

Susitna-Watana Hydroelectric Project Document

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

**Surveys of Eagles and Other Raptors Study
Study Plan Section 10.14**

Final Study Plan

Alaska Energy Authority



July 2013

10.14. Surveys of Eagles and Other Raptors

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 10.14 of the RSP described the Surveys of Eagles and Other Raptors Study. This study focuses on providing data for avoidance of raptor take, for the assessment of Project impacts, and ultimately for any necessary applications for federal eagle nest and take permits. RSP 10.14 provided goals, objectives, and proposed methods for data collection regarding eagles and other raptors.

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 10.14 was one of the 31 studies approved with no modifications. As such, in finalizing the Final Study Plan Section 10.14, AEA has made no modifications to this study from its Revised Study Plan.

10.14.1. General Description of the Proposed Study

The Surveys of Eagles and Other Raptors began in 2012 to prevent inadvertent take of raptors by providing information on raptor avoidance zones to Project personnel in the field in 2012. The Surveys of Eagles and Other Raptors will continue in 2013 and 2014, providing data for avoidance of raptor take, for the assessment of Project impacts, and ultimately for any necessary applications for federal eagle nest and take permits.

Study Goal and Objectives

The goal of the Surveys of Eagles and Other Raptors is to characterize population size, productivity, nesting phenology, and habitat use of raptor species to inform the prediction and quantification of impacts that may result from the proposed Project, and to provide information required for a possible application(s) for federal eagle take (lethal or disturbance take, see below) and/or eagle nest take permits. Common and scientific names of raptors that may occur in the Project area are listed in Table 10.14-1.

Six objectives have been identified for study:

- 1) Enumerate and identify the locations and status of raptor nests and territories that could be affected by Project construction and operations. Four specific tasks are associated with this objective:
 - a) Review and synthesize existing nest data for eagles and other raptors: Identify and assess the status of previously recorded nest locations of various species, including geographic coordinates, annual nest activity, descriptions of nest site characteristics, and general descriptions of cliff habitat in the proximity of each site.
 - b) Conduct field surveys to locate and characterize nests: Locate and map Bald Eagle and Golden Eagle nests in the Project study area, identifying all active and inactive nests and alternative nest sites. Locate and map active and inactive nests of other tree- and cliff-nesting raptor species (as well as Common Ravens) in the Project study area.
 - c) Create a geospatial database of all nests and territories: The database will be used to calculate inter-nest distances, estimate local average territory size, and, with overlays of Project footprint and habitats, determine the number of nests and territories potentially affected by the Project.

- d) Calculate local average territory size for Bald Eagles and Golden Eagles: Estimates of average territory sizes (and mean inter-nest distance) are required for the applications for federal eagle nest take permits.
- 2) Estimate Project effects on productivity of raptors. This objective includes four specific tasks:
 - a) Review existing productivity data.
 - b) Determine the average and range of productivity of nests of each species (eagle/other raptor/raven).
 - c) Consider impacts on productivity at the local and larger population level using current and historical data.
 - d) Undertake pre- and post-construction comparisons of productivity to evaluate whether realized take is consistent with the permitted take, and to ensure that the level of take is compatible with the preservation of eagle populations.
- 3) Estimate effects on nesting and foraging habitats by delineating suitable habitat features in a geospatial database (this work will be conducted in the Evaluation of Wildlife Habitat Use; Section 10.19), and characterize and map habitat as suitable or not suitable for nesting and foraging for the various raptor species. These characterizations will be used in four ways:
 - a) Calculate the percentage of local habitat lost.
 - b) Calculate numbers of breeding pairs and productivity.
 - c) Estimate whether or not a partial loss of a territory may functionally result in abandonment of the entire territory.
 - d) Identify whether or not habitats adjacent to the Project area may be available for displaced nesting birds.
- 4) Conduct field surveys and literature reviews to identify, map, and characterize the habitat-use patterns at fall and winter communal roost sites and foraging sites of Bald and Golden eagles and other raptor species. Describe seasonal habitat use, highlighting areas or conditions that may result in impacts on raptors.
- 5) Conduct a study to assess the extent to which planned overhead transmission lines may pose a collision risk to migrating or nesting raptors and to identify migratory corridors (including altitudes of raptor movements) in the Project transmission line corridors.
- 6) Provide information on the distribution, abundance, food habits, and diet of piscivorous (fish-eating) raptors; feather samples for characterization of mercury levels; and information on the effects of methylmercury on piscivorous raptors, for use in the Mercury Assessment and Potential for Bioaccumulation study (see Section 5.7).

10.14.2. Existing Information and Need for Additional Information

Historical information from aerial surveys of raptors in the early 1980s provided the first assessment of the distribution, abundance, and vulnerability of many raptor nests located within the proposed Project impoundment zone. Those surveys highlighted Bald and Golden eagles and Common Ravens, and, to a lesser extent, raptors such as Northern Goshawks. Extensive information on raptors was collected during the 1980s for the original Alaska Power Authority (APA) Susitna Hydroelectric Project and for other surveys in the region (discussed in ABR 2011). Hard-copy maps are available of eagle nests located during the APA Susitna Hydroelectric Project studies in the early 1980s (LGL 1984). Other nest site records may exist in the files of the University of Alaska Museum of the North (AEA 2011). Other investigators and agency personnel may have information on raptor nest sites and important habitats, such as

roosting sites, in or near the Project area. Similar regional databases of nest site information have been developed (Wildman and Ritchie 2000).

