Engaging fires before they start: Strategic fire planning for the 21st Century

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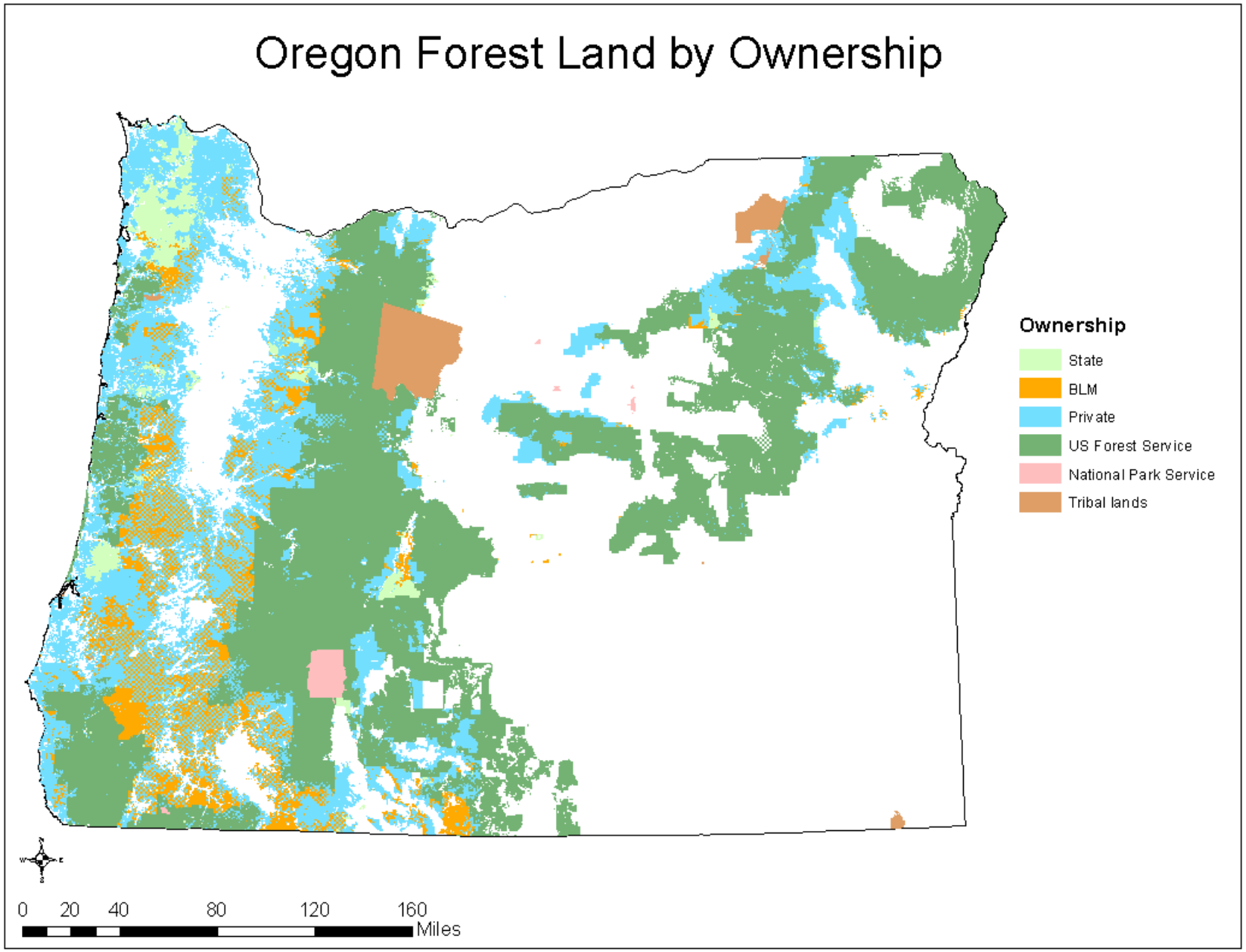
Kit O'Connor, USFS Rocky Mt. Research Station, Missoula, MT.
Rick Stratton, USFS, Washington, DC.
Joe Scott, Pyrologix, Inc., Missoula, MT.



Private - 8,767,593 acres (30%)

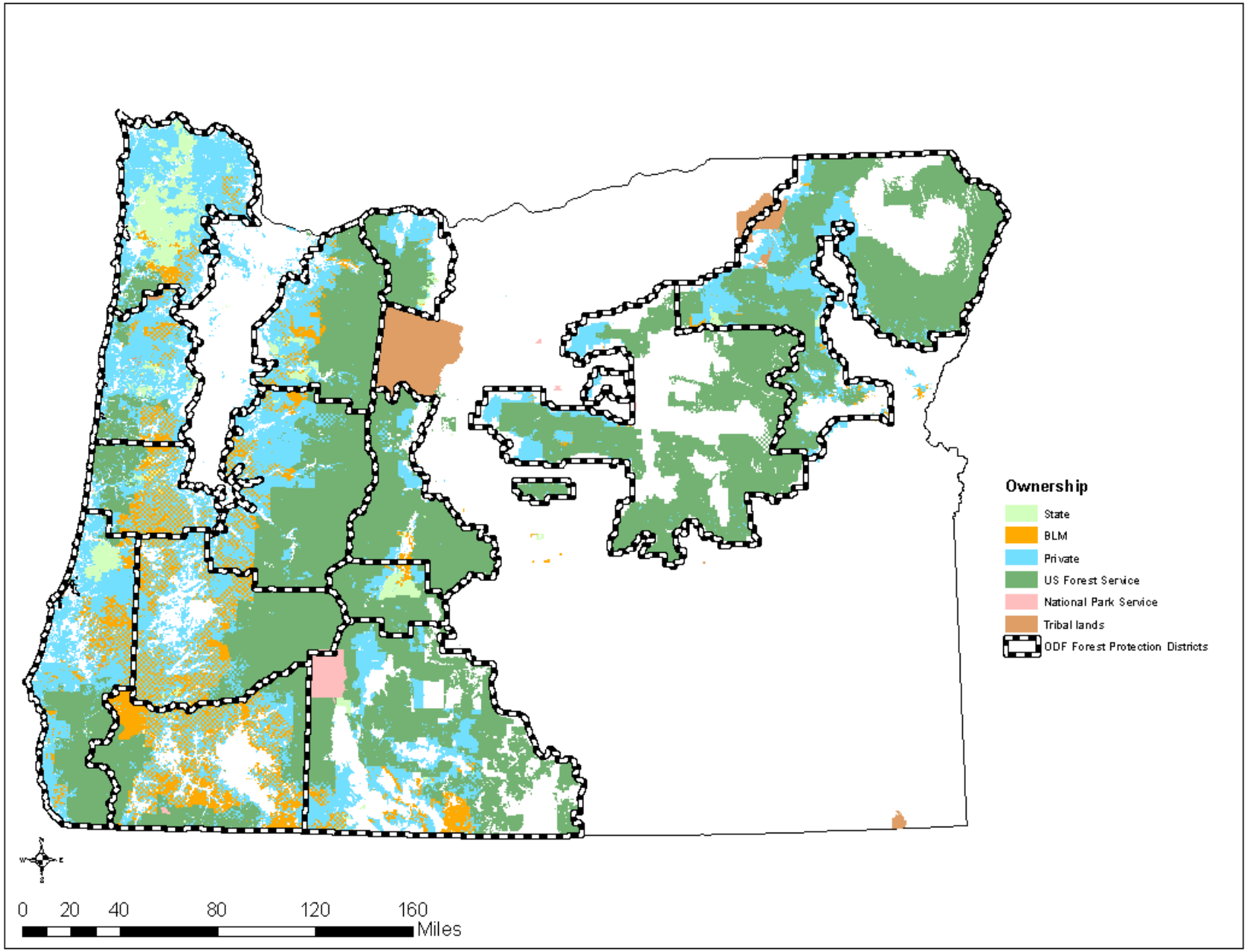
State - 914,408 acres (3%)

BLM - 2,637,155 acres (9%)

USFS - 15,571,361 acres (54%)

NPS - 199,468 acres (0.7%)

Tribal - 861,363 acres (3%)



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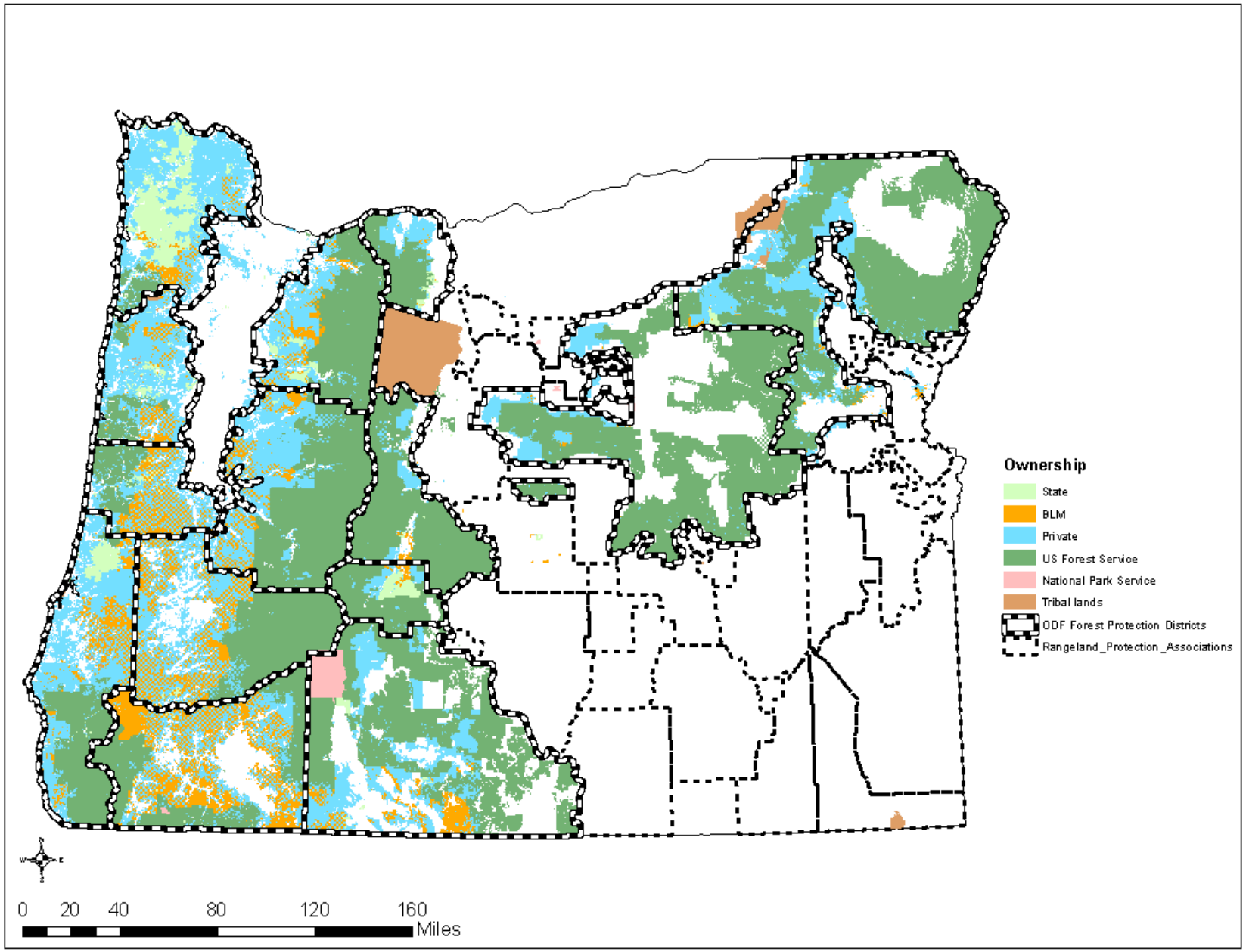

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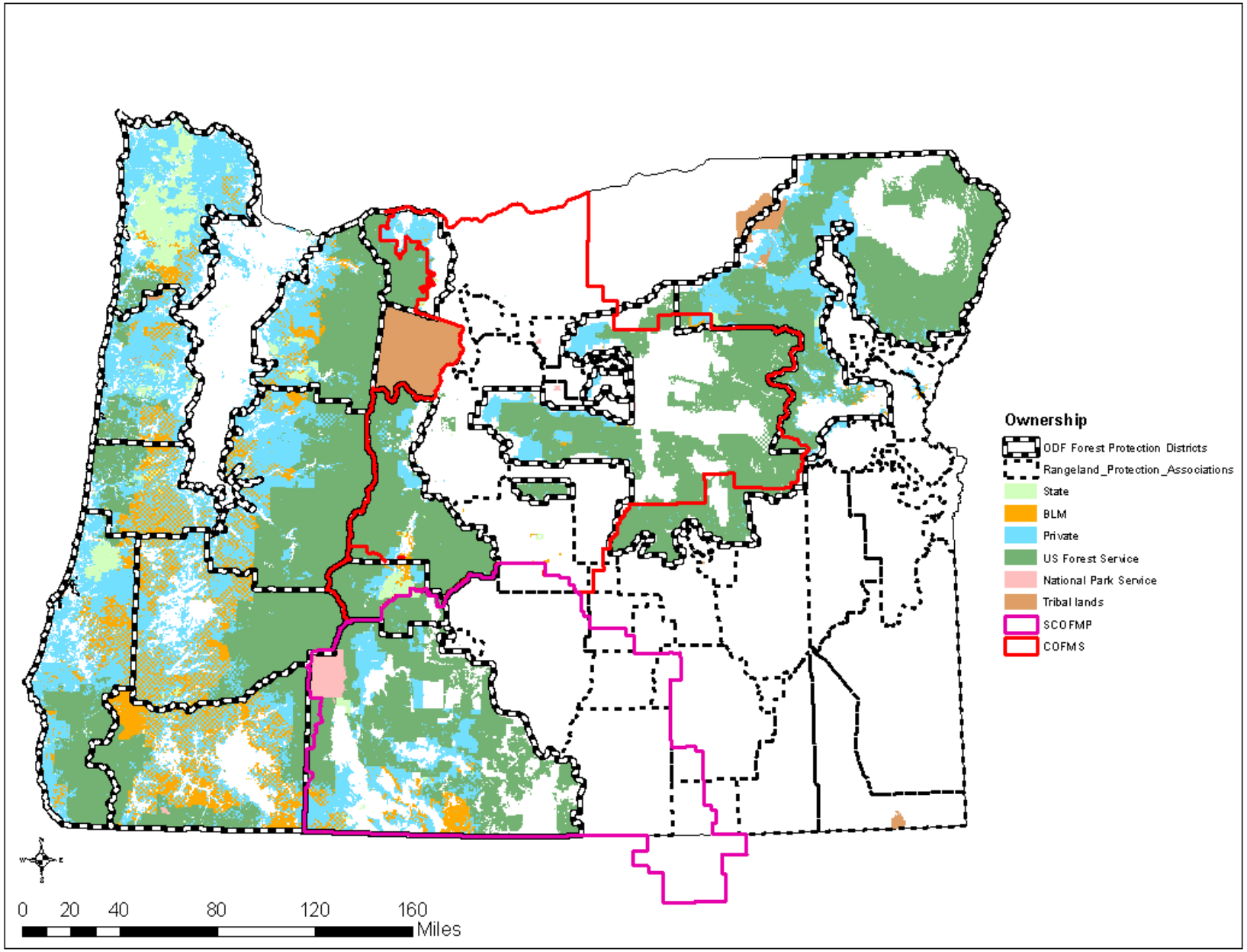

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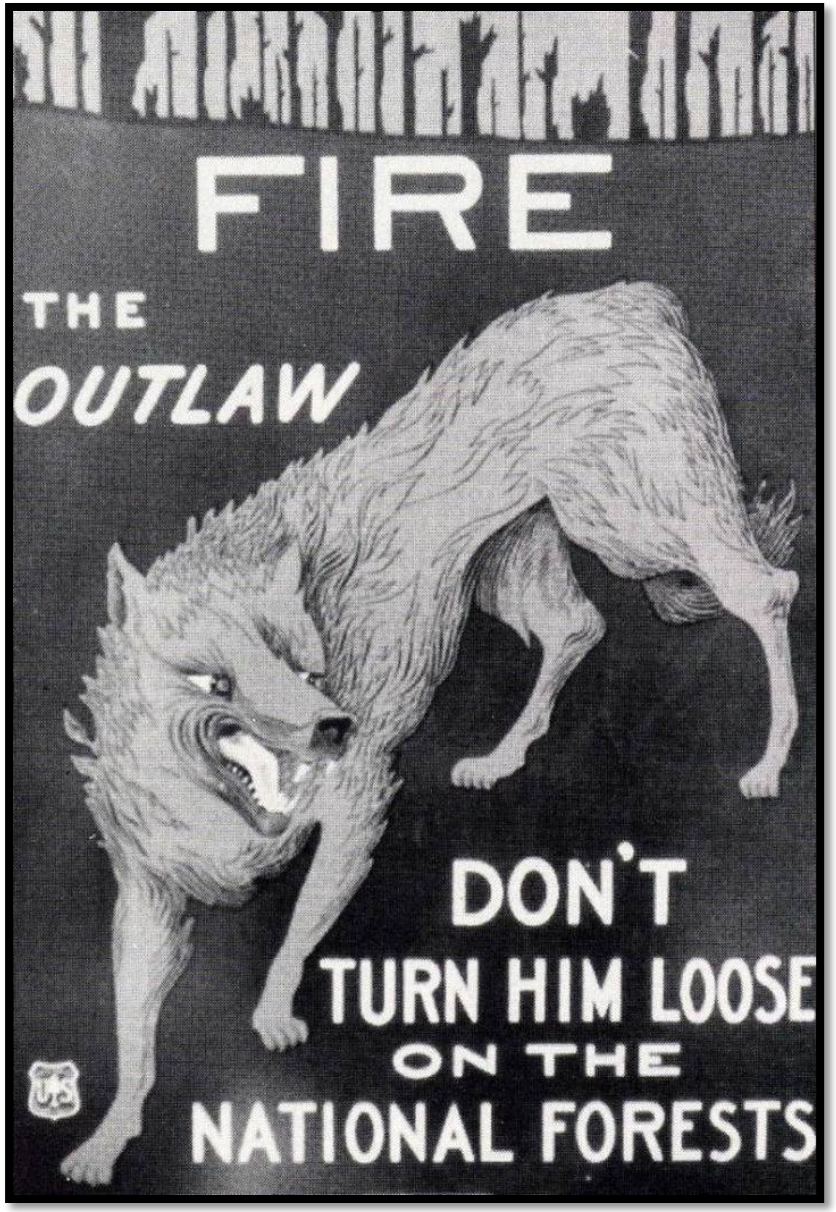
Fire as the problem

Paradise lost to Camp Fire

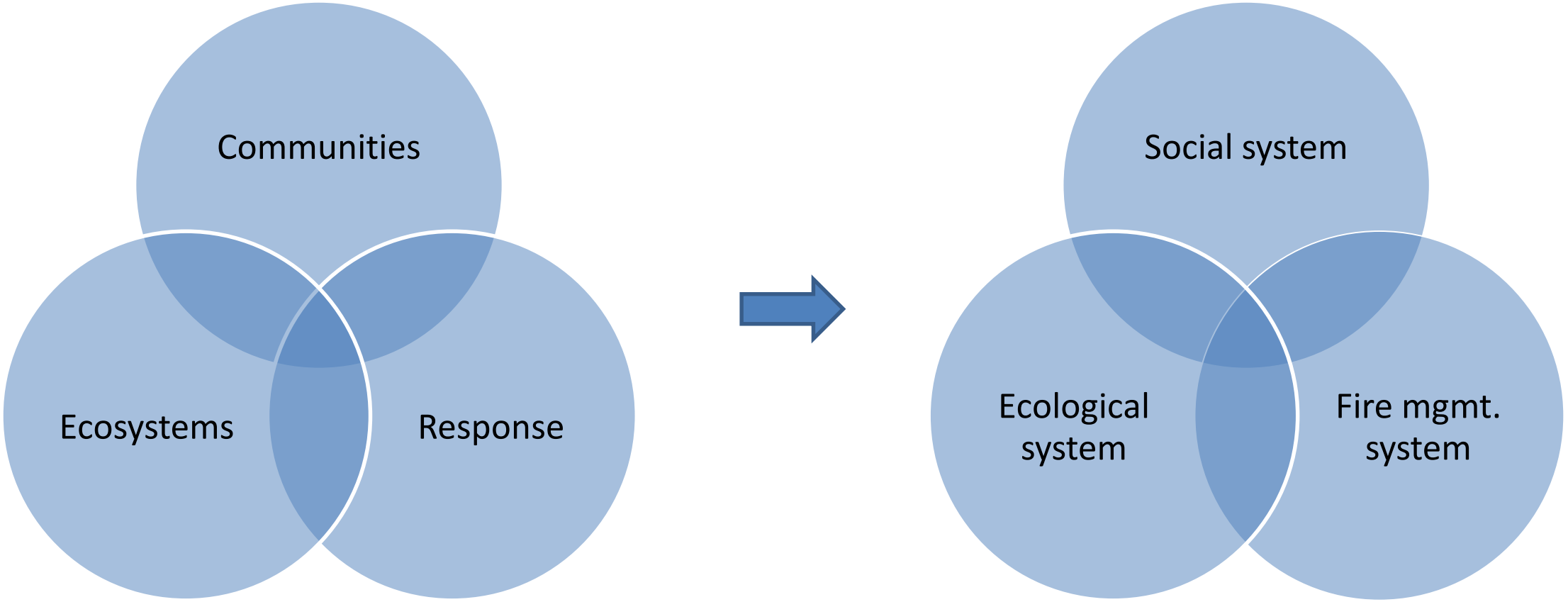


Fire as the solution

National Cohesive Wildland Fire Management Strategy vision:

