



Wildfire Risk in the Chama Basin

Steve Bassett, Dir. Planning & Spatial Analysis
The Nature Conservancy & Rio Grande Water Fund

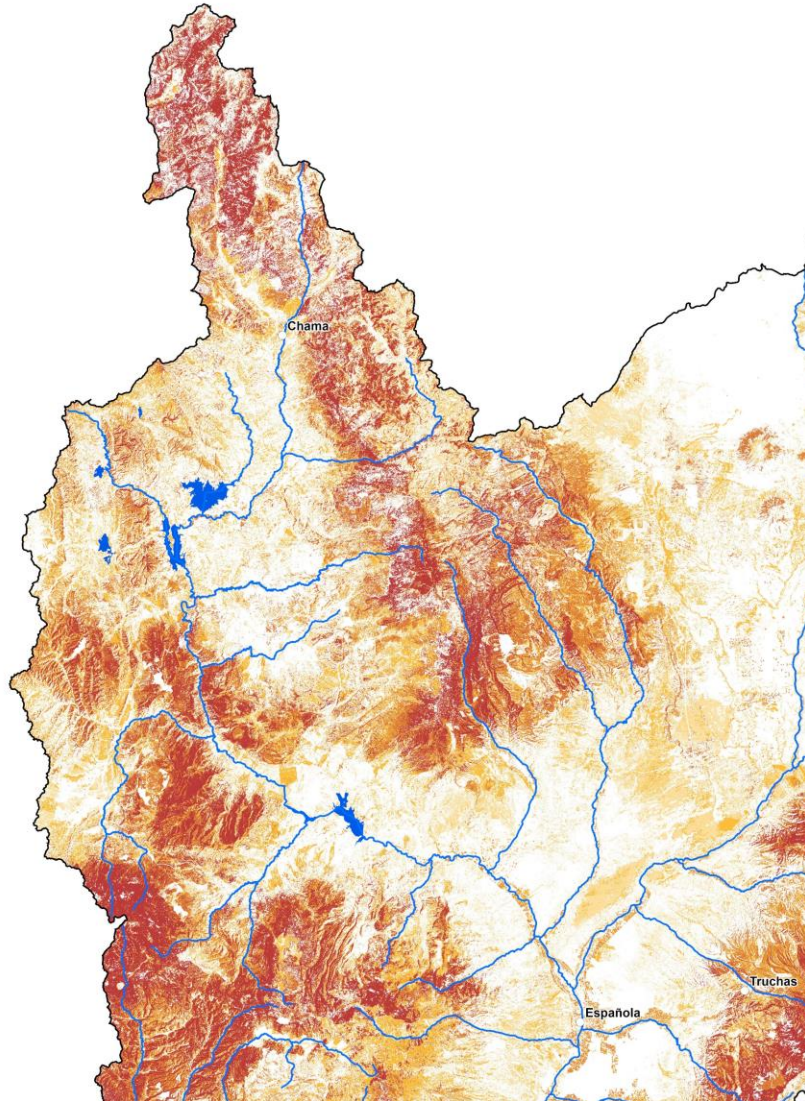
February 25, 2023 — 8th Annual Rio Chama Congreso

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RIO GRANDE **WATER FUND**
A Wildfire and Water Source Protection Project

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Extreme Wildfire Risk in Chama Basin

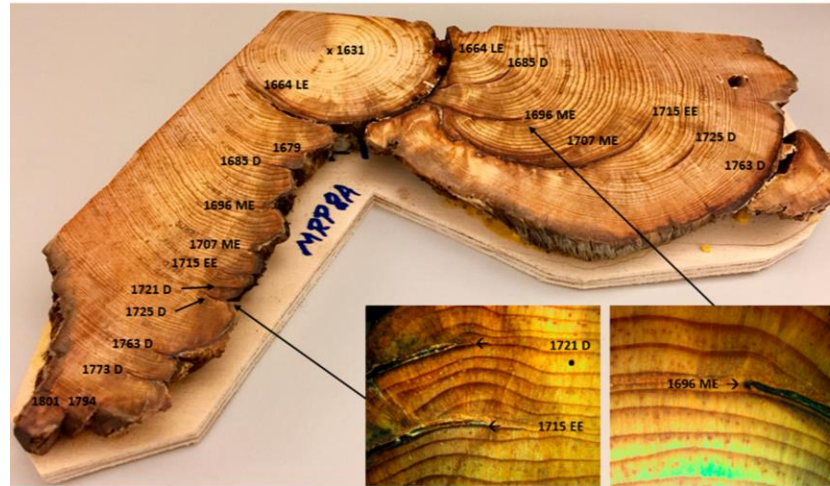


- Wildfire in the Rio Chama Watershed threatens homes, habitat, and water for irrigation and water for our cities.
- Lower annual probability of fire than where Calf Canyon/ Hermits Peak Fire burned,
- Catastrophic damage expected to things we care about when weather conditions allow fire to spread.

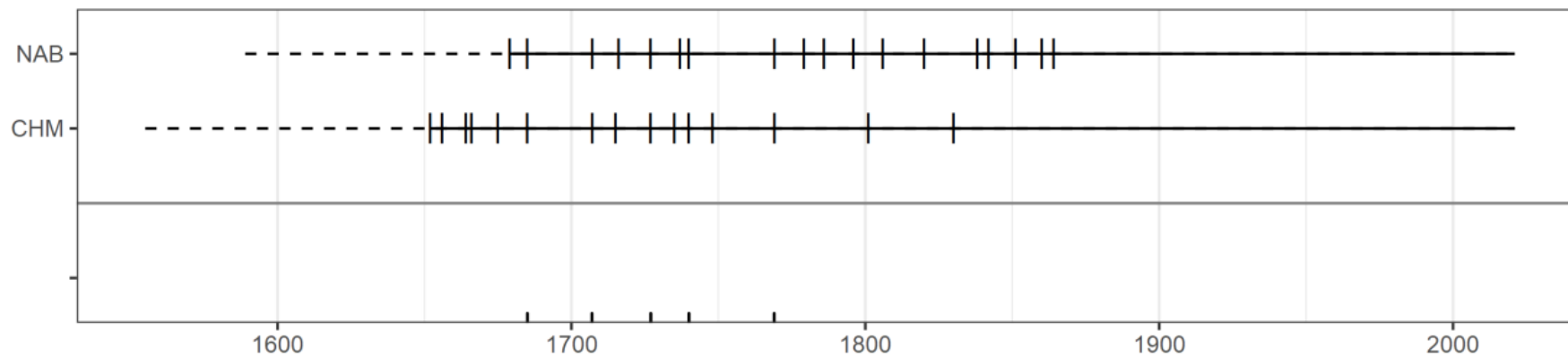
Historical Wildfire Context



Photo by Collin Haffey



Fire-scarred ponderosa pine cross section, Middle Rio Pueblo, Taos Pueblo
<https://doi.org/10.3390/fire2010014> (Johnson and Margolis 2019)

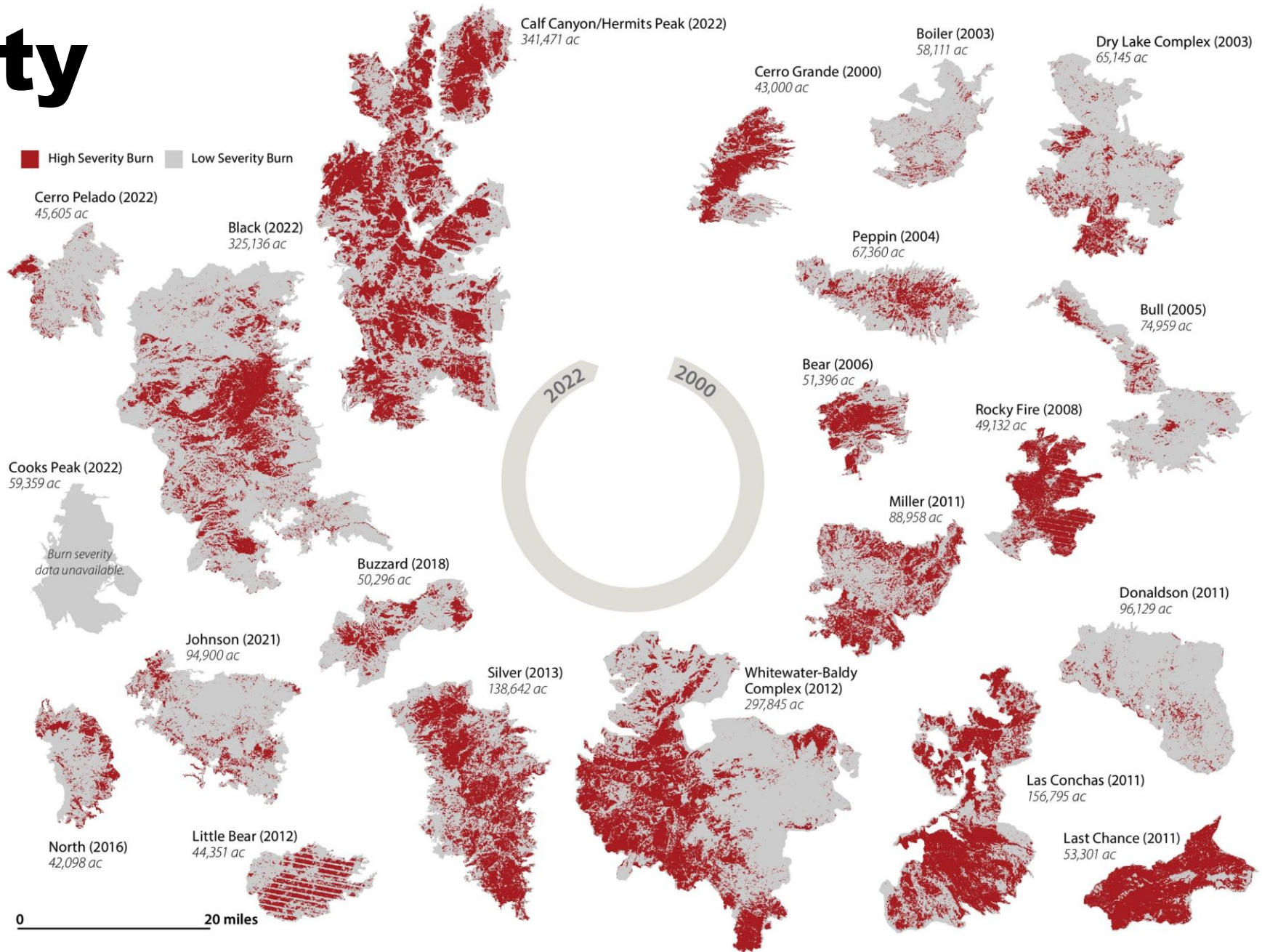


Historical fire occurrence recorded by fire scars (1650–present) in ponderosa pine stumps, Edward Sargent WMA, near Chama.
Fire history of the Edward Sargent Wildlife Management Area, New Mexico (Kasten, Margolis, Fox, & Lopez 2023)

New Reality



Calf Canyon/Hermits Peak Fire 2022
<https://twitter.com/HotshotWake/status/1537528421814771713>



Forest Restoration

- Thin overgrown forests, remove the 150-year buildup of fuels.
- Enables future fires to enhance the landscape instead of destroy it.
 - Proactively addresses this crisis
 - Ecologically sound
 - Scientific consensus
 - Pragmatic



Photo by Mark Scheutz



Lagunita Unit, Cibola NF, Photo by Melissa McLamb



Risk Mapping

- Where does wildfire pose the greatest threat to the things we care about?
- Risk is a function of:
 - Hazard likelihood
 - Hazard intensity
 - Susceptibility of things we care about to the hazard.



