Idaho Wilderness: Assessing Future Land Use and Climate Change in the State's Greatest Gems

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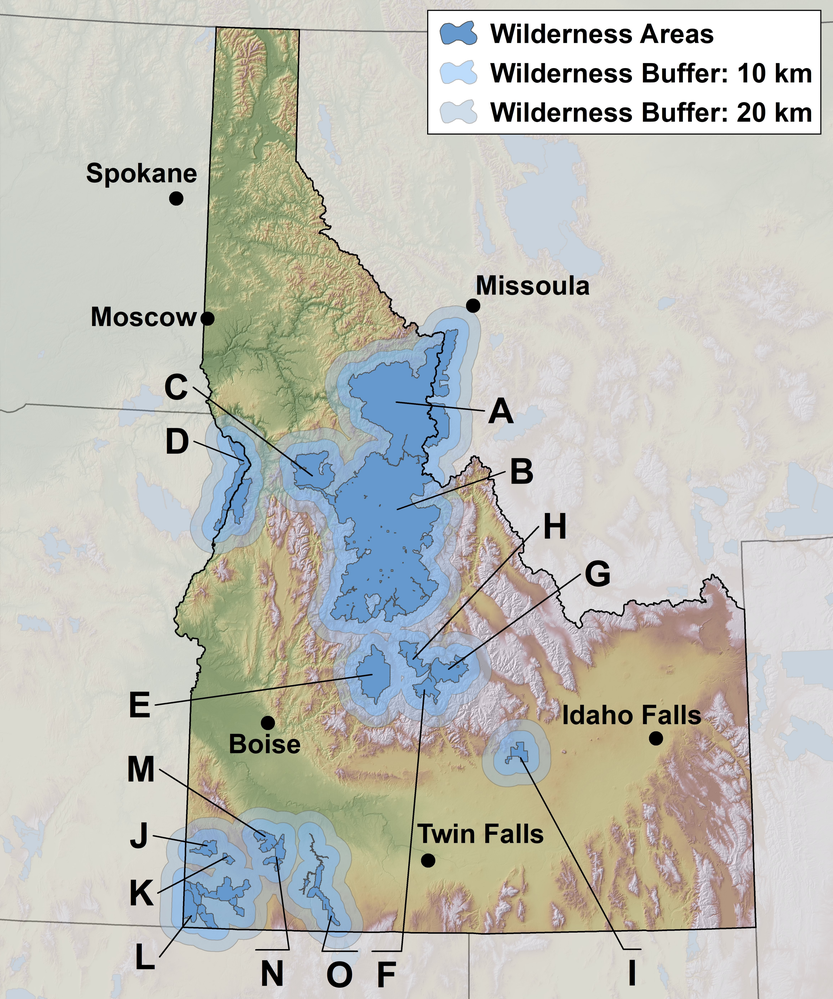
Introduction

The Wilderness Act of 1964 established the National Wilderness Preservation System (NWPS) "to secure for the American people of present and future generations the benefit of an enduring resource of wilderness" (U.S. Public Law 88-577). Since 1964 15 NWPS wilderness areas have been designated in Idaho (www.wilderness.net). The intent of these designations is to preserve natural condition, yet these areas and their surroundings are and will continue to be influenced by land use conversion and climate change. Our project assesses the impact of land use and climate change through 2050 to identify vulnerable wilderness areas

