Modeling Grizzly Bear Density Using Updated LANDFIRE Vegetation and New Greenness Layers

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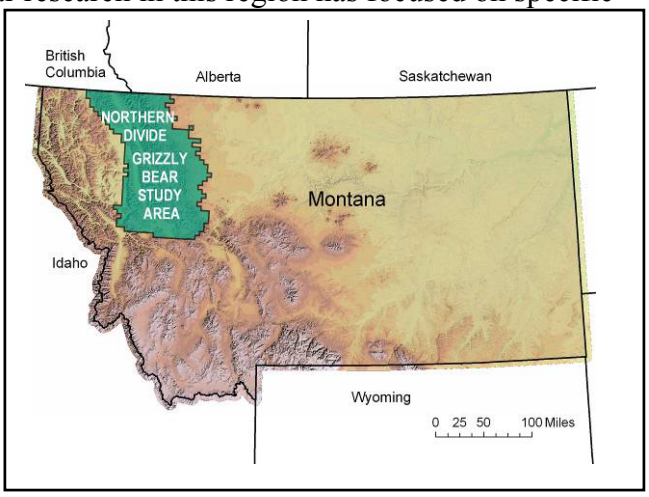
Obtaining a detailed, relevant, ecosystem-wide vegetation layer for use in analysis and monitoring of wildlife populations is a daunting task, especially in an ecosystem that experiences disturbances like forest fires that can cover large areas. In our analysis of grizzly bear density, we will include vegetation layers from LANDFIRE and layers that are required for the grizzly bear cumulative effects model.

Grizzly Bear Project Background:

The Northern Continental Divide Ecosystem (NCDE) grizzly bear population in northwest Montana is one of six threatened populations identified in the US Fish and Wildlife Service's Grizzly Bear Recovery Plan (1993). While previous grizzly bear research in this region has focused on specific issues in small areas, such as habitat use or the effects of roads on bears, little is known about the status of the population as a whole. The primary objectives of the Northern Divide Grizzly Bear Project (NDGBP) are to use noninvasive sampling and DNA fingerprinting of grizzly bear hair to:

- Develop a statistically rigorous estimate of grizzly bear population size.
- Assess variation in the density of bears throughout the NCDE.



In the summer of 2004, bear hair was collected from 5,300 bear rub trees and 2,600 hair snares systematically distributed across the 7.8 million acres of occupied grizzly bear range in the NCDE. This rugged area is 85% mountainous and 50% roadless, making field work logistically challenging. Genetic analysis of the 34,000 hair samples collected has identified the species, sex, and individual identity of the bears sampled. This information will be used in mark–recapture models to estimate population size.

As the largest DNA hair snagging study ever undertaken, cooperation with numerous agencies has been essential. Partners include five national forests, Glacier National Park, U.S. Fish and Wildlife Service, Bureau of Land Management, Montana Fish, Wildlife and Parks, Montana Department of Natural Resources and Conservation, Confederated Salish and Kootenai Tribes, Blackfeet Nation, Northwest Connections, University of Montana, and the provinces of Alberta and British Columbia.

Assessing Variation in Bear Density in the NCDE:

We are investigating bear distribution in the NCDE to understand why some areas within the ecosystem have many bears, while others have few or no bears. Results of this analysis will aid development of a conservation strategy for recovery of this and other smaller populations. Potential explanatory factors for density patterns include vegetation type, human density, road density, historical bear mortality, food storage regulations, topographical complexity, and climate variables. Maps of these variables must cover the entire study area and be relatively fine-grained so that bear distribution can be examined at multiple scales. Further, maps should represent conditions existing

when sampling was conducted in 2004.

Updating LANDFIRE vegetation

Of the vegetation maps considered for this analysis, the LANDFIRE (http://www.landfire.gov) vegetation layers best meets project requirements. LANDFIRE is the most accurate map that covers the entire study area with a resolution that is sufficient for multi–scale analysis. The classification system used is relevant to bear ecology. For example, it includes classes for high quality bear habitat components such as riparian systems, moist forests, and avalanche chutes, which are often difficult to extract from maps of dominant tree species created for forestry applications. The vegetation layers for our study area, created from 1999-2001 imagery, are completed.

Approximately 7% of the NDGBP study area has burned since the LANDFIRE vegetation layers were created. LANDFIRE (Zhi-Liang Zhu, Chris Winne) and the National Interagency Fuels Technology Team (Jeff Jones, USFS) are using burn severity data created by USGS (Carl Key, Northern Rocky Mountains Science Center) and the Remote Sensing Applications Center (Brian Schwind) to update the LANDFIRE vegetation layers in the NDGBP study area to 2004 conditions. The general approach is to modify only vegetation height and canopy cover for low to moderate severity fires, but to also adjust vegetation type for high severity fires. The process will create burn severity and fire perimeter layers for 2000 – 2004 and vegetation type, canopy cover, and vegetation height layers for 2004. We will evaluate success of this approach through review by people familiar with the burned areas. As a pilot project for a national update of LANDFIRE vegetation, we expect that people working in other areas or years will also benefit from this study. We expect to complete a cursory assessment of the update process by the beginning of April.

Cumulative Effects Model (CEM) Input Update

The NCDE grizzly bear CEM incorporates impacts from multiple human activities into a map of grizzly bear habitat quality. Under the auspices of the interagency NCDE committee, cumulative effects are being recalculated with 2004/2005 data. Kathy Ake (USFS) heads up the creation of layers that form inputs to the model. She is creating greenness, wetness, brightness and spectral diversity layers from 2004/2005 imagery, as well as several layers representing impacts of human activity (e.g. roads with impact levels). Image-based layers will include path rows 4126, 4127, 4027, and 4226. Human activity layers cover the NCDE grizzly bear recovery area. These layers are scheduled for completion within the next month.

Results from this assessment of variation in the distribution of bears across the ecosystem will permit managers to focus efforts on the factors most important to bear recovery. The NDGBP envisions other projects that would use LANDFIRE vegetation and CEM layers, including monitoring grizzly bear population trend, examining black bear distribution in the ecosystem, and investigating nutritional ecology of grizzly bears in the NCDE.

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