

# Introducing a Science-Management Partnership to Reduce Human-Caused Large Wildfires in the Southwest

Supported by the Joint Fire Science Program (JFSP)

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# Our team

## Forest Stewards Guild



**Zander Evans**



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**Cat Edgeley**



**Sarah Devenport**





*Forest Stewards*  
 **Guild**





# The Las Conchas Wildfire





# The Wallow Fire





# Prevention Tailored to Local Needs






# Prevention Tailored to Local Needs







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**Guild**  
putting the forest first

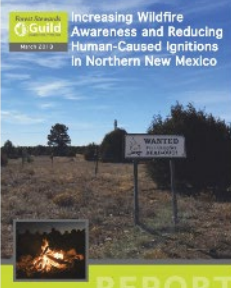
March 2018

**Increasing wildfire awareness and reducing human-caused ignitions in Northern New Mexico**

**SUMMARY**


Large, high severity wildfires are now a common occurrence in the forests of northern New Mexico. These wildfires burn through forests that are not adapted to high-severity fire and can devastate ecosystems and human communities. For example, the Las Conchas Fire of 2011 burned across 156,593 acres, caused severe flooding, and converted ponderosa pine forests to shrub fields, perhaps forever. Although lightning causes many wildfires in the Southwest, human ignitions are a significant risk. In 2016, wildfires ignited by humans burned over 200,000 acres in Arizona and New Mexico. Since human ignitions are preventable, raising education and awareness could be the key to reducing the number of large wildfires.

This study was designed to help support wildfire prevention by better understanding how people start wildfires, common locations of human-caused wildfires, existing public awareness campaigns, and current investments in public awareness of wildfire.



**REPORT**

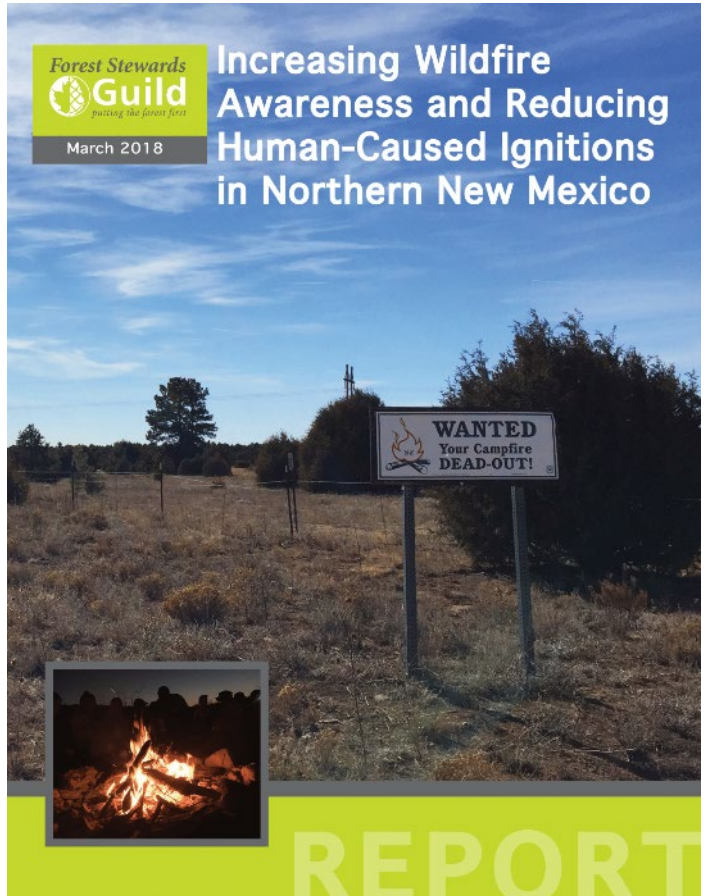
To view the full report please visit [www.foreststewardsguild.org/publications](http://www.foreststewardsguild.org/publications)



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**Increasing Wildfire Awareness and Reducing Human-Caused Ignitions in Northern New Mexico**



**REPORT**

# Human Ignitions and Fire Prevention Awareness

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# JOINT **FIRE SCIENCE** PROGRAM

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- The needs of managers and policymakers guide and frame research questions.
- The JFSP emphasizes open solicitation and fair competition.
- All research proposals receive an independent peer review to ensure scientific merit, applicability of outcomes, and feasibility of execution.
- We share, synthesize, interpret, and demonstrate/ validate results to maximize science adoption.
- We perform regular self and external evaluations of program activities



# JFSP Human Ignitions Research

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**Task statement 1:** Sources and distribution of human-caused ignitions and their relation to wildfire impacts.

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**Task statement 2:** Reducing damages and losses to valued resources from wildfire



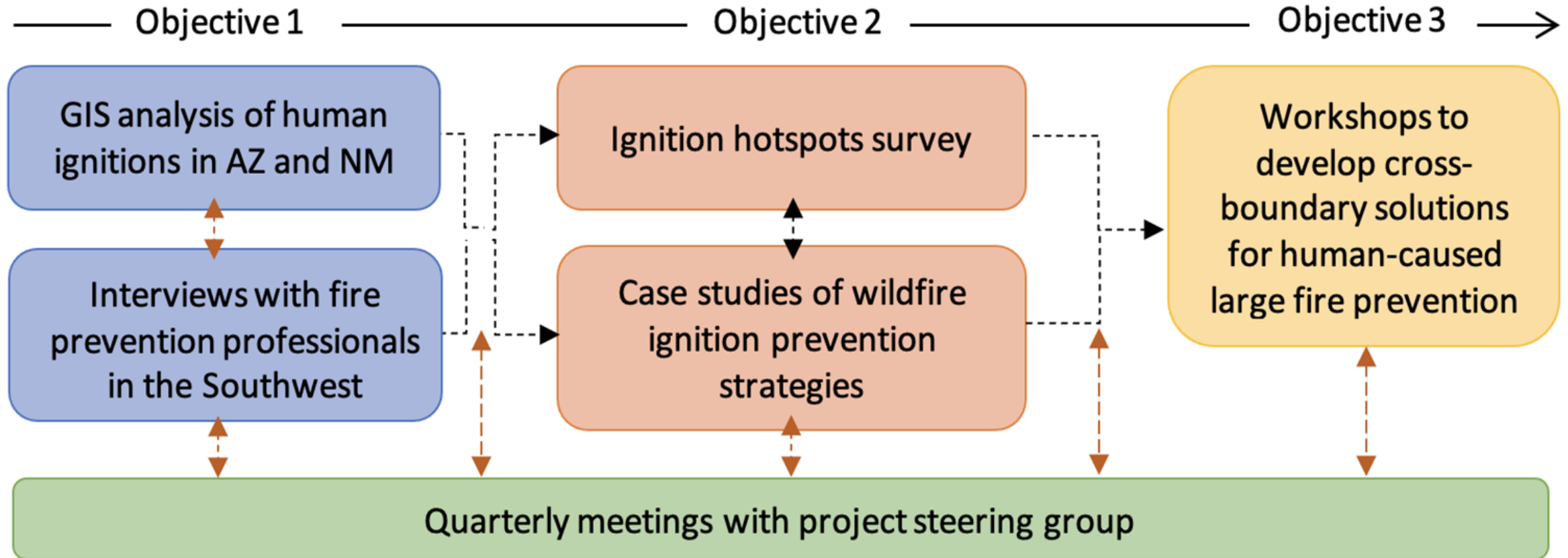
# Our Research Objectives

**Objective 1:** Identify factors driving spatial and temporal “hotspots” where large, human-ignited fires are consistently high across the Southwest

**Objective 2:** Assess the current state of public and manager knowledge about human-caused large wildfire prevention strategies and their effectiveness

**Objective 3:** Leverage science-management partnerships to establish a typology of cross-boundary management approaches to implement human-caused large wildfire prevention strategies





**Figure 2: Proposal study design overview.** Black arrows indicate where emergent findings from each objective will influence the next iteration of data collection; orange lines indicate structured opportunities to establish and strengthen our science-manager partnership.



# Objective 1: Identify factors driving spatial and temporal “hotspots”

## First steps:

- Clipped to AZ & NM boundaries
- Separated into three categories based on attribute “NWCG\_CAUSE\_CLASSIFICATION”:
  - Natural
  - Missing data/not specified/undetermined
  - Human
- Plotted points by cause classification each year to see if anything stood out
- Looked at numbers in Excel

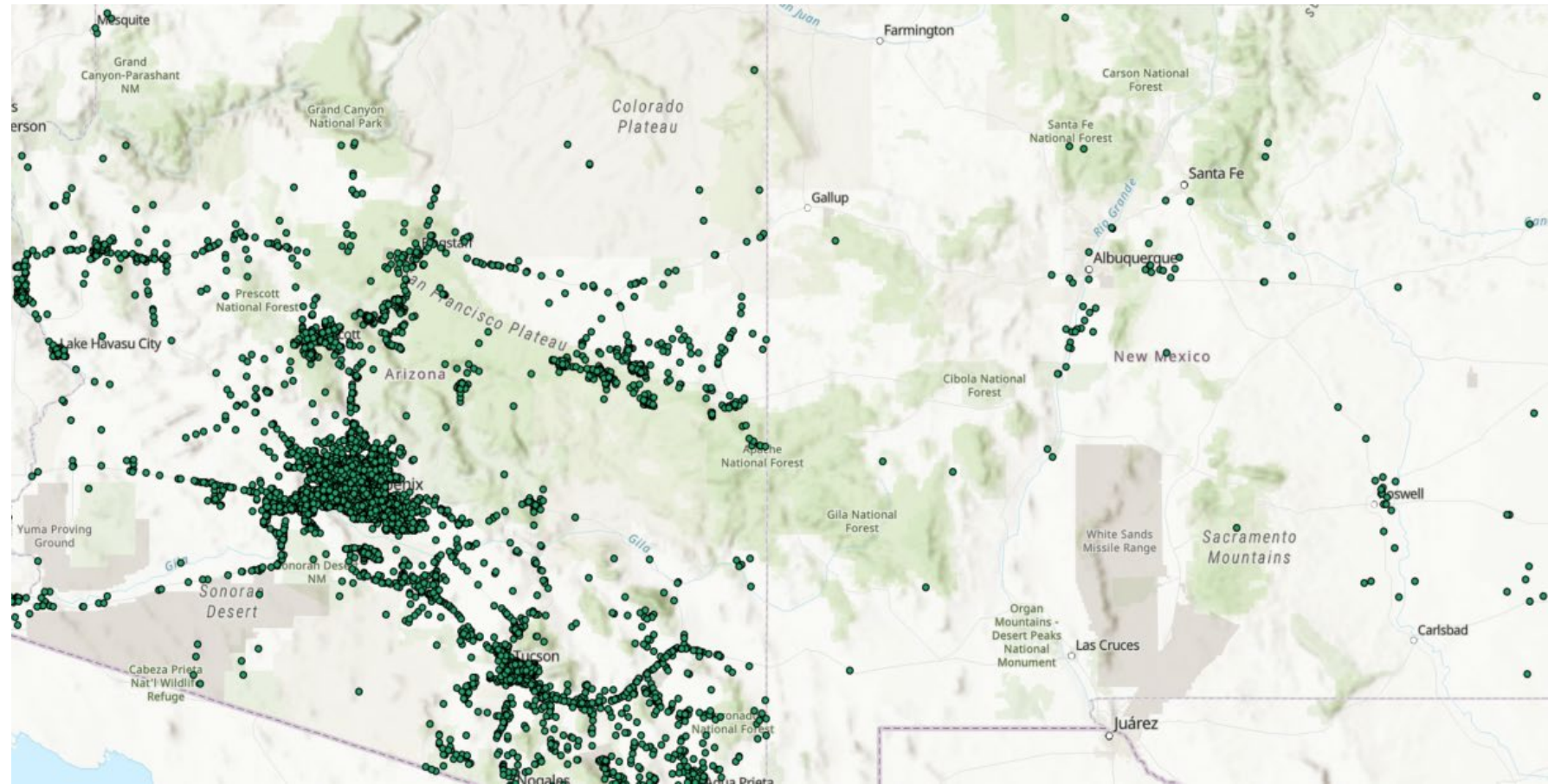
Data: Short, Karen C. 2021. Spatial wildfire occurrence data for the United States, 1992-2018 [FPA\_FOD\_20210617]. 5th Edition. Fort Collins, CO: Forest Service Research Data Archive. <https://doi.org/10.2737/RDS-2013-0009.5>



# Missing / not specified / undetermined cause fires

All missing / not specified / undetermined fires 2005-2018

- Primarily near populated areas & along roads
- Patterns suggest many are likely human-caused
- Will be excluded from analysis since cause cannot be attributed

