

**Susitna-Watana Hydroelectric Project
(FERC No. 14241)**

**Landbird and Shorebird Migration, Breeding, and
Habitat Use Study
Study Plan Section 10.16**

Final Study Plan

Alaska Energy Authority



July 2013

10.16. Landbird and Shorebird Migration, Breeding, and Habitat Use Study

On December 14, 2012, Alaska Energy Authority (AEA) filed with the Federal Energy Regulatory Commission (FERC or Commission) its Revised Study Plan (RSP), which included 58 individual study plans (AEA 2012). Section 10.16 of the RSP described the Landbird and Shorebird Migration, Breeding, and Habitat Use Study. This study focuses on collecting data on landbirds and shorebirds that are known or expected to occur in the Project area. The study will employ three basic survey methods: ground-based point-count surveys for breeding birds, a boat-based survey for colonially nesting swallows, and ground-based monitoring of migration using a combination of daytime visual observations and nocturnal radar sampling. RSP 10.16 provided goals, objectives, and proposed methods for data collection regarding landbirds and shorebirds.

On February 1, 2013, FERC staff issued its study plan determination (February 1 SPD) for 44 of the 58 studies, approving 31 studies as filed and 13 with modifications. RSP Section 10.16 was one of the 31 studies approved with no modifications. As such, in finalizing and issuing Final Study Plan Section 10.16, AEA has made no modifications to this study from its Revised Study Plan.

10.16.1. General Description of the Proposed Study

The Landbird and Shorebird Migration, Breeding, and Habitat Use Study is planned as a two-year study (2013–2014). Results from the first year of work in 2013 will be used to update existing information and to fine-tune the field survey methods and survey areas in 2014, if necessary. The landbird and shorebird study will employ three basic survey methods: ground-based point-count surveys for breeding birds, a boat-based survey for colonially nesting swallows, and ground-based monitoring of migration using a combination of daytime visual observations and nocturnal radar sampling. The point-count surveys are intended to record all birds seen or heard and to estimate the distance to each bird detected. Point-count surveys, which were designed to count singing male passerines, are now the preferred method for inventory and monitoring efforts for landbirds in remote, roadless terrain in Alaska (Handel and Cady 2004; ALMS 2010). These methods also have been adopted for shorebirds (ASG 2008) and are especially appropriate in forested landscapes, where shorebirds typically occur in low densities and where plot-based methods would yield few observations, even with a relatively large survey effort. The survey of colonially nesting swallows will focus on suitable habitats within the proposed reservoir inundation zone. The boat-based survey will identify swallow nesting colonies and potential nesting habitat.

Study Goal and Objectives

The goal of this study is to collect baseline data on the occurrence and habitat use of breeding landbirds and shorebirds in the Project area to enable assessments of the direct, indirect, and cumulative impacts on these birds from construction and operation of the proposed Project. This study will include species of conservation concern, both landbirds and shorebirds, that are known or expected to occur in the Project area (see AEA 2011), as well as numerous other species that are protected under the federal Migratory Bird Treaty Act (see Section 10.3).

The study has four specific objectives:

- Collect data on the distribution and abundance of landbirds and shorebirds during the summer breeding season.
- Identify habitat associations for landbirds and shorebirds.
- Evaluate changes in distribution, abundance, and habitat use of landbirds and shorebirds through comparison with historical data.
- Characterize the timing, volume, direction, and altitude of landbirds and shorebirds migrating through the dam and camp facilities area.

To achieve these objectives, the following surveys and analyses will be required:

- Conduct ground-based point-count surveys to collect field data on the distribution and abundance of landbirds and shorebirds in the study area during the summer breeding season.
- Conduct focused point-count and linear walking surveys in riparian and lacustrine habitats, targeting piscivorous species and other species typical of fluvial, riparian, and lacustrine habitats, which often are under-represented in standard point-count surveys.
- Conduct boat-based surveys of colonially nesting swallows in riparian habitats within the reservoir inundation zone.
- Collect habitat-use data for landbirds and shorebirds during the point-count surveys to inform the Evaluation of Wildlife Habitat Use Study (Section 10.19), which will be the first step in quantifying habitat change (i.e., gain/loss and alteration) for landbirds and shorebirds from the proposed Project.
- Review the literature on the foraging habits and diets of piscivorous and partly piscivorous landbird and shorebird species (e.g., Belted Kingfisher, American Dipper, Spotted Sandpiper), which will be used to inform the Mercury Assessment and Potential for Bioaccumulation Study (see Section 5.7).
- Conduct visual migration-watch surveys and radar sampling in the immediate vicinity of the dam, powerhouse, and camp facilities.
- Review historical (Alaska Power Authority [APA] Susitna Hydroelectric Project) data on landbirds and shorebirds for comparison with the current data from this study, to evaluate any changes in distribution, abundance, and habitat use over the intervening 30 years. Many species of migratory birds have suffered population declines in recent decades, so these comparisons may also provide information on the population status of those species in the Project area.