To safely and effectively extinguish fire when needed; use fire where allowable; manage our natural resources; and as a nation, to ***live with wildland fire.***

The cohesive strategy: Addressing fire prone landscapes as social-ecological systems

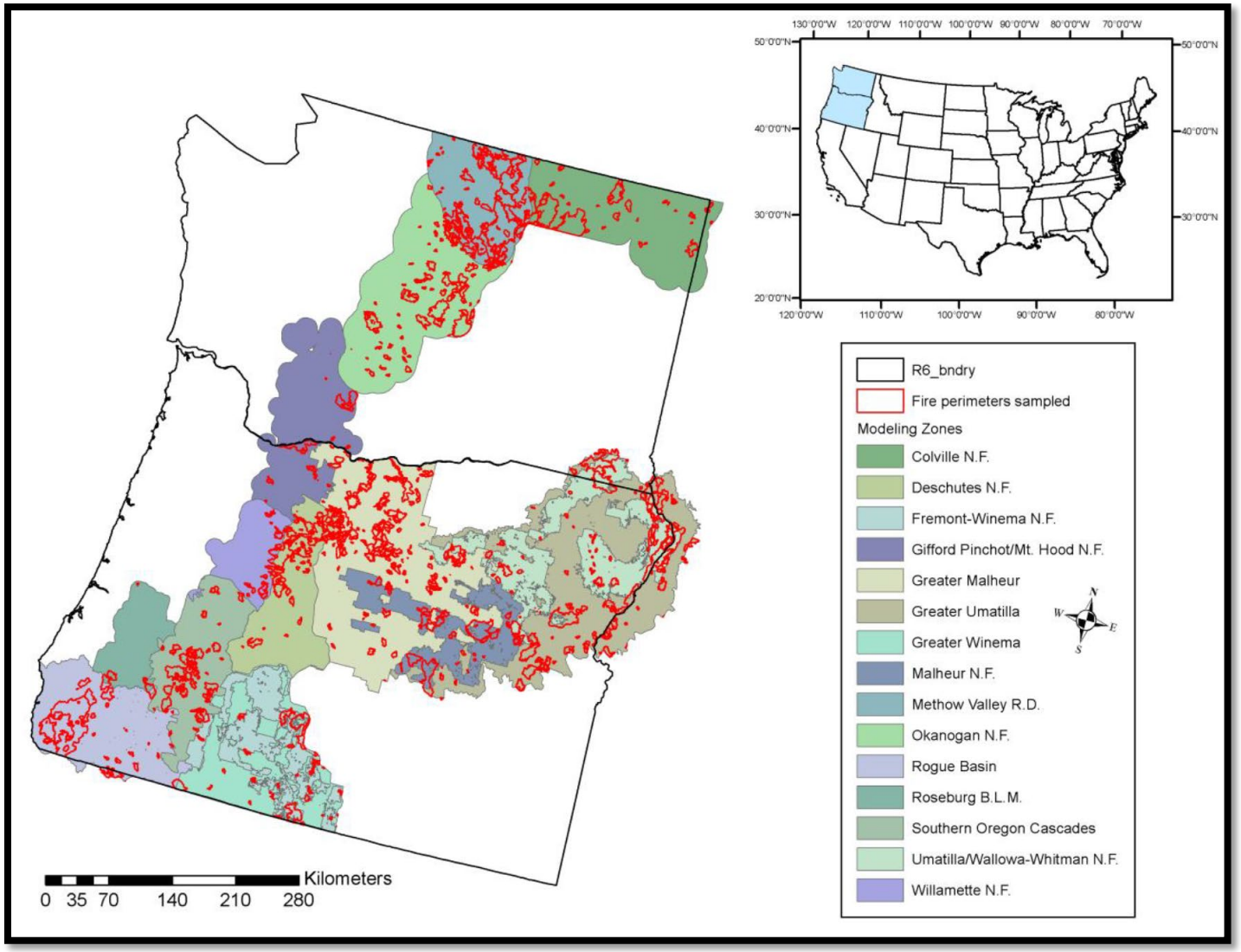


The Tools

Potential Control Location Atlas (PCLs)

Quantitative Wildfire Risk Assessment (QRA)

Suppression Difficulty Index (SDI)



https://www.youtube.com/watch?v=NMbzXNY9RU8&index=4&t=0s&list=PLNsZX2SBTlVn1ce0l9-0C6CCbIDOj2kwn

Informing wildfire response

Strategic and tactical response objectives and actions

Planning and response PODs in action

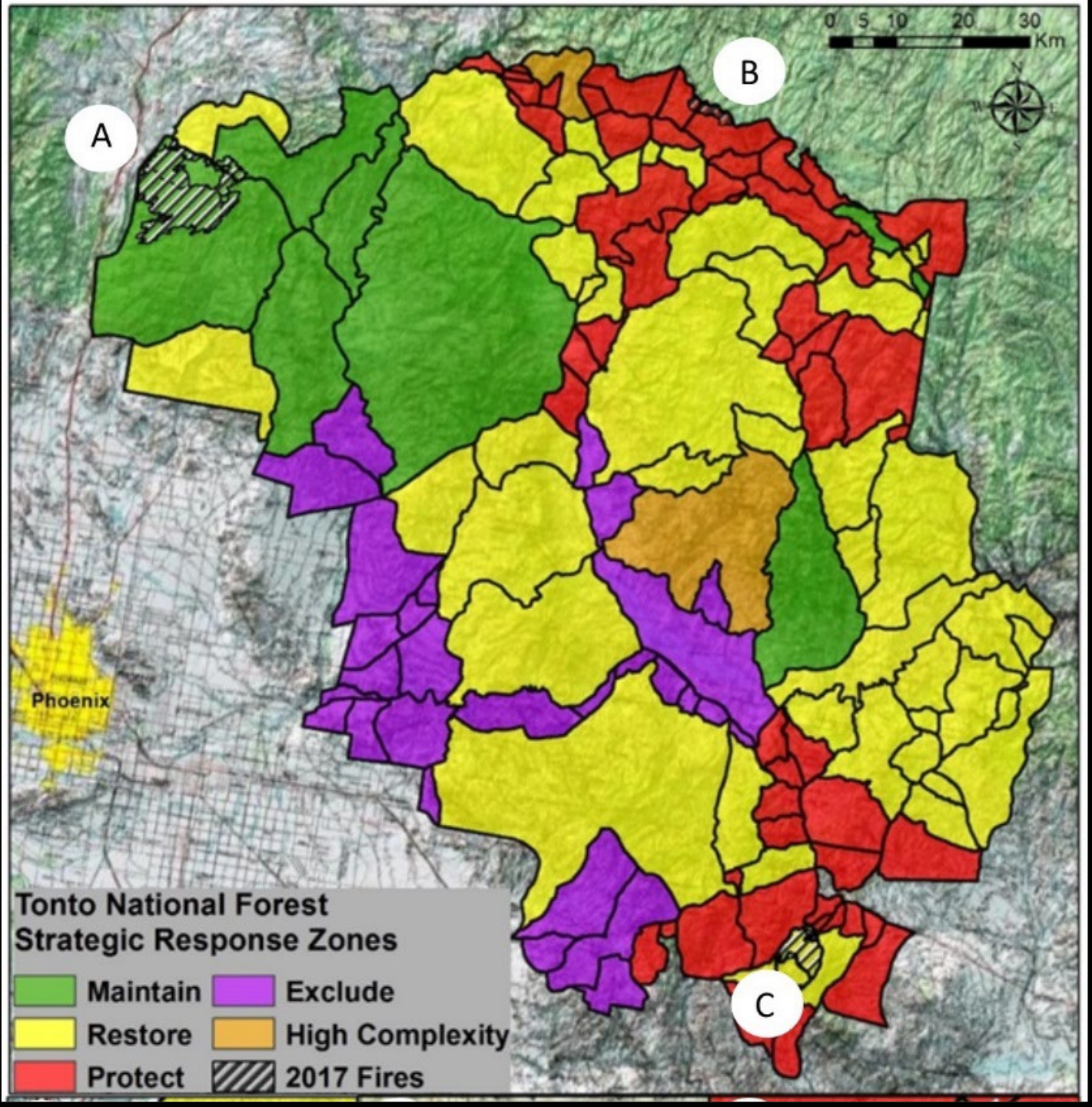
Protect: Current conditions are such that HVRAs are at high risk of loss from unwanted wildfire

Restore: Current conditions are such that HVRAs are at moderate risk of loss from wildfire

Maintain: Current conditions are such that HVRAs are at low risk of loss from wildfire, and many natural resources may benefit from fire

Exclude: Current conditions are such that HVRAs are at high risk of loss from wildfire

High complexity: Current conditions are such that HVRAs are at high risk of loss from wildfire, depending on ignition location and weather conditions



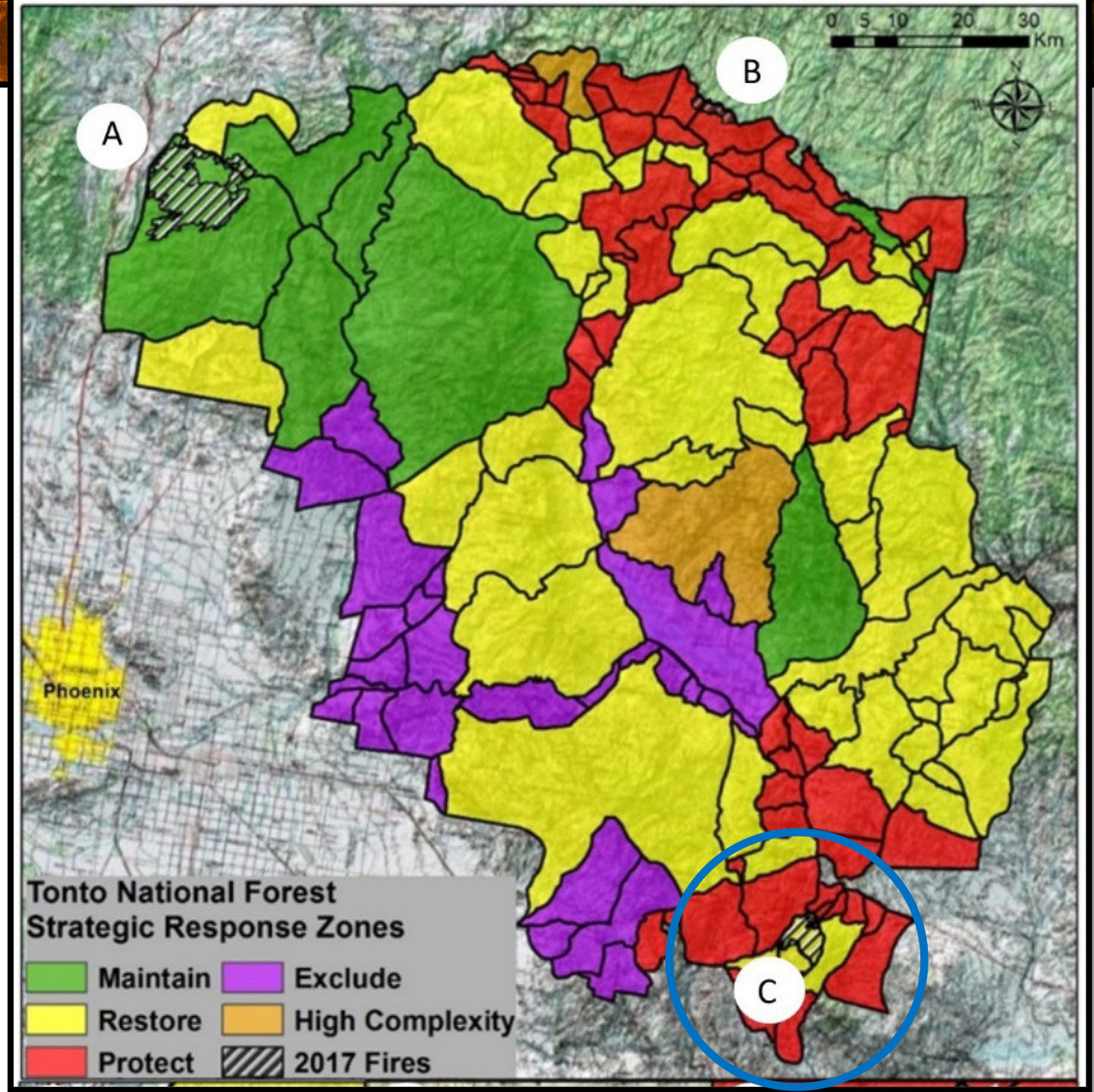
Planning and response POD Applications

Tonto N.F.

(A) Brooklyn wilderness fire

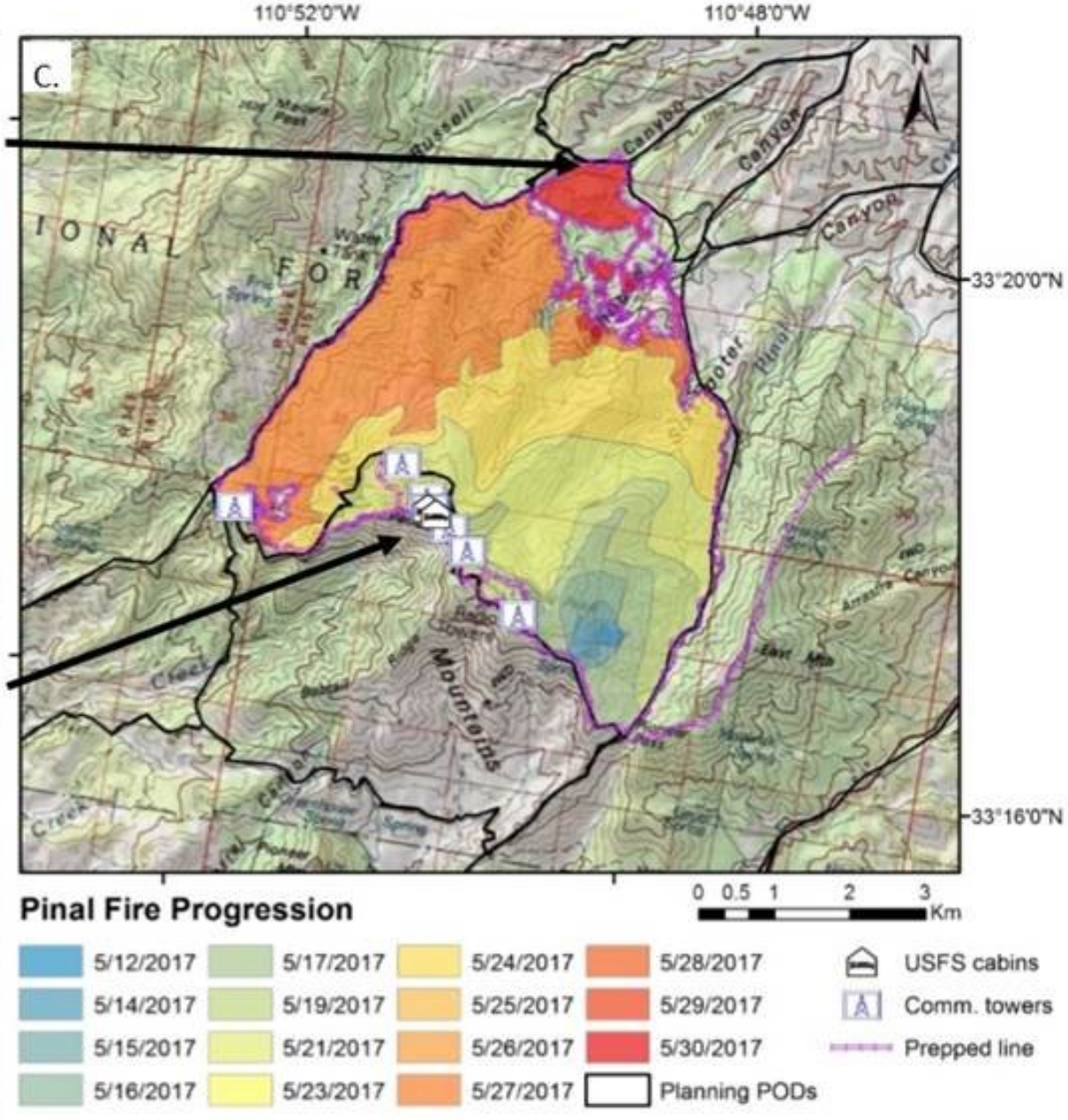
(B) Highline WUI fire

(C) Pinal resource benefit fire



A.

B.