Surveys completed in the middle and upper Susitna River valley during the 1980s identified 23 Golden Eagle, 10 Bald Eagle, 3 Gyrfalcon, 3 Northern Goshawk, and 21 Common Raven nest sites (some sites included more than one nest site, if they were close together) (APA 1985). Although Common Ravens are not raptors, they construct both cliff and tree nests that raptors often use, are culturally significant, and are protected by the Migratory Bird Treaty Act (MBTA). Of the eagle nest sites identified in the 1980s, 5 Golden Eagle and 3 Bald Eagle sites were expected to be completely inundated by the original APA Susitna Hydroelectric Project Phase I (Low Watana) impoundment (LGL 1984).

New raptor studies are needed because most of the existing information is almost 30 years old and it is unknown how distribution, status, or other conditions may have changed. Also, historical surveys did not cover the entire area of current interest, including access roads and power transmission corridors. More sophisticated geospatial analyses are now available that allow for more accurate assessments of the potential effects of the Project on raptors and their habitats. Finally, current data will be necessary for compliance with federal laws, especially the Bald and Golden Eagle Protection Act (BGEPA) and the MBTA, the 2011 FERC–USFWS Memorandum of Understanding (MOU), and application(s) for federal eagle nest/territory take permits.

A limited field survey for raptors was conducted in 2011 (ABR 2011) and more extensive surveys of the Project area were conducted in 2012 (AEA 2012) to provide current information needed to protect raptors by restricting Project activities near active raptor nests during pre-license field studies and construction. In 2011, surveys on June 27 were limited to the area near borehole sites drilled for the geotechnical program in the vicinity of the proposed Watana Dam. In 2012, occupancy surveys for nesting raptors were performed twice in May and productivity surveys were performed twice in July. The 2012 survey area comprised the area within a 2-mile buffer of the Project area (impoundment, access and transmission corridors, and facilities/infrastructure). Surveys were conducted from a Robinson R44 piston helicopter. Dozens of raptor nests were observed and occupied nest sites were located and mapped. In addition to Common Ravens, nests of six species of raptors were identified in the Project area in 2012: Golden Eagle, Bald Eagle, Peregrine Falcon, Gyrfalcon, Red-tailed Hawk, and Merlin. Global Positioning System (GPS) files, maps, and avoidance guidelines were distributed to Project personnel and contractors to avoid “take” of nests by disturbance.

Although transmission lines can be a source of mortality for eagles and other raptors by electrocution and collision, it is assumed that all new transmission lines and power transfer stations for the Project will be built to the “eagle-safe” standards developed by the Avian Power Line Interaction Committee (APLIC 2006), and therefore will not be likely to constitute a significant source of electrocution risk for raptors. However, significant lengths of new transmission lines will be constructed across miles of open and undisturbed landscape. As discussed in the Avian Protection Plan (APP) Guidelines (APLIC and USFWS 2005), collision risk assessments are recommended in the siting of overhead power transmission lines.

10.14.3. Study Area

The study area is subdivided into two different-sized survey areas, depending on the species of interest. For Golden Eagles, 10 miles is the survey radius typically recommended by the U.S. Fish and Wildlife Service (USFWS) for Golden Eagles (Pagel et al. 2010) in areas that contain suitable nesting habitat. After consultation with AEA, however, USFWS agreed to a 10-mile survey radius only around the reservoir inundation zone to calculate a mean inter-nest distance for this species and a 3-mile radius around proposed facilities and potential access road and transmission corridors (M. de Zeeuw and J. Muir, USFWS, pers. comm., April 2012).

For Bald Eagles and other raptor species, a radius of 3 miles around the reservoir inundation zone, proposed facilities, and centerlines of the potential access road and transmission line corridors is considered to be sufficient (M. de Zeeuw and J. Muir, USFWS, pers. comm., April 12, 2012).

Hence, the study area for the Survey of Eagles and Other Raptors encompasses: (1) a 10-mile radius around the reservoir inundation zone for Golden Eagles; (2) a 3-mile radius around the reservoir inundation zone for Bald Eagles and other raptor species; and (3) a 3-mile buffer for all eagles and other raptors around proposed facilities and the centerlines of the potential access road and transmission line corridors (Figure 10.14-1).

All Bald and Golden eagle habitat within the relevant survey area boundaries will be surveyed. For Bald Eagles, surveys will cover the area within a half-mile of the centers of all drainages with suitable timber and within a half-mile of all shorelines of lakes with similar characteristics in the inundation zone and wherever these habitats cross proposed road and transmission line corridors. Information on other large tree-nesting birds will also be collected during those surveys. Survey routes for cliff-nesting raptors will be flown in a cliff-to-cliff survey pattern, focusing on cliffs suitable for Golden Eagle nests.

