGS as described in Element 4: Data Management and Analysis. The procedure for adding ALMS products to ServCat is similar to that described by the "Alaska Region I&M Reporting Guidelines." The ServCat keywords should include the PRIMR "Survey ID" (see reporting guidelines), the keywords used in PRIMR, and other descriptors such as the habitat or ecosystem (e.g., boreal forest, arctic tundra).

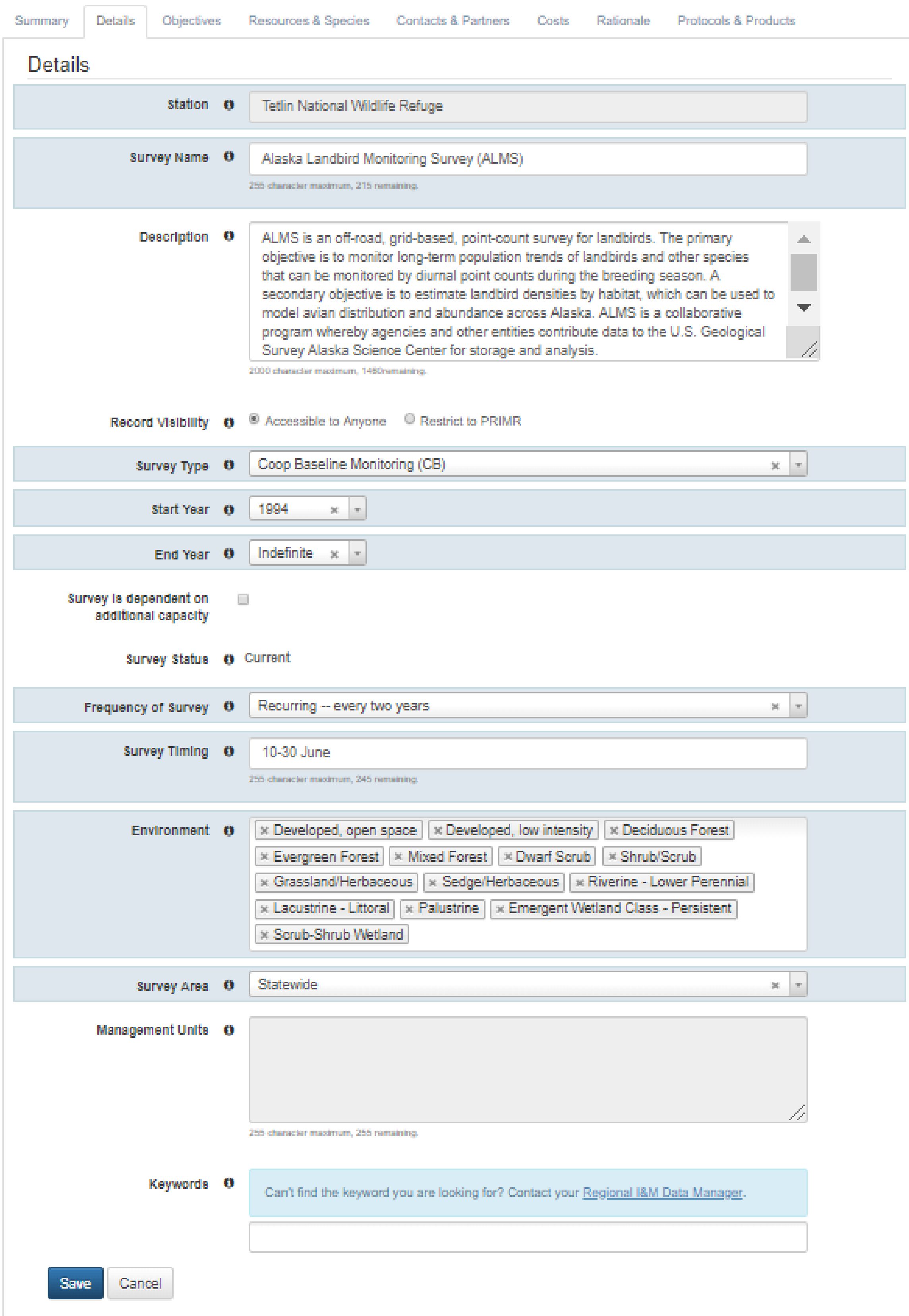


Figure SOP-11.1. PRIMR Details tab with entries for ALMS.

