**FWS PROJECT 2014 – 3 Year project**

**Project Title:** Core Habitat Identification and Fine Scale Habitat Use of Grizzly Bears in the US Northern Rockies and southern Canada
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**Partners (name, affiliation, location):** Michael Proctor**,** Birchdale Ecological, Kaslo,
**Project Summary (3 sentence target):** This project will focus on analysis of 10 years of GPS telemetry data for 60 grizzly bears across the threatened and fragmented trans-border grizzly bear subpopulations in the Cabinet, Yaak, Purcell, and Selkirk Mountain (Proctor et al. 2012) with a goal to identify areas of high quality core habitat and understand the ecological characteristics that underpin habitat use. We will use Resource Selection Function habitat-use models for partitioned by sex and in each of 3 seasons to capture the variation of bear habitat use. We will also work to integrate our results to inform wildlife and land managers on where to concentrate their management efforts by season to promote population health and resilience in both the US and Canada. We will also extend the ongoing trend monitoring effort through radio collaring females into the Canadian Yahk and Selkirks to monitor the effectiveness of the cumulative conservation efforts in these ecosystems.
**Category** Strategic Science

**Need:** *Habitat modeling:* Fragmentation is the growing conservation issue of our times and climate change is predicted to exacerbate its effects. Connectivity management is the major tool to foster options for natural systems to adapt. We have chosen the grizzly bear as an umbrella species to predict and then manage the trans-border region for connectivity of grizzly bears, and by extension, other species and ecological process. The grizzly bear is a relatively good umbrella species in this regard due to its broad and diverse habitat needs, sensitivity to human activities, and need for large healthy region-sized areas to sustain a population. Further, we have some very good data with which to underpin tough conservation decisions in the near future.

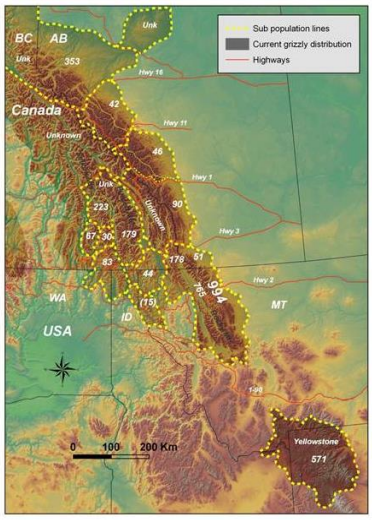
To manage habitat at the landscape and regional scale effectively for recovery of threatened populations and in response to climate change, it is essential to understand both linkage and backcountry core habitats. Proctor et al. (2012) identified the extensive fragmentation in the region, characterized by several small fragmented and isolated subpopulations (Fig 1a). The long-term persistence of this system requires these subpopulations be managed in a way that they are reconnected by some level of inter-area connectivity, and that their backcountry core habitats be identified and managed for long term habitat quality and security. Our work has identified the region's grizzly bear linkage areas (Proctor et al. 2014, Fig. 1b) and other arenas of our work are focused on enhancing management and purchase of strategic linkage lands (with a network of ENGOs) to foster movements by grizzly bears and other wildlife species. To date, our working network has purchased directly or in conservation easements, over $10 million of connectivity lands in the trans-border region of the US and Canada based on our research.

This proposal dovetails within our larger effort by focusing on identifying and understanding backcountry core habitats to inform management for long term habitat quality and security. It is the combination of core habitats connected by linkage areas through human environments that creates a sustainable system where grizzly bears and other wildlife species can navigate the larger landscape with an increasing human footprint overlaid with the inevitable change brought about by climate shifts. One example is motorized access management where approaches based solely on road density fail to account for habitat quality when making access decisions. Informing motorized access management

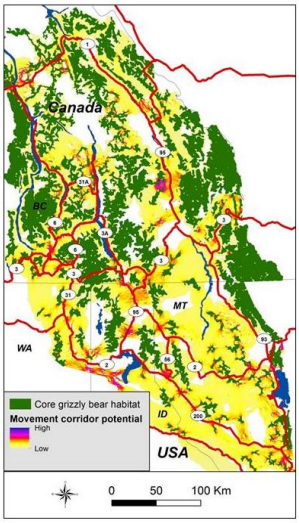
with habitat quality data optimizes land use patterns for wildlife and people, allowing economic prosperity and secure natural systems.