Risk Mapping

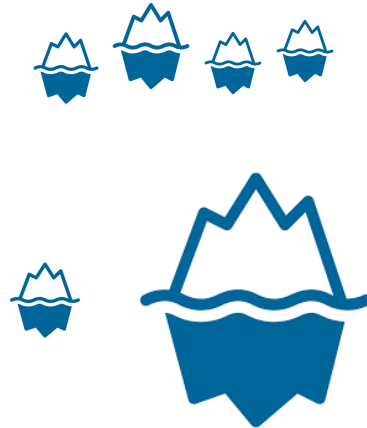
- Where do **icebergs** pose the greatest threat to the things we care about?

- Risk is a function of:

Hazard likelihood

Hazard intensity

Susceptibility of things we care about
to the hazard.



“All models are wrong, some are useful.”

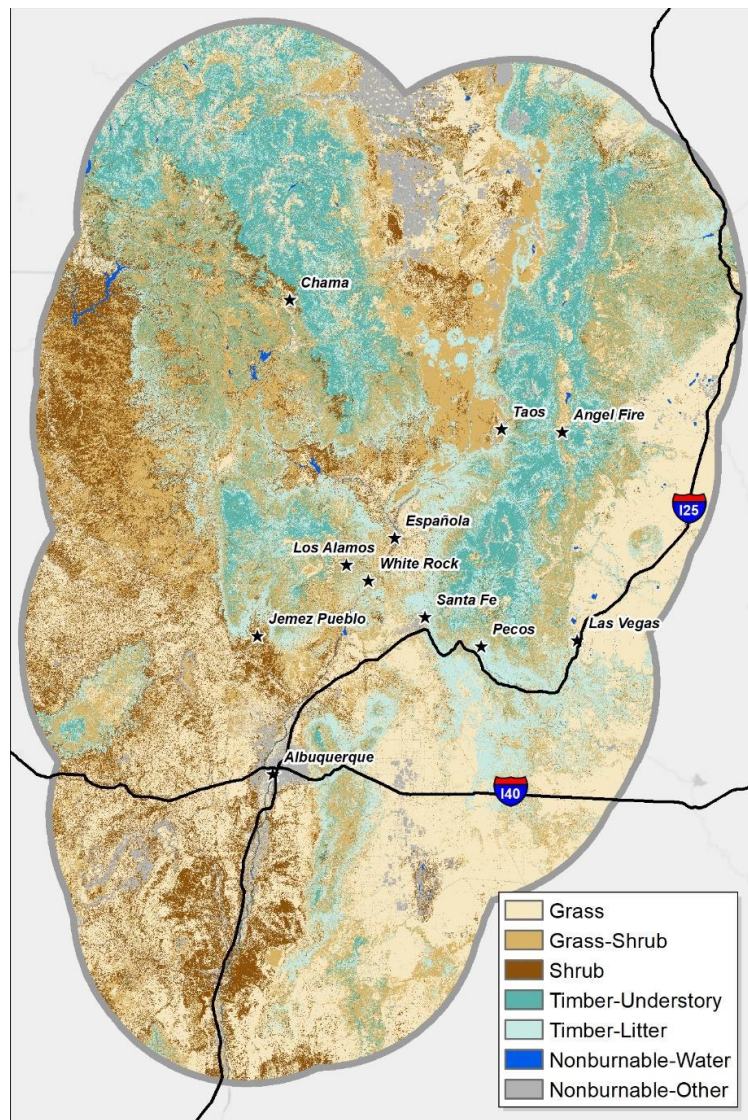
Wildfire Risk Mapping

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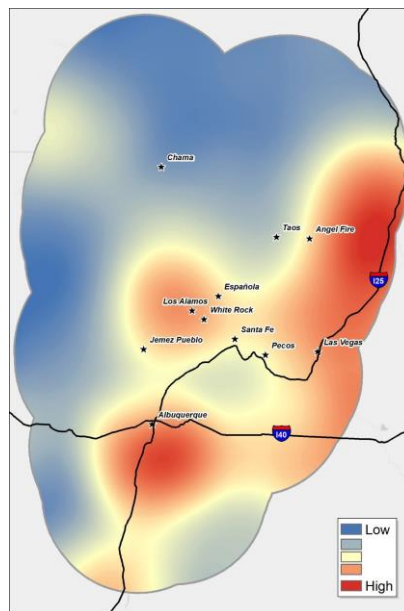


“All models are wrong, some are useful.”

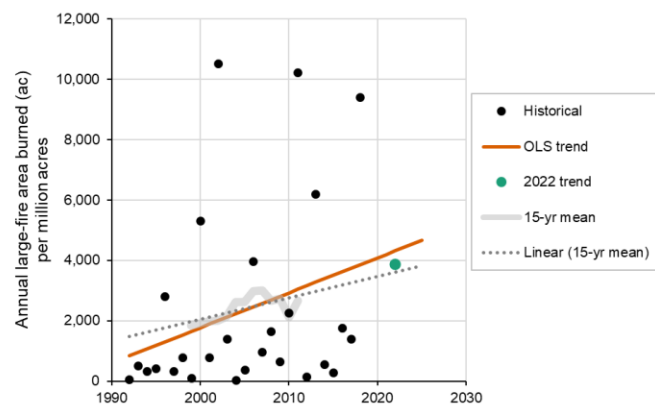
Hazard Model Inputs



Fuels Data updated through 2021



Historical Ignitions



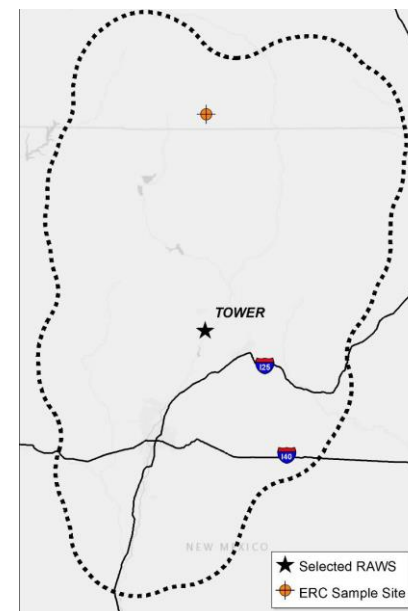
Fire Occurrence Trends

FOA	Mean annual number of large fires	FOA area (M ac)	Mean annual number of large fires per M ac	Mean large-fire size (ac)	Mean annual large-fire area burned (ac)	FOA-mean burn probability
505	10.78	17.6	0.61	6,333	68,284	0.004

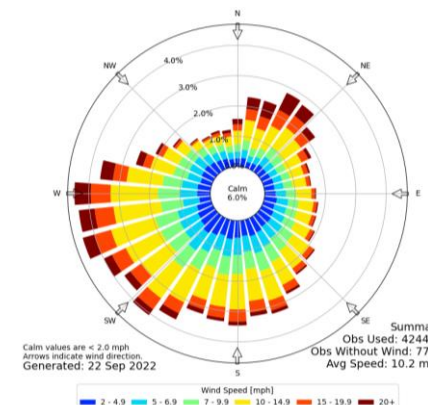
Historical Large Fire Occurrence (>70 acres)

Fuel Model Group	1-hr	10-hr	100-hr	Live-Herb	Live-Woody
Grass / Shrub	5 / 4 / 3	6 / 5 / 4	7 / 6 / 5	60 / 45 / 30	110 / 90 / 70
Timber / Slash	7 / 6 / 5	8 / 7 / 6	9 / 8 / 7	60 / 45 / 30	110 / 90 / 70

