Fire Regimes in the WUI

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Photo: Kari Greer
Courtesy of wildfiretoday.com

Outline

- Introduce Fire Regimes
- AZ Interior Chaparral Fire Regime
- Ponderosa Pine Fire Regime
- Changes in Severity
- Living with Fire
- Southwest Fire Science Consortium

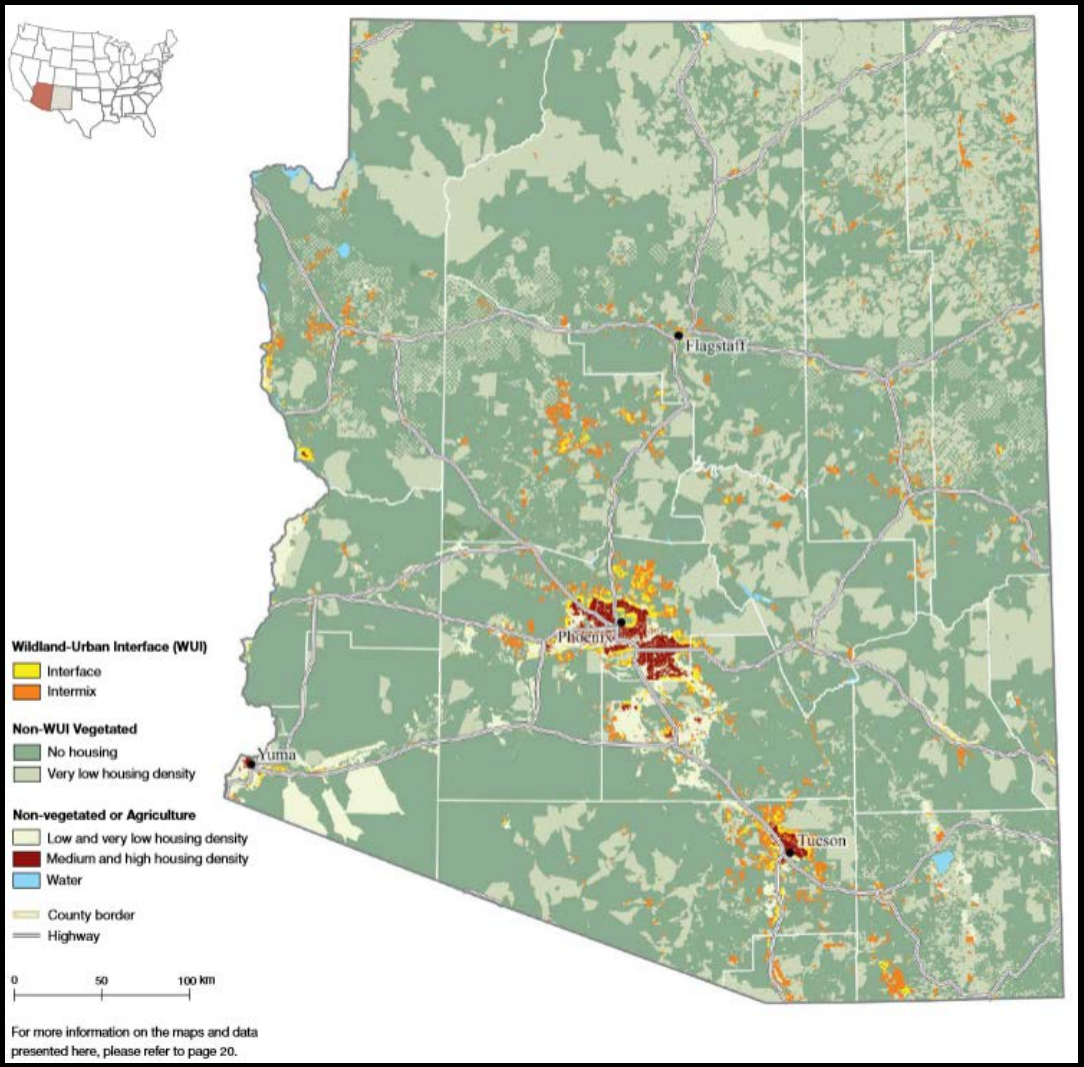
Fire as a Ecosystem Process

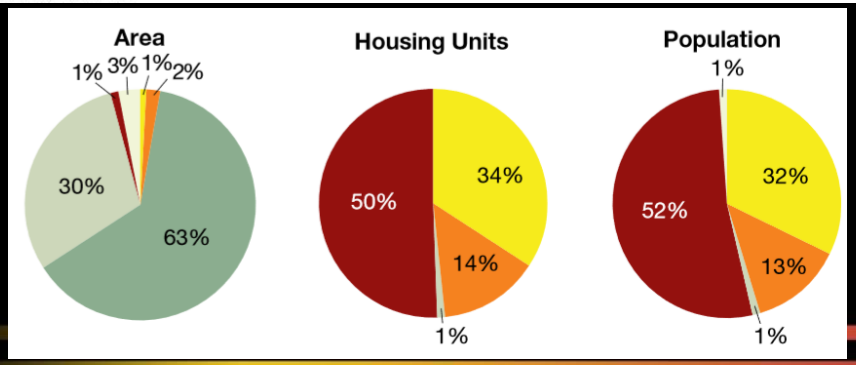
Photo: Mark Thiessen, National Geographic Creative; Courtesy of http://news.nationalgeographic.com

Photo: David Wallace/The Republic
Courtesy of azcentral.com, “In Harm’s Way”

- Fire is a process that operates within the context of natural ecosystems
- Fire is an integral part of ecosystem process and function
- However, ecosystems and humans are not separate on the landscape!

Arizona WUI





- Even though the WUI only makes up 3% of the area of the state,
- 45% of the population lives in the WUI, and
- 48% of the homes are in the WUI!

Martinuzzi et al. 2015

Understanding Where we Live

- Since 45% of us live in the WUI it is pertinent to understand the fire regimes of the area we live in to prepare for wildfire

This is NOT what living with wildfire has to be!

