

Susitna-Watana Hydroelectric Project Document

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1.1. Terrestrial Furbearer Abundance and Habitat Use

1.2. Requester of Proposed Study

AEA ~~anticipates that a resource agency will request this study on behalf of Dr. Laura Prugh, University of Alaska Fairbanks (UAF), Institute of Arctic Biology~~

1.3. Responses to Study Request Criteria (18 CFR 5.9(b))

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

The goal of this study is to provide current information on the abundance of terrestrial furbearers (coyote, red fox, lynx, and marten) for use in evaluating potential Susitna-Watana Hydroelectric Project -related (Project) impacts and identifying appropriate mitigation. The potential impacts of the Project include habitat loss and fragmentation, increased human harvest and disturbance, and changes in prey populations (AEA 2011). Accurate population estimates and habitat-use data are important for adequately assessing the potential effects of the Project on furbearer populations and to develop avoidance, minimization, and mitigation measures for development of management and monitoring plans.

Red fox, lynx, and marten are ecologically important and valuable furbearers; coyotes are also ecologically important but they are not as highly valued as furbearers. Although coyotes are widely distributed throughout Alaska, little is known about their abundance or ecological effects. The coyote is considered to be a “human commensal” species, benefiting from human activities such as road construction and agriculture (Young and Jackson 1951). Coyotes may increase in abundance as a result of the Project, and because they prey on a wide variety of large and small game, and compete with and prey on foxes and lynx changes in coyote abundance could have substantial effects on other wildlife resources. Trapper surveys show that Alaskans who trap in Game Management Units (GMUs) 11 and 13 are particularly concerned about the impact of coyotes on Dall’s sheep populations (Schwanke 2010) and several studies have found that coyotes are a major predator of Dall’s sheep lambs (Hoefs and McTaggart-Cowan 1979, Scotton 1998, Arthur and Prugh 2010).

Six specific objectives have been identified for this study:

- 1) Develop population estimates of coyotes and red foxes through collection of scats along trails and rivers throughout the study area during winter months (January–March) in 2013 and 2014;
- 2) Develop population estimates of marten through collection of hair samples in the reservoir inundation zone using hair snag tubes;
- 3) Develop population estimates of lynx through collection of hair samples throughout the study area using hair snag plates;
- 4) Develop an index of prey abundance in the study area by recording snowshoe hare sign;
- 5) Conduct genetic analyses of fecal and hair samples to confirm species identity and to differentiate individual animals; and
- 6) Calculate furbearer population estimates using genotype data and capture–mark–recapture statistics.

The study area will include all terrestrial areas that will be directly altered or disturbed by Project construction and operations, including facility sites, access roads, transmission-line corridors, laydown/storage areas, and the inundation zone for the reservoir.

The following data will be produced from this study:

- 1) Population estimates, with confidence intervals, for coyote, red fox, lynx, and marten in 2013 and 2014;
- 2) Estimates of survival, recruitment, and population growth for coyotes, red foxes, lynx, and marten between 2013 and 2014;
- 3) Habitat use and selection data based on aerial track surveys;
- 4) Snowshoe hare pellet count data in spruce and willow habitats;
- 5) Geographic Information System (GIS) mapping with layers showing the locations of study transects, furbearer snow tracks, and genetic samples collected during the study;
- 6) Master's thesis and up to two peer-reviewed publications examining the population dynamics and habitat use of terrestrial furbearers in the study area;
- 7) Presentation at a scientific conference communicating results of the study;
- 8) Genetic samples from furbearers in the study area, which will be stored for at least 5 years after the study is completed; and
- 9) Study plan to monitor furbearer populations during and immediately after Project construction, including specific metrics to evaluate furbearer responses.

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.]