Fuel Moisture values for 80th/90th/97th percentile ERCs



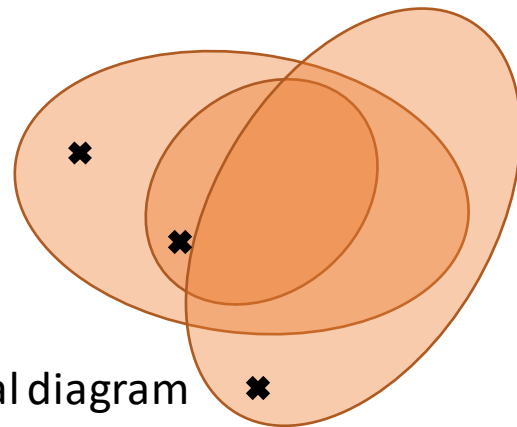
Weather Data 1992-2018



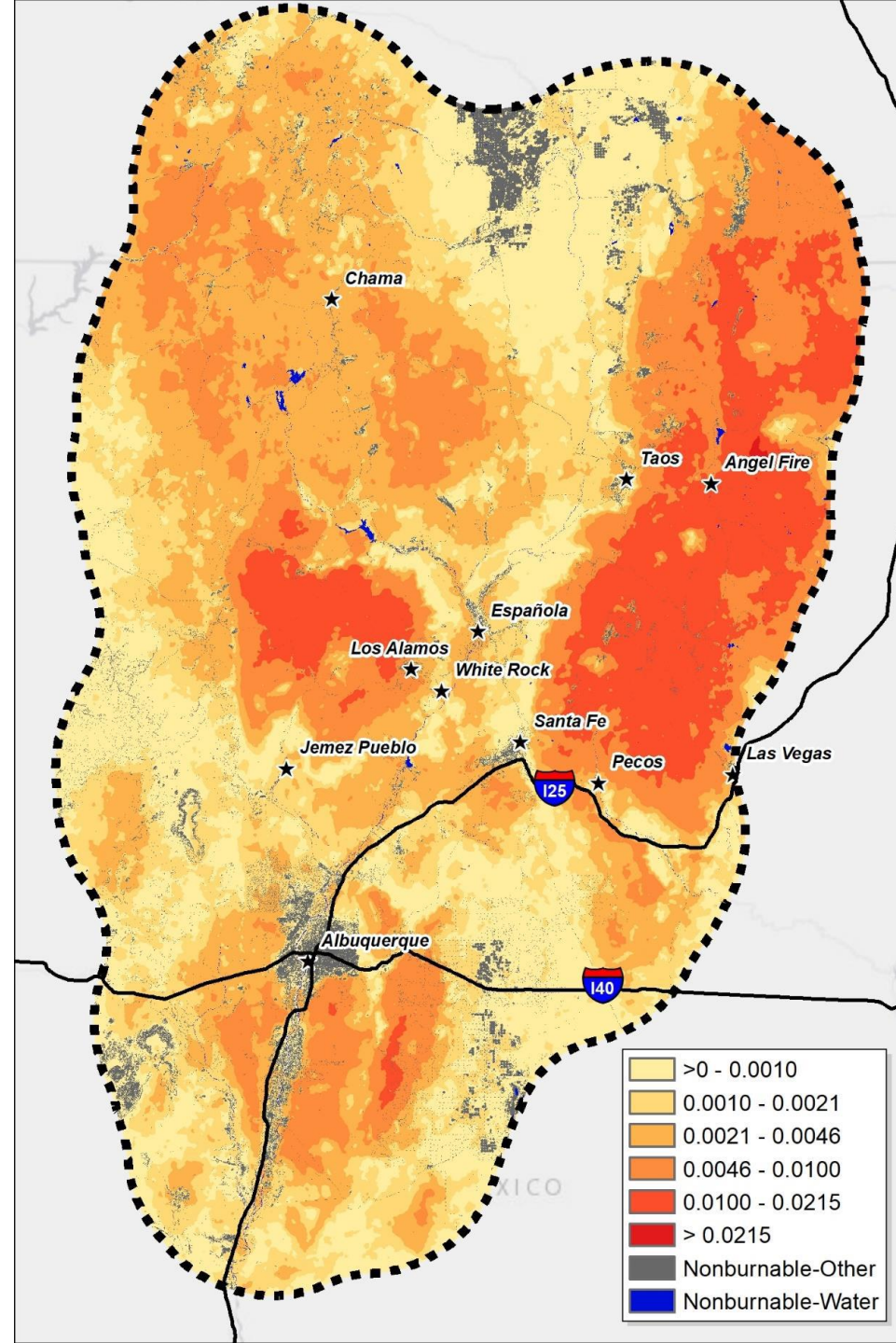
Example Windrose

Burn Probability

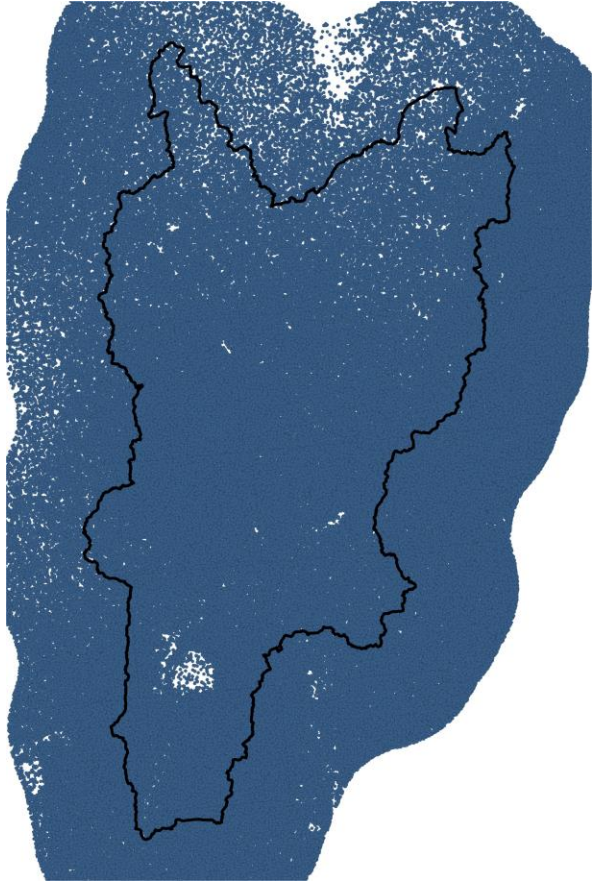
- 10,000 iterations of the next fire season
 - Sum of times burned divided by 10,000 is annual burn probability



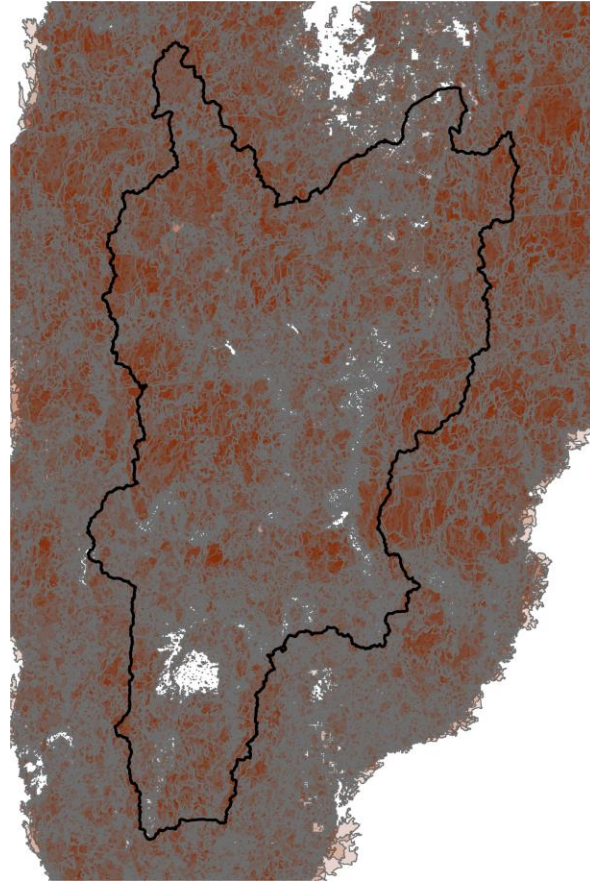
Burn probability conceptual diagram



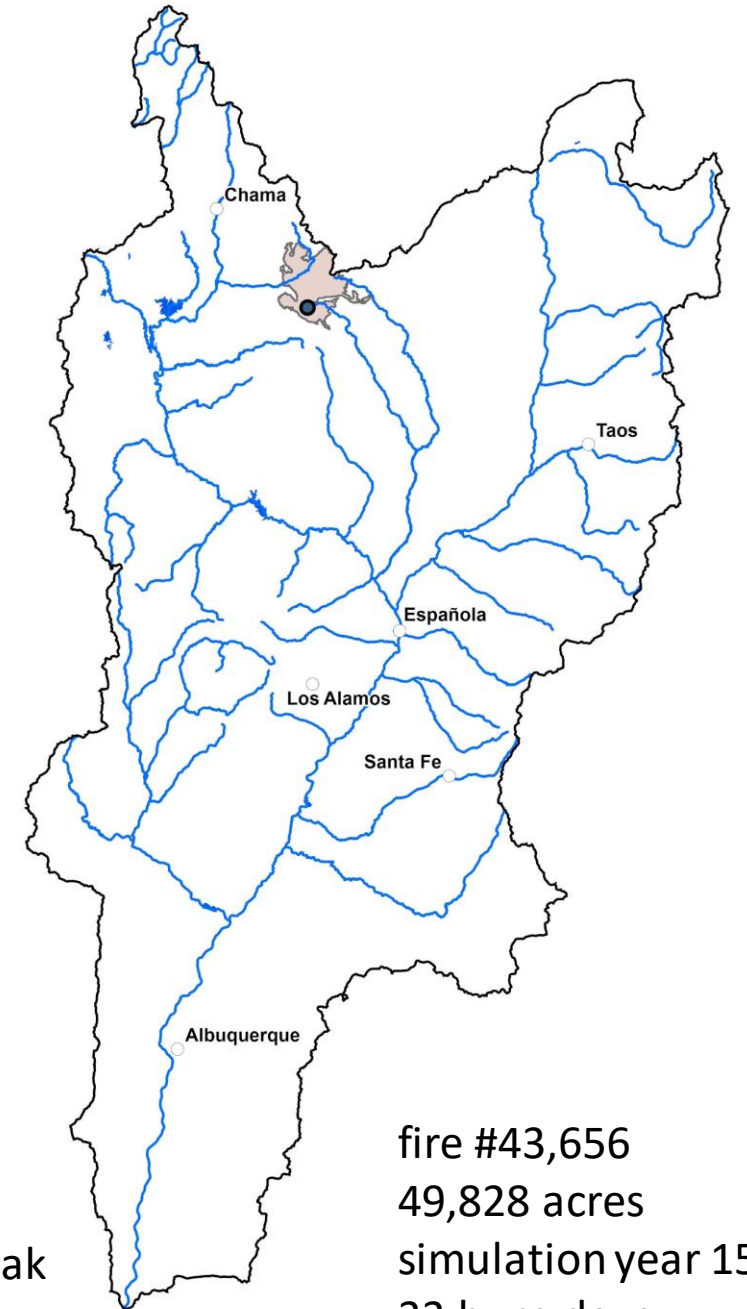
Fire Starts and Perimeters



>290,000 fire starts



84% stay under 1,000 acres
0.3% grow to be >100,000 acres
59 grow larger than Calf Canyon/Hermits Peak
1 exceeds 1M acres