Fire Regimes

A summary of the “kind of fire history that characterized an ecosystem”

(Heinselman 1981)

The “generalized description of the role fire plays in an ecosystem”

(Agee 1993)

Two Views of Fire

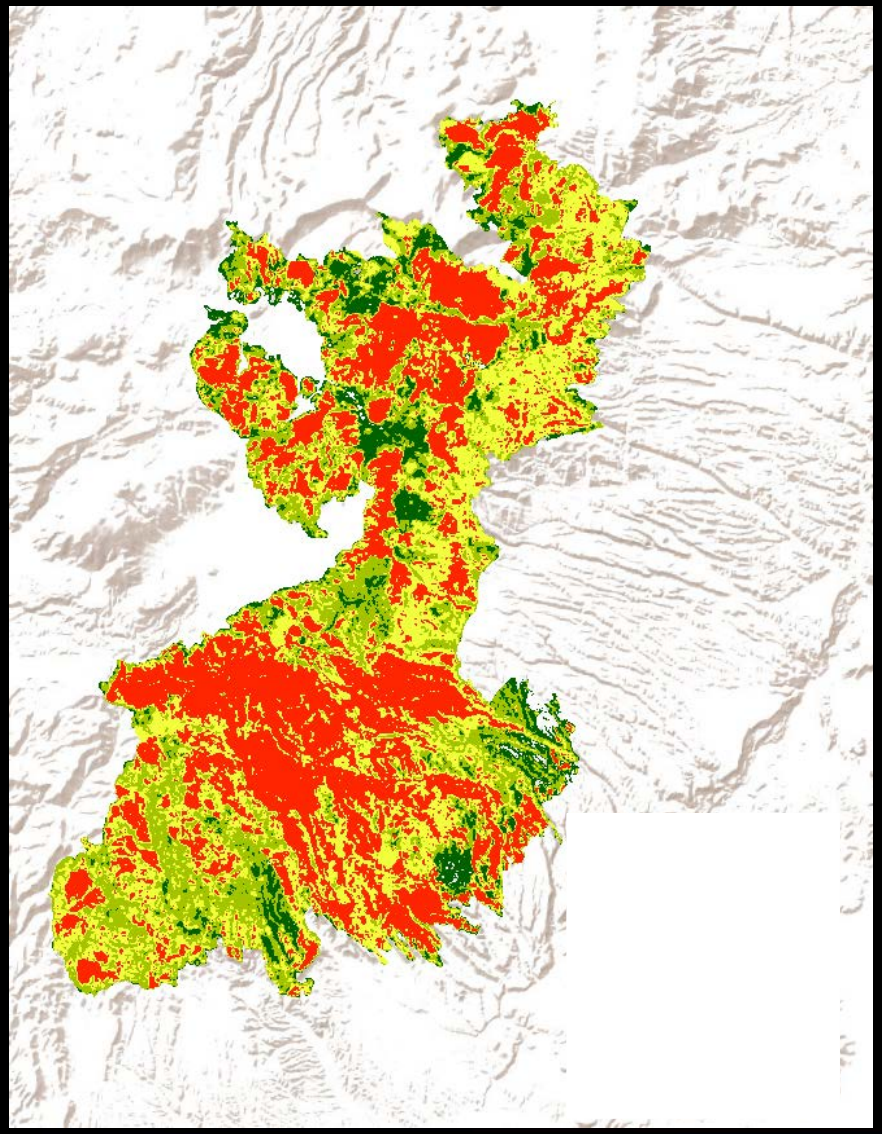
Individual fires
(single fires in isolation)

Vs

Repeated patterns of fire over time
(fire regimes)

(Agee 1993)

Fire Regime Attributes



Temporal

- Seasonality
- Fire Return Interval

Spatial

- Size/extent
- Spatial complexity

- Magnitude
  - Intensity
  - Severity
  - Fire type

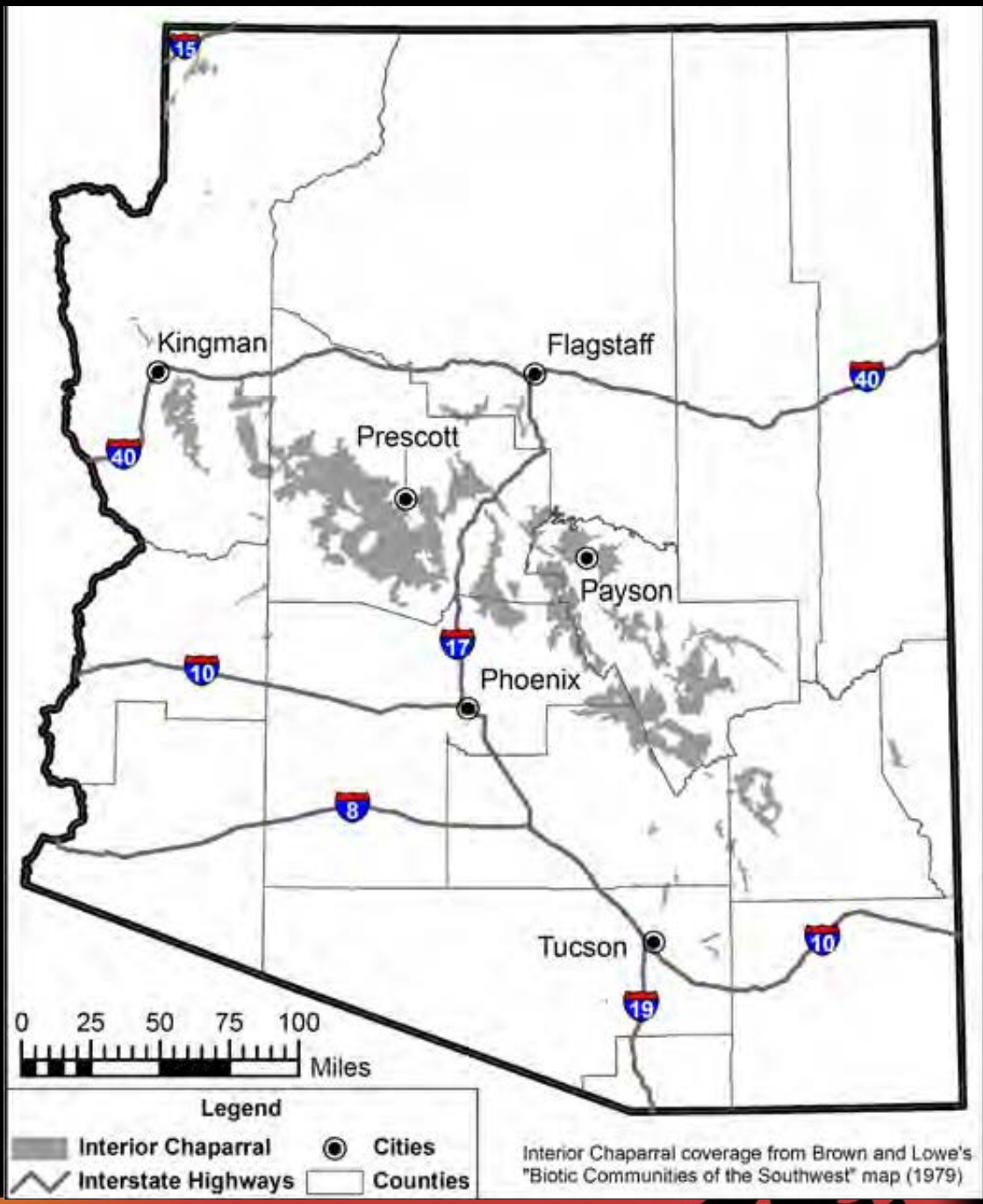
(Sugihara et al. 2006; Agee 1993)

