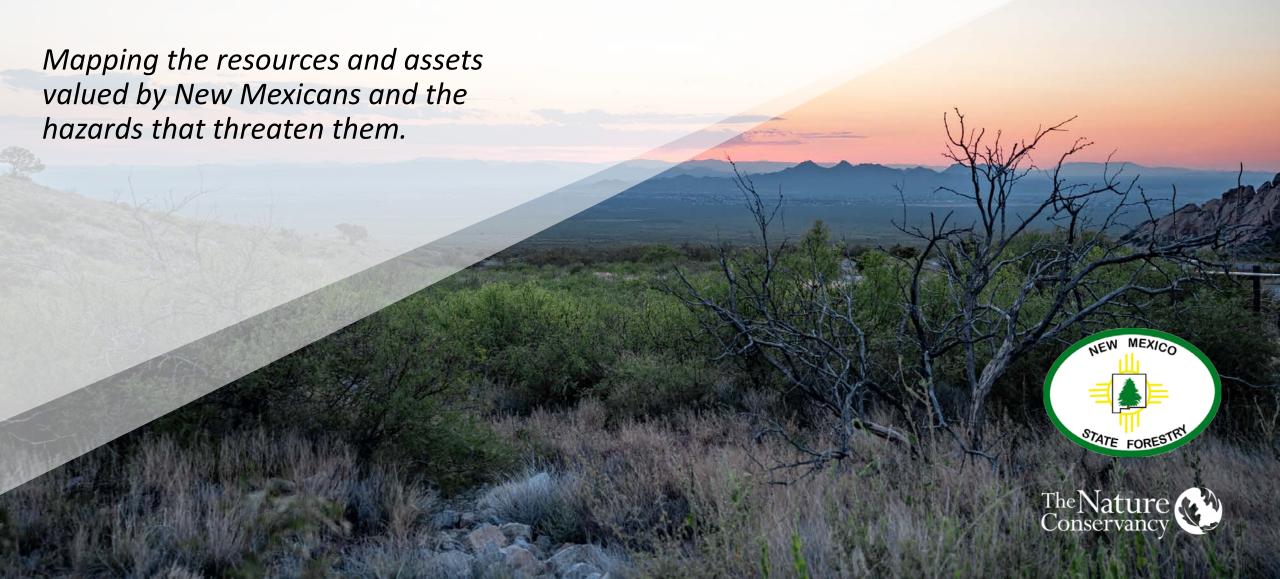
2020 New Mexico Forest Action Plan

Natural Resources Assessment



Forest Action Plan

- State Forest Action Plans
 - Required by 2008 Farm Bill
- Natural Resources Assessment
 - Documents the conditions and trends of forest resources
- Forest Strategy and Action Plan
 - Outline a plan of action to:
 - 1. Conserve Working Landscapes
 - 2. Protect Watersheds from Harm
 - 3. <u>Enhance Public Benefit</u> from Natural Resources



FAP Structure

- Natural Resources Assessment
 - Map <u>Resources & Assets</u>
 - Map <u>Hazards</u>
 - Map <u>Risk</u>
- Action Plan
 - Identify Strategies to Mitigate Risk and Enhance Value of Resources and Assets



Assessment Approach

- Science Based & Data Driven
 - Use Best Available Data

- Collaborative Approach
 - Eight Technical Panels convened
 - Over 100 Subject Matter Experts

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Themes: Resources and Assets We Value

- Wildland Communities
- Water Quality and Supply
- Carbon Balance: Biomass and Soils
- Timber and Grazing
- Biodiversity
- Indigenous and Traditional Communities
- Recreation and Cultural Use
- Urban Forests and Communities

Threats: Hazards We Worry About

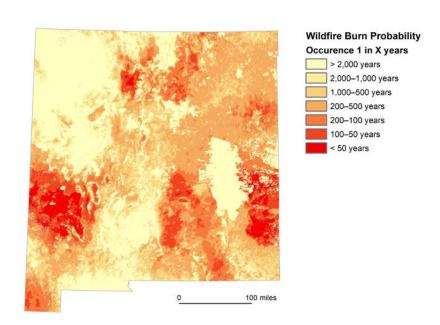
- Wildfire Hazard
- Post-wildfire Hazards
 - Debris Flow
 - Flooding
 - Erosion & Sedimentation
- Disease and Insects
- Development & Fragmentation
- Climate Change
- Use & Activity

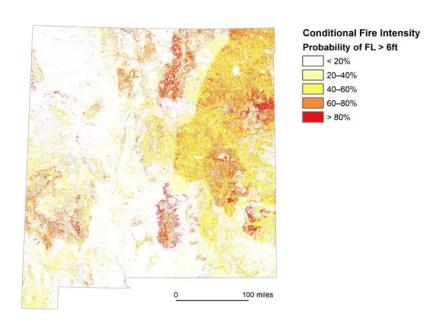
Threat: Wildfire Hazard

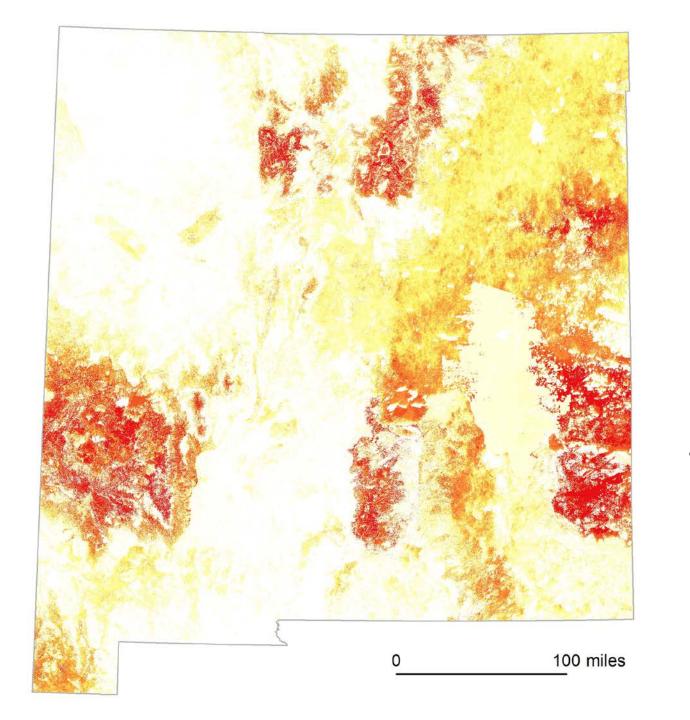


Wildfire Hazard

- Hazard is a function of the expected:
 - Probability of a Wildfire
 - Intensity of the Wildfire







Wildfire Hazard Likelihood of FL > 6ft

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0.001 - 0

0.001 - 0.001

0.002 - 0.001

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0.003 - 0.003

0.004 - 0.005

0.006 - 0.008

0.009 - 0.048

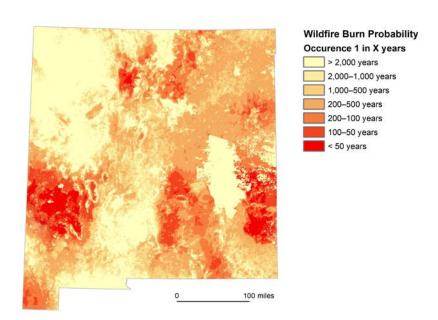
 Next fire season, what is the likelihood of a fire burning with flame lengths greater than 6 feet?

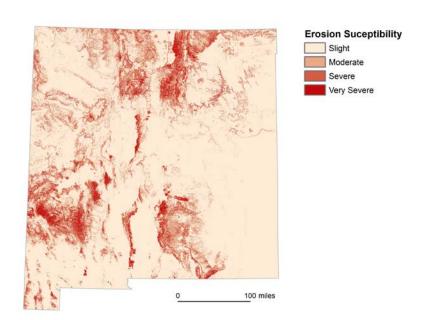
Threat: Post-wildfire Hazards

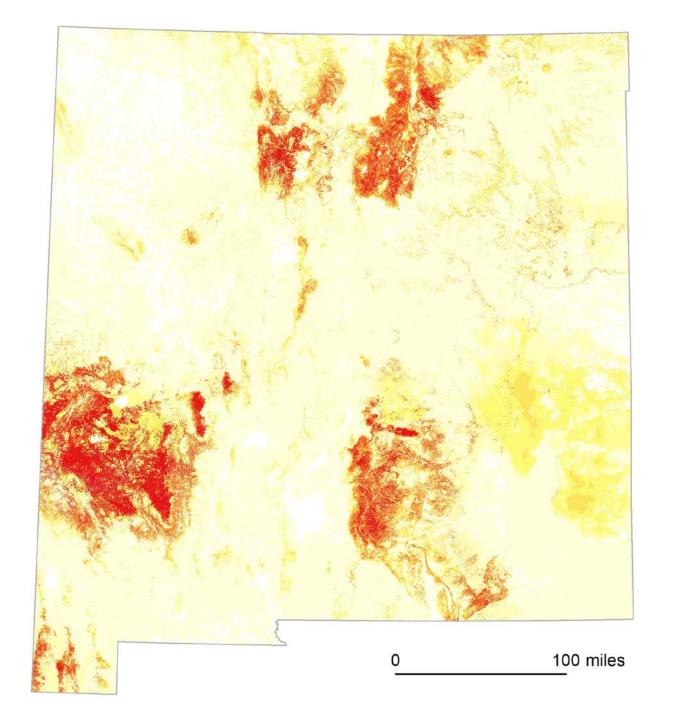


Post-Wildfire Erosion Hazard

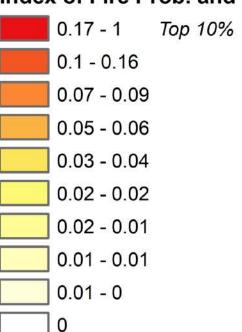
- Erosion hazard is a function of the expected:
 - Probability of a Wildfire
 - Intensity of the Erosion







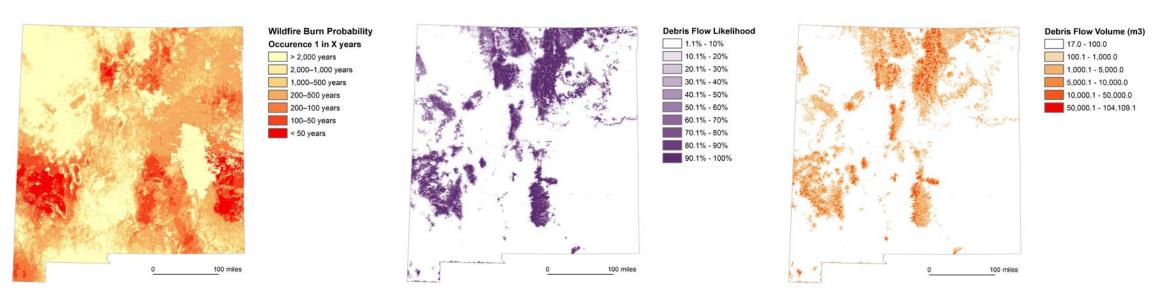
Post-wildfire Erosion Hazard Index of Fire Prob. and Erosion Intensity

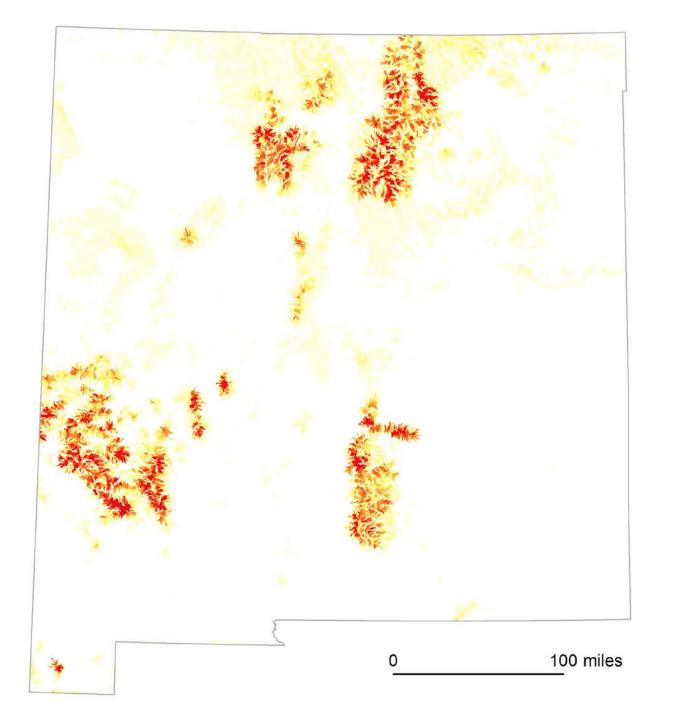


 Areas susceptible to erosion that are likely to experience wildfire.

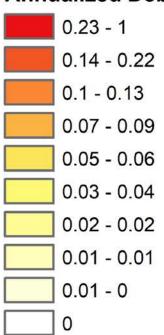
Post-wildfire Debris-flow Hazard

- Debris flow hazard is a function of the expected:
 - <u>Probability</u> of a wildfire
 - <u>Probability</u> of debris Flow
 - <u>Volume</u> of debris flow





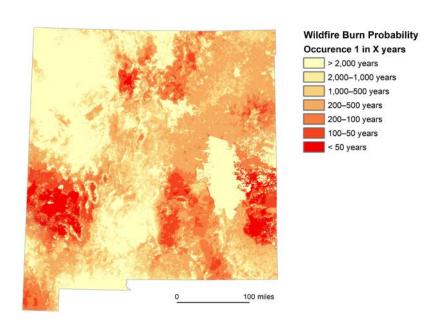
Post-Wildfire Debris Flow Hazard Annualized Debris Flow Volume

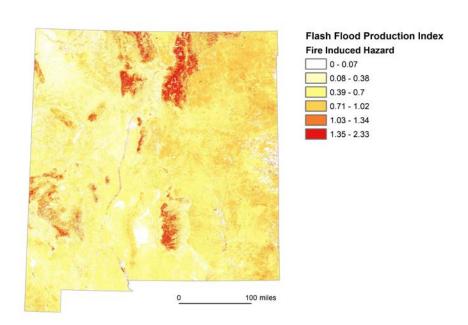


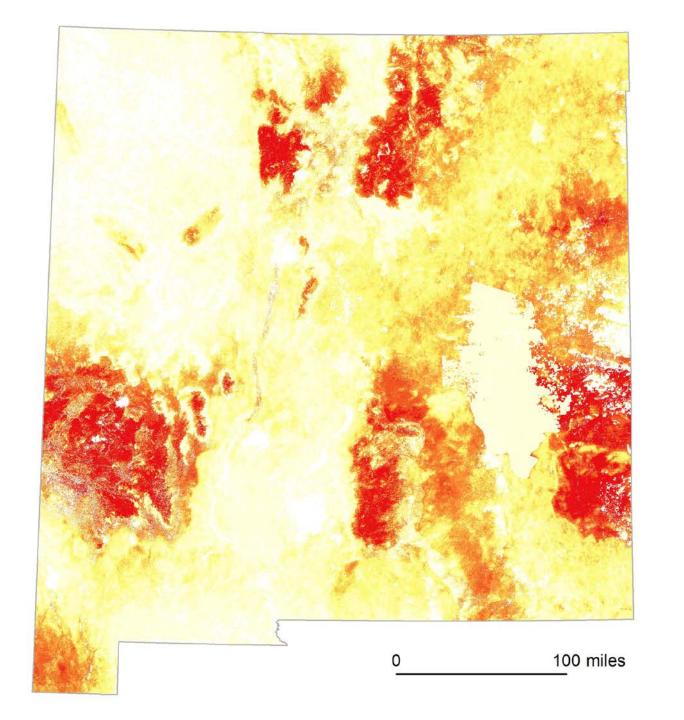
• Areas susceptible to post-fire debris flow and likely to be burned.

