11.1. Vegetation and Wildlife Habitat Mapping Study in the Upper and Middle Susitna Basin

11.1.1. General Description of the Proposed Study

In the vegetation and wildlife habitat mapping study, AEA will identify and map vegetation and wildlife habitats in the upper and middle Susitna basin. The mapping will encompass the inundation zone of the proposed reservoir, the dam site and associated infrastructure, and the three possible access route and transmission-line corridors. Vegetation and wildlife habitats in riparian areas along the Susitna River below the proposed dam will be mapped in a separate study, the riparian vegetation study (see Section 11.6). The mapping of vegetation and wildlife habitats in the upper and middle Susitna basin will be conducted using current, high-resolution aerial photography and remote-sensed imagery. The study will involve field surveys to collect ground-reference data to link the photosignatures in the study area (see Section 11.5.3 below) to known vegetation and wildlife habitat types; in the office, the boundaries for the identified vegetation and wildlife habitat types will delineated by on-screen digitizing in GIS using the aerial photography and remote-sensed imagery for the study area as the base data layers.

11.1.1.1. Study Goals and Objectives

The overall goals of the vegetation and wildlife habitat mapping study are to prepare baseline maps of the existing vegetation and wildlife habitats in the upper and middle Susitna basin (upstream of Gold Creek). This mapping information will be used in assessing impacts to both vegetation and wildlife resources from the proposed Project, and to develop any necessary protection, mitigation, and enhancement (PM&E) measures. The wildlife habitat maps will be used to quantitatively assess the impacts of habitat loss and alteration for all bird and mammal species evaluated during the FERC licensing process. This is the primary basis for evaluating impacts to wildlife species.

The specific objectives of the vegetation and wildlife habitat mapping study are to:

- Identify, delineate, and map vegetation and wildlife habitat types in the upper and middle Susitna basin using the vegetation map prepared in the 1980s for the Alaska Power Authority's Susitna Hydroelectric Project (APA Project) as a starting point, and updating that mapping to reflect current conditions as indicated on recent aerial imagery for the study area; and
- Quantify the potential direct, indirect, and cumulative impacts to vegetation and wildlife habitats from Project construction and operations.

This multi-year study is being initiated in 2012 and will be continued in 2013 and 2014. Results from the 2012 work will be used to: (1) fine-tune the field investigations and mapping efforts for the existing conditions found in the study area, and (2) customize the mapping work (e.g., study area) to reflect further refinements in the design of the Project.

11.1.2. Existing Information and Need for Additional Information

Wildlife habitats were not specifically mapped in the 1980s for the APA Project, although information on vegetation types important for moose browse was incorporated in the vegetation

mapping data prepared by Kreig and Associates (1987; see below). All vegetation mapping for the APA Project was based on ground-reference data, with map polygons hand-drawn on mylar or acetate over topographic maps or aerial photos acquired in the early 1980s.

University of Alaska Agricultural Experiment Station (UAAES) used ground-reference data collected in 1980 (McKendrick et al. 1982) to map vegetation communities to Level III of the first version of the Alaska Vegetation Classification (AVC; Viereck and Dyrness 1980). UAAES mapped the Susitna River floodplain from Talkeetna to Devils Canyon, and mapped the river basin upstream from Devils Canyon (AEA 2011). Directly affected areas were mapped at a scale of 1:24,000, the remainder of the Susitna basin was mapped at a scale of 1:250,000. An additional area was mapped at a scale of 1:63,360, extending 10 miles in all directions from the Susitna River between Gold Creek and the mouth of the Maclaren River and encompassing the central transmission-line corridor along both sides of the Susitna River between the originally proposed dam site to Gold Creek.