AZ Interior Chaparral Fire Regime

Courtesy of Vankat, 2013

Arizona Interior Chaparral

- Approx. 3.5 million ac
- 3,200 to 5,700 ft
- Precipitation from 15 to 24 in. with 55% in winter and 45% in summer
- Grows primarily in spring and summer

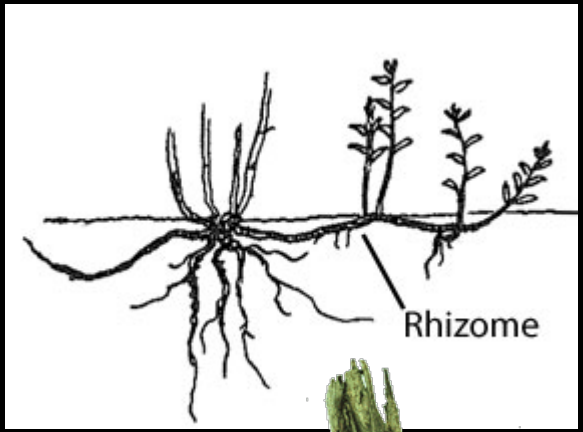


http://hdl.handle.net/10150/146961

Common AZ Chaparral Shrub Species

- Shrub Live Oak (*Quercus turbinella)*
- Pointleaf manzanita (*Arctostaphylos pungens)*
- Hollyleaf buckthorn *(Rhamnus crocea)*
- Silk tassels *(Garrya spp.)*
- Sugar sumac *(Rhus ovata)*
- Desert ceanothus *(Ceanothus greggii)*

Common AZ Chaparral Shrub Species



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These species can recover with complete topkill (high severity)

Common AZ Chaparral Shrub Species

Courtesy of : Vadheim and Drake

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Photo: Rick Halsey

Higher severity fire is needed for germination

AZ Interior Chaparral Fire Regime

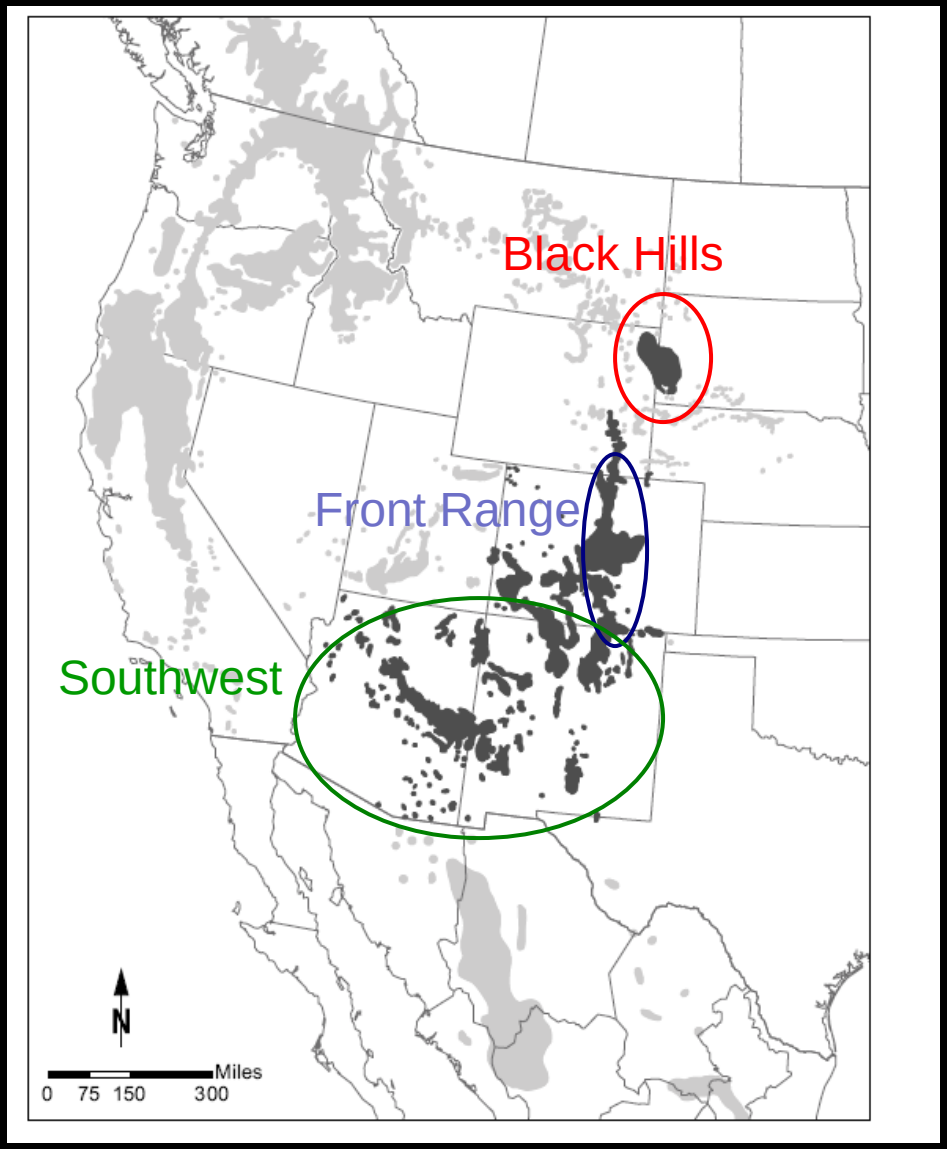
- Fire adapted community!
- Fire return intervals from 30-100 years
  - Depending on site and oak mix
  - 30-40 years in mixed oak species sites (Sneed and Floyd-Hanna 2002)
  - 74-100 years in shrub live oak dominated sites (Brooks et al. 2003)