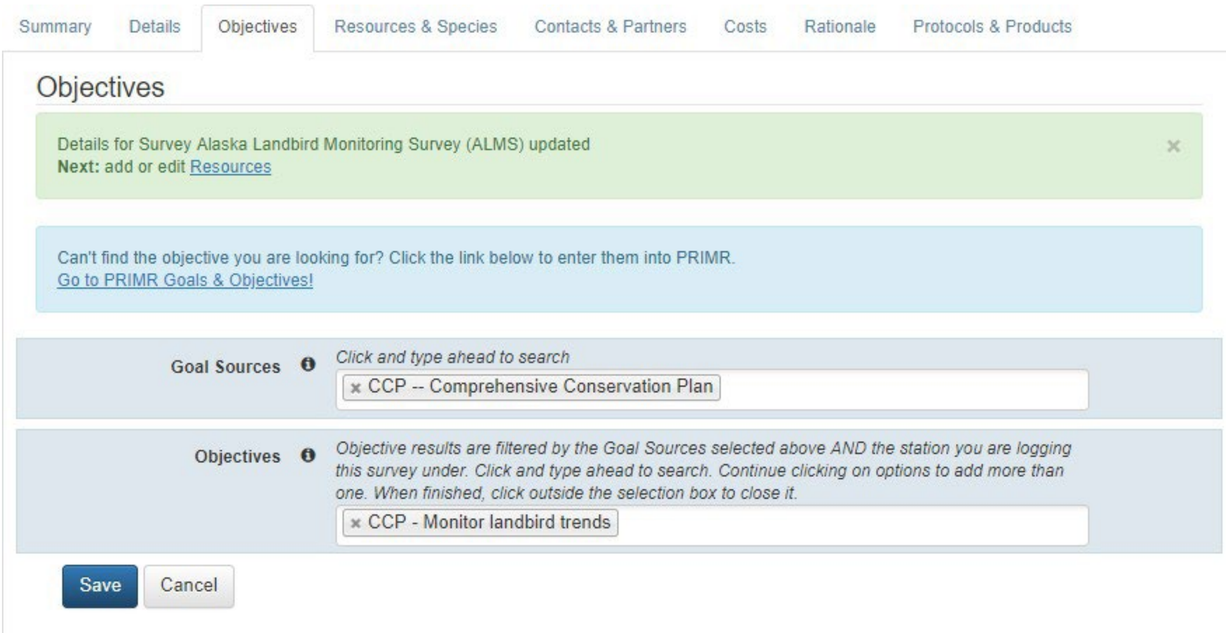


Figure SOP-11.2. PRIMR Objectives tab with example entries for ALMS.

