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

Supported by the Joint Fire Science Program (JFSP)

Principal Investigator: Dr. Catrin Edgeley, School of Forestry, Northern Arizona University Co-PIs: Dr. Alexander Evans, The Forest Stewards Guild; Gabe Kohler, The Forest Stewards Guild; Liz Bailey; The Forest Stewards Guild; Sarah Devenport, Northern Arizona University

## Our team



#### **Forest Stewards Guild**





#### **Northern Arizona University**

#### Cat Edgeley



Gabe Kohler



#### Sarah Devenport



Liz Bailey



# Forest Stewards

## The Las Conchas Wildfire



## The Wallow Fire



## **Prevention Tailored to Local Needs**





## **Prevention Tailored to Local Needs**





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 arcs, aued severe flooding, and converted ponderosa pine forests to shrub fields, perhaps forever. Although lighting causes many wildfires in the Southvest, human ignitions are a significant risk. 10216, wildfires grinted phytumas 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.





 In New Mexico, human-caused wildfire accounted for half of the acres burned by wildfire since 2001
 Abandoned campfires account for 44% of the human-caused wildfires since 2001 and 37 percent of the acres burned by

these fires. • Electrical power lines are a significant cause of wildfires. In New Mexico, three major wildfires in the last decade were all caused by electrical lines, including the Las Conchas fire, which cost

- more than one billion dollars to control. • More knowledge about the spatial patterns of human ignitions presents the opportunity for targeted outreach and education, which is a cost-effective way to reduce wildfire impacts.
- In New Mexico 80 percent of wildfires started by campfires are within a quarter mile of a road.
  Hotspot modeling to identify areas of high arson potential can
- help law enforcement reduce wildfire threats. Currently, federal agency budgets for prevention programs do not reflect their importance.
- The National Wildfire Prevention Program only has an annual budget of \$95,000 and one full-time staff person for the whole country to help coordinate awareness efforts.
- Research has shown that wildfire damages can be as much as 35 times greater than the cost of prevention education.
- Public awareness campaigns, such as Smokey Bear and the more recent One Less Spark, seek to change behaviors, but
- there is little information about their effectiveness.
   The most recent investigation into the effectiveness of wildfire prevention signs was more than 40 years ago.

To view the full report please visit **www.foreststewardsguild.org/publications** 

Forest Stewards<br/>O Guild<br/>March 2018Increasing Wildfire<br/>Awareness and Reducing<br/>Human-Caused Ignitions<br/>in Northern New Mexico



#### Human Ignitions and Fire Prevention Awareness



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

**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/R DS-2013-0009.5

## Missing / not specified / undetermined cause fires

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



All missing / not specified / undetermined fires 2005-2018

## Natural fires

All natural caused fires 2005-2018

Primarily occurring in forested areas & unpopulated grasslands



- Would be expected in populated areas, roads, and recreation areas
- Excluded two sub-cause categories that are outside the scope of this project:
  - power generation / transmission / distribution
  - railroad operations & maintenance



















![](_page_25_Figure_1.jpeg)

![](_page_26_Figure_1.jpeg)

![](_page_27_Figure_1.jpeg)

![](_page_28_Figure_1.jpeg)

![](_page_29_Figure_1.jpeg)

## All human-caused fires 2005-2018

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

![](_page_30_Picture_2.jpeg)

## 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

• Point density spatial analyst tool on ArcGIS Pro

#### Point density "hot spots" for all large (>100 acres) human-caused fires

![](_page_34_Figure_1.jpeg)

#### Point density "hot spots" for >25-acres human-caused fires

![](_page_35_Figure_1.jpeg)

#### Point density "hot spots" for >10-acres human-caused fires

![](_page_36_Figure_1.jpeg)

#### Point density "hot spots" for all human-caused fires (no size exclusion)

![](_page_37_Figure_1.jpeg)

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

![](_page_38_Figure_1.jpeg)

#### 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 <i>,</i> 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

![](_page_39_Figure_3.jpeg)

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

- Intercept surveys of public lands users at ~4 ignition hotspots (summer 2022)
- Interviews with fire prevention experts (fall 2022)
- Case studies (summer 2023-2024)
  - Prevention programs and interventions
  - Ignition hotspots

![](_page_40_Picture_6.jpeg)

## **Objective 3: Leverage science-management** partnerships

- •Quarterly research advisory group meetings

  - Share research updates
    Capture emergent challenges
- Potential for our research to support the use or further development of WPSAPS
- •Key informant interviews with representatives from the SW Fire Prevention and Information group

![](_page_41_Picture_6.jpeg)

## Questions

Catrin Edgeley, Northern Arizona University <u>catrin.edgeley@nau.edu</u>

Alexander Evans, The Forest Stewards Guild zander@forestguild.org

Gabe Kohler, The Forest Stewards Guild gabe@forestguild.org

Sarah Devenport, Northern Arizona University <u>sarah.devenport@nau.edu</u>

![](_page_42_Picture_5.jpeg)

![](_page_42_Picture_6.jpeg)