Figure 1a) grizzly bear fragmentation mediated subpopulation map of the trans-border region from Proctor et al. (2012), and b) Grizzly bear core areas and linkage area predictions derived from GPS telemetry across major fractures in the trans-border region from Proctor et a. (2014)

a




b




Currently we have GPS telemetry data for 60 grizzly bears in our larger study area that includes 39 bears in the Purcell and Cabinet Mts. and 21 in the Selkirks. We intend to use these data to build sex, season, and mountain range specific fine-scale habitat use models to underpin several levels of land management that will enhance habitat quality and security for grizzly bears and other wildlife species. These models will identify important grizzly bear habitats in riparian dominated valley bottoms, mid-elevation open canopy forests, and higher sub-alpine and alpine habitats. These models will be more useful to forest managers in project level planning and decision making that should result in better resolution for specific management actions, therefore improving the recovery potential of this population by improving management of backcountry core areas. For instance, this level of data would be more appropriate for laying out timber sales or resource extraction projects and access management decisions. Managers would have another important tool to assess project level effects to target timber sales to improve food production or avoid certain sites that may already be high use habitat. Access management in the form of road building, restrictions, or reclamation could be directed by effects on associated habitat quality with individual road segments.

We need to understand grizzly bear habitat needs to manage their critical habitats now and into the future. Further, our analysis and results will provide us with options to model habitat changes and their influence on habitat use as climates evolve. Understanding and managing backcountry core (this project) and linkage habitat (previous project) will cover the spectrum of needs to optimize long-term viability for grizzly bears and other wildlife species by providing for well managed core habitat and linkages between those core areas. Wildlife and land managers from both the US and Canada have been asking us for this type of analysis and are eager to put it to use.

*Trend monitoring:* Monitoring for population trend is the best way we gain feedback on the efficacy of the cumulative recovery efforts, mortality control efforts, access management, habitat management, and population changes due to climate change and other forces. The USFWS has an ongoing radio collar trend monitoring effort. However, both these subpopulations are shared by both the US and Canada and it is important to get good spatial representation of females to yield an accurate assessment of population trend. This proposal would help fund efforts in the Canadian portions of these ecosystems for trend monitor radio collaring.

This project is focused at the regional scale by addressing connectivity issues across 3 Mountain ranges, Cabinets, Purcells, & Selirks. Our work is on a focal species (the grizzly bear) of the GNLCC and the Rocky Mountain Partner Forum, and is highly cooperative as we work closely with relevant government agencies at various levels and ENGOs. These project activities are all designed to attain and be consistent with the IGBC identified goals for the recovery and long-term persistence of the Cabinet/Yaak, and Selkirk grizzly bear subpopulations. Further, we are working to solve issues also identified as critical by the GNLCC and RMPF of enhancing habitat quality and connectivity to improve the ability to adapt to climate change.

**Objective** *Habitat modeling:* Our main objective is to identify areas of high quality habitat and understand the ecological characteristics that combine to create those habitats through development of sex, season, and Mt. range-specific Resource Selection Function (RSF) habitat-use models (Boyce and McDonald 1999, Manly et al. 2002, Nielsen et al. 2002). The ultimate objective is to secure and improve important core habitat and reconnect several fragmented threatened grizzly bear subpopulations (Cabinets, Yaak, and S Selkirks) to large healthy populations in southern BC, Canada and the U.S. northern Rocky Mountains. By understanding and managing the larger system of core and linkage habitats we can provide and manage both for use by grizzly bears and other wildlife increasing their resiliency and ability to adapt to climate change.
*Trend monitoring radio collaring:* Our objective is to radio collar at least 3 females and provide the resulting data to the USFWS ongoing trend monitoring program.