Additional vegetation mapping covered parts of the upper and middle Susitna basin, from near the mouth of the Oshetna River (upstream of the Watana Dam site) to just downstream of the Devils Canyon Dam site (Kreig and Associates 1987). Vegetation types important for moose browse was one focus of this mapping effort. Vegetation types with high forage values for moose (mainly shrub and forest types) were mapped to the AVC Level IV (vegetation structure combined with dominant plants). In addition, each map polygon was assigned values for understory cover of willows, shrub birch, and alder; a limited ground-truth survey was conducted to verify understory shrub cover values. Mapping was performed at the 1:63,360 scale and incorporated the previous vegetation mapping (McKendrick et al. 1982); ground data and photography provided by the Alaska Department of Fish & Game (ADF&G), Bureau of Land Management (BLM), and U.S. Forest Service (USFS); and newly obtained ground and aerial data. A relational database of attributes for each polygon was developed and provided to ADF&G. The mapping data of Kreig and Associates (1987), in ArcGIS format, will be updated to reflect current conditions in the study area (see Section 11.5.4).

Although Kreig and Associates (1987) provides an overview of vegetation types within the study area, the map polygons delineated in the 1980s are likely to be outdated because of changes in landscape characteristics over the intervening 25-plus years. In particular, reductions in forest cover from fires (Kasischke and Turetsky 2006, Kasischke et al. 2010) and insect outbreaks (Werner et al. 2006), and permafrost degradation (Jorgensen et al. 2001) have been documented in recent decades in interior Alaska. These recent landscape changes will not be represented in mapping data from the 1980s, and thus recent aerial imagery will be used to update Kreig and Associates (1987).

In addition, previous vegetation maps do not include the landscape context and physical habitat information necessary to adequately describe wildlife habitats. The vegetation and wildlife habitat mapping study proposed here will involve an integrated approach, mapping terrain units in addition to vegetation (see Section 11.5.4).

As described below in Study Methods (Section 11.5.4), the vegetation mapping of Kreig and Associates (1987) will be overlain on recent aerial imagery and the vegetation polygon boundaries will be updated to reflect the current extent of each vegetation type in the study area, mapped to Level IV of the AVC (Viereck et al. 1992). The 1980s vegetation mapping will also be used as a planning tool to develop a list of vegetation types to survey in the field.

11.1.3. Study Area

The proposed study area for the mapping of vegetation and wildlife habitats consists of a 4-mile buffer zone surrounding those areas that would be directly altered or disturbed by Project construction and operations (Figure 11.5-1). The affected areas include the proposed reservoir impoundment zone, areas for infrastructure of the dam and powerhouse and supporting facilities, the proposed access route and transmission-line corridors, and materials sites.

The alteration of successional vegetation and wildlife habitats downstream of the dam due to changes in instream flow, ice processes, and riverine geomorphology in the Susitna River will be specifically addressed in the Riparian Study (Section 11.6). The Riparian Study will be developed in coordination with the proposed studies of riverine physical processes, most notably instream flow, ice processes, and riverine geomorphology (see Section 11.6).

11.1.4. Study Methods

AEA proposes an integrated approach to mapping vegetation and wildlife habitats based on methods developed for Ecological Land Surveys (ELS) studies conducted in tundra, boreal forest, and coastal regions in Alaska (see Jorgenson et. al. 2002 for an example study in Southcentral Alaska). This integrated mapping approach involves mapping terrain units such as vegetation type, physiography, surface form, and disturbance type, and then combining them into units with ecological importance (in this case wildlife habitats).

The method of combining various ITUs allows for the preparation of a number of thematic maps depending on the specific study needs. For the Project, a vegetation map at Level IV of the Alaska Vegetation Classification (Viereck et al. 1992), and a wildlife habitat map based on the best combination of ITUs will be produced to yield a habitat map that accurately reflects use by wildlife. A concerted effort will be made to use data from existing vegetation maps prepared for the APA Project (McKendrick et. al. 1982, Kreig and Associates 1987). As Kreig and Associates (1987) incorporates McKendrick et al. (1982) and is available in digital form, it will serve as the de facto existing vegetation map developed for the APA Project.