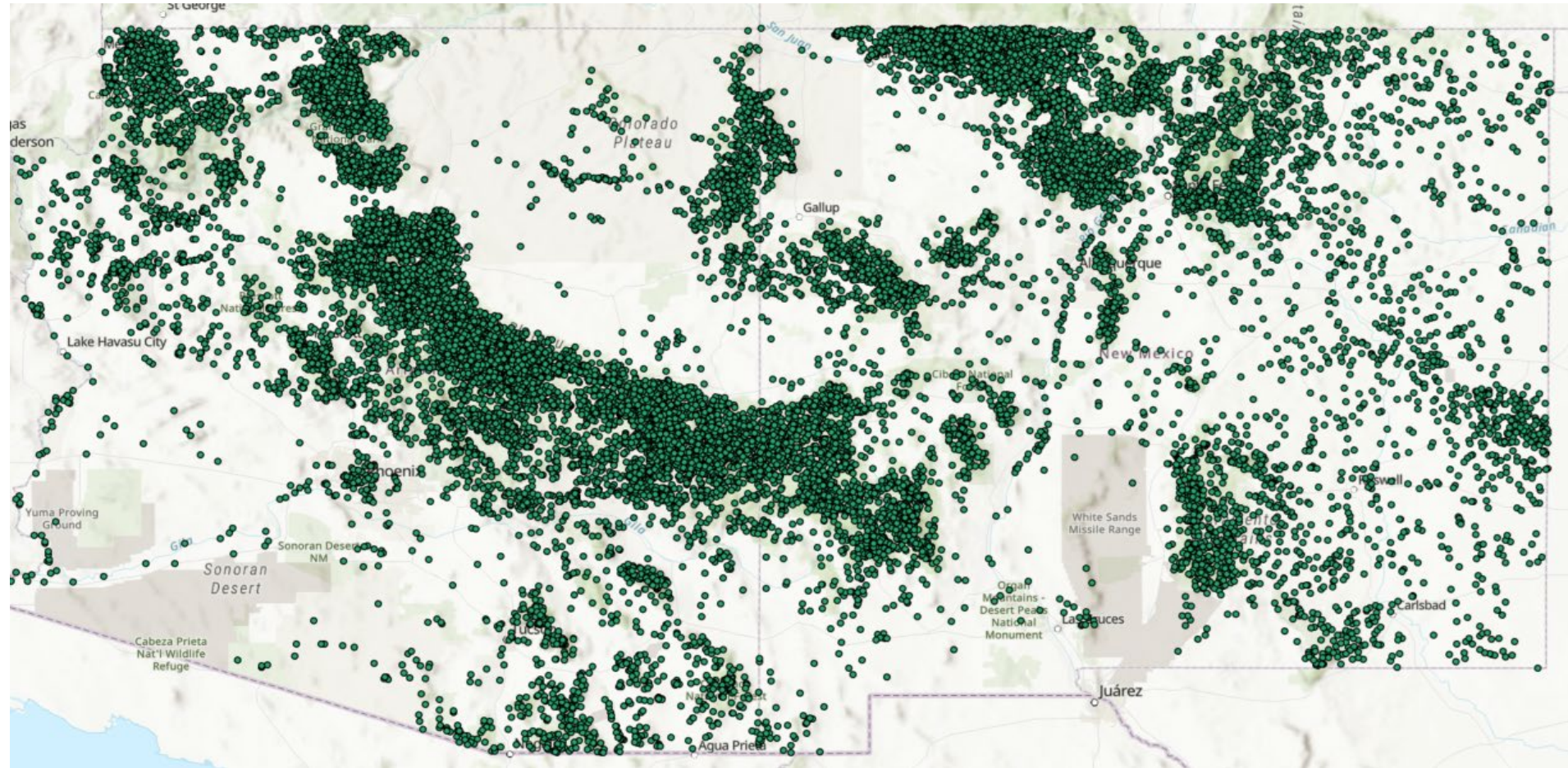




# Natural fires

All natural caused fires 2005-2018

Primarily  
occurring in  
forested  
areas &  
unpopulated  
grasslands

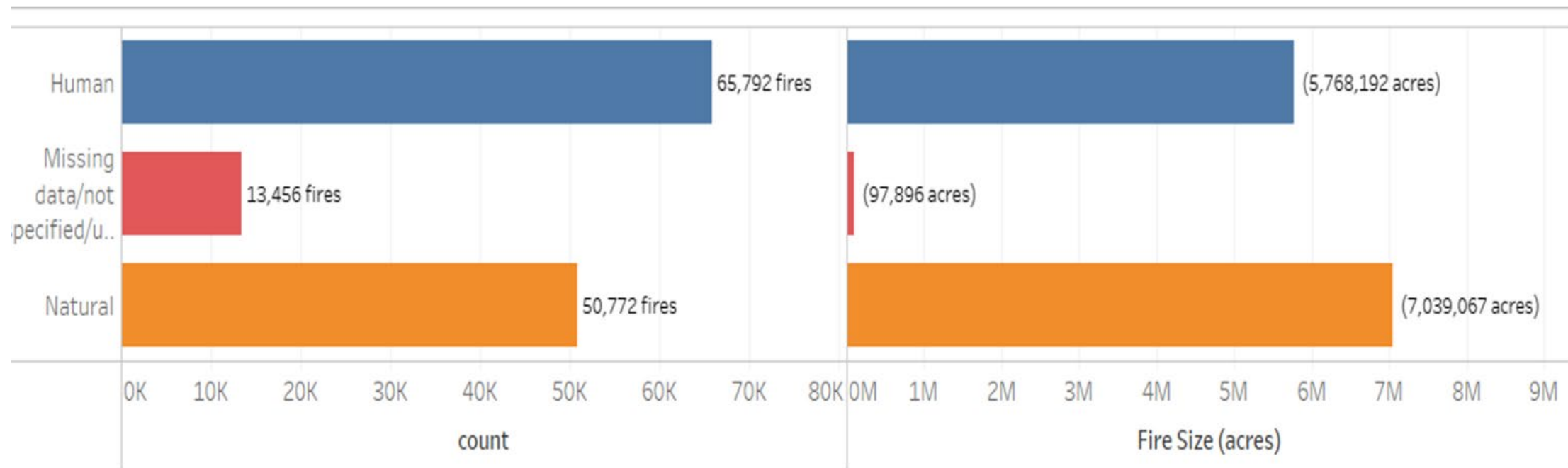




# Human-caused fires

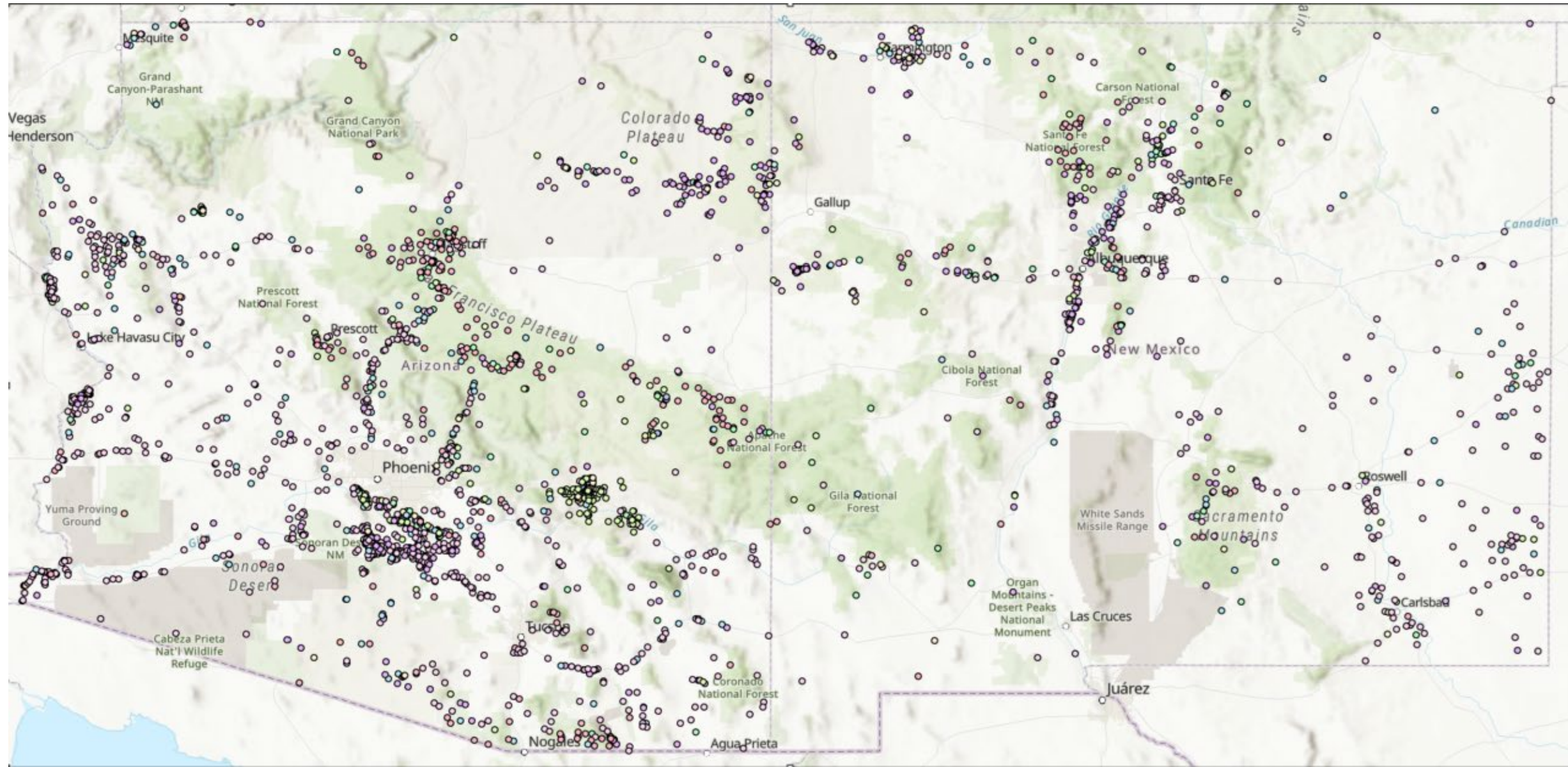
- Would be expected in populated areas, roads, and recreation areas
- Excluded three sub-cause categories that are outside the scope of this project:
  - Power generation / transmission / distribution
  - Railroad operations & maintenance
  - Vehicle and equipment use