AZ Interior Chaparral Fire Regime

- Typically high intensity and higher severity fire (particularly in older denser stands)
- "Conventional wisdom in the fire suppression community is that chaparral either does not burn, or when it does burn, it burns hot."
  - Schalau and Twaronite, 2010

Ponderosa Pine Fire Regime

Ponderosa Pine



- Extensive area
- Diverse soils, plant associates, and environmental conditions
- Wide genetic variation

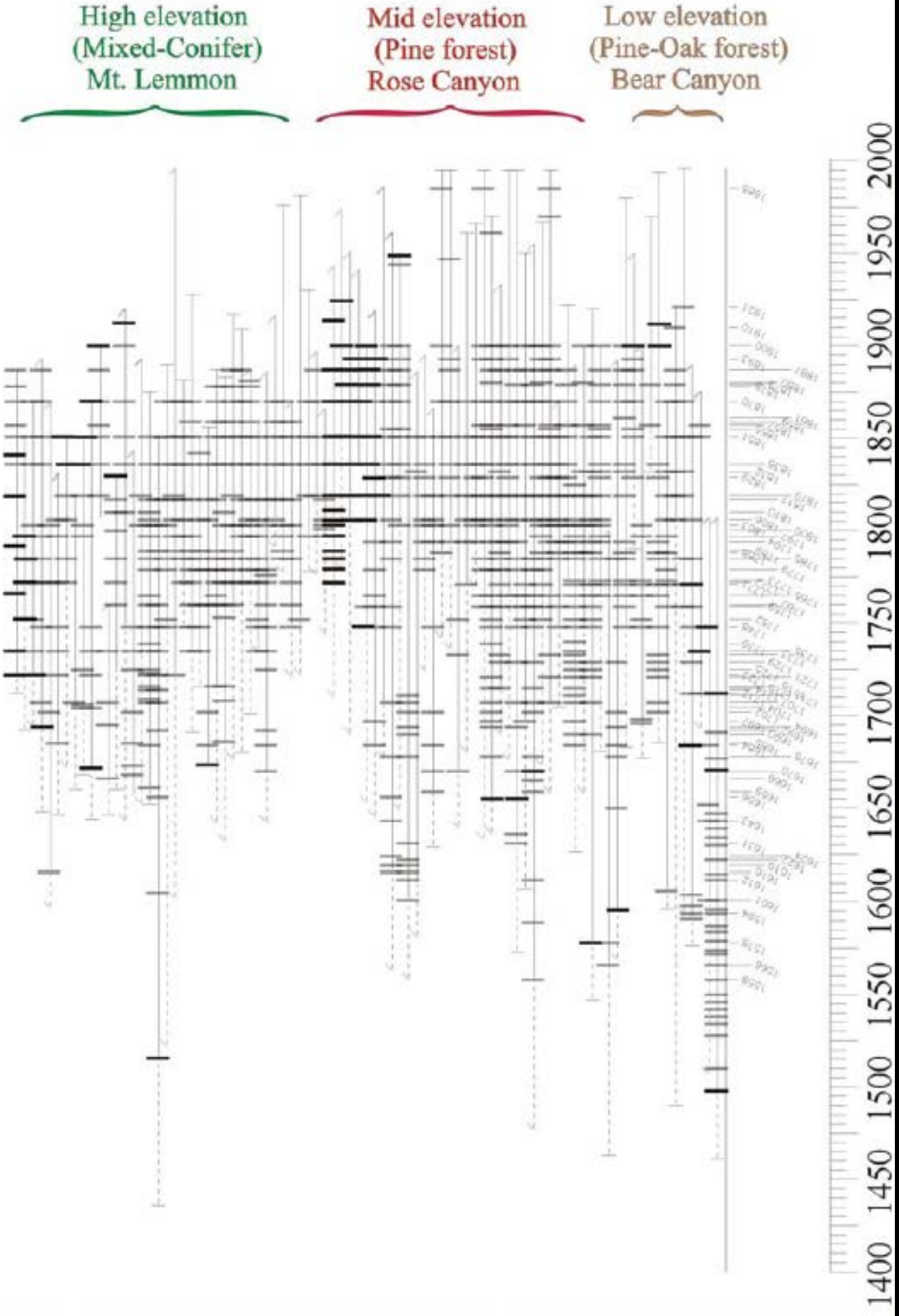
SW Ponderosa Pine Fire Regime

- 4 to 36 years mean fire return interval (Swetnam and Baisan 1996)
- Surface fires, little evidence of past crown fires
- Fires burned early in summer, before monsoons
- Lightning and human ignitions

SW Ponderosa Pine Historical Structure

Powell Plateau, Grand Canyon National Park; Pete Fule

- 10 to 124 trees per acre (RMRS -GTR-310)
- Varies by elevation, aspect, other topographical features, and soils


High elevation
(Mixed-Conifer)
Mt. Lemmon
Mid elevation
(Pine forest)
Rose Canyon
Low elevation
(Pine-Oak forest)
Bear Canyon
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400