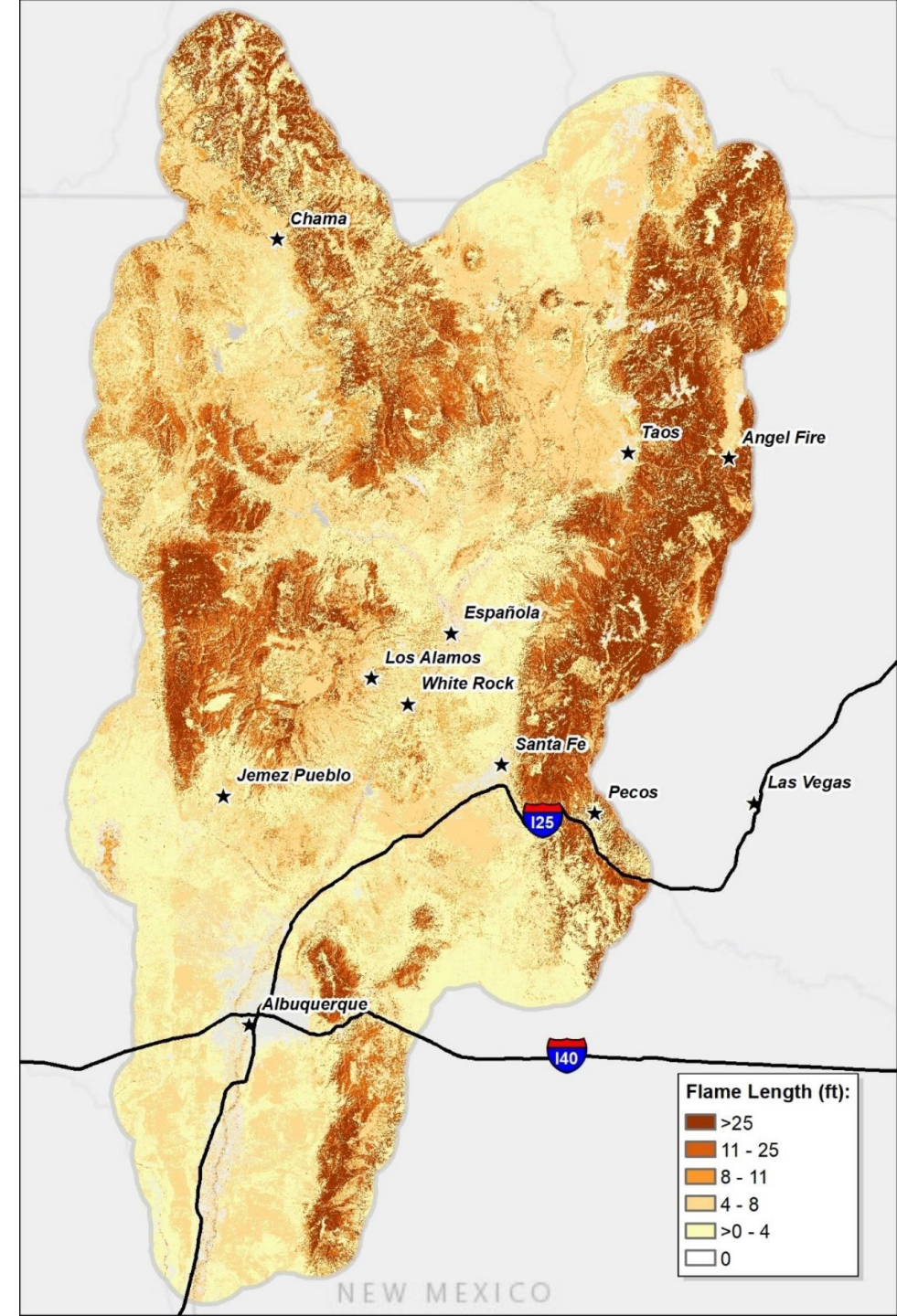
fire #43,656
49,828 acres
simulation year 1510
33 burn days

Fire Intensity

- Flame Length: weighted-average flame length in feet for a given pixel in the fuelscape, including any contribution of crown fire under a given weather type



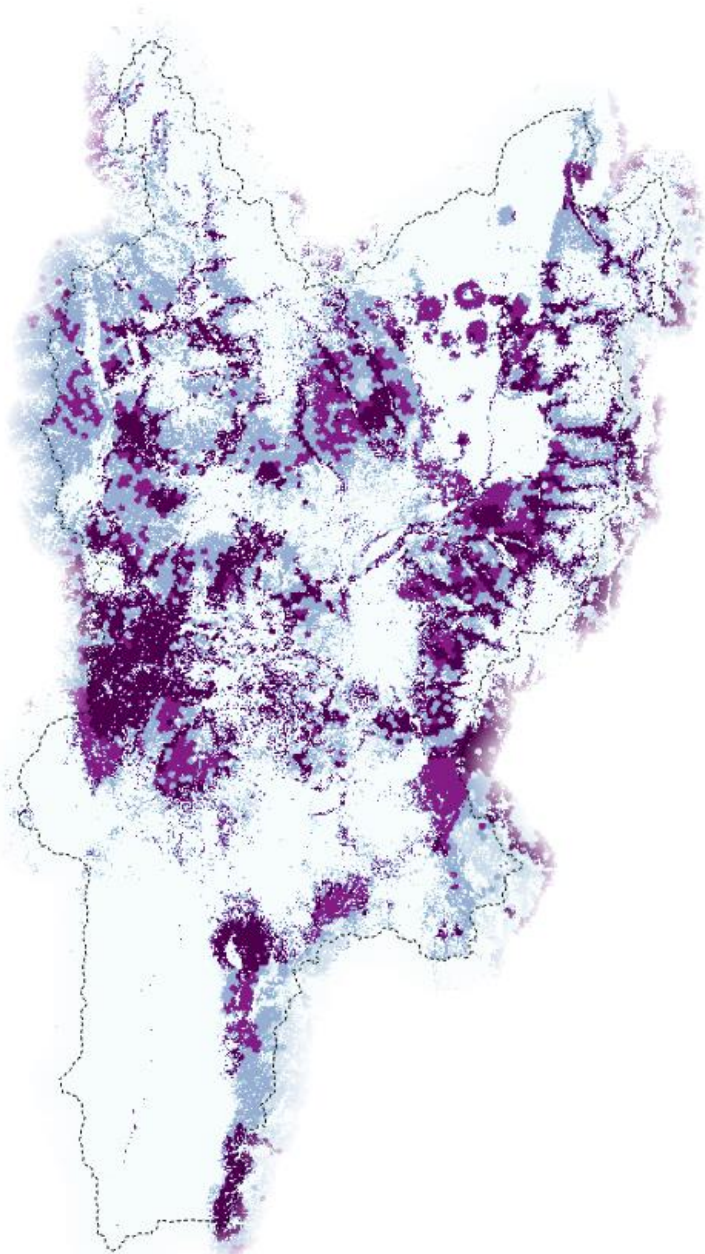
After Gillam 2020 with USFS Photos



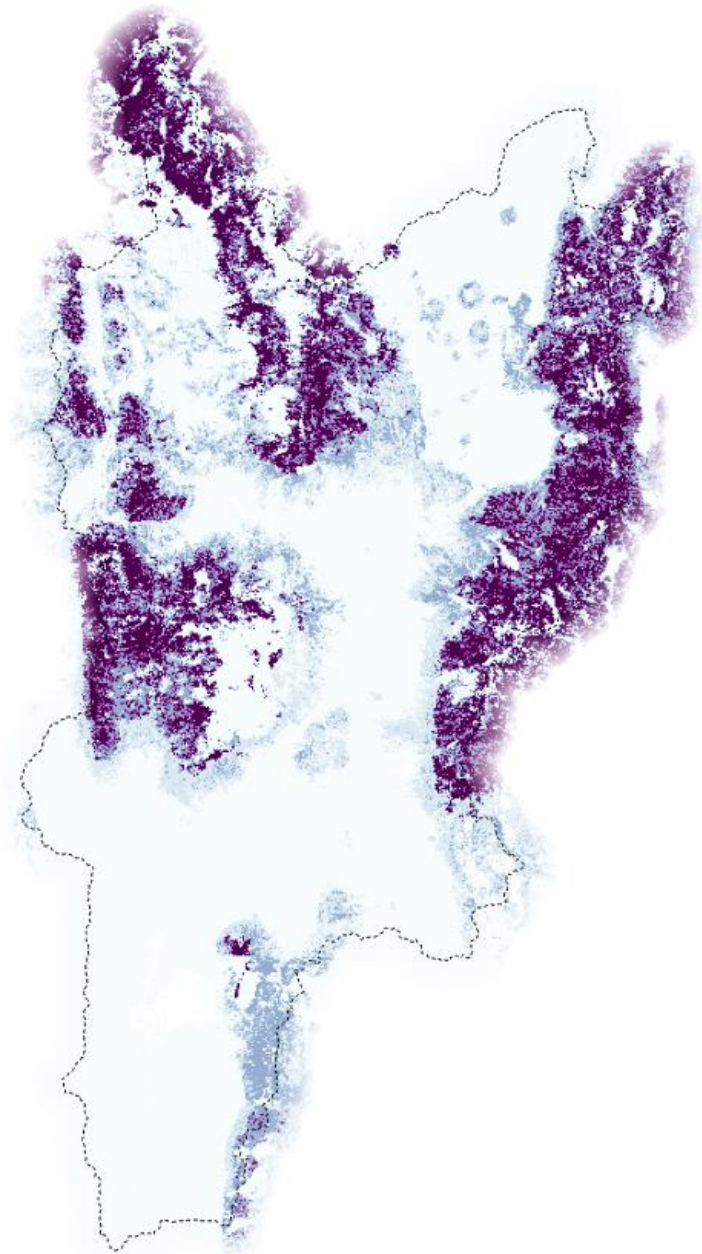
Susceptibility

- Risk to what?
 - Water Provisioning for Irrigation
 - Water Provisioning for Public Water Systems
 - Water Provisioning for Aquatic Ecosystems
 - Debris Flow Mitigation for Water Transmission
 - Terrestrial Ecosystems
 - Terrestrial Habitat
 - Debris Flow Mitigation for Aquatic Habitat
 - Timber
 - Structures
 - Flood Mitigation for Structures