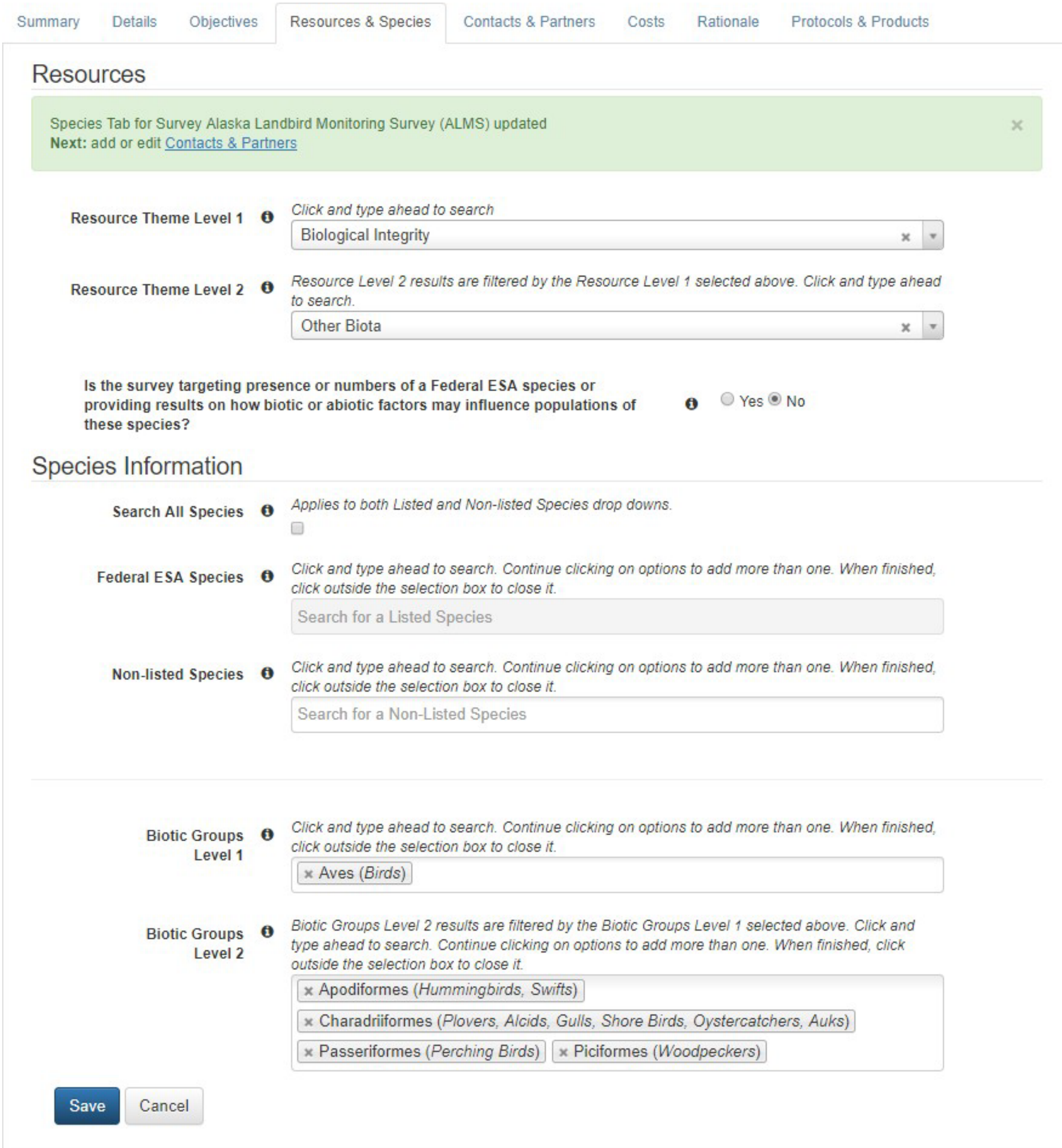


Figure SOP-11.3. PRIMR Resources & Species tab with entries for ALMS.

