



Understanding landscape change and recovery chronosequences

after wildfires: A proposed interdisciplinary study

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Abstract: We propose research to examine post-wildfire landscape recovery using three integrated approaches: 1) Social science (questionnaires and semi-structured interviews) to understand perceptions of landscape recovery and attitudes towards land management, 2) Remote sensing (Landsat) images showing pre- and post-wildfire vegetation cover, and 3) Vegetation sampling in the study area to ground truth the remote sensing data and characterize the vegetation changes following a wildfire. Previous research has focused on each of these aspects of wildfire individually, but how these data sets relate to each other is still unclear. Determining what influences perceptions of landscape recovery will help inform pre- and post-wildfire management decisions. Management implications may vary if perceptions are determined by people's subjective understanding of ecological processes and socially constructed connections to the landscape, as opposed to actual physical changes in the landscape (e.g., changes in species composition or total vegetation cover).

1. Introduction: People have personal and social connections with the landscapes around them. In addition to the visible features of the landscape, socially constructed meanings also affect peoples' connections to the landscape (Greider and Garkovich, 1994). Those connections not only affect attitudes towards land management decisions, but they can also impact one's well-being and quality of life. Thus, in addition to the biophysical impacts of wildfire often studied, the changes to a landscape from wildfire can impact people's well-being and quality of life, as well as their attitudes towards land management.

Research has shown that the general public lacks a comprehensive understanding of ecosystem processes and often relies on visual cues when assessing the landscape around them (Lazo et al., 1999; Nassauer, 1995). For example, Hull et al. (2001) found that species diversity and the presence of dead trees and bare soil affected perceptions of forest health. Zaksek and Arvai (2004) showed that people often lacked understanding of the beneficial implications of wildfire for forest health. Given the important role of wildfire in ecosystems, it is necessary to understand how people perceive biophysical changes (including landscape recovery) from wildfire, because those perceptions likely affect peoples' connections with a landscape, as well as their attitudes towards land management.

This research aims to examine how perceptions of post-wildfire landscape recovery relate to both personal, subjective meanings associated with landscapes and objective measures of landscape change. Specifically, we propose to examine the extent to which perceptions of landscape change (i.e., recovery) from wildfires are driven by peoples' connections with a landscape and understanding of ecological processes, or by the actual physical changes in the landscape (e.g., different vegetation types/cover, presence of burned trees).

2. Research Approach: A comprehensive understanding of landscape recovery following wildfires requires an interdisciplinary approach.

Examining people's mental models of landscape recovery and the role of fire as an ecological process allows a better understanding of how and why landscape changes from wildfires affect people and their relationships with the land, including attitudes towards land management.

Capturing the dynamic relationship between social and biophysical components requires an in-depth understanding of the actual physical changes of the landscape.

Remote sensing images, such as Landsat, can provide insights into the landscape level changes in vegetation cover, and to an extent, changes in species composition. On-the-ground vegetation sampling can verify these changes and provide a clear description of current vegetation distribution and composition.

3. Research Questions

Objective: Explore how people's perceptions of landscape recovery from a wildfire relate to (a) subjective meanings (including mental models) and (b) biophysical changes in the landscape.

- How is post-wildfire landscape recovery defined and perceived by the public?
- How do individuals' perceptions of recovery compare to conclusions based on biophysical data?
- To what extent do biophysical changes versus peoples' subjective meanings (mental models of ecosystem processes) explain perceptions of landscape change?

Remote Sensing Data (LandSat)

- biomass and cover

Post-wildfire landscape recovery

4. Conceptual Overview

Vegetation Sampling

- biomass, cover, and species and life form diversity

Social Perceptions

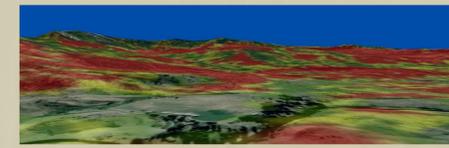
- mental models of wildfire and ecosystem processes; perceptions of landscape change; attitudes towards land management

5. Proposed Research Methods

1. Select one or more wildfires in the past 10 years where a burned area is part of a prominent viewshed for a nearby community; fires should include mixed levels of burn severity and post-wildfire landscape recovery within the viewshed.