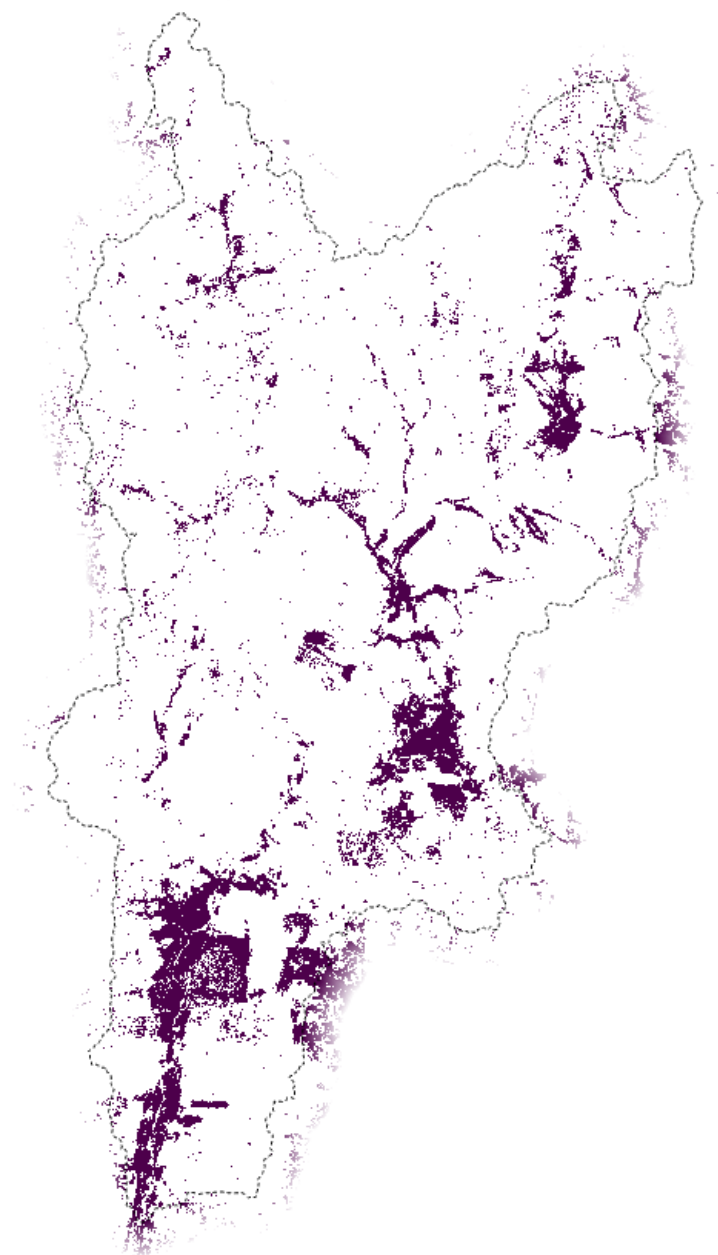




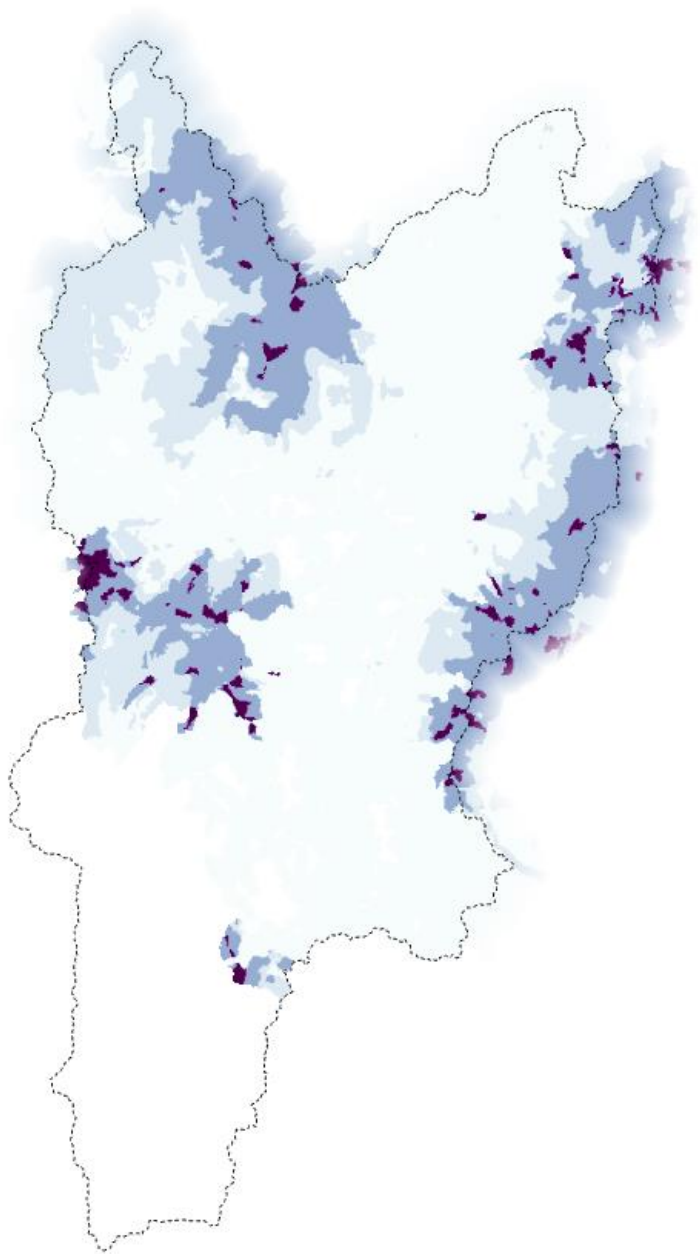
Terrestrial Habitat



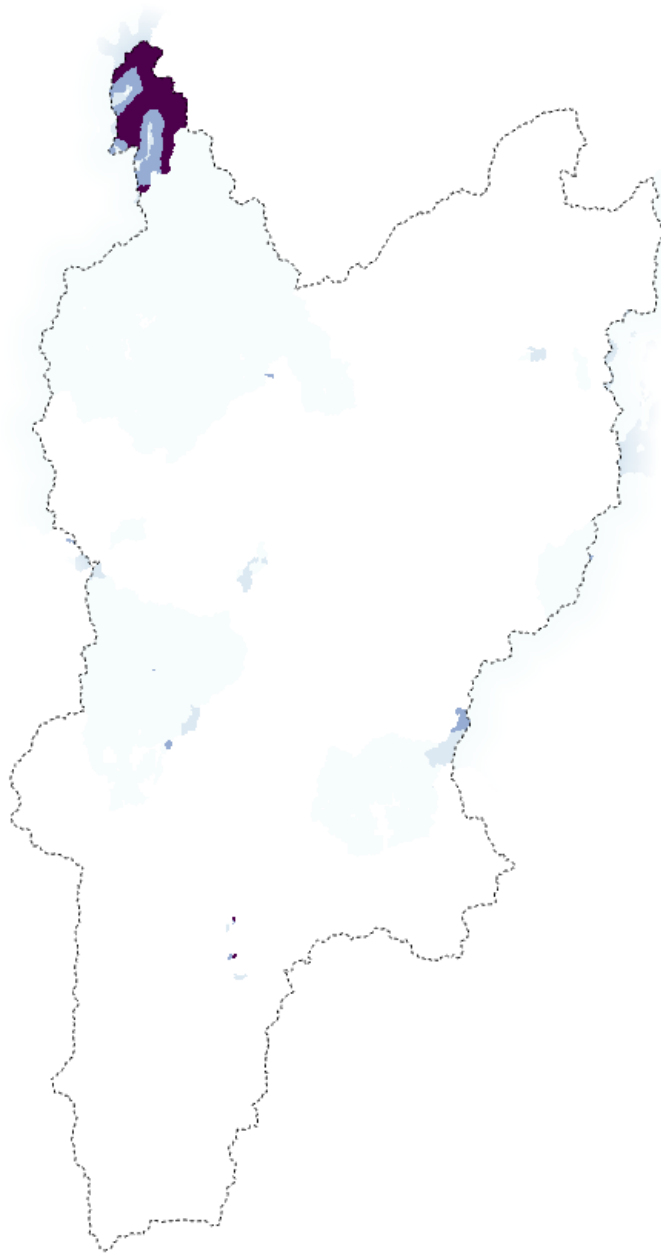
Timber



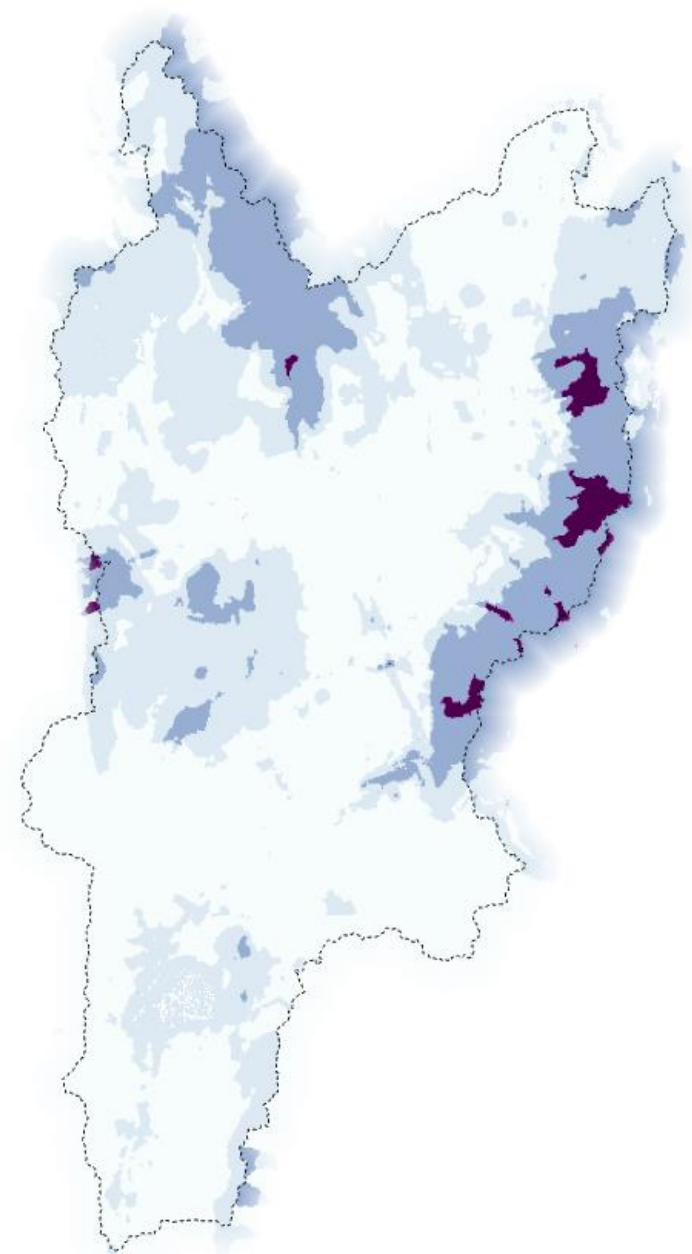
Structures



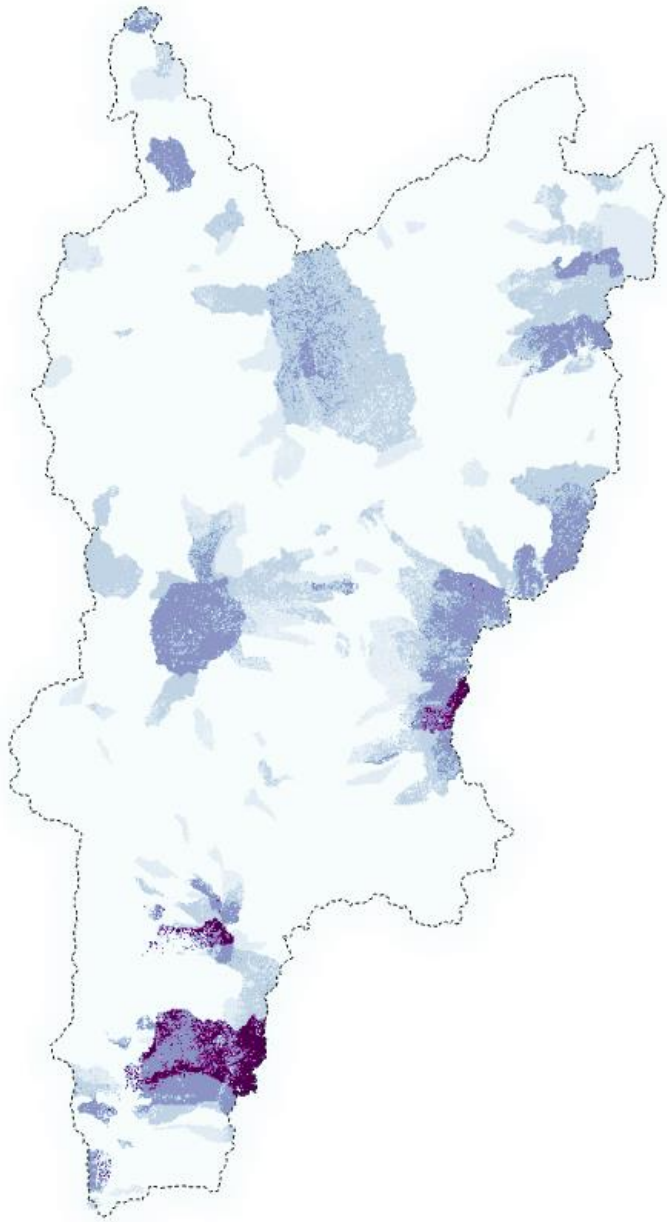
Water Provisioning for Aquatic Ecosystems