C.
110°52'0"W
110°48'0"W
33°20'0"N
33°16'0"N
N
Pinal Fire Progression
0 0.5 1 2 3
Km
5/12/2017
5/14/2017
5/15/2017
5/16/2017
5/17/2017
5/19/2017
5/21/2017
5/23/2017
5/24/2017
5/25/2017
5/26/2017
5/27/2017
5/28/2017
5/29/2017
5/30/2017
Planning PODs
USFS cabins
Comm. towers
Prepped line

Planning and response POD Applications

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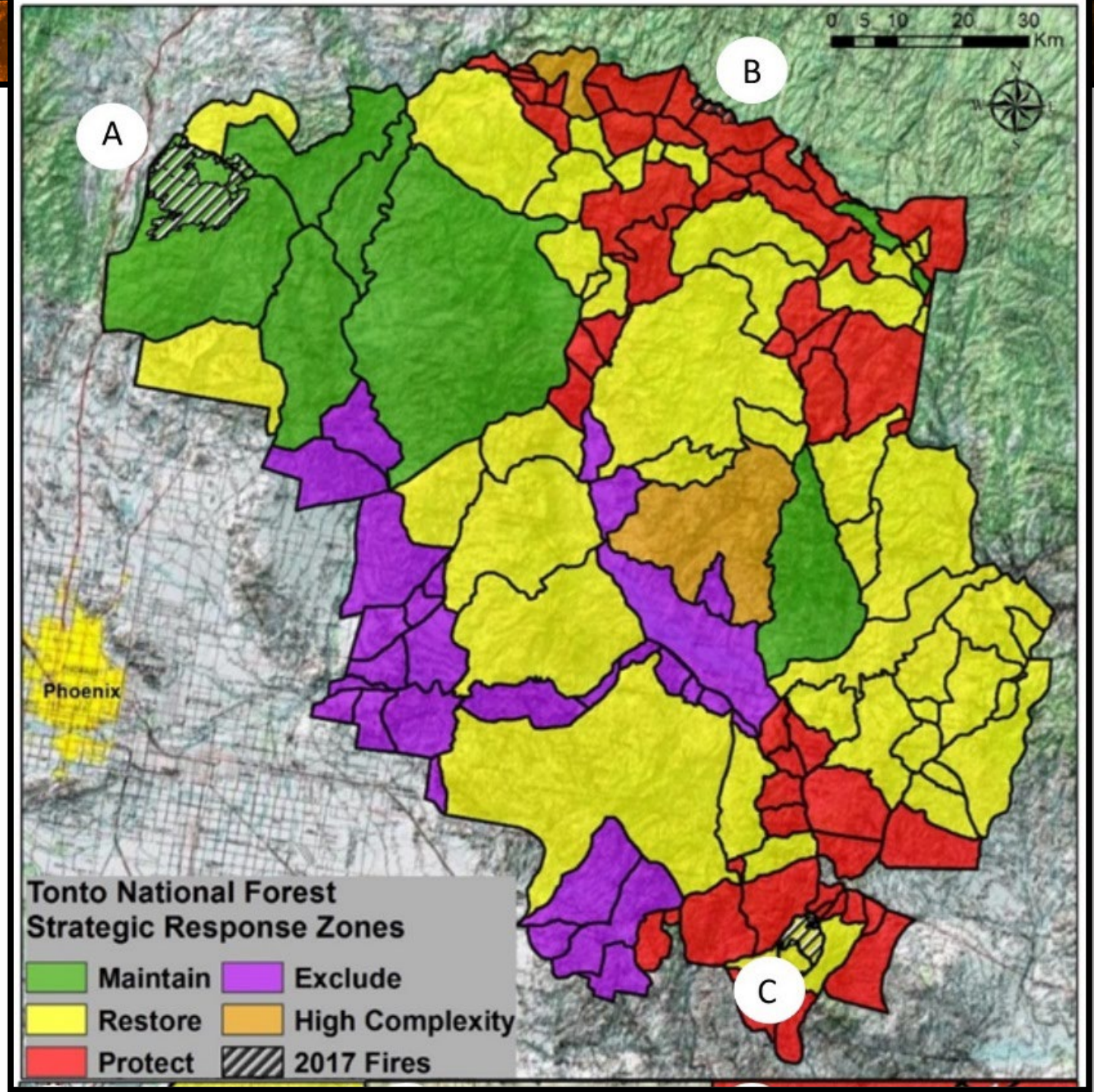
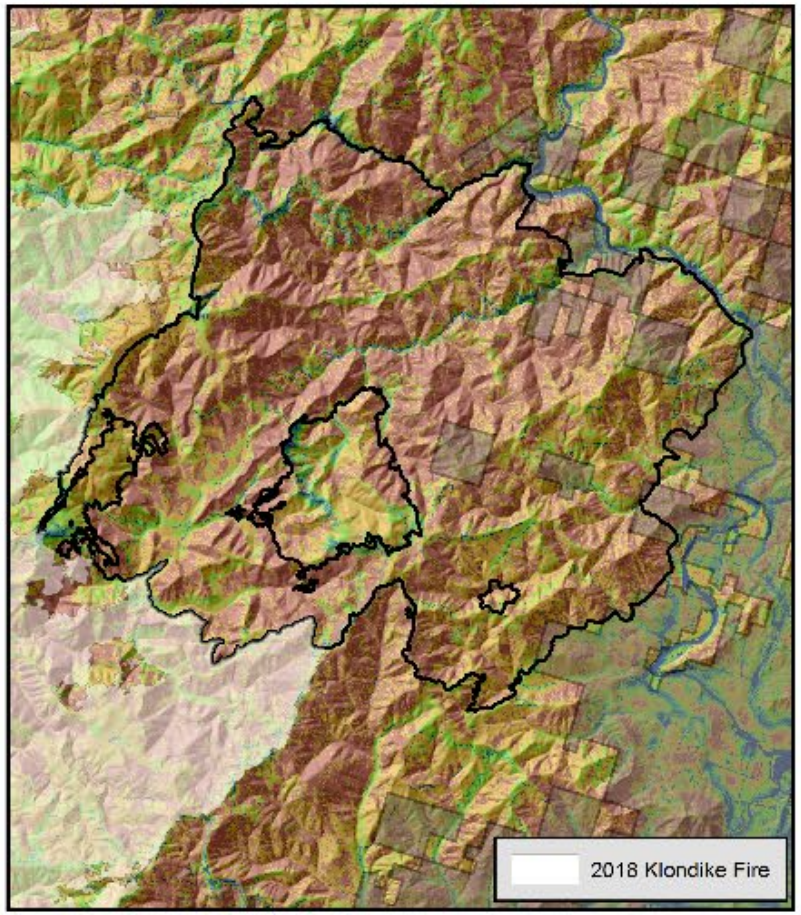


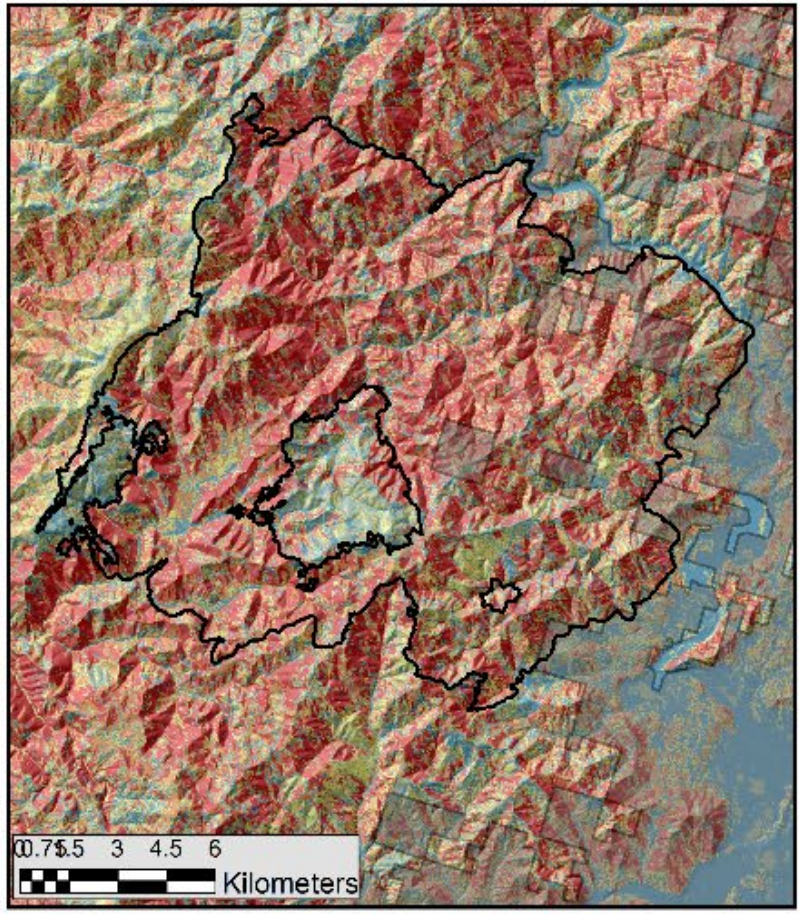
Forecasting suppression effectiveness

2018 Taylor Creek Fire

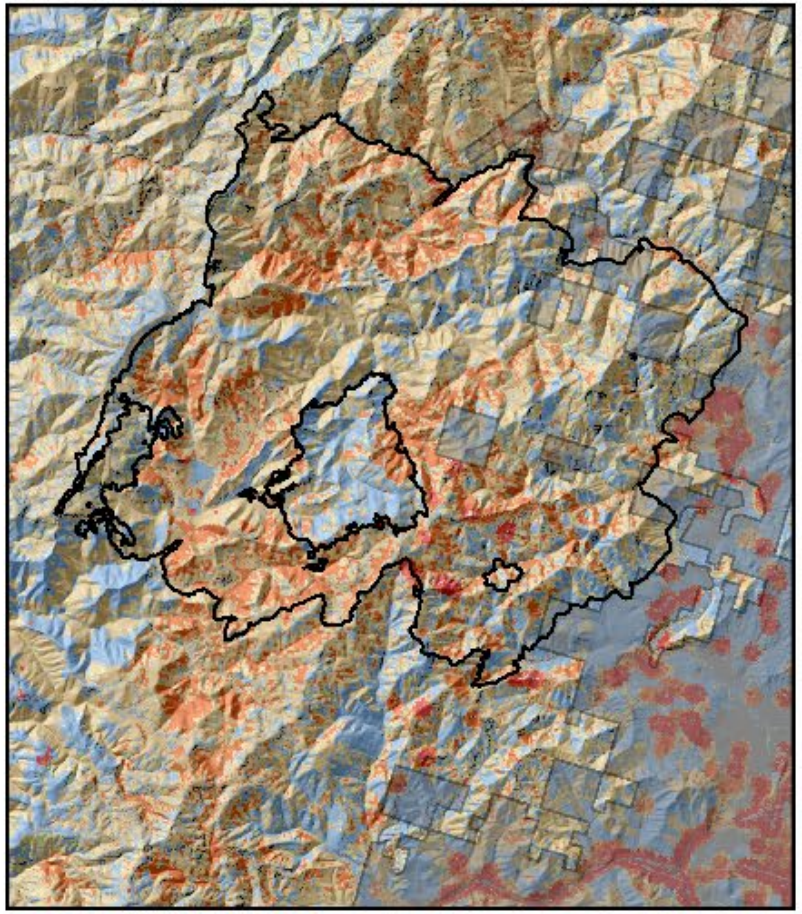
Potential Control Lines



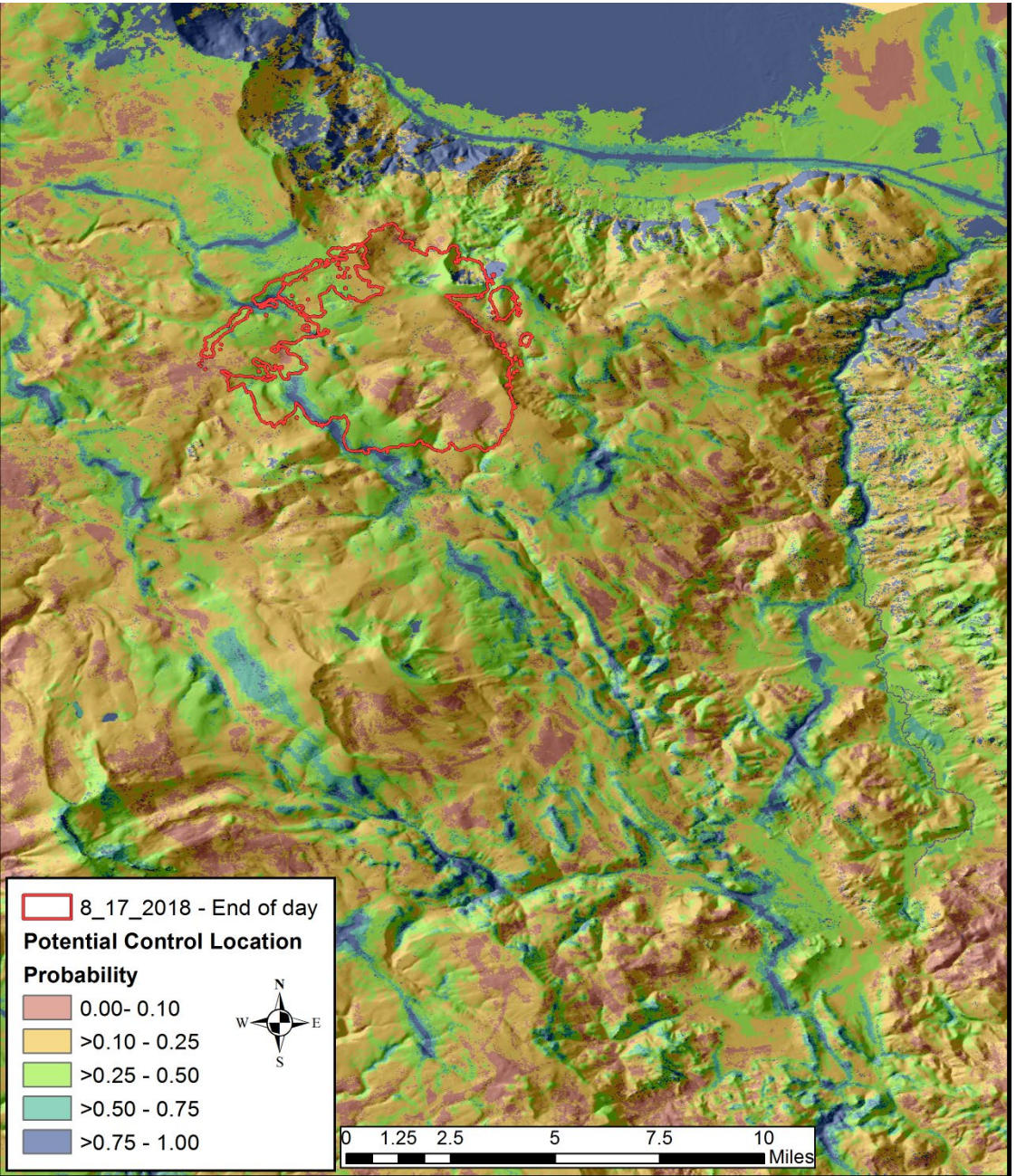
Suppression Difficulty Index



Quantitative Risk Assessment



Potential Control Locations



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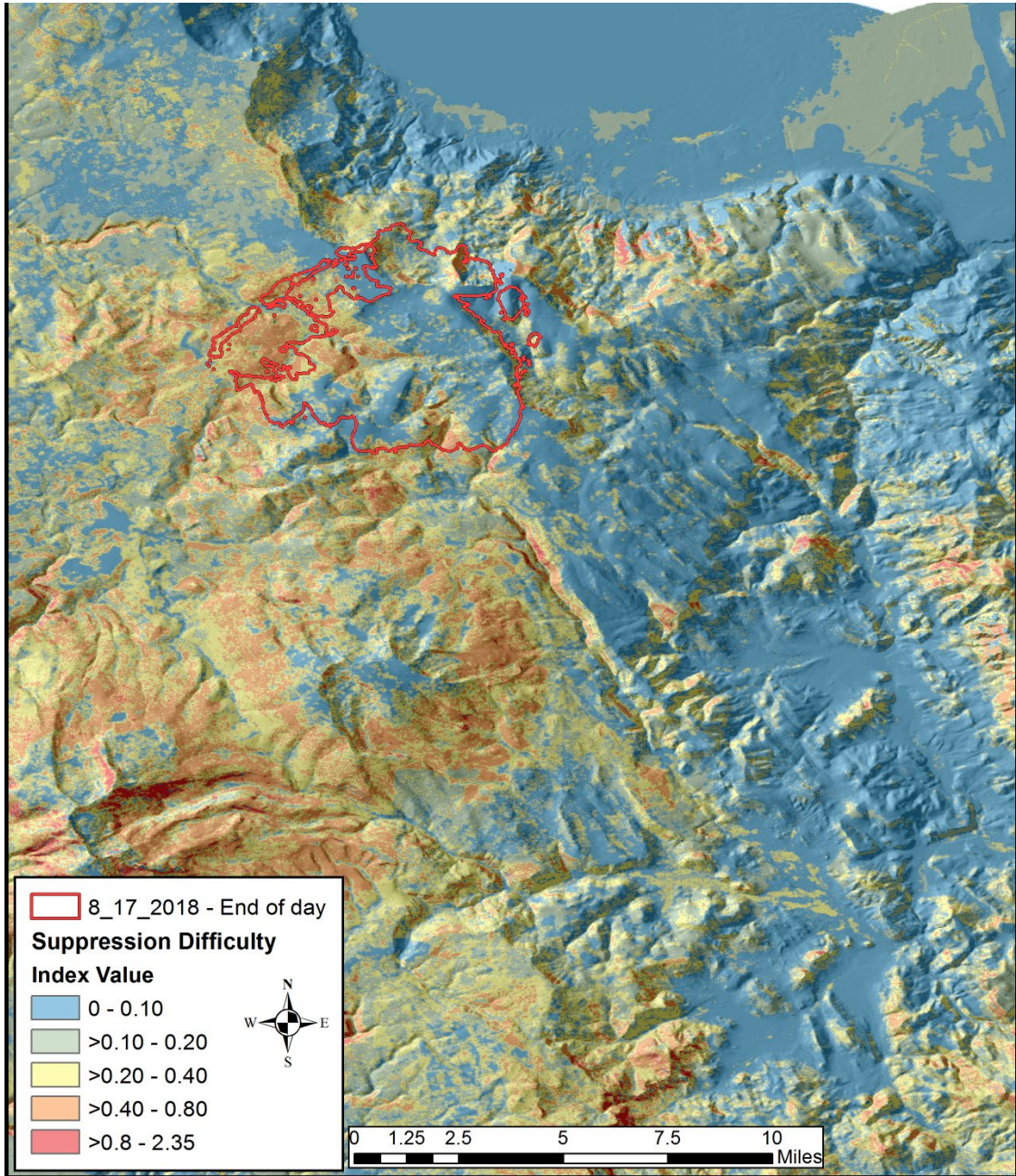

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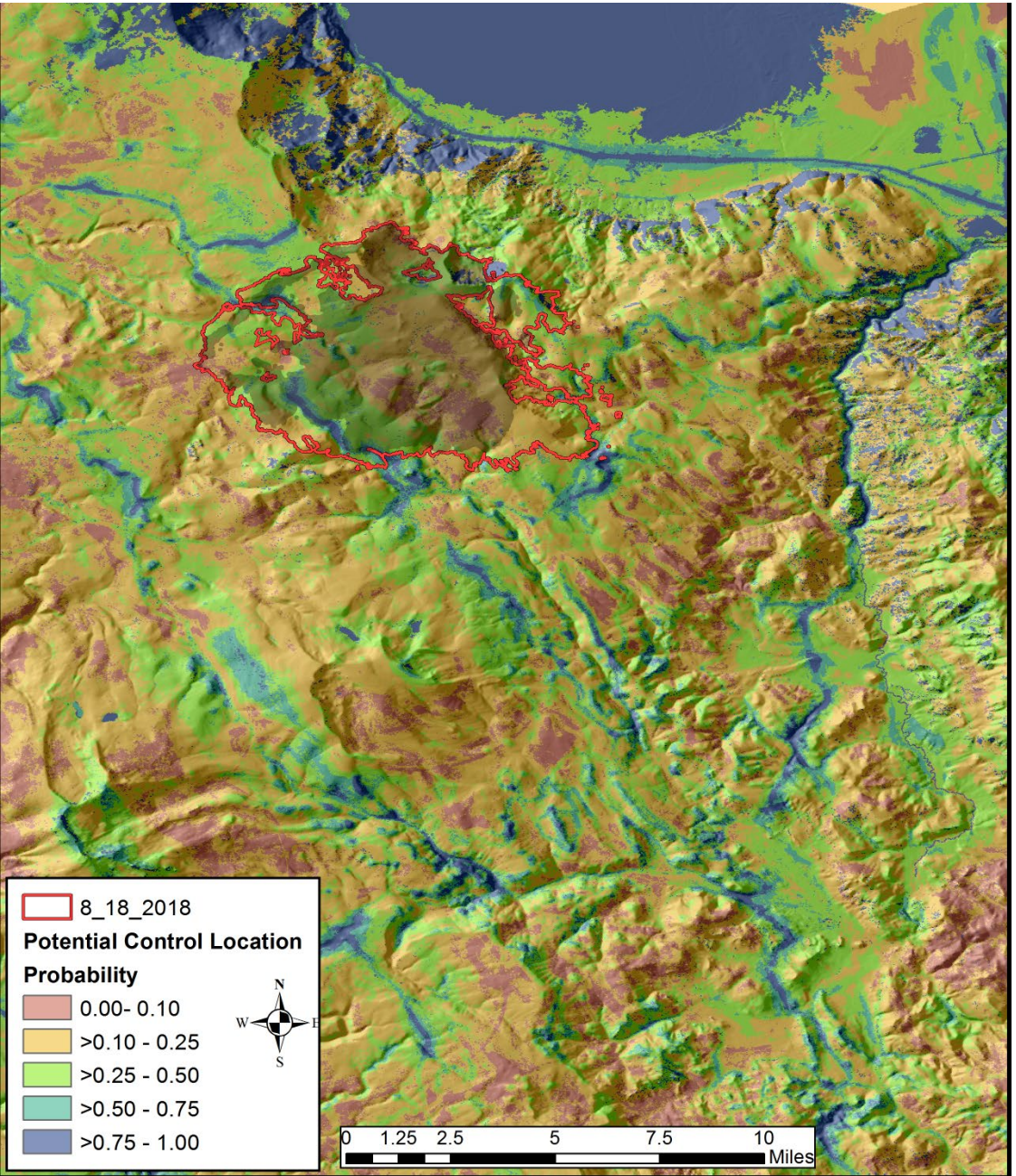

