

Susitna-Watana Hydroelectric Project Document

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1.1. Title of proposed study

Riparian Instream Flow Study

1.2. Requestor of proposed study

AEA anticipates resource agencies will request this study.

1.3. Responses to study request criteria (18 CFR 5.9(b))

The following sections provide the necessary context and justification for the proposed study.

1.3.1. Describe the goals and objectives of each study proposal and the information to be obtained.

The Riparian Instream Flow Study will develop and apply a modeling approach to assess the response of riparian vegetation to Project-induced changes in river hydroregime, ice process regime, and sediment transport regime, as appropriate.

Specific Riparian Instream Flow Study objectives are to:

1. Synthesize the 1980s instream flow study information and evaluate the applicability of the studies to the current Project;
2. Select study sites in coordination with the Botanical Riparian Study 2012 field surveys and the Instream Flow, Geomorphology, and Ice Processes Studies;
3. Quantify potential changes in riparian vegetation (recruitment patterns, encroachment, species composition, and vegetation succession), including the spatial extent of vegetation change throughout the Project Study area;
4. Develop a modeling approach with the Geomorphology and Ice Processes Study teams to understand interactions between riparian vegetation, flow regime, sediment regime, and ice regime on channel and floodplain geomorphology and riparian vegetation;
5. Provide riparian vegetation model output for analyzing the effects of geomorphological and riparian vegetation change to aquatic and riparian/wildlife habitat; and
6. Develop a groundwater / surface water interaction model of shallow floodplain aquifer and riparian plant community relationships.
7. Coordinate groundwater / surface-water riparian interaction modeling with evaluation of potential operational impacts to shallow groundwater users (see Groundwater-Related Aquatic Habitat Study). Assist in determination if additional monitoring wells are required for shallow groundwater user impact analyses.
8. Coordinate instream flow study data needs across resource disciplines and studies.

1.3.2. If applicable, explain the relevant resource management goals of the agencies and/or Alaska Native entities with jurisdiction over the resource

to be studied. [Please include any regulatory citations and references that will assist in understanding the management goals.]

To be completed by requesting organization.

1.3.3. If the requestor is not resource agency, explain any relevant public interest considerations in regard to the proposed study.

Fisheries and aquatic resources are owned by the State of Alaska, and the Project could potentially affect these public interest resources by affecting riparian vegetation.

1.3.4. Describe existing information concerning the subject of the study proposal, and the need for additional information.

Information for the study area includes, but is not limited to, recent and historic aerial photography; riparian vegetation surveys and characterizations from recent and early 1980s studies; and riparian vegetation succession conceptual models developed from the 1980s data as part of the original Susitna Hydroelectric Project (SHP) Phase I vegetation mapping studies conducted along the Susitna River from Devils Canyon to Talkeetna, and the vegetation succession studies conducted in the Susitna River floodplain between Gold Creek, and the Deshka River (McKendrick et al. 1982, UAFAFES 1985). The riparian sites visited in the 1980s studies were resampled in 1992–1993 (Collins and Helm 1997, Helm and Collins 1997). Of primary importance to the Riparian Study is the previous vegetation mapping and successional dynamics studies by McKendrick et al. (1982), Collins and Helm (1997), and Helm and Collins (1997). These previous works will serve as a baseline for developing a stratified sampling protocol for both the Instream Flow Riparian and Botanical Riparian Study vegetation surveys. The riparian study modeling efforts will build upon the Collins and Helm (1997) riparian vegetation succession conceptual model.

Although substantial data and information concerning riparian vegetation were collected in the 1980s, those data are approximately 30 years old and therefore additional information needs to be collected to provide a contemporary understanding of the baseline riparian conditions existing in the Susitna River. Moreover, the previous studies (McKendrick et al. 1982; Collins and Helm 1997; Helm and Collins 1997) were largely descriptive of riparian vegetation composition, structure and forest succession, and as such, they do not provide an analytical framework sufficient for assessing potential impacts to riparian vegetation that may result from Watana Dam operations, nor do they provide the ability to model and develop potential flow mitigation measures. In addition, the configuration and proposed operations of the Project have changed and must be evaluated within the context of the existing environmental setting. This includes consideration of potential load following effects on riparian ecosystems downstream of the Watana Dam. This evaluation needs to extend for the entire length of the Susitna River below the Watana Dam that is affected by the Project, including the reach of river below the confluence of the Chulitna and Talkeetna rivers, as appropriate. Thus, additional riparian studies are necessary to adequately address the effects of potential project operations on the riparian communities.

1.3.5. Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.

Construction and operation of the Watana Dam will modify the flow, ice processes, and sediment regimes of the Susitna River downstream of the proposed dam. These modified physical regimes may have direct, indirect and cumulative effects on the composition, abundance and distribution (temporal and spatial) of riparian/floodplain vegetation, aquatic and wildlife habitat and floodplain riparian vegetation processes. The Riparian Instream Flow Study will quantify the response of riparian/floodplain habitats to the Project induced changes to the operationally altered flow hydroregime, and other parameters, as appropriate. Results of the Riparian Instream Flow Study will be used to evaluate potential Project impacts and develop potential Protection, Mitigation and Enhancement measures (PM&Es).

The riparian instream flow efforts will be coordinated with other studies to identify areas of mutual interest and shared analysis. Specifically these include: fish habitat utilization studies; wildlife studies; ice processes studies; geomorphology studies; botanical riparian studies; and groundwater related habitat studies.

