The FireCLIME VA: Applying a Rapid and Flexible System for Assessing Ecosystem Vulnerability to Climate-Fire Interactions to National Forests



Megan M. Friggens & Stephanie Mueller 8th International Fire Ecology & Management Congress November 21st, 2019



Landscape Impacts of Fire and Climate Change in the Southwest: A Science-Management Partnership





Figure 12.—An illustration of the adaptation process used to incorporate climate change as a management consideration and help ecosystems adapt to the anticipated effects of climate change. Additional resources provide information and tools that support the process.

From "Forest Adaptation Resources" GTR-NRS-87, Swanston et al., 2016

Science management partnership

Identified critical predictors of Climate-Fire-Landscape interactions

Used these predictors to quantify ecosystem vulnerability to climate related changes in fire regimes



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> User Guide to the FireCLIME Vulnerability Assessment (VA) Tool: A Rapid and Flexible System for Assessing **Ecosystem Vulnerability to Climate-Fire** Interactions

Megan Friggens, Rachel Loehman, Andrea Thode, William Flatley, Alexander Evans, Windy Bunn, Craig Wilcox, Stephanie Mueller, Larissa Yocom, Donald Falk



Rocky Mountain





Forest Stewards

















General Technical Report DMDC CTD 205

September 2019

Science management partnership

Southwest

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Science management partnership

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1. Exposure

2. Intrinsic Sensitivity/ Adaptive Capacity Fire Regime Response

11

Vulnerability score for the ecosystem and for each of 8 landscape components

Vulnerability= Departure from user-defined **Desired Future Conditions (DFC)**

Southwest



Recent Applications

Santa Fe National Forest

- Jemez Mountains
- Literature-based Assessment

Lincoln National Forest

- Two project areas: Perk-Grindstone and 16 Springs
- Manager-led assessment





Vulnerability of Ponderosa Pine in Two Project Areas:

- Manager led Assessments
- Webinars +
- Meetings: May 9th and August 20, 2018; June 2019



LNF participants: David Baker, Marisa Bowen, Wesley Hall, Daniel Ray, Rhonda Stewart, Daniel Ray, Craig Wilcox



Site 1: Perk-Grindstone

- Smokey Bear Ranger District
- The Perk-Grindstone Fuel Reduction Project was implemented starting in 2008 to reduce hazardous fuels within the wildland-urban interface of the greater Ruidoso, NM area
- WUI
- DFC: Historical/Natural range of variation
- Project Environmental Analyses





Site 2: 16 Springs

- Sacramento Ranger District
- Multiple land ownerships
- The objectives of the 16 Springs project are to improve the overall ecological sustainability, resiliency and biodiversity of the entire watershed
- WUI & non-WUI, MSO
- DFC: Reference conditions (pre-1870)
- Environmental Impact Statement and Forest Plan





Anticipated Climate and Fire Regime Change

CCSM4 CMIP5 Projection

Climate Scenario	Response
Fire Season Length	Increase
ERC	Increase
Drought Frequency and Duration	Increase
Average Summer Temperature	Increase
Relative Humidity	Decrease
Snowpack or SWE	Decrease

Fire Regime Response	Response
High Severity Patch Size	Increase
Fire Frequency	Increase
Soil Burn Severity	Increase
Annual Area Burned	Increase



Treatment Scenarios:

Perk-Grindstone

- Treatment 1. A single-entry prescribed fire only
- Treatment 2. Mechanical thinning followed by a single-entry prescribed fire
- Treatment 3. Mastication of fuels followed by a single-entry prescribed fire

16 Springs

- Treatment 1. Multiple prescribed burns and managed fire use
- Treatment 2. Lop and scatter. Slash treatment left onsite followed by prescription fire
- Treatment 3. Lop and scatter. Slashed removed



Overall Scores: How Does PIPO Compare?

Perk-Grindstone

16 Springs

Table 2.1. Scores	reported on scale of -10 to +10	Table 2.1. Scores	reported on scale of -10 to +10	
Overall Vulnerability *	5.3	Overall Vulnerability *	4.4	Vulnerability a bit lower at 16 springs
Overall Exposure	5.0	Overall Exposure	5.0	Exposure was the same at both sites
Intrinsic Sensitivity	6.9	Intrinsic Sensitivity	9.2	greater intrinsic sensitivity at 16 springs
Average Response Score	0.9	Average Response Score	-1.9	but more
Average Impact	4.6	Average Impact	2.0	expected at 16 springs
*Overall vulnerability scale is	-7.04 to +10	*Overall vulnerability scale is	-7.04 to +10	

Treatment Effectiveness for Reducing Vulnerability of Ecosystem Components



Treatment Effectiveness for Fuel Components

Perk-GrindStone

16 Springs



Using the FireCLIME VA to inform development of management strategies

- Identify ecosystems most at risk of increased departure
- Identify drivers of vulnerability
- Evaluate and compare effectiveness of treatments



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For more information or to download tool:

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https://www.fs.fed.us/rm/pubs_series/rmrs/gtr/rmrs_gtr395.pdf https://www.fs.usda.gov/treesearch/pubs/59033

Case Study Webpage:

https://www.fs.usda.gov/rmrs/projects/iden tifying-vulnerability-southwesternlandscapes-changes-climate-and-wildfireregimes



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