The survey methodology will obtain information for an area larger than the 1980s survey coverage, will gather information on key species in a more well-defined study impact area, and will provide information needed for eagle permitting and to develop avoidance areas and mitigation protocols to reduce the potential disturbance of nesting raptors from Project construction and operations. The nesting survey may be sectioned to include segments that match the extent of the 1980s survey to the extent appropriate for comparative purposes to evaluate trends in raptor populations and/or habitat use.

The study area for migration route surveys may be limited to specific locations along planned transmission line routes that may pose risks to migrating birds (e.g., ridgelines). These study areas will be determined in consultation with USFWS and be based on review of existing raptor migration data, topographical and wind current information, and other relevant factors.

10.14.4. Study Methods

10.14.4.1. Field Surveys

Inventory and monitoring methodologies for nest occupancy and productivity surveys will follow established aerial and ground-based protocols for eagle nest surveys (USFWS 2007; Pagel et al. 2010), using appropriately trained observers and suitable survey platforms (helicopter or fixed-wing aircraft). Modifications may be necessary to extend to the objective of identifying

and monitoring the nests of other raptors. Nests of cliff-nesting raptors (including Golden Eagle, Peregrine Falcon, Gyrfalcon, and potentially Bald Eagle) and raptors using large stick nests (including Bald Eagle, Great Horned Owl, Northern Goshawk, Red-Tailed Hawk, Osprey, and potentially Golden Eagle) will be inventoried and monitored, as will raven nests.

Small to medium-sized raptor species (e.g., Short-eared Owl, Boreal Owl, Northern Hawk Owl, Northern Harrier, American Kestrel, Merlin, and Sharp-shinned Hawk) will be recorded during ground-based surveys for the breeding landbird and shorebird point-count surveys (see Section 10.16).

Raptor nest occupancy surveys will begin in spring before leaf-out (late April to late May), focusing on primary habitats for Bald and Golden eagles, but also considering primary habitats of resident species nesting in woodlands (e.g., Great Horned Owl and Northern Goshawk) and on cliffs (e.g., Gyrfalcon and Peregrine Falcon).

The nest productivity survey period will extend from mid-June to late July to verify and monitor nesting activity and to search for additional nests of later-nesting raptors. Because of the wide range of breeding dates for all raptors considered in the study (mid-February for resident owls through early September for dispersal of Bald Eagles from nesting areas), the second survey period will encompass a broad timing window. The nesting chronology of each focal species of raptor will be considered during survey scheduling.

The same helicopter protocols will be employed for the occupancy and productivity surveys. A helicopter will be used, carrying two observers in addition to the pilot. Flight altitude and speed will follow standard survey protocols for each habitat type (Pagel et al. 2010). Observers will be seated on the same side of the aircraft during surveys. Location and nest attribute data, including substrate, species, and nest status, will be collected for entry into a geodatabase.

In any aerial survey, a key concern is quantifying the sightability of the target species to adjust density estimates for targets missed. The actual sightability of nests depends on many factors, including nest size, location, survey weather/light conditions, substrate and tree density, habitat type, observer experience, and survey platform. Although Golden and Bald eagles often construct large, conspicuous stick nests, some inconspicuous nests are likely to be missed when conducting surveys. Re-surveys of sub-samples of the study area will be performed to quantify the sightability of raptor nests in the Project area.

To prevent disturbance to Dall's sheep during the lambing period and near the Jay Creek and Watana Creek mineral lick sites, standard eagle survey protocols may need to be modified (Pagel and Whittington 2011) and helicopter surveys will be routed to avoid these areas during these periods.

The wildlife habitat map developed by the Vegetation and Wildlife Habitat Mapping Study in the Upper and Middle Susitna Basin (Section 11.5) will be used to delineate the probable distribution of early nesting owls. Results from point counts conducted for the Landbird and Shorebird Migration, Breeding, and Habitat Use study (Section 10.16) will be combined with information from a literature review to assess the distribution, abundance, and habitat use by these owl species, which will then be incorporated into the Evaluation of Wildlife Habitat Use (Section 10.19). No winter surveys are proposed for early nesting owls because they would require logistically difficult and potentially dangerous nocturnal surveys during winter in remote areas to obtain information on only two species (Boreal Owl and Northern Hawk Owl) that are

uncommon. Great Horned and Great Gray owl nests will be recorded during aerial surveys for Bald Eagles and other tree-nesting raptors.

Surveys for foraging and communal roost locations will be conducted primarily in fall and early winter. Repeated surveys of suitable protected forest stands may be necessary due to the high mobility of wintering Bald Eagles. Four aerial surveys of foraging habitat and communal roosts, primarily for Bald Eagles, will be conducted each year at intervals of 7 to 21 days between mid-October and early December. Survey numbers and timing may be adjusted in 2013 and 2014, based on the results of the initial surveys conducted in 2012. A helicopter or a fixed-wing aircraft carrying two observers will be used for these surveys. Surveys will be conducted near dawn or dusk. Information on fall fishery concentrations will be requested from Project fisheries researchers and from agency biologists to more effectively monitor potential Bald Eagle concentration areas.

