Towards Resilience: Perspectives from Wilderness

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Wildland Fire Canada 2016
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1964 Wilderness Act
765 units
44 million hectares

“...managed to preserve natural conditions...”

“...affected primarily by the forces of nature...”

“...without permanent improvements ...”
Wilderness Research
Wilderness for Science        Science for Wilderness

Recreation & Visitor Use
Values & Benefits
Environmental Change
Management Tools
Monitoring
Ecological Resilience

Capacity of an ecosystem to absorb or withstand perturbations and other stressors such that the system remains within the same regime, essentially maintaining its structure and functions.

Reduced resilience increases vulnerability to disturbances.

The new regime may be less desirable.

Restoration may be complex, expensive, or impossible.
Historically dynamic but persistence through stabilizing feedbacks

Stabilizing feedbacks

Ponderosa pine forest
Loss of stabilizing feedbacks

Dense, ladder fuels

unstable
Loss of stabilizing feedbacks $\rightarrow$ Alternative stable domain

Loss of big trees and regeneration potential
Loss of stabilizing feedbacks $\rightarrow$ Alternative stable domain
A natural experiment in fire management

Wilderness Fire: Intentionally allowing a fire to burn (primarily) on its own terms to benefit the resource

- “Let Burn”
- Prescribed Natural Fire
- Natural Fire Management
- Wildland Fire Use
- Wildland Fire for Resource Benefit
- Managed Wildfire
A natural experiment in fire management

National Park Service
1967 policy: “fires from natural causes...predetermined fire management units”

Selway-Bitterroot
Frank Church-River of No Return
Sequoia-Kings Canyon

Forest Service
1972 policy: “fire will be allowed to more nearly play its natural role”

Yosemite
Saguaro
Gila
Bob Marshall
Grand Canyon

Okefenokee
Everglades

Alaska
Western US Fire Regimes
What have we learned?

- Hypothesis
- Observation
- Experiment
- Prediction
Fire is a self-limiting landscape process

Occurrence
Previous burns limit subsequent fire occurrence
This effect lasts 9 to 25+ years depending on the ecosystem

Parks et al. 2015
Fire is a self-limiting landscape process

**Occurrence**

**Extent**

Previous burns limit the spread of subsequent fires.

This effect lasts 6 to 18 years depending on the ecosystem.

The effect is weaker under extreme weather conditions.

*Parks et al. 2015; also Collins et al. 2009; Teske et al. 2012*
Fire is a self-limiting landscape process

Occurrence

Extent

Burn severity

Reburns have lower severity than areas that have not burned recently

This effect decays over time, but lasts at least ~10 years

Parks et al. 2014; also several others
Forests may possess a “latent resilience”
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Larson et al. 2013

Bob Marshall Wilderness
Photo: Andrew Larson
Forests may possess a “latent resilience”

Larson et al. 2013

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Forests may possess a “latent resilience”

Larson et al. 2013

Low density mixed-conifer

High density mixed-conifer

Closed-canopy lodgepole

Bob Marshall Wilderness

Photo: Andrew Larson
Forests may possess a “latent resilience”

Low density mixed-conifer

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Larson et al. 2013

Bob Marshall Wilderness

Photo: Andrew Larson
Wilderness fires are more heterogeneous

Longer durations, heterogeneous burning conditions

Table 2. Start date and duration (days) and for prescribed fires, wildfires, and fire use fires >40 ha in Yosemite National Park, 1974 through 2005.

<table>
<thead>
<tr>
<th>Fire management type</th>
<th>Start date</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Prescribed fire</td>
<td>7/21</td>
<td>102.2</td>
</tr>
<tr>
<td>Wildfire</td>
<td>8/19</td>
<td>40.5</td>
</tr>
<tr>
<td>Fire use</td>
<td>8/2</td>
<td>30.4</td>
</tr>
<tr>
<td>All fires</td>
<td>8/3</td>
<td>61.0</td>
</tr>
</tbody>
</table>

van Wagtendonk & Lutz 2007
Longer durations, heterogeneous burning conditions

Wilderness fires are more heterogeneous

Less high severity fire than

suppressed wildfires
Wilderness fires are more heterogeneous

Longer durations, heterogeneous burning conditions

Less high severity fire than suppressed wildfires

Smaller patches of high severity than suppressed fires

Figure 6. Mean patch size (ha) by severity level for prescribed fires, wildfires, and fire use fires >40 ha, Yosemite National Park, 1984 through 2005.

van Wagendonk & Lutz 2007
What have we learned?
...an argument for expanding wilderness fire

Self-limiting

Latent resilience

Heterogeneity
But can we?

Many factors influence the decision to let fire burn

- Policy
- Assessment of risk
- Safety
- Staffing
- Resources available
- Wildland-urban interface
- Public support
- Air quality regulations
- Incentive structure
- Comfort with fire
Wildfire Response Planning
A Three-zone Approach

- **Protect.** Treat fuels to protect homes and allow for more effective fire suppression.

- **Restore.** Wildfire could provide ecological benefits. Fuel treatments may be necessary precursor.

- **Maintain.** Wildfires provide ecological benefits. Very limited suppression.

Thank you