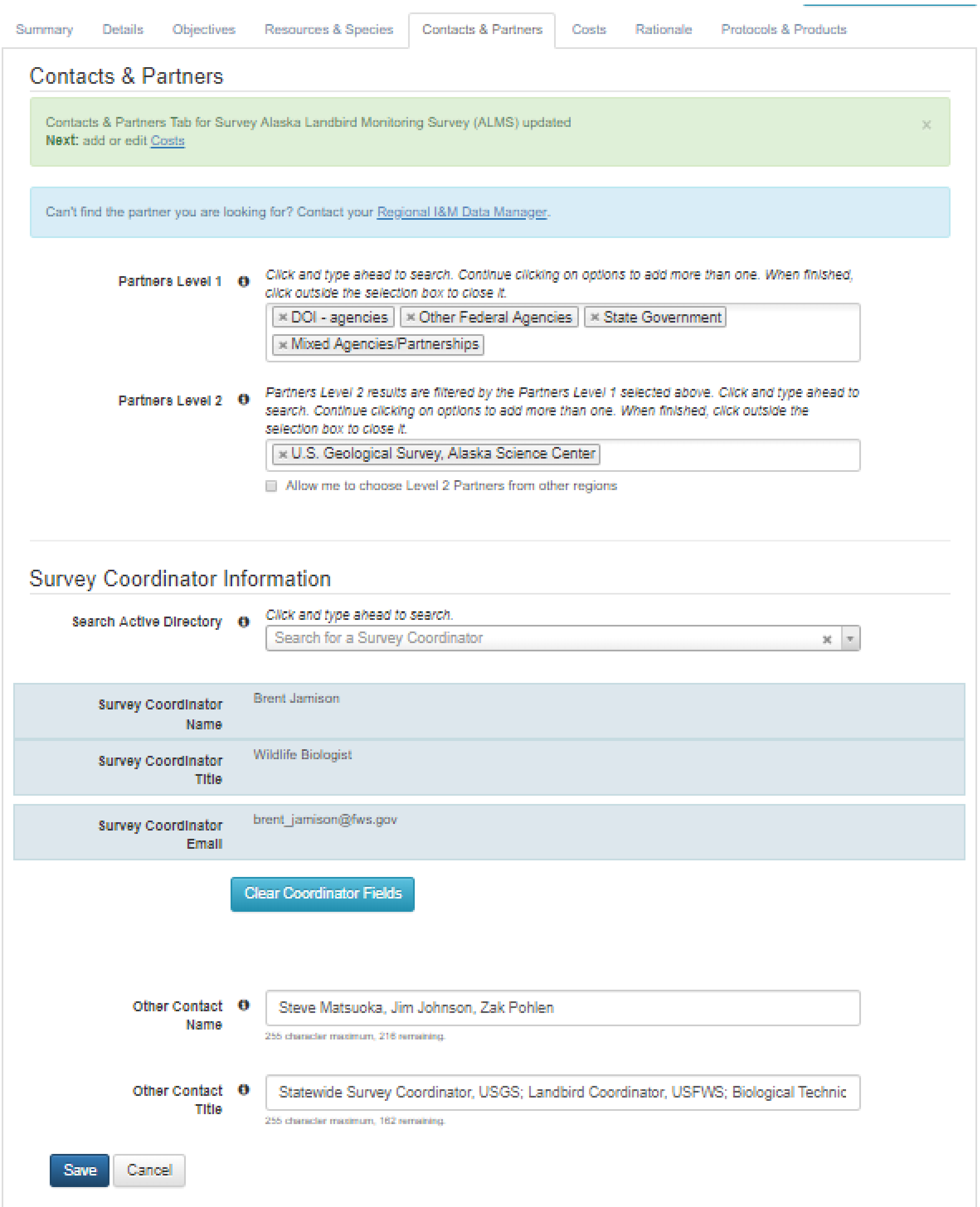


Figure SOP-11.4. PRIMR Contacts & Partners tab with entries for ALMS.