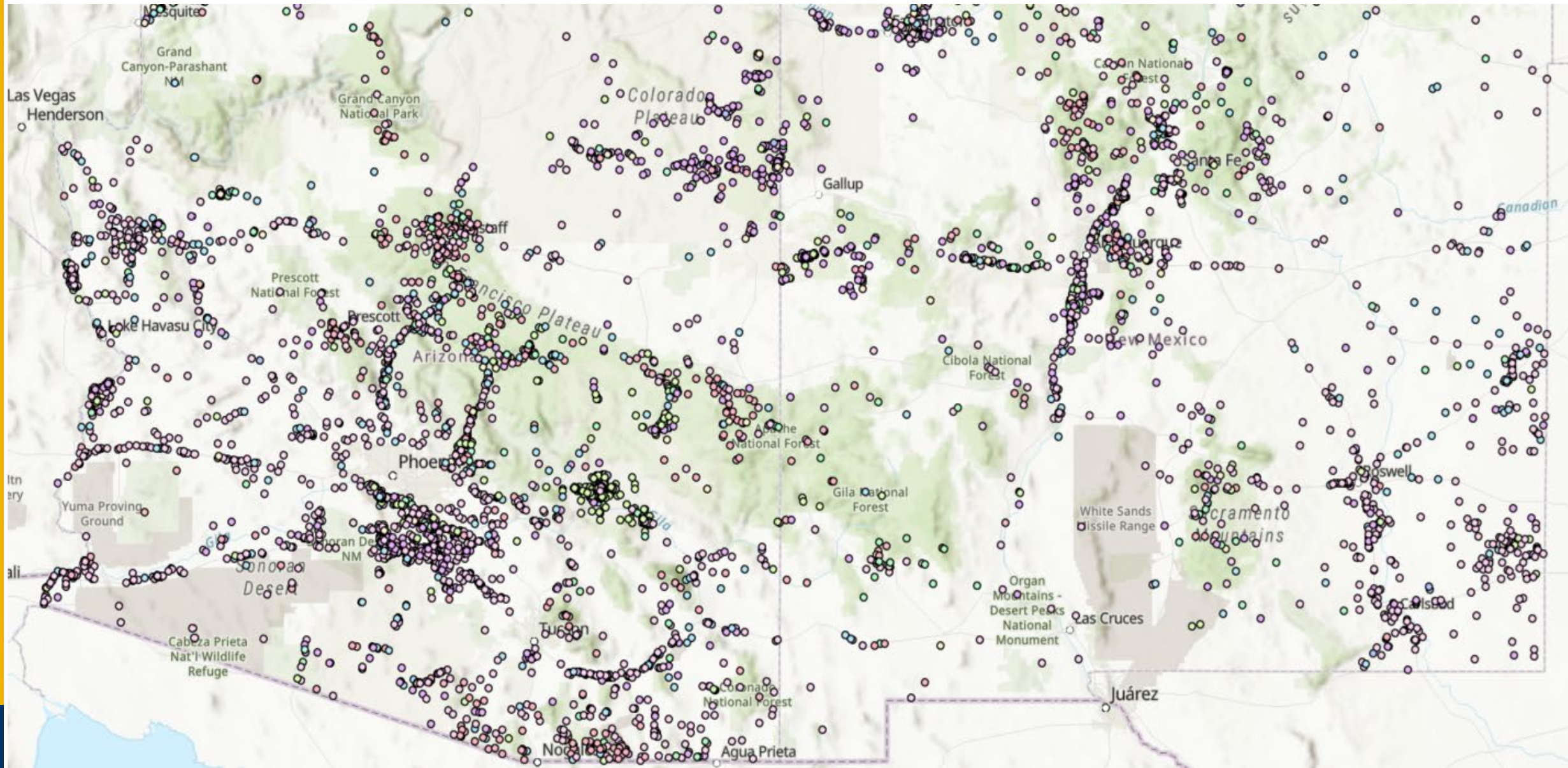


# Human caused fires 2005



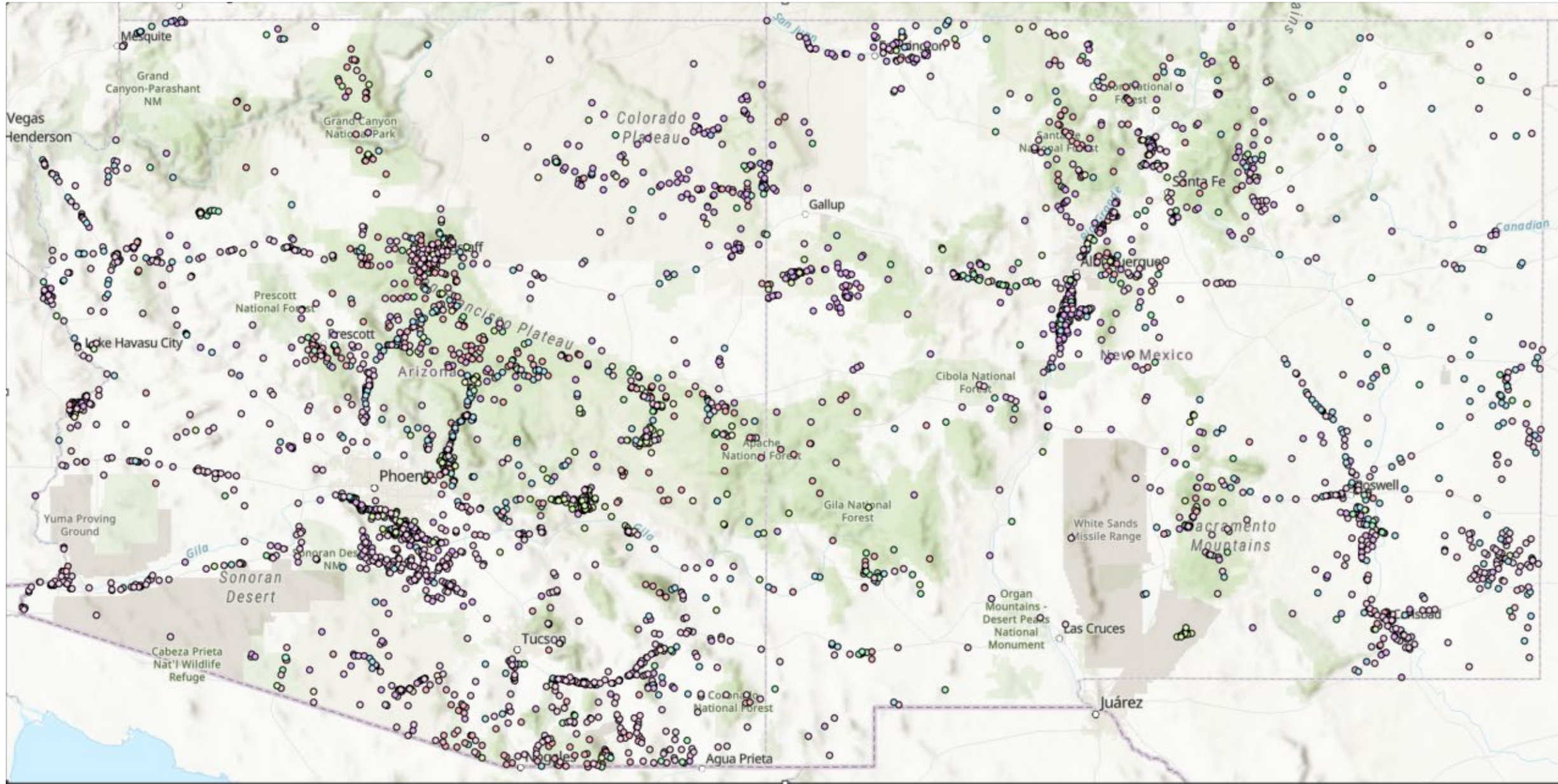


# Human caused fires 2006



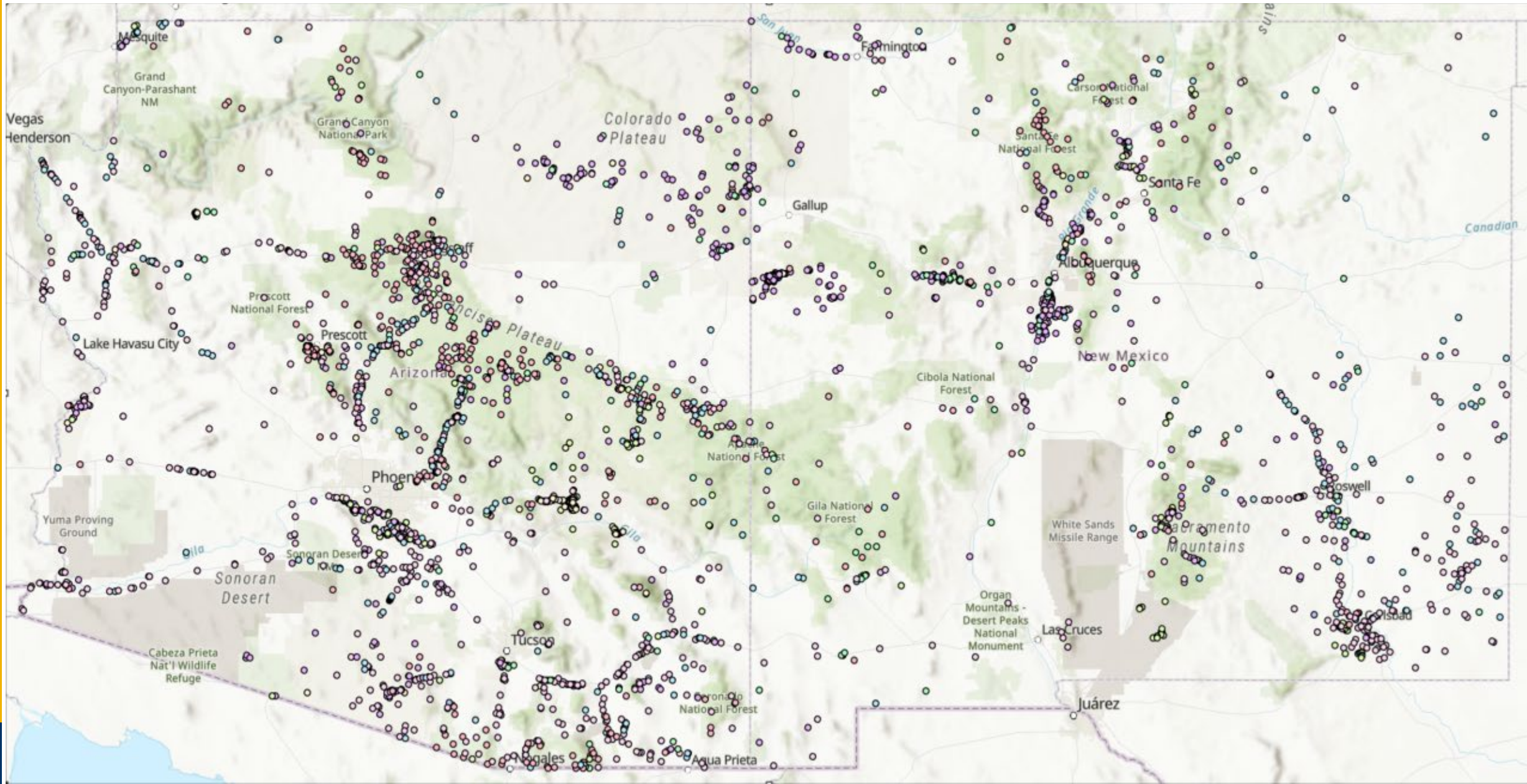


# Human caused fires 2007



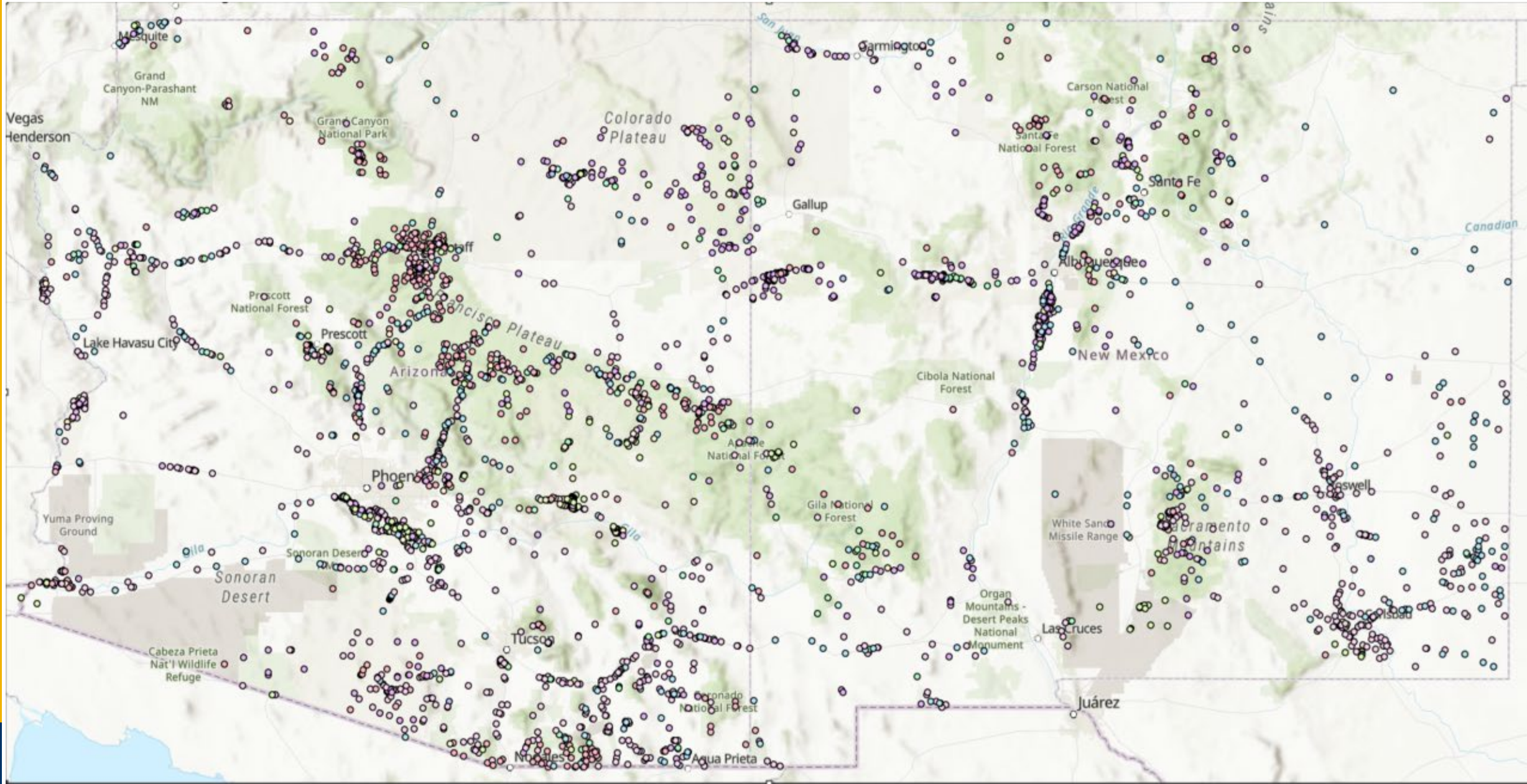


# Human caused fires 2008



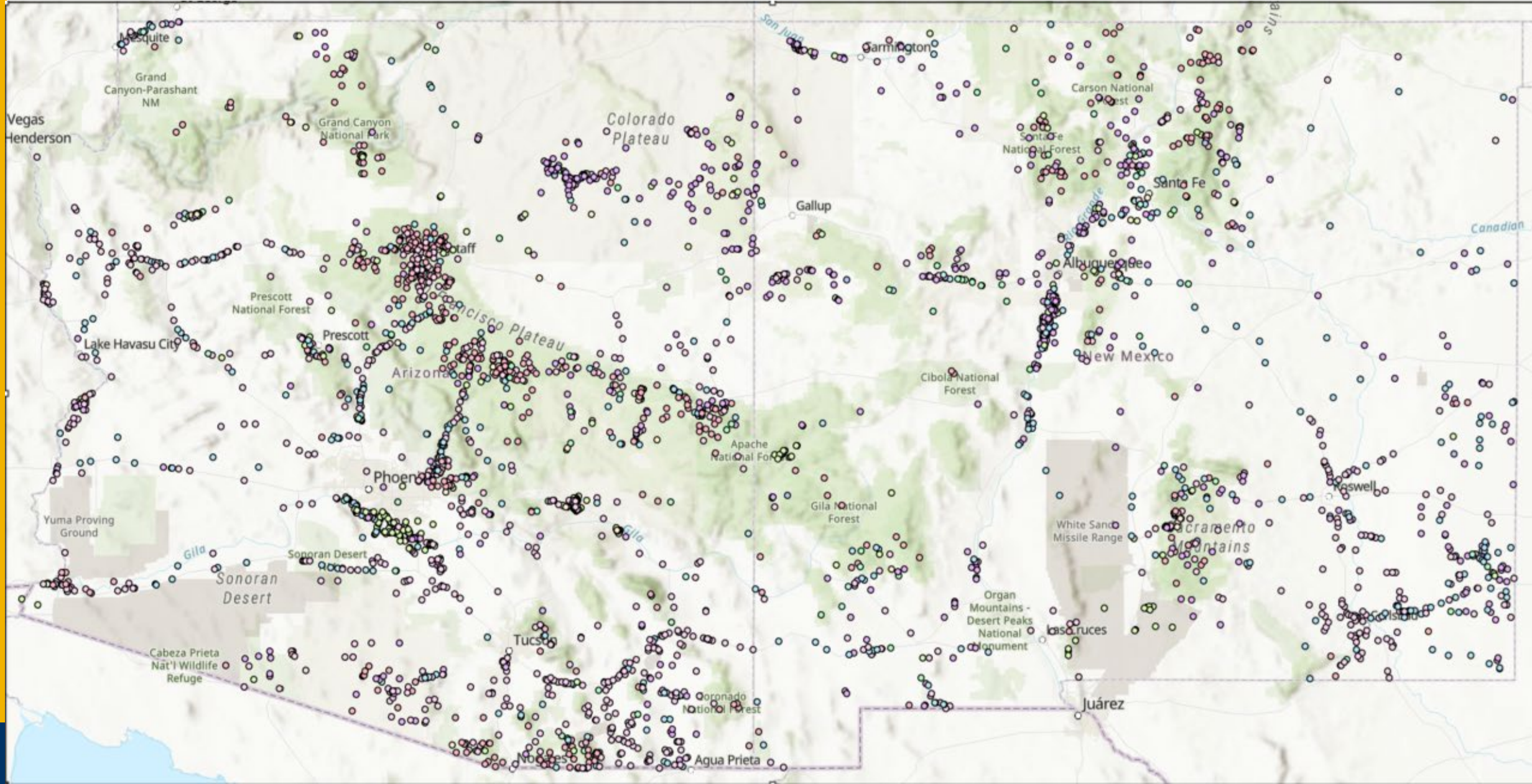


# Human caused fires 2009



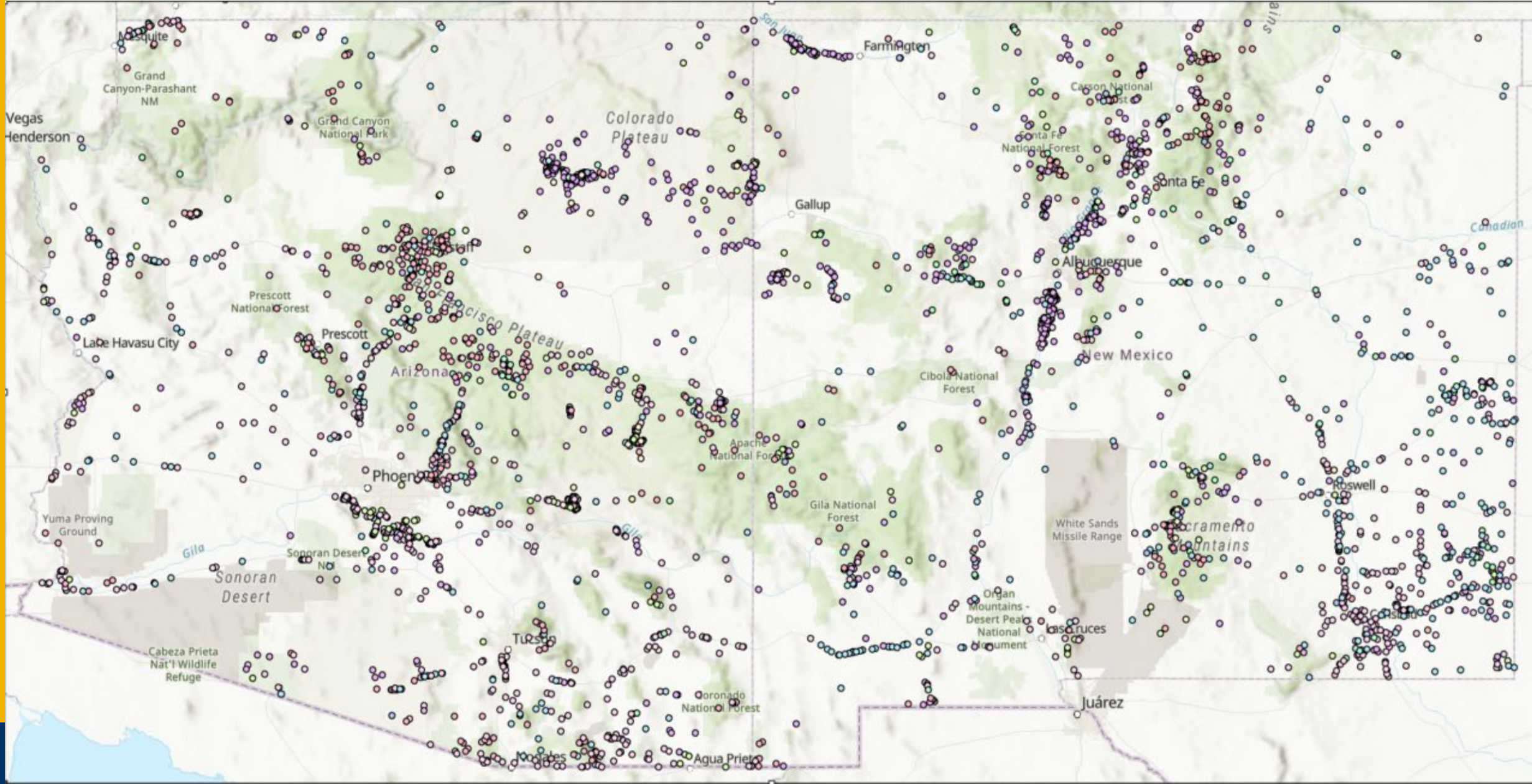


# Human caused fires 2010



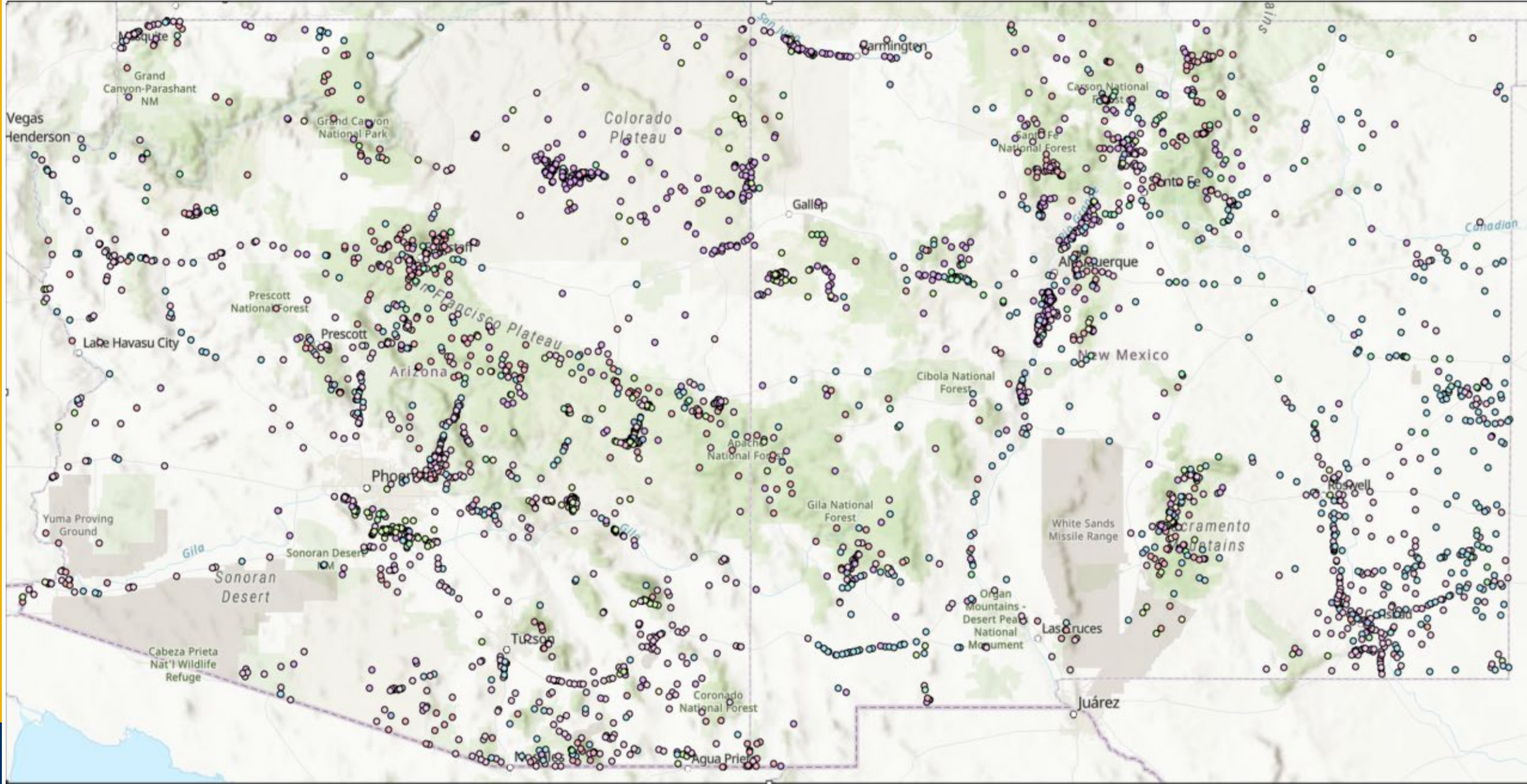


# Human caused fires 2011



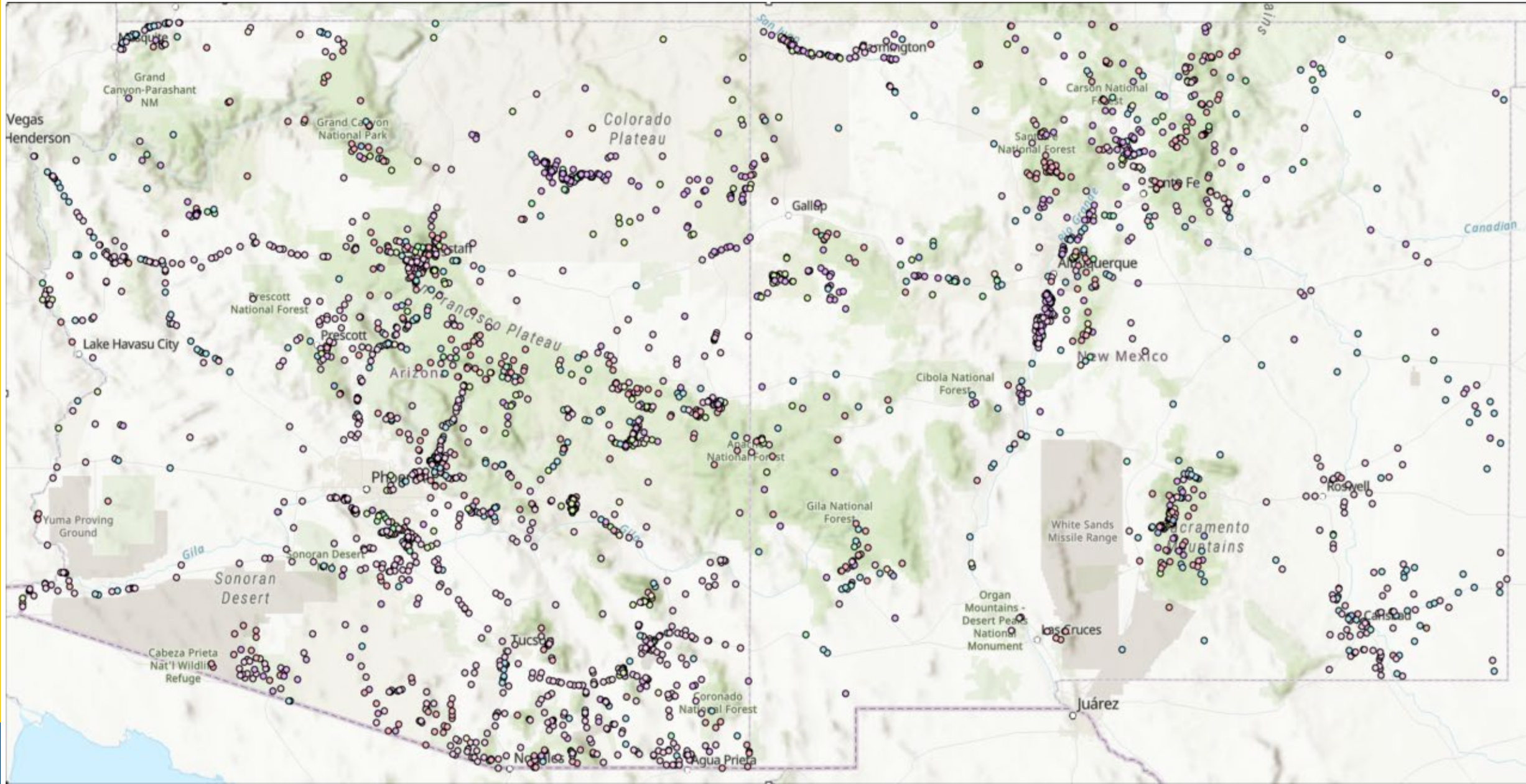