10.16.2. Existing Information and Need for Additional Information

In 1980 and 1981, breeding landbirds and some shorebirds were surveyed for the APA Susitna Hydroelectric Project using modified territory-mapping methods, which involved repeated visits between May 20 and July 3 to 12 study plots, each 10 hectares (24.7 acres) in size (Kessel et al. 1982; AEA 2011). Each plot was placed in an area of homogeneous habitat, as defined using Kessel's avian habitat classification (Kessel 1979). At that time, territory mapping was the standard method for surveying landbirds. Because each plot was surveyed repeatedly, substantial information on bird occurrence and habitat use was obtained for the limited area encompassed by those 12 plots. However, because only 12 plots were sampled in homogeneous habitats, the data did not adequately address spatial variability in bird occurrence and habitat use across the broader study area. Some additional information on shorebird occurrence was obtained during

ground-based surveys of lakes, ponds, and wetlands for waterbirds (Kessel et al. 1982), but focused surveys for breeding shorebirds were not conducted. No studies of landbirds or shorebirds have been conducted more recently in the Project area (AEA 2011).

During the surveys by Kessel et al. (1982), four species of swallows were observed in the Project area: Tree Swallow, Bank Swallow, Cliff Swallow, and Violet-green Swallow. Violet-green and Tree swallows were considered fairly common, whereas Bank and Cliff swallows were considered uncommon, and all four species were either confirmed or suspected to nest in the study area. A nesting colony of 25 pairs of Bank Swallows was recorded along upper Watana Creek and three colonies of Cliff Swallows were observed at Watana and Clarence lakes. The distribution of avian survey plots and incomplete representation of habitat types suitable for swallows likely led to an underestimate of swallow abundance and distribution in the Project area by Kessel et al. (1982). No studies of swallows have been conducted more recently in the study area.

Because of the limitations in extrapolating results from intensive surveys of territory-mapping plots to the larger Project area, it will be necessary to study these species groups again using currently accepted protocols (point-count surveys), which allow large landscapes to be sampled adequately and which provide more data on variability in habitat use. Because the most recent surveys for landbirds and shorebirds were conducted over 30 years ago, and because populations of these birds and their habitats have likely changed during that period, new studies are recommended. Current data on the distribution, abundance, and habitat use of landbirds and shorebirds is necessary to be able to adequately assess the impacts from the proposed Project on these species.

Point-count surveys are not always effective in riparian habitats, where the auditory capacity of observers can be reduced in some locations because of rapidly flowing water, and are sub-optimal for species such as swallows, that have highly clumped distributions (Swanson and Nigro 2003). Because much of the swallow nesting habitat in the study area is difficult to access or observe on foot, a separate survey effort has been designed to assess the distribution and abundance of colonially nesting swallows in riparian habitats.

No migration surveys for landbirds and shorebirds were conducted specifically for the original APA Susitna Hydroelectric Project studies, although information was compiled opportunistically (Kessel et al. 1982). The U.S. Fish and Wildlife Service (USFWS) is concerned about the potential for attraction of migrating landbirds and shorebirds to artificially lighted facilities constructed for the Project, potentially resulting in mortality from collisions, as expressed in comments in various meetings.

10.16.3. Study Area

The study area for the breeding landbird and shorebird point-count survey includes a 2-mile buffer zone around the proposed reservoir impoundment zone, dam and camp facilities area, access road and transmission corridor alternatives, and material sites (Figure 10.16-1). All direct and indirect effects of the proposed Project on landbirds and shorebirds and their habitats in the upper Susitna basin are expected to be encompassed by this 2-mile buffer.

The point-count and linear walking surveys in riparian and lacustrine habitats will be conducted in the primary riparian and lacustrine habitats in the inundation zone, the infrastructure area

surrounding the site of the proposed dam, and in riparian habitats along the Susitna River immediately below the location of the proposed dam.

The survey area for colonially nesting swallows includes riparian habitats along the Susitna River and its tributaries within the reservoir inundation zone. The Susitna River in the inundation zone is an alluvial river located in a shallow canyon and is moderately braided with a low gradient. Tributaries to the Susitna River (e.g., Deadman, Tsusena, Watana, Jay, and Kosina creeks) are lower volume, steeper gradient, clearwater streams with deeply incised canyons along their lower reaches. Habitat features to be examined during the survey will include all riverbanks and cliffs adjacent to these rivers and streams.

The sampling site for the migration study component will be located on the adjacent benchland just above the dam site on the north side of the river (Figure 10.16-1).

10.16.4. Study Methods

10.16.4.1. Point-count Surveys

10.16.4.1.1 Study Design

The proposed methods for the breeding landbird and shorebird study are ground-based point-count surveys, in which all birds seen or heard are recorded, along with an estimate of the horizontal distance to each bird observed. Point-count surveys, which were designed to count singing male passerine birds, are now the preferred method for inventory and monitoring efforts for landbirds in remote, roadless landscapes in Alaska (Handel and Cady 2004; ALMS 2010). These methods have been adopted for shorebirds (ASG 2008) and are especially appropriate in forested landscapes, where shorebirds typically occur in low densities and where plot-based methods would yield few observations, even with a relatively large survey effort.