Fire Exclusion, Grazing, & Logging Affected Forests in SW USA

1909

1938

2000

Gus Pearson Natural Area, AZ

Effects of Altered Forest Structure

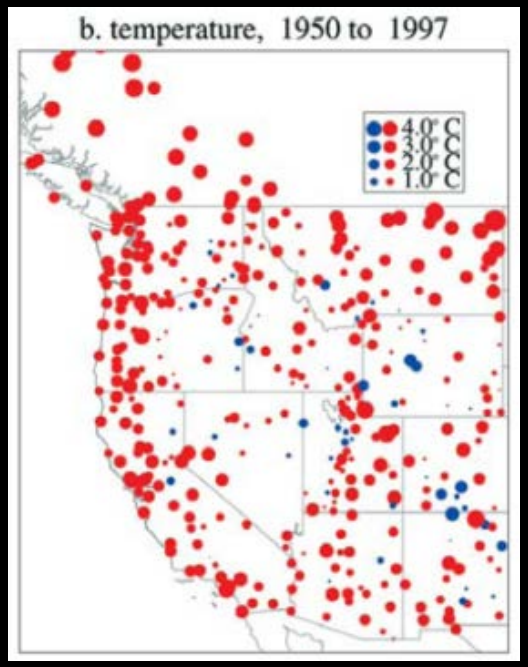
- Reduced water yield from watersheds
- Increased potential for insect outbreaks
- Reduced forage production and understory diversity
- Reduced habitat quality for many wildlife species
- Increased potential for severe and large crown fires

Effects of severe crown fires

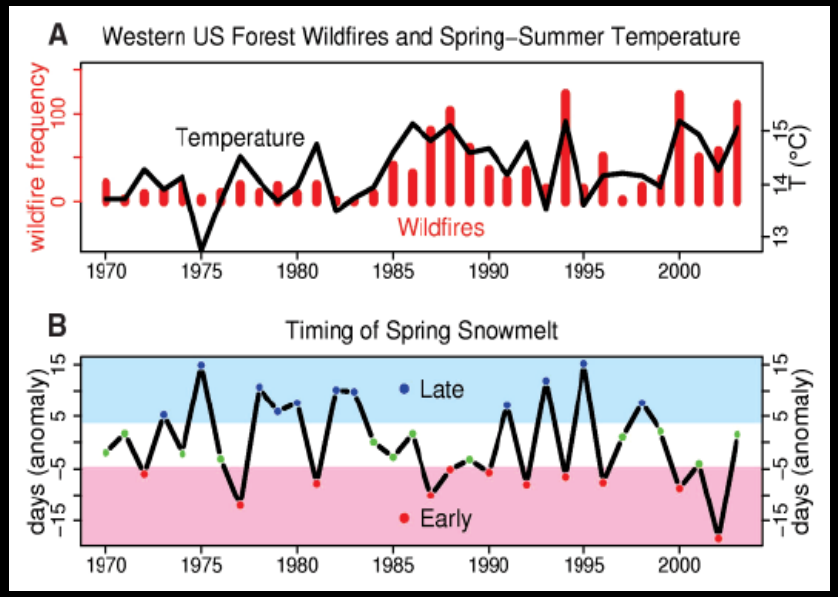
- Increased potential for runoff and soil erosion
- Reduced availability of water and soil nutrients
- Increased potential for establishment of invasive species
- Type conversions: forest to shrubland or grassland