Post-wildfire Flash Flood Hazard

- Post-fire flash flood hazard is a function of the expected:
 - <u>Probability</u> of a wildfire
 - Intensity of a flash flood







Post-wildfire FFPI Fire Induced Hazard

10

0.0001 - 0.0004

0.0005 - 0.0008

0.0009 - 0.0012

0.0013 - 0.0019

0.002 - 0.0027

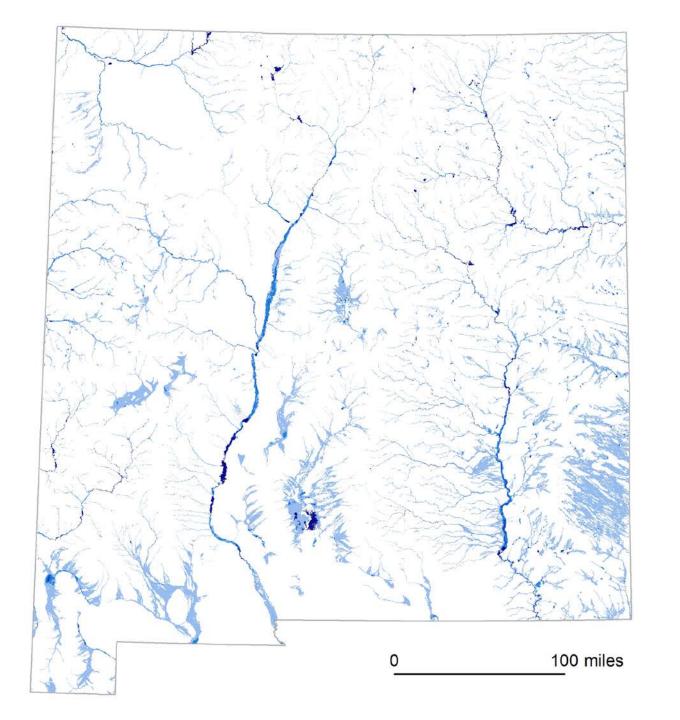
0.0028 - 0.0039

0.004 - 0.0062

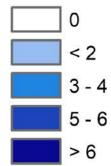
0.0063 - 0.0113

0.0114 - 0.099

 Areas with high production of postfire flash floods and high likelihood of wildfire



500-year Floodplain Innundation Depth (ft)



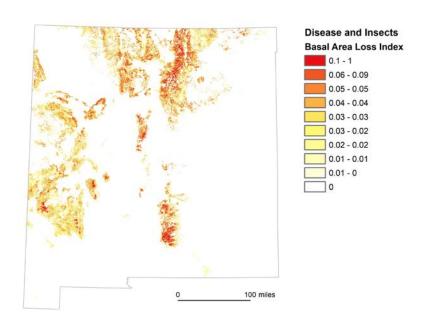
- "500-year Floodplain" can be used to identify Resources and Assets that will be exposed to post-fire floods
- 500-year events happen every year following a wildfire

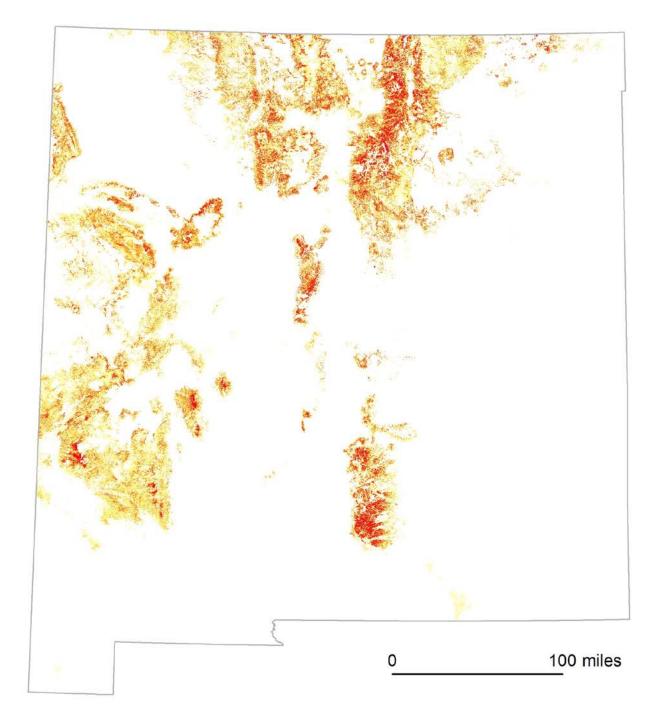
Threat: Disease and Insects



Disease and Insects

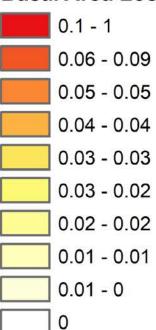
- Disease and Insect Hazard Mapped for U.S. (NIDRM)
 - Intensity of Basal Area Loss by 2027





Disease and Insects

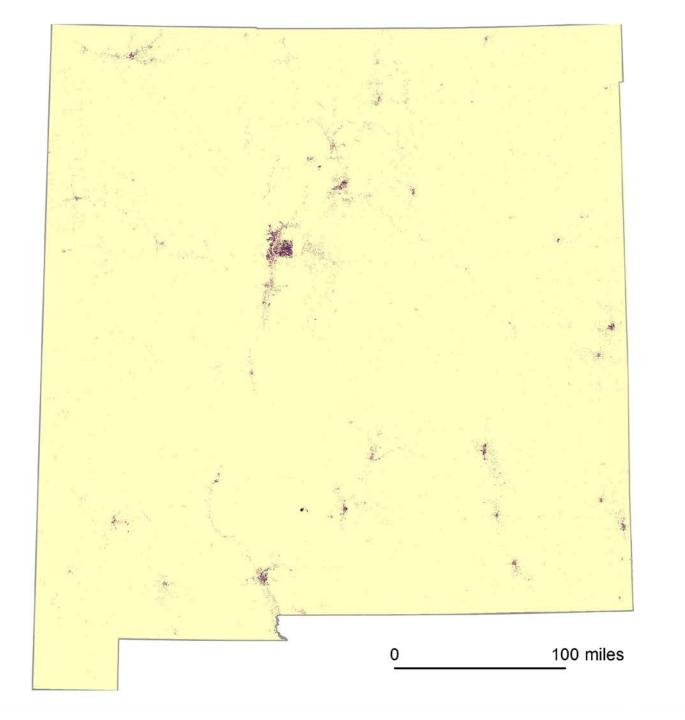
Basal Area Loss Index



- All forests are at risk.
- Absolute basal area loss (pictured) is highest in forests.

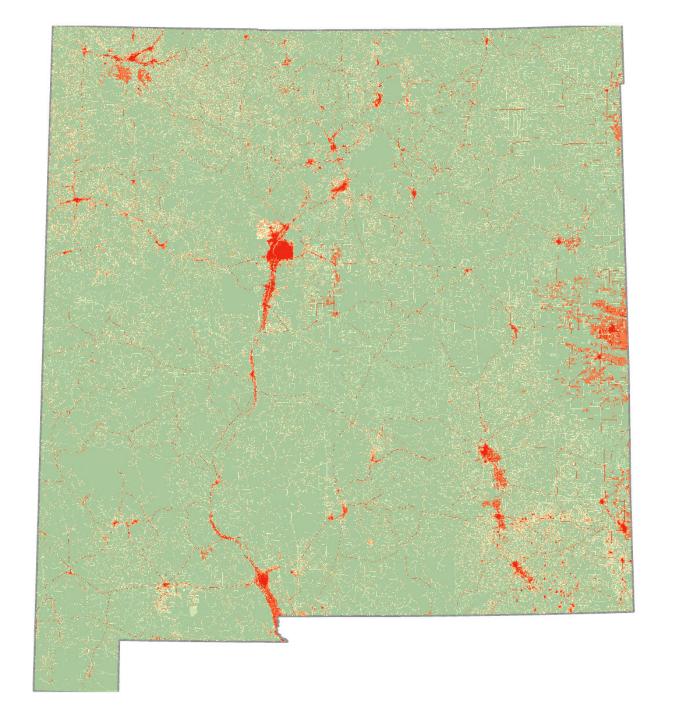
Threat: Development and Fragmentation





Building Footprints

Percent coverage

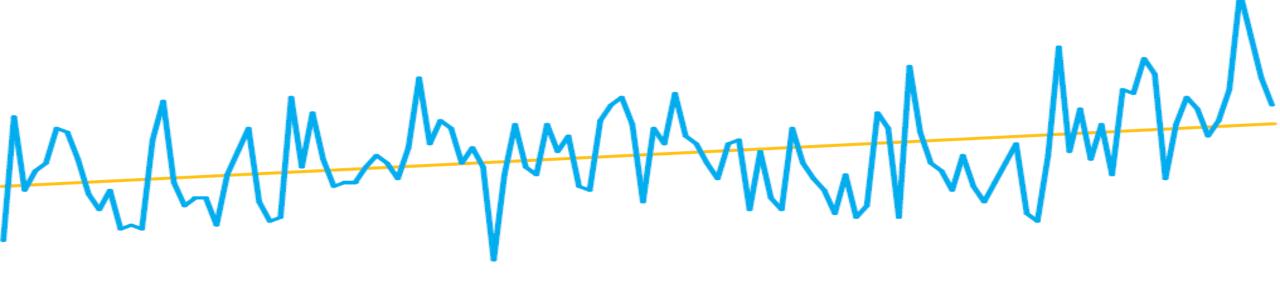


Development / Fragmentation

Model of degree of human modification as described in 2016 technical report by Conservation Science Partners.

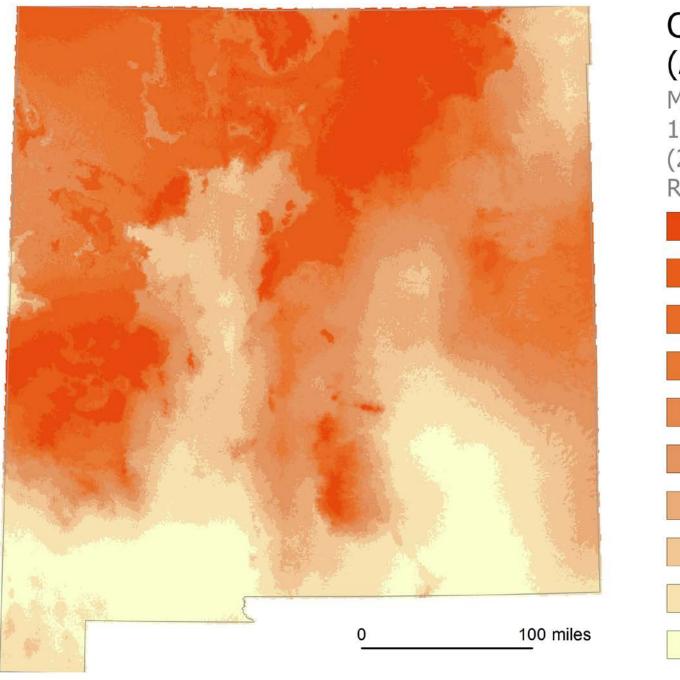
(2018 data used in analysis; older, coarse data shown at left, per use agreement)

Threat: Climate Change



Climate Dissimilarity

- Represents how different the future climate will be at a location be from its current climate
- When combined with resources and assets, is a measure of exposure to climate change
- Complementary metrics:
 - (a) Absolute magnitude of dissimilarity, and
 - (b) Dissimilarity relative to historical interannual climatic variability



Climatic dissimilarity (Absolute magnitude)

Multivariate climate space between 1971-2000 climate normals and future (2071-2100) projected climate under RCP8.5: high emission scenario

Themes: Resources and Assets We Value

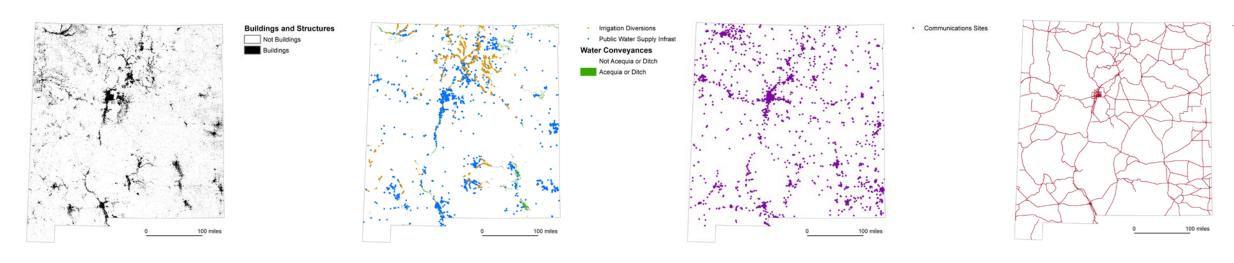
- Wildland Communities
- Water Quality and Supply
- Carbon Balance: Biomass and Soils
- Timber and Grazing
- Biodiversity
- Indigenous and Traditional Communities
- Recreation and Cultural Use
- Urban Forests and Communities

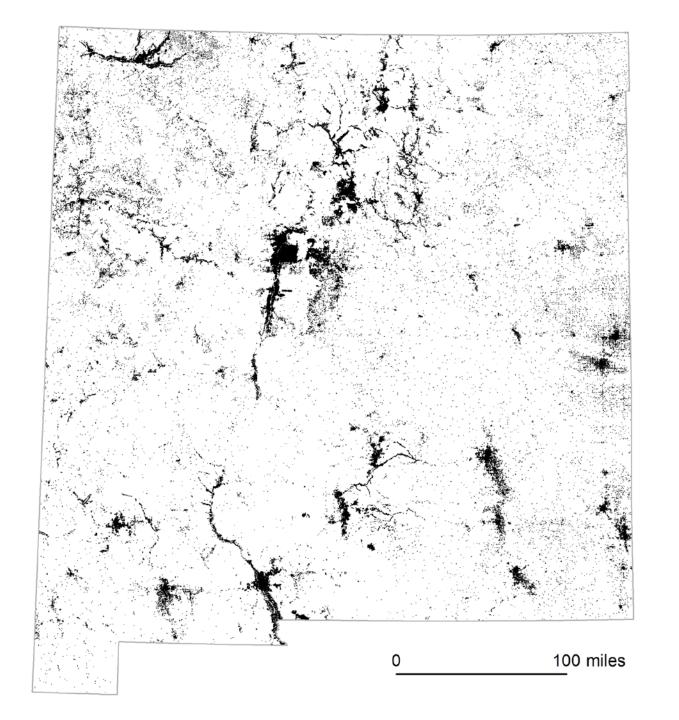
Theme: Wildland Communities



Wildland Communities

- Wildland Community values:
 - Buildings and structures representing homes, schools, businesses, etc.
 - Water Supply Infrastructure for irrigation and public water supplies
 - Communications Sites critical for emergency response
 - Major Roads used for access/egress and relied upon for commerce

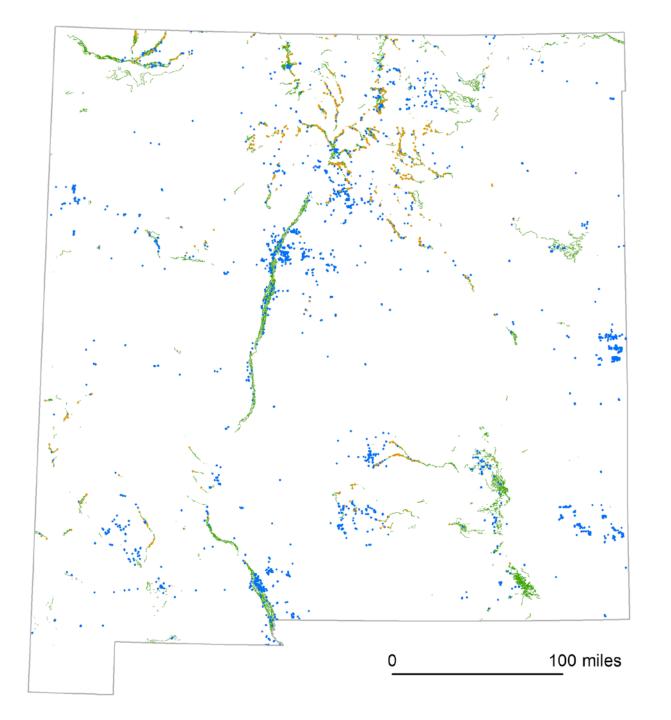




Buildings and Structures

Not Buildings
Buildings

- Microsoft building footprints
- Manually screened for accuracy
- Current through mid-2010s



