

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

**Rare Plant Study
Study Plan Section 11.8**

Final Study Plan

Alaska Energy Authority



July 2013

11.8. Rare Plant 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 11.8 of the RSP described the Rare Plant Study. This field-based study focuses on identifying appropriate habitats for a set of rare vascular species likely to occur in the Project area, and conducting field surveys to search for any populations of rare plants that may occur. The focus of the surveys will be limited to those areas in which rare plant populations could be directly or indirectly affected by Project development activities in the upper and middle Susitna basin. RSP 11.8 provided goals, objectives, and proposed methods for data collection regarding rare plants.

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 11.8 was one of the 31 studies approved with no modifications. As such, in finalizing and issuing Final Study Plan Section 11.8, AEA has made no modifications to this study from its Revised Study Plan.

11.8.1. General Description of the Proposed Study

The Rare Plant Study is a field-based investigation in which AEA will identify appropriate habitats for a set of rare vascular species likely to occur in the Project area, and will conduct field surveys to search for any populations of rare plants that may occur. The focus of the surveys will be limited to those areas in which rare plant populations could be directly or indirectly affected by Project development activities in the upper and middle Susitna basin.

Study Goals and Objectives

The primary goal of the Rare Plant Study is to locate populations of rare vascular plant species that may occur in the upper and middle Susitna basin (upstream of Gold Creek) and may be affected by the Project. Rare vascular plant species in Alaska currently are being tracked in a database maintained by the Alaska Natural Heritage Program (AKNHP 2012a); this database will be used as the source list for possible rare species in the Project area. The Rare Plant Study is designed so that habitats where rare plants may occur are identified and then surveyed to locate any rare plant populations present. These data then will be used in AEA's License Application (see Section 11.8.7 below) to assist with Project design, construction, and operations planning to help develop protection, mitigation, and enhancement (PM&E) measures, as appropriate.

The specific objectives of the Rare Plant Study are to:

- Locate populations of rare vascular plant species that may occur in those portions of the Project area that would be disturbed by Project construction and operations activities; and
- Estimate population sizes for rare species and map their current distributions.

The data on any rare plant populations found in this study will be used, in the FERC License Application (to be prepared in 2015), to estimate quantitatively the potential direct, indirect, and cumulative impacts to rare plants from Project construction and operations activities. The Rare Plant Study is planned as a two-year study (2013–2014) and will be formally initiated in 2013.

Any rare species found (with identifications confirmed by the herbarium at the University of Alaska, Fairbanks) during the field surveys in 2012 for the Vegetation and Wildlife Habitat Mapping Study in the Upper and Middle Susitna Basin (Section 11.5), the Riparian Vegetation Study Downstream of the Proposed Susitna-Watana Dam (Section 11.6), and the Wetland Mapping Study in the Upper and Middle Susitna Basin (see Section 11.7) will also be documented and used to assist in the planning of the rare species field surveys in 2013 and 2014. This study plan will be updated if necessary, which could include fine-tuning the field survey methods and survey areas, based on the results from the first year of work in 2013 and on AEA's recommendations for the Initial Study Report (ISR), as well as ISR comments received by FERC staff, resource agencies, and other interested licensing participants.

11.8.2. Existing Information and Need for Additional Information

The AKNHP maintains a geospatial database, called BIOTICS, with collection locality and habitat information for rare and/or endemic vascular plants in Alaska (AKNHP 2012a). The species list from that database, known as the Rare Vascular Plant List, currently includes 306 taxa (AKNHP 2012b). In a review of rare plant collection locations from the BIOTICS database—selected from within a broad region surrounding the Project area (AEA 2011)—19 species with state rankings of S1 (critically imperiled) and S2 (imperiled) were identified (Table 11.8-1). These species were selected from the previous Rare Vascular Plant Tracking List (AKNHP 2008), which was the most up to date list available in 2011. Species that are very rare in the state (5 or fewer occurrences or very few individuals) or that are especially vulnerable to extirpation from the state are given a S1 ranking, whereas species with 6 to 20 collections in the state and with a somewhat lower vulnerability to extirpation are given a S2 ranking (Lipkin and Murray 1997). A higher number of species in the search area were ranked as S3 (rare or uncommon; 21 to 100 collections in the state), but in this study, the focus will be on those species with the rarer state rankings (S1, S2, S1S2, and S2S3).