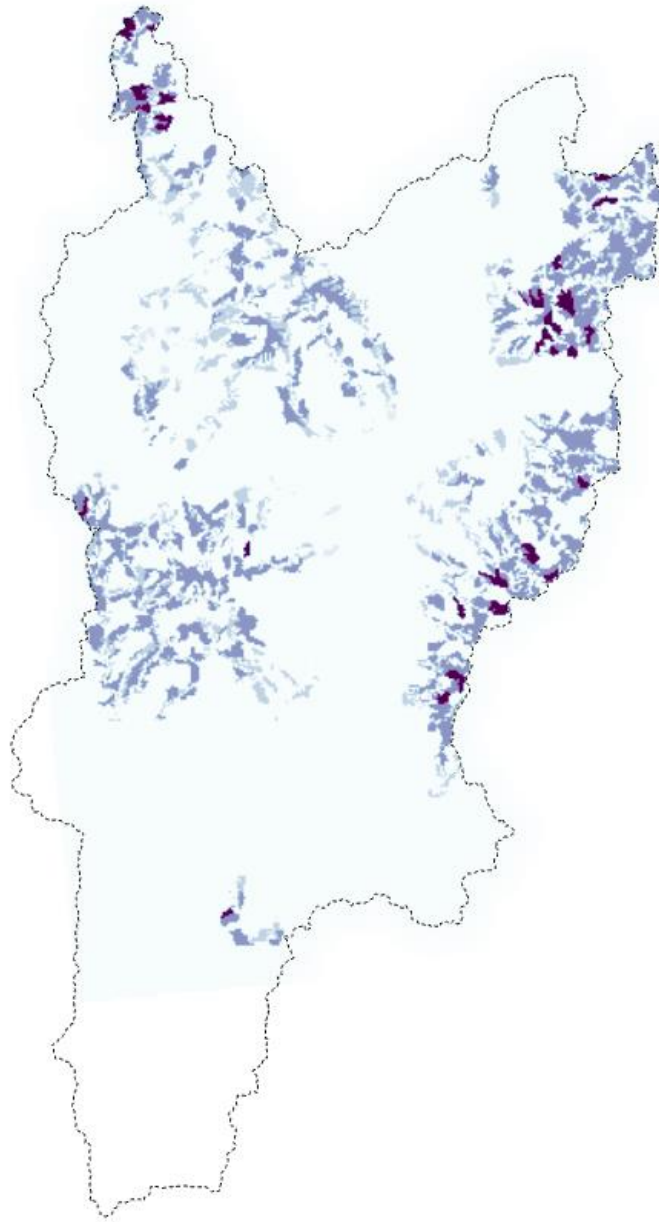
Water Provisioning for Public Water Systems



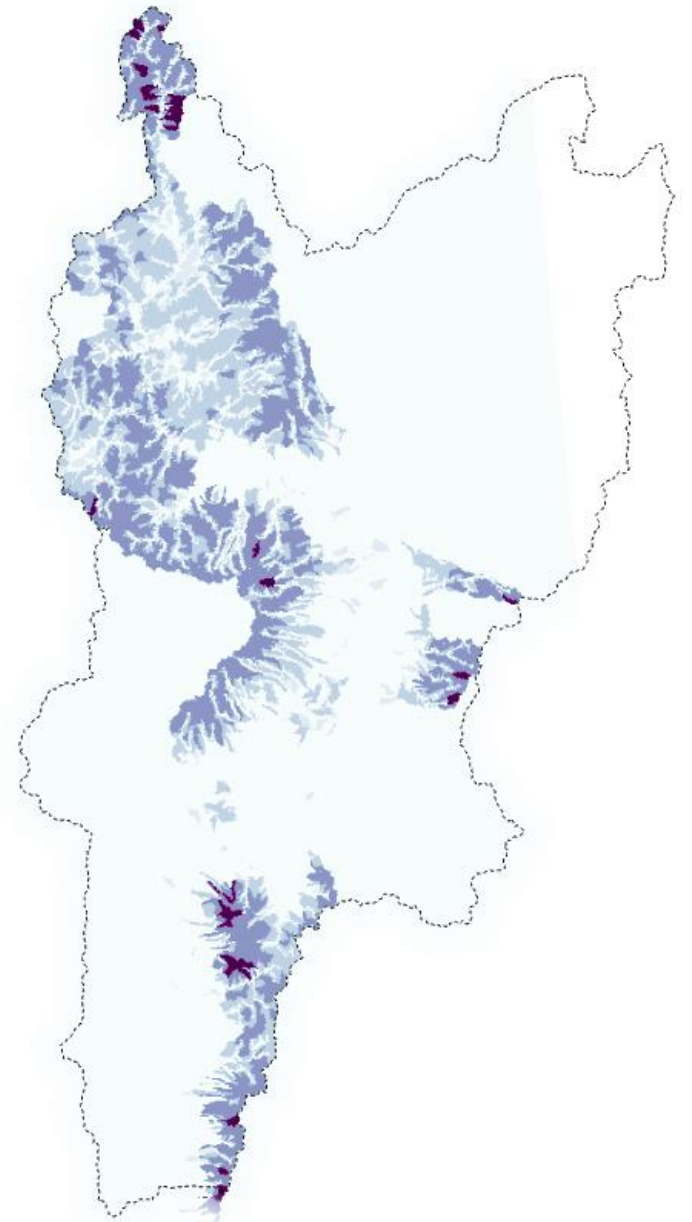
Water Provisioning for Irrigation



Flood Mitigation for Structures



Debris Flow Mitigation for Aquatic Habitat



Debris Flow Mitigation for H2O Trans.

