

Geography of Wildfires Across the West

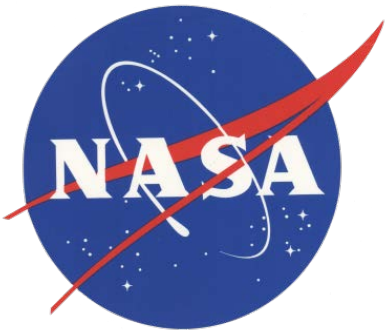
Keith T. Weber¹, GISP and PI NASA RECOVER

Rituraj Yadev¹, Jonah Davis¹, Kindra Blair¹, John Schnase², Mark Carroll², Roger Gill²

webekeit@isu.edu

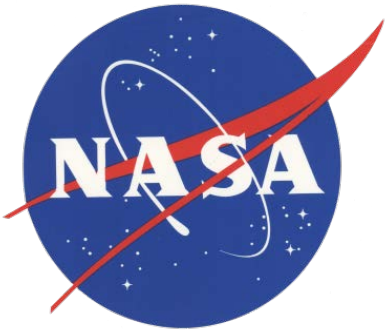
1- Idaho State University- GIS TReC

2- NASA Goddard Space Flight Center



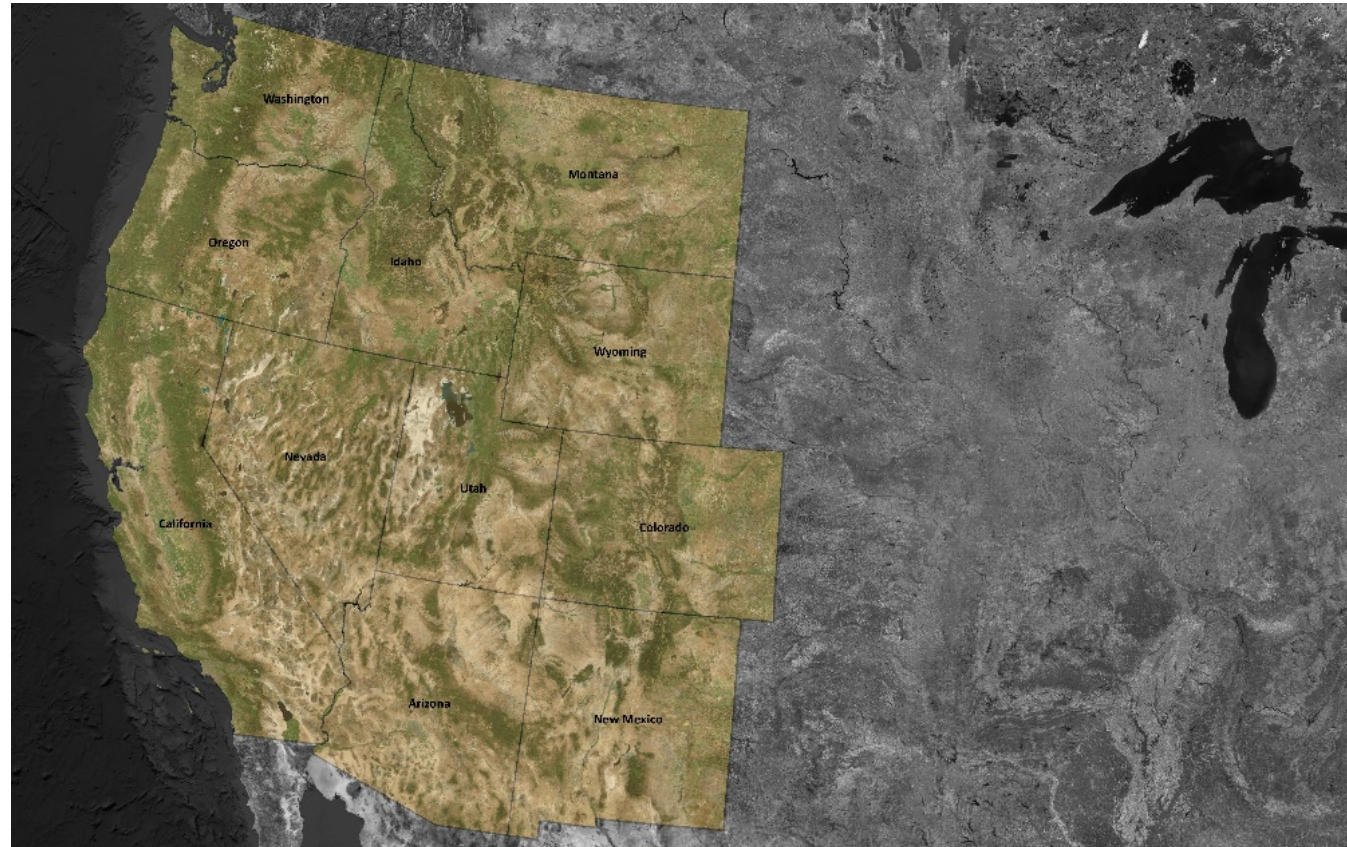
What is RECOVER?

- Post-wildfire Decision Support System (DSS)
 - Rapid assembly of site-specific data
 - Delivered in customized GIS analysis environment
 - Wildfire focus



Data Architecture

- RECOVER
 - Serves the Western US
 - Used on over 100 wildfires



GIS Layers

- By default each RECOVER DSS contains...
 - 26 base layers automatically clipped to fire AOI
 - One of those layers is the Historic Fires polygon feature class

Naming convention of RECOVER Base Layer data

The following list describes the RECOVER base layers available to our partners along with the standard naming convention applied to the web services hosted at ISU's GIS TRcC (please note the exact name including capitalization and the use of underscores).

Geology	
Habitat	
LandslidePotential	
NHD	
PLSS	
Roads	
SMA	
Soils_SSURGO	
Soils_STATSGO	
Soils_STATSGO_KFactor	
WatershedsWBD	
Wetlands	
HistoricFires	<u>Past fire datasets</u>
HistoricFires_PastDecade	
FRG_FireRegimeGroup	
	
	<u>Vegetation datasets</u>
BPS_BioPhysicalSetting	
ESP_EnvironmentalSitePotential	
EVC_ExistingVegetationCover	
EVT_ExistingVegetationType	
	<u>Topography datasets</u>
Elevation	
Aspect	
Hillshade	
Slope_degree	
Slope_percent	
SlopesGTE30deg	

* The spatial reference system for these data is USA Contiguous Albers Equal Area Conic USGS version, NAD83, WKID: 102039

Historic Fires Database

- Contains all *documented* wildfires (1950-2017)¹
- Assembled from authoritative sources
 - USGS GeoMac
 - NIFC
 - BLM
 - USFS
 - State Agencies (e.g., CalFire)