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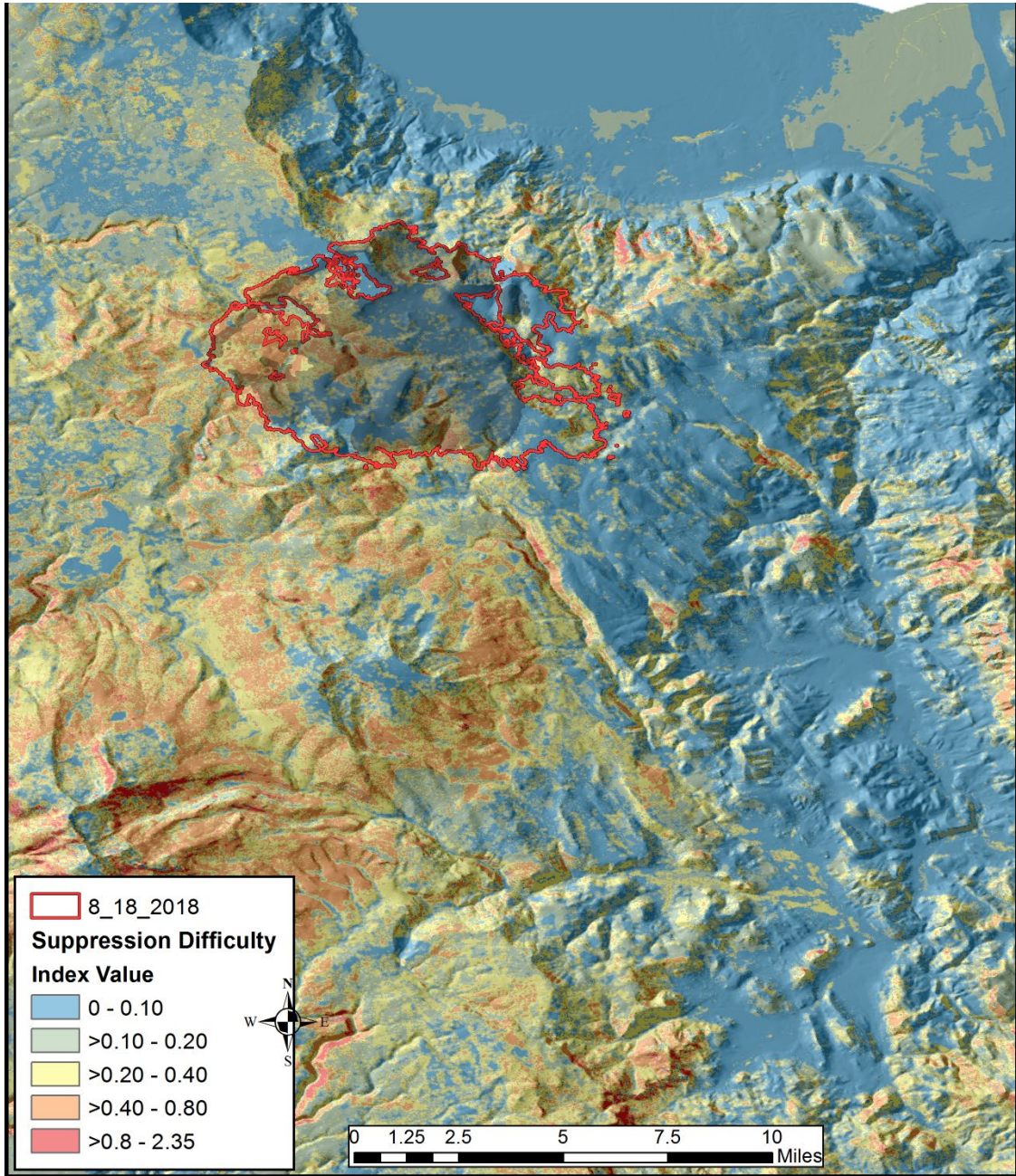

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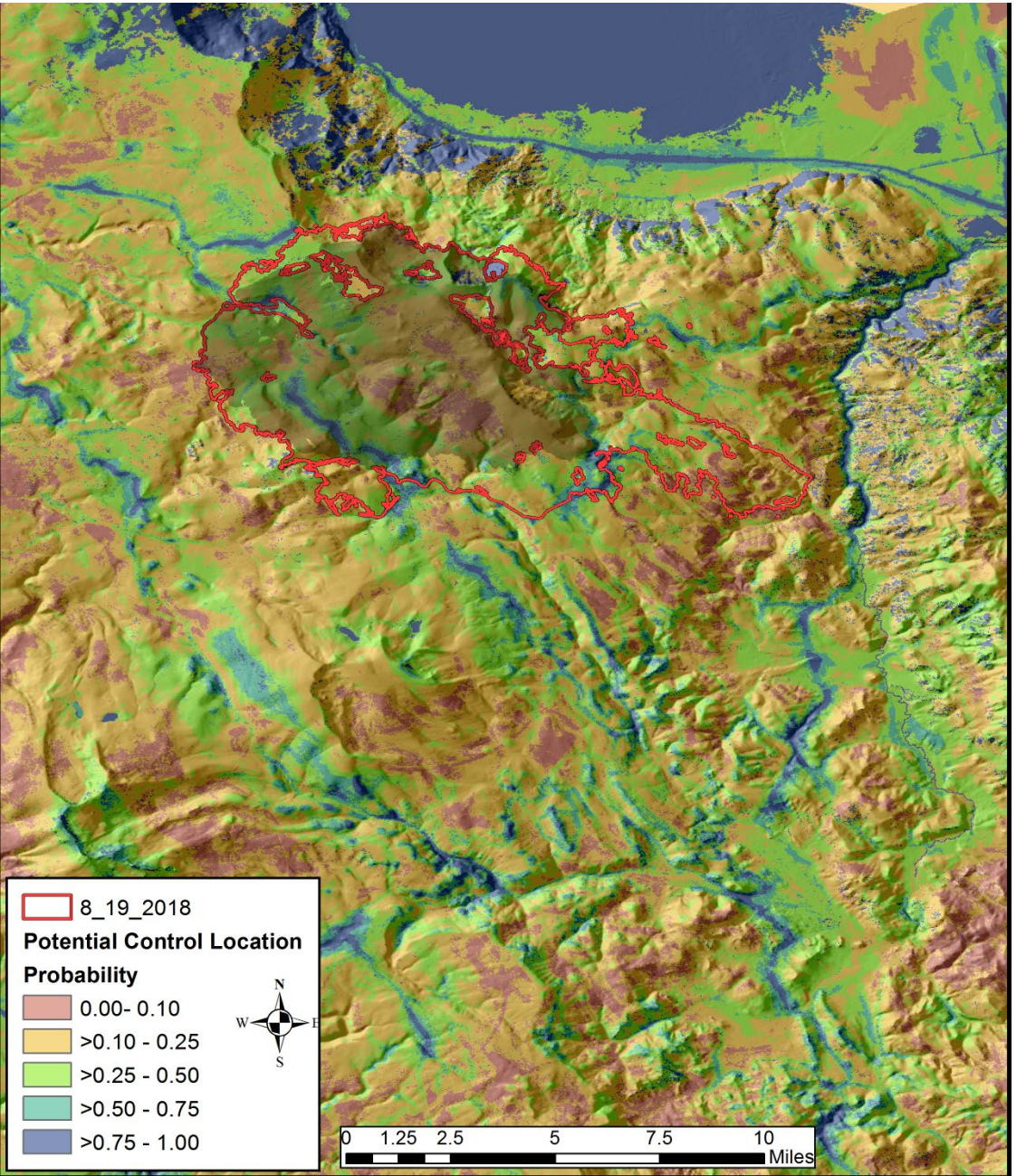

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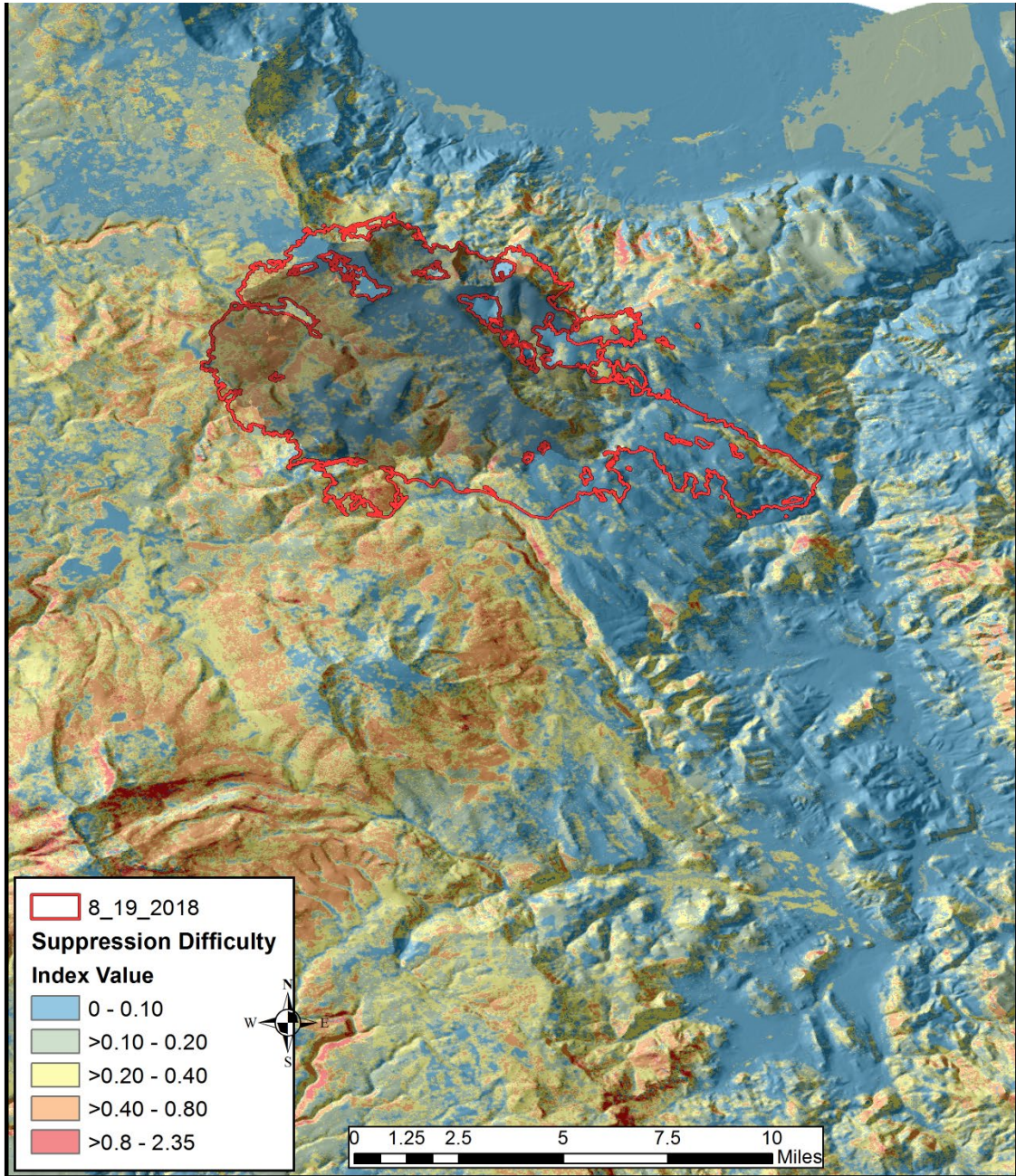

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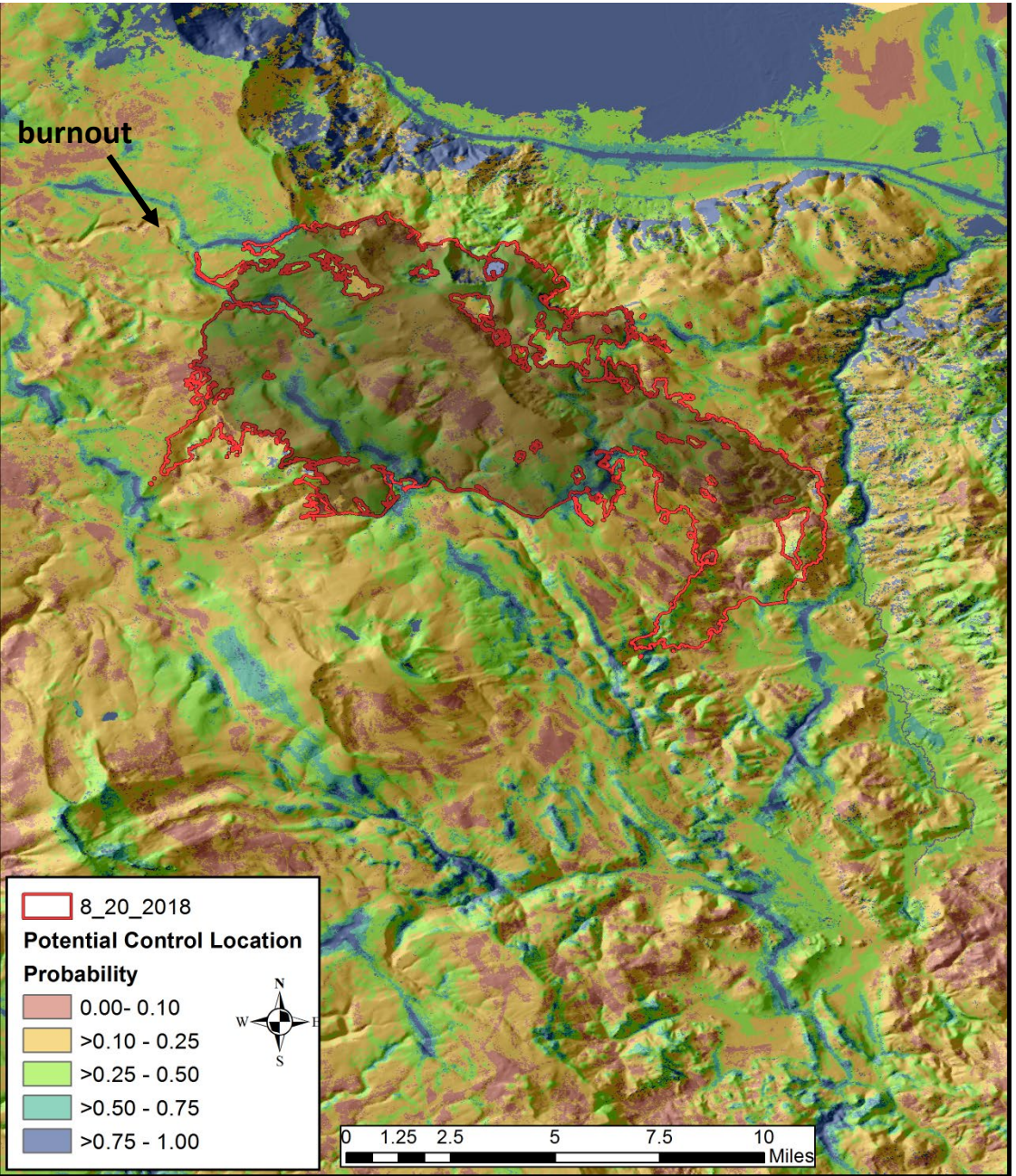

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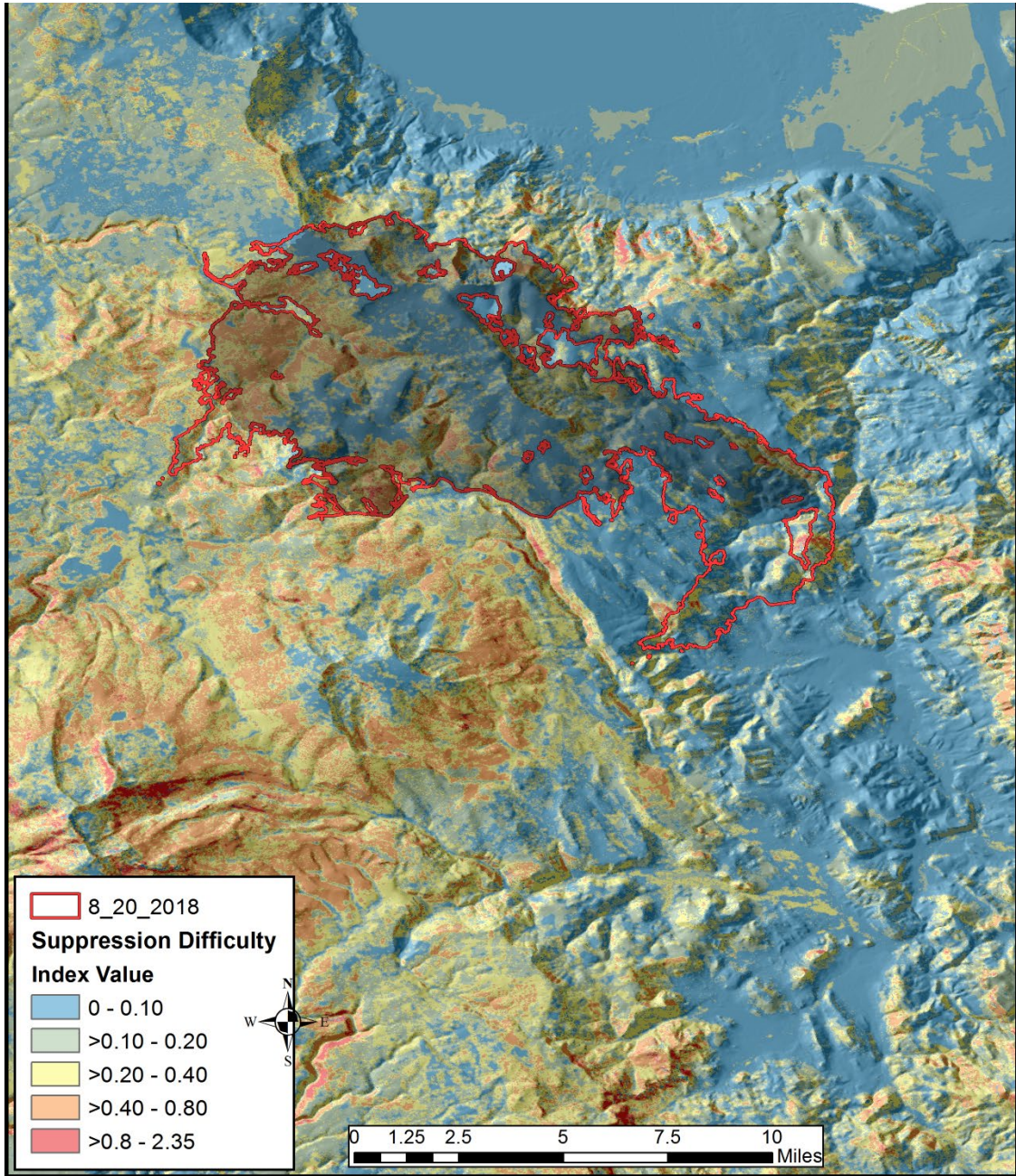

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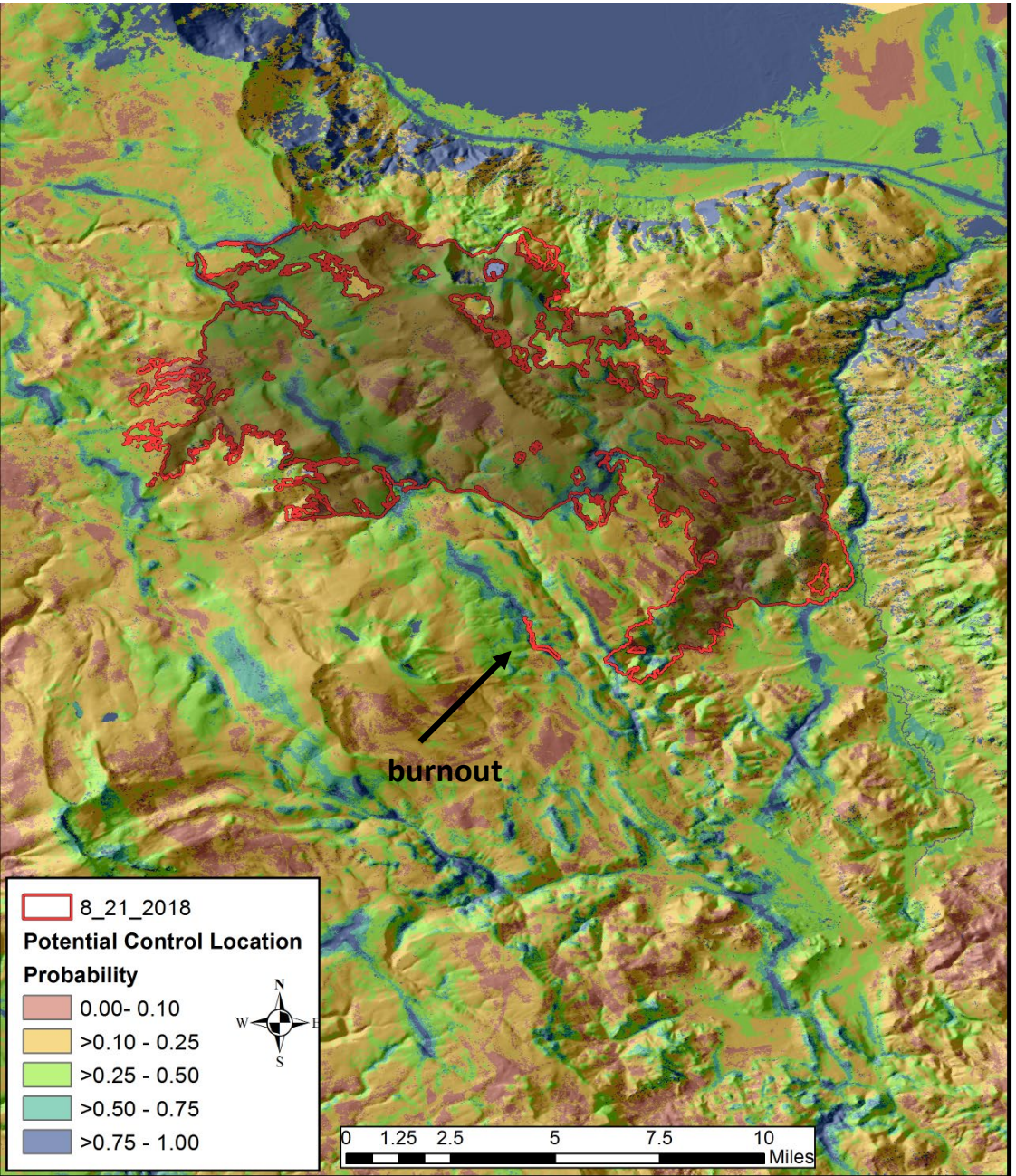