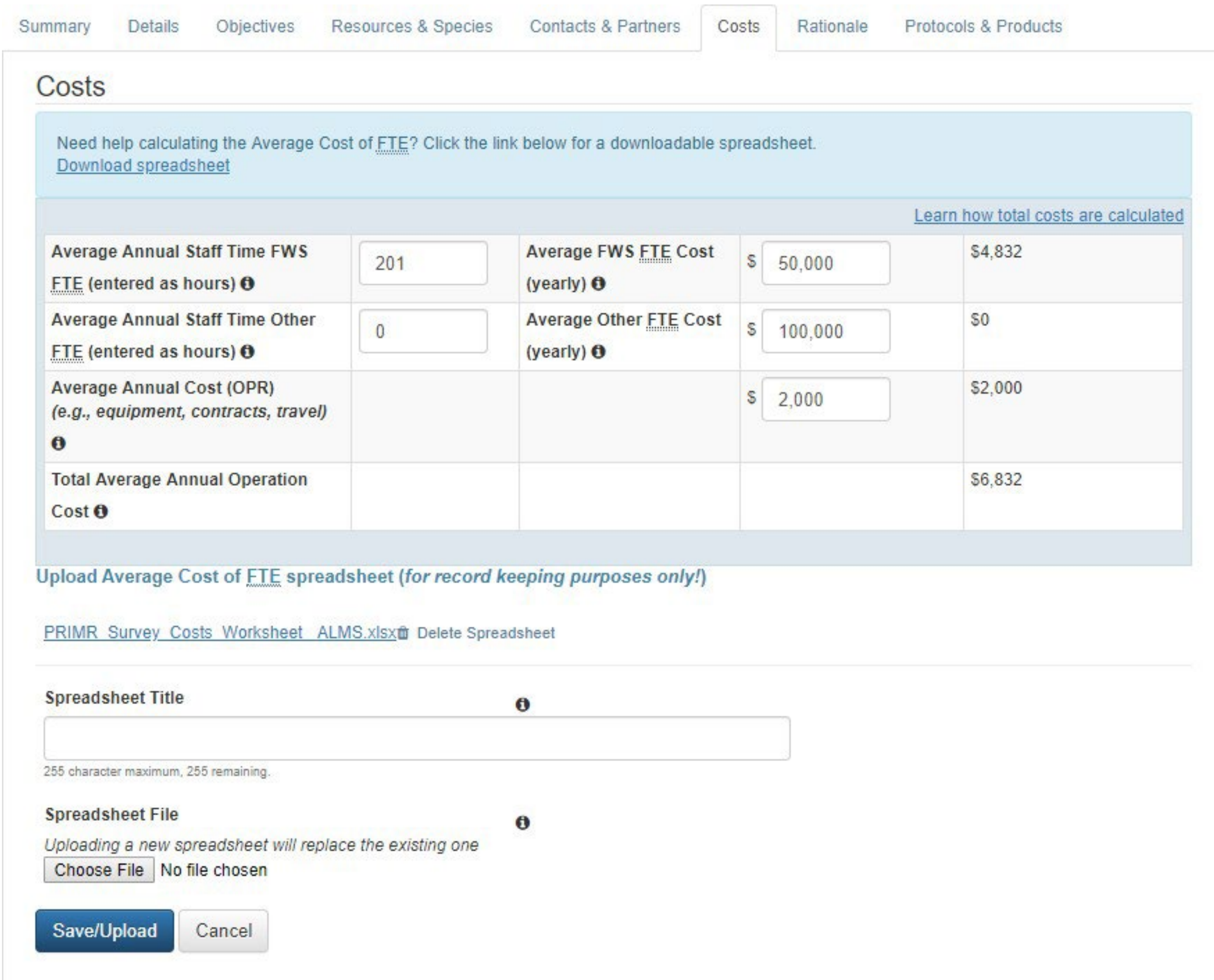
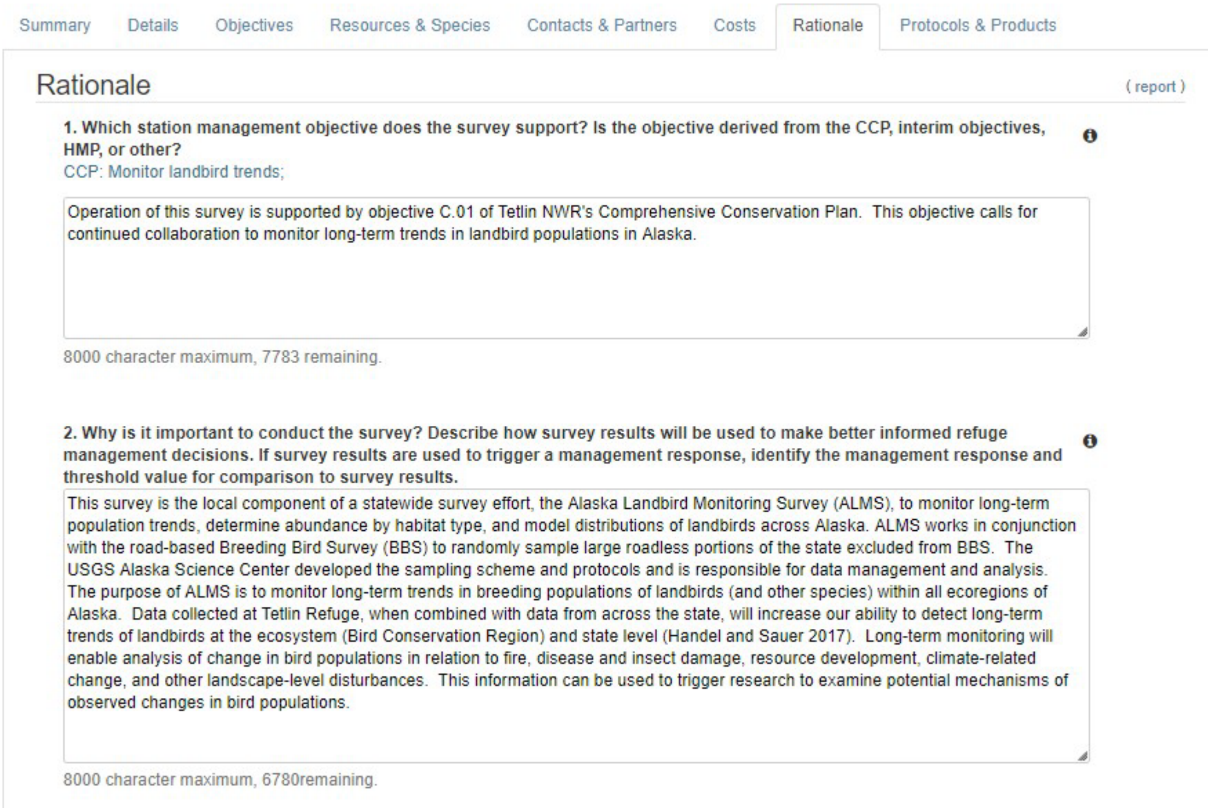