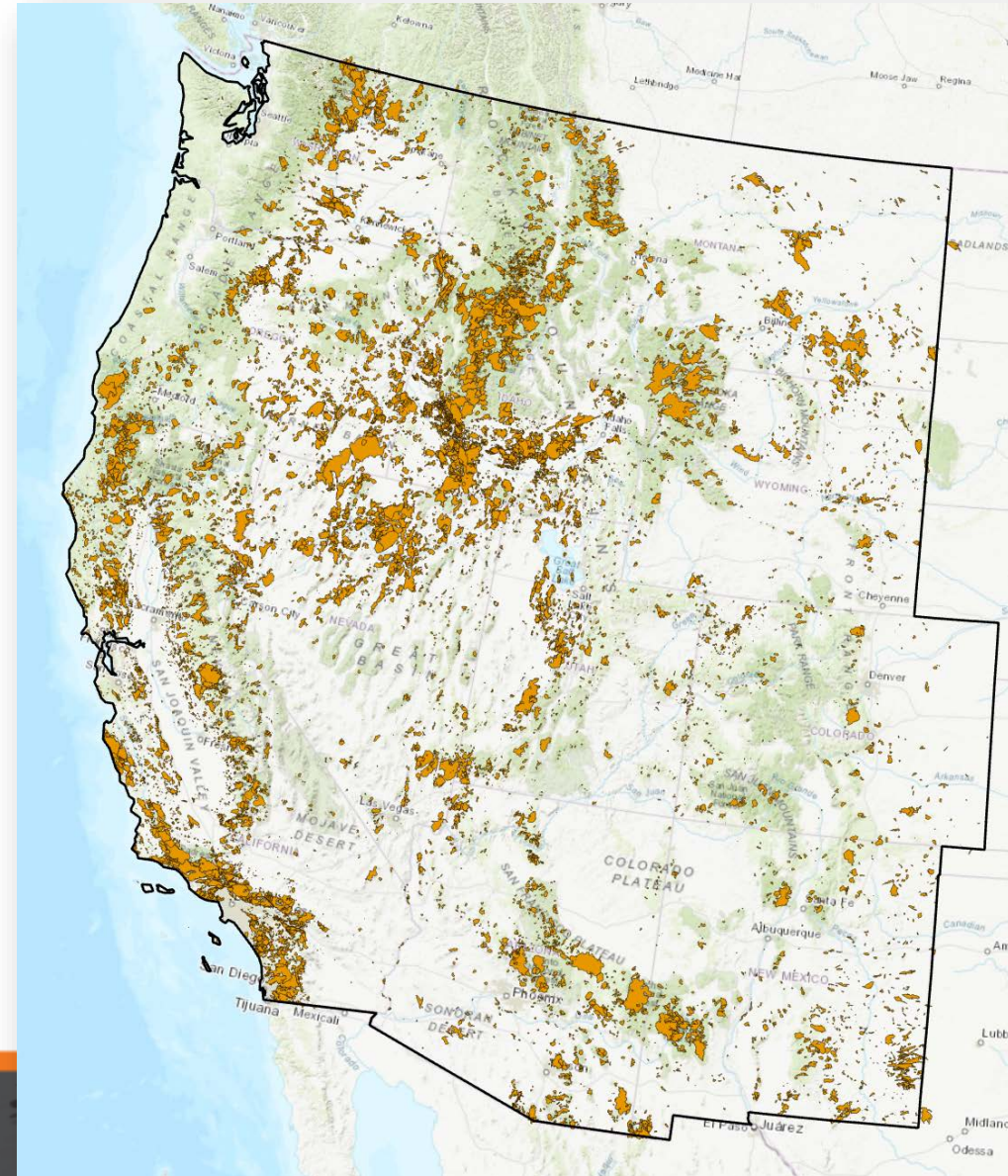
1- This database is not considered comprehensive but is as complete as possible

Overview

- Since 1950
 - **11%** of Western US lands has experienced a wildfire
 - **89%** has no documented record of a wildfire (1.00 – 0.11)
 - **3%** has experienced a burn-on-burn event

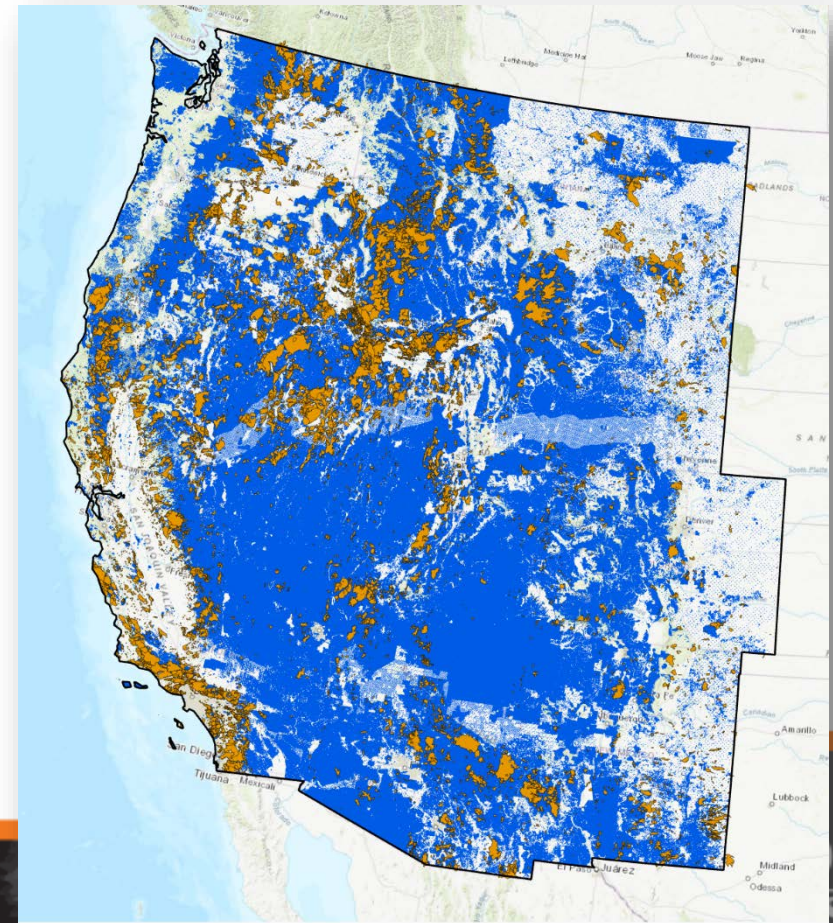
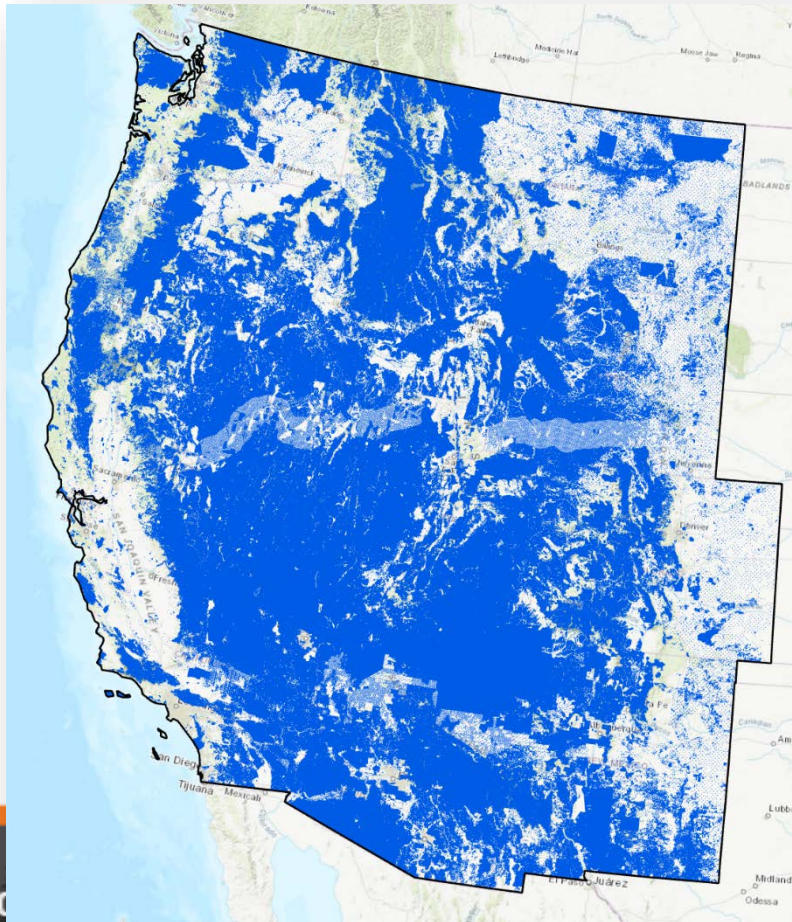
Public Land Bias?