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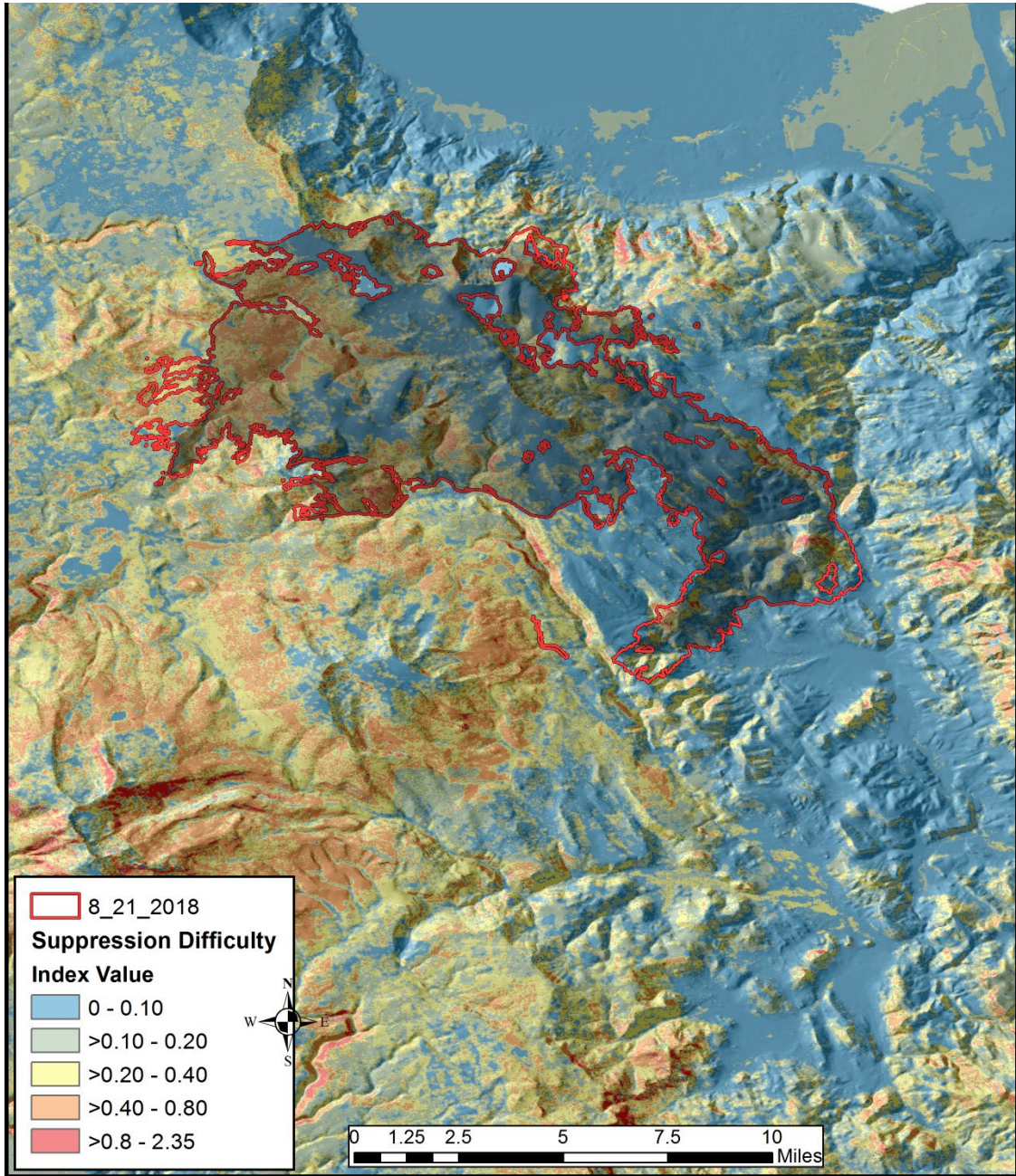

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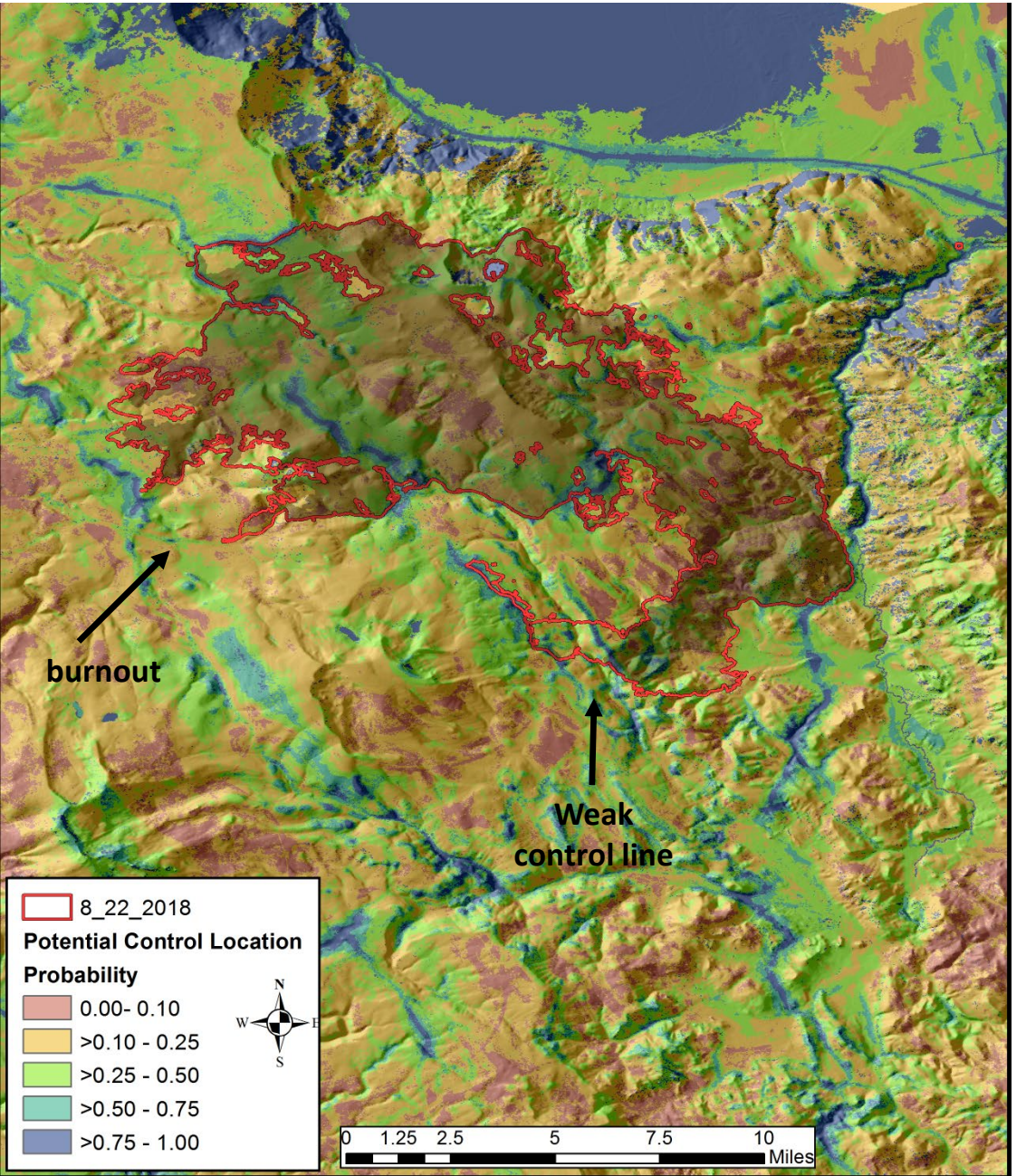

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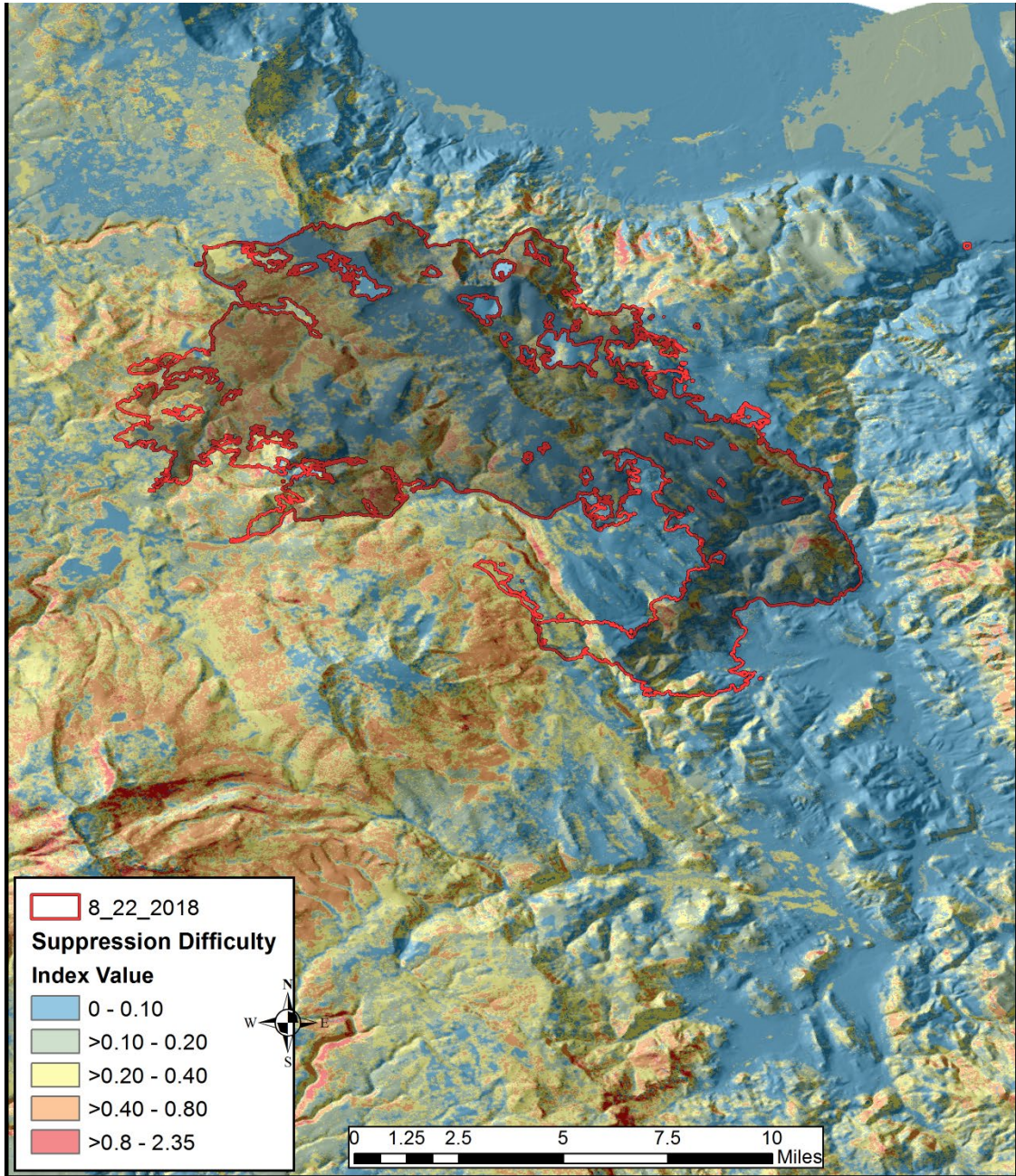

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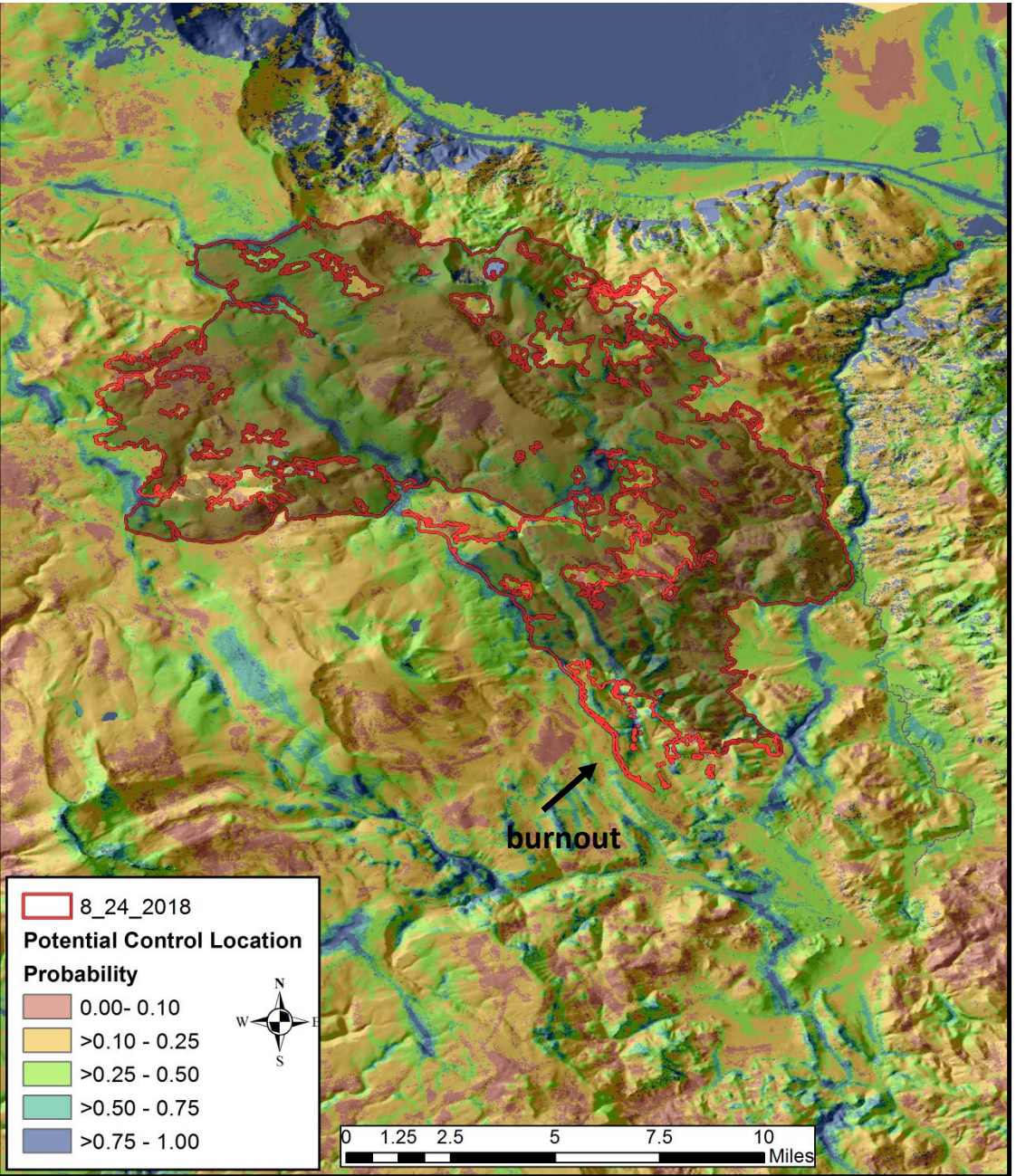

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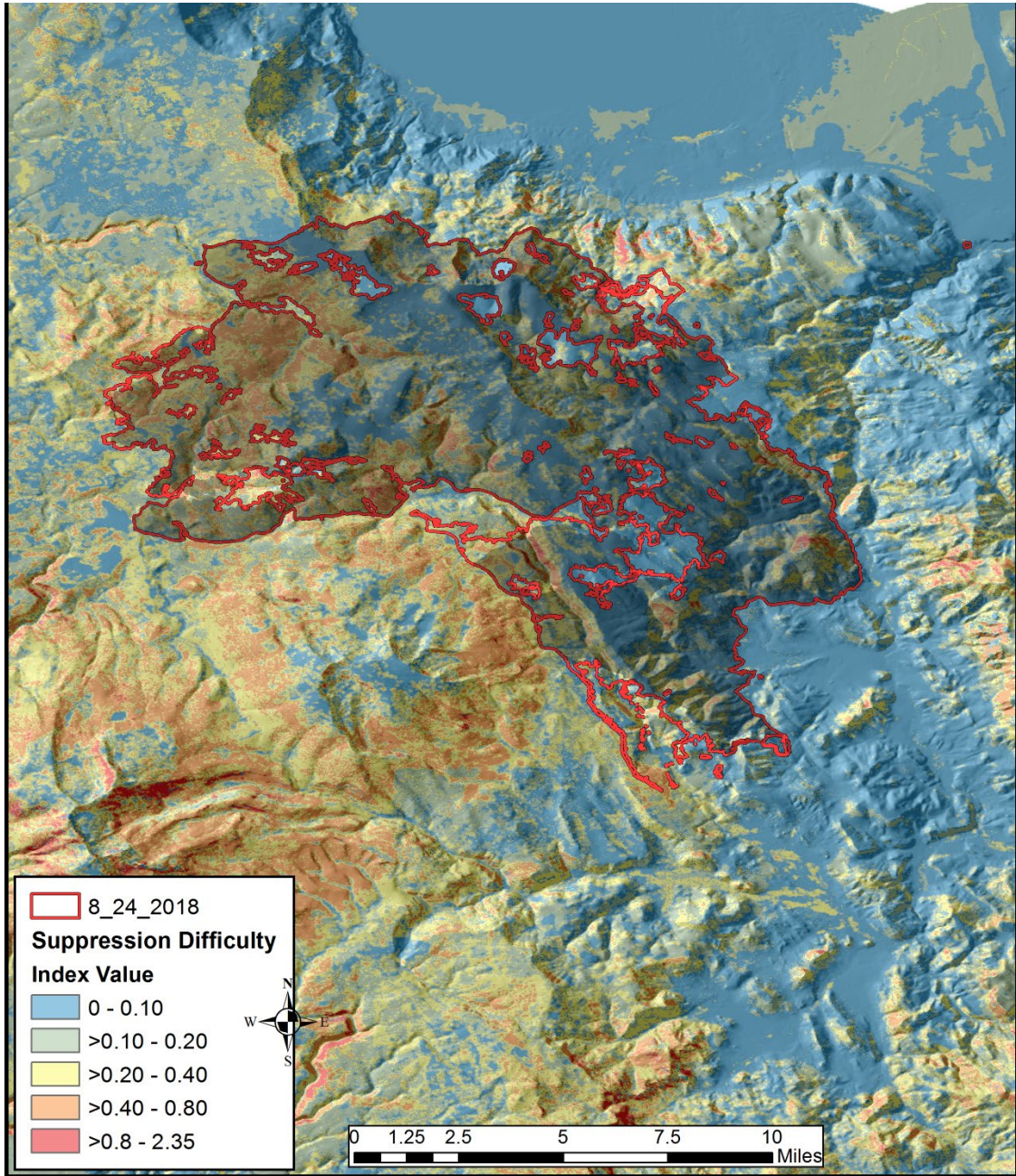