11.1.4.1. Develop Mapping Materials from Historical and Current Data

All available historical and current data layers that can be used to facilitate the mapping of vegetation and wildlife habitats have been compiled and are being managed in an ArcGIS geodatabase. These data include existing high-resolution aerial photography (for part of the study area), National Wetland Inventory (NWI) mapping, and existing digital vegetation mapping for the study area (Kreig and Associates 1987). The existing vegetation map layer (Kreig and Associates 1987) has been updated to ArcGIS 10.0 format for review and updating (see below). Additional fine-scale, recent imagery will be needed to complete the mapping of vegetation and wildlife habitats in this multi-year study, and it is expected that imagery will be available in late 2013.

11.1.4.2. ITU Mapping and Derivation of Wildlife Habitats

The existing vegetation map data (Kreig and Associates 1987) will be assessed for accuracy within the portions of the study area for which there is recent, high-resolution digital imagery, and map polygons will be updated to reflect Level III or IV vegetation types as defined by

Viereck et al. (1992). The assignment of Level III (largely reflecting vegetation structure) or Level IV (vegetation structure plus dominant species) vegetation types will depend on how accurate the 1987 mapping is when compared to recent imagery. The accuracy assessment will focus on the extent of registration errors, match-line errors between adjoining mapping blocks, and on accuracy of map polygon vegetation codes in comparison to recent imagery. As much as possible, the 1987 vegetation mapping will be used as a planning tool to develop a list of target vegetation types to document during the field work. The 1987 mapping, if not highly accurate at the Level IV of Viereck et al. (1992), may be modified (aggregated) into broader-scale vegetation types (Level III). These broad-scale vegetation map polygons would then serve as the basis from which finer-scale map polygons would be developed. When modifying the 1987 vegetation map layer, a minimum mapping size of 1.0 acre for vegetated areas and 0.25 acres for waterbodies will be used. Each vegetation map polygon will be updated and coded with preliminary Level III or IV vegetation types (Viereck et al. 1992), as well as preliminary physiography, surface form, and disturbance types.

After the field season in 2012, the preliminary mapping will be revised so that it accurately reflects the field-verified occurrences of Level IV vegetation types, physiography, surface form, and disturbance types. Preliminary map polygons will be revised after the 2013 and 2014 field seasons. Once substantial progress has been made on the ITU mapping, a preliminary set of vegetation and wildlife habitat types will be prepared and presented for comment in the Initial Study Report and Updated Study Report.

To derive wildlife habitat types, the ITU attributes assigned to each map polygon (vegetation, physiography, surface form, and disturbance type) will be combined to produce a large number of multivariate habitat types. These initial multivariate habitats then will be aggregated into a smaller set of derived habitat types that share similar characteristics considered important to the wildlife species that occur in the study area, such as the expected levels of available (plant) food sources and cover for escape and/or shelter. These factors can be directly related to the quantity and quality of vegetation, physiographic position, surface form, microtopography, soils, hydrology, and/or microclimates present. In the derivation of wildlife habitats, vegetation, physiography, surface form, and disturbance types will be used as the primary factors representing wildlife habitat quality, but information on soil drainage will be added as needed.

11.1.4.3. Field Surveys

Ground-reference plots to be surveyed during summers of 2013–2014 will be selected to cover the range of mapped types identified during the preliminary mapping (above). When possible, ground-reference plots will be allocated directly to map polygons on the preliminary mapping representing Level IV vegetation types and the aggregated set of preliminary wildlife habitat types. For areas that have not been mapped yet, ground-reference plots will be selected using photosignatures from both moderate- and fine-scale imagery, as needed, to acquire the field data necessary to map vegetation to the Level IV of Viereck et al. (1992).

High-resolution imagery for the entire mapping study area will not be available in 2013 for either the preliminary mapping phase or the field season. Field sampling will be expanded beyond the Project footprint areas that are currently covered by 1-foot pixel resolution imagery (obtained by the Matanuska-Susitna Borough LIDAR mapping project and publicly available on AlaskaMapped.org). Areas not covered by preliminary mapping or high-resolution digital

imagery will be sampled during summer 2013 using the recent 5-meter pixel resolution imagery obtained from the RapidEye satellite.