- 40,260 wildfire polygons
- Potential bias of including fires on public land while omitting fires on private land
 - Examine the proportion of private land/public land (availability)
 - Relative to the proportion of fires (observed)



Let's Investigate using GIS

- Public/Private lands
- Overlaid with Historic Fires



Tabular/Statistical

- Public/Private lands
 - 33% of the West is private land
 - 29% private land susceptible to wildfire
 - 23% BLM
 - 19% USFS
 - Balance other public lands
- Historic Fire occurrence
 - 16% on private land
 - 25% BLM
 - 35% USFS
 - Balance other public lands

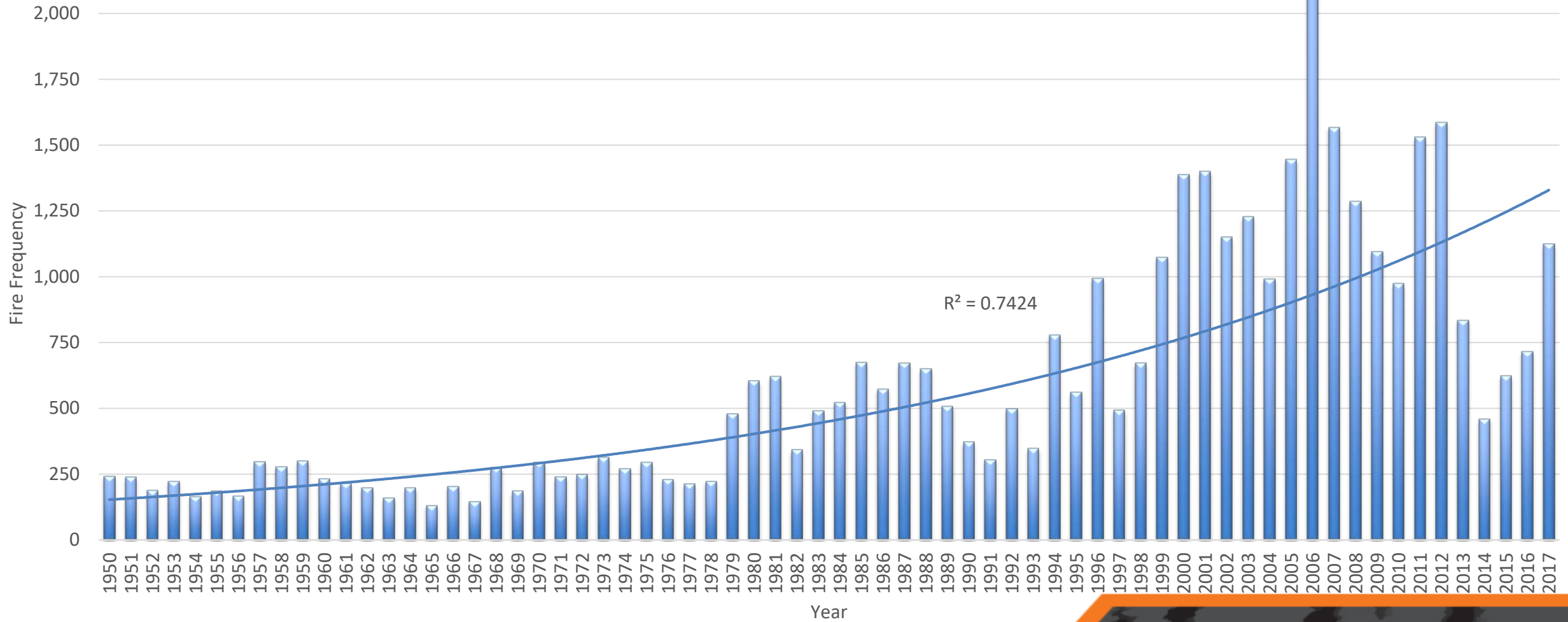
There appears to be no bias toward public land fires in this database;

$$\chi^2_{(1,1)} P = 0.09$$

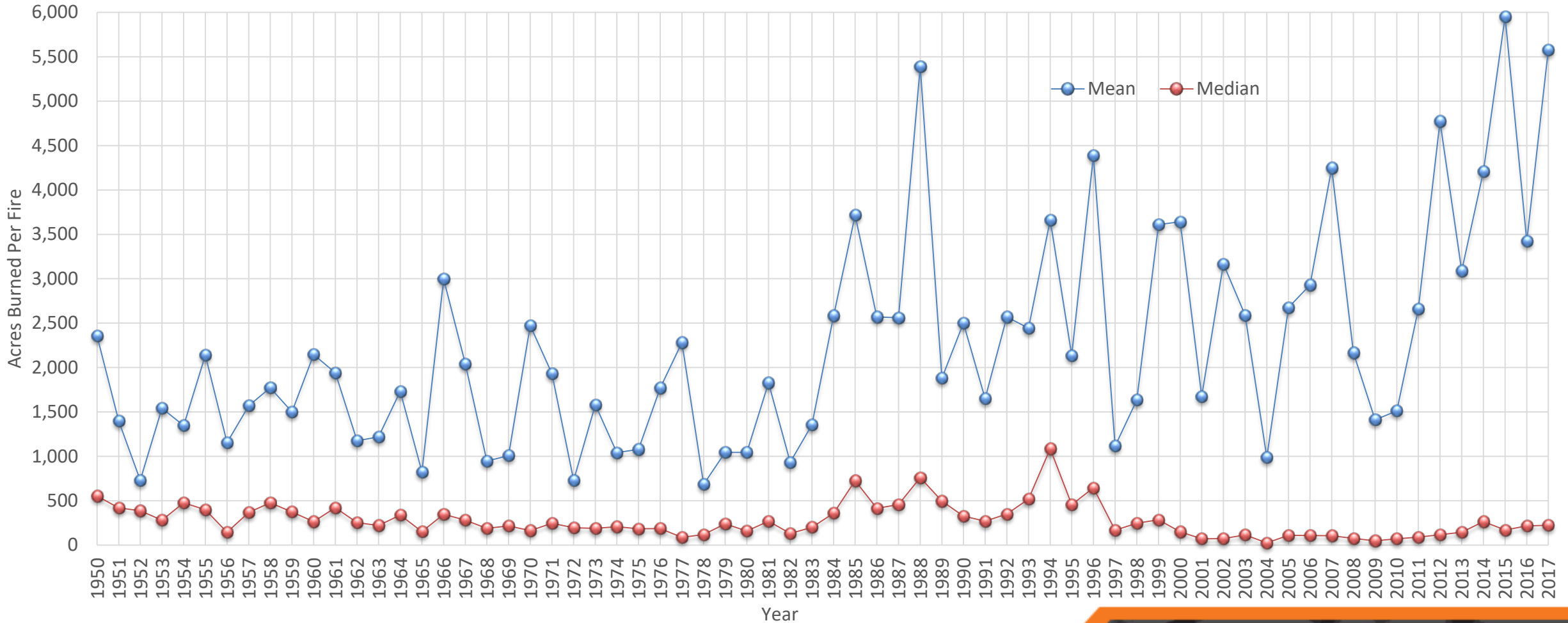
PART ONE:

WILDFIRES ACROSS TIME

Wildfires Across Time



Wildfires Across Time (cont'd)

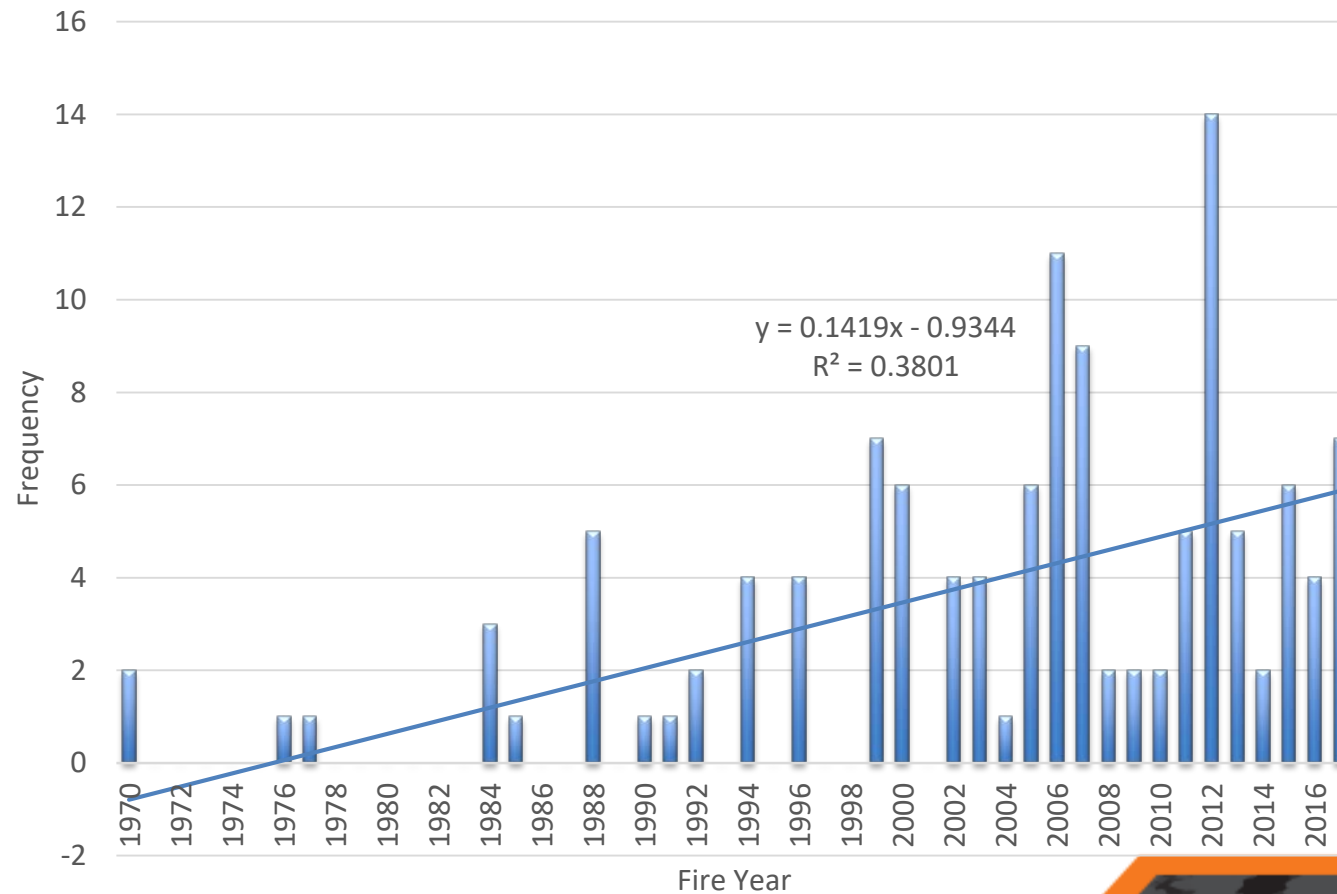


More Fires and More Large Fires

- Median fire size peaked in the decade of the mid-80's to mid-90's
- Mean (avg.) fire size has not yet peaked, but is generally increasing

Mega-Fires

- Fires burning $\geq 100,000$ acres (156 mi²)



Wildfires in the New Millennia

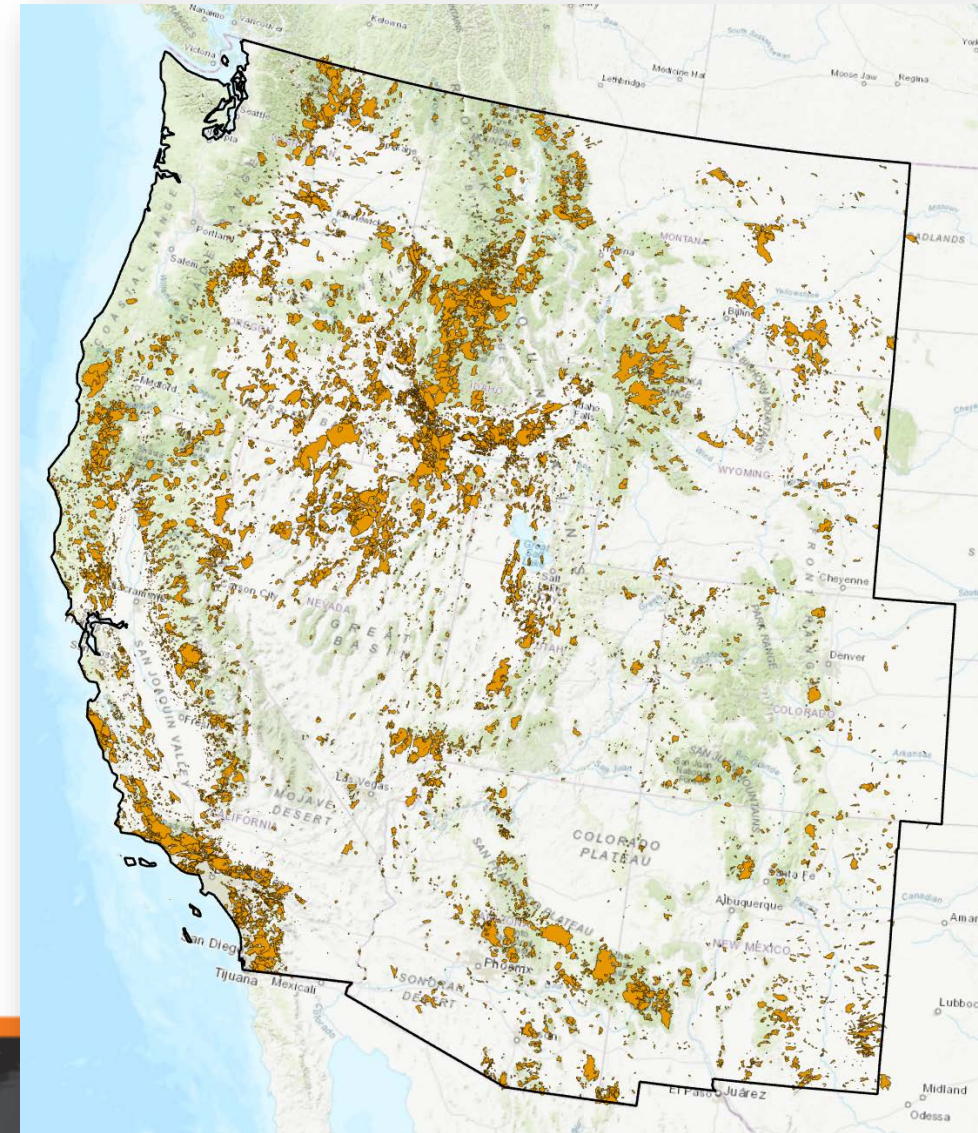
- **61%** of the total area burned since 1950 occurred in the new millennia (2000-2017)