Susceptibility and Relative Importance

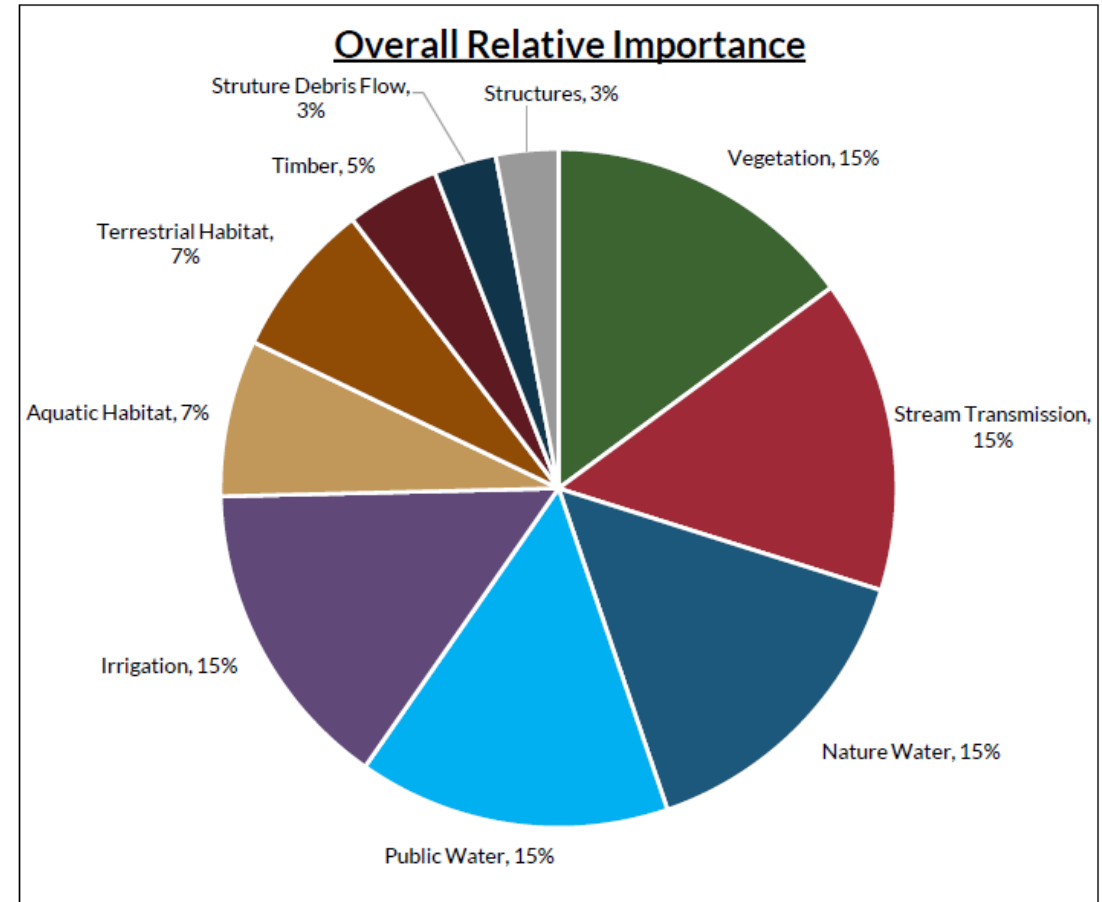
Table 2. Flame-length values corresponding to Fire Intensity Levels used in assigning response functions.

Fire Intensity Level (FIL)	1	2	3	4	5	6
Flame Length Range (feet)	0-2	2-4	4-6	6-8	8-12	12+

Table 3. Response Functions used for Rio Grande Water Fund Wildfire Risk Assessment

HVRA	FIL1	FIL2	FIL3	FIL4	FIL5	FIL6
Irrigation	20	10	0	-20	-40	-60
Public Water	20	10	0	-20	-40	-60
Water for Nature	20	10	0	-20	-40	-60
Stream Transmission	0	0	-20	-40	-60	-80
Vegetation	30	10	0	-30	-60	-90
Terrestrial Habitat	30	10	0	-30	-60	-90
Aquatic Habitat	0	0	-20	-40	-60	-80
Timber	30	10	0	-30	-60	-90
Structures	-20	-30	-50	-70	-80	-95
Structure Debris Flow	0	0	-10	-30	-55	-90

Response Functions

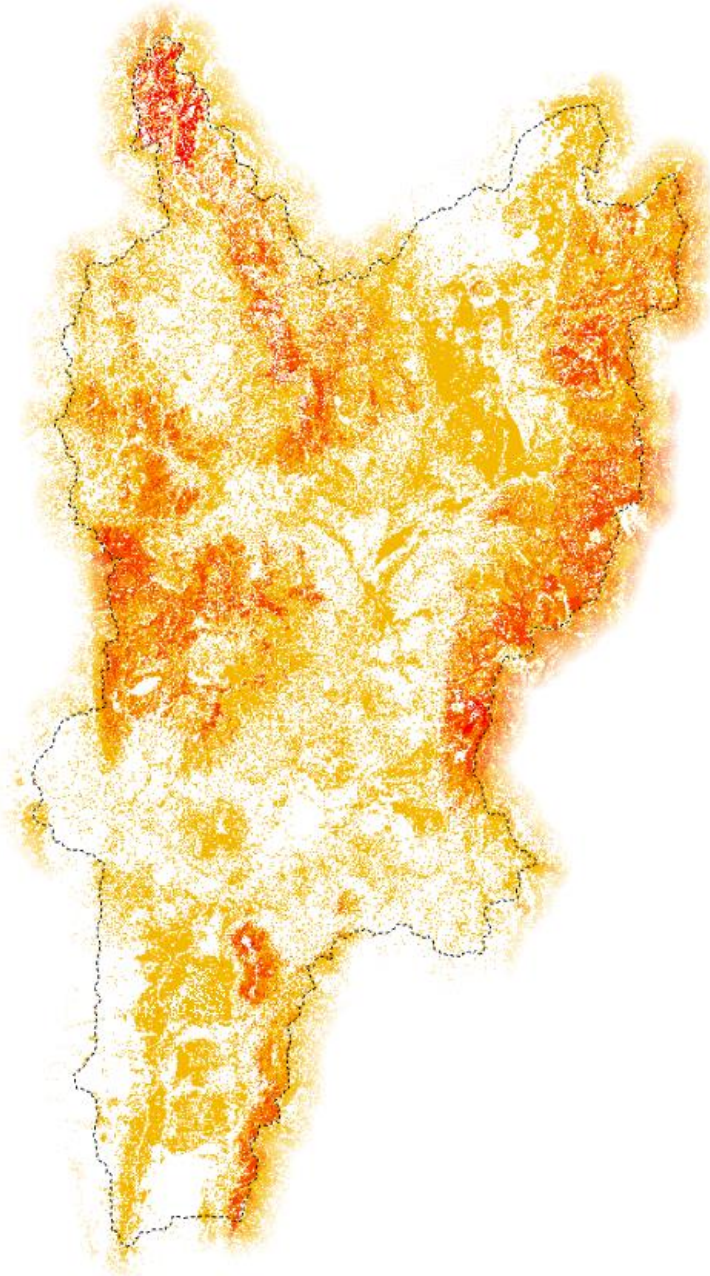


Overall Value

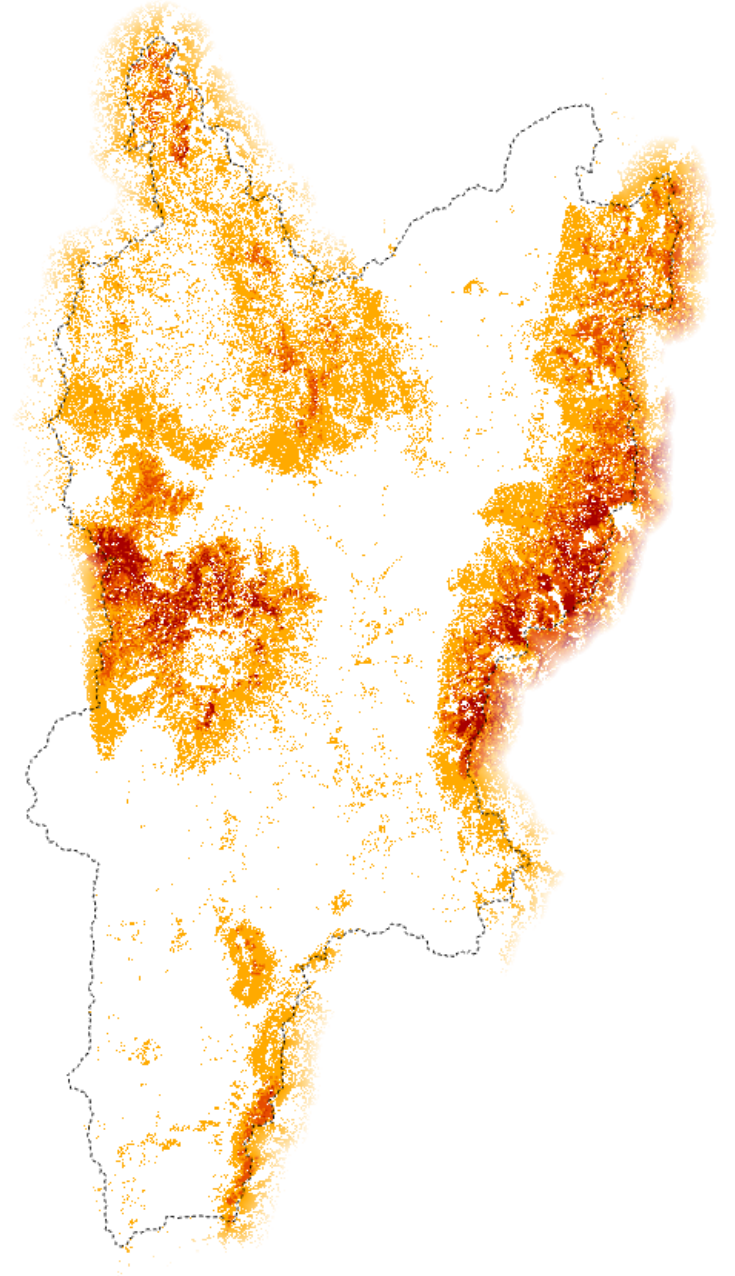
Risk Maps

“Conditional” on fire occurring.

“Expected” adds annual burn probability.