Figure SOP-11.5. PRIMR Costs tab with example entries for ALMS.



Summary | Details | Objectives | Resources & Species | Contacts & Partners | Costs | Rationale | Protocols & Products

Rationale (report)

1. Which station management objective does the survey support? Is the objective derived from the CCP, interim objectives, HMP, or other?

CCP: Monitor landbird trends;

Operation of this survey is supported by objective C.01 of Tetlin NWR's Comprehensive Conservation Plan. This objective calls for continued collaboration to monitor long-term trends in landbird populations in Alaska.

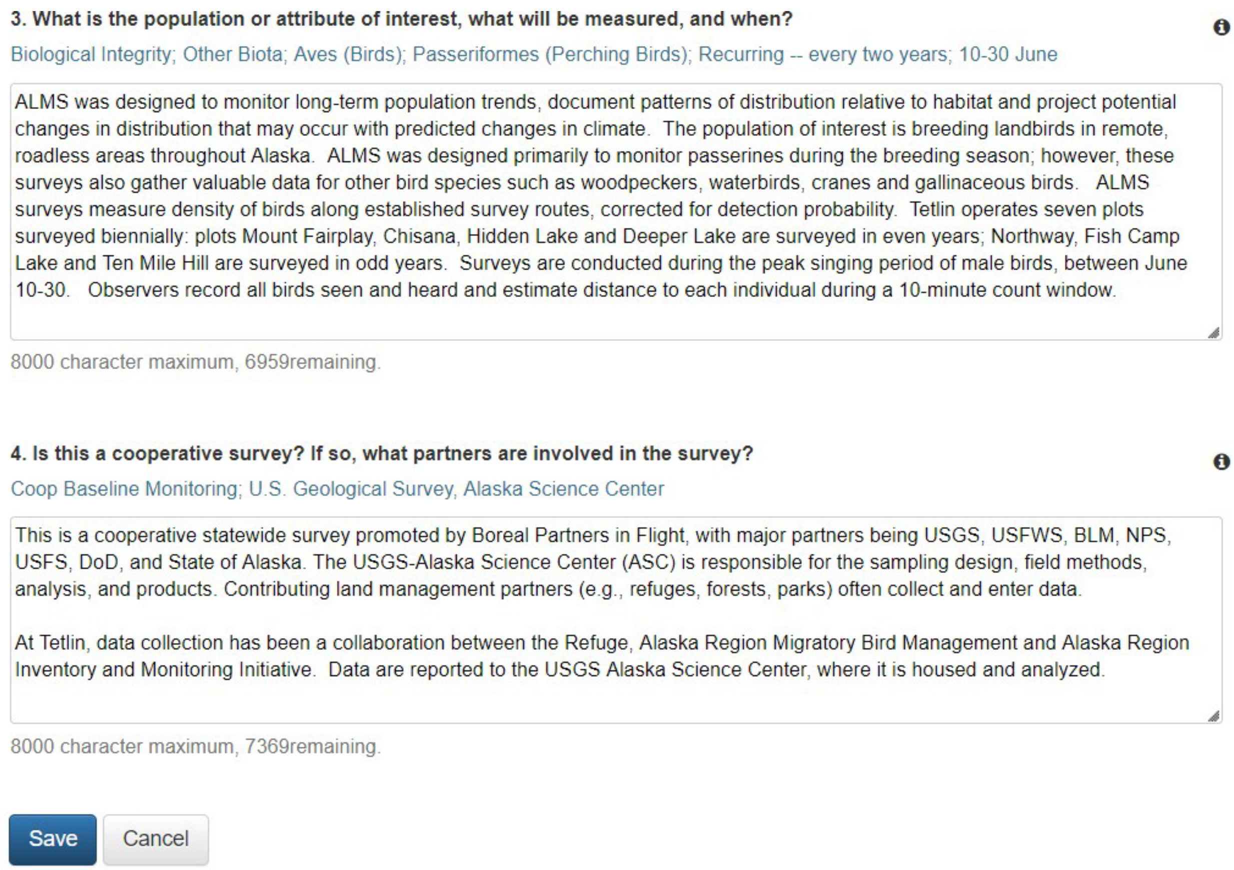
8000 character maximum, 7783 remaining.