This study will be a collaborative effort between UAF and the Alaska Department of Fish and Game (ADF&G). The mission of ADF&G is “to protect, maintain, and improve the fish, game, and aquatic plant resources of the state, and manage their use and development in the best interest of the economy and the well-being of the people of the state, consistent with the sustained yield principle.” The guiding principles of ADF&G include providing “the greatest long-term opportunities for people to use and enjoy Alaska’s fish, wildlife, and habitat resources,” and maintaining “the highest standards of scientific integrity and providing the most accurate and current information possible” (ADF&G website: www.adfg.alaska.gov). Accurate population estimates of harvested animals such as furbearers are needed to (1) manage their populations in accordance with sustained yield principles; (2) ensure the long-term viability of their populations, and (3) maintain the scientific integrity of the department.

ADF&G is responsible for the management, protection, maintenance, and improvement of Alaska’s fish and game resources in the interest of the economy and general well-being of the State (AS 16.05.020). ADF&G manages subsistence and sport hunting for small game (5 AAC 85.065) and hunting and trapping for fur animals (5 AAC 85.060) through regulations set by the Board of Game (AS 16.05.255). The Federal Subsistence Board, which comprises representatives from the U.S. Fish and Wildlife Service, National Park Service, Bureau of Land Management, Bureau of Indian Affairs, and U.S. Forest Service, oversees the Federal Subsistence Management Program (57 FR 22940; 36 CFR Parts 242.1–28; 50 CFR Parts 100.1–28) with responsibility for managing subsistence resources on Federal public lands for rural residents of GMU 13.

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

The mission of UAF is to “advance and disseminate knowledge through teaching, research and public service with an emphasis on Alaska, the circumpolar North and their diverse peoples” (UAF website: www.uaf.edu). This study will provide important knowledge on the effects of the Project on furbearer populations. Furbearers are of considerable interest to the public due to their cultural and economic value to subsistence users, recreational trappers and hunters, and wildlife viewers.

~~In addition to providing useful knowledge about public wildlife resources, this study will also provide training and employment opportunities for a graduate student, seasonal field technician, and laboratory technician. Students and employees will gain valuable skills conducting wildlife studies and genetic analyses, under experienced supervision to guarantee quality control.~~

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

The original Alaska Power Authority Susitna Hydroelectric Project (SHP) study program collected data on use of the Project area by marten (Gipson et al. 1982, 1984; Buskirk 1983, 1984; Buskirk and MacDonald 1984; Buskirk and McDonald 1989) and red fox (Hobgood 1984), but no information was collected on coyotes or lynx, aside from incidental sightings. The SHP studies indicated that marten may be especially impacted by the reservoir, because a substantial amount of their preferred habitat (mature spruce forest) occurs within the inundation zone. ADF&G has not conducted population estimates of small furbearers in GMU 13. Trapping reports indicate that populations have experienced normal annual and cyclic fluctuations, but no indications of long term increases or decreases have been apparent (Schwanke 2010).

Major advances in the estimation of predator population sizes have occurred since the original SHP studies were conducted in the 1980s. A large body of literature has accumulated on the use of noninvasive genetic techniques to obtain population estimates for numerous species around the world. Many studies of wolves, bears, wolverines, coyotes, foxes, lynx, marten, otter, and others have successfully used noninvasive techniques to accurately estimate population sizes (Mowat and Paetkau 2002, Waits and Paetkau 2005, Petit and Valiere 2006, Long et al. 2008).

The wildlife data-gap analysis conducted for the Project (ABR 2011) recommended using a combination of aerial track surveys and non-invasive capture–mark–recapture surveys to determine current habitat use, movement patterns, and population sizes of furbearer species. Marten is the most economically valuable furbearer in GMU 13 (Schwanke 2010). Loss of habitat combined with increased access could lead to unsustainable levels of harvest and population declines in marten and other furbearers. Thus, current population estimates are needed to serve as a baseline for assessing the impact of Project activities and for development of protection, mitigation, and enhancement methods and for management and monitoring plans.

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.