An aquatic species known as flatleaf pondweed or Robbins pondweed (*Potamogeton robbinsii*) was recorded in the APA Project area in the 1980s, in Watana Lake (McKendrick et al. 1982). That collection represents a second recorded observation for the species in the search area (the only other record was near the Summit airstrip in 1953). *P. robbinsii* is listed as S1S2 (critically imperiled or imperiled in Alaska) and as G5 (demonstrably secure globally), indicating that populations are more numerous outside Alaska. Characteristic of most rare species, many of the 19 listed rare plant taxa identified in the data review in the PAD (AEA 2011) often occur in a narrow range of habitats (e.g., *Artemisia dracuncululus* on exposed bluffs). Given the wide array of habitats present in the Project area (e.g., alpine, subalpine, forest, meadows, bogs, fens), it is possible that other rare plant taxa besides *P. robbinsii* may occur in the Project area.

Field surveys for rare plants will be needed for the proposed Project to document any populations of rare species occurring in areas that would be disturbed by Project construction and operations activities. This information will be used to develop PM&E measures to address rare plant species, as appropriate.

11.8.3. Study Area

Because rare plant species typically occur in specific habitats, the study area for the survey of rare plants will be defined primarily by the locations of suitable habitats that could support rare

plant species (and that could be affected by development activities) within the Project area. This study area is depicted in Figure 11.8-1. Field surveys will be conducted only in areas in and adjacent to those portions of the Project area in which habitat loss, alteration, and/or disturbance will occur (the reservoir impoundment zone, areas for infrastructure of the dam and powerhouse and supporting facilities, the proposed access route and transmission-line corridors, material sites, and temporary camps and staging areas). Habitats for rare species will be identified from the preliminary mapping of vegetation, wildlife habitats, and wetlands (see Sections 11.5 and 11.7), and from photointerpretation of plant habitats on aerial photos or remote-sensed imagery. To prioritize the field survey efforts, areas to be searched will be categorized as having low, moderate, or high potential for supporting rare plants (see Section 11.8.4). Surveys for rare plants downstream of the proposed dam currently are not planned because complete habitat loss (which could affect rare plant populations) through placement of fill and other construction activities will not occur in downstream riparian areas. This approach may be altered, however, if one or more rare species are suspected to occur in riparian habitats and are sensitive to habitat alterations that may result from Project development activities.

11.8.4. Study Methods

11.8.4.1. Field Surveys

The list of 19 rare species identified in AEA (2011), which have the rarer state rankings (S1, S2, S1S2, and S2S3; Table 11.8-1), will serve as the initial list of rare species to survey. Species that are less rare in the state (S3 and S3S4 rankings) will be recorded if encountered in the field, but the focus of the survey work will be on the rarer species. The broad, regional search area used for rare plants in the PAD (AEA 2011) was a large rectangular area encompassing the entire drainage of the Susitna River from the headwaters in the Alaska Range to the mouth at Cook Inlet. In early 2013, AEA, with the help of resource management agencies and the AKNHP, will refine this regional search area so that it encompasses, as much as possible, areas with landscape features and habitats similar to those occurring in the local study area of the Project. Then, in early 2013, a formal request will be made to the AKNHP for a listing of rare vascular plant species from the BIOTICS database that have been recorded in the updated search area. These species will be selected from the recently updated Rare Vascular Plant List (AKNHP 2012b). Using the collection-area information for the list of rare species from the BIOTICS database, the suitable habitats for each rare species will be identified. For cases in which the habitat information from the collected specimen(s) is sparse, additional information on the habitats for rare species will be obtained from the scientific literature. These habitat types will serve as the primary focus for the field survey efforts.

Prior to the field surveys in 2013 and 2014, the preliminary mapping of vegetation, wildlife habitats, and wetlands, which is to be conducted in 2012 and 2013 (see Sections 11.5 and 11.7), as well as current, high-resolution aerial photography and remote-sensed imagery will be reviewed to identify suitable habitats for the rare plant species within the study area.