2. Why is it important to conduct the survey? Describe how survey results will be used to make better informed refuge management decisions. If survey results are used to trigger a management response, identify the management response and threshold value for comparison to survey results.

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 road-based Breeding Bird Survey (BBS) to randomly sample large roadless portions of the state excluded from BBS. The USGS Alaska Science Center developed the sampling scheme and protocols and is responsible for data management and analysis. The purpose of ALMS is to monitor long-term trends in breeding populations of landbirds (and other species) within all ecoregions of Alaska. Data collected at Tetlin Refuge, when combined with data from across the state, will increase our ability to detect long-term trends of landbirds at the ecosystem (Bird Conservation Region) and state level (Handel and Sauer 2017). Long-term monitoring will enable analysis of change in bird populations in relation to fire, disease and insect damage, resource development, climate-related change, and other landscape-level disturbances. This information can be used to trigger research to examine potential mechanisms of observed changes in bird populations.

8000 character maximum, 6780remaining.

Figure SOP-11.6. PRIMR Rationale tab with entries for ALMS; questions 1 and 2.



3. What is the population or attribute of interest, what will be measured, and when?

Biological Integrity; Other Biota; Aves (Birds); Passeriformes (Perching Birds); Recurring -- every two years; 10-30 June

ALMS was designed to monitor long-term population trends, document patterns of distribution relative to habitat and project potential changes in distribution that may occur with predicted changes in climate. The population of interest is breeding landbirds in remote, roadless areas throughout Alaska. ALMS was designed primarily to monitor passerines during the breeding season; however, these surveys also gather valuable data for other bird species such as woodpeckers, waterbirds, cranes and gallinaceous birds. ALMS surveys measure density of birds along established survey routes, corrected for detection probability. Tetlin operates seven plots surveyed biennially: plots Mount Fairplay, Chisana, Hidden Lake and Deeper Lake are surveyed in even years; Northway, Fish Camp Lake and Ten Mile Hill are surveyed in odd years. Surveys are conducted during the peak singing period of male birds, between June 10-30. Observers record all birds seen and heard and estimate distance to each individual during a 10-minute count window.

8000 character maximum, 6959remaining.

4. Is this a cooperative survey? If so, what partners are involved in the survey?

Coop Baseline Monitoring; U.S. Geological Survey, Alaska Science Center

This is a cooperative statewide survey promoted by Boreal Partners in Flight, with major partners being USGS, USFWS, BLM, NPS, USFS, DoD, and State of Alaska. The USGS-Alaska Science Center (ASC) is responsible for the sampling design, field methods, analysis, and products. Contributing land management partners (e.g., refuges, forests, parks) often collect and enter data.

At Tetlin, data collection has been a collaboration between the Refuge, Alaska Region Migratory Bird Management and Alaska Region Inventory and Monitoring Initiative. Data are reported to the USGS Alaska Science Center, where it is housed and analyzed.

8000 character maximum, 7369remaining.

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Figure SOP-11.7. PRIMR Rationale tab with entries for ALMS; questions 3 and 4.