For terrestrial furbearers, the Project likely will result in habitat loss and alteration, habitat fragmentation, disturbance, and direct and indirect mortality due to development infrastructure

and activities. The terrestrial furbearer study will provide data to assess the following direct and indirect impacts and cumulative effects:

- Direct and indirect loss and alteration of wildlife habitats from Project construction and operation;
- Potential physical and/or behavioral blockage and alteration of movements due to reservoir water and ice conditions, access and transmission corridors, and new patterns of human activities and related indirect effects, including habitat connectivity and genetic isolation;
- Potential direct mortality due to Project-related fluctuating water and ice conditions in the reservoir and downstream river reaches;
- Potential direct, indirect, and cumulative impacts on predator and prey abundance and distribution related to increased human activities and habitat changes resulting from Project development;
- Potential direct behavioral impacts to wildlife, 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 hunting, 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 vehicle strikes, exposure to contaminants, attraction to garbage and human activity, and protection of life and property; and
- Potential changes in wildlife mortality rates due to increased subsistence and sport harvest facilitated by Project development.

This terrestrial furbearer study will provide preconstruction baseline data for the Project area, including habitat use data for development of habitat evaluation criteria. The terrestrial furbearer study will provide a basis for impact assessment; developing protection, mitigation, and enhancement (PME) measures; and developing resource management and monitoring plans. For example, road and transmission-corridor construction may lead to increases in the coyote population, which in turn could cause declines in other species such as Dall sheep, red fox, lynx, and ptarmigan. This study will provide baseline information on the population sizes of terrestrial furbearers, which will be needed to assess the magnitude of these impacts and to develop appropriate mitigation and management plans. These plans could include recommended amendments to trapping seasons and bag limits based on changes detected in population sizes, or continued monitoring of prey species impacted by furbearers, such as Dall's sheep or ptarmigan.

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.

Noninvasive genotyping is a well-established technique to obtain reliable population estimates of coyotes, red foxes, lynx, and marten. Dr. Laura Prugh, assistant professor of wildlife ecology at UAF, will lead the study. Dr. Prugh previously used fecal genotyping successfully to monitor coyote population dynamics from 2000 to 2002 in the central Alaska Range (Prugh and Ritland 2005, Prugh et al. 2005, Prugh et al. 2008).

Sample Collection

Snowmachine trails will be established along creeks and rivers throughout the study area (i.e., along road and transmission corridors and the inundation zone). Trails will be traveled approximately every 2 weeks during January–March in 2013 and 2014, and all canid and felid scats will be collected. Scats will be collected with Ziploc bags and then placed within autoclave bags to prevent cross-contamination. Scats will be stored frozen, which preserves DNA for analysis. Unlike canids, lynx and marten do not preferentially travel on rivers and trails. Therefore, hair snags will be used to obtain genetic material from those species. Lynx habitat within the study area (i.e., areas with tree or shrub cover) will be divided into approximately 50 blocks. Each block will be 25 km² in size, approximately the average size of a lynx home range (Slough and Mowat 1996, Vashon et al. 2008). Two hair snag plates will be placed in each block, in locations that are accessible and likely to be encountered by any lynx occurring in the area. Hair snag plates will consist of an attractant that will cause lynx to rub and a barb to collect a hair sample (Zielinski et al. 2006). Hair-snag stations will be checked monthly during January–March in 2013 and 2014, and all hairs found on barbs will be placed in coin envelopes and stored in a dry location to preserve the DNA. Because marten home ranges are small and a survey of the entire study area would be impractical, the marten survey will be restricted to the inundation zone. This zone, which is approximately 125 km² in size, will be divided into 25 5-km² blocks. The home range size of female marten reported in this area during the 1980s was 3–6 km² (Buskirk 1983). Two hair snag tubes will be placed within each block in locations likely to be used by marten, as described by Williams et al. (2009).

Genetic Analyses

The outer surface of each frozen scat will be scraped with a scalpel, and shavings will be placed in 2-mL vials. DNA from hair samples will be extracted using Qiagen kits. Mitochondrial analyses will be used to determine the species identification and sex of individuals that deposited each hair and scat sample. Genotypes will be determined by amplifying DNA at 6 loci. Amplification will be repeated 2–3 times to verify accuracy because DNA from feces and hairs sometimes are degraded and errors can occur (Miller et al. 2002).