Surveys to assess whether migrating raptors would be at risk for collision with Project power transmission lines will be conducted using fixed-radius migration point counts. These surveys generally will follow the USFWS's recommended point-count protocol, based on the standard hawk migration counting protocols described in Appendix C of the *Draft Eagle Conservation Plan Guidance* (USFWS 2011). Migration point counts will be centered in plots with a radius of 800 meters and will be conducted for a period of 30 minutes each. The plot locations will be delineated along the transmission corridor alternatives before surveys begin, and the final selection of plots to be sampled will be determined by focusing on areas judged likely to concentrate migrating raptors (on the basis of topography). Survey efforts will be timed to coincide with times of day when thermal updrafts are most likely to occur (from midday through the afternoon hours).

After federal and state permits have been acquired and nests of eagles and other raptors have been vacated for the season, a sample of nests of piscivorous raptors (primarily Bald Eagle but also Osprey, if any nests of the latter species are found) in the vicinity of the proposed reservoir will be visited to obtain samples of feathers for laboratory analysis of mercury levels, which will be provided to the investigators conducting the Mercury Assessment and Potential for Bioaccumulation Study (Section 5.7). A literature review will be conducted for this study to provide basic information on the food habits and diets of, as well as the documented effects of methylmercury on, piscivorous raptors. Because this information will be provided to the investigators conducting the mercury study, it will not be included in the reports prepared for the study of eagles and other raptors.

10.14.4.2. Reporting

Reporting of inventory and monitoring data will comply with the protocols and standards described in the MOU between FERC and USFWS (FERC and USFWS 2011). Survey reports will include the following:

- Maps and associated metadata for historical eagle and other raptor nest and communal roost locations with survey extents to compare to current survey data.
- Maps and associated metadata with coordinates for current nest locations, nest activity status, fall and winter communal roost areas, and migration routes.
- Summary and mapping of suitable forest, riparian, and cliff habitats to evaluate the extent of suitable nesting habitats and facilitate nest searches within the study area.

Observations will be recorded and geo-referenced with associated habitats during raptor surveys. Some raptor nests and observations will also be recorded during breeding landbird and shorebird point-count surveys. All raptor observations will be plotted on the wildlife habitat map using field GPS coordinates. Nest characteristics will be recorded according to a protocol developed in consultation with the USFWS, including the protocol of the USFWS Alaska Bald Eagle Nest Atlas (<http://alaska.fws.gov/mbsp/mbm/landbirds/alaskabaldeagles/default.htm>).

The wildlife habitat map will provide the basis for an ecosystem approach to assessing the effects of development-related habitat impacts on raptors. The wildlife habitat map will facilitate quantitative spatial analyses of raptor habitat availability and changes likely to result from development, and, in combination with raptor survey data, will provide a way to assess the potential for changes in local raptor populations during construction and operations. Spatial analyses will be used to calculate the area and percentage of habitat lost and the numbers of breeding pairs and their productivity that likely would be affected; to determine whether or not a partial loss of a given territory may functionally result in abandonment or failure of the entire territory; to identify whether or not habitats adjacent to the Project area may be “available” (notwithstanding occupancy) for displaced nesting birds; and to assess the risk of raptor collisions with overhead transmission lines.

10.14.4.3. Data Analysis

A geospatially referenced relational database will be developed to incorporate historical and current data, including nest and roost locations for each species; occupancy, activity, and productivity data; nest type and characteristics; vegetation stand characteristics; and photographs. Suitable raptor nesting habitat will be delineated using a combination of field mapping and Geographic Information System (GIS) analysis. Existing nest locations and distribution of timber stands with suitably sized nest trees, in coordination with Project studies involving vegetation surveys and mapping, will be incorporated into the identification and delineation of suitable raptor nesting habitats. Foraging habitats will also be delineated whenever possible. Distribution of spawning salmon (determined through collaboration with Project salmon studies, Sections 9.5, 9.6, and 9.7) will be used to identify Bald Eagle foraging locations and potential aggregation areas. Distribution of fall waterfowl staging areas (determined in coordination with the waterbirds study, Section 10.15) will provide additional information for locating fall Bald Eagle foraging locations and potential communal roost areas. The distribution of Dall’s sheep lambing areas and caribou calving areas, identified in part by the studies of Dall’s Sheep Distribution and Abundance (Section 10.7) and Caribou Distribution, Abundance, Movements, Productivity, and Survival (Section 10.6), will provide information for Golden Eagle foraging habitat analyses.

Local Bald Eagle and Golden Eagle territory sizes will be estimated using inter-nest distances, as described in the *Draft Eagle Conservation Plan Guidance* (USFWS 2011). Recommendations will be developed for future data-gathering needs and analyses designed to evaluate potential Project-related impacts to eagles and other raptors.

10.14.4.4. Deliverables

Study products will include the following:

Geospatially-Referenced Relational Database. A geospatially-referenced relational database will be developed that incorporates all historic and current data, including nest, forage, and roost locations for each species; occupancy/activity; nest type and characteristics; stand characteristics; and photographs. This database will be expanded from the work done for the 2012 Raptor Study. All field data must be associated with location information collected using a GPS receiver in un-projected geographic coordinates (latitude/longitude) and the NAD 83 datum (or convertible as such). Migratory corridor information will be included for specific areas of concern, as discussed above.