1.3.6. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

The Riparian Instream Flow Study is specifically directed toward establishing a contemporary understanding of riparian plant communities, associated habitats, and the hydrologic, physical, and chemical habitat generating processes that are currently operating in the Susitna River that directly influence those resources. The focus of much of this work will be on establishing a set of analytical tools/models based on the best available information and data that can be used for defining both baseline conditions; i.e., how these resources are currently functioning under existing flow conditions, and how these resources and processes will respond to various alternative Project operations.

The standard state-of-the science approach to assessing both physical processes riparian/floodplain vegetation interactions, and potential hydroregulation impacts to downstream riparian plant communities and processes, is to utilize physical process modeling techniques coupled with empirical studies of riparian/floodplain vegetation succession. Physical process studies include hydraulic modeling, geomorphic processes analysis, ice processes modeling and groundwater / surface water interaction modeling. Riparian vegetation succession studies include space-for-time vegetation surveys capturing the entire sequence of plant community seral states from initial recruitment to mature vegetation.

Riparian vegetation mapping and sampling will follow protocols developed in parallel and collaboration with the Botanical Riparian Study plan. Riparian habitats in this study will be mapped to the Level IV of the Alaska Vegetation Classification (Viereck et al. 1992) with adjustments, as needed, for early successional riparian stages following Helm and Collins (1997). An Integrated Terrain Unit (ITU) mapping approach will be used. The ITU approach is based on methodology developed for various Ecological Land Surveys (ELS) done throughout the state of Alaska over the past 15 years (e.g. Jorgenson et. al. 2003). The selection and riparian vegetation sampling approach and protocols for the intensive riparian modeling sites will be developed in coordination with the Botanical Riparian Study. All sampling will occur in the growing season months of June, July, and August. The sampling of preselected study sites will be conducted in conjunction with the instream flow, wetland mapping, and wildlife habitat mapping studies (wetland determination data and wildlife habitat data will be collected at each study site). Study sites will be at a minimum 500 m² (forested) and 50 m² (non-forest) circular plots, although shape may vary depending on the shape of the vegetation stand being sampled. The riparian habitat sampling methods of McKendrick et al. (1982), Collins and Helm (1997), and Helm and Collins (1997) will be followed.

Development of the study approach to physical processes study design, modeling, and methods will be coordinated closely with the Instream Flow, Geomorphology, Ice Processes, Botanical Riparian, and Groundwater-Related Habitat Study Teams. The integrated physical process and plant succession model will be based upon: (1) physical modeling studies of select intensive study reaches representative of Susitna Project Area riverine process domains (Montgomery 1999), (2) HEC-RAS, HEC-GEORAS modeling of river stage / discharge and floodplain terrain inundation relationships for the intensive study reaches (or 2D modeling where available), (3) groundwater / surface water interaction modeling of floodplain shallow alluvial aquifer and surface water relationships, and (4) spatially explicit survey, mapping and analysis of the riparian floodplain plant communities' composition, structure, and location throughout the study area (Botanical Riparian Study results). The intensive study reaches will be selected to represent the range of riverine process-domains within the study area in coordination with the Instream Flow, Geomorphology, Ice Processes, Botanical Riparian, and Groundwater-Related Habitat Study teams. The physical and plant succession modeling will be designed to scale-up from the intensive reach to the process domain scale for estimation of hydroregulation effects throughout the Project Study Area. Where appropriate, the groundwater / surface-water riparian interaction modeling will be used to assist in determination of potential operational impacts to shallow groundwater users (see Groundwater-Related Aquatic Habitat Study).

It is anticipated that field surveys would be conducted for 30 to 40 days in 2013 and 2014 (less extensive field surveys may be needed in 2014 as the groundwater study installations and riparian mapping of the study area progresses). Data analysis and model development would follow each field season, with formal development and application of analytical models to evaluate project effects occurring in 2014.

1.3.7. Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

The Instream Flow Riparian Study is planned as a 2 year effort, with field sampling conducted spring through summers of 2013-2014. Delivery of final reports is estimated in late Fall 2014 to meet the summer 2015 FERC deadline.

Instream Flow Riparian Study elements and their estimated levels of effort include:

1. Spring/Summer 2013 field work investigating up to six intensive study reaches. Field effort will involve approximately a team of three ecologists one week per study site to map and sample riparian vegetation.
 - \$250,000
2. Spring/Summer 2014 field work.
 - \$250,000
3. Modeling forest succession and physical processes (groundwater / surface water, hydraulic, ice processes, operational flow simulations)
 - \$350,000
4. Analysis and report development, meetings, presentations.
 - \$350,000

Total approximate effort/cost: \$1.2-1.5 million.

Details and level of field effort will be based upon approved overall study objectives and design. Field surveys would be conducted for 30 to 40 days in each year, depending on the needs for additional ground-verification data (less extensive field surveys may be needed in 2014 as the groundwater study installations and riparian mapping of the study area progresses). The riparian study will involve extensive, office-based activities to delineate riparian habitat boundaries in a GIS, to conduct requisite physical modeling and to prepare study reports.

The types and level of physical process modeling will be determined in coordination with the Instream Flow, Geomorphology, Ice Processes, Botanical Riparian, and Groundwater Related Habitat Study teams. Estimated study costs are subject to review and revision as additional details are developed.

1.3.8. Literature Cited

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