PART TWO:

WILDFIRES ACROSS SPACE

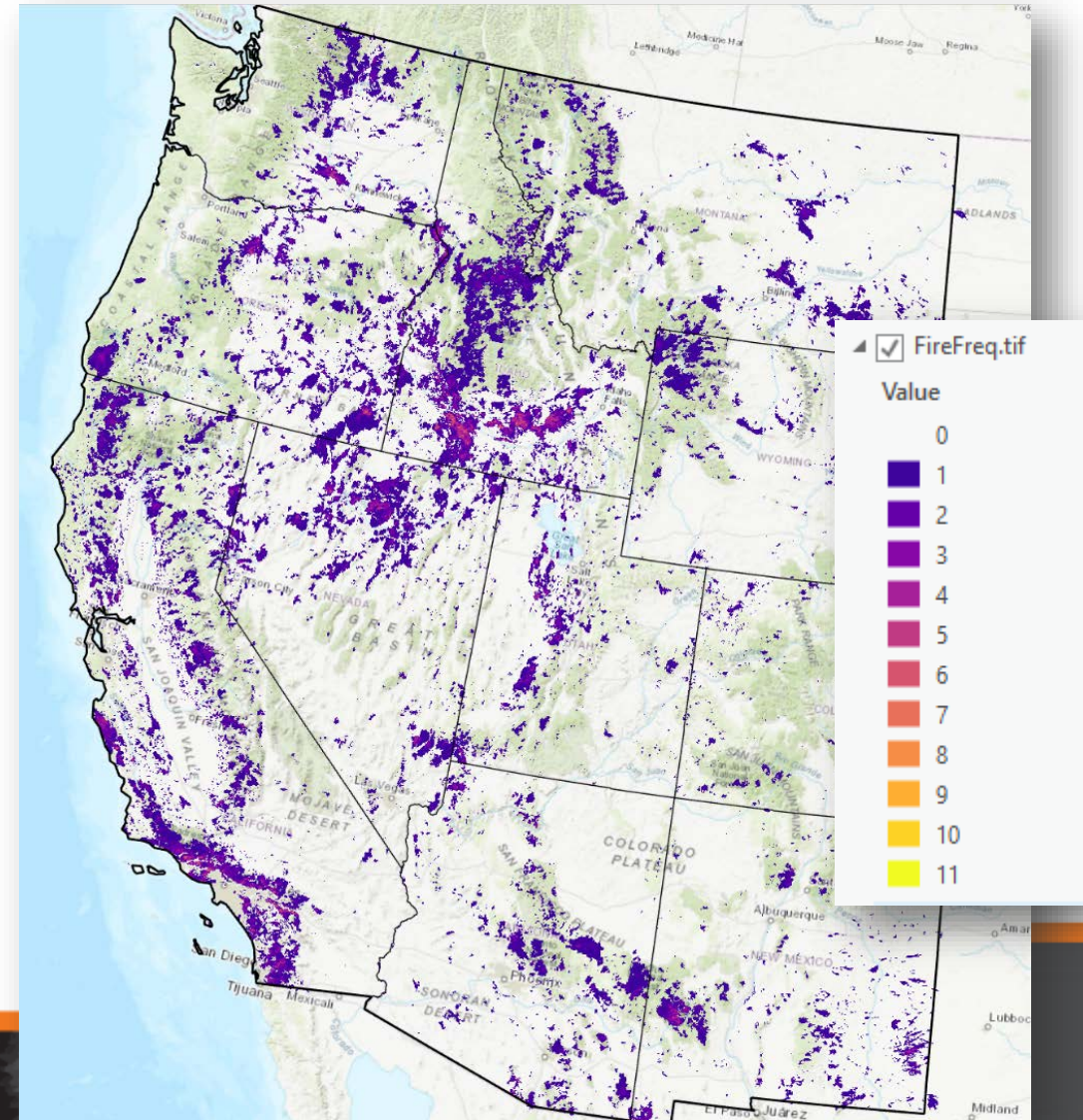
Historic Fires

- Recall **40,000+** documented wildfires contained in the Historic Fires GDB
- Over **100 Million** acres



Some Areas Burn Frequently

- **3%** of the West has experienced burn-on-burn effects
- Some areas have experienced **11 fires since 1950**
 - On average, a fire **every 7 years**



Why?

- Why are some *areas* burning often?
- What *areas* are burning?
 - Let's analyze the landscape (vegetation/land cover)

USGS Landfire Program

- BPS- Bio-Physical Setting



Spatial Analysis Across the West

- Overlay fire polygons on BPS
- Zonal Statistics as Table
 - Shrub land + Grassland = 56% (52%, after 2000)
 - BUT, notice the recent shift toward coniferous forest fires

All Fires 1950-2017	
Majority	PCT
Conifer	38%
Shrubland	44%
Grassland	12%
Riparian	0%
Hardwood	6%
Hardwood-Conifer	1%
Sparse	0%
	100%