- Irrigation Diversions
- Public Water Supply Infrastructure

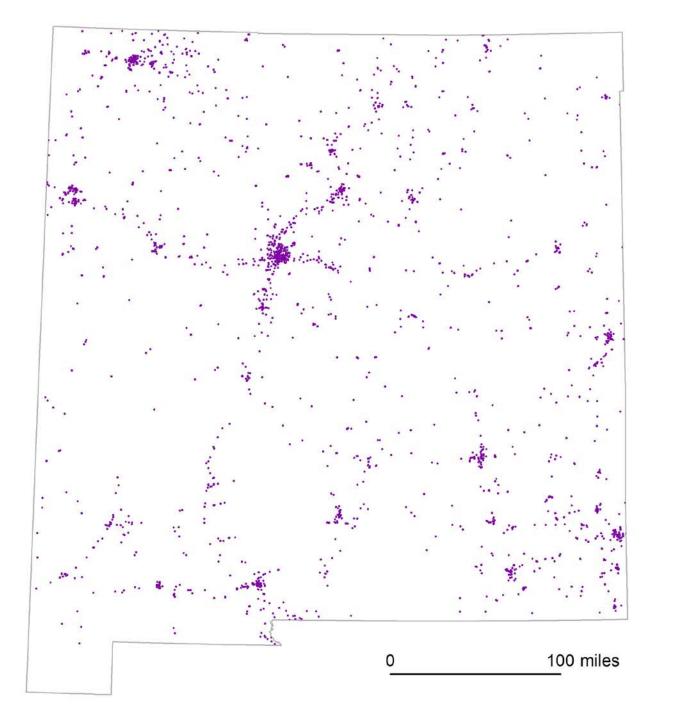
Water Conveyances

Not Acequia or Ditch



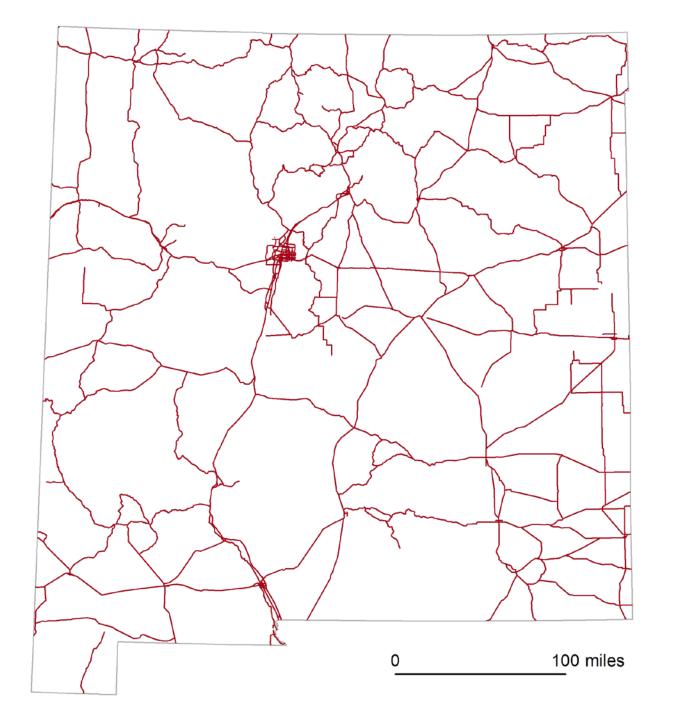
Acequia or Ditch

- Public Water Facilities from NMED
- Irrigation Conveyances from NMOSE
- "Water Infrastructure"



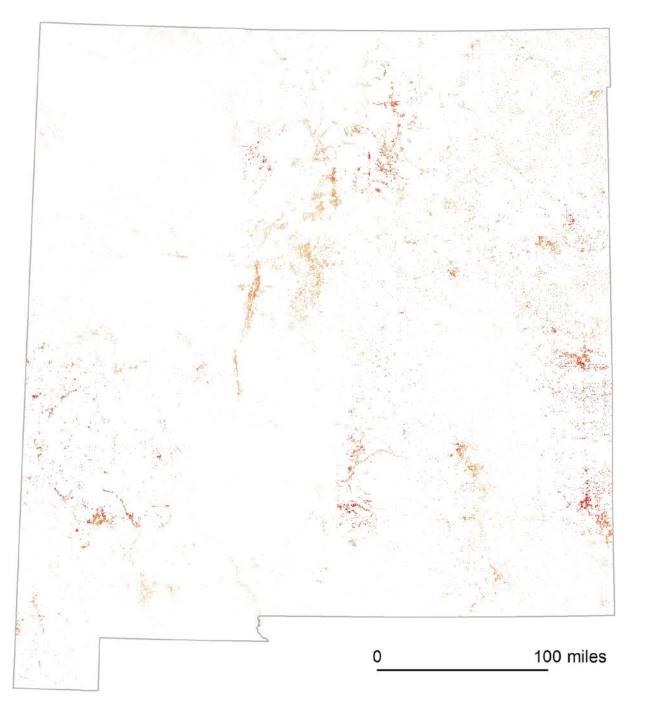
Communications Sites

- Comms Sites from FCC
- Accessed via WFDSS
- Excludes Private and Commercial "Land Mobile"

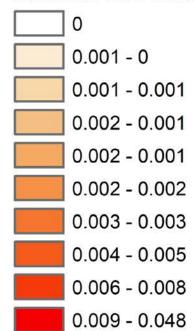


—— Major Roads

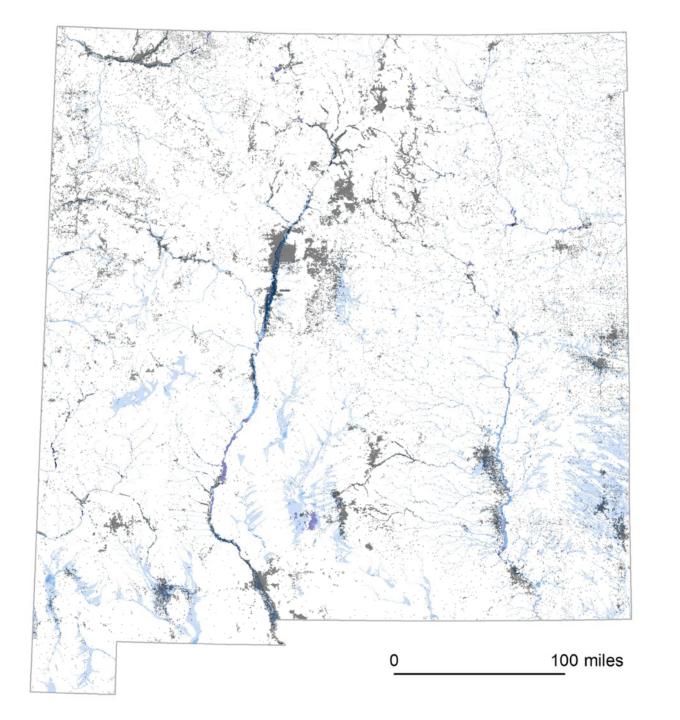
- National Highway Planning Network
- From BTS
- Includes most major routes



Wildfire Risk to Buildings Annualized Probability of Building Loss



- Risk is a function of
 - burn probability
 - fire intensity
 - building density



50.0 ky ieragrsFamolc/Spitauinctures

InnundatiBuildDepth (ft)

Buildings

< 2

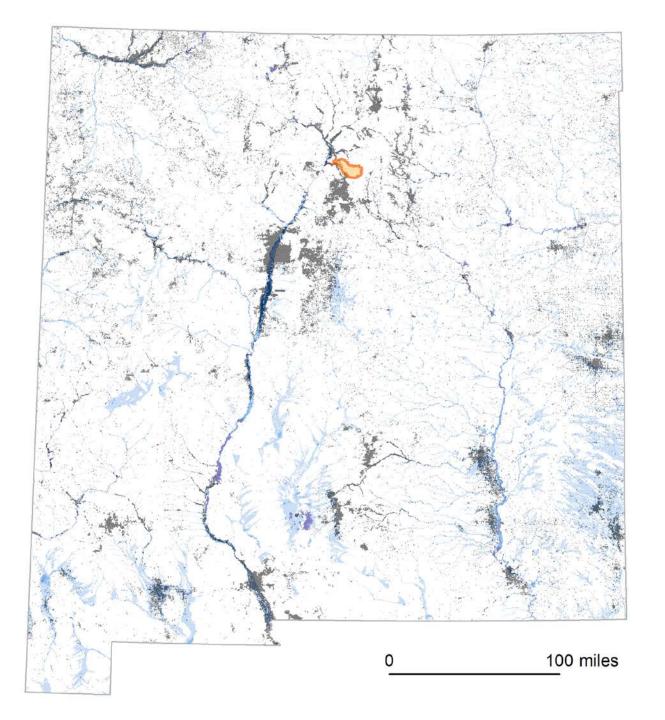
3 - 4

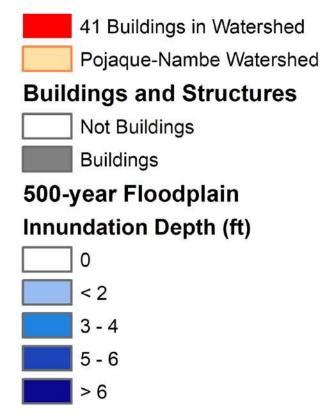
5 - 6

> 6

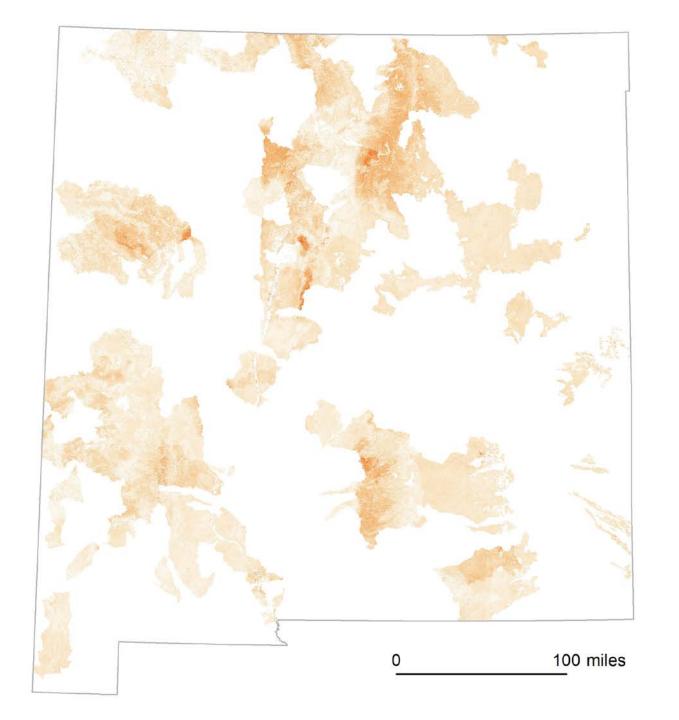
- Buildings in 500-year floodplain
- Risk is a function of the FFPI and burn probability in the immediate upstream watersheds and the number of structures in the floodplain.







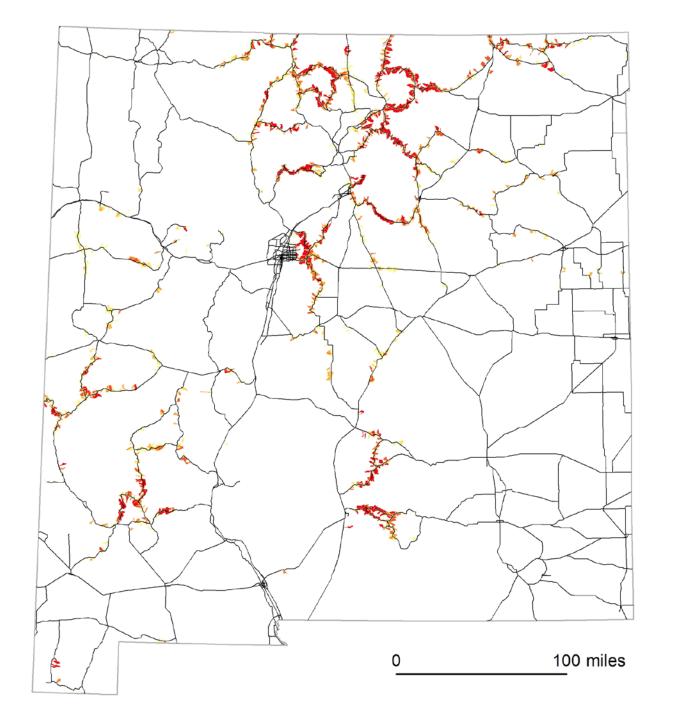
• Upstream sources of flood risk to downstream development.



PostFireFloodRisk_Buildings



 Upstream sources of flood risk to downstream development.



Major Roads

Debrisf-flow Hazard to Roads Exposure to Prob. Weighted Volume

64.433599 - 602.073157

602.073158 - 1005.961196

1005.961197 - 1456.071829

1456.071830 - 2041.099069

2041.099070 - 2848.581067

2848.581068 - 3904.058219

3904.058220 - 5671.497046

5671.497047 - 8587.398802

8587.398803 - 15264.576386

15264.576387 - 195351.766166

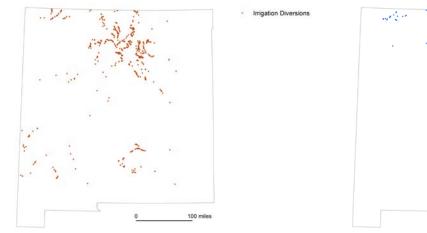
- Roads aren't very susceptible to fire
- Post-fire debris flow can be very damaging to roads

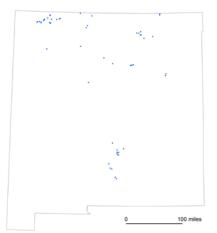
Theme: Water Quality and Supply

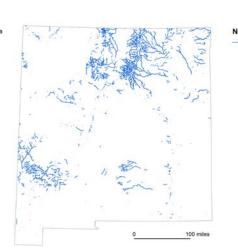


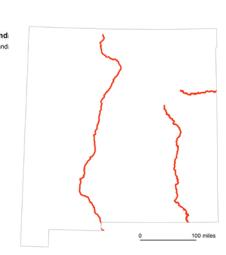
Water Quality and Supply

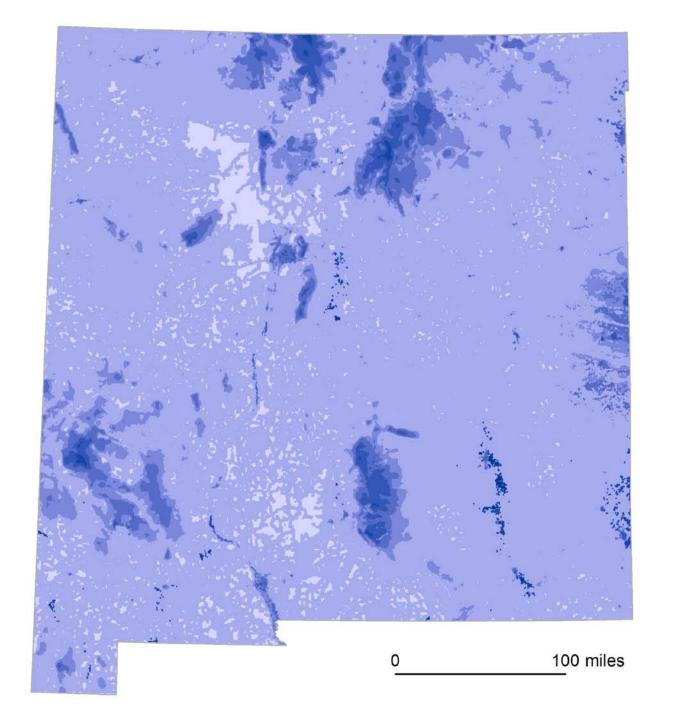
- Water Quantity:
 - valued by <u>irrigators</u> and <u>public water systems</u>
- Water Quality:
 - valued at Points of Diversion and to meet NMED Water Standards
- Water Transmission:
 - valued by <u>downstream water users</u> and for <u>compact delivery</u>