Climate Change and Fire: current observations

Temperature rise



Mote et al. 2005

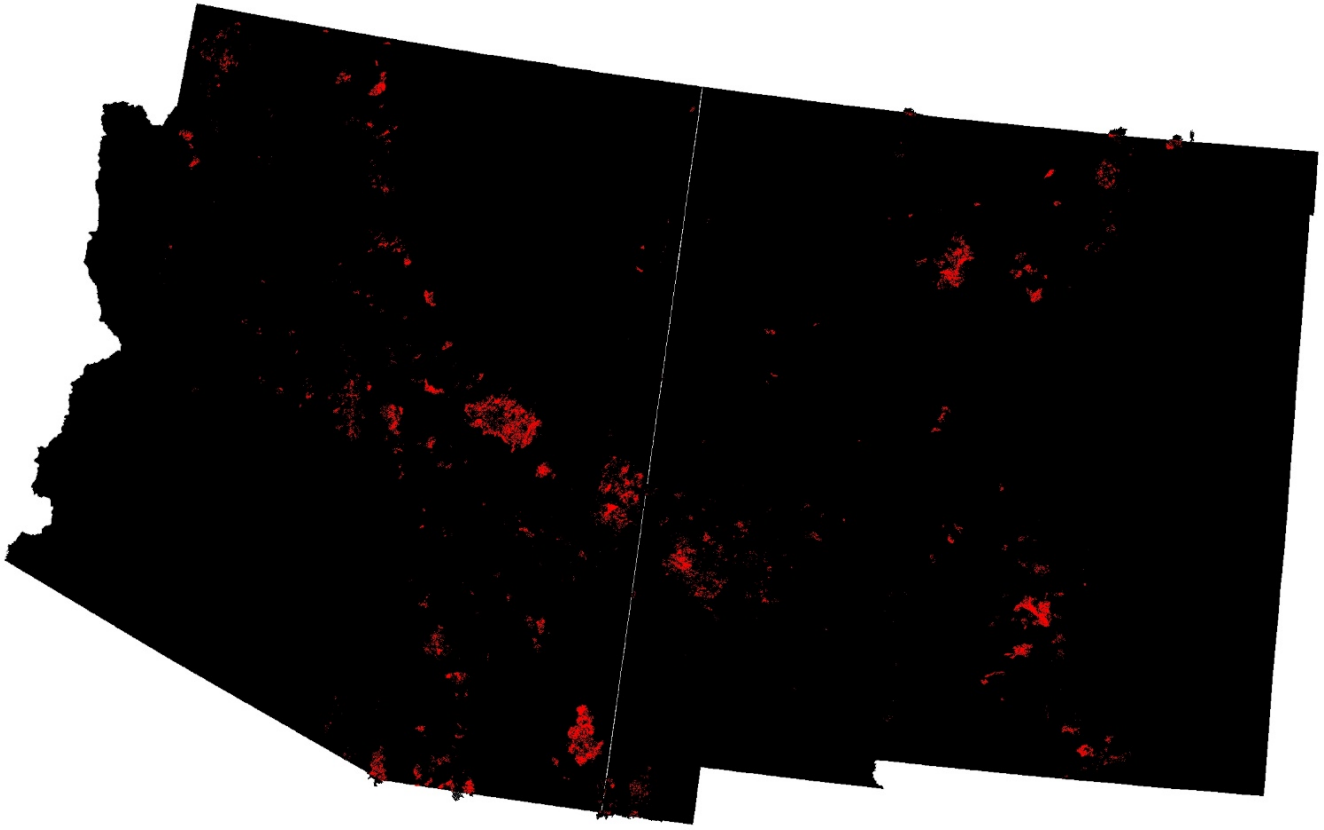


Westerling et al. 2006

Reduced snow pack and earlier snowmelt → bigger, more frequent fires

Slide courtesy of Peter Fulé

High Severity in the Southwest
Last 30 years



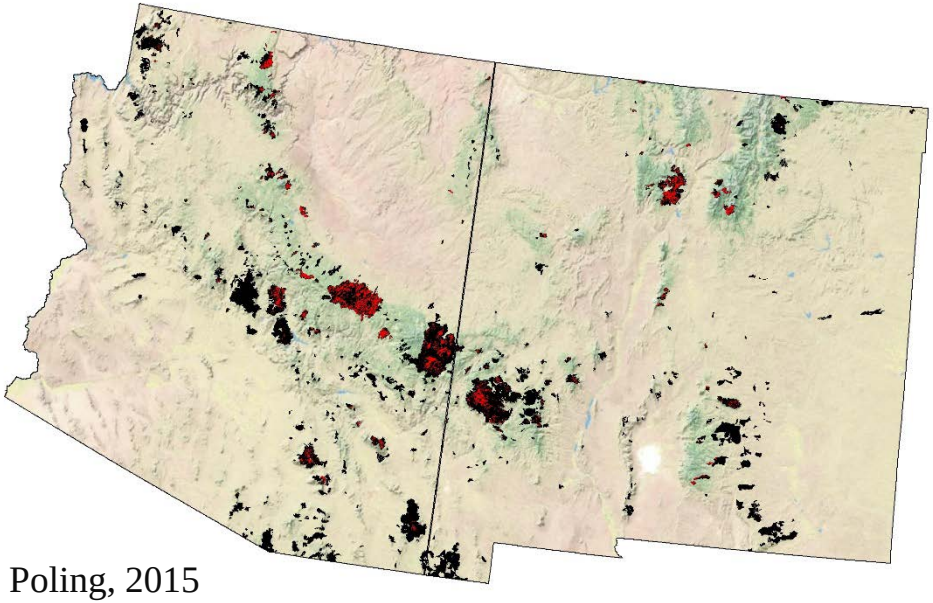
Poling, 2015

Area of High Severity from 1984-2013

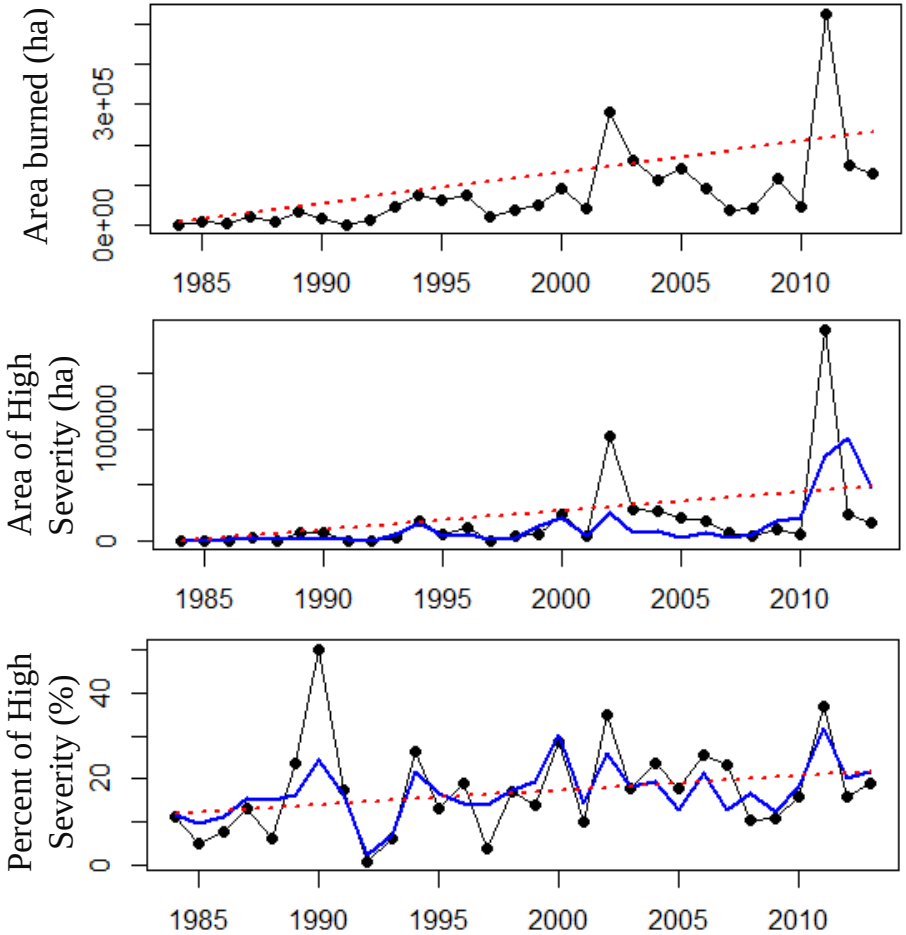
Burn Severity is Increasing Across the Southwest (1984-2013)

Figures below are for Forest and Woodland Communities

	P value	Year (ha)	Year (%)
Area Burned	<**0.001**	7672	
Area of High Severity	<**0.001**	1666	
Percent of High Severity	<**0.001**		0.339



Poling, 2015



Living with Our Fire Regimes

Fire Regimes and the WUI
Living with high severity fire regimes

- If you live in a high intensity and high severity fire regime treatment needs to be done.
- The natural fire regime is not conducive to community protection

Figure 3. Arizona interior chaparral before survivable space treatment.