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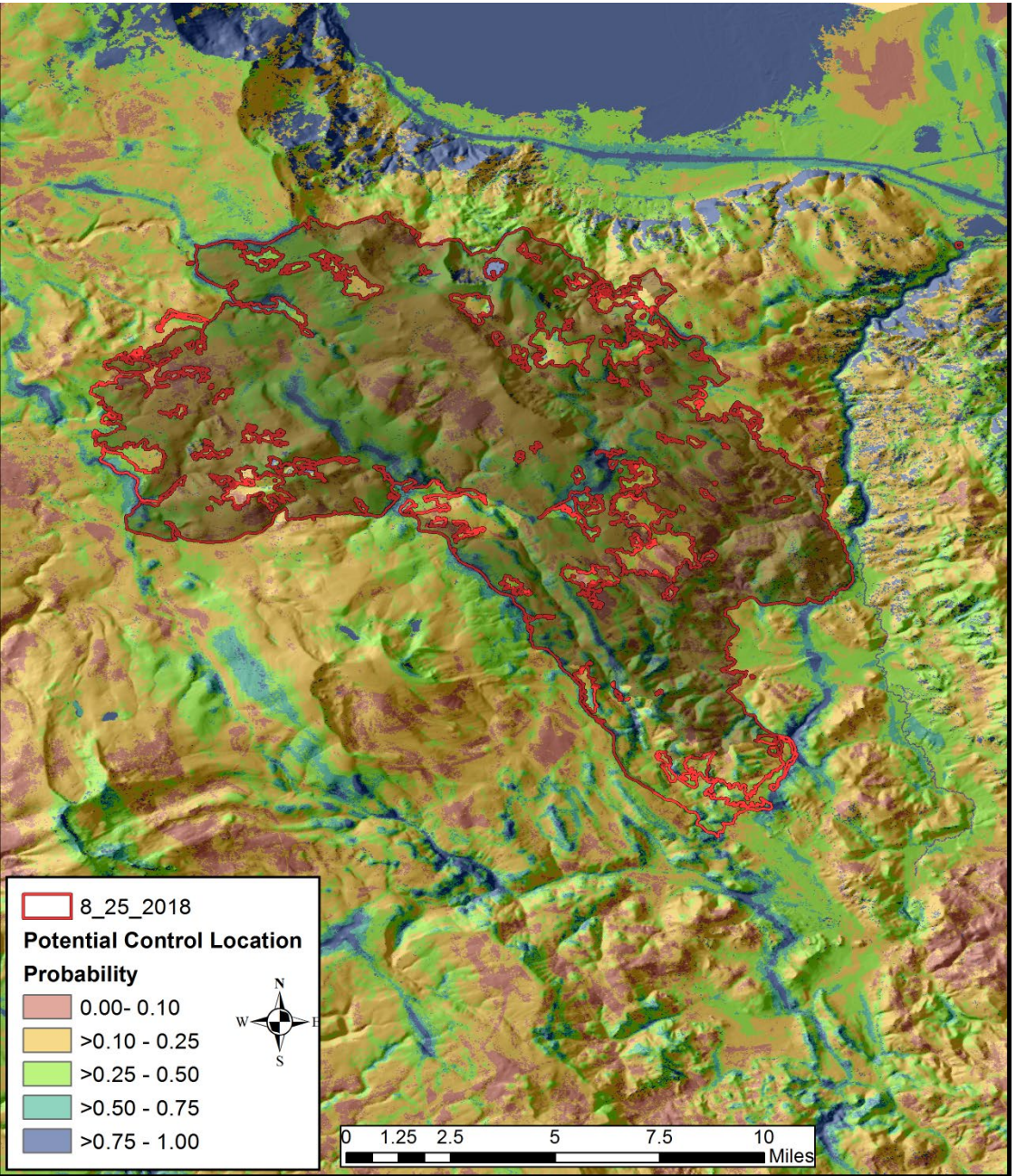

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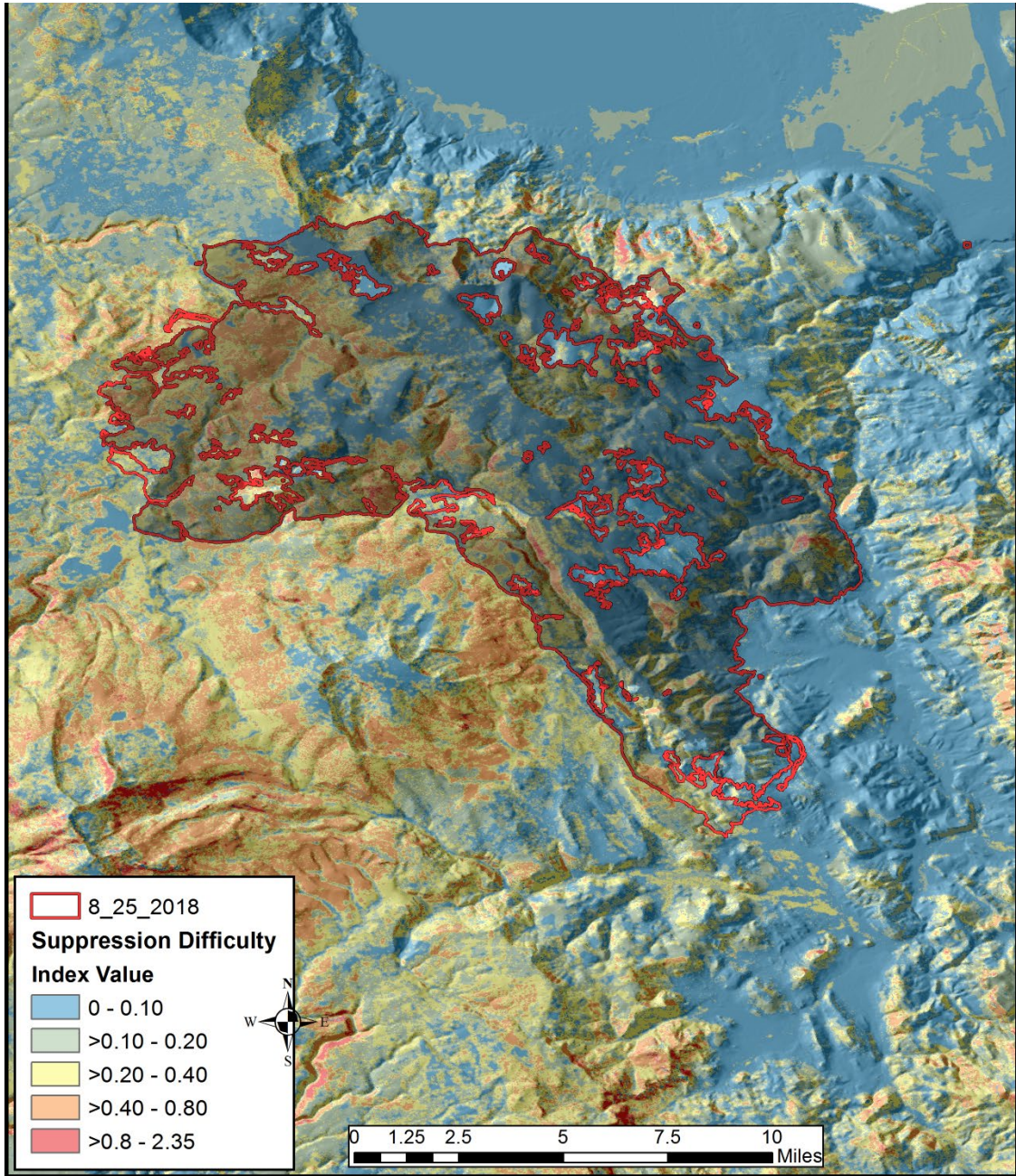

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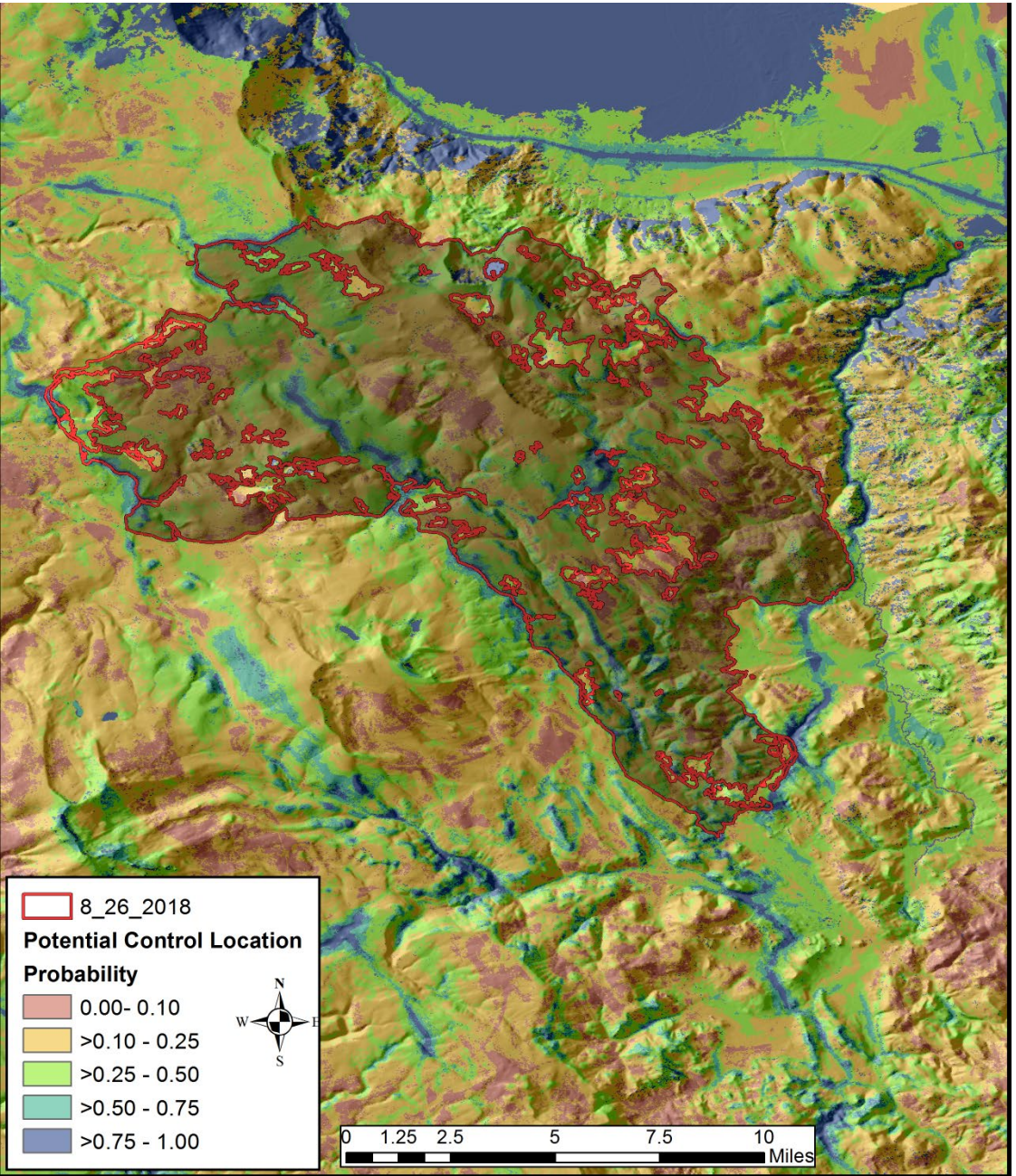

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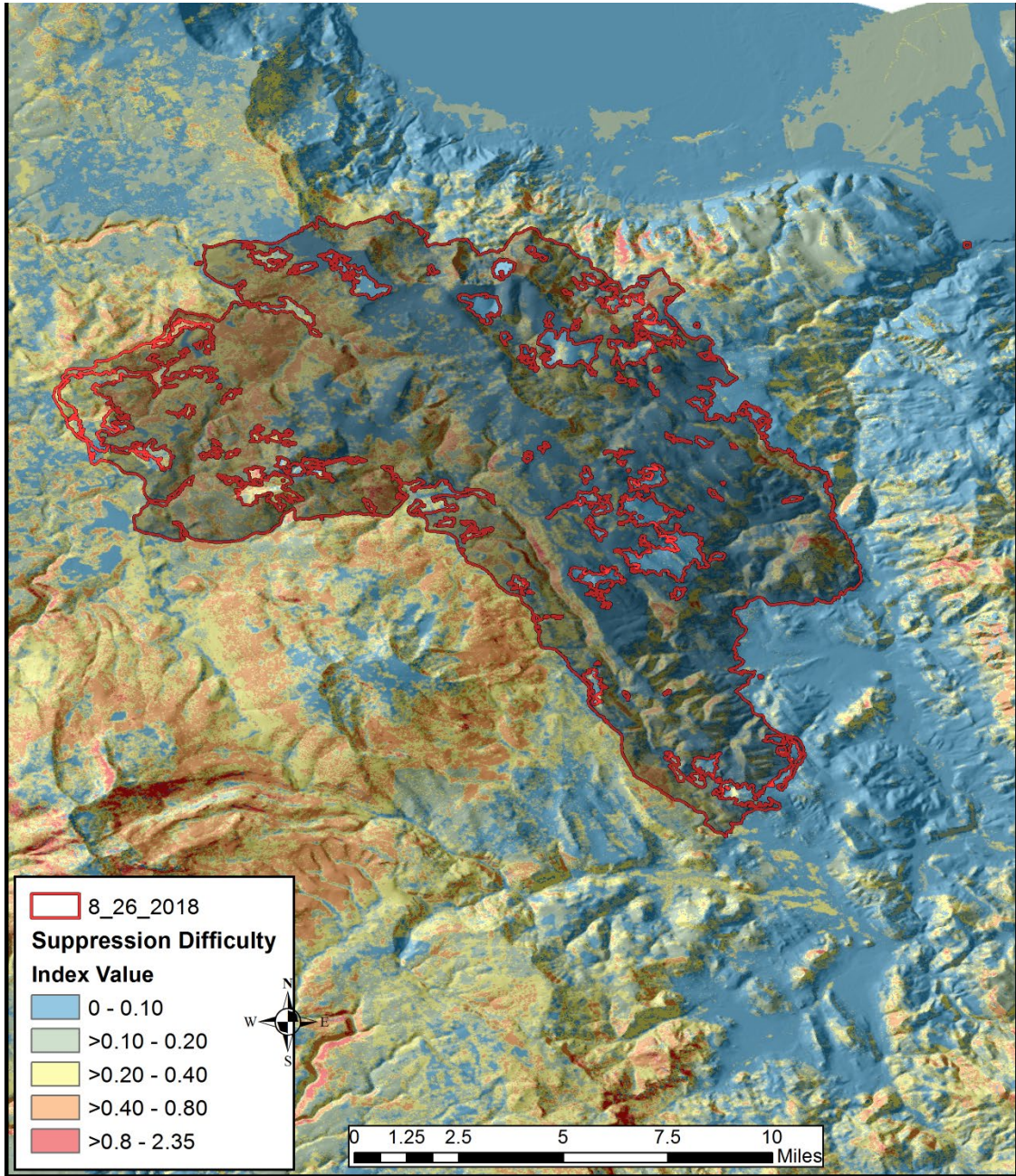

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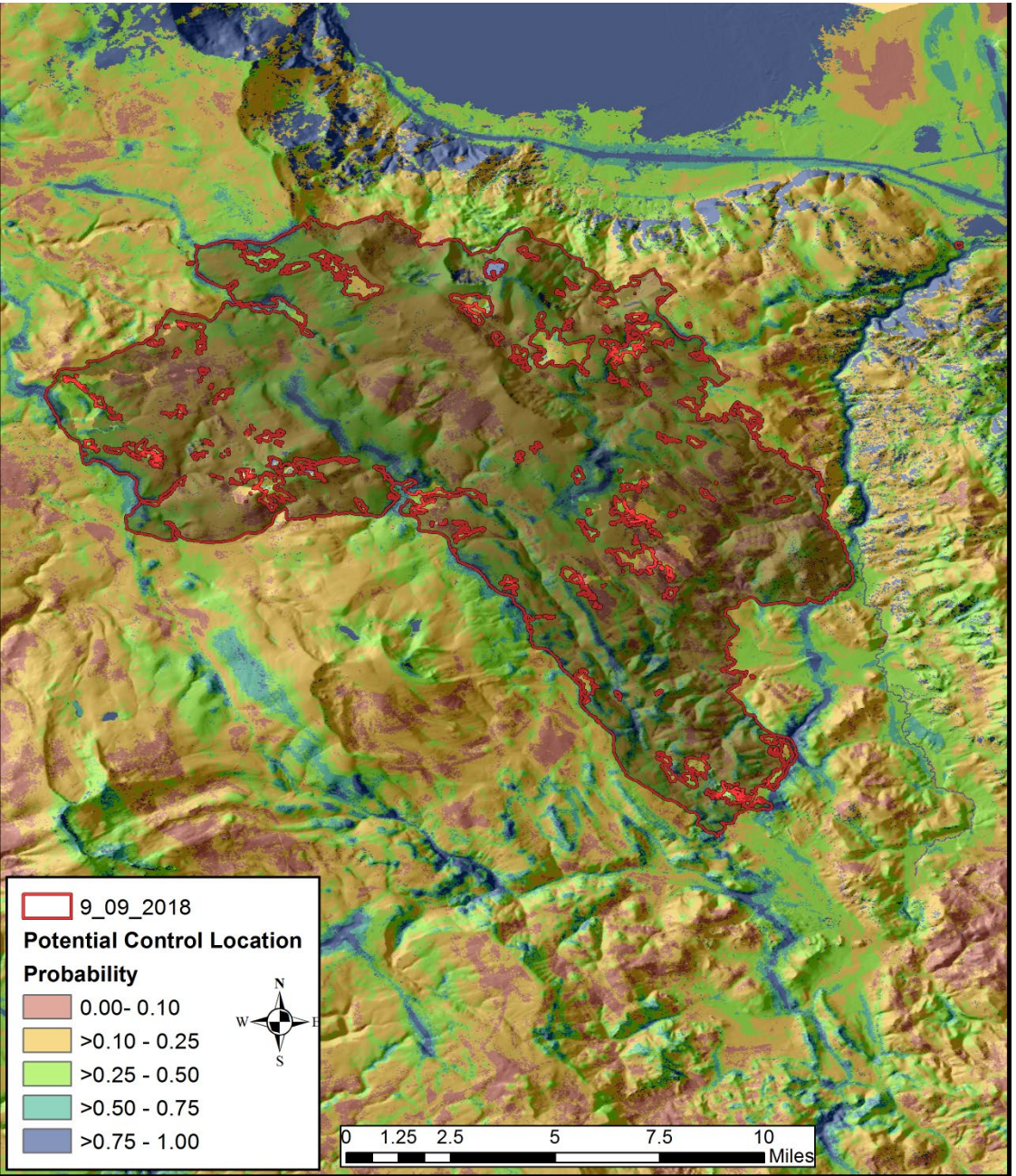