Point-count surveys are appropriate for large development projects that affect a large area and can include many different types of habitats. The sample points can be distributed across the landscape and allocated among habitat types to ensure that all prominent habitat types are sampled. Because management agencies in Alaska are increasingly concerned with landbird and shorebird species of conservation concern (which are generally uncommon), and because it is important to sample many different occurrences of each habitat type to detect uncommon species (which are patchy in occurrence across the landscape), this study has been designed so that point-counts are allocated in as many different occurrences of each of the prominent habitat types in the study area. In 2013, point-count sampling locations will be distributed using a pseudo-stratified random plot allocation procedure based on aerial photosignatures as the sampling strata (because a current, complete habitat map will not be available by spring 2013). The plot allocation methods may change in 2014 after a current, complete habitat map is available. This procedure will result in adequate sampling of habitats, over two years of surveys, so that habitat-use evaluations for landbirds and shorebirds will be supported by Project area-specific data. These habitat-use evaluations (see Section 10.19) are a critical link in conducting quantitative assessments of habitat loss and alteration for breeding landbirds and shorebirds.

Several species of landbirds and shorebirds are not commonly recorded in standard point-count surveys allocated randomly across available habitats, but are known to be closely associated with riparian and lacustrine habitats (e.g., Belted Kingfisher, American Dipper, Semipalmated Plover,

Solitary Sandpiper, Spotted Sandpiper, Wandering Tattler). Therefore, an additional set of point-count surveys will be conducted specifically in riparian and lacustrine habitats that are expected to be affected by Project development (see Section 10.16.4.2 below). These additional surveys were requested by USFWS.

The landbird and shorebird study will be coordinated with the other wildlife studies being conducted for the Project, especially the raptor and waterbird studies, so that sightings of bird species that apply to other studies can inform the qualitative results and reporting efforts among studies.

10.16.4.1.2 *Field Surveys*

Point-count field surveys will follow standard protocols for point-counts in Alaska (Handel and Cady 2004; ALMS 2010). These protocols are based on the variable circular-plot point-count methods and temporally stratified observation periods (Ralph et al. 1995; Buckland et al. 2001; Farnsworth et al. 2002; Rosenstock et al. 2002). Surveys will be conducted during early morning hours to maximize the detection of breeding species, especially singing male passerines. Standard 10-minute observation periods will be used and, to facilitate the collection of habitat-use data, the specific habitat being used by each bird observed will be recorded whenever possible. These data on the habitats being used by landbirds and shorebirds at the time of observation also will be used as an additional ground-reference data set to help in the mapping of wildlife habitats in the upper and middle Susitna basin (see Section 11.5).

As noted above, the point-count plot locations in 2013 will be selected using a pseudo-stratified random plot allocation procedure based on aerial photosignatures as the sampling strata, because it is unlikely that a current and complete habitat map will be available by spring 2013. In 2014, point-count locations will be selected again using a pseudo-stratified random plot allocation procedure, but mapped wildlife habitat types are expected to be available for use as the sampling strata (to the extent the wildlife habitat mapping is complete by spring 2014). In both years, the plot allocation will be constrained so that an adequate number of plots are placed in each mapped habitat or photosignature type. Without this constraint, an excessive number of plots would be located in the most common habitat types and far fewer would occur in uncommon types, resulting in under-sampling of uncommon habitat types. In all cases, sample points will be located in a random and spatially unbiased fashion (using the Geographic Information System [GIS]) within each mapped habitat or photosignature type, subject to the restriction of maintaining a minimum distance of 500 meters (1,640 feet) between sample points in open habitats and 250 meters (820 feet) in closed habitats. This sampling scheme will result in a selection of point-count locations that is unbiased with respect to the distribution of breeding birds on the landscape. The goal in plot allocation is to derive a set of sample points that are spread broadly across the study area and are replicated within each photosignature/habitat type to capture spatial variability in habitat use by breeding birds. Replicate sampling is also important to locate the often patchy occurrences of the less common species of conservation concern.

The point-count observers will estimate distance to birds detected on the surveys, using distance classes of 10-meter increments to 100 meters, then 100–125 meters, 125–150 meters, and >150 meters. Laser rangefinders will be used to confirm and calibrate the distance estimates. Using finer-scale distance classes in the field will allow the data to be grouped into broader categories later for analysis, if necessary. Experienced point-count observers will be used for these surveys, and all observers will receive refresher training before beginning fieldwork, to include bird

identification (visual and by song and call), distance estimation to known targets, distance testing in a simulated survey, accuracy re-testing of distance estimates, and final distance testing in a simulated survey.