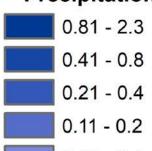






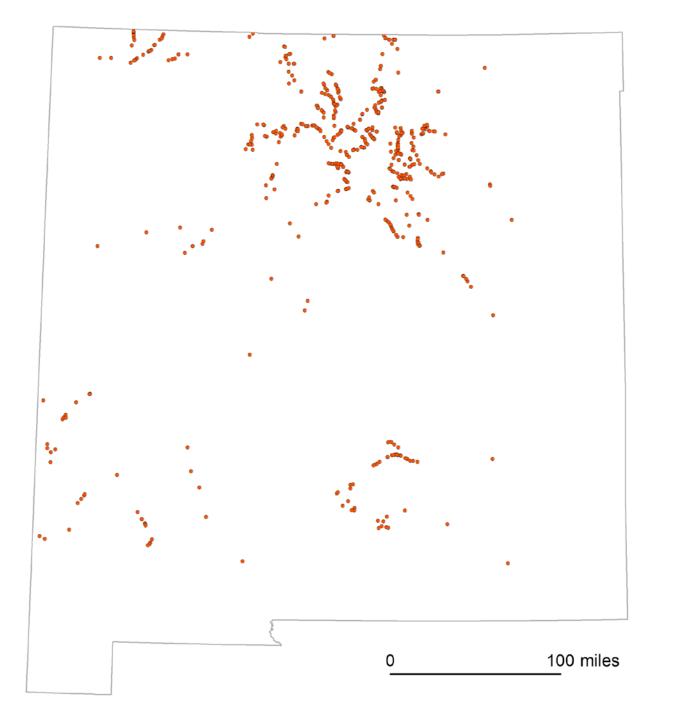
Average Annual Runoff

= Precipitation - EVT - Infiltration



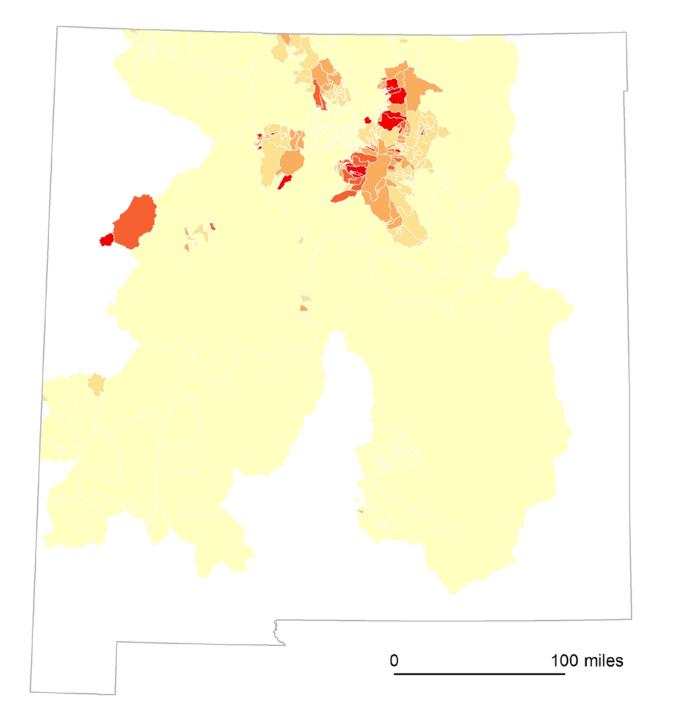
- 0.06 0.1
- 0.01 0.05

- Where is water used by irrigators?
- How many irrigators rely on each diversion?



Irrigation Diversions

- Where is water used by irrigators?
- How many irrigators rely on each diversion?

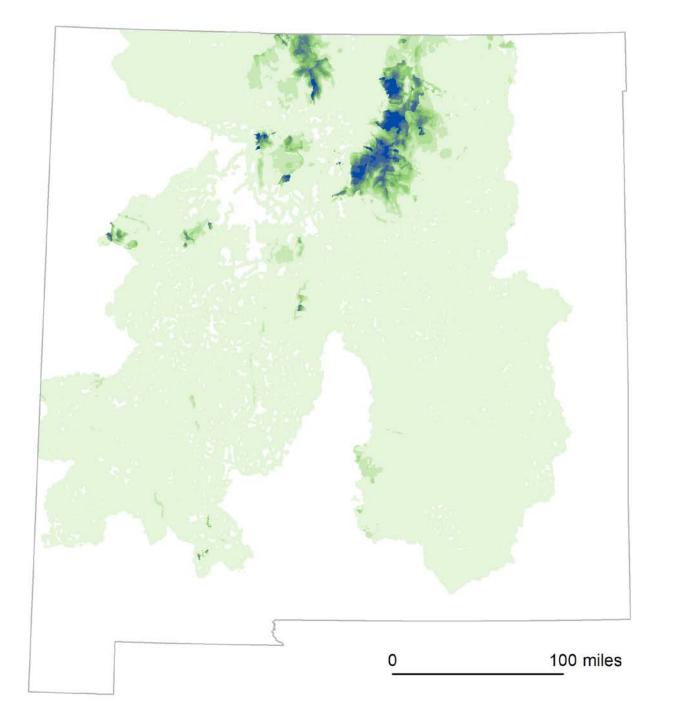


Watershed above Irrigation Diversions AF per Downstream Irrigator

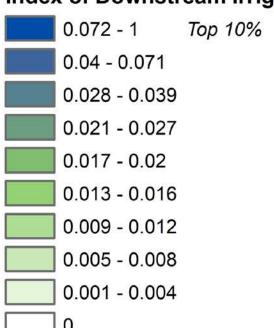
0.000033 - 0.010000 0.010001 - 0.020000 0.020001 - 0.040000 0.040001 - 0.080000

0.080001 - 0.654898

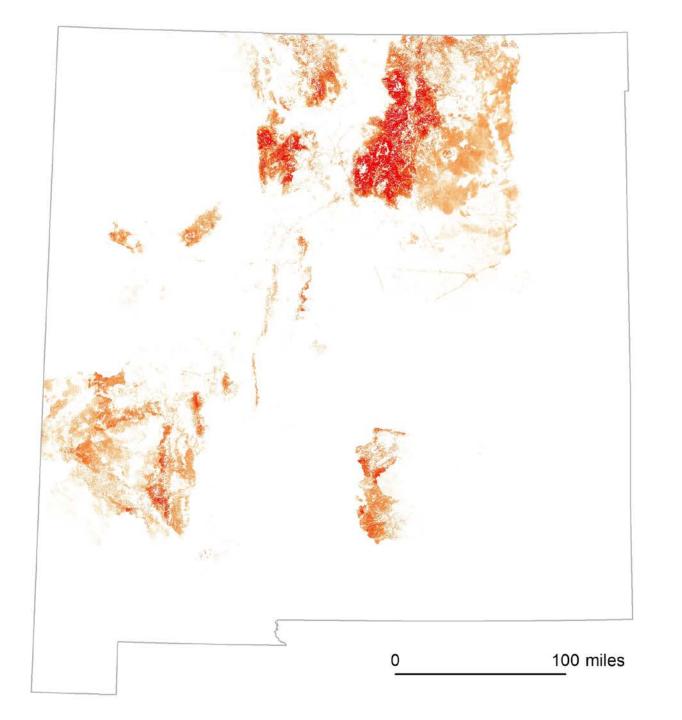
- Where is water used by irrigators?
- How many irrigators rely on each diversion?



Annual Surface Water Runoff Index of Downstream Irrigators per AF



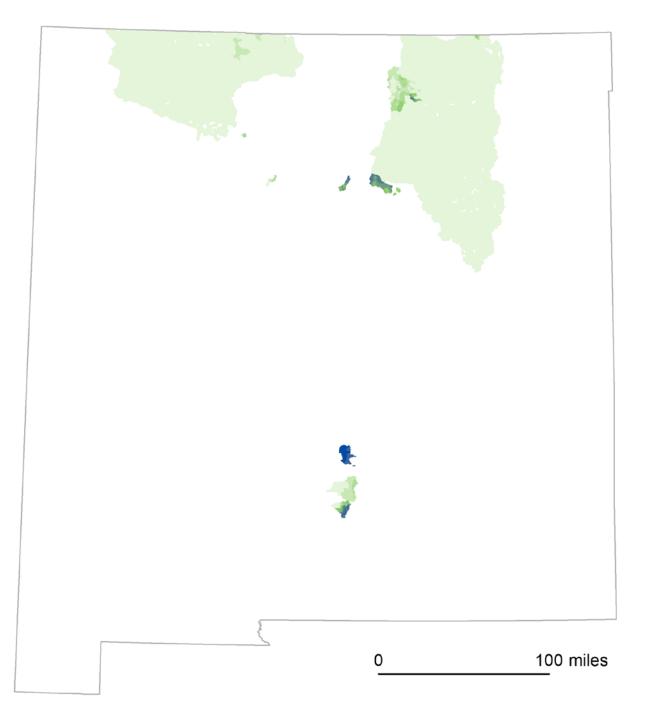
- Value is highest where there are many irrigators per AF of available runoff.
- Each drop matters to more irrigators.
- Upstream sources are mapped (clipped here)



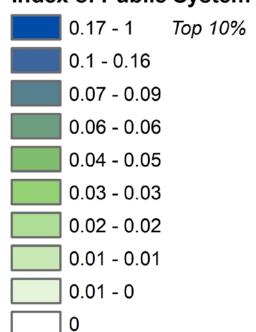
WildfireRisk_WaterIrrigationSupply

Walue High: 1 Low: 0

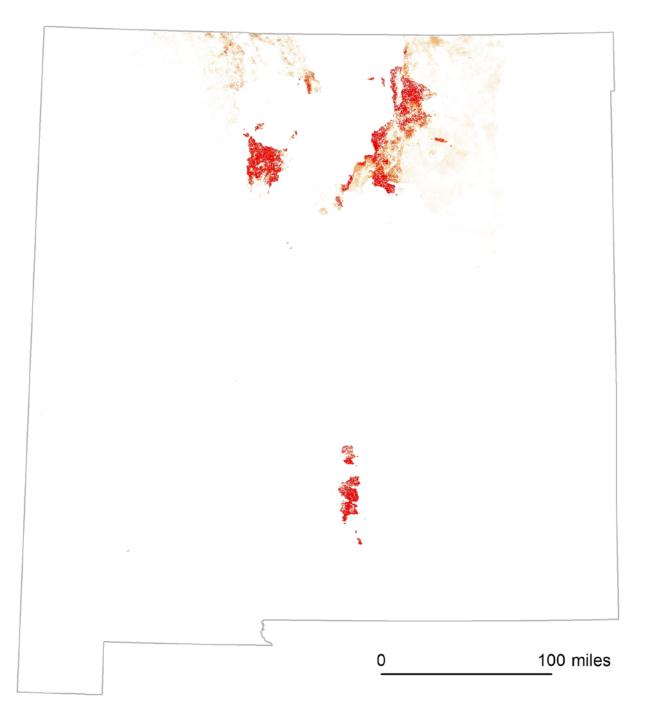
 Risk is highest where burn probability and intensity are highest and where there are many irrigators per AF of available runoff.



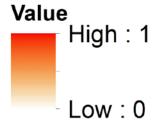
Annual Surface Water Runoff Index of Public System Users per AF



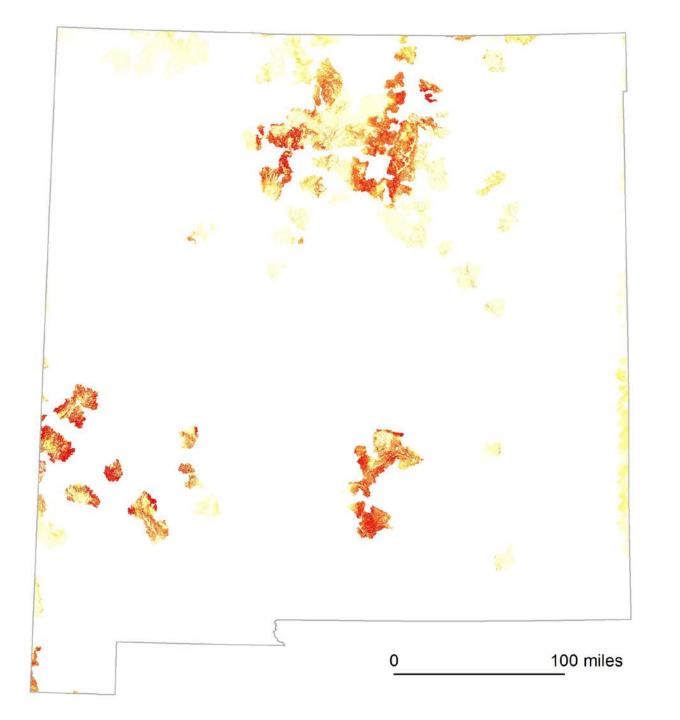
- Same beneficiary mapping process as irrigators, but with population served
- Surface water supplies only
- Will be updated to include spring sources



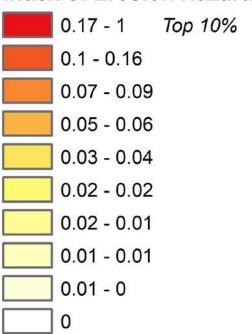
WildfireRisk_WaterPublicSupply



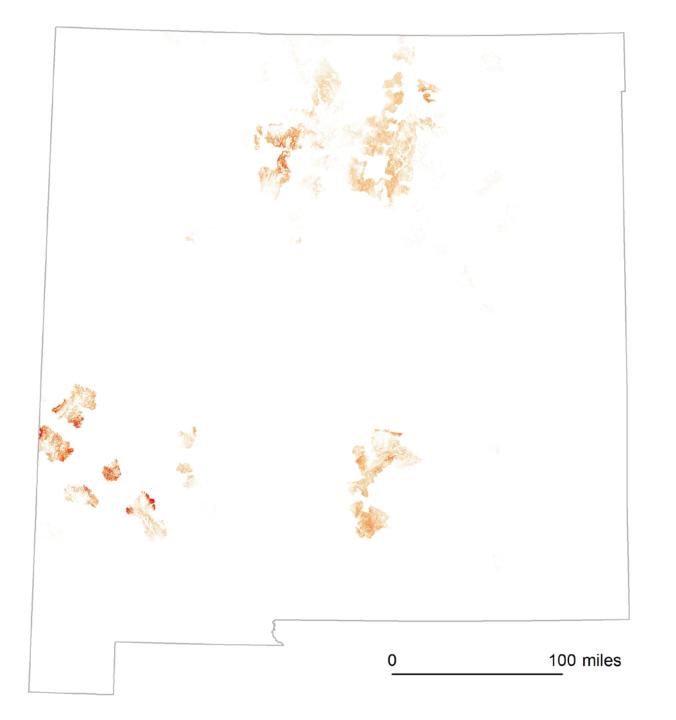
 Risk is highest where burn probability and intensity are highest and where there are many people served by downstream public water systems per AF of available runoff.



Post-wildfire Erosion Risk to Diversions Index of Erosion Hazard



- Water quality impacts points of diversion and stream segments.
- Areas immediately upstream from the point of diversion pose the greatest threat.