Figure 4. Arizona interior chaparral after survivable space treatment showing small groupings of plants and chipped material used as mulch.

http://hdl.handle.net/10150/146961

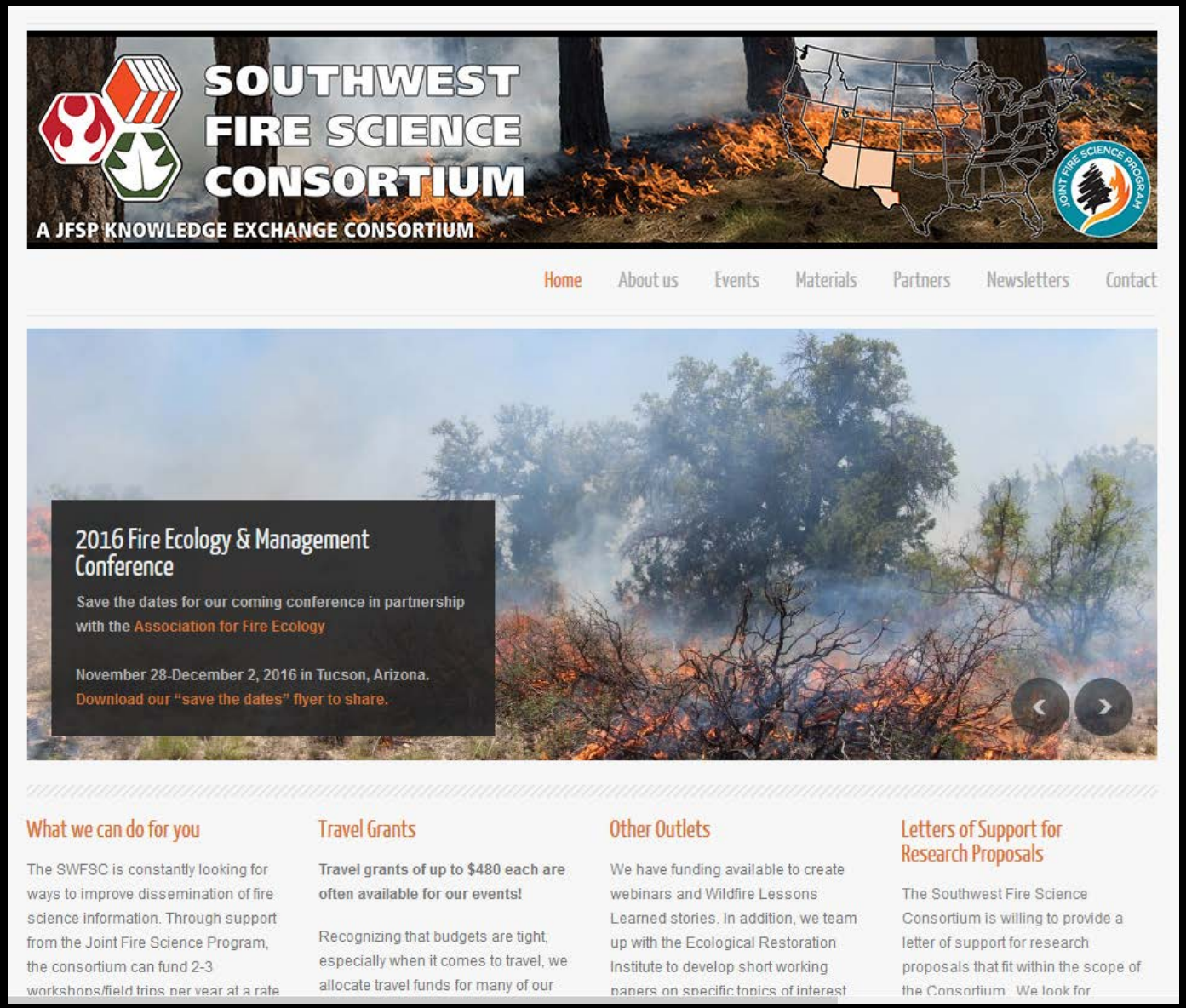
Fire Regimes in the WUI
Living with low severity fire regimes

- Restoring more historical stand structures and fuel loads may be needed
- Maintaining those areas is critical!

The natural fire regime and community protection go hand in hand.