No standardized protocols have been developed for conducting rare plant surveys in Alaska, but the reconnaissance sampling methodology used by the AKNHP (Carlson et al. 2006; modified from Catling and Reznicek 2003) provides a template for use in this study. Using this methodology, researchers identify survey areas based on site-specific criteria, including regional or locally unique geological features, suitable habitats for the species of concern, logistical

feasibility, and areas with high environmental gradients to maximize the potential of encountering rare species. For this study, emphasis will be placed on identifying and surveying suitable habitats for each species that has some potential to occur in the study area (see above). By combining these landscape elements, regions within the study area will be categorized as having low, moderate, or high potential for supporting rare plants, and survey efforts will be prioritized in those areas with high and moderate potential.

Field surveys will be conducted by botanists skilled in the identification of vascular plants, who have extensive field experience in Alaska (including previous experience surveying for rare plants), and who are competent using local, statewide, and national-level taxonomic keys. Most identifications of rare plants will be made initially using the Flora of Alaska (Hultén 1968) and the Alaska Rare Plant Field Guide (Lipkin and Murray 1997). In some cases, the Flora of North America North of Mexico (FNAEC, 1993–2012) will be used, for those plant families that have been revised by the FNAEC. Final nomenclature for rare plant taxa will follow that used in AKNHP (2012). In cases where the field crew determines that the collection of several plants will not significantly impact the population, voucher specimens will be collected for verification of identifications. The confirmation of plant identifications will be made by the University of Alaska Herbarium. Otherwise, photographs will be taken and detailed plant descriptions compiled to confirm identifications.

The habitat-specific surveys for rare plants will be conducted multiple times during the summers of 2013 and 2014, as needed, to coincide with the flowering times of the particular species being sought. The timing of these surveys will depend on which plant taxa are determined to have the potential of occurring in the study area. When encountered, rare plant observations also will be recorded during the field surveys for vegetation and wildlife habitat mapping and wetland mapping studies in 2012, 2013, and 2014.

11.8.4.2. *Reporting and Data Deliverables*

The reports and data deliverables for this study include:

- **Electronic copies of field data.** A geospatially-referenced relational database of the rare plant locations found during the 2013 and 2014 field seasons, including representative photographs of the rare plant populations, will be prepared. If permission is granted from the AKNHP, the records of rare plants from the BIOTICS database, which occur near the Project area, will also be included in the database. Naming conventions of files and data fields, spatial resolution, map projections, and metadata descriptions will meet the data standards established for the Project.
- **Rare plant maps in ArcGIS and PDF formats.** The preliminary and final maps of the locations of rare plant populations will be developed and 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 established for the Project.
- **Initial Study Report and Updated Study Report.** The Rare Plant Study results will be presented in the Initial and Updated study reports, according to the schedule indicated below. The reports will include descriptions of the rare plant populations found as well as detailed site characteristics, survey methodology, and the names and experience of the

surveyors. The Initial Study Report will include recommendations for the 2014 field survey effort. Both reports also will include copies of site photographs.

11.8.5. Consistency with Generally Accepted Scientific Practice

The Rare Plant Study will be conducted using the most up to date information on the previous locations of rare plants near the Project area, from the BIOTICS database maintained by the AKNHP (2012a, b). The field protocols for the rare plant surveys will follow those outlined in the reconnaissance sampling methodology used by the AKNHP (Carlson et al. 2006; modified from Catling and Reznicek 2003) for rare plant surveys in Alaska. These methods are the current standards for field surveys of rare plants in Alaska and were developed by the AKNHP, which is the state authority on rare plants and field surveys for rare plants.

11.8.6. Schedule

See Table 11.8.2 for schedule information for the Rare Plant Study. 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.

11.8.7. Relationship with Other Studies

The Rare Plant Study will be completed with data inputs (see Figure 11.8-2) from three other Project studies: the vegetation and wildlife habitat mapping, riparian vegetation, and wetland mapping studies (Sections 11.5, 11.6, and 11.7). Suitable habitats for rare plant species to be surveyed in the field will be identified from aerial imagery and from the mapping of vegetation, wildlife habitats, and wetlands. In addition, any observations or collections of rare plants recorded during the vegetation and wildlife habitat mapping, riparian vegetation, and wetland mapping field surveys will be used to help streamline the rare plant field surveys.