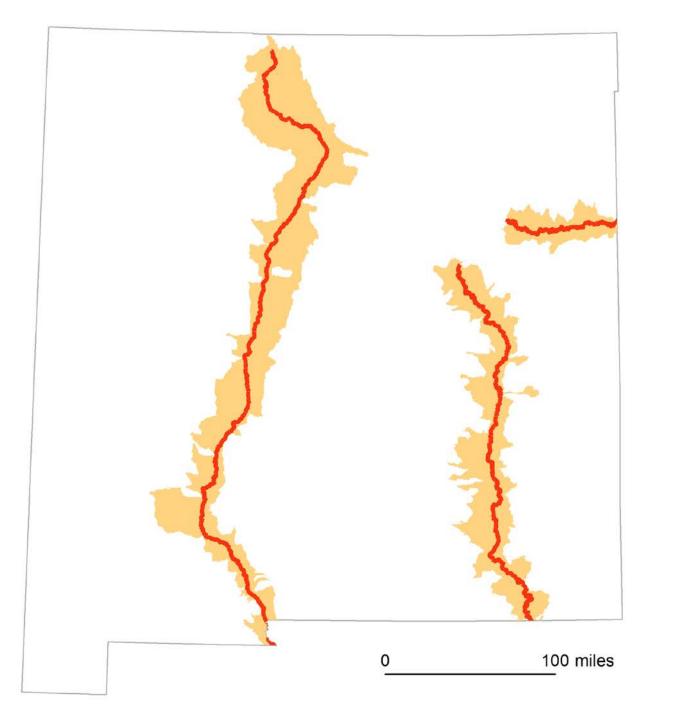


PostFireErosionRisk WaterIntakesDiversions

High: 1

Low: 0

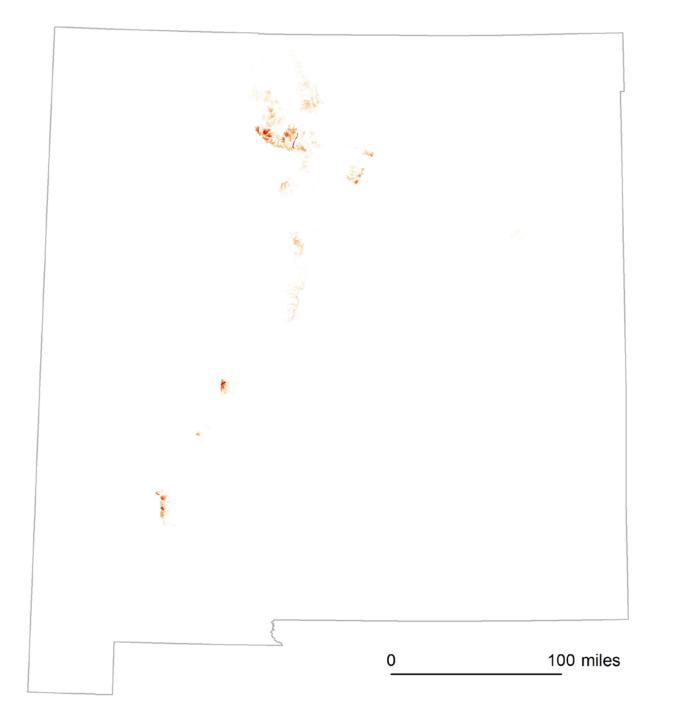
- Water quality impacts points of diversion and stream segments.
- Areas immediately upstream from the point of diversion pose the greatest threat.



Transmission Streams

Direct Tributaries to Transmission Streams

• Where could a debris flow happen and block water deliveries?



WaterTransmission High: 1 Low: 0

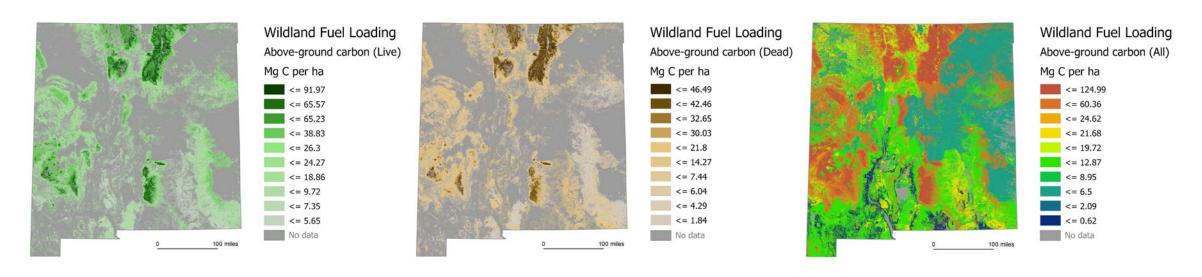
• Where could a debris flow happen and block water deliveries?

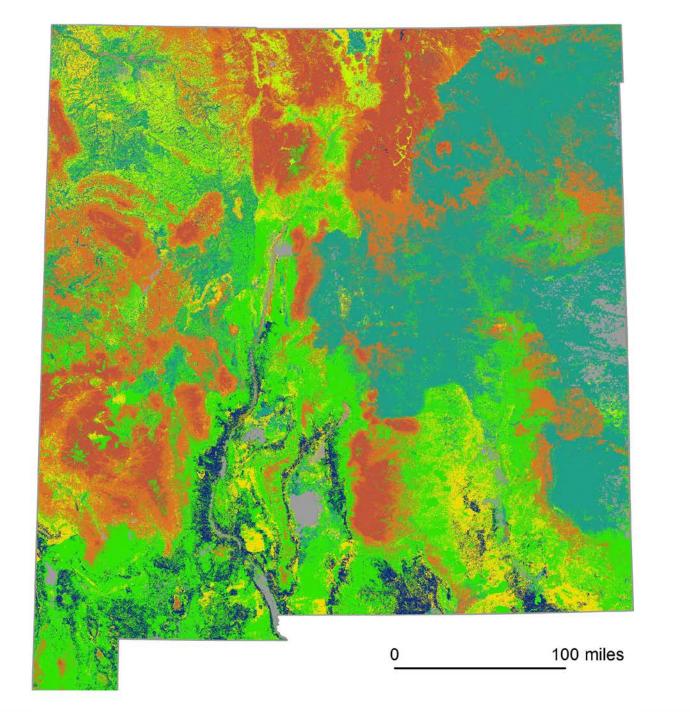
Theme: Carbon Balance: Biomass and Soils



Carbon Balance: Biomass

- Above-ground forest carbon stocks (Mg C / ha) were calculated from mean modeled biomass per hectare (Mg / ha) over several strata:
 - Live biomass: Trees, Shrubs, and Herbaceous
 - Dead biomass: Snags, Woody Debris (Coarse and Fine), Duff, and Litter

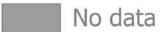


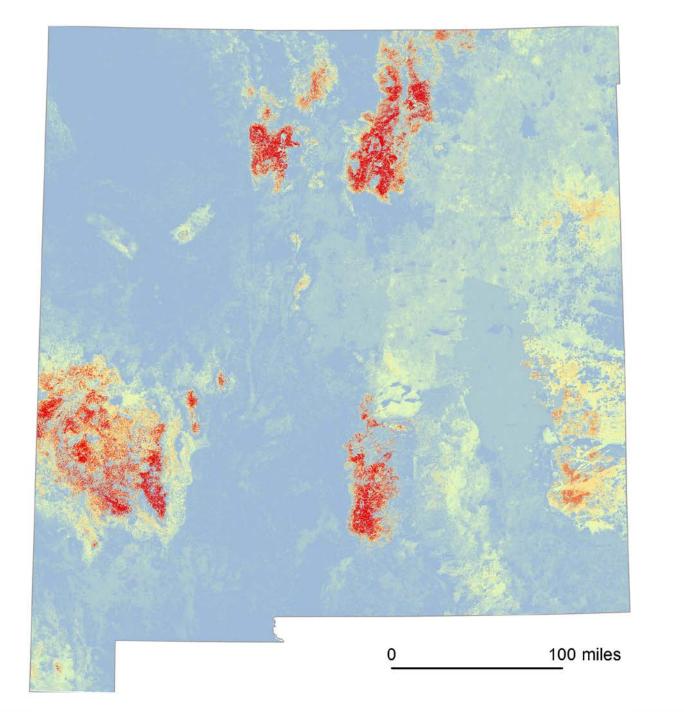


Wildland Fuel Loading

Above-ground carbon (All)

Mg C per ha



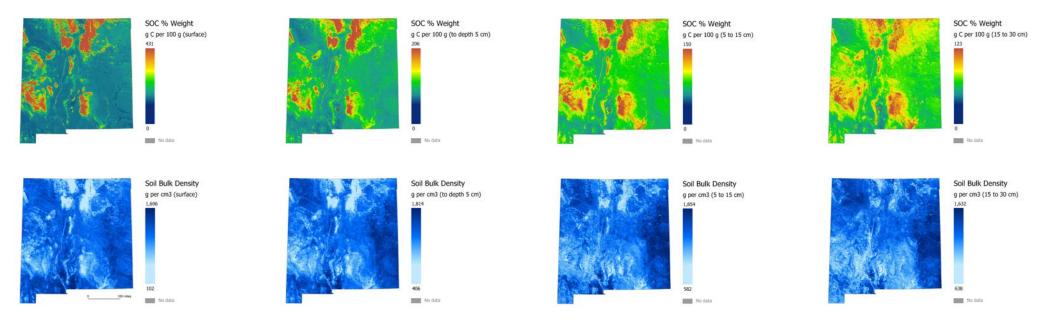


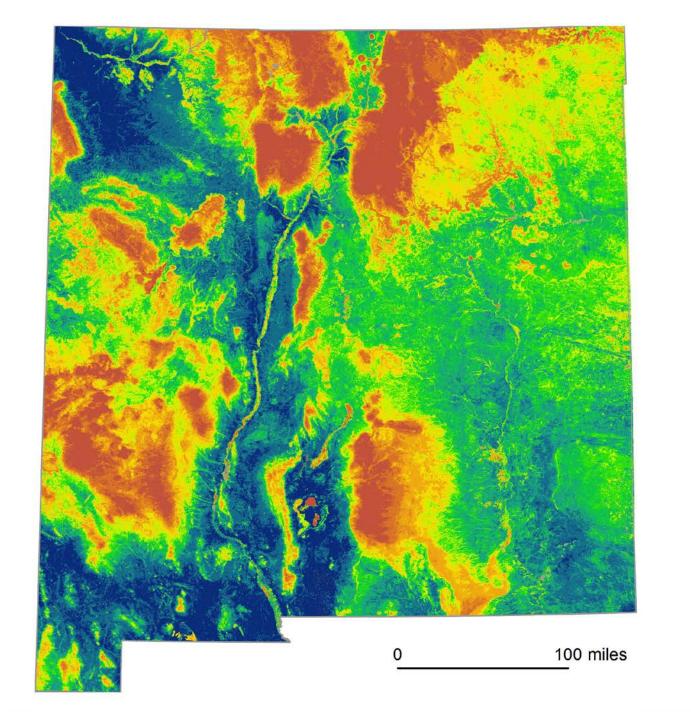
Risk of carbon release by wildfire

Risk calculated off combined soil and above-ground carbon

Carbon Balance: Soils

 Using 100-m gridded predictions of Soil Organic Carbon % weight and soil bulk density, SOC (Mg C / ha) was calculated and summed across four standard soil depths (0 – 30 cm).

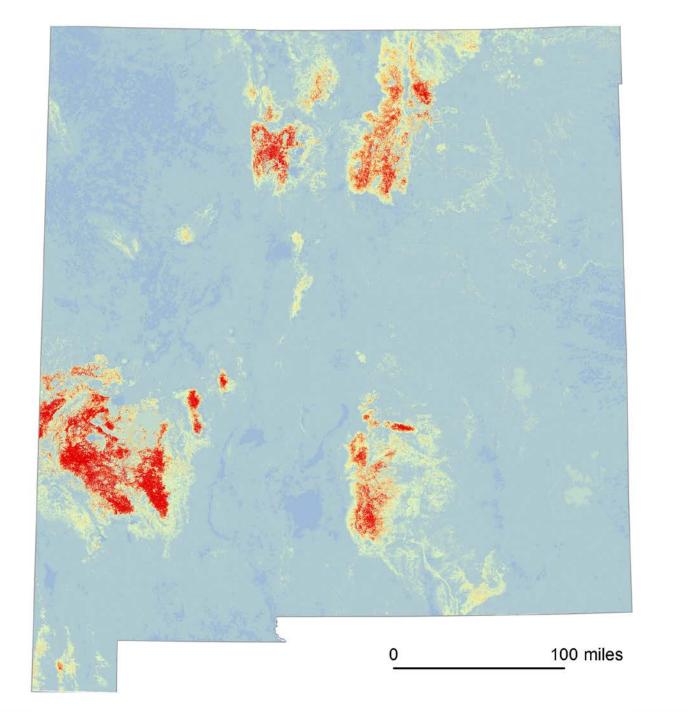




Soil Organic Carbon

Mg C per ha (to depth 30 cm)

No data



Risk of soil carbon release by post-fire erosion

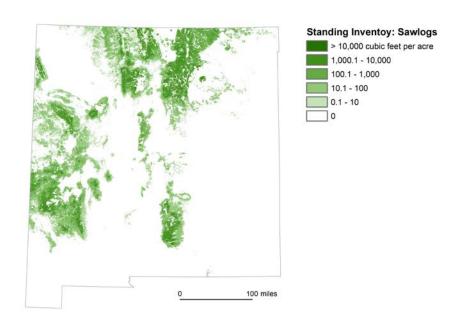
Risk calculated off soil organic carbon

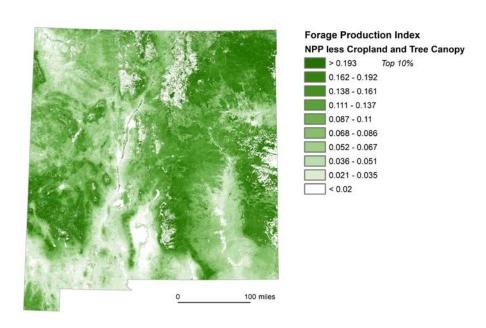
Theme: Timber and Grazing

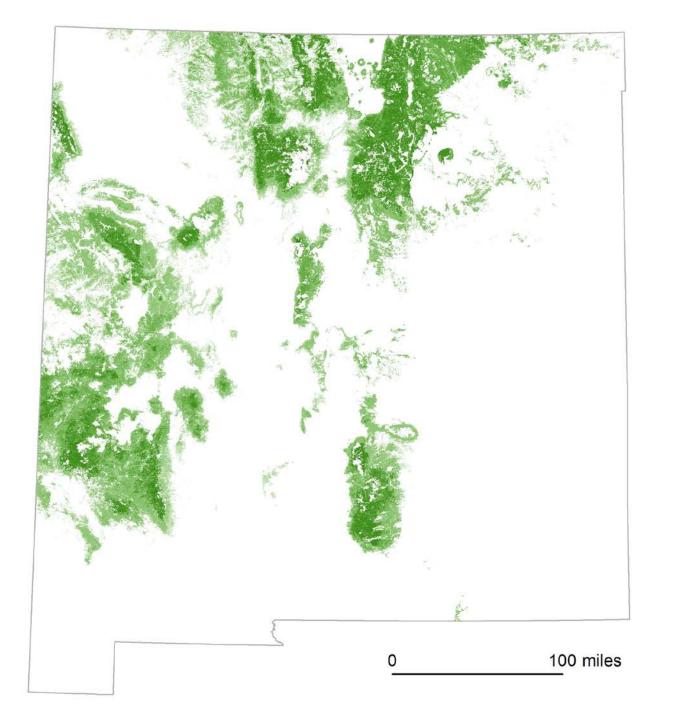


Timber and Grazing

- Timber value:
 - Standing Inventory of Sawlogs, Small-diameter Logs, and Other Biomass
- Grazing Value:
 - Forage Production on Private Lands and Allotments







