

Using GIS to Model Preferred Grizzly Bear Habitat in North Cascades National Park, Washington



Introduction

Grizzly bears were once widespread in western North America, including the Cascade Mountains ecosystem of Washington state. Mostly hunted out during the 19th century, only a small handful of grizzly bears remain in the North Cascades today. Estimates range from as few as 5 individuals to possibly as many as 20, and sightings are extremely rare. Studies have shown that the North Cascades ecosystem can support several hundred grizzly bears (e.g. Skagit Environmental Endowment Commission, 2016). Grizzlies represent an important natural component of the North Cascades that has been largely missing in the modern era; in addition, grizzly bears hold cultural significance to Native Americans in this region. Given the above factors, it is worth exploring the introduction of a more sustainable population of grizzly bears to the North Cascades ecosystem.

Background and Data

Research has shown that the success of grizzly bear populations depends on large tracts of land where human contact can be minimized (US Fish and Wildlife Service, 1993). As such, primary importance in this analysis was given to avoiding areas in the NCNP where people may be found. Of secondary importance were land cover considerations, as the NCNP is generally forested with plentiful potential prey species as well as water supplies; i.e. generally favorable habitat conditions for grizzly bears assuming human contact can be minimized. Three datasets were utilized to represent the extent of human encroachment on potential grizzly bear habitat – public roads, trails, and campgrounds. The National Land Cover Database (NLCD) 2011 landcover dataset was used in order to delineate forested areas, the most favorable habitat for grizzly bears. Finally, a dataset of rivers and streams was used in order to augment the analysis, as fish can be a secondary food source for grizzly bears.

References

Conservation Northwest. North Cascades Grizzly Bears. Available at: https://www.conservationnw.org/ourwork/wildlife/north-cascades-grizzly/

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https://www.nps.gov/noca/learn/nature/grizzly-bears.htm

Skagit Environmental Endowment Commission. April 2016. Grizzly Bear Carrying Capacity in the North Cascades Ecosystem. Seattle, WA. 21 pp.

U.S. Fish and Wildlife Service. 1993. Grizzly bear recovery plan. Missoula, MT. 181 pp.

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Figure 8

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In a 2016 poll of Washington residents, more than 80% agreed that grizzly bear populations should be restored in the North Cascades (Conservation Northwest)

Study Area

The North Cascades National Park Service Complex was chosen as the study area. The NCNP Service Complex includes both the North and South units of the national park, as well as two adjoining National Recreation Areas – Ross Lake and Lake Chelan. Together, the NCNP Service Complex forms a contiguous, federally-managed area of the North Cascades ideally positioned for preservation and oversight of natural ecosystems in this region.

Fig. 1: Landcove

Data Sources

Data.gov – NCNP Service Complex boundaries, NCNP campgrounds, Streams National Land Cover Database (NLCD) 2011 – Landcover Washington Dept of Transportation (WSDOT) – Roads, Ferry terminal Washington Dept of Natural Resources (DNR) -Trails



Methods/Workflow

All datasets were re-projected to a common coordinate system, UTM Zone 10N, and clipped to, intersected, or extracted by mask in order to conform with NCNP Service Complex boundaries. The NLCD 2011 layer was reclassified into 6 generic landcover classes (Fig. 1).

1) Euclidian Distance

Euclidian distances were calculated for the trails (Fig. 2), campgrounds (Fig. 3), and streams (Fig. 4) layers. Increments of 500 meters were chosen based on available literature.

2) Reclassifying

The Euclidian distance bands were reclassifying on a scale of 1 to 5, with 5 representing most favorable conditions. For the trails and campgrounds layers, a classification of 5 was assigned to the furthest distance band. For the streams layer, a classification of 5 was assigned to the closest distance band. In addition, the NLCD dataset was reclassified based on known grizzly bear habitat preferences. A value of 5 was assigned to forests, and a value of 4 was assigned to grasslands/meadows.

3) Weighted Overlays

A two-part weighted overlay process was utilized. The first weighted overlay (Fig. 5) combined the Euclidian distance bands generated earlier in the analysis. Distances from trails and campgrounds were each assigned **45%** influence, while streams were assigned **10%** as their influence on grizzly bear habitat decisions is assumed to be minimal. The second weighted overlay (Fig. 6) combined the output of the first overlay with the NLCD landcover dataset. The output of the first weighted overlay was assigned **70%** influence, while landcover was assigned **30%** as land type is of lesser importance to the survival of grizzly bears than possible conflict with humans.

4) **Buffering of Transportation Corridors**

A 2,000 meter buffer was applied to the public roads layer (Fig. 7). Literature suggests significantly reduced grizzly bear habitat utilization within 500 meters of an open road (Skagit Environmental Endowment Commission, 2016). A conservative 2 km buffer was chosen as there are very few roads in the NCNP Service Complex, and the objective of this analysis was to find only the most favorable habitat areas.

5) Final Classification (Fig. 8)

As a final step, the output of the second weighted overlay was reclassified into 1) Level 1 – Most Suitable for all areas classified as "5," 2) Level 2 – Suitable for all areas classified as "4," and 3) Not Suitable for all areas classified as 1-3. Additionally, the transportation corridor buffers were removed from the analysis area and assigned to the Not Suitable category.

Fig. 5: Overlay of Euclidian **Distance bands**