Ground-reference plots will be sampled along transects located within major physiographic types, including riverine, lacustrine, lowland, and upland areas. To maximize efficiency in data collection, at each ground-reference plot data will be collected as necessary for vegetation and wildlife habitat mapping as well as wetlands mapping. Wetlands data collection efforts will be consistent with U.S. Army Corps of Engineers (USACE) requirements for wetland delineations (Environmental Laboratory 1987, USACE 2007; see Section 11.7). Vegetation and wildlife habitat data elements will be recorded digitally in the field on an Android tablet computer using a customized data entry form designed to link directly to a relational database (Microsoft Access). At each ground-reference plot, visual cover estimates will be made for all vascular plant species present. Recorded site characteristics will include: vascular and non-vascular plant community structure, physiography, surface form, microtopography, site disturbances, and plant phenological observations. Observations will typically be recorded within a 10-m (33-ft) radius of relatively homogeneous vegetation as specified in the 1987 Manual (Environemental Laboratory 1987). The size and dimensions of the plots may be modified, however, depending on the site characteristics of the plant community (e.g., narrower plots in riparian fringe habitats). The locations of all incidental observations of rare plants, invasive plants, wildlife species, or significant wildlife habitat features (e.g., raptor nests) will be documented. At each plot, a small soil pit will be dug to evaluate soil characteristics.

11.1.4.4. Impact Assessment

Direct impacts to vegetation and wildlife habitats are expected to occur in the form of habitat loss from the placement of fill and the conversion of vegetation and terrestrial wildlife habitats to lacustrine habitats in the proposed reservoir. Direct habitat alteration in areas adjacent to gravel fill would occur from construction activities (e.g., storage and laydown yards, vehicular traffic). Indirect habitat alteration in areas adjacent to gravel fill could occur due to erosion, fugitive dust accumulation, permafrost degradation, landslides, and off-road vehicle use. Additional indirect habitat alteration could occur in areas adjacent to the proposed reservoir from changes in local climatic conditions. Indirect impacts could occur to riparian vegetation and wildlife habitats downstream of the proposed dam due to changes in instream flow, ice processes, and fluvial geomorphology in the Susitna River. These downstream effects will be addressed in the riparian study (see Section 11.6).

The fundamental impact assessment for vegetation and wildlife habitats will be conducted in GIS. Direct effects to vegetation and wildlife habitats will be determined by overlaying the Project footprint on the final map polygons. Indirect effects to vegetation and wildlife habitats will be similarly determined by overlaying disturbance buffers (surrounding the proposed Project infrastructure) to identify areas likely to be affected by ancillary impacts associated with Project construction, operations, and maintenance. The size and number of disturbance buffer(s) will be based upon the updated specifications for Project construction, operations, and maintenance activities, which will be updated throughout 2013-14.

The vegetation and wildlife habitat impact assessment will quantify direct and indirect effects to vegetation (acreage per vegetation type) and wildlife habitat (acreage per wildlife habitat type) per development alternative. The wildlife habitat types will also be used to quantitatively assess the impacts of habitat loss and habitat alteration for each bird and mammal species of concern

evaluated for impacts during the FERC licensing process (see Section 10.19). The first step in assessing impacts of habitat loss and alteration for wildlife species will be to conduct wildlife habitat-use evaluations for the bird and mammal species of concern. In that effort, each wildlife habitat type mapped in the study area will be categorically ranked for habitat value for each of the bird and mammal species of concern (see Section 10.19).

Cumulative effects on vegetation and wildlife habitats in the region of the proposed Project will be assessed in the license application document (to be prepared in 2015) and the details of that analysis (e.g., the spatial scale and temporal extent for cumulative effects) will be defined at that time.