Delineation of Suitable Eagle and Raptor Nesting and Foraging Habitats. Habitat delineation will be completed using GIS software as part of the Vegetation and Wildlife Habitat Mapping Study (Section 11.5) and the Evaluation of Wildlife Habitat Use (Section 10.19).

Study Reports. The Initial Study Report will be completed February 2014 and the Updated Study Report will be completed February 2015. The Updated Study Report will summarize the results for both years (plus 2012). These reports will include the following information:

- Discussion of nest-mapping results
- Calculation of the following:
 - Local average territory size for Bald Eagle and Golden Eagle
 - Productivity (annual, mean, range) for each raptor species and Common Raven among Project subareas (reservoir impoundment zone, access roads, power transmission corridors)
- Discussion of migration survey results
- Preliminary discussions and calculations of potential Project impacts, including the following:
 - Numbers of nests and territories that will be lost per species per subarea
 - Numbers of nests and territories otherwise affected per subarea
 - Type and level of impacts to forage and roost areas
 - Locations of any potential collision hazard areas for migrating raptors
 - Other potential impacts, including large increases in open-water habitats created by the reservoir impoundment

10.14.5. Consistency with Generally Accepted Scientific Practice

The study methods described above are consistent with generally accepted scientific practice. The field protocols may be modified to address logistical constraints imposed by the size and remoteness of the study area. The field protocols for raptor surveys generally follow established techniques for cliff- and tree-nesting raptors in North America (e.g., Anderson 2007). In addition, survey protocols and study areas will be tailored for specific species. For example, inventory and monitoring methodologies for nest occupancy and productivity surveys follow established aerial and ground-based protocols for eagle nest surveys (USFWS 2007; Pagel et al. 2010), using appropriately trained observers and suitable survey platforms (helicopter or fixed-wing aircraft). Nest characteristics will be recorded according to protocols developed in consultation with USFWS, including the protocol of the USFWS Alaska Bald Eagle Nest Atlas (<http://alaska.fws.gov/mbmp/mbm/landbirds/alaskabaldeagles/default.htm>). Local Bald Eagle and Golden Eagle territory sizes will be estimated using inter-nest distances as described in the *Draft Eagle Conservation Plan Guidance* (USFWS 2011). Surveys to determine if migration routes

exist that may put migrating raptors at risk for collision with Project power transmission lines will generally follow USFWS's recommended migration point-count protocol, based on standard hawk migration counting protocols described in Appendix C of the *Draft Eagle Conservation Plan Guidance* (USFWS 2011).

10.14.6. Schedule

This study is a multi-year effort that began in 2012 and will continue through 2013 and 2014 into the first quarter of 2015. The data-gathering and reporting schedule is described in more detail in Table 10.14-2.

Nest occupancy and productivity surveys will be conducted periodically between late April and late July in 2013 and 2014. Occupancy surveys will be conducted between late April and late May and productivity surveys will be conducted between mid-June and late July. A minimum of two aerial surveys at least 30 days apart are recommended by USFWS for the Golden Eagle protocol (Pagel et al. 2010). Early reporting of potentially active raptor nest sites after the initial surveys in May (potentially earlier, depending on USFWS recommendations) will be used to develop avoidance measures for Project-related field study activities that have the potential to disturb active nests. As soon as they are found, active eagle and other raptor nest sites will be reported to AEA in order to develop avoidance zones for field studies.

Raptor migration point-count surveys will be conducted during April–May and September–October in 2013 and 2014. Surveys will be conducted during peak periods of raptor migration in spring and fall.

Field survey data will be used to update the geospatially referenced, relational database of historical and current nest data in August 2013 and 2014, after occupancy and productivity surveys have been completed. At that time, the most current delineation of suitable eagle and raptor nesting habitat and the locations of active and inactive nest locations will be entered into the database and proofed.

Roosting and staging surveys will be conducted between mid-October and early December in 2013 and 2014. Surveys will be conducted periodically to identify the use of winter foraging and potential communal roost sites along the Susitna River. Four aerial surveys will be flown at intervals of 2 to 3 weeks, depending on weather and the results of preceding surveys.

The Initial Study Report and Updated Study Reports will be completed within 1 and 2 years, respectively, of FERC's Study Plan Determination (February 1, 2013). The study reports will include a summary of the study results to date. In addition, study updates will be presented at the Technical Workgroup meetings, which will be held quarterly during 2013 and 2014.