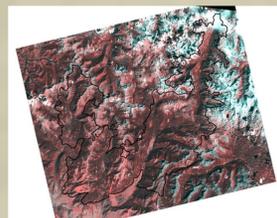
The green shaded area in the image above is the portion of the 2006 Columbia Complex fire in the viewshed for Dayton, WA residents.



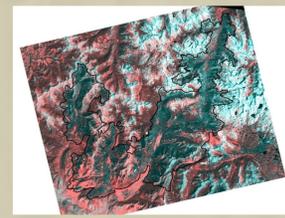
The image above is from an observation point (see MTBS burn severity map below) of the Storm Creek Fire of the 1988 Yellowstone fires from a 3D perspective.

2. Retrieve pre-and post-fire Landsat images to illustrate the extent of landscape changes, as well as images showing burn severity (dNBR) for the fire.

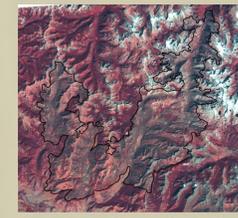
- Potential metrics include biomass and cover estimates from pre- and post-fire Landsat images of the study area.



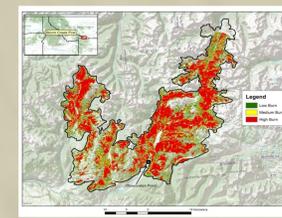
Pre-Storm Creek Fire



Post-Storm Creek Fire 1989



5-year post-Storm Creek Fire



Burn Severity Map (MTBS) Storm Creek Fire of 1988

3. Vegetation Sampling -- Collect measurements of current vegetation cover and composition, and compare to pre-fire vegetation sampling data

- Potential metrics include vegetation biomass, cover, density, and species diversity. Percentage cover of different life forms will also be recorded (i.e., tree, shrub, forb, or grass), including visual characteristics such as color (e.g., green vs. charred black as the prominent color). Presence and cover of invasive species will be documented.



4. Use quantitative questionnaires and semi-structured interviews with residents living in areas where the selected viewshed is prominent to understand their perceptions of landscape change after the fire and attitudes about future land management decisions. Peoples' mental models of wildfire as a social and ecological process can be examined quantitatively and qualitatively to understand how people perceive landscape changes due to wildfires. Multivariate and regression analysis will be applied to understand the biophysical and attitudinal predictors of perceptions of landscape recovery, as well as the role of these predictors and perceptions in affecting support for forest and wildfire management.

6. Looking for Input

Study site locations:

- wildfire within the last 10 years
- with varying levels of burn severity and landscape recovery
- where pre-fire vegetation sampling data are available
- where varying levels of landscape recovery have occurred within a prominent viewshed of a local community

7. References

Greider, T., and Garkovich, L. (1994). Landscapes: The social construction of nature and the environment. *Rural Sociology*, 59, 1-24.

Hull, R. B., Robertson, D. P., & Kendra, A. (2001). Public understandings of nature: A case study of local knowledge about "natural" forest conditions. *Society and Natural Resources*, 14(4), 325-340.

Lazo, J. K., Kinnell, J., Bussa, T., Fisher, A., & Collamer, N. (1999). Expert and lay mental models of ecosystems: Inferences for communication. *Risks: Health, Safety & Environment*, 45, 45-64.

Nassauer, J. I. (1995). Messy ecosystems, orderly frames. *Landscape Journal*, 14(2), 161-170.

Zaksek, M., and Arvai, J. L. (2004). Toward improved communication about wildland fire: mental models research to identify information needs for natural resource management. *Risk Analysis*, 24(6), 2004.

Landsat and viewshed images, and burn severity map courtesy of Dr. Karen Lannom

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