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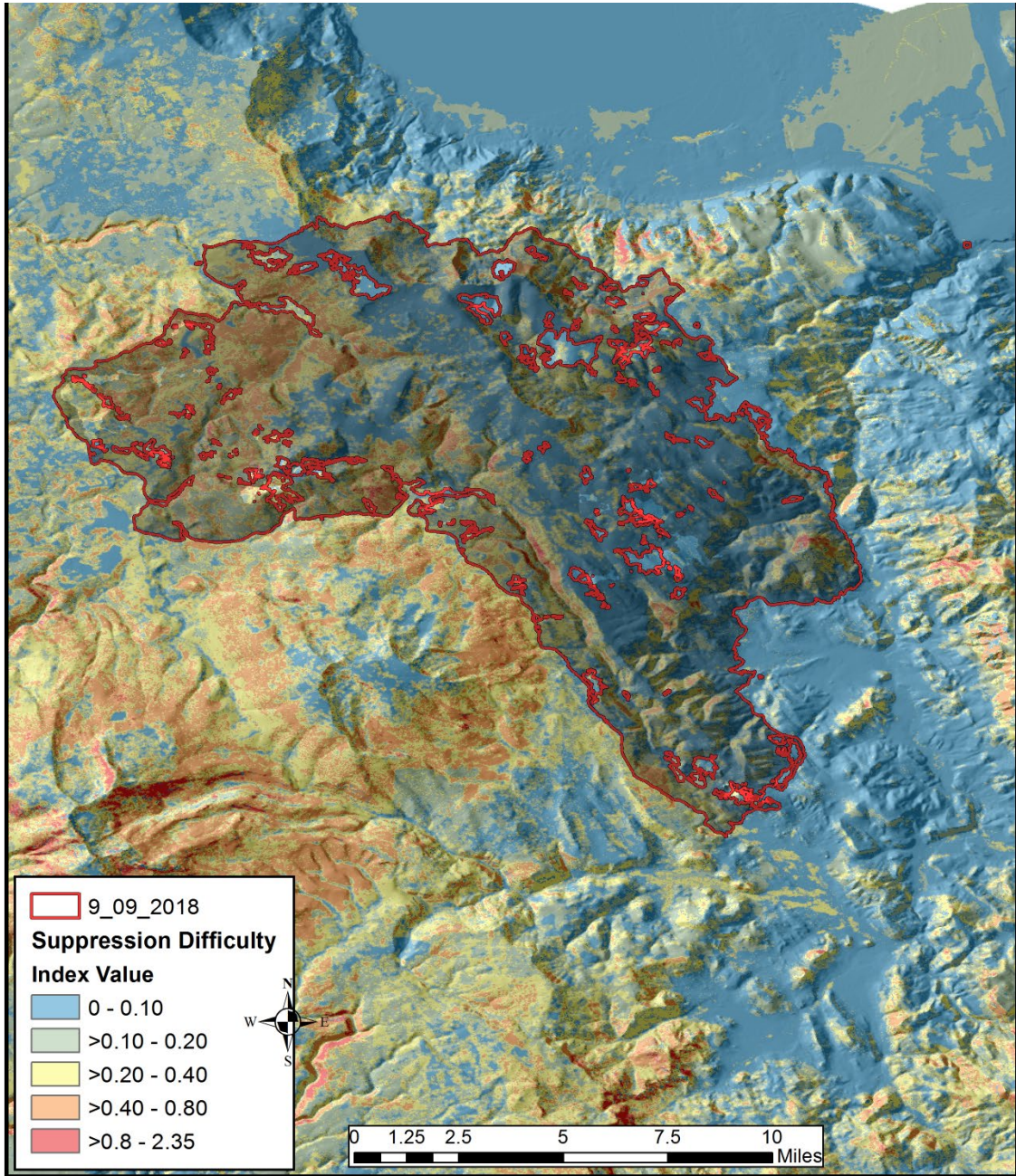

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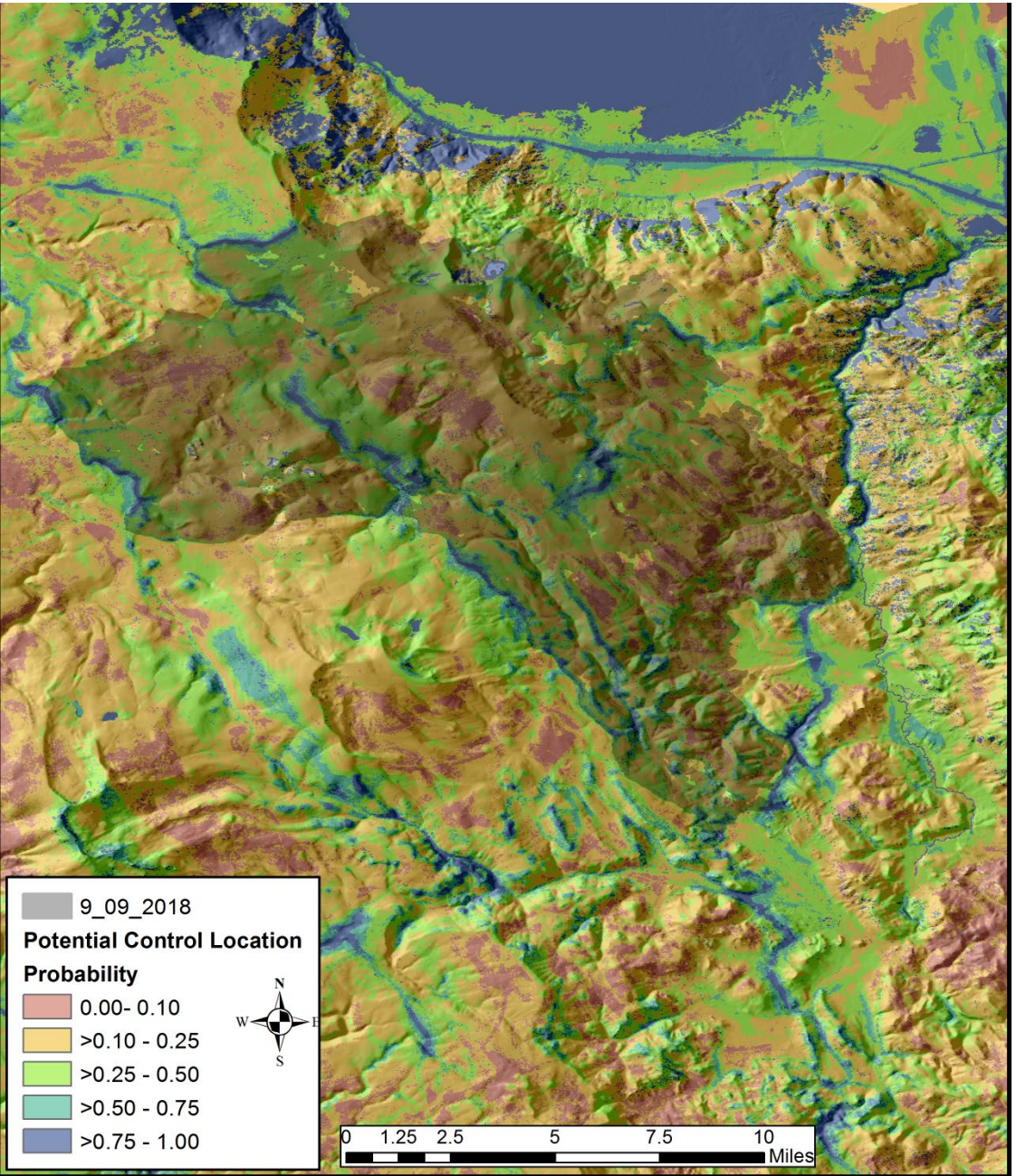

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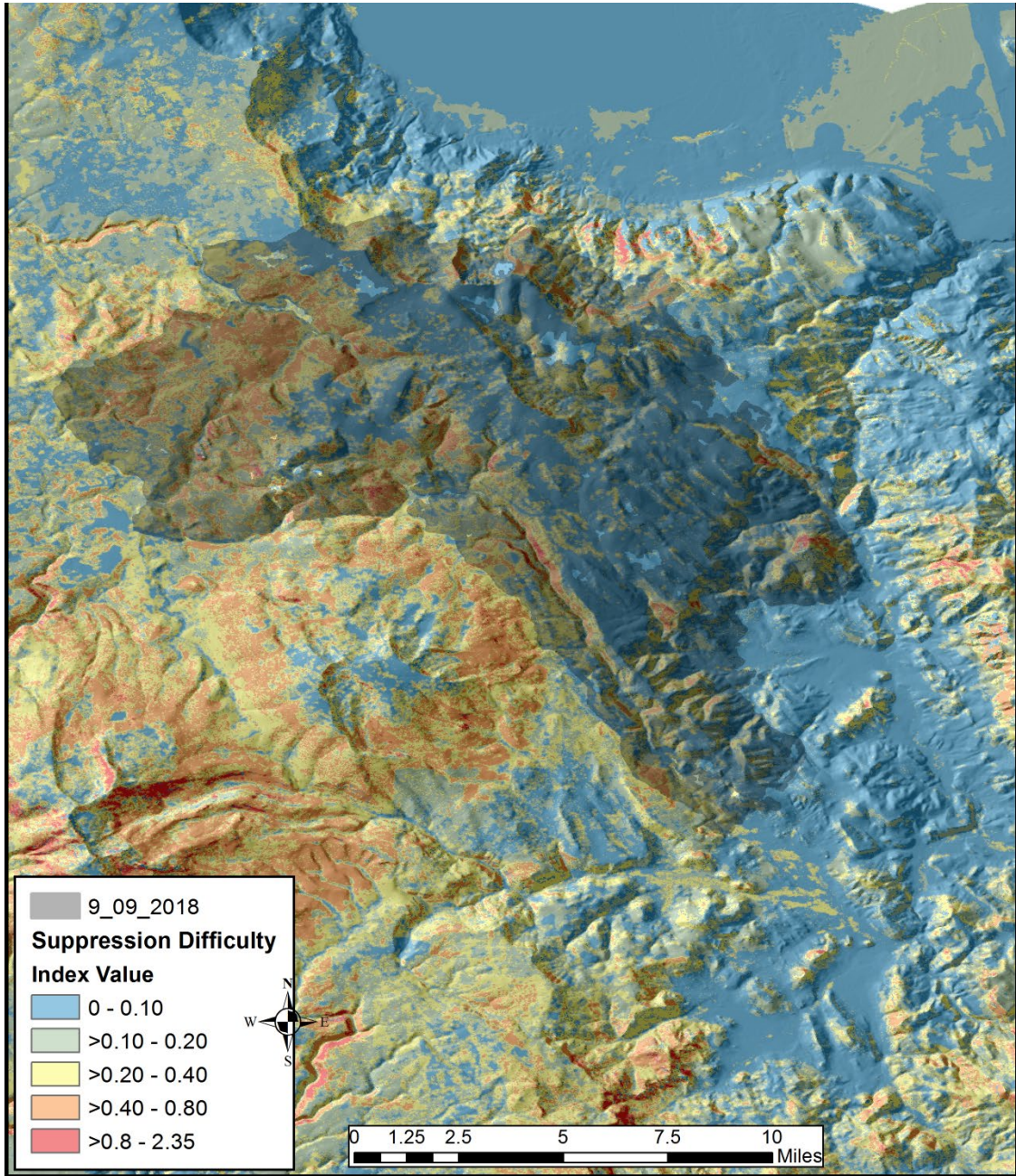


Targeting mitigation: Where, when, why, and who?

Targeting mitigation - Community exposure

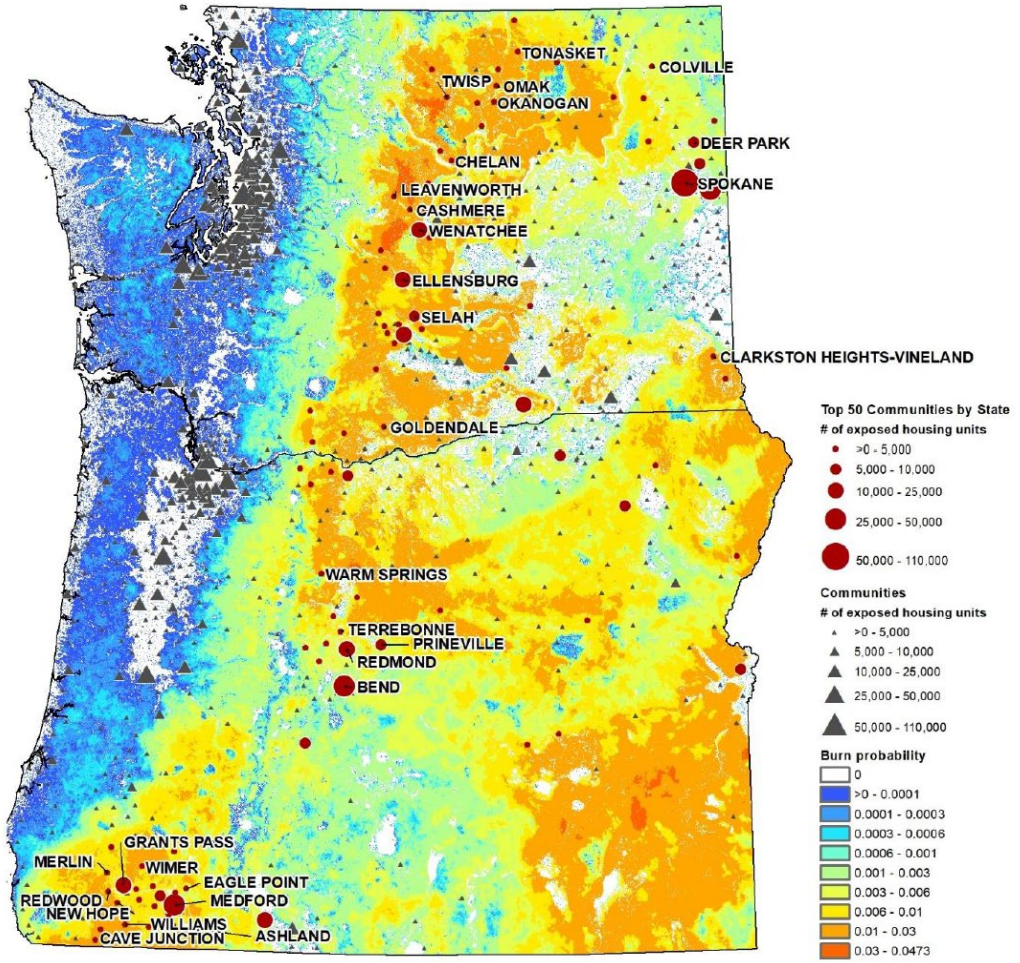


Figure 1. Annual burn probability across the states of Washington and Oregon and exposed human communities in each state. The 50 most-exposed communities in each state are mapped in dark red. The most-exposed communities tend to be in areas with the highest annual burn probabilities based on the FSim modeling results.

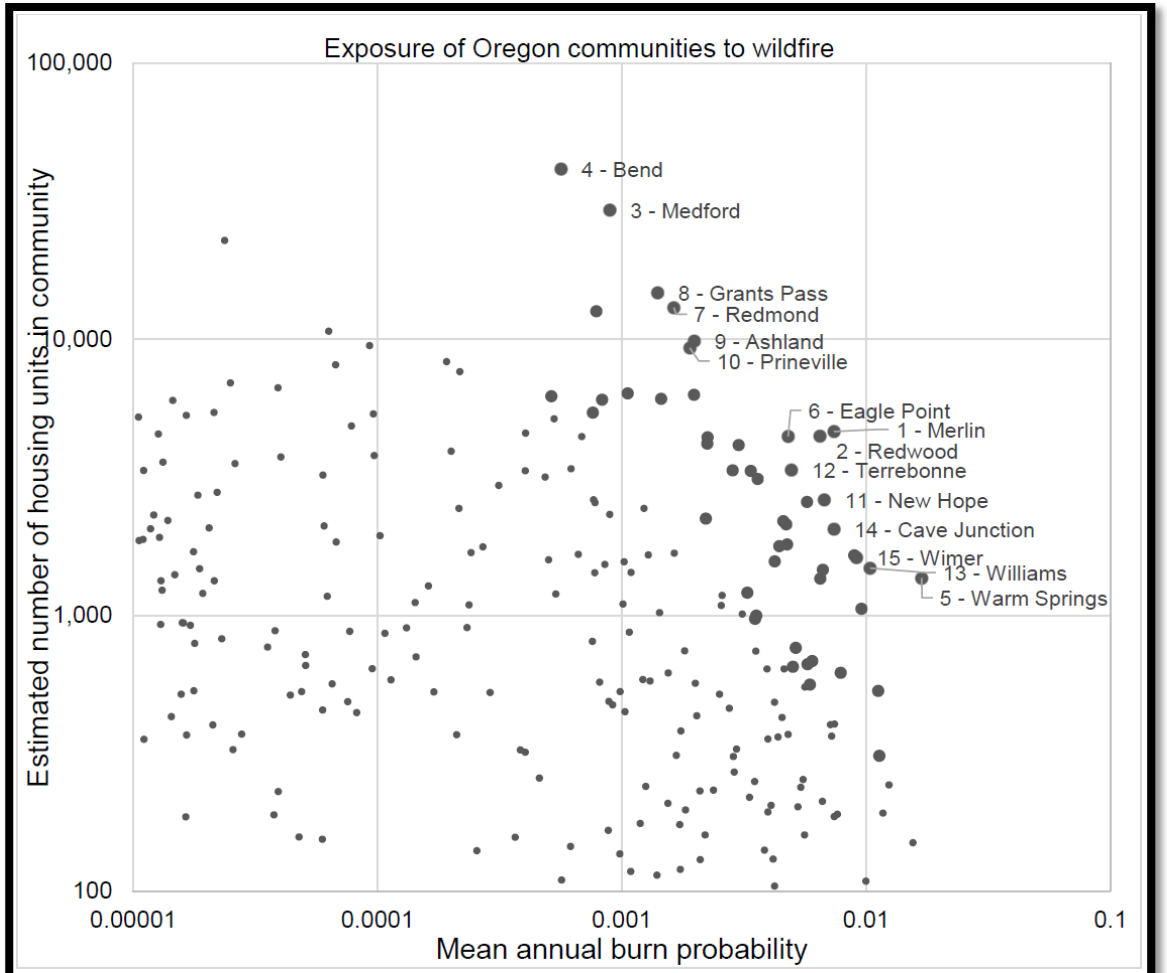


Figure 3. Exposure of Oregon communities to wildfire. The 50 most-exposed communities (by cumulative annual housing-unit exposure) are shown as larger gray dots. The top 15 are labeled with the rank and community name. See Table 2 for the names of the remaining top-50 communities. Smaller gray dots represent communities not among the 50 most exposed. Only the 244 communities with a mean burn probability greater than 0.0001 (1 in 10,000) are shown; 133 communities with a lower mean burn probability are not shown. Axes are shown on a common-log scale (base 10).

Targeting mitigation - Community exposure

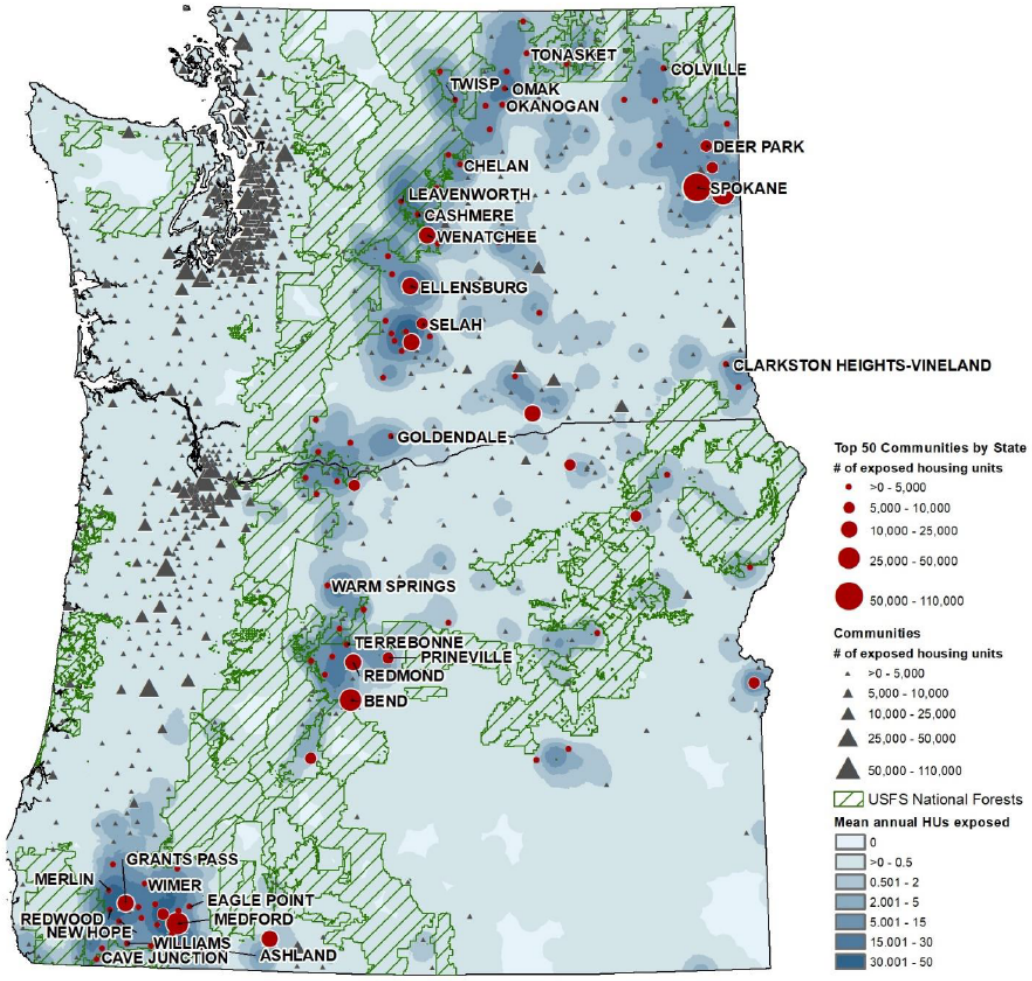
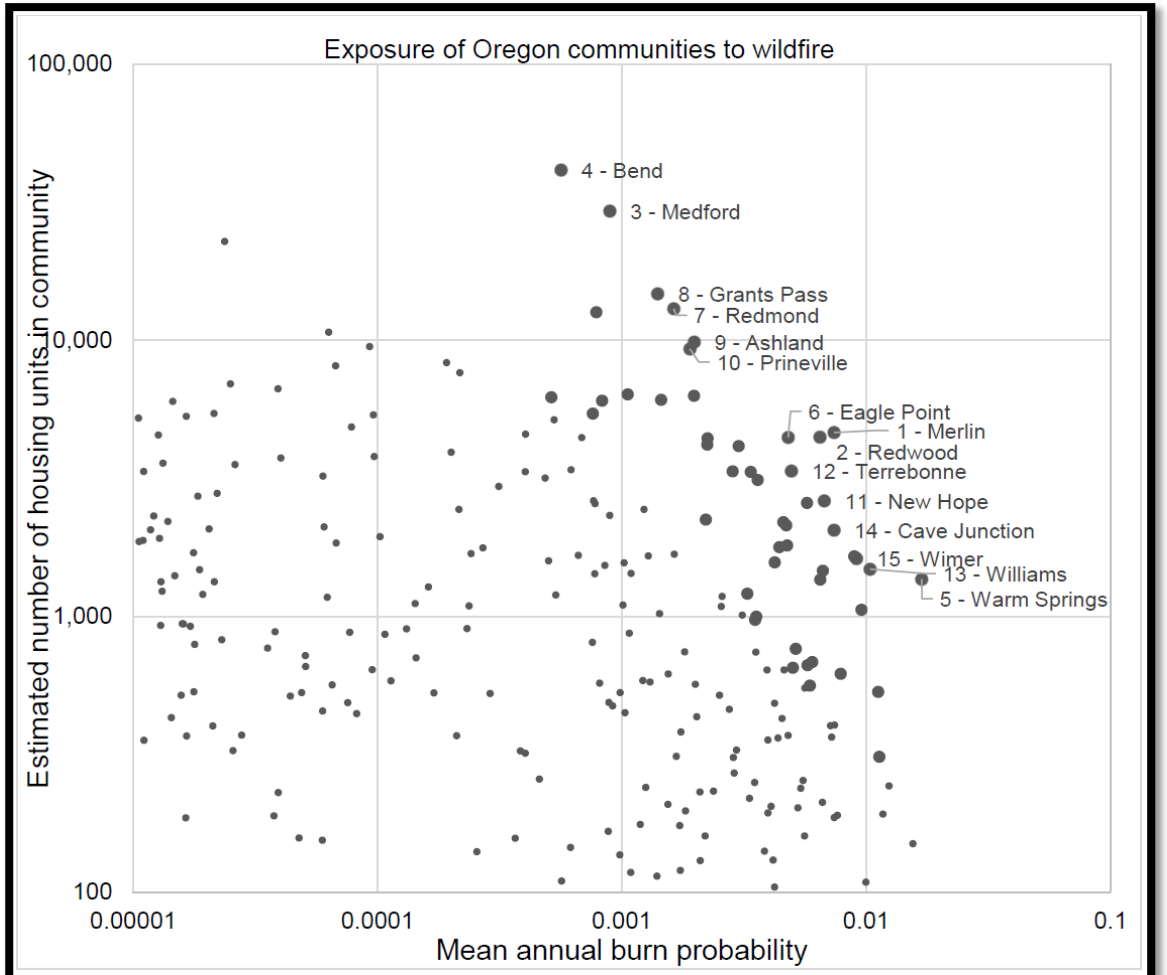