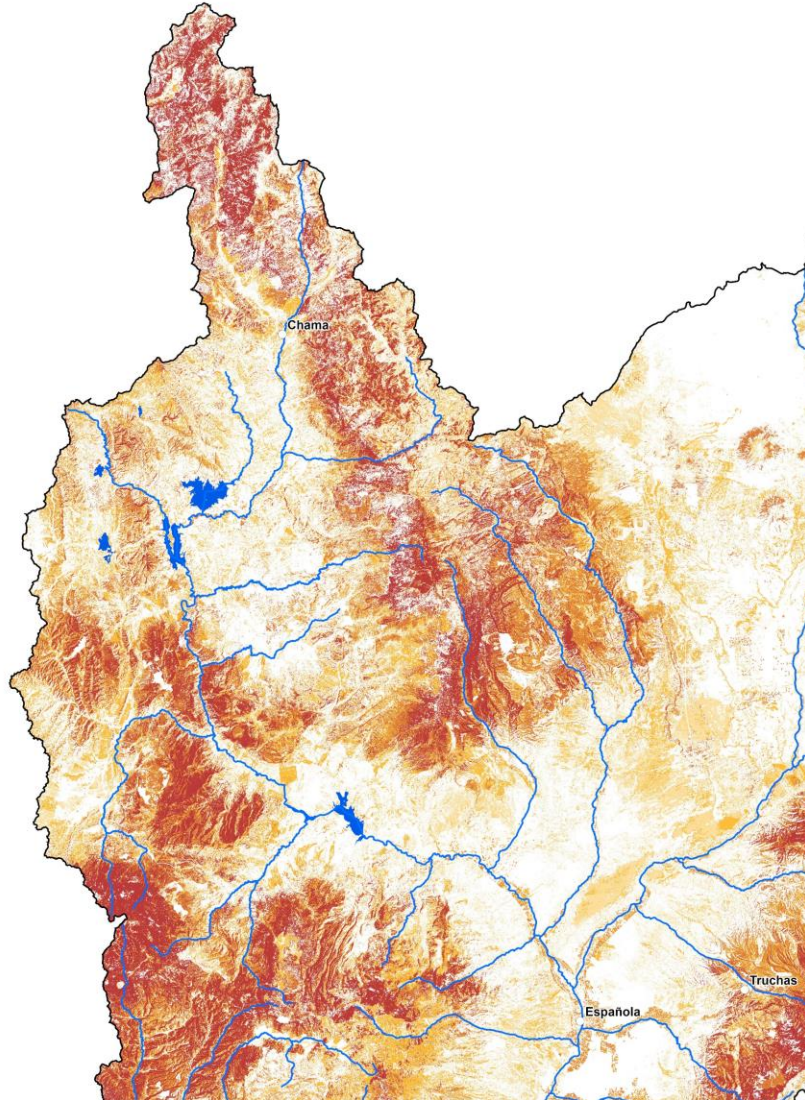


Conditional Net Value Change



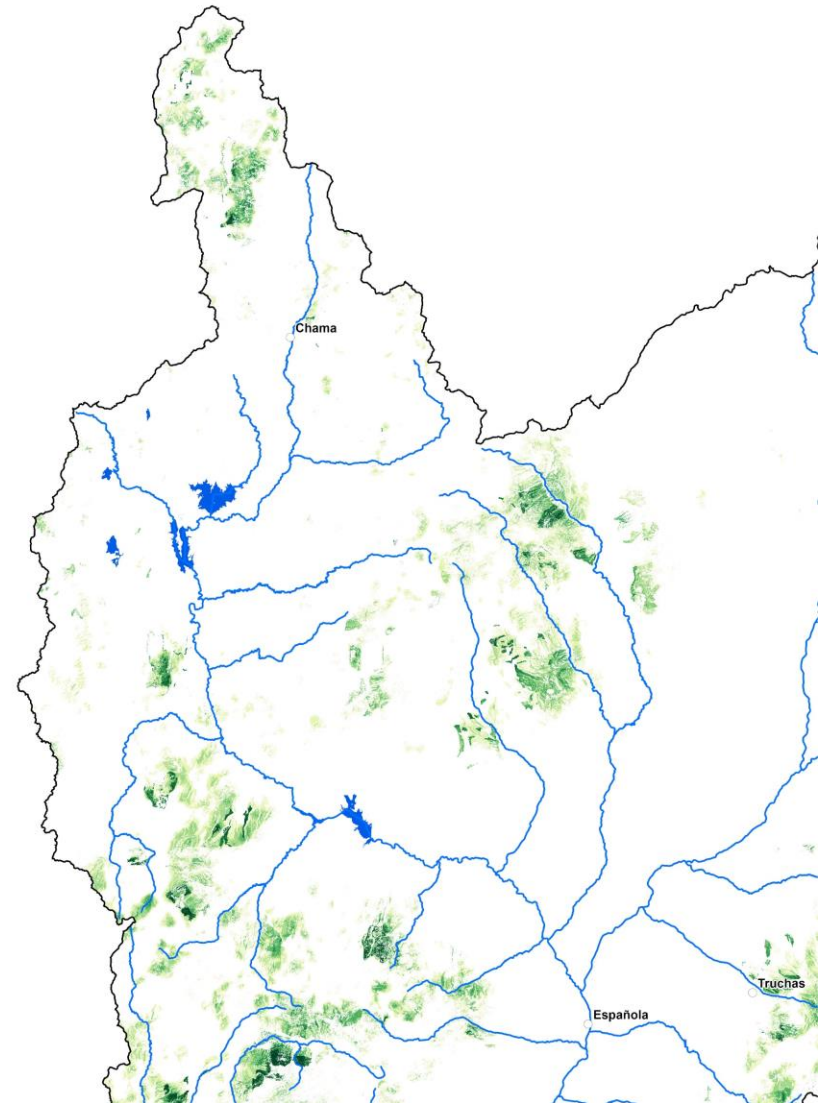
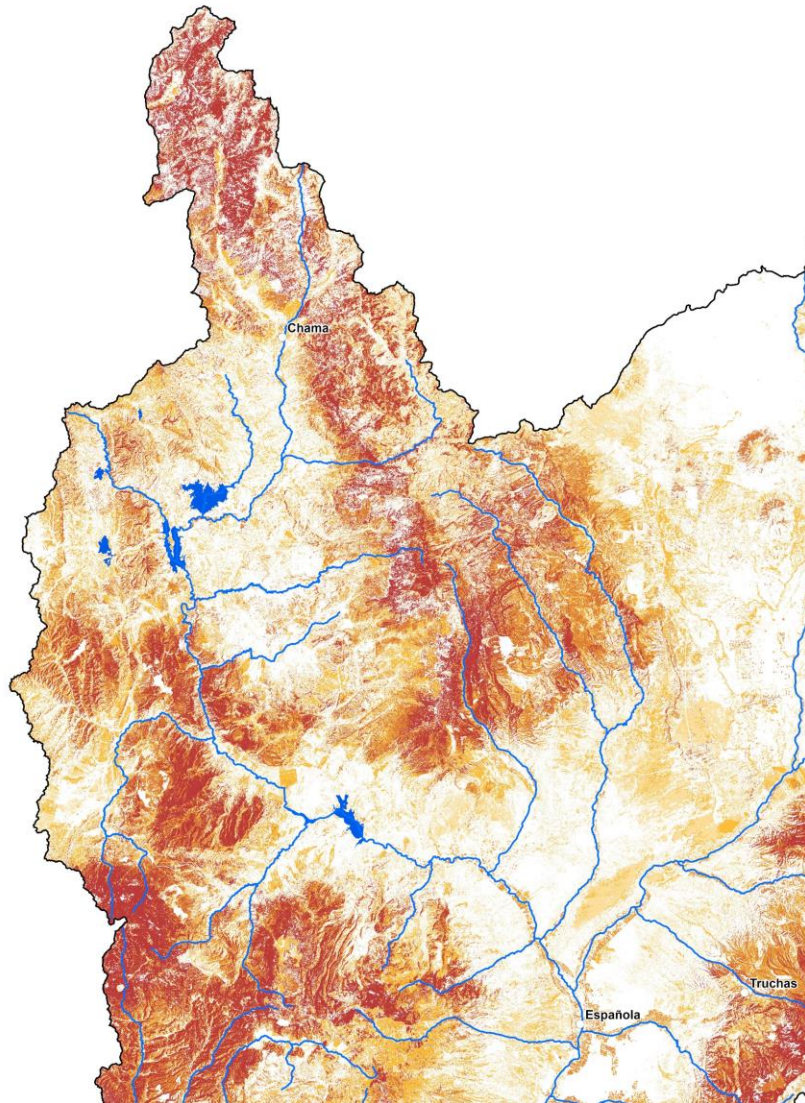
Expected Net Value Change

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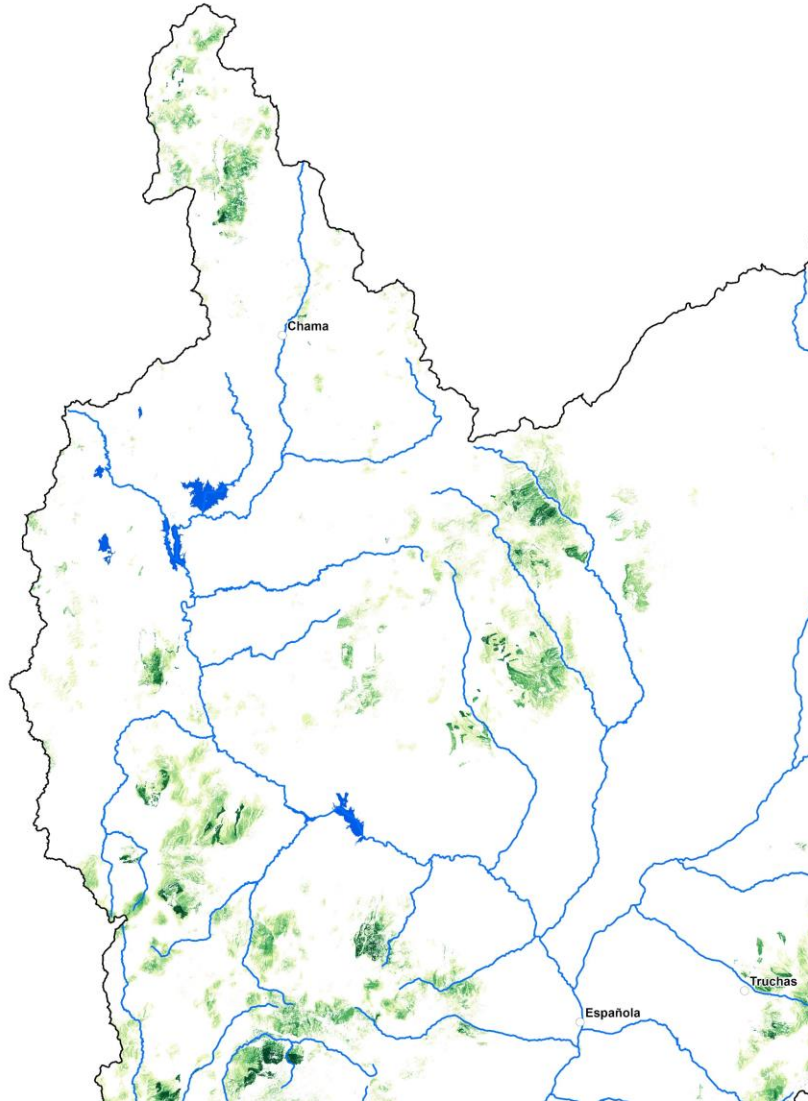


- Moderate likelihood of fire, *but*
- Extreme intensity of fire, *and*
- Extreme concentration of things we care about that are susceptible to fire.

Forest Restoration Reduces Risk



Treatment Effects



- Difference in risk from undisturbed landscape
- Decrease in [annual] expected net value change
- Percent change may be more informative



Thank You!

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