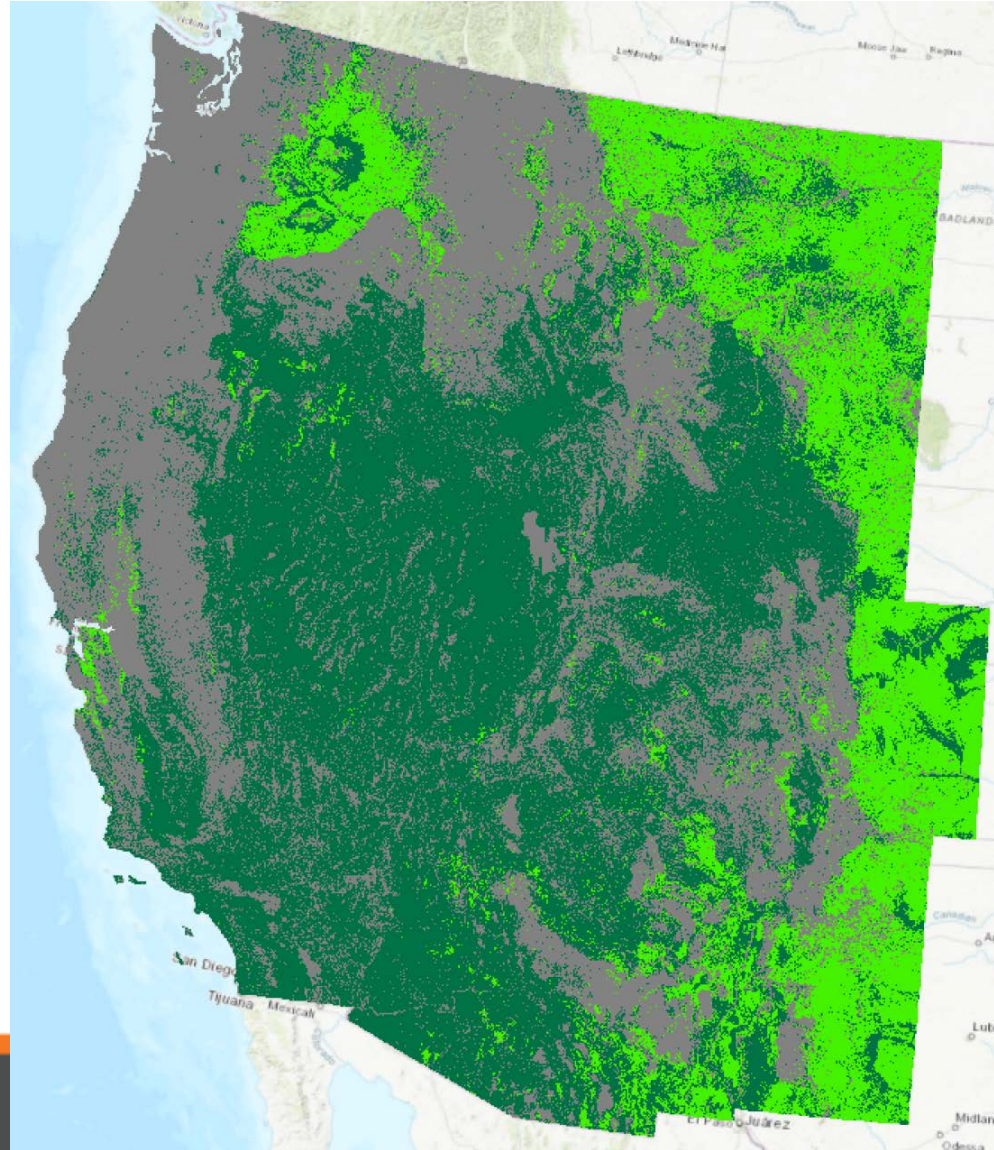
Fires after 2000	
Majority	PCT
Conifer	42%
Shrubland	39%
Grassland	13%
Riparian	0%
Hardwood	5%
Hardwood-Conifer	1%
Sparse	0%
	100%

Here in Idaho

All Fires 1950-2017	
Veg Group	PCT
Conifer	38%
Shrubland	61%
Grassland	1%
Riparian	0%
Hardwood	0%
Sparse	0%
Hardwood-Conifer	0%
	100%

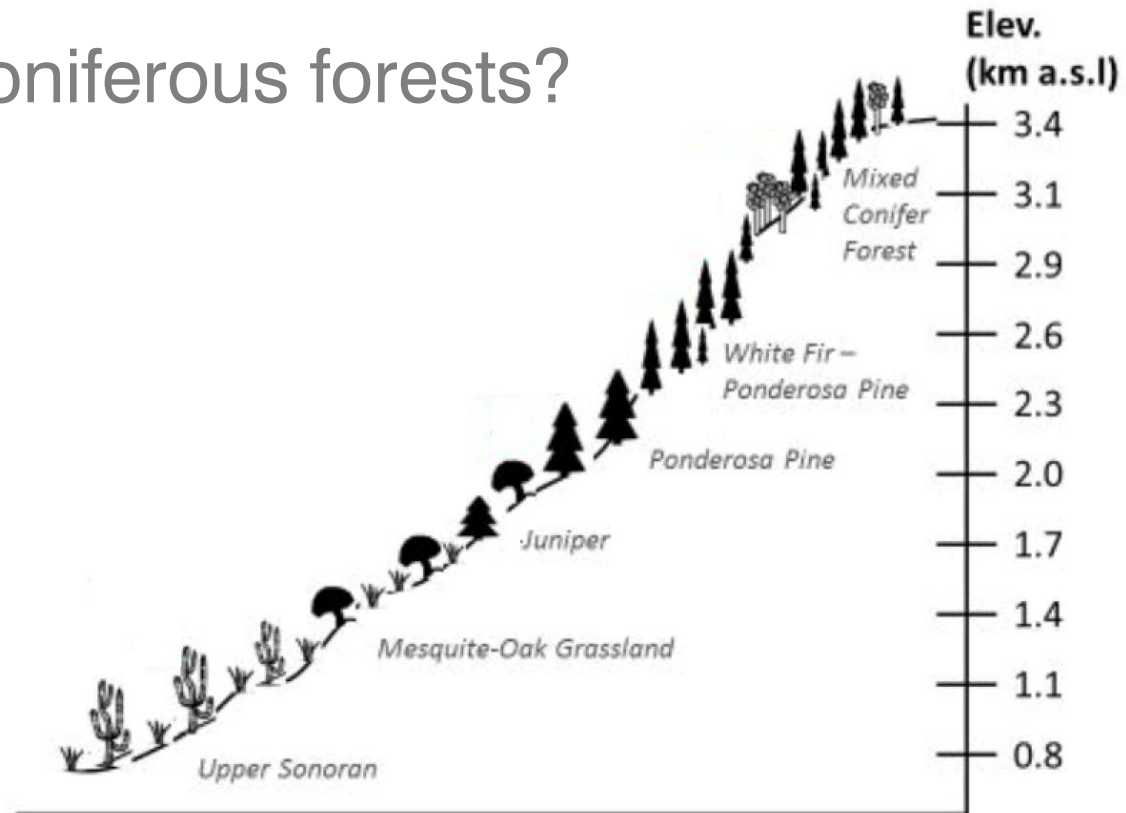
Fires after 2000	
Veg Group	PCT
Conifer	46%
Shrubland	52%
Grassland	2%
Riparian	0%
Hardwood	0%
Sparse	0%
Hardwood-Conifer	0%
	100%

Shrub land & Grasslands...