# Human caused fires 2012



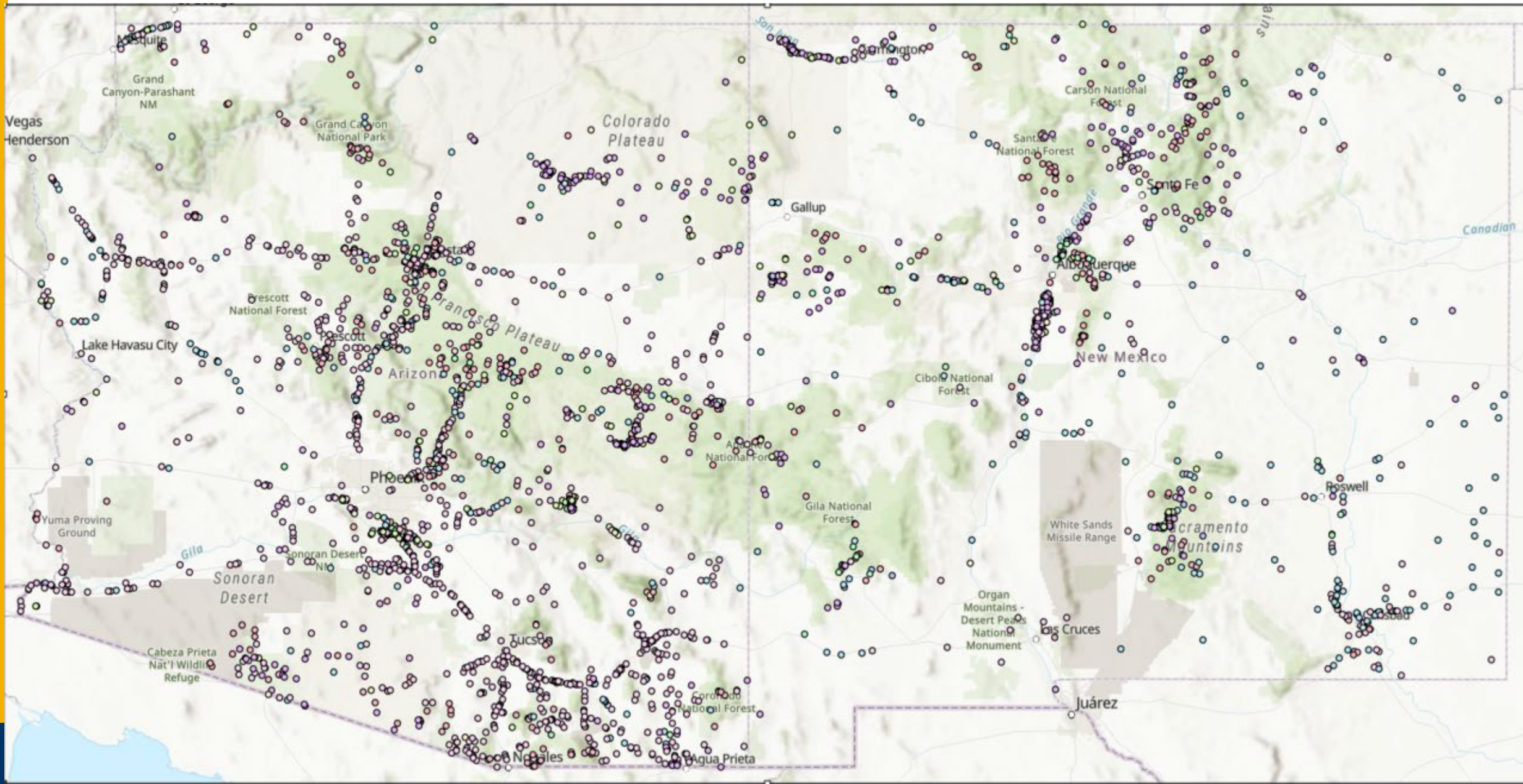


# Human caused fires 2013



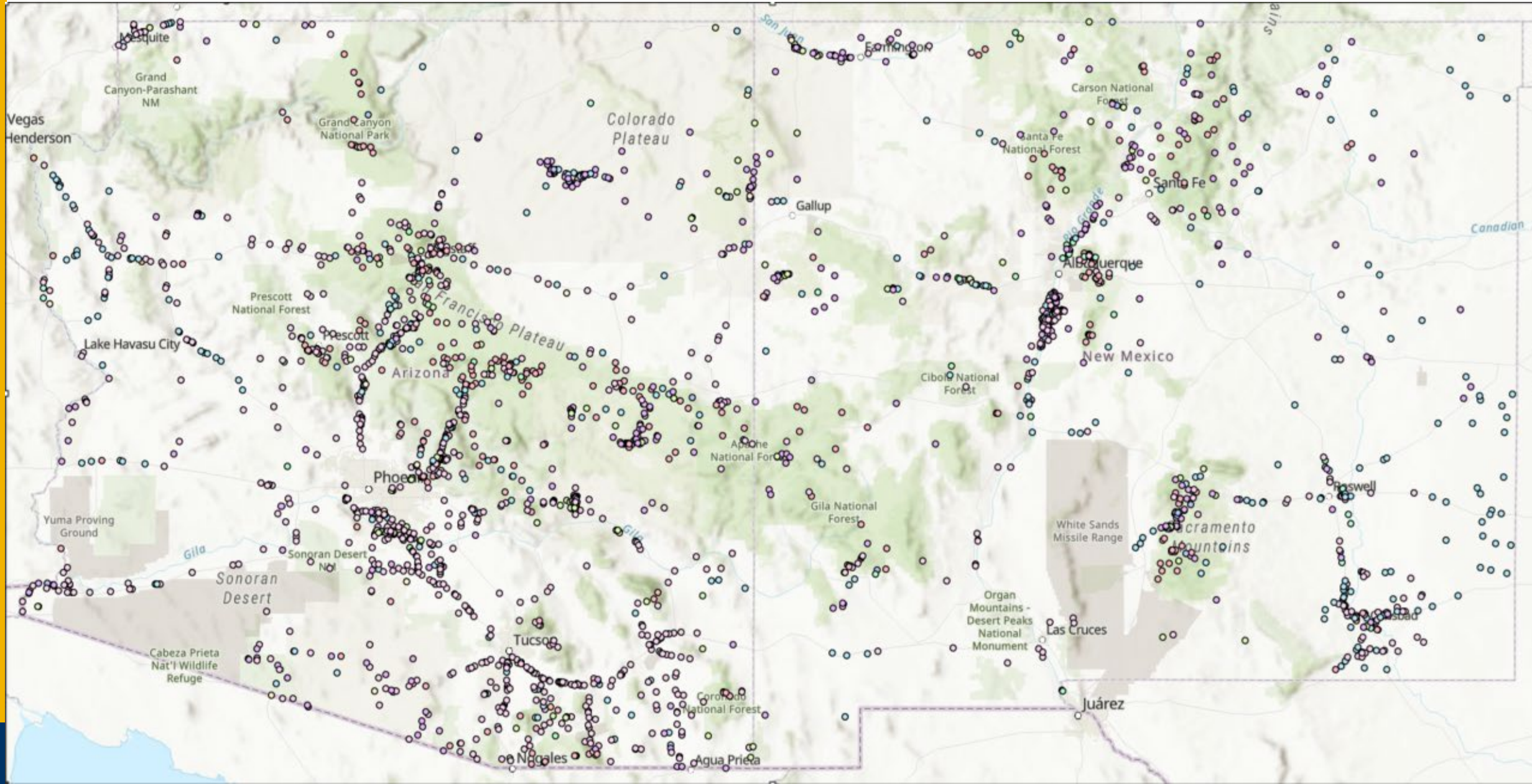


# Human caused fires 2014



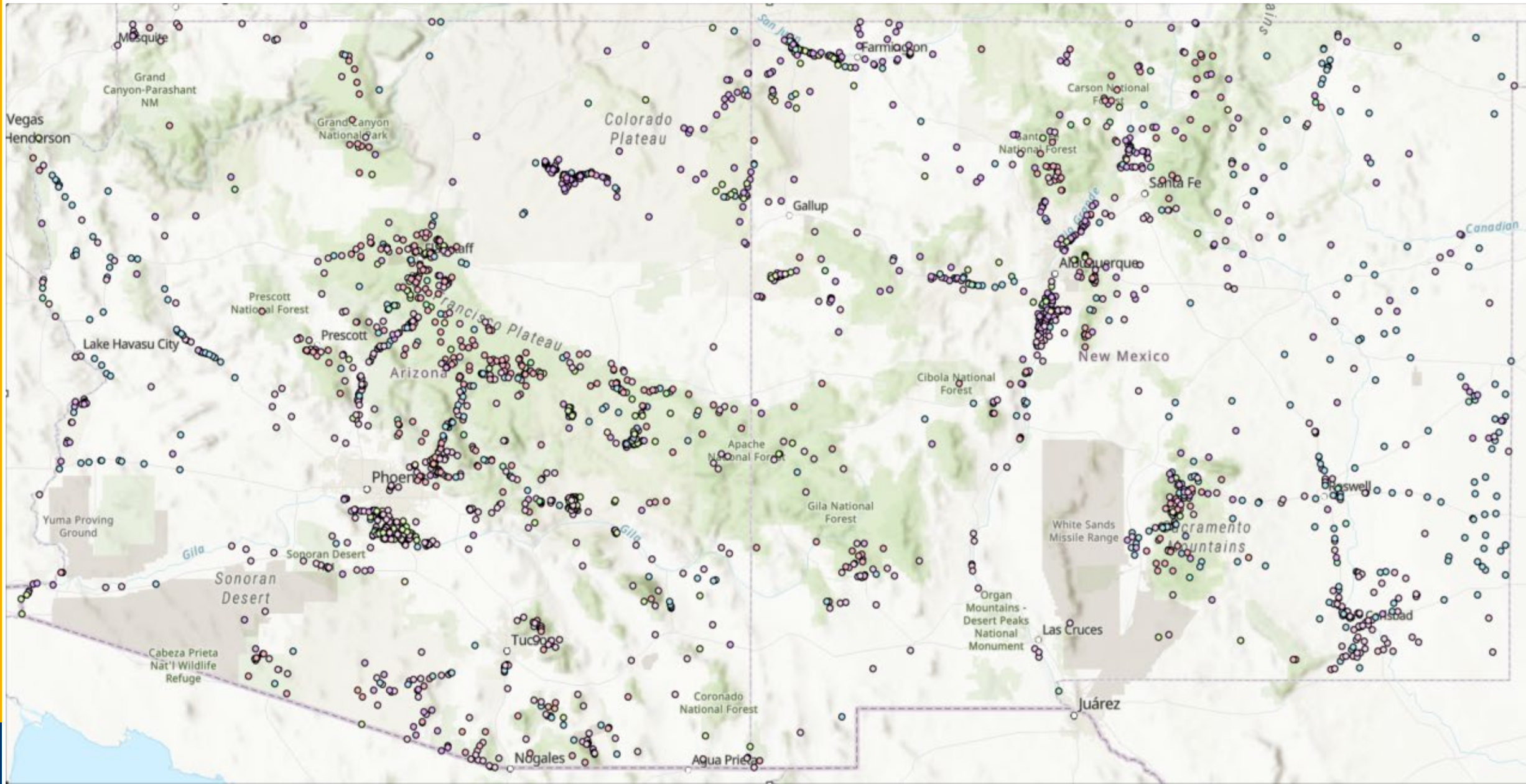


# Human caused fires 2015



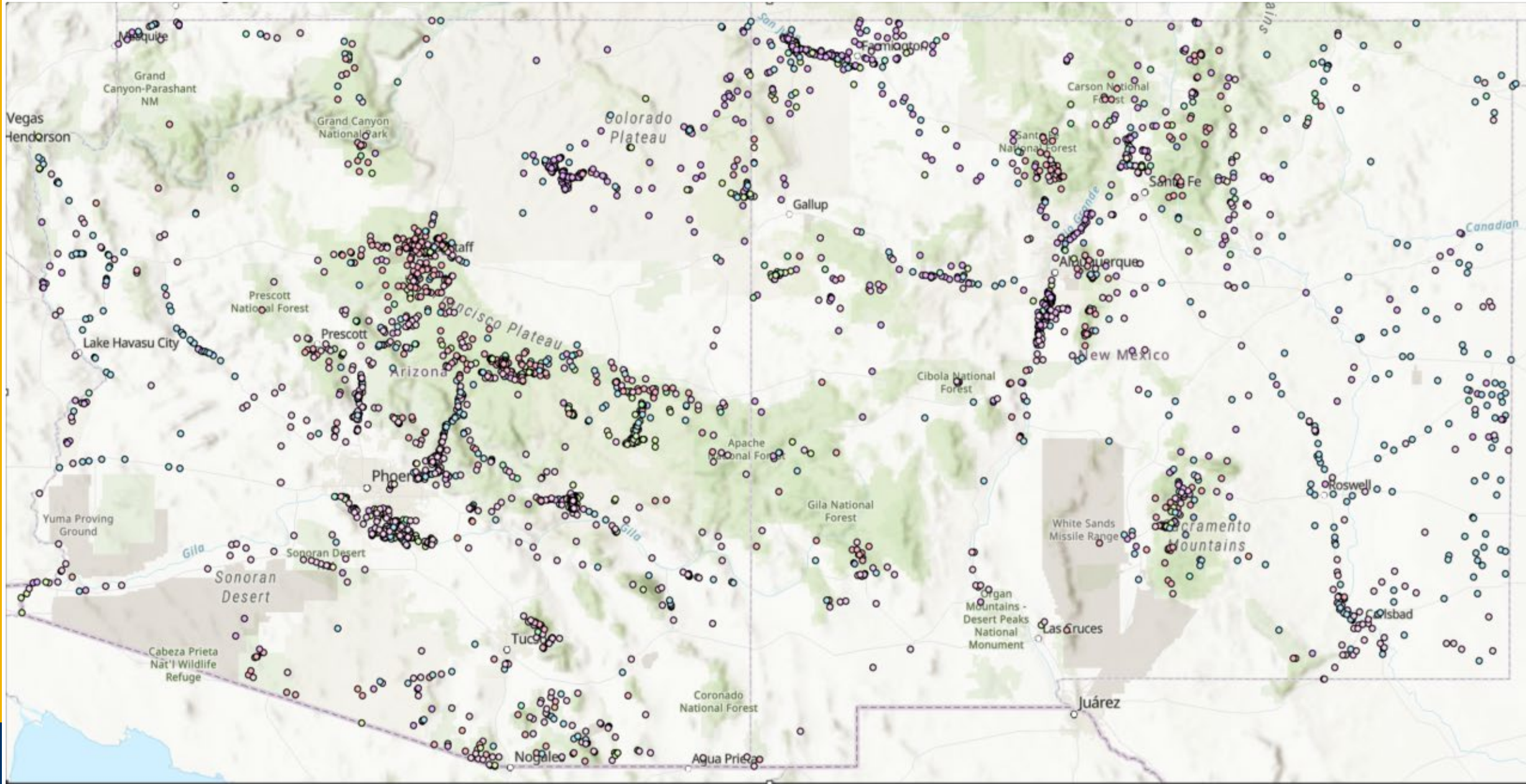


# Human caused fires 2016



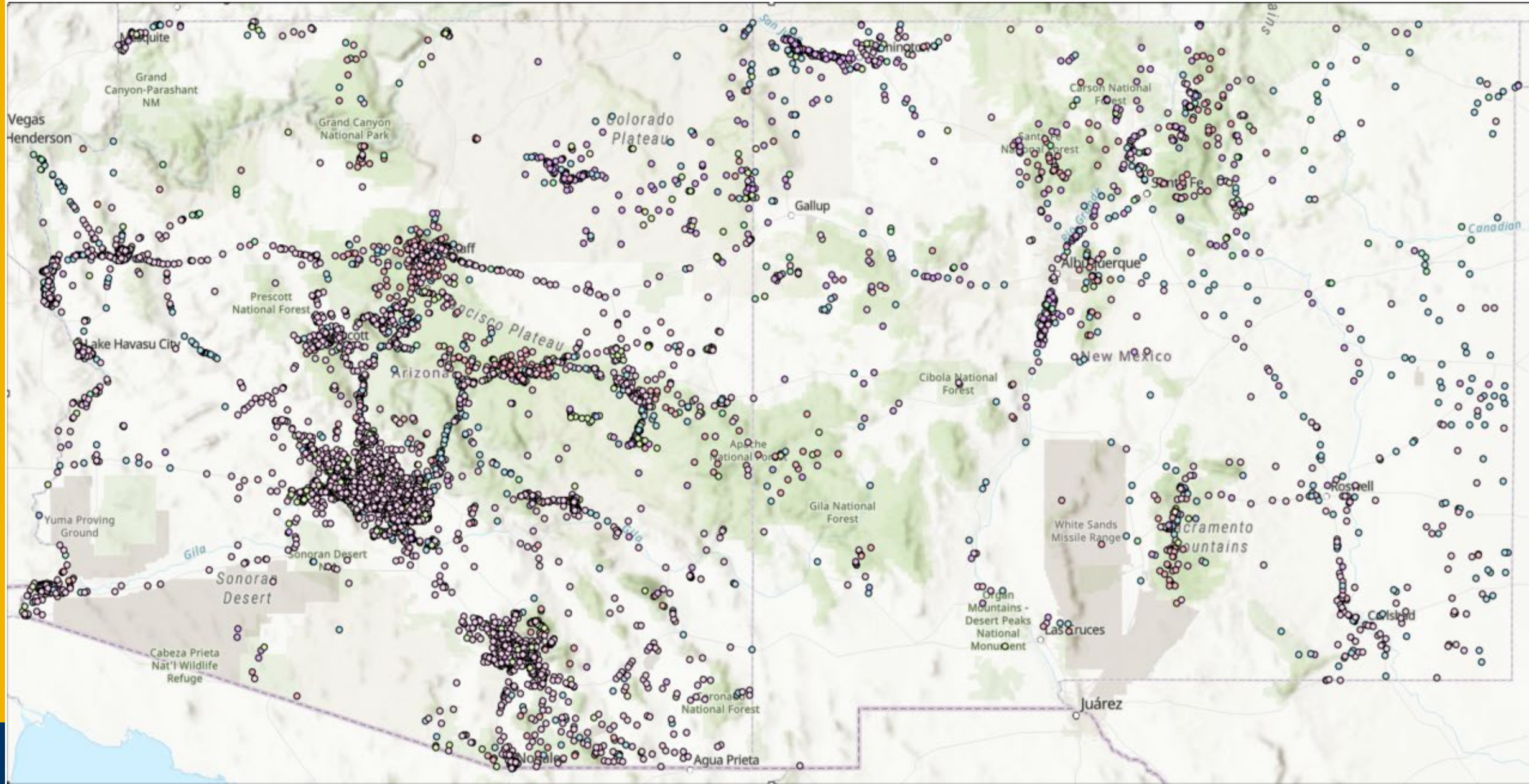


# Human caused fires 2017





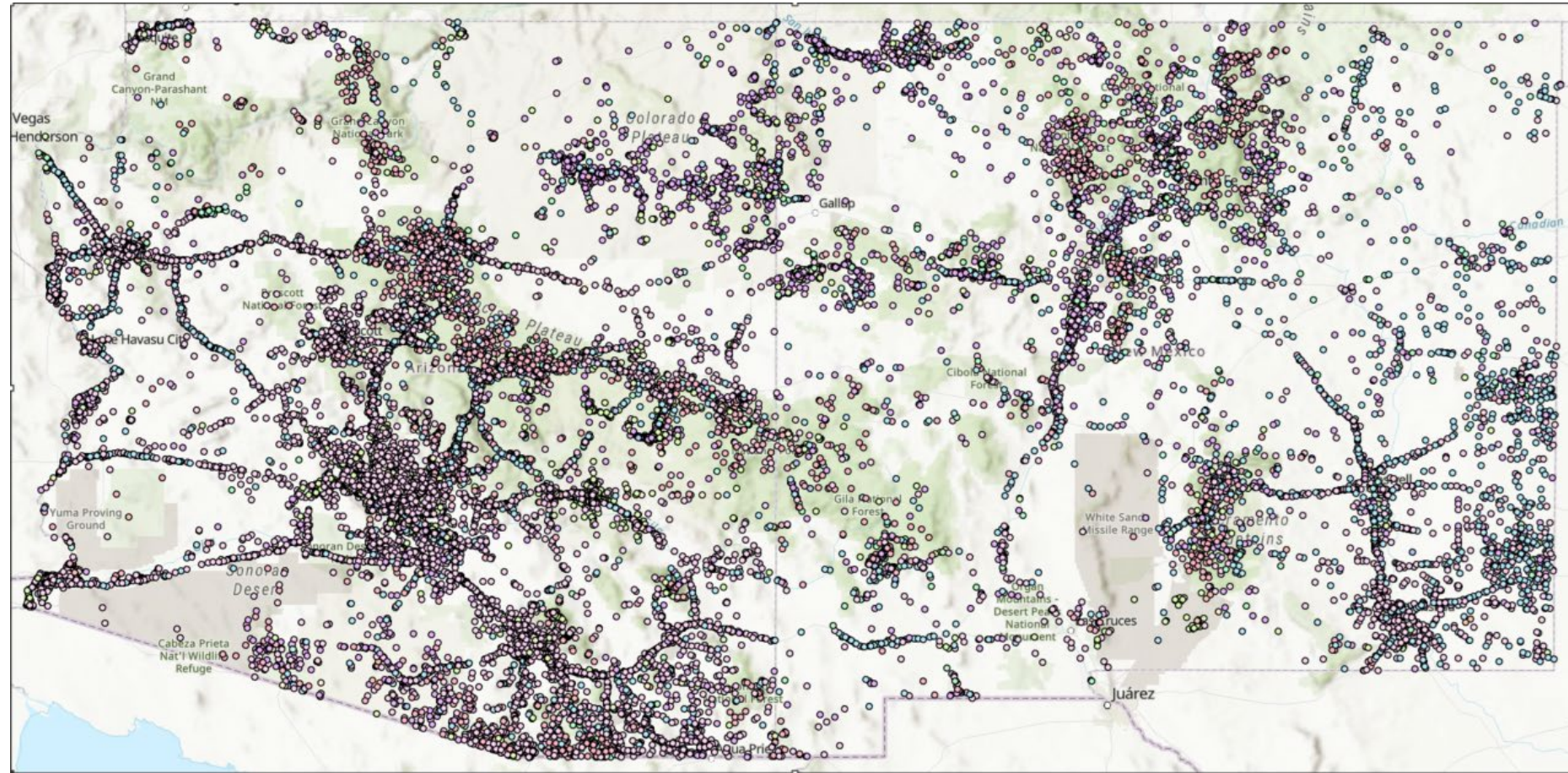
# Human caused fires 2018





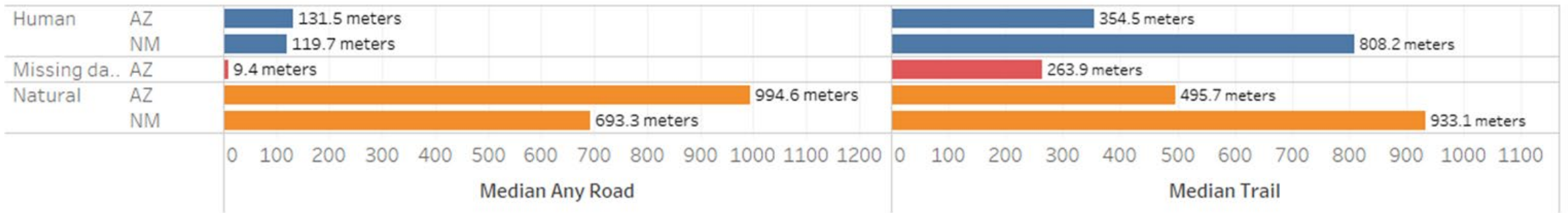
# All human-caused fires 2005 - 2018

Concentrations along roads, near populated areas, along rivers, and in recreational areas