The data collected during the Rare Plant Study (locations and estimated population sizes) will be used directly in AEA's License Application in 2015 to assess the impacts the proposed Project could have on populations of rare plant species in the Project area. The rare plant data also will be used, in the License Application, to develop a set PM&E measures to address any potential impacts to rare plant species, as appropriate. Direct impacts to rare plant species from development of the Project could occur in the form of habitat loss from the placement of fill and from the conversion of terrestrial vegetation to lacustrine habitats in the proposed reservoir. Indirect impacts could occur from erosion, fugitive dust accumulation, permafrost degradation, landslides, infestations of invasive species, and off-road vehicle use.

The impact assessment for rare plant species will be conducted in GIS by overlaying the Project footprint on the locations of rare plant populations to determine which populations would be affected directly by fill. Determining which populations could be indirectly affected will be conducted similarly by overlaying disturbance buffers (surrounding the proposed Project infrastructure) to identify which areas are likely to be affected by ancillary impacts associated with Project construction, operations, and maintenance. The size and number of disturbance buffer(s) to be used will be determined based upon the final specifications for Project construction, operations, and maintenance activities.

In the impact assessment, the potential impacts to rare plant species will be evaluated by quantifying the reductions in populations (0 to 100 percent) that could occur directly from fill associated with the development of each Project alternative. Potential for indirect impacts (percentage reductions in populations in the disturbance buffers noted above) will also be assessed. Cumulative effects on rare plant species in the region of the proposed Project will be assessed in the FERC 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.

11.8.8. Level of Effort and Cost

The Rare Plant Study is planned to be conducted over two years (2013–2014). Field sampling will be conducted each year during the growing season by a crew of two observers. It is anticipated that the level of effort in 2013 and 2014 will be roughly the same (14 days each year). The Rare Plant Study will be coordinated with the other botanical studies being performed for the Project to help facilitate the field surveys for rare plants and minimize costs. The field crews for the vegetation and wildlife habitat mapping, riparian, and wetland mapping studies will document the locations of any rare plant species encountered during their field surveys in 2012 and 2013, and this information will be used to help prioritize the field surveys for the Rare Plant Study. The total projected cost for this study for 2013 and 2014 combined is estimated at approximately \$220,000.

11.8.9. Literature Cited

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11.8.10. Tables

Table 11.8-1. Rare vascular plant taxa that have been collected in a broad region surrounding the Susitna River drainage (see AEA 2011).¹

Scientific Name	Common Name	No. of Collections	State Rank ²	Global Rank ³
<i>Arnica diversifolia</i>	Sticky arnica	1	S1	G5
<i>Arnica lessingii</i> ssp. <i>norbergii</i>	Norberg arnica	1	S2	G5T2Q
<i>Arnica mollis</i>	Hairy arnica	1	S1	G5
<i>Artemisia dracunculus</i>	Dragon wormwood	2	S1S2	G5
<i>Blysmopsis rufa</i>	Red clubrush	1	S1	unranked
<i>Botrychium ascendens</i>	Upward-lobed moonwort	1	S2	G2G3
<i>Carex athrostachya</i>	Slender beak sedge	1	S1S2	G5
<i>Carex parryana</i>	Parry sedge	2	S1	G4
<i>Ceratophyllum demersum</i>	Common hornwort	1	S1	G5
<i>Chamaerhodos erecta</i> ssp. <i>nuttallii</i>	Nuttall's ground-rose	1	S1S2	G5T4T5
<i>Cicuta bulbifera</i>	Bulb-bearing water-hemlock	1	S2	G5
<i>Eleocharis kamtschatica</i>	Kamchatka spike-rush	1	S2S3	G4
<i>Eriophorum viridicarinatum</i>	Green-keeled cottongrass	1	S2	G5
<i>Erysimum asperum</i> var. <i>angustatum</i>	Wallflower	1	S1S2	unranked
<i>Glyceria striata</i> var. <i>stricta</i>	Fowl mannagrass	3	S2	G5T5
<i>Maianthemum stellatum</i>	Starry solomon-plume	4	S2	G5
<i>Potamogeton obtusifolius</i>	Blunt-leaf pondweed	2	S2S3	G5
<i>Potamogeton robbinsii</i> ⁴	Flatleaf pondweed	1	S1S2	G5
<i>Potentilla drummondii</i>	Drummond cinquefoil	1	S2	G5