10.14.7. Relationship with Other Studies

Information from two other studies will provide useful input for planning surveys of eagles and other raptors (Figure 10.14-2). Preliminary mapping of forested habitats from the Vegetation and Wildlife Habitat Mapping Study in the Upper and Middle Susitna Basin (Section 11.5) will help in survey planning for Bald Eagles and other tree-nesting raptors. Information on the location and timing of late-season spawning runs of salmon from the studies of Fish Distribution and Abundance in the Upper Susitna River (Section 9.5), Fish Distribution and Abundance in the Middle and Lower Susitna River (Section 9.6), and the Salmon Escapement Study (Section 9.7)

will help in planning surveys of roosting and staging eagles in the fall and early winter. The geospatial database of raptor nest locations will contribute directly to the Vegetation and Wildlife Habitat Mapping Study in the Upper and Middle Susitna Basin (Section 11.5) and to the Bat Distribution and Habitat Use study (Section 10.13) by identifying suitable cliff-nesting habitats. Seasonal location and distribution data from the nest occupancy and productivity surveys, roosting and staging surveys, and migration surveys will be used to identify high-value wildlife habitat types for different raptor species in the Evaluation of Wildlife Habitat Use (Section 10.19). Data on nest distribution, species abundance, and productivity, as well as data on the numbers and flight paths of raptors during migration surveys of the transmission corridors, will be used to inform the assessment of Project impacts in 2015 in the FERC License Application and to help identify any potential PM&E measures, as appropriate. Feathers collected from nests after the breeding season will provide samples to characterize pre-construction levels of mercury in tissues of piscivorous raptors for the Mercury Assessment and Potential for Bioaccumulation study (Section 5.7).

The primary impact mechanisms of the Project on raptors may include the following:

- Permanent direct and indirect habitat loss and alteration, including loss of nesting sites and loss and alteration of foraging habitat.
- Temporary direct and indirect habitat loss and alteration, including indirect impacts resulting from altered distribution and abundance of prey.
- Potential direct behavioral impacts, such as attraction or avoidance, resulting from vehicular use, noise, and increased human presence associated with Project construction or operation.
- Potential indirect behavioral impacts to wildlife, such as attraction or avoidance, resulting from changes in vehicular use, noise, and increased human presence associated with increased subsistence or recreational access that may be facilitated by Project development.
- Potential direct mortality due to strikes with vehicles, power lines, towers, or other Project facilities; exposure to contaminants; and attraction to garbage and human activity.

Any impacts associated with habitat loss and alteration, attraction and avoidance, and direct mortality will occur primarily in the Project area, including the reservoir inundation zone, access and transmission corridors, and other Project infrastructure. Impacts associated with altered distribution and abundance of prey may occur over a larger area due to potential changes in both competing mammalian predators and prey species abundance.

During the impact assessment that will be conducted in 2015 for the FERC License Application, the impacts of direct and indirect habitat loss and alteration can be assessed through geospatial analysis. When plotted on the wildlife habitat map, raptor nest location data will allow the identification of high-value breeding habitats. Similarly, important habitats for prey species will also be identified by the Evaluation of Wildlife Habitat Use (Section 10.19). Using GIS software, the direct impacts of habitat loss can be evaluated for each raptor species by overlaying the reservoir impoundment, related infrastructure areas, and access road and power transmission corridors onto the wildlife habitat map prepared by the Vegetation and Wildlife Habitat Mapping in the Upper and Middle Susitna Basin study (Section 11.5) to calculate loss of preferred habitats. As was noted earlier, pertinent data from other studies will be incorporated into the evaluation of potential Project-related impacts to eagles and other raptors. Indirect impacts of

habitat loss and alteration and behavioral reactions (such as avoidance) can be estimated by applying various buffer distances, as determined from the literature on the effects of similar projects, including responses of both raptor and their prey. In this way, the GIS analysis can be combined with information from the literature to estimate the geographic extent, frequency, duration, and magnitude of Project effects on raptor populations. Effects on the habitats of prey species included in the Evaluation of Wildlife Habitat Use (Section 10.19) can be incorporated into the impact assessment for raptors. Any necessary protection, mitigation, and enhancement (PM&E) measures will be developed, as appropriate by examining the distribution and abundance of raptor species and habitats in relation to the geographic extent and seasonal timing of various Project activities.

Data collected for this study will allow calculation of the numbers of nests and territories that will be lost per species per sub-area; the numbers of nests and territories otherwise affected per sub-area; the type and level of impacts to forage and roost areas; the locations of any potential collision hazard areas for migrating raptors; and other potential impacts, including large increases in the availability of open water habitats created by the impoundment.

10.14.8. Level of Effort and Cost

Occupancy/productivity for nesting raptors and fall and winter roost/forage surveys in 2013–2014 will require an estimated 10–12 days of additional fieldwork beyond the 2012 surveys due to the extended survey area for Golden Eagles. Therefore, costs for these surveys (including helicopter time, analysis, and reporting) will be approximately \$500,000 per year.

Transmission corridor surveys for migrating raptors in 2013–2014 will require approximately 30 field days, and estimated costs for these (with helicopter drop-offs, literature search, analysis, and reporting) will be approximately \$80,000 per year.

10.14.9. Literature Cited

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10.14.10. Tables

Table 10.14-1. Raptors in the vicinity of the middle basin of the Susitna River (from Tables 4.6-2 and 4.8-2 in AEA 2011).