Habitat Use

Habitat use will be evaluated by conducting aerial surveys of tracks in snow. Experienced ADF&G staff will fly pre-determined transect lines and record Global Positioning System (GPS) receiver locations of tracks encountered. These locations will be overlaid onto habitat maps using ArcGIS[®] software (ESRI, Redlands, California) to examine patterns of habitat use and selection in the Project area for each furbearer species.

Statistical Analyses and Data Interpretation

Once reliable genotypes are obtained, each genotyped sample is considered to be a “capture” event. Mark–recapture population estimates and confidence intervals will be obtained using program *rMark* (Laake and Rexstad 2008). Survival, recruitment, and population growth rates will be estimated between years using open mark–recapture estimators such as Pradel models (Laake and Rexstad 2008).

Snowshoe hare numbers and wolf control may influence furbearer abundance in the study area, making it difficult to isolate the effects of Project activities. To assess these confounding factors, abundance estimates and trends found in this study will be compared with findings from a

similar study that Dr. Prugh is leading in nearby Denali National Park and Preserve (DNPP). Trends found in Denali will indicate how furbearer populations are fluctuating in response to the hare cycle in the absence of wolf control and in the absence of Project activities. Hare pellet counts will be conducted in Denali as well as in the Project area. Comparing baseline furbearer surveys in the Project area with surveys in Denali will indicate how wolf control is affecting furbearers in the Project area. This comparison will be useful in subsequently determining which changes in furbearers may be due to the Project activities and which changes may have occurred due to other factors. Although this comparison will be useful in evaluating Project impacts, funds for work in Denali will come from other sources (UAF funds to L. Prugh, in-kind support from DNPP). Thus, all funds requested for this proposed study will be used to conduct work within the Project study area.

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.

This study will require two field seasons to adequately assess furbearer abundance prior to Project construction. Fieldwork will be conducted by one graduate student and a seasonal field technician. Supervision, data analysis, writing reports, and attending meetings are expected to require one month of faculty time per year. Genetic analyses will be conducted by an experienced technician in Dr. Prugh's laboratory at UAF. Two snowmachines will be required to conduct fieldwork and several fixed-wing airplane trips will be needed each field season.

Assessing furbearer population sizes by conducting aerial surveys of tracks in snow may be appropriate for large furbearers such as wolves and wolverines, which often travel over long distances in open habitats where tracks are possible to follow from the air. Similarly, beaver and muskrat sign is also easy to see from the air. However, there are several difficulties that make aerial tracking impractical for obtaining population estimates of smaller furbearers such as coyotes, foxes, lynx, and marten.

The aerial snow-track survey method that provides estimates of population size is known as the survey-unit probability estimator (SUPE; Becker et al. 1998, 2004). This method has several assumptions and requirements that make it impractical for small furbearer population surveys. First, the method requires following the full length of a track from its end, where the animal is seen, back to its start, when the last snowfall ended. Small furbearers often travel in tightly meandering routes within dense brushy or forested areas, and their tracks can be obscured by snowshoe hare tracks. Coyotes prefer to travel on trails broken by other species (e.g., wolf and moose trails) because they have high foot loading and avoid traveling in deep snow (Murray and Boutin 1991), making their tracks easily lost. Second, aerial tracking is highly reliant on weather conditions that are uncommon (a fresh snowfall followed by several days of calm weather), and a SUPE survey can take several days per species to conduct (Becker et al. 1998). Therefore, it is unlikely that weather conditions and availability of experienced personnel would allow sufficient time to complete SUPE estimates for other furbearers in the study area in addition to the planned SUPE estimates for wolves and wolverines.

In addition, the SUPE has not been tested on smaller furbearers. Validations of SUPE population estimates in areas with known population sizes have occurred for wolves and cougars only, with mixed results (Vansickle and Lindzey 1991, Patterson et al. 2004, Choate et al. 2006). Thus, aerial track transects may be useful for obtaining information on habitat use and movement patterns of smaller furbearer species, but accurate estimation of population size requires different methodologies.

1.3.8. Literature Cited

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