11.1.4.5. Reporting and Data Deliverables

The reports and data deliverables for this study include:

- **Electronic copies of field data.** A geospatially-referenced relational database of historic (APA Project) data and data collected during the 2012–2014 field seasons, including representative photographs of vegetation and wildlife habitat types will be prepared. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards to be established for the Project.
- **Vegetation and wildlife habitat maps in ArcGIS and PDF formats.** The preliminary and final maps of vegetation and wildlife habitats will be delivered according to the schedule indicated below. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards to be established for the Project.
- **Initial Study Report and Updated Study Report.** The vegetation and wildlife habitat mapping study results will be presented to licensing participants in the Initial and Updated study reports, according the schedule indicated below. The reports will include descriptions of the vegetation and wildlife habitats identified, a summary table (acreages) of the vegetation and wildlife habitats represented in the mapping effort, and descriptions of the potential impacts to vegetation and wildlife habitats from development of the Project. In the Initial Study Report, recommendations will be made for the 2014 field survey effort. Both reports also will include field plot photos including site, ground, and soil photographs for each plot surveyed.

11.1.5. Consistency with Generally Accepted Scientific Practice

The vegetation and wildlife habitat mapping study will be conducted using standard methods for vegetation and terrain feature mapping through onscreen digitizing in GIS over digital aerial imagery. The mapping will be based on intensive ground-reference data, focused especially in the Project footprint areas where most impacts will occur. A multivariate, ITU mapping approach (following Jorgenson et al. 2002) will be used to derive and map wildlife habitats, following the methods successfully used to map wildlife habitats for other recent projects in Alaska (e.g., ABR 2008, Schick and Davis 2008, PLP 2011).

11.1.6. Schedule and Study Interdependencies

See Table 11.5-1 for schedule information for the vegetation and wildlife habitat mapping study and Figure 11.5-2 for information on the relationships between the vegetation and wildlife habitat mapping study and other Project studies.

11.1.7. Level of Effort and Cost

The vegetation and wildlife habitat mapping study is planned as a three-year effort; work began in 2012 and will continue in 2013 and 2014. Field sampling will be conducted each year during the growing season by four to eight observers (working in crews of two). Surveys will be conducted for approximately 20 days in each year. The level of effort for 2013 is expected to be considerably greater than in 2012, because the 2012 effort was focused only on those portions of the study area that had aerial photography coverage of sufficient resolution for preliminary mapping and field sampling. High-resolution imagery should be available for the entire study area by fall 2013, so the number of person-days dedicated to the field effort will be increased to provide sufficient data for mapping the newly acquired high-resolution imagery. A less intensive field survey and mapping effort is anticipated in 2014, . Field surveys will be conducted in conjunction with the wetland mapping study to maximize efficiency and reduce costs. The study will involve extensive office-based activities to delineate the boundaries of various ITUs (vegetation, physiography, surface form, disturbance type) in a GIS and to prepare study reports.

Total costs in 2013 are estimated to be on the order of $500,000. The more limited 2014 field survey, which will be focused on problem areas or areas where the field survey coverage is insufficient, is estimated to cost approximately $300,000.

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11.1.9. Tables

Table 11.5-1. Schedule for implementation of the vegetation and wildlife habitat mapping study.

Activity	2012				2013				2014				2015
	1 Q	2 Q	3 Q	4 Q	1 Q	2 Q	3 Q	4 Q	1 Q	2 Q	3 Q	4 Q	1 Q
Vegetation/habitat mapping and field plot selection					——	——							
Field surveys						——	——						
Vegetation/habitat map revisions							——	——					
Initial Study Report								——	Δ				
Delivery of field data and preliminary vegetation and habitat maps								——					
Vegetation/habitat mapping and field plot selection for remaining unmapped areas									——	——			
Field surveys										——	——		
Final vegetation/habitat map revisions											——	——	
Updated Study Report												——	▲
Delivery of final field data and final vegetation and habitat maps												——	

Legend:

—— Planned Activity
----- Follow up activity (as needed)
Δ Initial Study Report
▲ Updated Study Report