Standing Inventoy: Sawlogs

> 10,000 cubic feet per acre

1,000.1 - 10,000

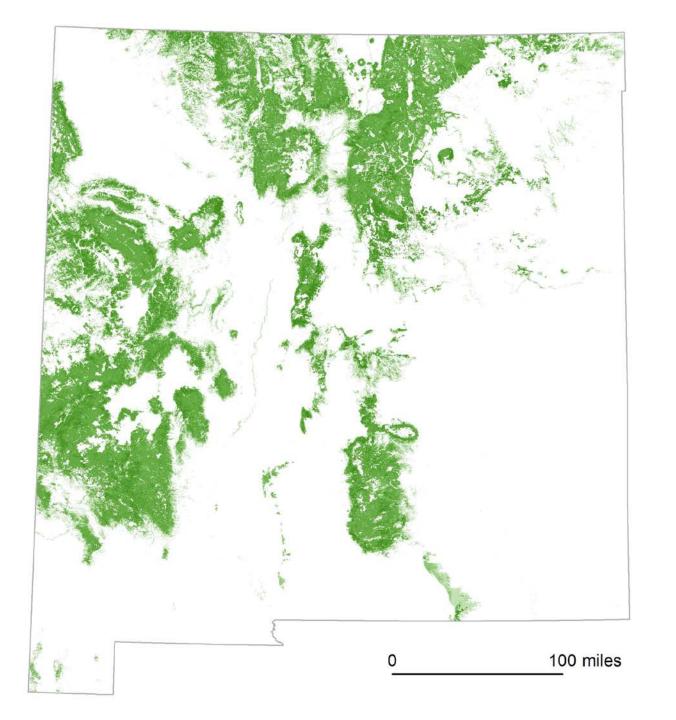
100.1 - 1,000

10.1 - 100

0.1 - 10

0

- Standing Inventory is modeled using Forest Inventory and Analysis (FIA)
 Program county-level estimates
- downscaled using maps of <u>forest</u> <u>vegetation type</u> and <u>continuous</u> <u>estimates of basal area</u>



Standing Inventoy: Small Diameter

> 10,000 cubic feet per acre

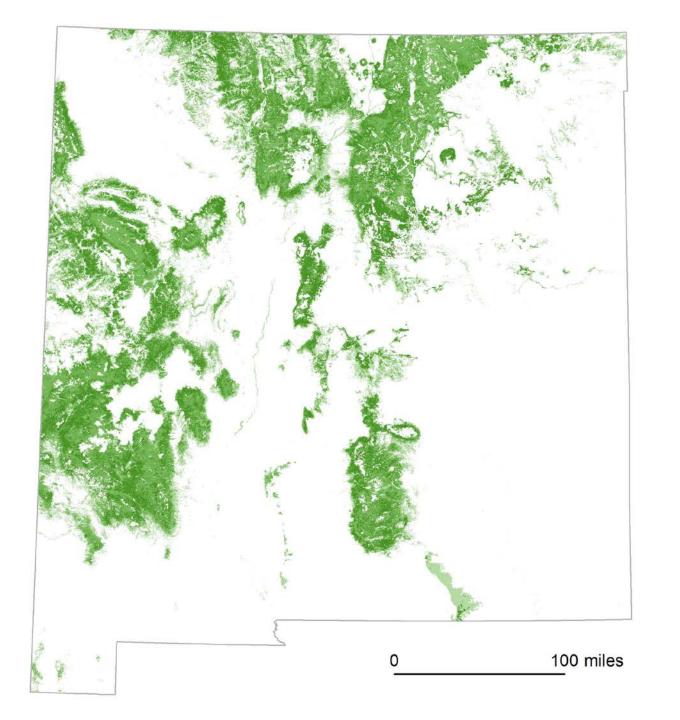
1,000.1 - 10,000

100.1 - 1,000

10.1 - 100

0.1 - 10

| 0



Standing Inventoy: Other Biomass

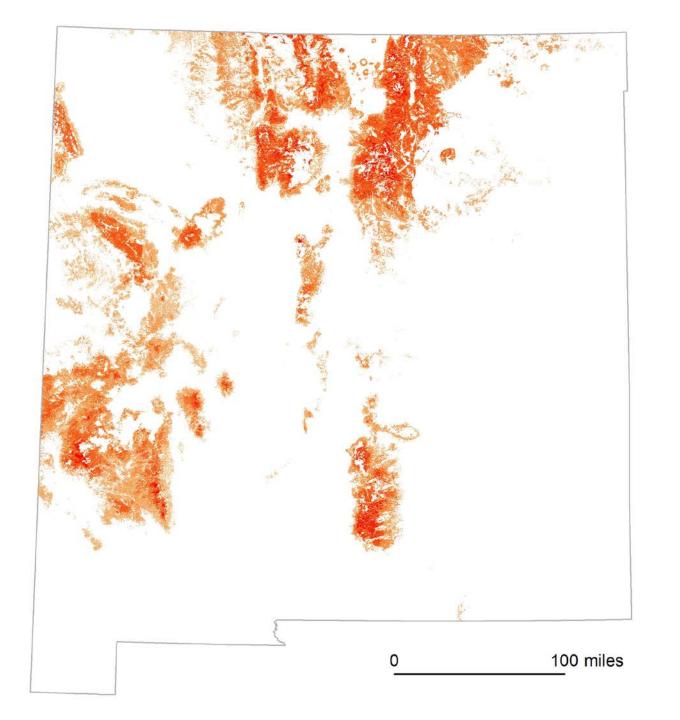
> 100 short tons per acre

10.1 - 100

1.1 - 10

0.1 - 1

0



Disease and Insect Risk to Sawlogs Risk in cubic feet lost per acre by 2027

> 1,000 cubic feet per acre

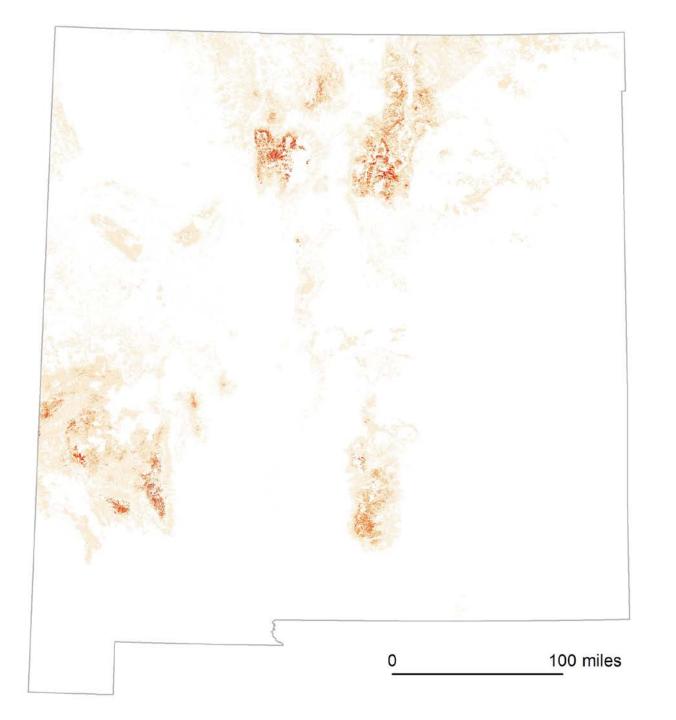
100.1 - 1,000

10.1 - 100

1.1 - 10

0.1 - 1

| (



Fire Risk to Sawlogs

Annual risk in cubic feet lost per acre

60.405 - 1,283.584

40.27 - 60.404

30.203 - 40.269

25.169 - 30.202

20.136 - 25.168

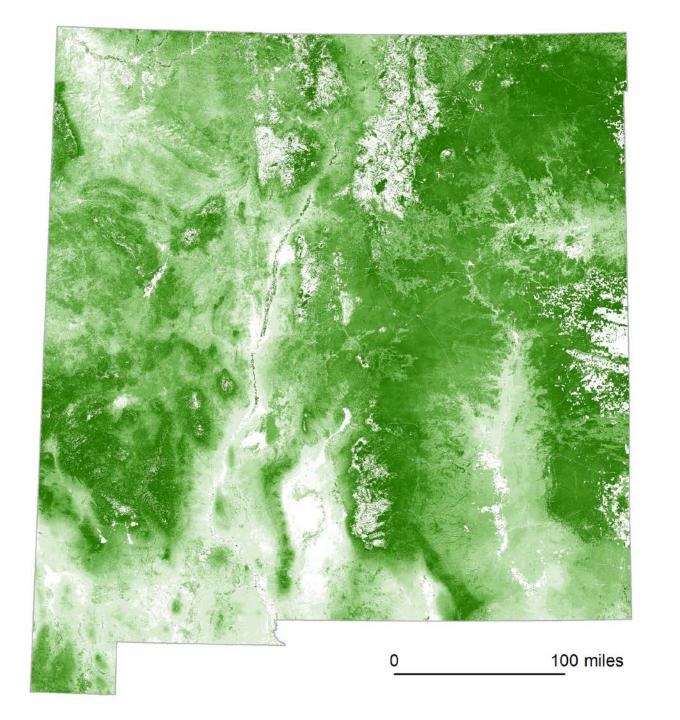
15.102 - 20.135

10.068 - 15.101

5.035 - 10.067

0.001 - 5.034

0



Forage Production Index NPP less Cropland and Tree Canopy

> 0.193

Top 10%

0.16

0.162 - 0.192

0.138 - 0.161

0.111 - 0.137

0.087 - 0.11



0.068 - 0.086



0.052 - 0.067



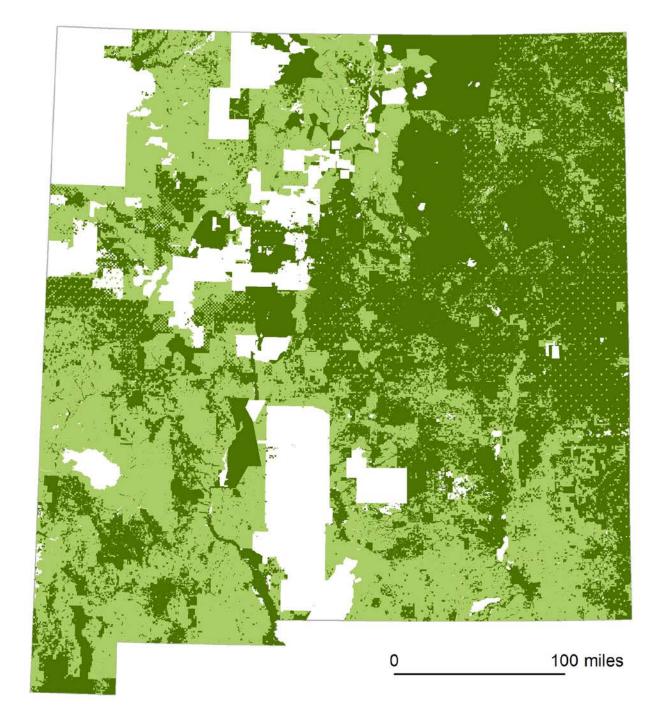
0.036 - 0.051



0.021 - 0.035



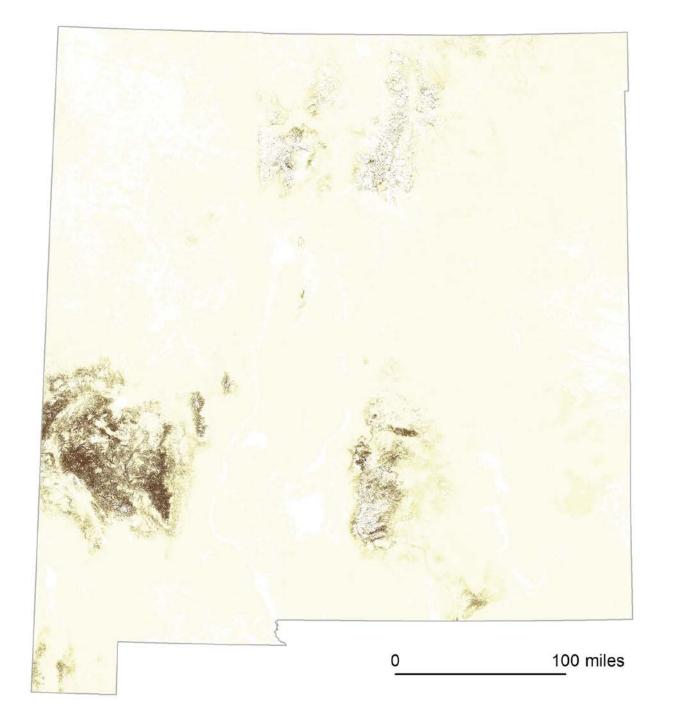
< 0.02



Private Lands and Allotments

Allotments on Public Lands

Private Lands



Post-fire Erosion Risk to Forage

0.074 - 0.689 Top 10%

0.042 - 0.073

0.028 - 0.041

0.02 - 0.027

0.015 - 0.019

0.009 - 0.014

0.006 - 0.008

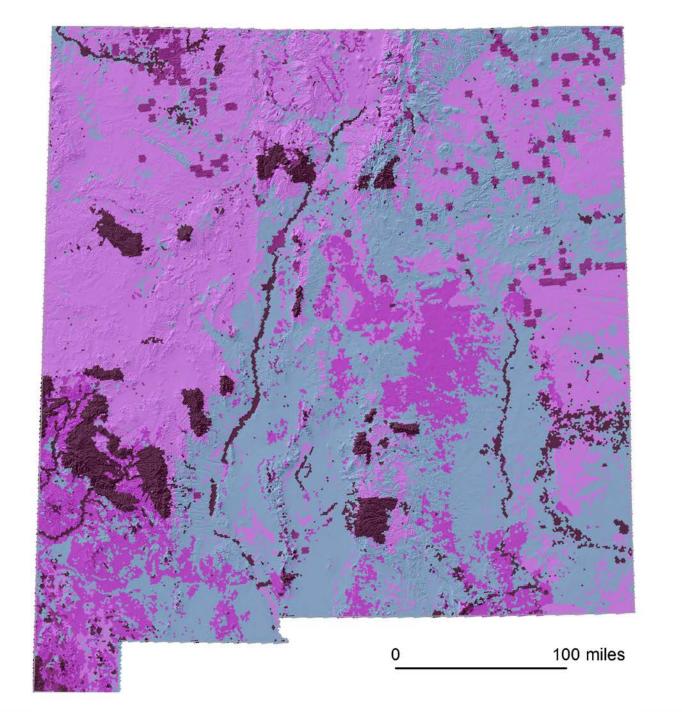
0.004 - 0.005

0.001 - 0.003

| 0

Theme: Biodiversity



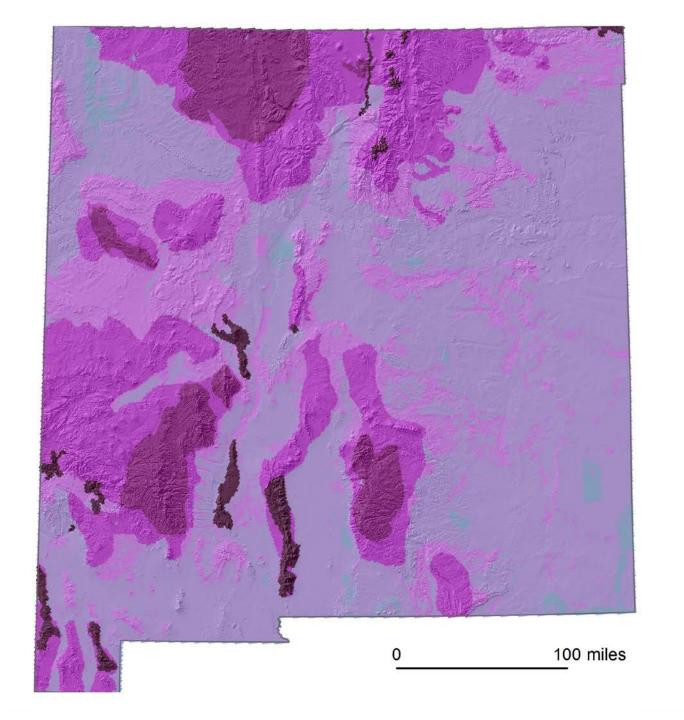


Biodiversity: Terrestrial

WAFWA: Crucial Habitat Assessment Tool (CHAT)

All Species of Concern (2018)