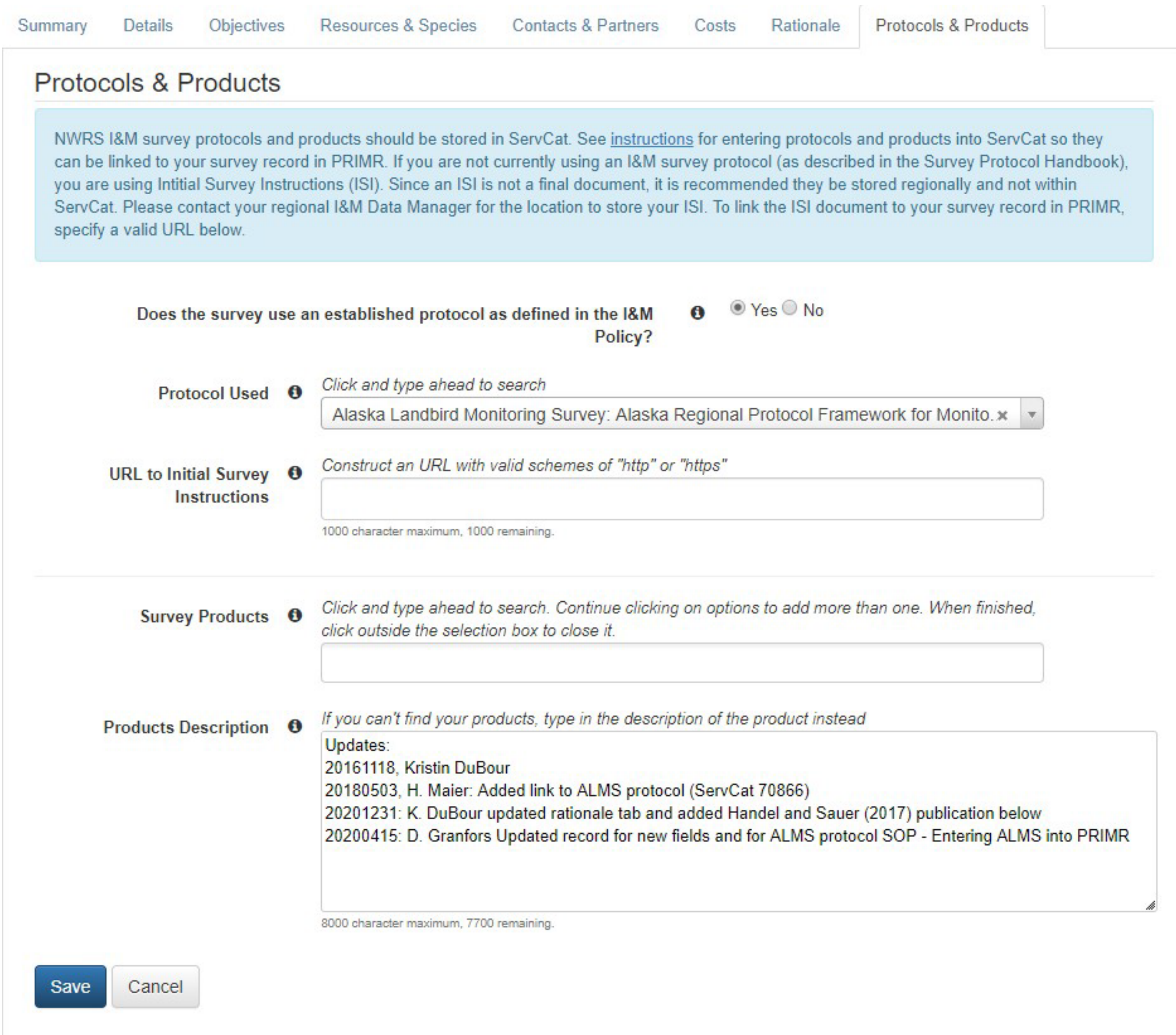

Figure SOP-11.8. PRIMR Protocols & Products tab with entries for ALMS.

References and links

PRIMR: https://ecos.fws.gov/primr/

PRIMR Help Dashboard:
https://my.usgs.gov/confluence/pages/viewpage.action?pageId=451936324

USFWS Service Catalog (ServCat): https://ecos.fws.gov/ServCat/

USFWS Service Catalog (ServCat) Help:
https://ecos.fws.gov/ServCat/DataStoreReports/Public/ServCat%20Help

Supplemental Materials

All supplemental materials are also available for download at https://www.usgs.gov/centers/alaska-science-center/science/alaska-landbird-monitoring-survey

SM 1: Data Forms

https://www.usgs.gov/media/files/alms-forms-all-2022

SM 2: Reference Sheets

https://www.usgs.gov/media/files/alms-reference-sheets

SM 3: Packing List

https://www.usgs.gov/media/files/alms-packing-list

SM 4: Template Safety Plan

https://www.usgs.gov/media/files/alms-safety-plan