Notes:

- 1 Data from the Rare Vascular Plant Tracking List (AKNHP 2008), as represented in 2011 in the BIOTICS database of rare species (AKNHP 2012a).
- 2 State rarity rankings: S1 = critically imperiled, S2 = imperiled, and S3 = rare or uncommon.
- 3 Global rarity rankings: G2 = imperiled, G3 = rare or uncommon, G4 = apparently secure, G5 = demonstrably secure, T = rank of subspecies or variety, Q = indicates uncertainty about taxonomic status which may affect global rank.
- 4 A second record of this species was made by McKendrick et al. (1982) in the upper Susitna River basin (Watana Lake) (see AEA 2011).

Table 11.8-2. Schedule for implementation of the Rare Plant Study.

Activity	2013				2014				2015
	1 Q	2 Q	3 Q	4 Q	1 Q	2 Q	3 Q	4 Q	1 Q
Refine regional search area for rare plant occurrences	—								
Review of BIOTICS data and field survey site selection		—							
Field survey		—	—						
Data analysis			—	—					
Initial Study Report				—	▲				
Delivery of preliminary field data and rare plant population maps				—					
Review of 2013 data and field survey site selection						—			
Field survey						—	—		
Data analysis							—	—	
Updated Study Report								—	▲
Delivery of final field data and rare plant population maps								—	

Legend:

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

11.8.11. Figures

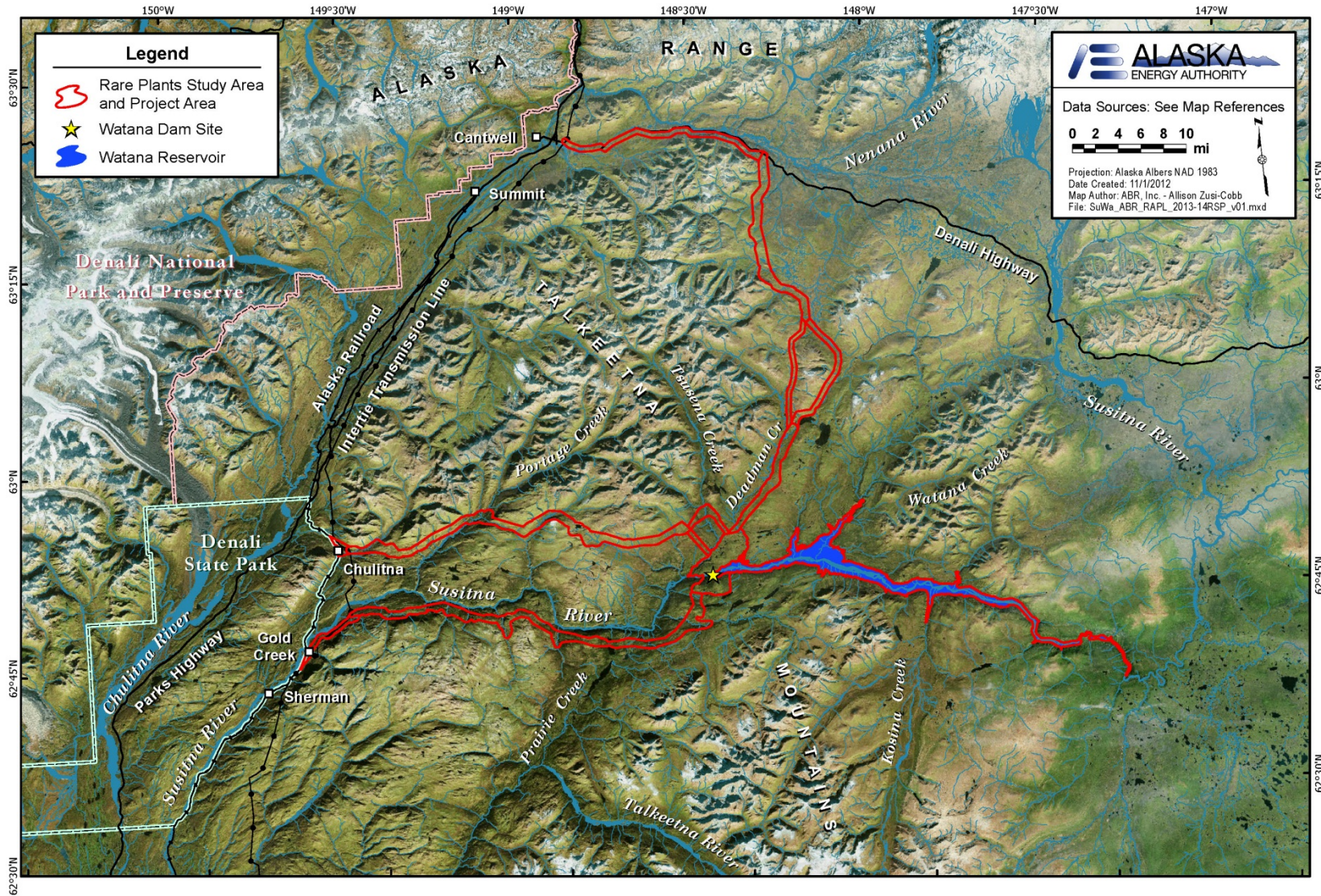


Figure 11.8-1. Study area for rare plant surveys in 2013 and 2014 in the Susitna-Watana Hydroelectric Project area.

STUDY INTERDEPENDENCIES FOR RARE PLANT STUDY

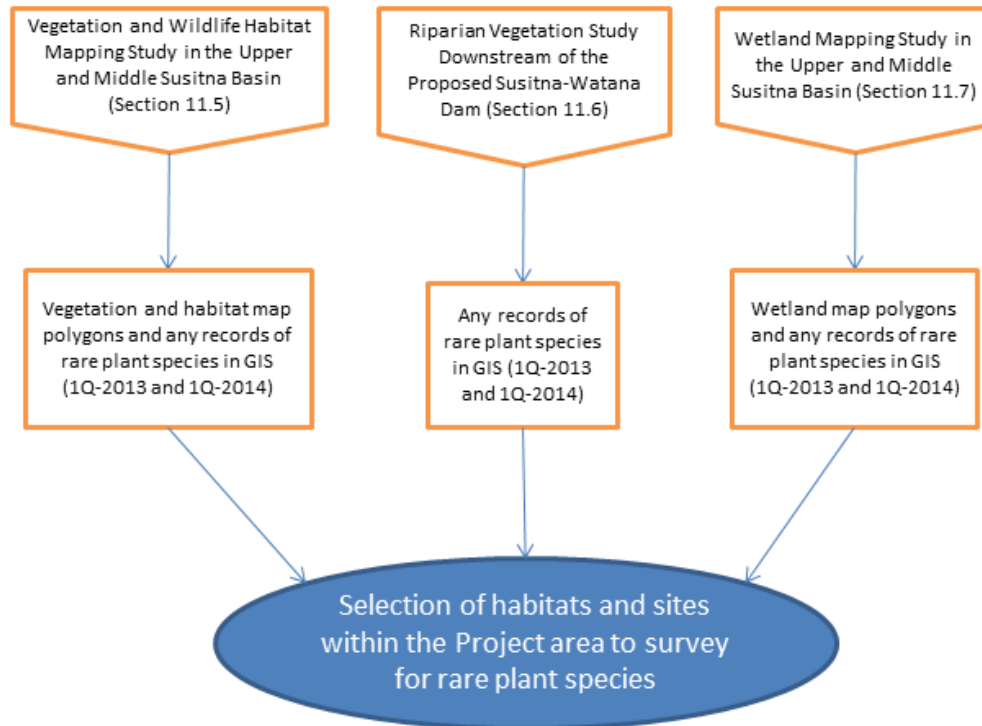


Figure 11.8-2. Study interdependencies for the Rare Plant Study.