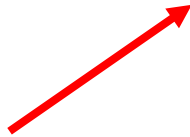
Distance (m)





# Numbers by cause

SW FIRES 2005 - 2018		
Category	Count	Acres
Human	32,849	3,531,233
Natural	20,877	4,674,028
Missing	12,876	140,456



ALL HUMAN-CAUSED FIRES 2005 - 2018		
Attributed cause	Count	Acres
Missing data / not specified	16,060	1,487,206
Recreation & ceremony	3,701	1,108,383
Equipment & vehicle use	3,172	431,999
Debris & open burning	4,764	201,362
Arson / incendiarism	3,017	153,677
Fireworks	291	62,703
Firearms & explosives use	60	27,782
Other	195	25,314
Smoking	690	20,475
Misuse of fire by a minor	899	12,332



# Numbers by land ownership

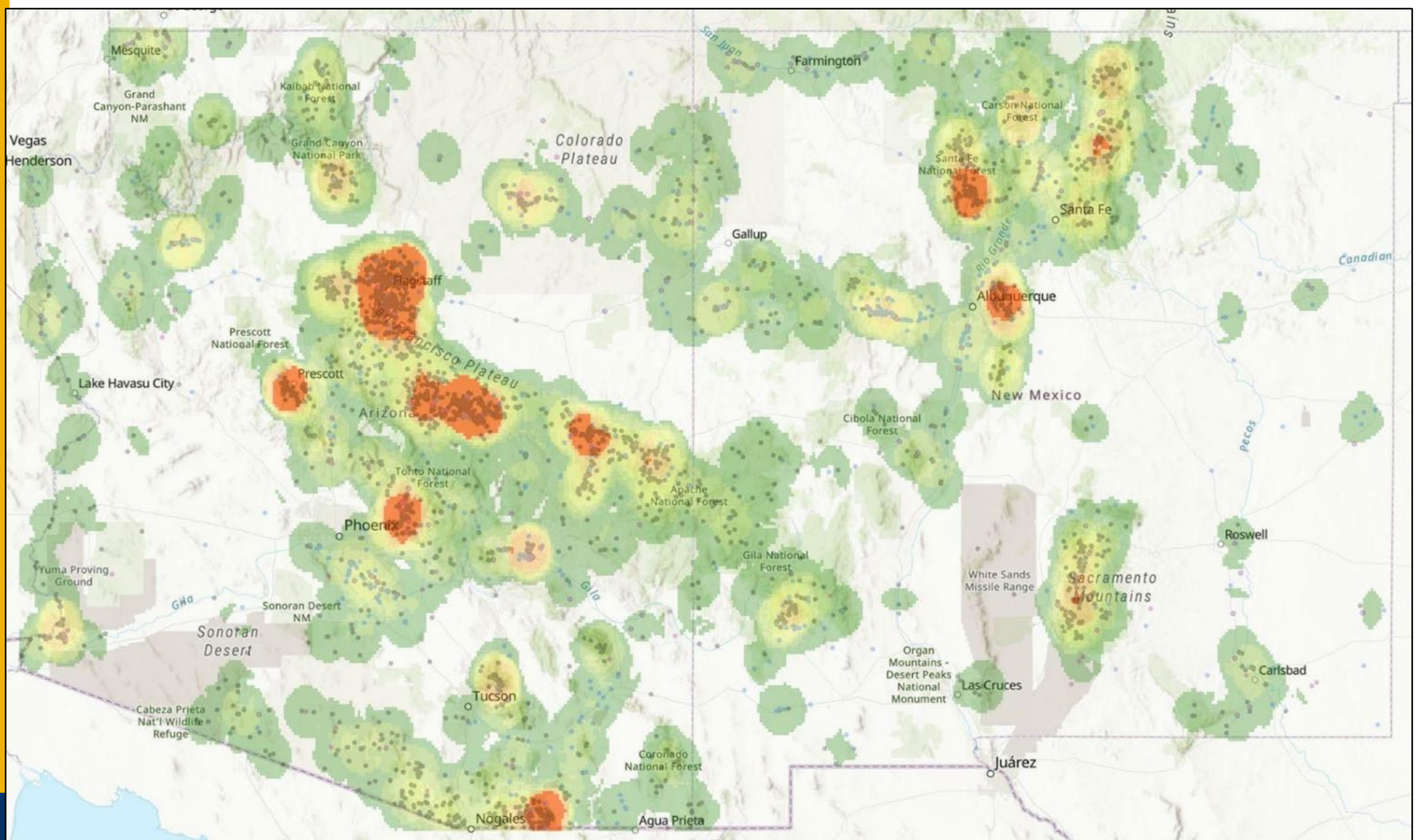
ALL HUMAN-CAUSED FIRES 2005 - 2018		
Land ownership	Count	Acres
US Forest Service	5,866	1,556,085
Private	2,400	556,210
Missing	12,296	483,319
State	705	328,023
Bureau of Land Management	1,887	203,849
Bureau of Indian Affairs	8,870	189,330
Other federal	56	81,954
National Park Service	232	62,186
FWS	126	50,824
State or private	116	14,122
Bureau of Reclamation	63	2,866
Tribal	223	2,462
Undefined federal	7	3.6
Municipal / local	1	0.5
County	1	0.1