Southwest Fire Science Consortium

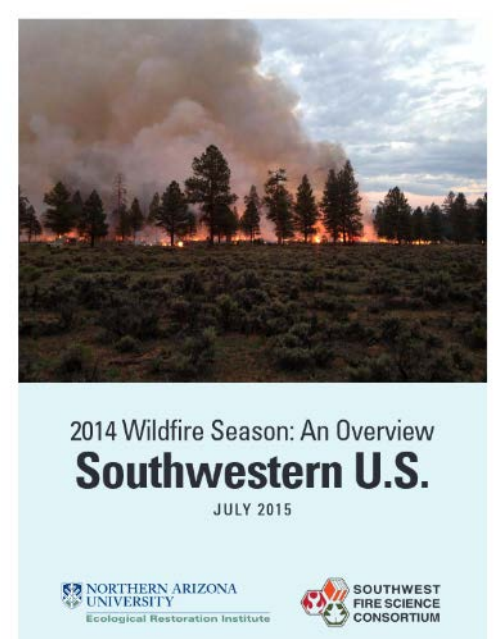
http://swfireconsortium.org/

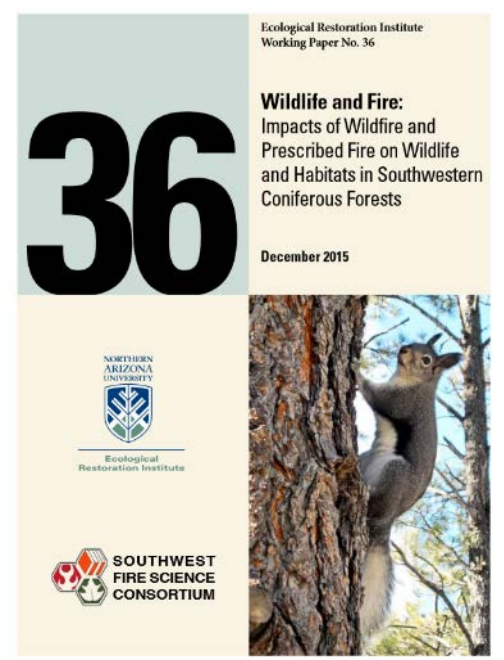


Science Based Resources

http://swfireconsortium.org/

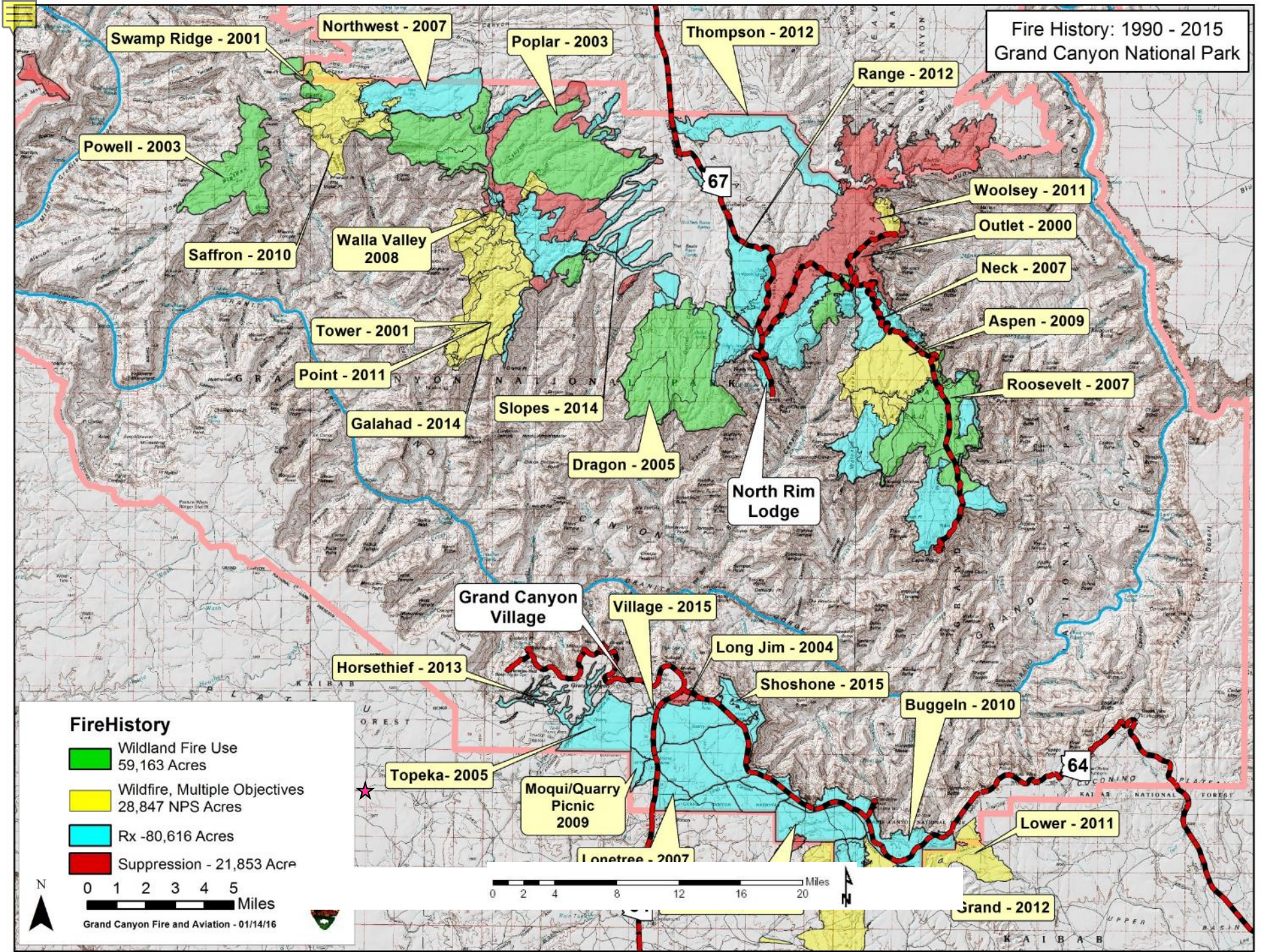
- Videos
- Synthesis Papers
- Fact sheets
- Workshops
- Field Trips





- The San Carlos Apache Tribe is managing two lightning-started fires to improve resource conditions. (Courtesy InciWeb)
  Read more at [*http://indiancountrytodaymedianetwork.com/2015/08/27/evacuations-ordered-northwest-looks-sky-relief-wildfires-161542*](http://indiancountrytodaymedianetwork.com/2015/08/27/evacuations-ordered-northwest-looks-sky-relief-wildfires-161542)

- Sneed and Floyd-Hanna 2002
- Brooks et al. 2003
- U of A document
- Martinuzzi et al. 2015


Fire History: 1990 - 2015
Grand Canyon National Park
Swamp Ridge - 2001
Northwest - 2007
Poplar - 2003
Thompson - 2012
Range - 2012
Powell - 2003
Saffron - 2010
Walla Valley 2008
Woolsey - 2011
Outlet - 2000
Neck - 2007
Aspen - 2009
Tower - 2001
Point - 2011
Roosevelt - 2007
Slopes - 2014
Galahad - 2014
Dragon - 2005
North Rim Lodge
Grand Canyon Village
Village - 2015
Long Jim - 2004
Horsethief - 2013
Shoshone - 2015
Buggeln - 2010
Topeka- 2005
Moqui/Quarry Picnic 2009
Lower - 2011
Lonetree - 2007
Grand - 2012
67
64
FireHistory
Wildland Fire Use 59,163 Acres
Wildfire, Multiple Objectives 28,847 NPS Acres
Rx -80,616 Acres
Suppression - 21,853 Acre
0 1 2 3 4 5 Miles
0 2 4 8 12 16 20 Miles
N
Grand Canyon Fire and Aviation - 01/14/16