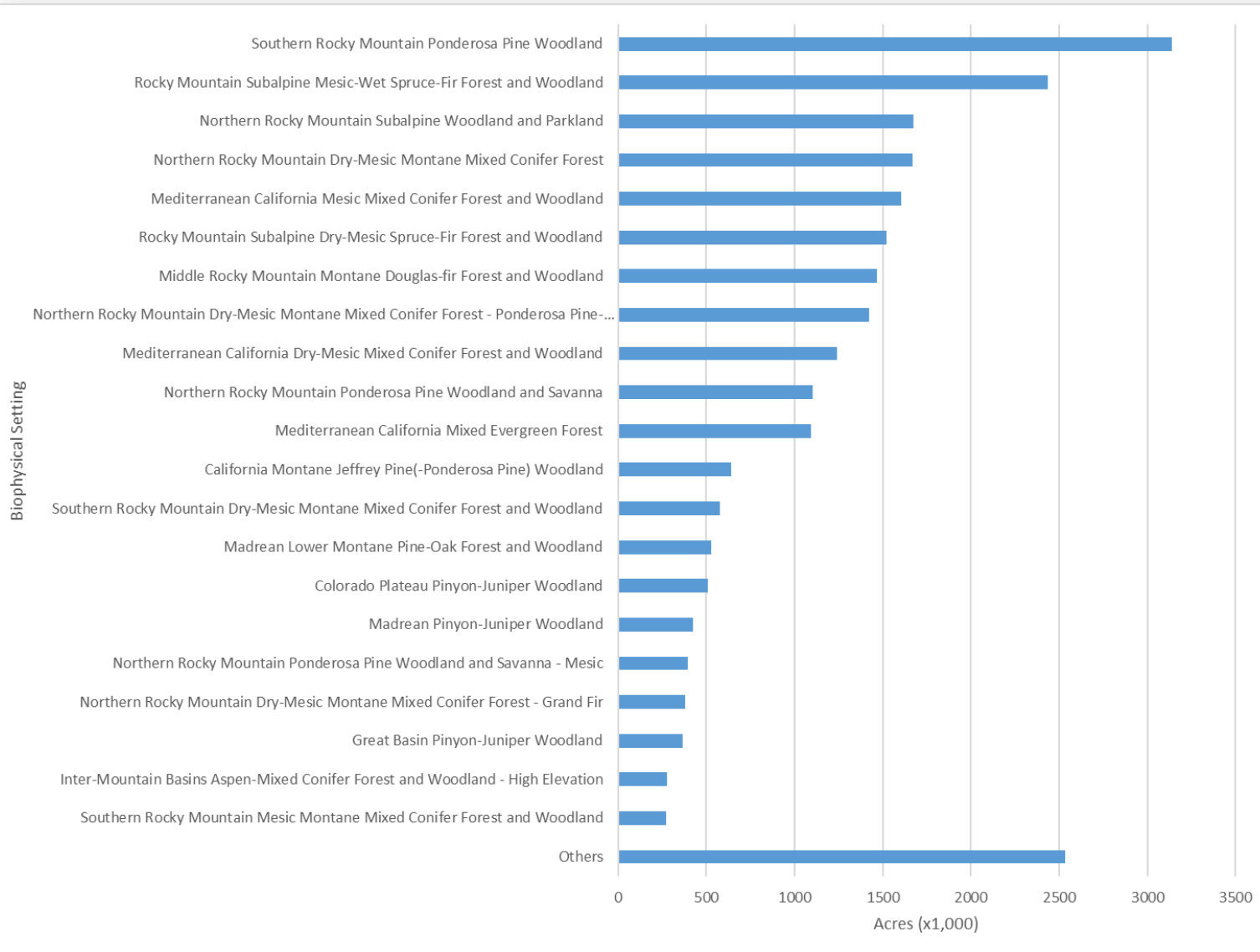
Conifers...

- What type of coniferous forests?
 - Juniper?
 - Pine?
 - Spruce-fir?



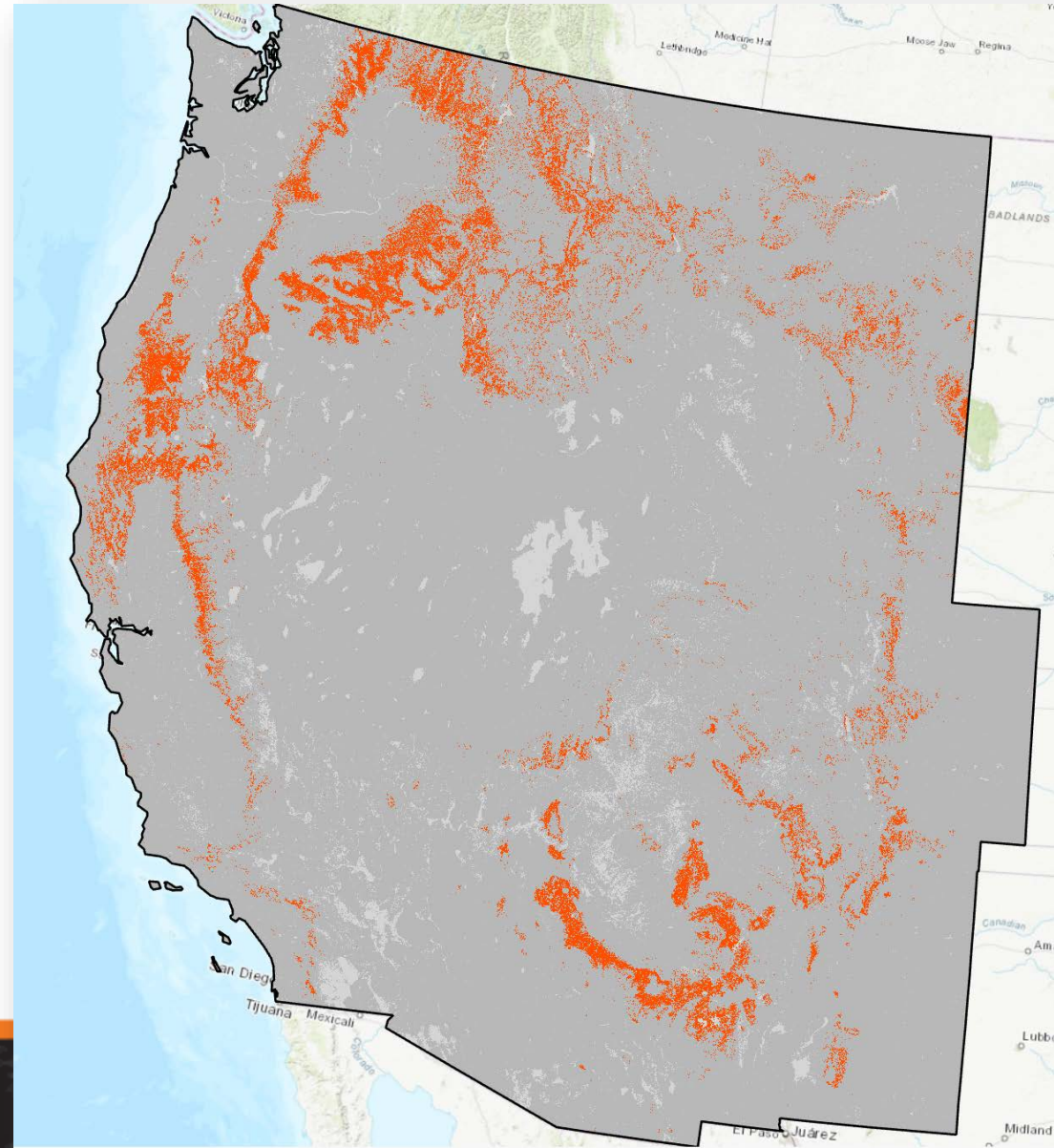
Modified from <http://criticalzone.org/catalina-jemez/infrastructure/field-areas-catalina-jemez/>

Across the West...