# Developing hot spots

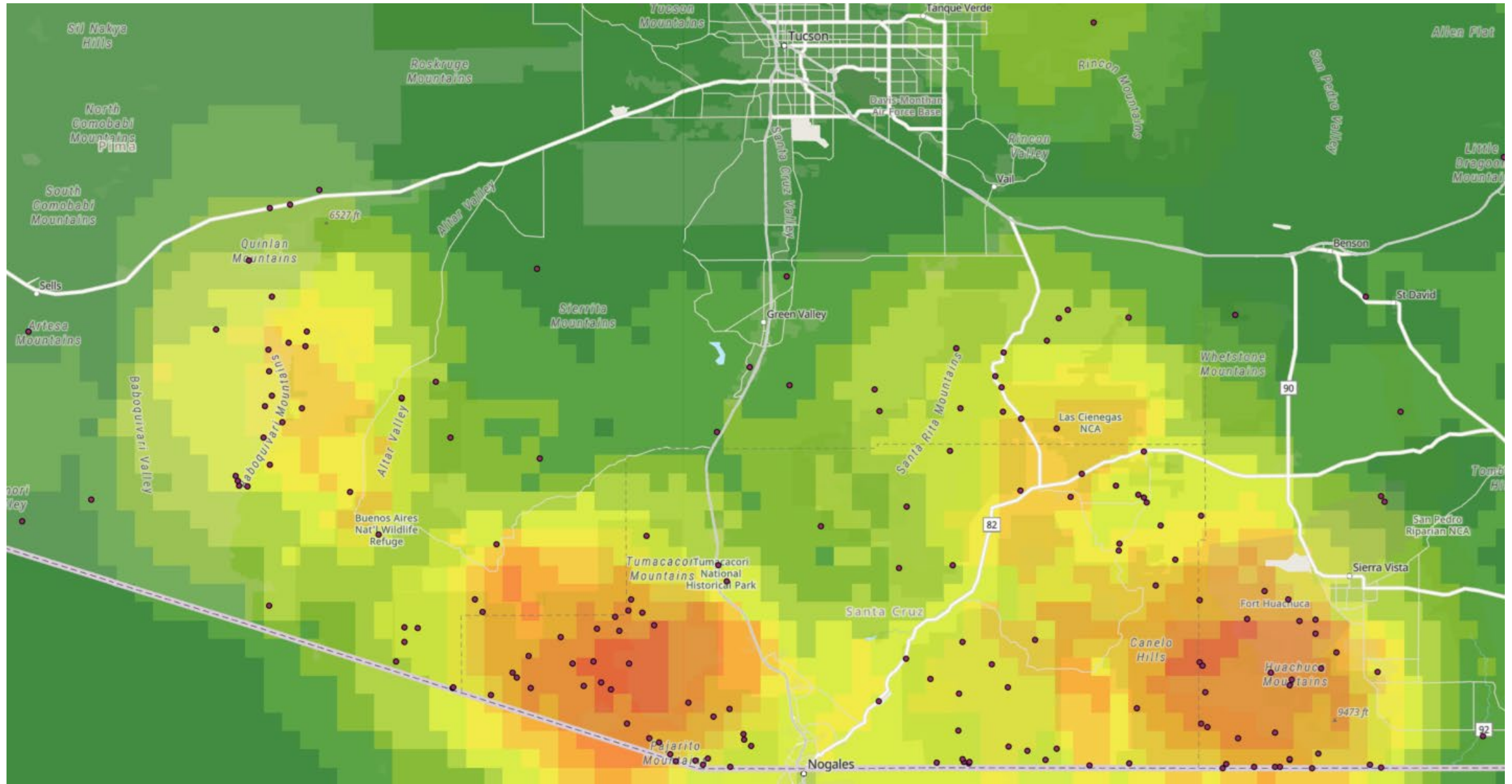
- Plotted wildfire ignition points to identify emergent clusters
- Used point density spatial analyst tool on ArcGIS Pro to identify the densest areas of human ignitions







# Hot spot example: Tumacacori mountains & Buenos Aires National Wildlife Refuge

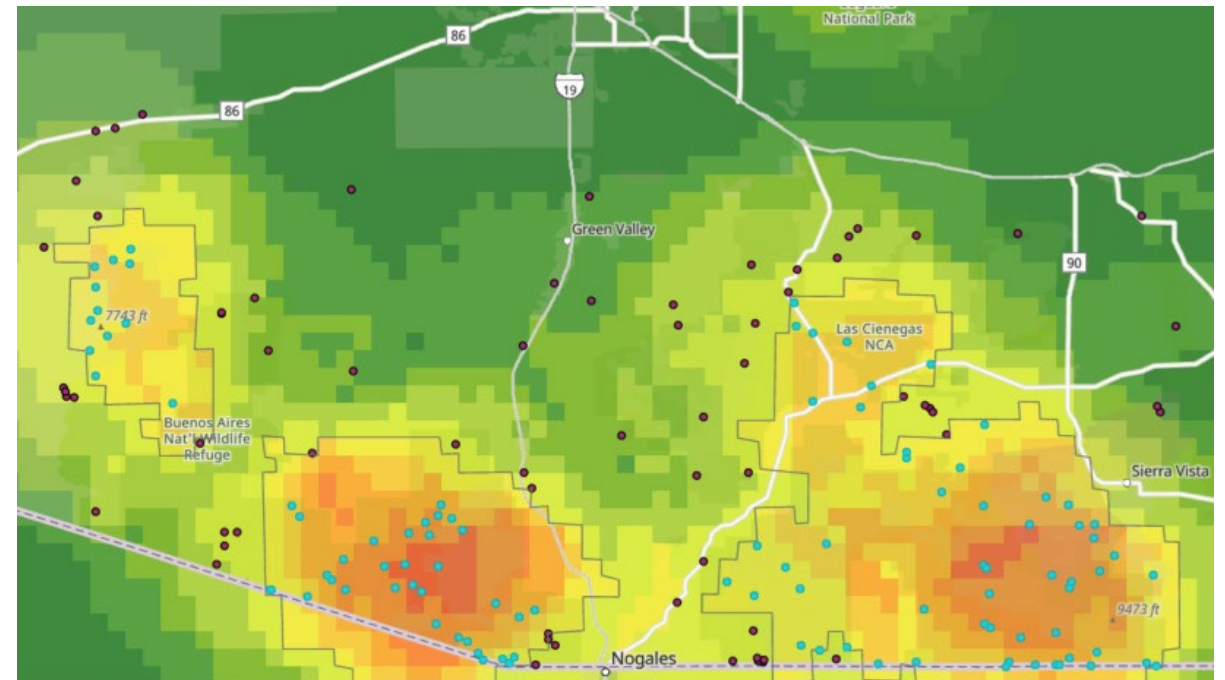




## HOT SPOT EXAMPLE HUMAN-CAUSED FIRES 2005 - 2018

Land ownership	Count	Acres
USFS	63	176,452
NPS	2	30,606
BLM	5	27,928
FWS	2	15,455
BIA	5	7,225
MISSING	9	6,477
PRIVATE	3	5,440
STATE	5	4,661
OTHER FEDERAL	6	2,231
TRIBAL	1	445
STATE OR PRIVATE	1	398

Attributed cause	Count	Acres
Missing data / undetermined	51	193,066
Recreation & ceremony	29	43,259
Debris & open burning	4	16,423
Equipment & vehicle use	9	15,356
Arson / incendiarism	4	7,106
Smoking	5	2,108





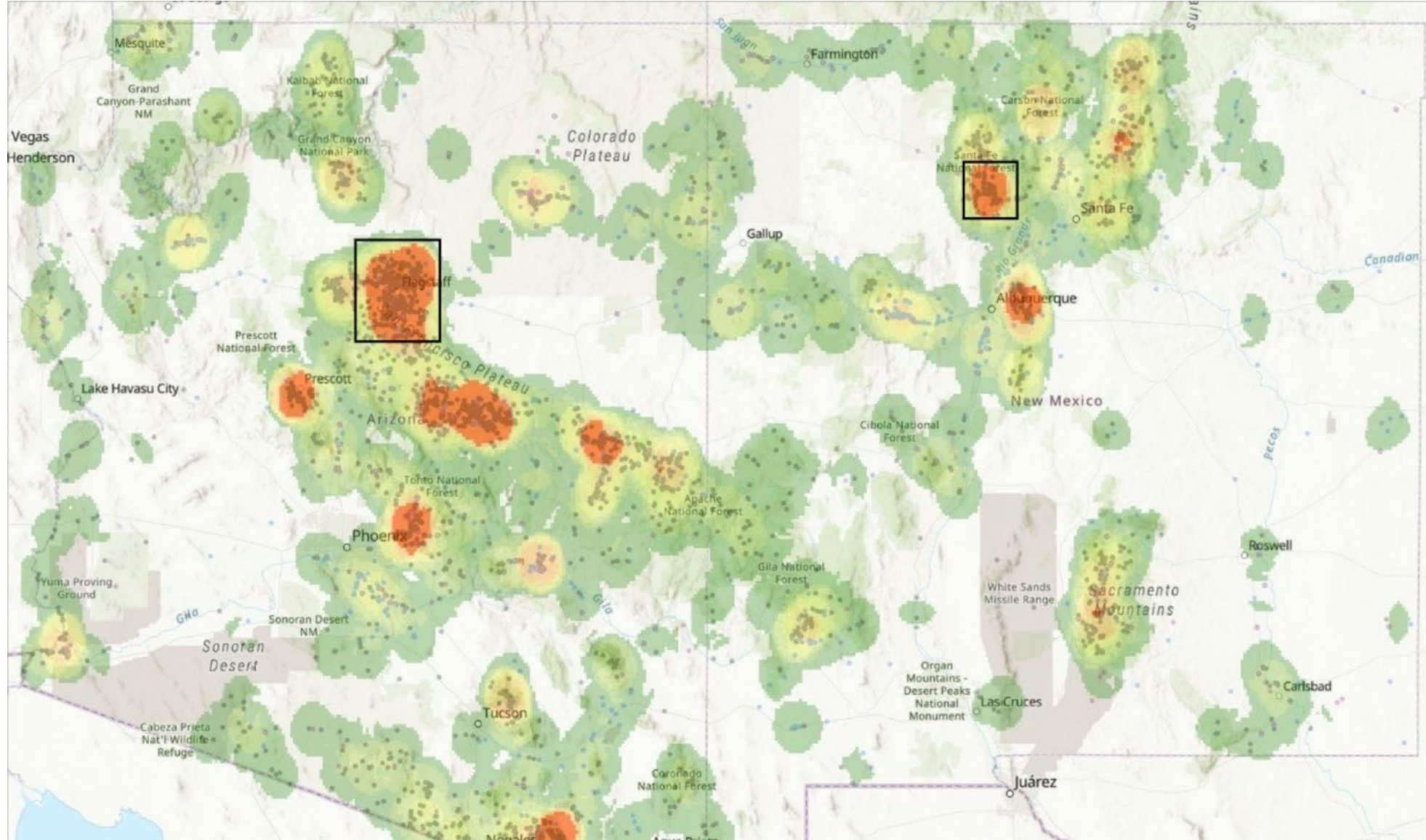
# Objective 2: Assess the current state of public and manager knowledge about wildfire prevention strategies

- Intercept surveys of public lands users at 3 ignition hotspots (summer 2022)
- Interviews with fire prevention experts (winter 2022)
- Case studies (summer 2023-2024)
  - Prevention programs and interventions
  - Ignition hotspots





# Survey locations

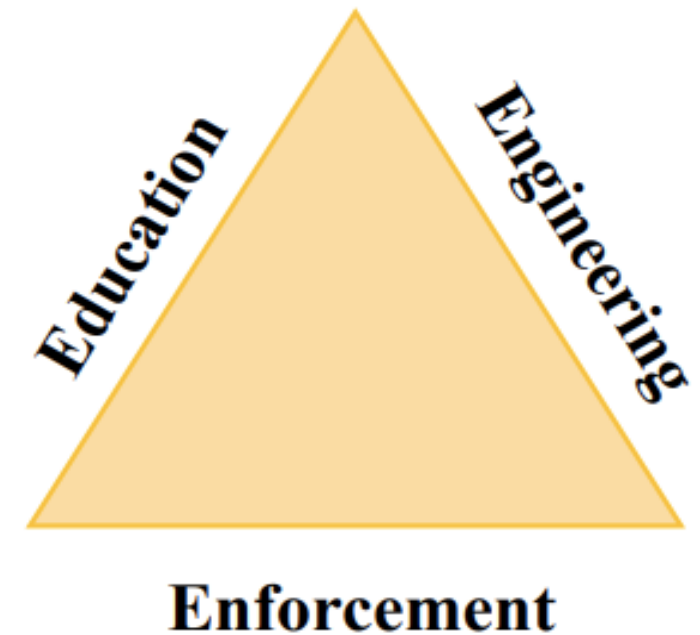




# Survey design

**Goal:** Assess how public land users influence wildfire prevention

1. Experience on public lands
2. Preparation and information seeking behaviors
3. Perceptions of effectiveness of prevention strategies
4. Acceptability of ignition sources
5. Demographics