11.1.10. Figures

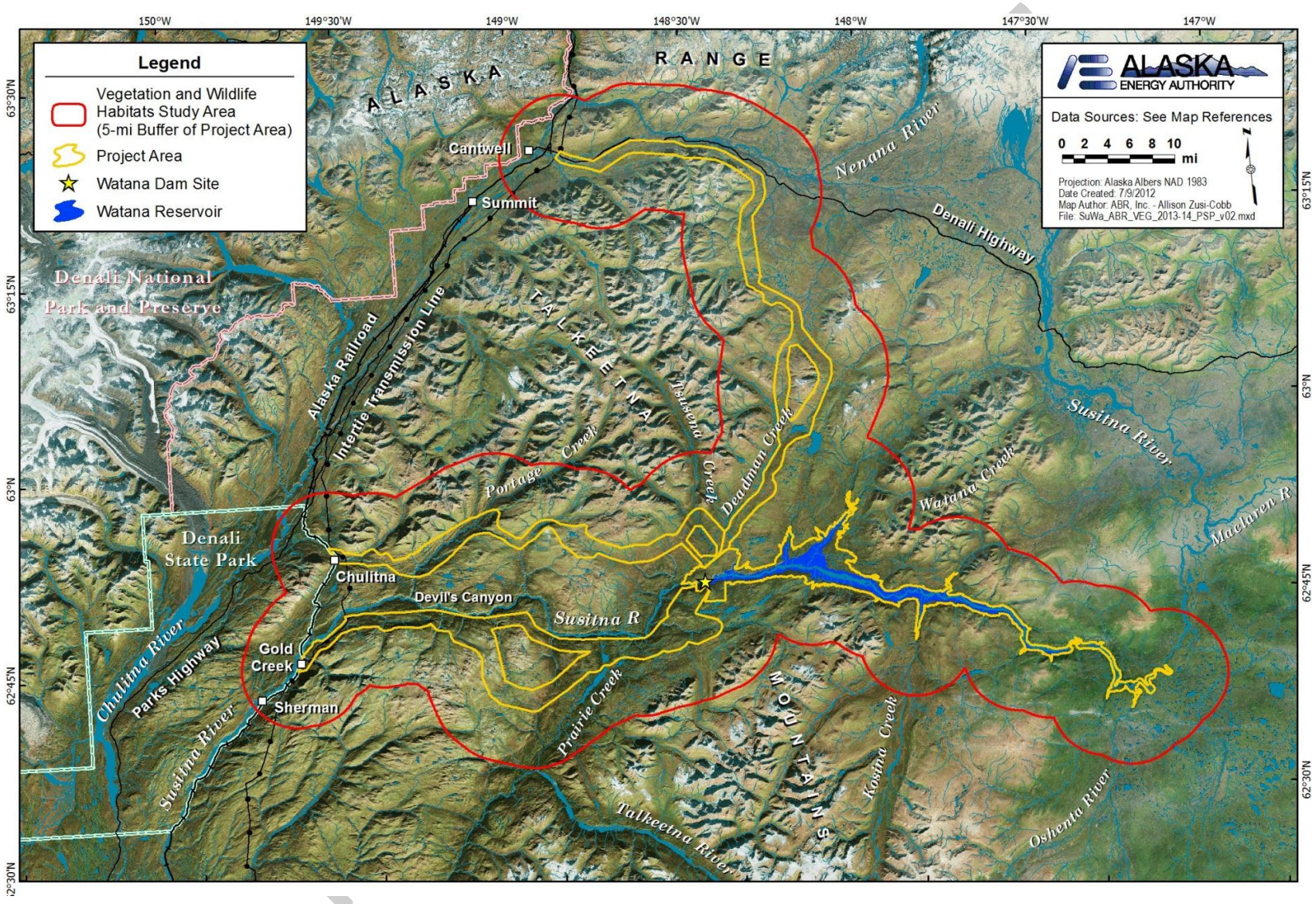

Figure 11.5-1. Study area for vegetation and wildlife habitat mapping for 2013 and 2014 in the Susitna-Watana Hydroelectric Project area. NOTE: this figure has not been updated yet to reflect the revised 4-mile buffer being proposed in the RSP (see Section 11.5.3 above).