One extended field survey is planned in each summer breeding season in 2013 and 2014. In general, the survey is planned to begin in mid-May in each year, although survey timing may need to be adjusted to account for variability in the onset of breeding activities in response to early or late snowmelt and/or unseasonable temperature conditions in spring; local weather conditions and the activities of breeding birds in the Project area will be monitored each spring by communicating with the Project helicopter pilots and other wildlife researchers in the area (e.g., raptor biologists who will be surveying in the area in late April of each year). The surveys in May will be focused on breeding shorebirds and early nesting landbirds such as the Rusty Blackbird, a species of conservation concern in Alaska (USFWS 2008). It is likely that data on early nesting resident birds also will be collected in the early portion of the survey period because nesting starts later at the higher elevations typical of the Project area. The point-count survey period will extend into mid-June to focus on neotropical migrant landbirds. Late-arriving flycatchers (e.g., Alder Flycatcher) will be present by early June. It is expected that some data on nesting resident birds and shorebirds will be collected during early June as well.

For the early portion of the survey period in May, point-count plots will be allocated preferentially in open habitats that are used by breeding shorebirds. These habitats include open wetlands in forested areas as well as open, dwarf scrub-dominated habitats in upland and alpine terrain. Woodland bog and tall scrub habitats in poorly drained lowlands will also be sampled because they are used by breeding shorebirds and Rusty Blackbirds. By later in the survey period (late May and early June), point-count plots will be allocated across all available habitats in the study area. As noted above, this survey will focus on neotropical migrant landbirds.

10.16.4.1.3 Data Analysis

Point-count survey data are subject to errors resulting from species-specific variability in vocalizations and behavior, observer variability in detecting birds, variability in detecting birds in different habitats, and variability in distance estimates. Consequently, to improve estimates of abundance and density, in analyses of the point-count survey data, researchers will use removal sampling (to improve the estimates of detection probabilities, especially for uncommon species; Farnsworth et al. 2002) and distance sampling (to calculate detection probabilities and densities; Buckland et al. 2001; Rosenstock et al. 2002), as recommended by USFWS during the landbird-shorebird meeting on September 6, 2012. Observations will be stratified temporally (by point-count period) and spatially (by distance category) to estimate detection probabilities for all species, and allow corrections of the data to account for those birds that were present but not detected (Buckland et al. 2001; Rosenstock et al. 2002). Conducting both removal and distance analyses to estimate detection probabilities will result in improved estimates of abundance and density. As recommended by USFWS, existing detection functions, developed in other point-count studies in Alaska, will be used when necessary (e.g., to improve detectability estimates of uncommon species for which few observations in the study area may be available for analysis).

10.16.4.2. Riparian- and Lacustrine-focused Surveys

In May, an additional set of point-count surveys and linear surveys between point-count plot locations will be conducted specifically in riparian and lacustrine habitats that are expected to be affected by Project development. These surveys will be conducted in the inundation zone, in the infrastructure area surrounding the site of the proposed dam, and immediately below the location of the proposed dam. The surveys will target species (e.g., Semipalmated Plover, Spotted Sandpiper, Solitary Sandpiper, Wandering Tattler, Belted Kingfisher, and American Dipper) that are known to use riparian and lacustrine habitats, and which are not often recorded on point-counts allocated randomly across all available habitats. In addition to the point-count surveys in riparian and lacustrine habitats, researchers will walk along the sampled stream courses and lake/pond shorelines as they move between point-count locations. During these linear surveys, all birds observed will be recorded. The resulting data will be represented as the number of observations of each species per unit time spent in-transit to provide a standardized, relative measure of abundance across all species (following methods used by Andres et al. 1999 and Boisvert and Schick 2007). A similar survey design for recording landbirds and shorebirds and relative levels of abundance while in transit between point-count locations was successfully completed on the Seward Peninsula in 2006 (Boisvert and Schick 2007) by the same wildlife contractors who will conduct the riparian- and lacustrine-focused surveys for this Project.

An additional goal of the riparian- and lacustrine-focused surveys will be to collect data on the distribution and abundance of piscivorous species (primarily Belted Kingfisher, but also American Dipper and Spotted Sandpiper, which occasionally consume fish) in the inundation zone and immediately below the location of the proposed dam (because elevated mercury levels could occur there in any fish that make it through the turbines). This information will be provided to the researchers conducting the mercury assessment study (see Section 5.7).

10.16.4.3. Survey of Colonially Nesting Swallows

The focal species for this survey effort include Bank Swallow, Cliff Swallow, and Violet-green Swallow. These three species are gregarious, colonial nesters that prefer riparian cutbanks and cliffs near lacustrine or fluvial waters (Kessel et al. 1982; Brown et al. 1992; Brown and Brown 2002; Garrison 2002). Bank and Violet-green swallows nest in burrows in relatively soft, sandy substrates and may form mixed-species colonies (Brown et al. 1992; Garrison 2002); data on Belted Kingfishers also are likely to be obtained incidentally because they nest in burrows in the same type of bank habitat. Cliff Swallows build nest cavities of mud and clay on rocky cliffs, bridges, and other human-made structures (Brown and Brown 2002). All three species feed on flying insects and often forage over or near water bodies (Brown et al. 1992; Brown and Brown 2002; Garrison 2002).