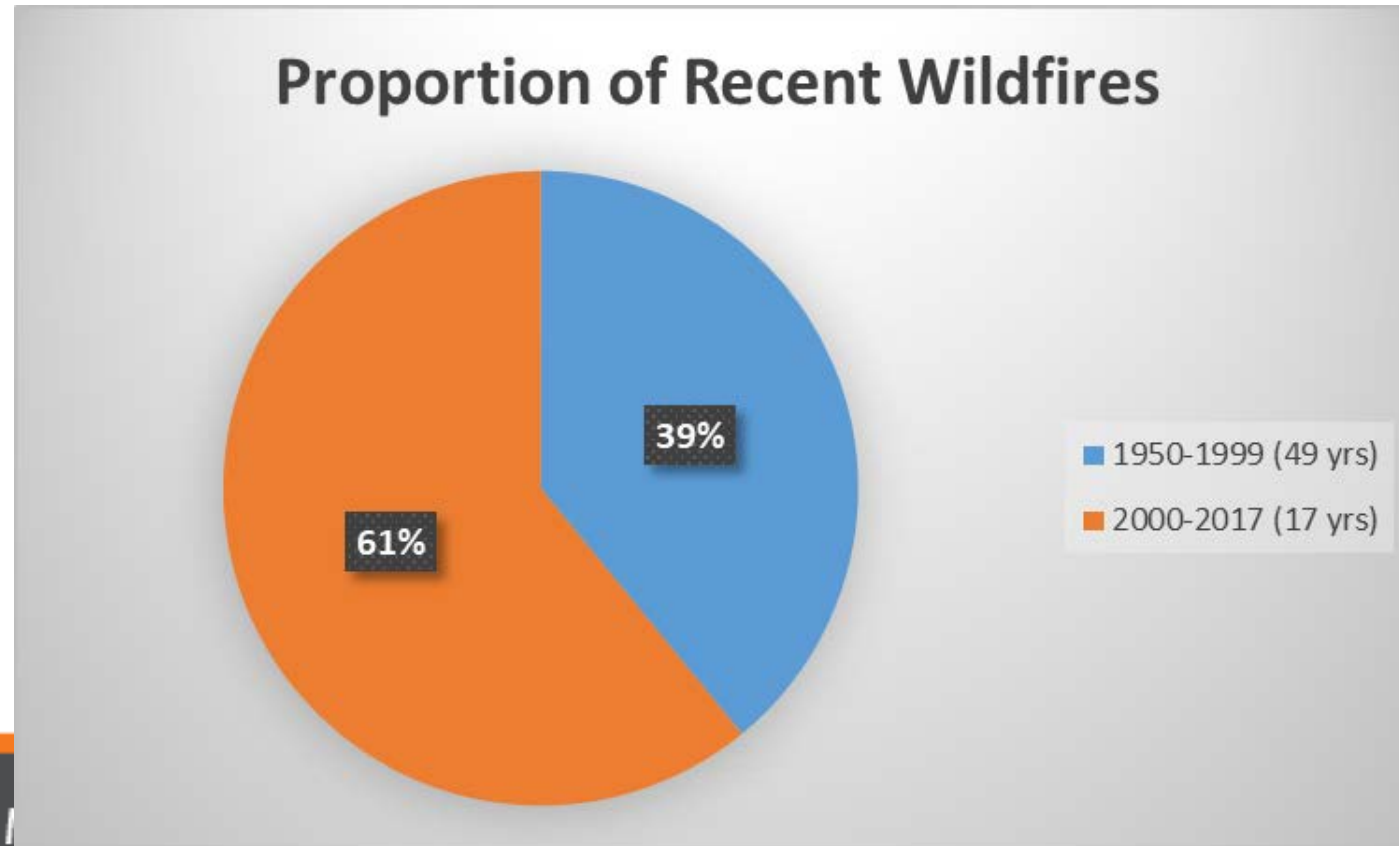
Reality Test

- “Ponderosa Pine” in Landfire BPS
 - Does this agree with your experience?

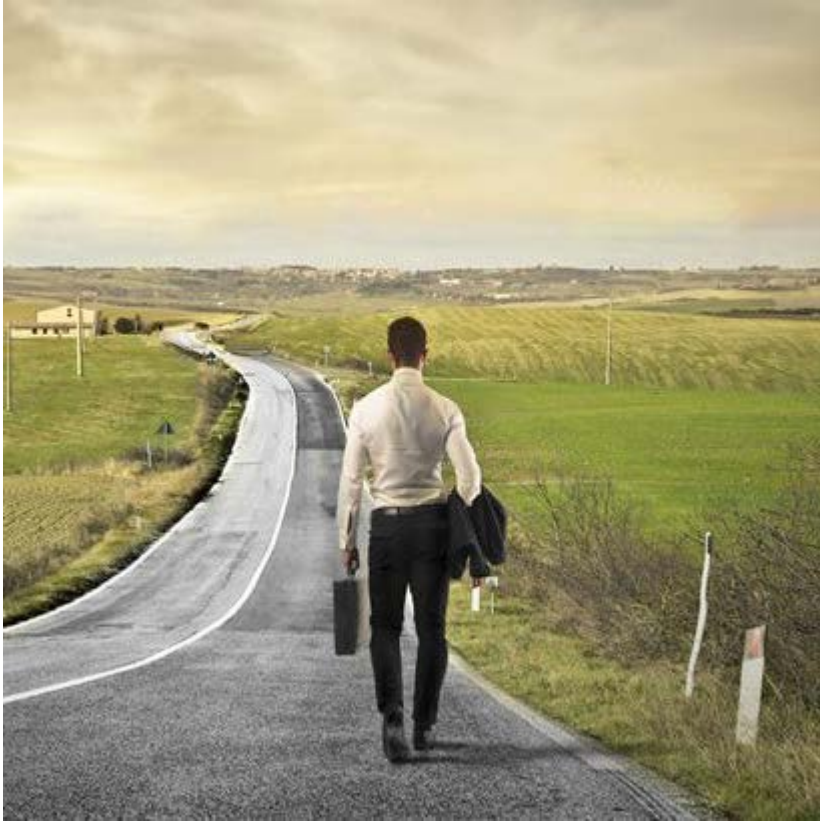


Where to From Here?

- Continue analysis
 - Compare trends between 1950-1999 and 2000-2017



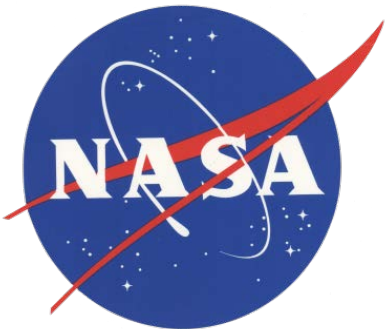
Take Home Message



- Over time:
 - ↑ Wildfire frequency
 - ↑ Area burned
 - ↑ Coniferous forest fires
- 90% of the West has not burned since 1950
 - Burn-on-burn relatively common
- Expect, plan, and manage for wildfires

Questions?

Visit http://giscenter.isu.edu/research/Techpg/nasa_RECOVER/webekeit@isu.edu



RECOVER is a NASA Applied Sciences sponsored project. K. T. Weber (PI), J. Schnase (Co-PI) and M. Carroll (Co-PI), Goddard Space Flight Center