Common Name	Scientific Name	Conservation Status ¹	Seasonal Status ²	Relative Abundance ³
Bald Eagle	<i>Haliaeetus leucocephalus</i>	FS	B	uncommon
Boreal Owl	<i>Aegolius funereus</i>	PIF, FS	R	rare
Golden Eagle	<i>Aquila chrysaetos</i>	BLM, FS	B	fairly common
Great Gray Owl	<i>Strix nebulosa</i>	PIF, FS	?	rare
Great-horned Owl	<i>Bubo virginianus</i>	FS	R	uncommon
Gyrfalcon	<i>Falco rusticolus</i>	PIF, FS	R	uncommon
Merlin	<i>Falco columbarius</i>	FS	B	uncommon
Northern Harrier	<i>Circus cyaneus</i>	FS	B	fairly common
Northern Goshawk	<i>Accipiter gentilis</i>	FS	B	uncommon
Northern Hawk Owl	<i>Surnia ulula</i>	FS	R	uncommon
Osprey	<i>Pandion haliaetus</i>	FS	M	rare
Peregrine Falcon	<i>Falco peregrinus anatum</i>	BCC, FS	M	unknown
Red-tailed Hawk	<i>Buteo jamaicensis</i>	FS	B	uncommon
Short-eared Owl	<i>Asio flammeus</i>	BLM, FS	B?, M, S	uncommon
Sharp-shinned Hawk	<i>Accipiter striatus</i>	FS	B	uncommon

Notes:

- 1 Conservation Status: FS = Featured Species (ADF&G 2006); BCC = Birds of Conservation Concern (USFWS 2008); BLM = BLM Sensitive Species (BLM 2010); PIF = Boreal Partners in Flight Working Group (BPIFWG 1999).
- 2 Seasonal Status: M = migrant (transient); B = breeding; S = summering; R = resident; ? = uncertain (Kessel et al. 1982; APA 1985: Appendices E5.3 and E6.3).
- 3 From Kessel et al. (1982) and APA (1985: Appendices E5.3 and E6.3).

Table 10.14-2. Schedule for implementation of Surveys of Eagles and Other Raptors.

Activity	2012			2013				2014				2015
	2 Q	3 Q	4 Q	1 Q	2 Q	3 Q	4 Q	1 Q	2 Q	3 Q	4 Q	1 Q
Aerial surveys for nest occupancy and productivity assessments (2 surveys each)	—				—					—		
Migration surveys (transmission corridors)					—		—					
Update geospatial database of historical and current nesting data							—				—	
Update delineation of suitable nesting habitat, old and active nest locations, historical fall and winter roost locations					—	—	—			—	—	
Conduct roosting and staging surveys			—				—					—
Initial Study Report								—	△			
Updated Study Report												—

Legend:

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

10.14.11.Figures

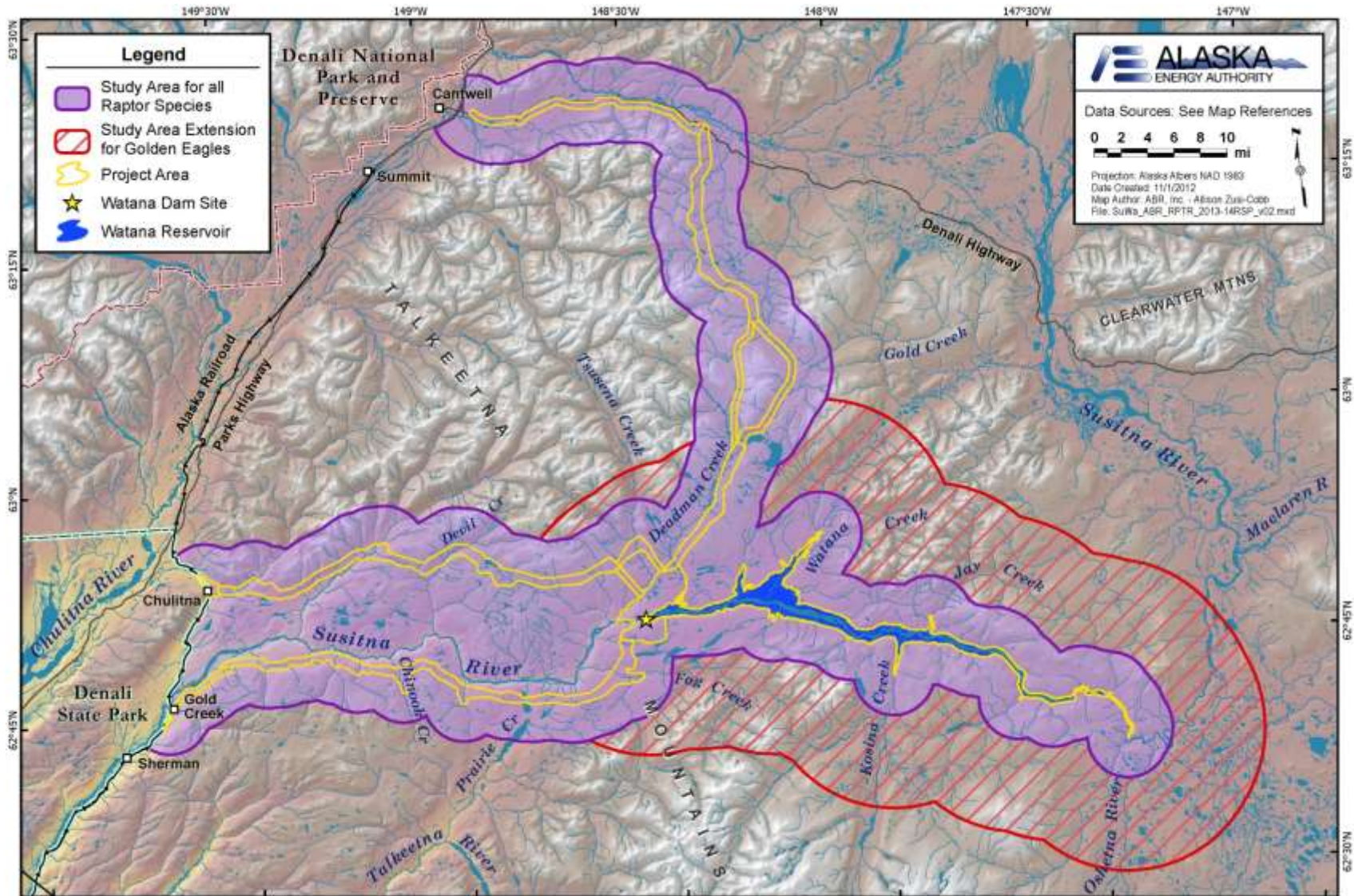


Figure 10.14-1. Study area for Surveys of Eagles and Other Raptors.

STUDY INTERDEPENDENCIES FOR SURVEYS OF EAGLES & OTHER RAPTORS

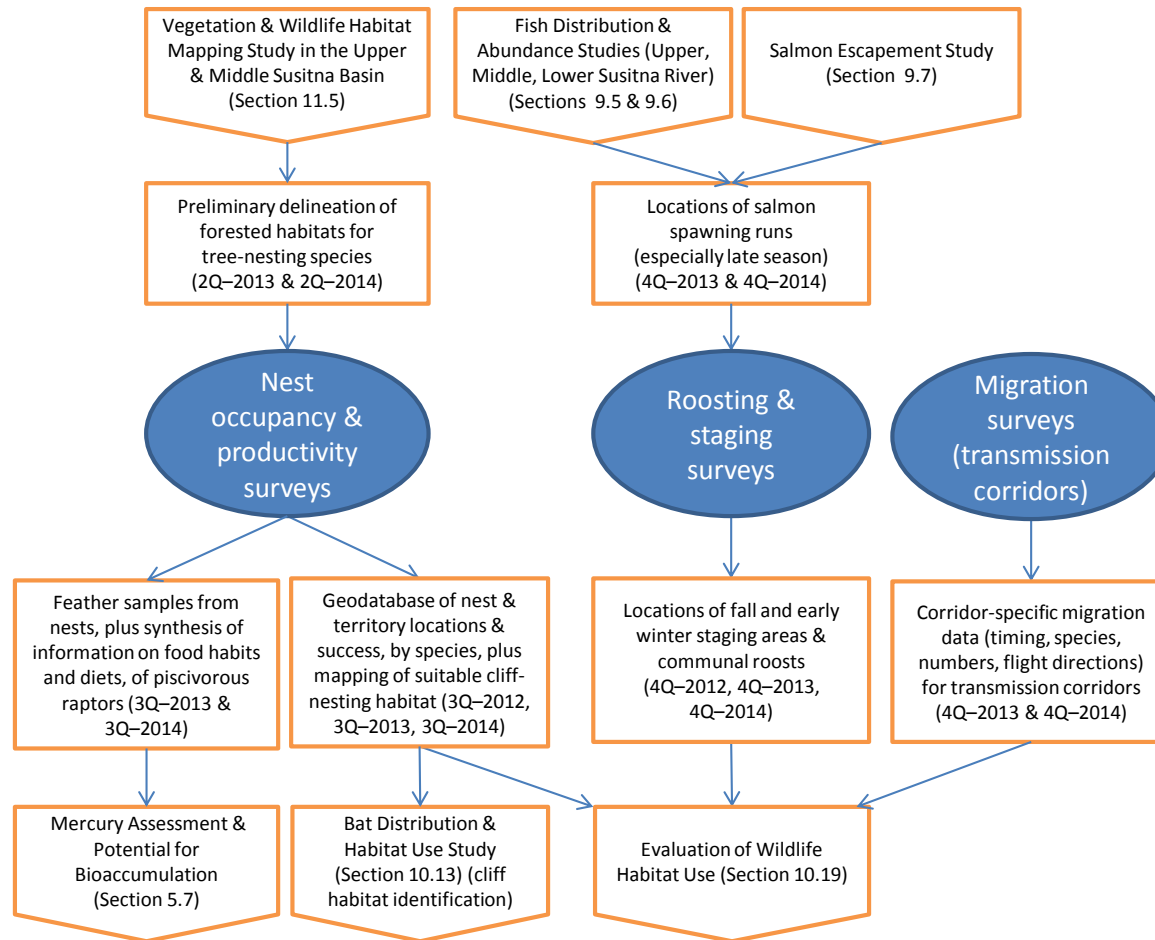


Figure 10.14-2. Study interdependencies for Surveys of Eagles and Other Raptors.