The swallow survey will be conducted using a motorized river boat for access to the Susitna River and tributary streams in the reservoir inundation zone. Researchers will search suitable nesting habitat and record nesting colonies. Two observers, plus the boat operator, will conduct the survey. In portions of tributary streams not accessible by boat, the survey will be conducted on foot. One observer will record the geographic locations of nesting habitat and colonies on a topographic map or aerial imagery, as well as in a hand-held global positioning system (GPS) receiver. The other observer will photograph the habitat and colonies to aid in accurate nest counts and to quantify the total area of potential nesting habitat. Both observers will assist in

species identification and will estimate abundance and activity. Researchers will stop and observe active colonies for a minimum of 15 minutes, as recommended by Garrison et al. (1989), to allow accurate species identification and to obtain estimates of abundance and activity.

Accessible colonies will be closely inspected to estimate the proportion of active burrows. Researchers will check a stratified-random (spatially balanced) sample of burrows within accessible colonies using a flashlight and an angled mirror attached to an extendable rod. Burrows containing eggs, young, or adults will be considered occupied. The number of eggs or young in nests will be recorded. These data will be used to estimate the total number of active burrows in each colony and in the surveyed area as whole, thereby facilitating an estimation of population size.

The survey will be conducted in late June or early July of 2013 and 2014, depending on the snowmelt and temperature patterns in spring and early summer of each year. All three focal species normally arrive in Interior Alaska by mid- to late May and nesting occurs in June and July (Kessel et al. 1982; Brown et al. 1992; Brown and Brown 2002; Garrison 2002). Bank Swallows may reuse old burrows or create new burrows during courtship (Hickman 1979). Therefore, surveys will be timed to occur after mating and nest establishment to reduce variability in burrow numbers (Jones 1987). Vacant, but suitable, nesting habitat will be recorded to quantify the total area of potential nesting habitat present in the study area and to inform subsequent survey efforts in 2014, which will focus on revisiting colonies located in 2013.

All accessible navigable portions of the study area will be surveyed once in 2013 and again in 2014. Changes in numbers of individuals, colonies, and nests between the two years could provide information on the variability in swallow populations and will improve abundance estimates. In addition to swallows, researchers will record incidental observations of other birds during this survey to support this and the other avian studies.

10.16.4.4. Migration Surveys

The migration survey component of this study will employ a combination of daytime visual sampling and nocturnal radar and visual sampling (using night-vision devices) during both the spring (late April to June) and fall (late August to mid-October) migration periods. This study component will be conducted in concert with the waterbirds study and is described in more detail in that study plan (see Section 10.15).

10.16.4.5. Integration of Existing Information with Current Study

The landbird and shorebird data collected in the APA Susitna Hydroelectric Project area in the 1980s (Kessel et al. 1982; AEA 2011) will be reviewed and incorporated into analyses of habitat use by these species presented in the Initial Study and Updated Study reports (see below). The primary focus will be to compare habitat-use patterns in the historical data with the results of current data analyses. The abundance and distribution information for landbirds and shorebirds from Kessel et al. (1982) will be reviewed to evaluate changes in abundance and distribution over the intervening 30 years. These historical comparisons will provide information on the recent trends for these species in the Project area, which will be useful for impact predictions and assessments.

10.16.4.6. Mercury Assessment

Scientific literature on the foraging habits and diets of piscivorous landbirds and shorebirds (primarily Belted Kingfisher, but also American Dipper and Spotted Sandpiper) will be reviewed to inform the mercury risk-assessment work (see Section 5.7, Mercury Assessment and Potential for Bioaccumulation Study) and to complement the field data gathered on the distribution and abundance of these species in the study area. To the extent possible, the information gathered will be focused on data from Alaska studies. In addition to the literature review, feathers will be collected from any kingfisher nests located during the swallow survey and will be provided to the study lead for the mercury study for laboratory analysis of methylmercury levels.

10.16.4.7. Reporting and Data Deliverables

The database and reporting deliverables for this study include the following:

- **Electronic copies of field data.** A geospatially-referenced relational database will be prepared, containing historical (APA Susitna Hydroelectric Project) data and current data collected during this study, including representative photographs of breeding bird habitats at point-count locations. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards established for the Project.
- **Initial Study Report and Updated Study Report.** The landbird and shorebird study results will be presented in the Initial and Updated Study reports, according the schedule indicated in Table 10.16-1. The reports will include descriptions of the field survey methods, a map of the locations surveyed, and survey results with tables indicating abundance by species and habitat type.

10.16.5. Consistency with Generally Accepted Scientific Practice

The landbird and shorebird study will employ point-count surveys and analytical methods that conform to currently accepted, standard protocols for the monitoring of landbirds in remote, roadless landscapes of Alaska (Handel and Cady 2004; ALMS 2010). In recent years, these methods have also been adopted for shorebird surveys in Alaska (ASG 2008) and are especially appropriate in forested landscapes, where shorebirds typically occur in low densities and where plot-based methods would yield few observations, even with a relatively large survey effort.