Methods

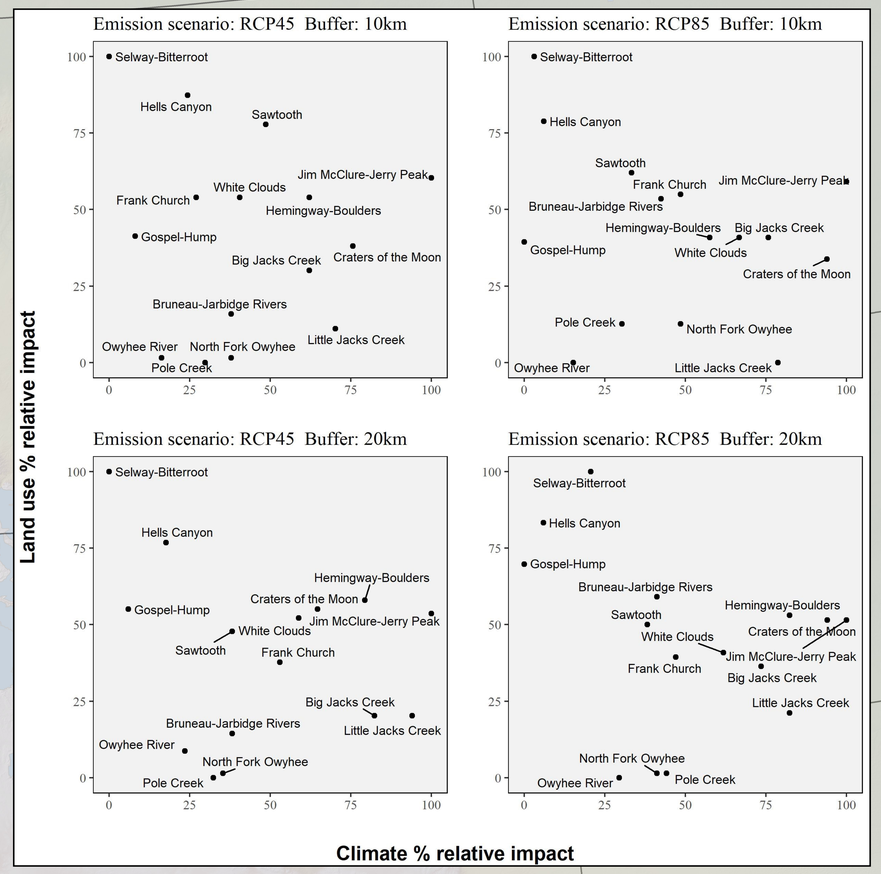
Land use and climate variables were obtained from several sources (see table). The 15 land use variables were intersected with 10 and 20 km buffers surrounding wilderness areas, while 20 climate variables were intersected with the wilderness areas plus the two buffer distances. Variables projected to 2050 were also summarized for two climate change scenarios, RCP45 and RCP85, representing increasing amounts of greenhouse gases in the atmosphere. Values for all wilderness areas were ranked by deciles then summed across land use and across climate change variables. Each wilderness area rank was plotted using its rank relative to other Idaho wildernesses.

Variable(s)	Time period	Climate scenarios	Source
Land use			
Change in population density, housing unit density, and population density in the wildland urban interface	1990-2010	None	[1,2]
Percent change in water, barren, grassland, shrubland, forest, wetland, developed, mining, forest harvest, and agriculture	2006-2050	RCP45, RCP85	[3]
Percent change in core and noncore natural land cover	2006-2050	RCP45, RCP85	[3,4]
Climate			
Change in return interval for extreme drought, heat, precipitation, and cold in fall, summer, winter, and spring, as well as spring false blooms	2006-2050	RCP45, RCP85	[5]
Change in wildfire potential	2006-2050	RCP45, RCP85	[6]
Backward and forward climate displacement and velocity	2000-2050	RCP45, RCP85	[7,8]
Climate dissimilarity	2000-2050	RCP45, RCP85	[8]



Idaho Wilderness Areas

- **A. Selway-Bitterroot**
- **B. Frank Church**
- **C. Gospel-Hump**
- **D. Hells Canyon**
- **E. Sawtooth**
- **F. Hemingway-Boulders**
- **G. Jim McClure-Jerry Peak**
- **H. White Clouds**
- **I. Craters of the Moon**
- **J. North Fork Owyhee**
- **K. Pole Creek**
- **L. Owyhee River**
- **M. Little Jacks Creek**
- **N. Big Jacks Creek**
- **O. Bruneau-Jarbridge Rivers**



Discussion

In both RCP scenarios and at both buffer distances the Selway-Bitteroot was ranked highest for land use change, and the Jim McClure-Jerry Peak was ranked highest for climate change. In the case of the Selway-Bitterroot, development in Missoula was a major driver of this ranking. Hells Canyon was also highly affected by land use change, although this was driven by natural cover type conversions (i.e., forest, shrubland, and grassland). The Jim McClure-Jerry Peak was particularly sensitive to forward velocity, an indicator of how far organisms must migrate to maintain current climate conditions. Increased extreme heat in the fall and spring was observed for nearly all areas. Wilderness areas in southwest Idaho ranked lower for both land use and climate change, although proximity to the Snake River valley appeared to increase vulnerability.

Our results suggest that all of Idaho's wilderness areas are vulnerable to increasing extreme heat events; however, managers may be especially interested in areas such as the Jim McClure-Jerry Peak where species cannot easily disperse to analogous climatic zones. Additionally, land use policies and protection could be focused on wilderness areas with higher vulnerability to land use change.

References

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