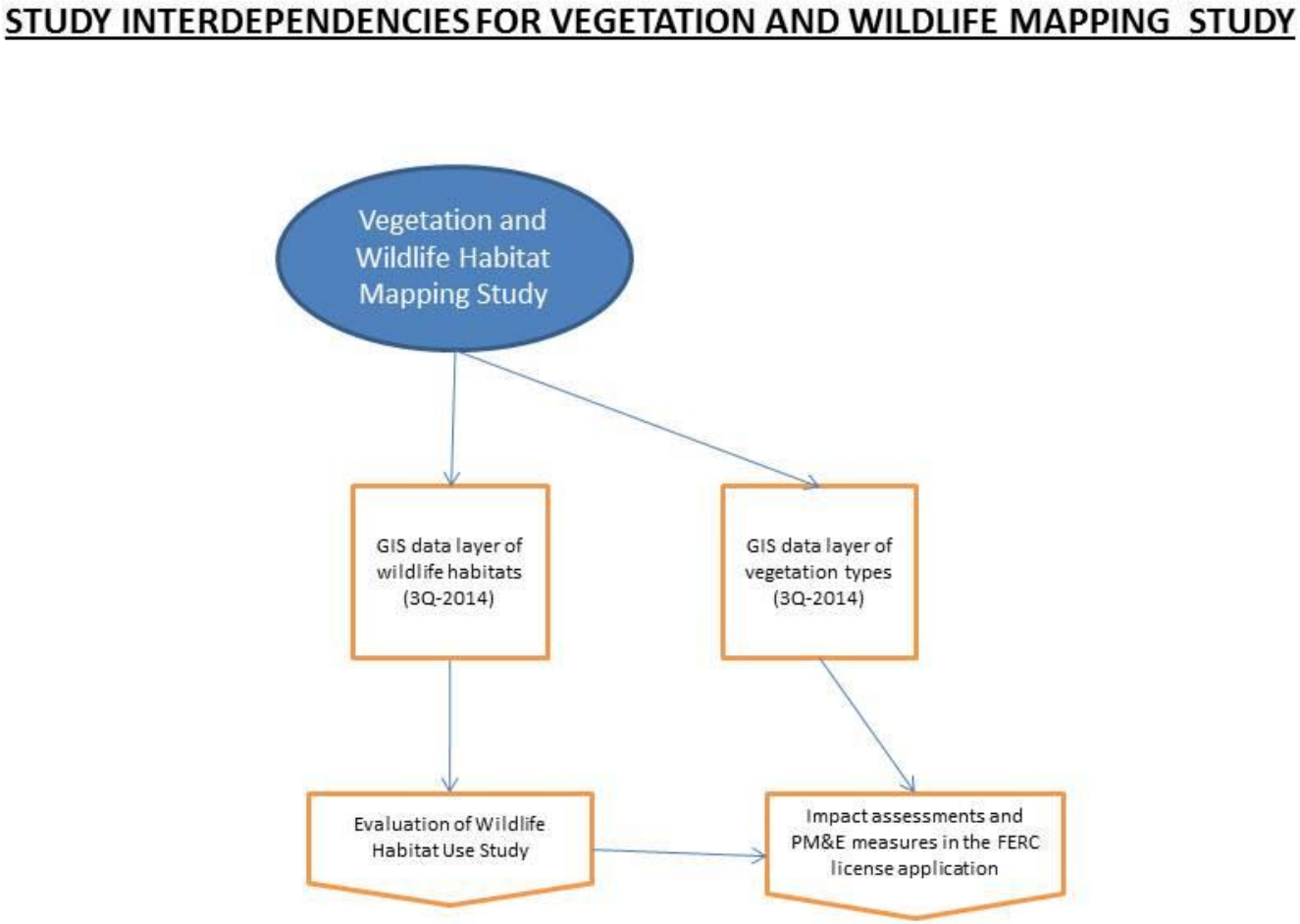

Figure 11.5-2. Study interdependencies for vegetation and wildlife habitat mapping study