The survey of colonially nesting swallows will employ the best available techniques. There currently is no standard protocol for surveying swallow colonies, but the methods proposed above follow those used elsewhere (Garrison et al. 1989; Watts et al. 1996). These methods are intended to be an improvement on point-count surveys, which are widely regarded to be inadequate for swallows and similar riparian species (Swanson and Nigro 2003).

The migration surveys will employ well-developed techniques for radar and visual sampling that have been used for similar studies in Alaska and elsewhere in North America, as is described in more detail in the waterbirds study plan (Section 10.15).

10.16.6. Schedule

The landbird and shorebird study will be a two-year effort. The schedule for the 2013 and 2014 activities is presented graphically below (Table 10.16-1). Logistics and survey planning will occur in March and April of 2013 and 2014. The radar and visual surveys of spring migrant birds (conducted in conjunction with the waterbirds study) will occur from late April to early June of 2013 and 2014. Point-count surveys and the riparian- and lacustrine-focused surveys will take place over a continuous 30-day period from mid-May to mid-June in 2013 and 2014. The swallow colony survey will take place over approximately four days between June 20 and July 10 of 2013 and 2014. Fall migration sampling (radar and visual sampling conducted in conjunction with the waterbirds study) will occur from mid-August to mid-October of 2013 and 2014. Data analysis will occur from July to December of 2013 and 2014. The Initial Study Report will be completed in February of 2014 and the Updated Study Report in February of 2015.

In 2014 and 2015, licensing participants will have opportunities to review and comment on the study reports (Initial Study Report in early 2014 and Updated Study Report in early 2015). Updates on the study progress will be provided during Technical Workgroup meetings, which will be held quarterly in 2013 and 2014.

10.16.7. Relationship with Other Studies

This study has limited information needs from other studies, as is portrayed below (Figure 10.16-2). Before the point-count surveys and the riparian- and lacustrine-focused surveys, preliminary interpretation of aerial imagery from the Vegetation and Wildlife Habitat Mapping Study in the Upper and Middle Susitna Basin (Section 11.5) will be conducted to establish a preliminary classification of habitats for sample allocation. A pseudo-stratified random sampling scheme will be used to allocate point-count locations and effort among habitats. Habitat-specific survey data from the field surveys will be used to describe the distribution and abundance of each species detected in each habitat sampled, and density estimates will be calculated for each species in each habitat in which it was detected. Field survey data from the swallow colony survey will be used to document the locations of swallow colonies, which will facilitate separate population estimates of those species within the surveyed area. The diurnal visual and nocturnal radar migration surveys will be conducted in conjunction with the waterbird study (Section 10.15) to provide data on landbird and shorebird migration, including timing, volume, altitude, flight directions, and any corridors identified. High-value habitats for each species will be identified and density and distribution data from the various surveys of landbirds and shorebirds will be used to inform the Evaluation of Wildlife Habitat Use Study (Section 10.19), which in turn will be used to quantify potential Project impacts and to develop any protection, mitigation, and enhancement (PM&E) measures for landbirds and shorebirds, as appropriate (see below).

Landbirds and shorebirds could be affected directly by the loss of breeding habitat from the placement of fill and from the conversion of terrestrial habitats to lacustrine habitats in the proposed reservoir. Additional indirect impacts could occur from alteration of habitats by erosion, fugitive dust accumulation, permafrost degradation, landslides, and off-road vehicle use. Disturbance effects (displacement from breeding habitats) from construction and operations activities represent another possible source of indirect impacts. Direct impacts could occur through injury and mortality in various ways (e.g., if exposed to fuel from accidental spills or

from in-flight collisions with infrastructure). Alterations in riparian wildlife habitats downstream from the proposed dam due to changes in instream flow, ice processes, and riverine geomorphology in the Susitna River are also possible, and will be addressed in the Riparian Vegetation Study Downstream of the Proposed Susitna-Watana Dam (see Section 11.6).

The impact assessment for landbirds and shorebirds will be conducted during preparation of AEA's License Application in 2015 by first conducting habitat-use evaluations (see Sections 10.19 and 11.5) to assign habitat values for each landbird and shorebird species to each of the wildlife habitats mapped in the Vegetation and Wildlife Habitat Mapping Study (see Section 11.5). Then the various components of the Project "footprint" will be overlaid on the mapped wildlife habitat types using GIS to quantify the acreages of important breeding habitats for each species that would be lost directly to fill or inundation. The determination of acreages of landbird and shorebird habitats that may be affected indirectly by habitat alteration and behavioral disturbance will be conducted similarly by overlaying habitat alteration and disturbance buffers (surrounding the proposed Project infrastructure). The size and number of habitat alteration and disturbance buffer(s) to be used will be determined based upon the final specifications for Project construction, operations, and maintenance activities, which will be provided in the Project description. Direct impacts on landbirds and shorebirds will be assessed qualitatively by evaluating the likelihood of injury and mortality from various sources during Project construction and operations. Cumulative effects on landbirds and shorebirds in the region of the proposed Project will be assessed by evaluating the extent of the direct and indirect impacts expected from the Project in conjunction with the existing impacts on landbirds and shorebirds in the region.