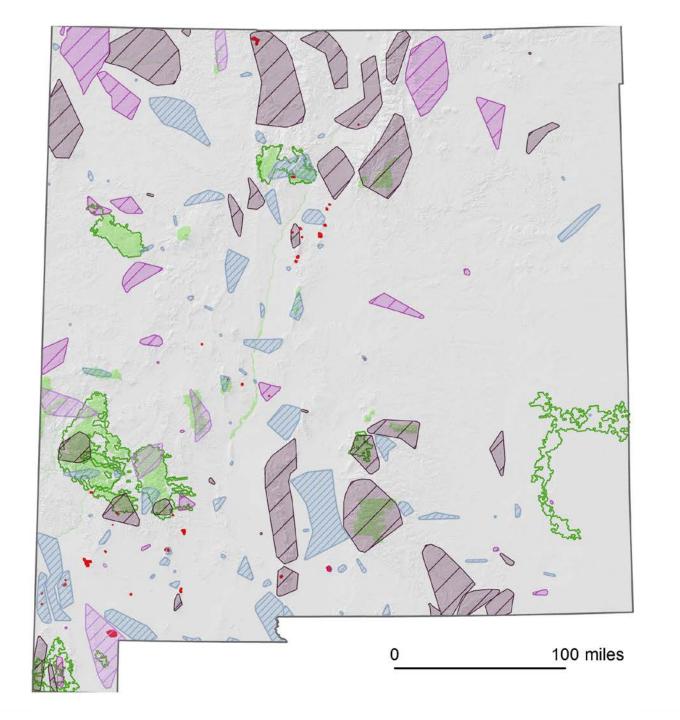


Biodiversity: Terrestrial

WAFWA: Crucial Habitat Assessment Tool (CHAT)

SERI (Terrestrial)





Biodiversity: Terrestrial

Natural Heritage New Mexico

Significant Bat Use Areas

Important Plant Areas

Rank

// High

//

1///

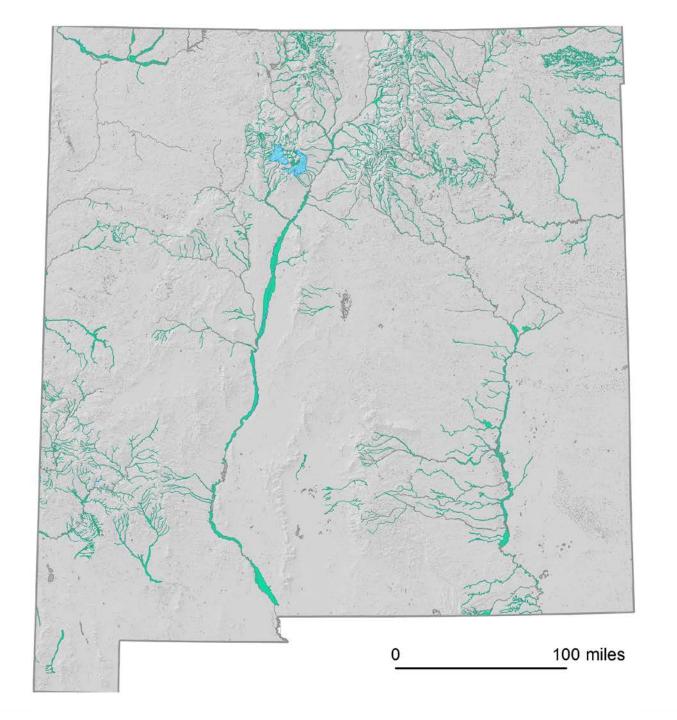
Low

NM Department of Game and Fish

COAs (Montane)

US Fish and Wildlife Service

Critical Habitat



Biodiversity: Aquatic

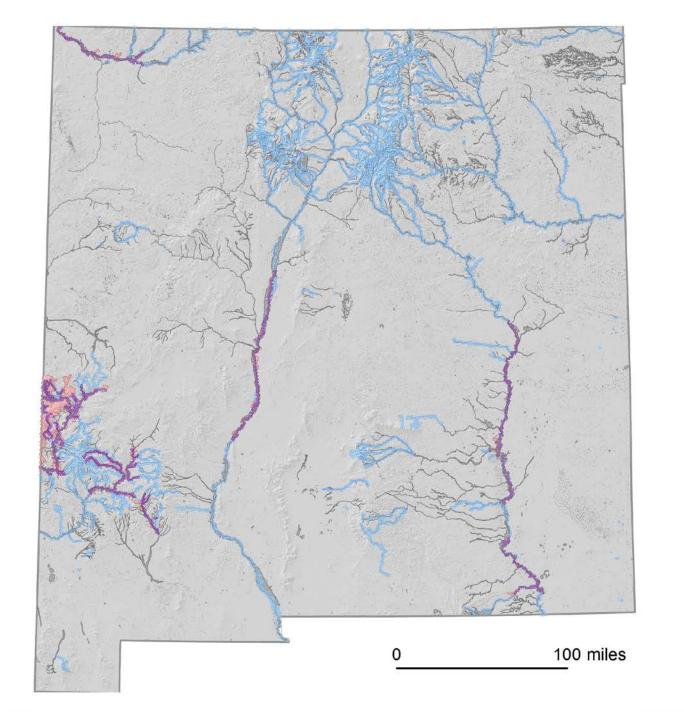
Rivers and Lakes /
Reservoirs

US Fish and Wildlife Service



Natural Heritage New Mexico





Biodiversity: Aquatic

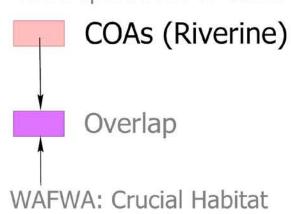
US Fish and Wildlife Service



Natural Heritage New Mexico

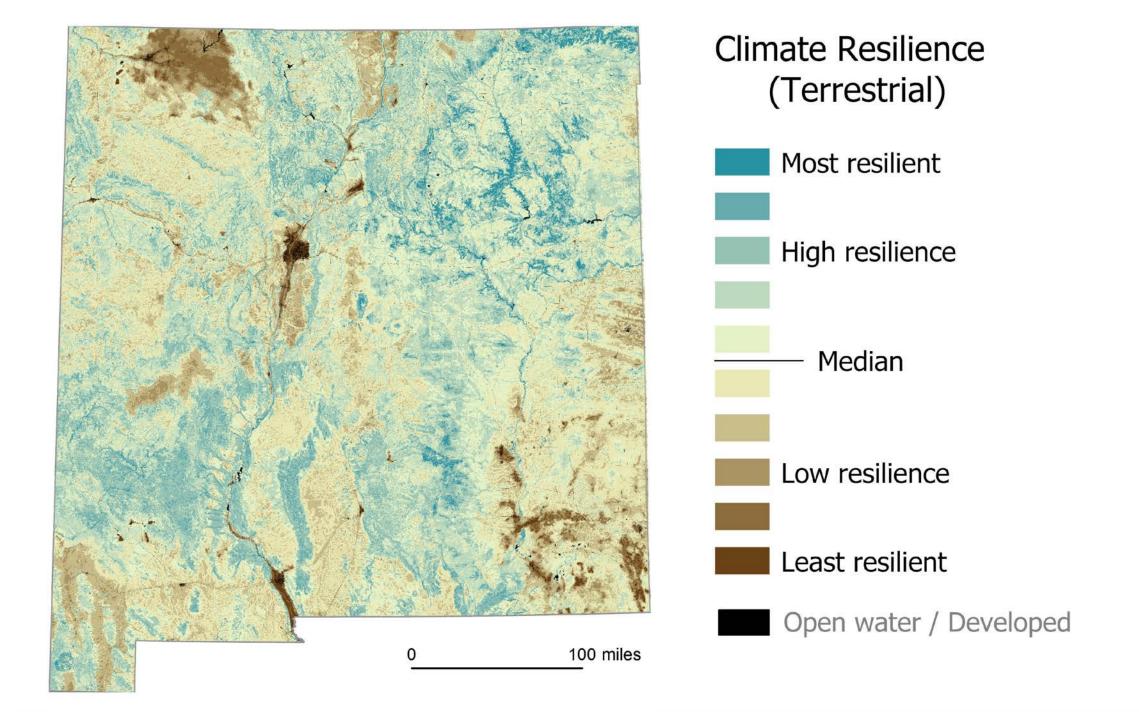


NM Department of Game and Fish



SERI - Aquatic (High Rank) 75

Assessment Tool (CHAT)



100 miles

Omnidirectional connectivity

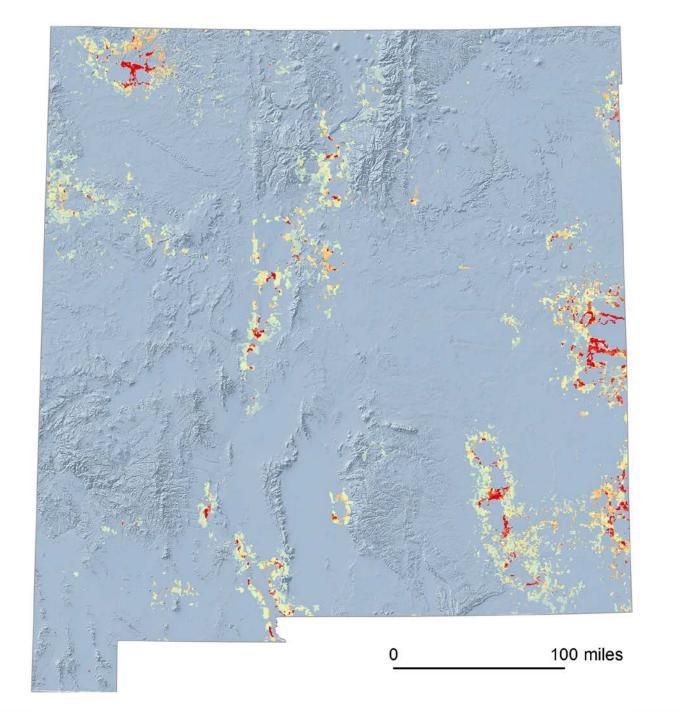
Importance to preserving landscape-scale connectivity



- Animal movement channelized into a potentially single option
- Connectivity could be severed with the loss of a relatively small amount of dispersal habitat

___ High

- Reduced options for animal movement
- Important in relation to nearby areas of critical importance

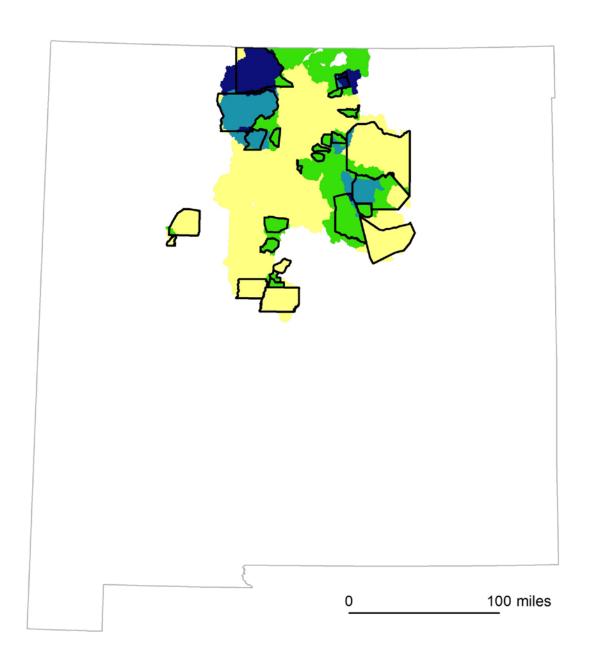


Fragmentation risk to landscape connectivity

Existing human modification used as predictor of more intensive future modification

Theme: Indigenous & Traditional Communities



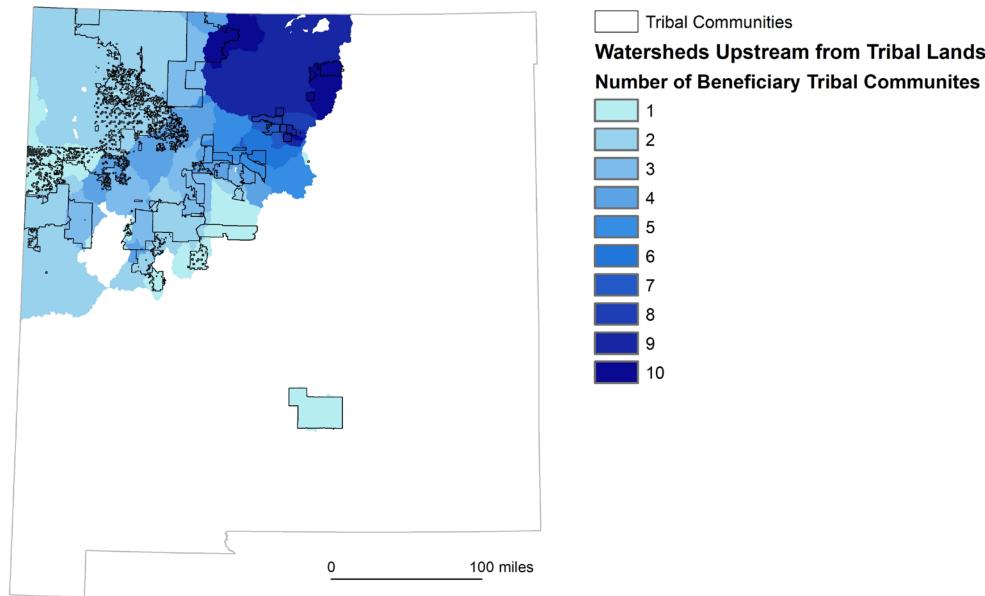


Active_Land_Grant_Traditional_Use_Boundaries_(Oct_2019)

Watersheds Upstream from Land Grants

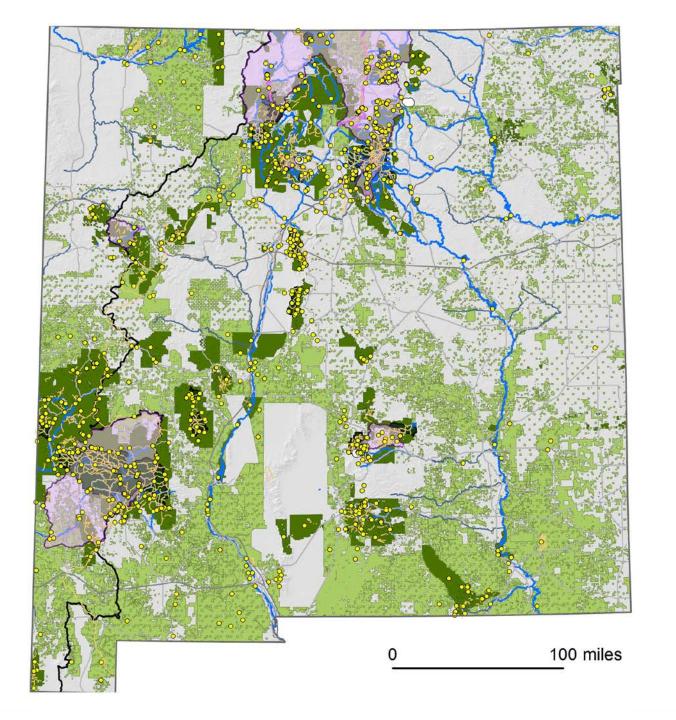
Number of Beneficiary Land Grants

1
2
3



Theme: Recreation and Cultural Use





Recreation and Cultural Use

- Recreational Site (multiple agencies)
 - Continental Divide Trail
- Trails (local)
- Ski Area
- Fishing Waters (NMDGF)

Wild and Scenic Rivers (WSR)

- → WSR River
- Contributing area (watershed)

Recreation by Land Ownership

- Managed for Recreation
- Recreation Allowed
- Restricted Access
- Wilderness
- River Highway