**Methods** *Habitat modeling:* We have already gathered the necessary GPS telemetry locations from 60 grizzly bears across the South Selkirk, South Purcell, and Cabinet Mountains, over the past 10 years (2004-2013). Therefore, this project builds on the previous work that has been a result of a large network of organizations and funders in both the US and Canada. We have approximately 100,000 GPS telemetry locations, which will be used to develop sex and season-specific RSF habitat use models. RSF modeling is the published standard for habitat predictions based on understanding the ecological characteristics that drive habitat use and food production as well as identifying core habitats that can be managed to promote population viability (Boyce and MacDonald 1999, Manley et al. 2002). Because habitat use can shift as the seasons change, and management regimes should also shift by season (Mace et al 1996, 1999), we will build models for spring (pre-berry season, April 15 – June 30), summer (berry season, July 1 – Aug 31) and fall (post-berry season, Sept 1 – Oct 15). Also, to capture sex specific habitat use, we will model all bears by gender. RSF models are developed using multi-variable logistic regression by comparing locations where bears use habitat (telemetry points) to available habitat (random locations). We use a combination of Geographical Information Systems (GIS) work and a statistical package (Stata) to build and evaluate models. We will use model building rules from Hosmer and Lemeshow (1989). We have a suite of 20 equivalent ecological and human use variables across our international study area for model development. We will evaluate our models using a suite of published methods including the use of independent data. We will integrate sex specific models to develop population level models and these will be the basis for identifying core areas of high quality habitat and

management decisions. Core habitats will be identified using clustered areas of greater habitat selection (higher RSF scores, (Chetkiewicz and Boyce 2009).

*Trend monitoring radio collaring:*
We will trap for GPS radio collaring in the Canadian Selkirks and Yahk with the goal to follow the fates and reproductive success of female grizzly bears. Trend is estimated using the known fates of individual female bear's survival reproductive information. There is a parallel effort going on in the US portion of these subpopulations. We will use accepted trapping protocols similar to those used by the USFWS trapping teams. Our goal will to radio collar at least 3 females annually for 3 years. We have most of the required money to carry out this effort (radio collars, download fights, collar retrieval, data management, analysis, write up, 1 trapper), here we are only requesting $14,000 annually for each of 3 years. These funds will be used for vehicle expenses, wages for 1 bear trapper, and some miscellaneous expenses.

**Deliverables:**
Fully integrated population level habitat models for each of the South Selkirk, South Purcell, and Cabinet Mountains for each sex and 3 seasons, spring, summer, and fall.

Annual reports to GNLCC detailing annual progress.
Final project report to GNLCC.
Peer reviewed scientific publication.

The most important result from this work will be our consultation with land and wildlife managers at various levels of government in both the US and Canada. We have a good track record of realizing management goals emanating from our research. Our fragmentation and connectivity work has underpinned an ongoing multi-million dollar strategic land purchase effort for wildlife connectivity across settlement corridors in the region. We will deliver these results, reports and recommendations on habitat management to all relevant wildlife and land managers across our study area, with consultation as to appropriate application of land use decisions. In the US, this includes the Forest Service, Bureau of Land Management, Idaho, Montana, and Washington Fish and Wildlife agencies and State land management agencies, and large private industrial timber land owners (Stimson and Plum Creek). We will also work with local and county governments to integrate our results so as to optimize human values and economic need, as well as those of our natural systems. In British Columbia, this entails the BC Ministry of Environment, the Ministry of Forests, Lands, and Natural Resource Operations, relevant large timber companies (CanFor, Wynndel Box) that operate on the land and make many land use decisions, regional districts (county equivalents) and ENGOs that facilitate conservation solutions in southern BC. This consultation will provide for science-based adaptive management of the backcountry to facilitate habitat quality and regional connectivity.

The GPS radio collar data and known fates of these bears will be shared annually with the USFWS to estimate trend for the international Yaak/Yahk and Selkirks. Trend data will be incorporated in our larger adaptive managemnt strategies for several of our conservation programs, including those within this proposal.

**Schedule:**
Fall 2014 – Spring 2015 RSF modeling Part 1 & annual report, May-June trapping effort
Fall 2015 – Spring 2016 RSF modeling Part 2 & annual report, beginning of the consultation process with government decision makers, May-June trapping effort

Fall 2016 – Spring 2017 Continued consultation with results and government agencies from both countries, integrated analysis, synthesis, final report & peer review publication submitted, May-June trapping effort

**Statement of compliance:**
The Project Coordinator and Principal Investigators have read the Great Northern Landscape Conservation Cooperative Information Management, Delivery, and Sharing Standards and agree to comply with these standards, given selection of our proposal.

**Literature Cited**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