10.16.8. Level of Effort and Cost

The ground-based point-count surveys are planned to be conducted over two years (2013–2014). The point-count field surveys (late spring and early summer) will be conducted each year by a crew of eight observers (four crews of two persons each). Point-count surveys will be conducted for approximately 28 days each year, with the goal of obtaining at least 800 point-count samples each year. Helicopter support will be required for this survey with drop-off and pick-ups each day in the field. The surveys will start at first light in the morning, which in the Project area will be approximately 3:30 A.M. The bulk of the costs associated with this study are for field sampling, data analysis, and reporting.

The survey of colonially nesting swallows will focus on estimating the abundance and distribution of swallows in riparian habitats within the inundation zone. The field survey will be conducted in a short time period (estimated four days each year) and require only two observers (plus a boat operator). However, this survey has specific field equipment and safety requirements, including boating and camping equipment that will require helicopter sling transport.

The estimated cost for the landbird/shorebird component of the spring and fall migration surveys is included in the cost estimate for the waterbirds study plan (see Section 10.15), so is not listed here.

The projected annual cost of this study is in the range of \$425,000–\$450,000, for an estimated total of \$850,000–\$900,000 over both years.

10.16.9. Literature Cited

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10.16.10.Tables

Table 10.16-1. Schedule for implementation of the landbird and shorebird study.

Activity	2013				2014				2015
	1 Q	2 Q	3 Q	4 Q	1 Q	2 Q	3 Q	4 Q	1Q
Review aerial imagery & select point-count survey sites	—				—				
Point-count field surveys		—				—			
Riparian- and lacustrine-focused surveys		—				—			
Swallow colony survey			—				—		
Migration surveys (radar & visual)		—	—			—	—		
Data analysis			—	—			—	—	
Initial Study Report					△				
Updated Study Report									▲

Legend:

- Planned Activity
- △ Initial Study Report
- ▲ Updated Study Report

10.16.11. Figures

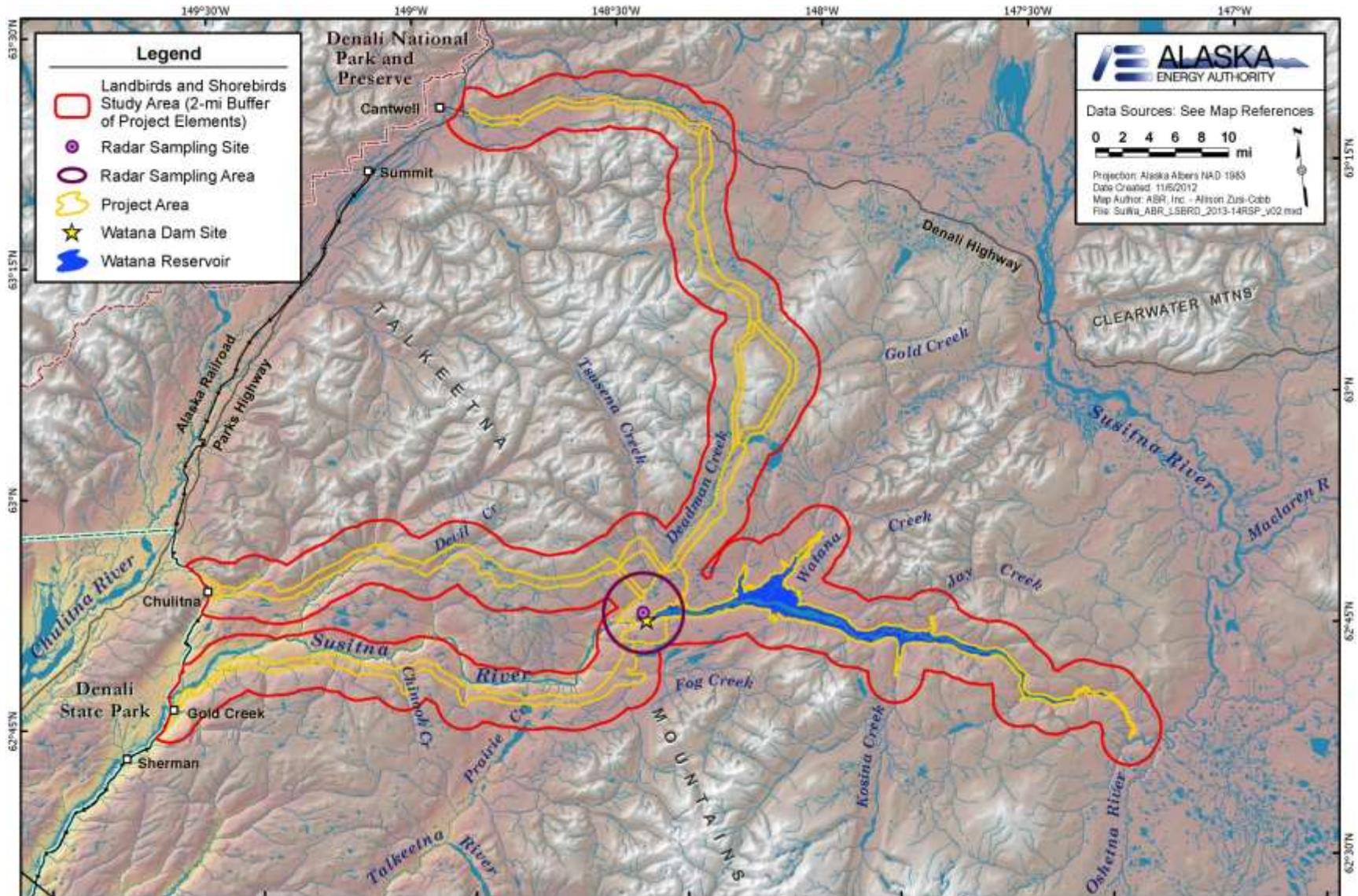


Figure 10.16-1. Landbird and shorebird study area.

STUDY INTERDEPENDENCIES FOR LANDBIRD AND SHOREBIRD STUDY

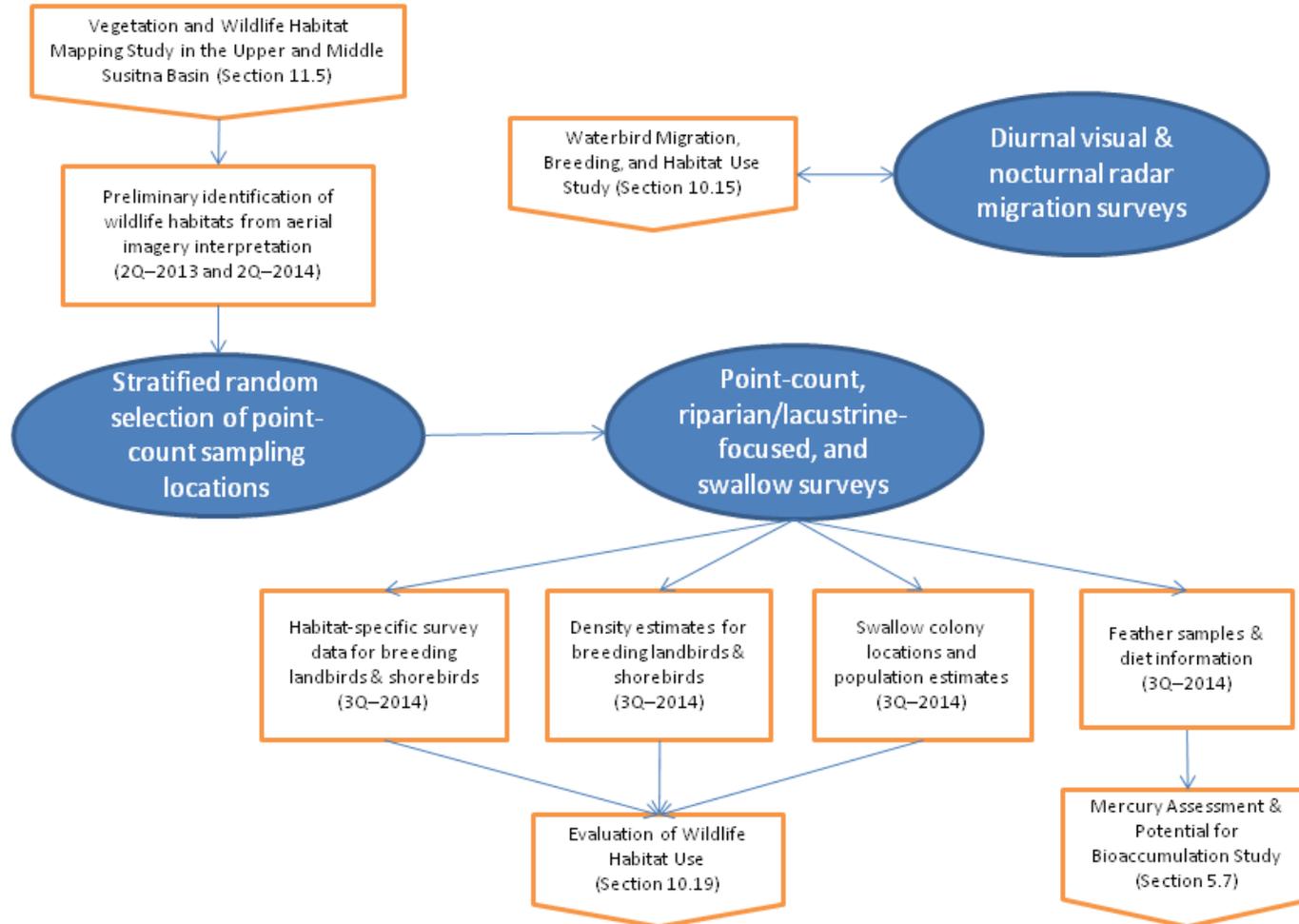


Figure 10.16-2. Study interdependencies for the landbird and shorebird study.