# Why intercept surveys?

- Target participants were public land users
- In-person surveys gave us the highest response rate
- Track conditions in real time
- Adaptability





# Data collection

- Study subjects → public land users
- Surveyed each location over a 10-day period
- Staged at key areas
- Mixed mode – In person, online, mail-in





# Who responded?

## Jemez Ranger District

→ 305 respondents

- 54% male, 45% female, 1% non-binary or other
- Average age – 44 years old

## Flagstaff Ranger District

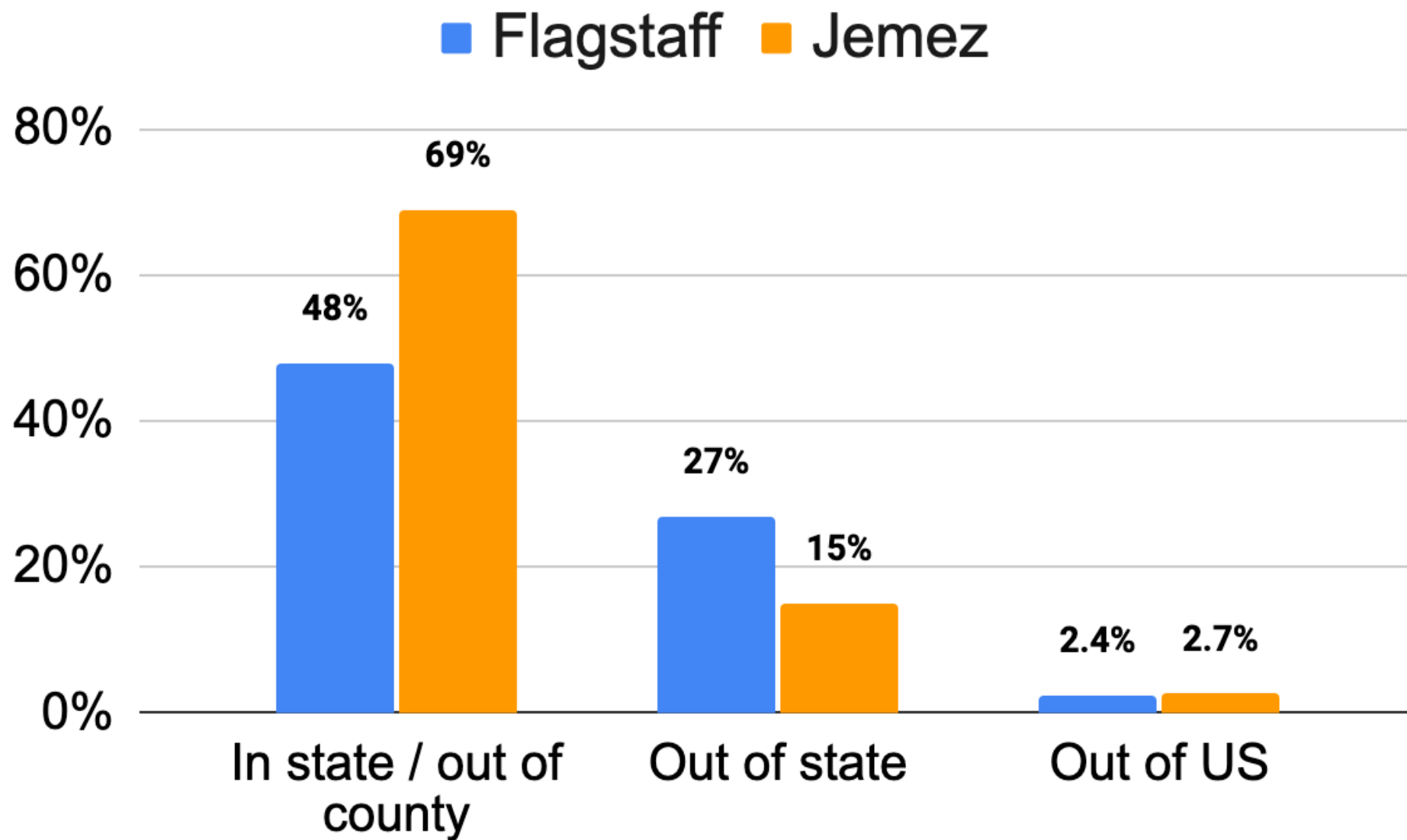
→ 324 respondents

- 52% male, 47% female, less than 1% non-binary or other
- Average age – 47 years old

**629** total respondents



## Zip Code Analysis





# Jemez - Fire related information accessed

Information	Before trip	During trip	Did not access
Fire danger or red flag warnings	48%	18%	27%
Forest closures	46%	12%	24%
Fire restrictions	43%	15%	32%
Campfire bans	37%	15%	35%



# Flagstaff - Fire related information accessed

Information	Before trip	During trip	Did not access
Fire danger or red flag warnings	46%	24%	31%
Fire restrictions	38%	19%	36%
Campfire bans	36%	17%	39%
Forest closures	38%	16%	38%



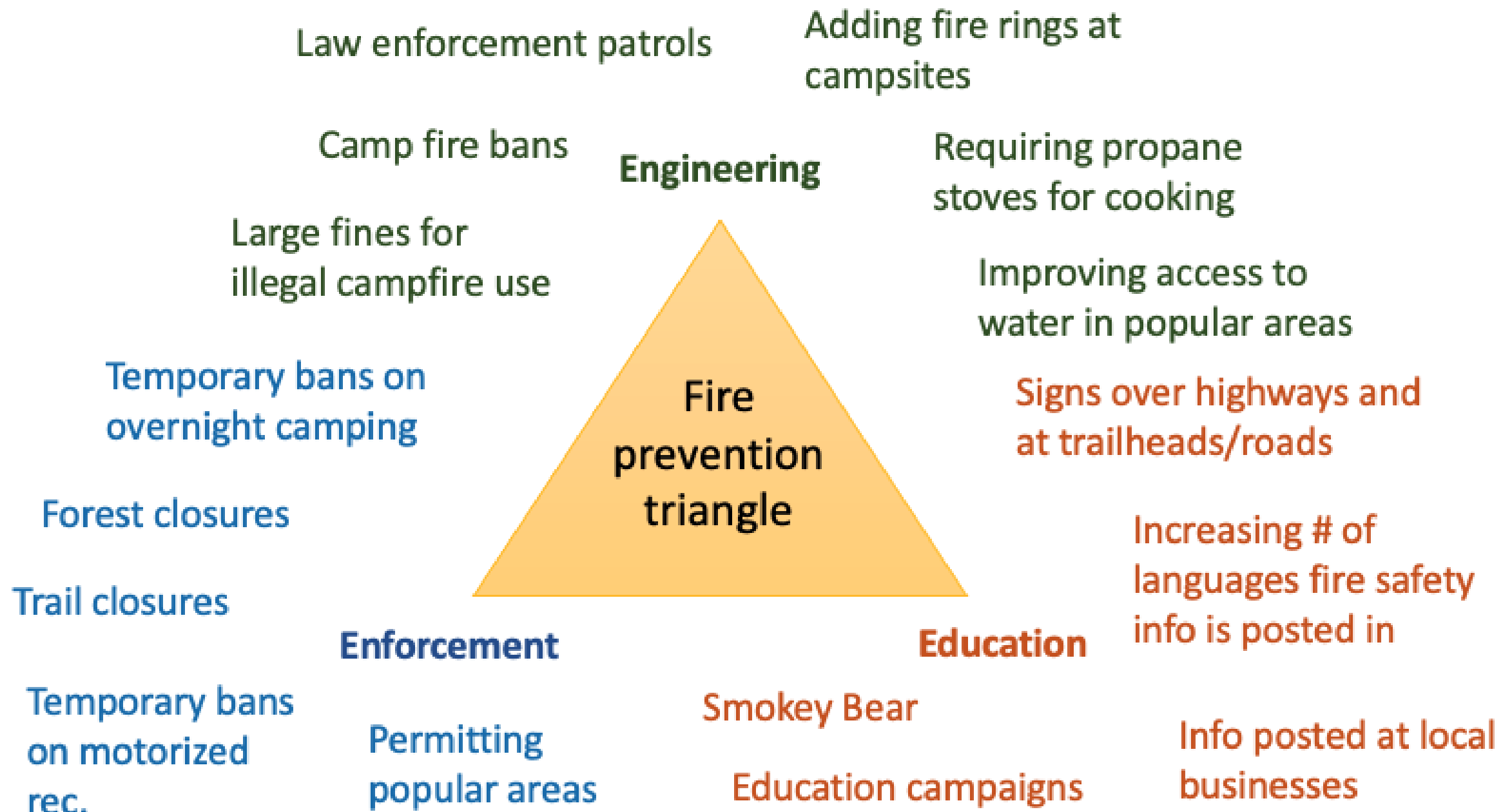
# Perceptions of prevention strategies

Intervention	All	Flagstaff	Jemez
Signs over highways and on roads or trails	92	91	93
Campfire bans	88	90	86
<b>Ensuring developed campsites include established fire rings</b>	<b>88</b>	<b>83</b>	<b>94</b>
Education campaigns	84	81	88
Law enforcement patrols	84	83	85



Intervention	All	Flagstaff	Jemez
Large fines for illegal campfire use	83	80	88
Requiring the use of propane stoves for cooking instead of campfires	82	83	81
Forest closures	80	83	77
Temporary bans on overnight camping	77	77	77
<b>Improved access to water in popular areas</b>	<b>77</b>	<b>69</b>	<b>85</b>







# Personal accountability

**92%** believe that visitors are responsible for every fire they ignite

**95%** believe they know how to mitigate their own ignition risk

**87%** said they would report someone being irresponsible with fire

**Of the respondents having a campfire:**

- 67% reported having a **shovel**
- 83% reported having at least **5 gallons of spare water**



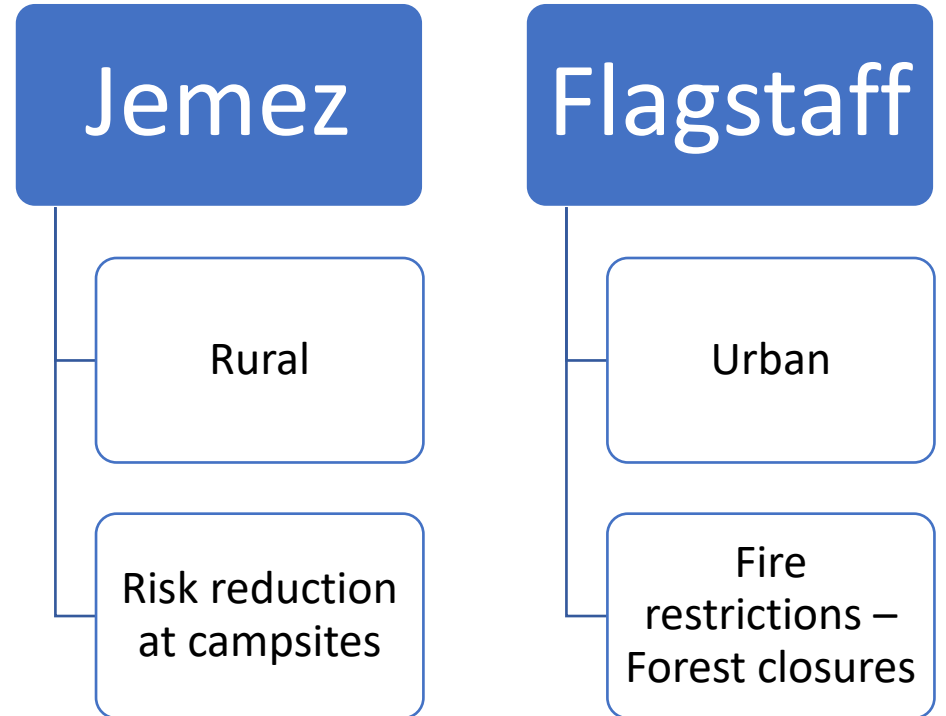
# Visitation under these conditions...

Condition	Percent unlikely to visit		
	All	Flagstaff	Jemez
Active wildfire burning in the area	82	76	87
Smoke in the area	77	74	80
Forest closure	74	66	83
Red flag warning	37	31	42
Campfire ban	16	13	19



# Takeaways

- Highly supported interventions vary depending on **majority user type and community type**
- **Clear communication** of processes and barriers of fire restriction implementation may help expectation management





# Takeaways

- Finding ways to promote relevant information on **fire risk and related restrictions while visitors are recreating** is essential
- **Intended visitation** is impacted by wildfire activity and restrictions, potential impacts to local economy





# Coming soon: Deep dives into varied contexts for human-caused fires

- Interviews with fire prevention specialists and adjacent positions across the Southwest
  - Your concerns, challenges, opportunities
- Case studies of programs, policies, and other interventions to reduce human-caused fires in AZ and NM





# How can you get involved?

- Forthcoming interviews
- Got an interesting case study or ignition head scratchers?  
Let us know and we can study it!
- Materials for further reading
  - One pagers





# Questions?

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