Theme: Urban Forests and Communities

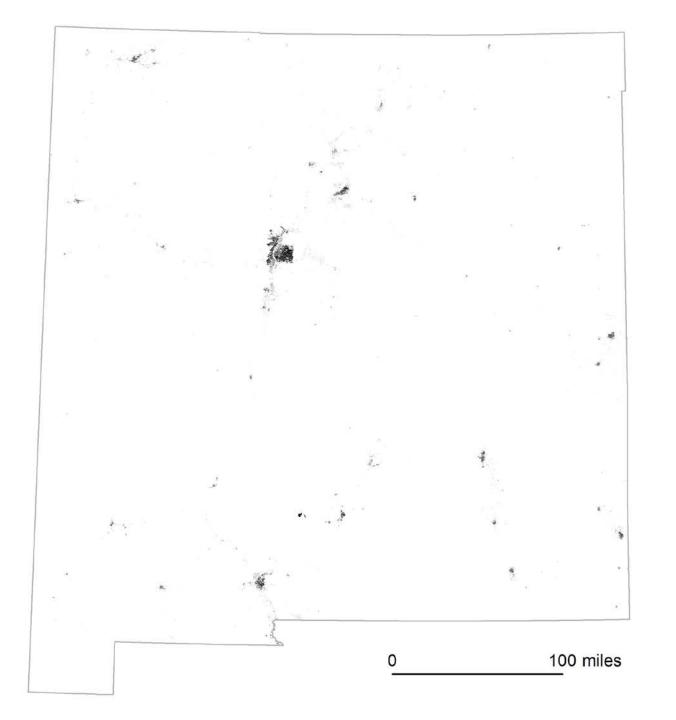




Tree Canopy (Urban areas)

Classification of NAIP 2018 imagery (0.6m)

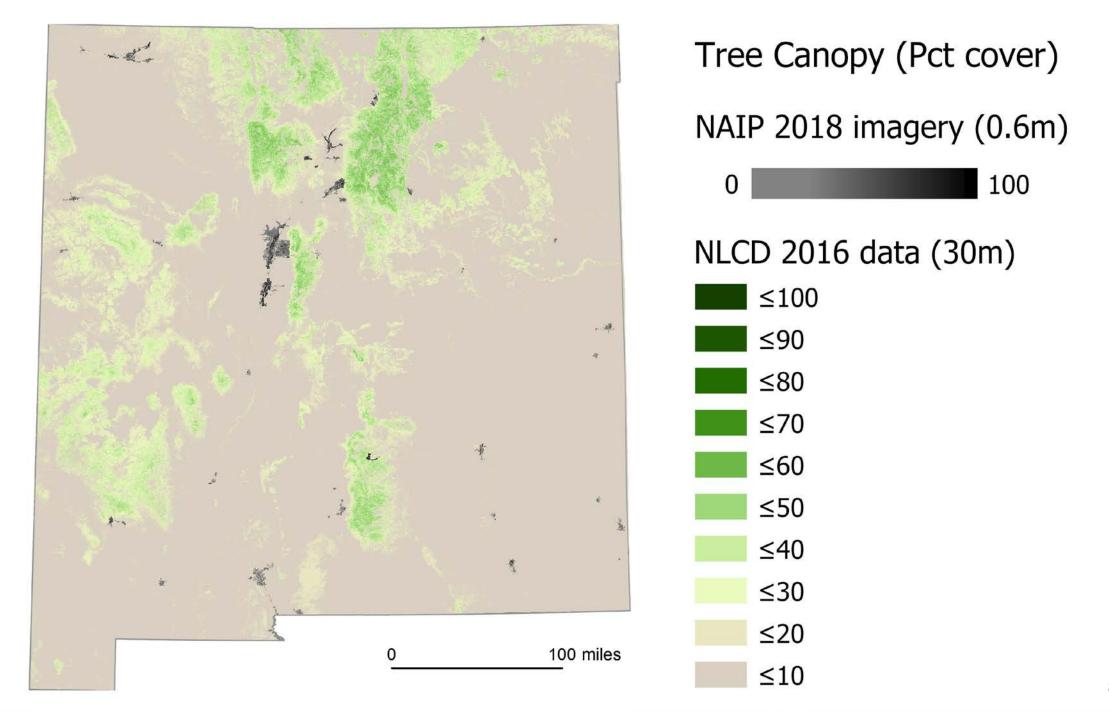
- Tree
- Tree (~ 95%) or Irrigated Grass (~ 5%)
- Shadow
- Irrigated Grass
- Permeable
- Impervious (incl. Large Buildings)
- Impervious

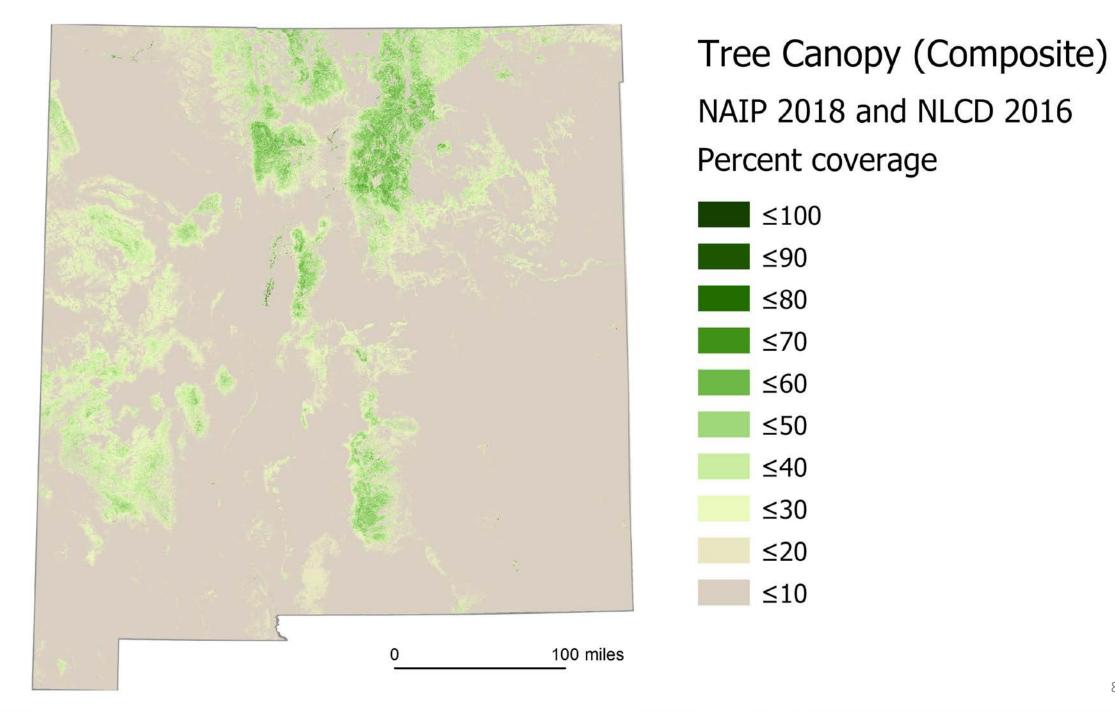


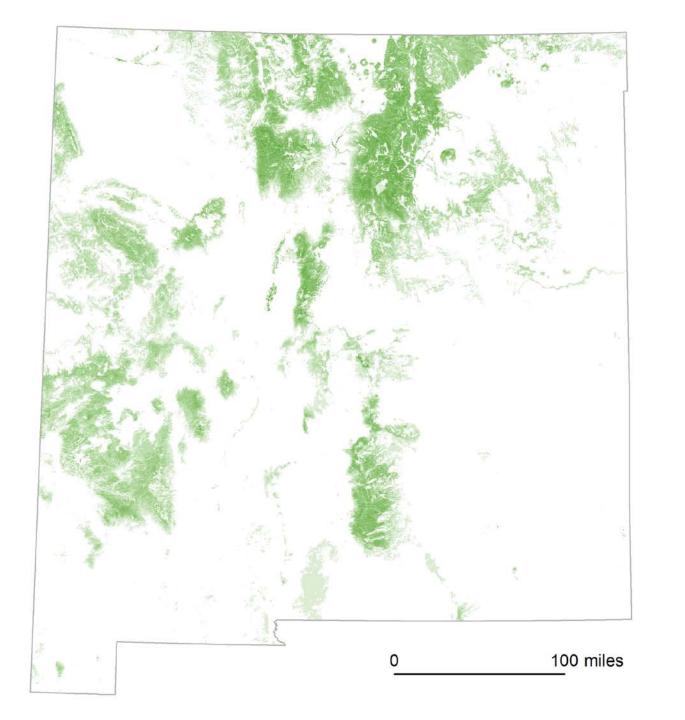
Buildings

Value High: 1

Low: 0







Tree Canopy w/in 270 meters Canopy Cover (%)

0 - 10

10.1 - 20

20.1 - 30

30.1 - 40

40.1 - 50

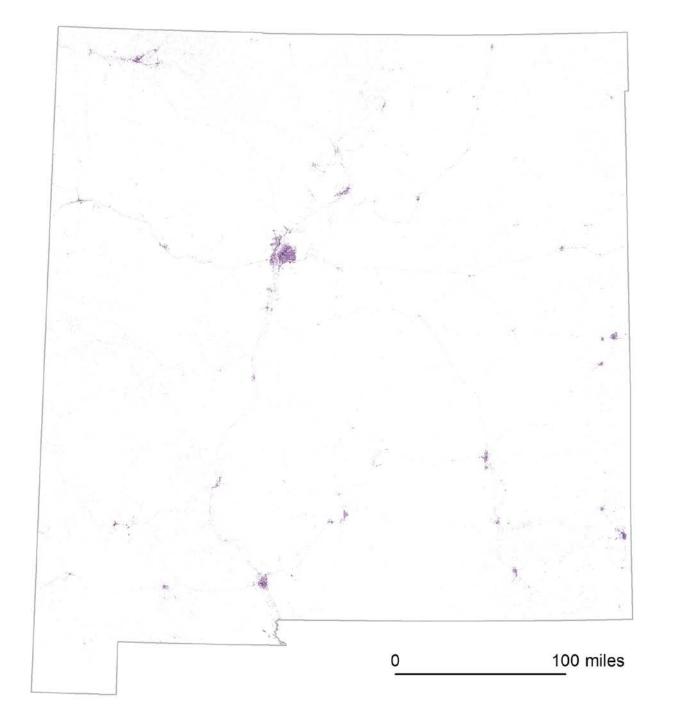
50.1 - 60

60.1 - 70

70.1 - 80

80.1 - 90

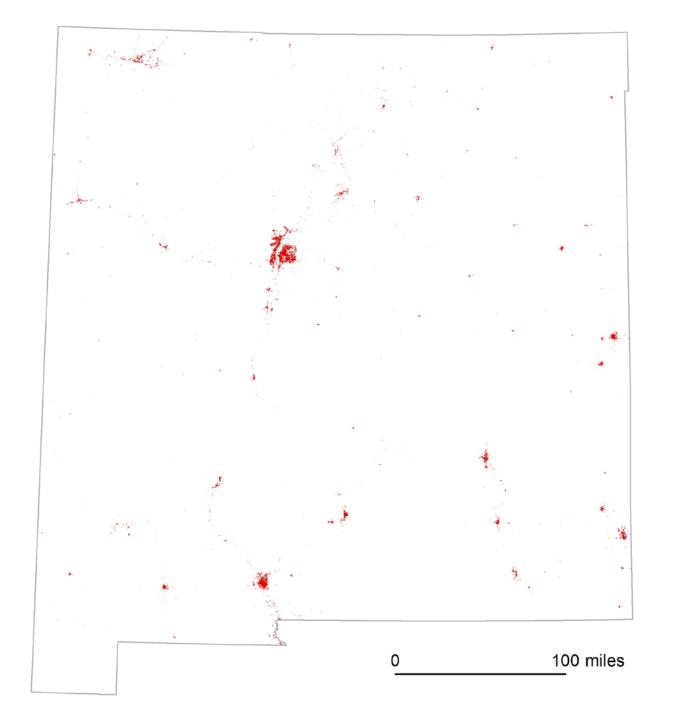
90.1 - 100



Impervious Surface

Percent High: 1

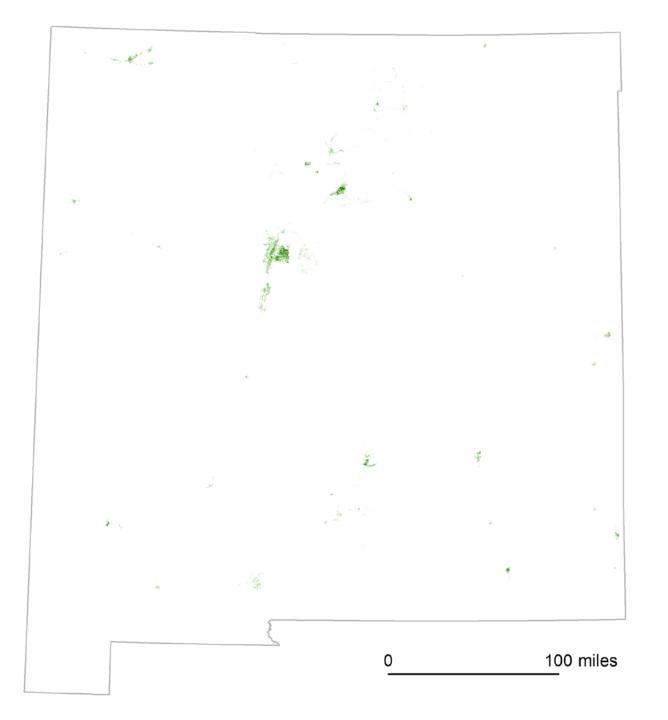
Low: 0



Tree Planting Need Model

Missing Tree Index High: -0

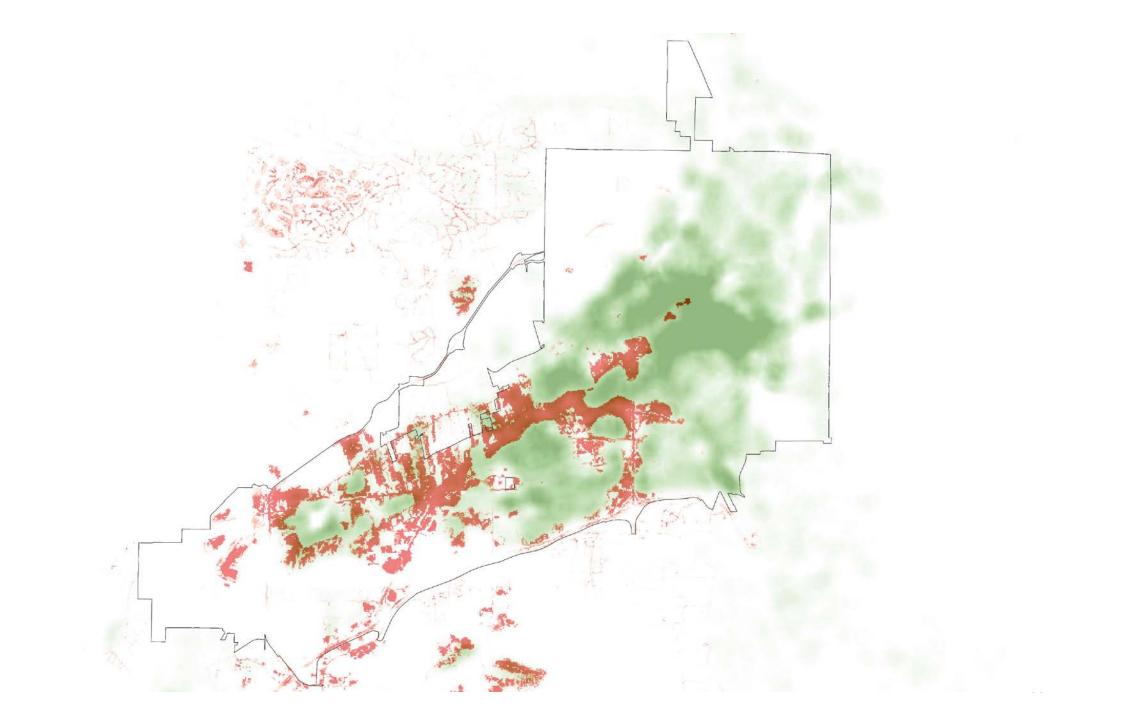
Low: -0.580827



Tree Maintainence Need Model

Existing Tree Value Index High: 0.129463

Low: 0



Thank You