Figure 4. Sources of housing-unit exposure to wildfire across Washington and Oregon and exposed communities across the two states. The fifty most exposed communities in each state are shown in dark red, the remaining communities in gray. Dark blue areas of the map tend to produce greater annual housing-unit exposure.



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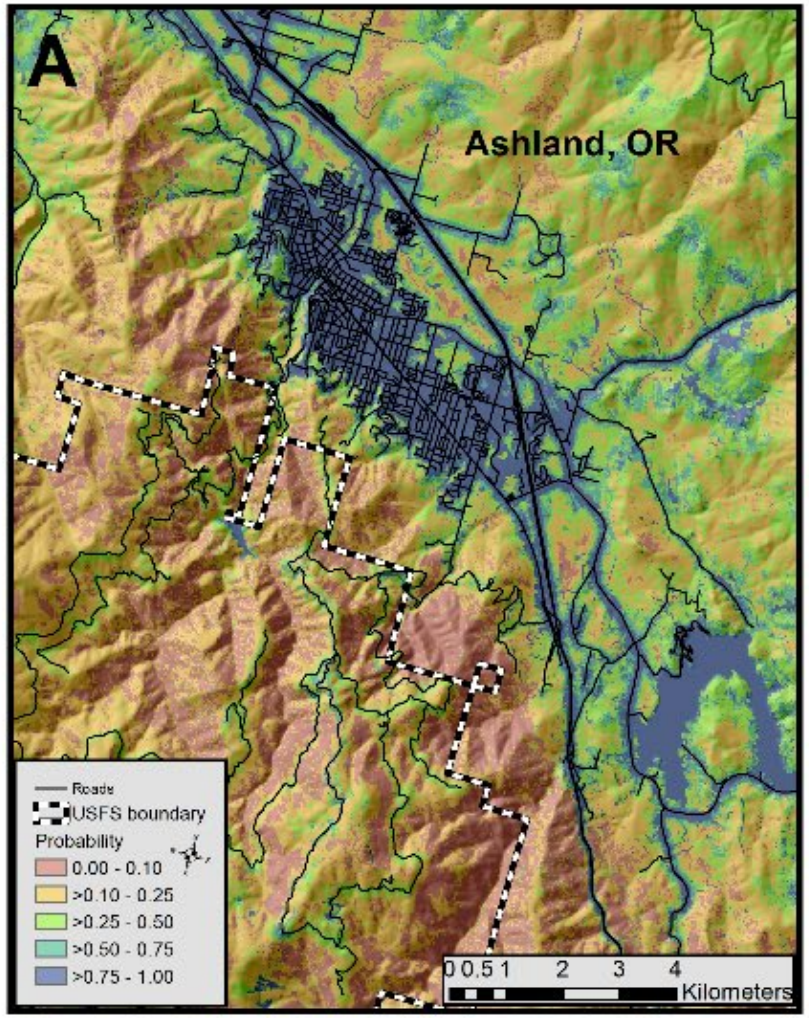
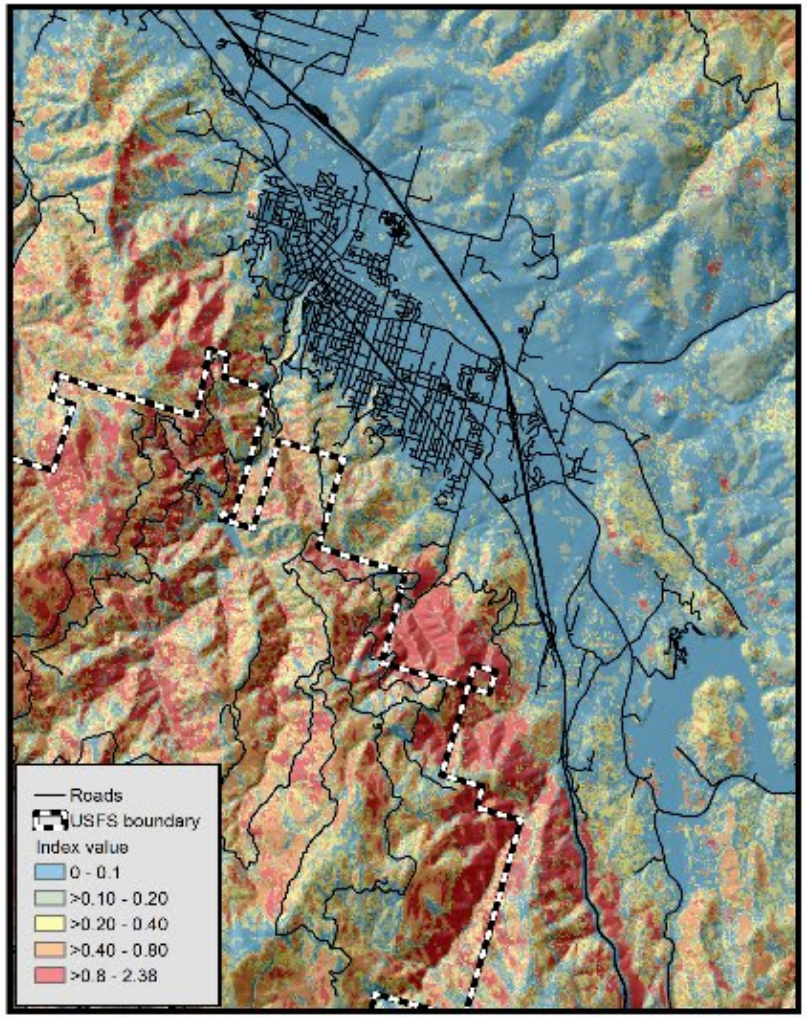
Targeting mitigation – Communities

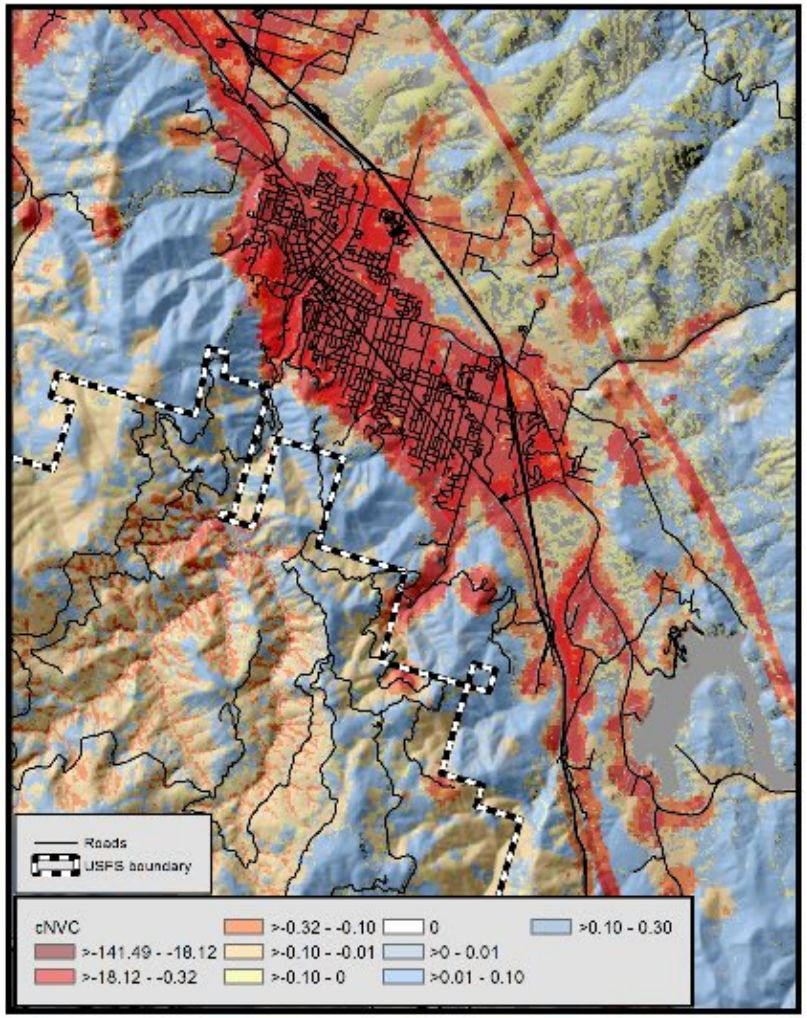
Potential Control Lines



Suppression Difficulty Index

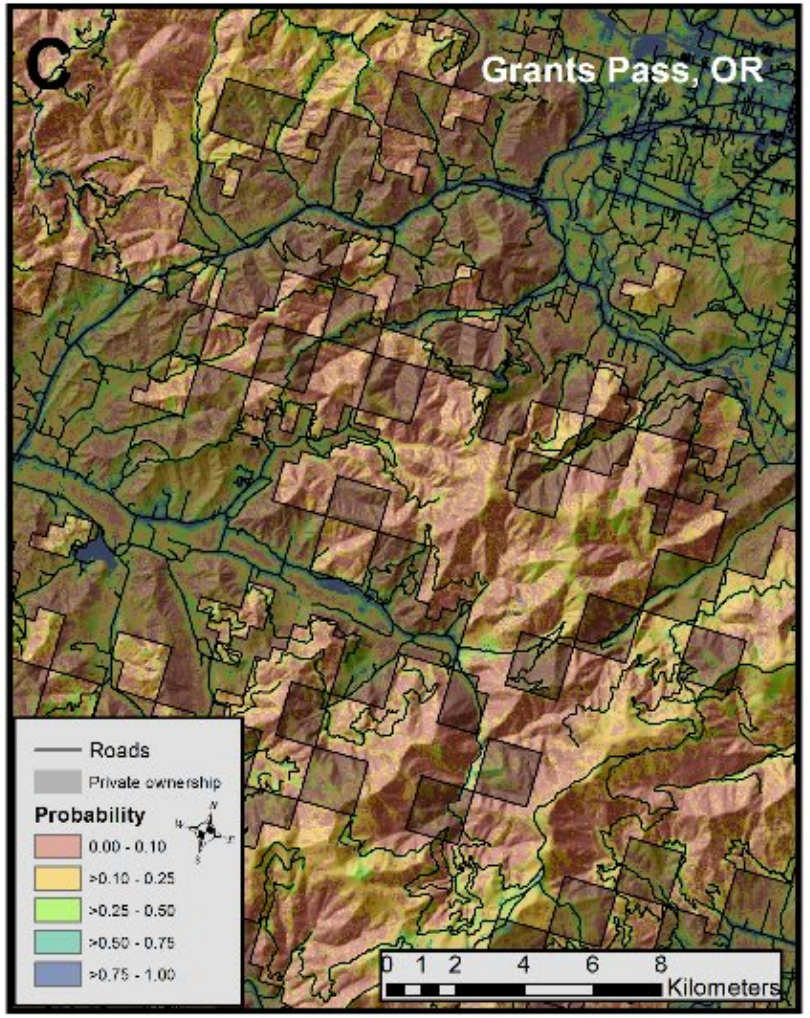


Quantitative Risk Assessment



Targeting mitigation – Shared responsibility

Potential Control Lines



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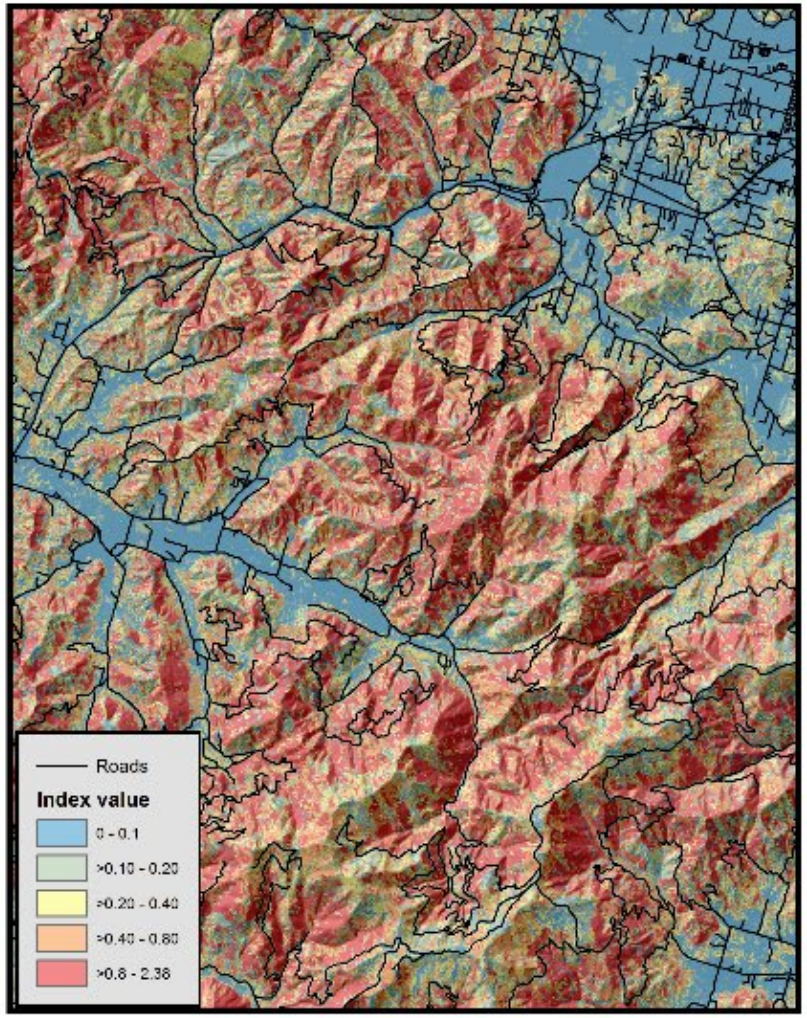
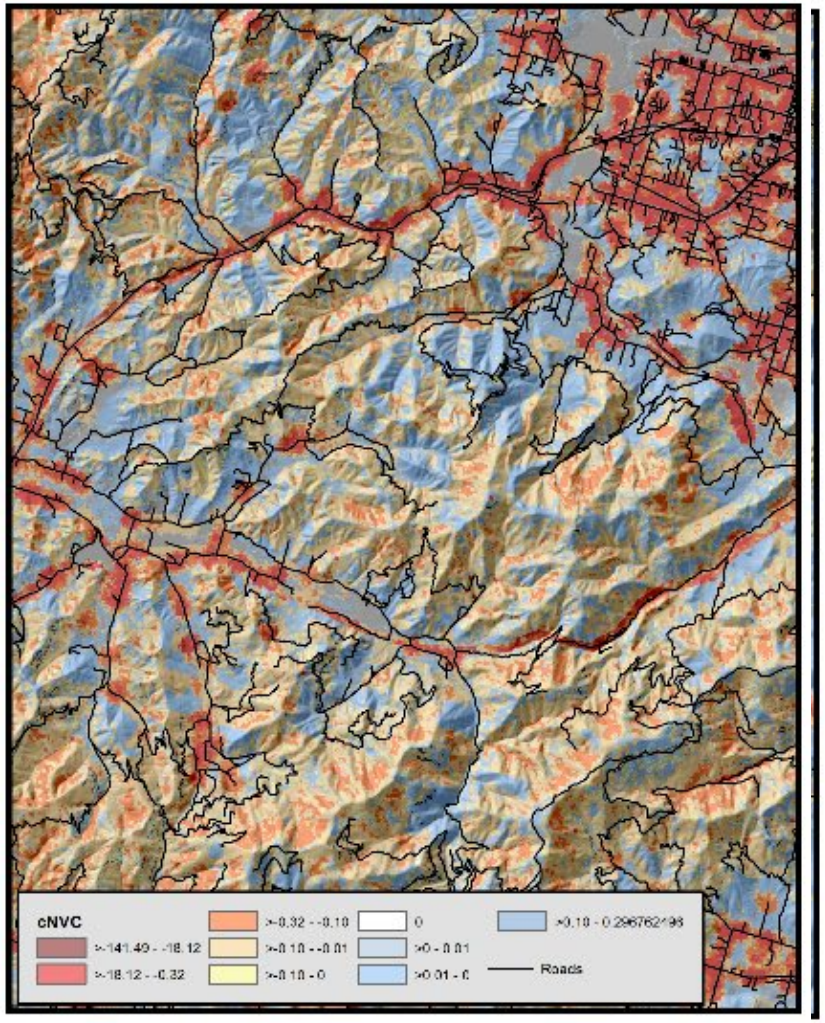


Quantitative Risk Assessment



Concluding thoughts

1. Part of the solution to the fire problem is alignment of fire management actions with an eye towards long-term risk reduction

2. Designed to form the foundation for addressing shared responsibility and co-management in fire and land management

3. Provides an exceptional communication tool during pre-planning/scenario planning and during wildfire response

4. Not a substitute for local and experiential knowledge, rather complimentary

5. Not decisions, but decision tools.

Additional resources

Risk Management Science Team: https://www.fs.fed.us/rmrs/groups/wildfire-risk-management-science-team

Whiteboard video links: https://www.youtube.com/playlist?list=PLNsZX2SBTlVn1ce0l9-0C6CCbIDOj2kwn

Tony Schick – Can Moneyball Fix How The West Manages Wildfire? https://www.opb.org/news/article/fire-wildfire-west-management-science-data-risk-moneyball/

O'Connor, CD, Calkin, DE (2019) Engaging the fire before it starts: A case study from the 2017 Pinal Fire (Arizona) https://www.iawfonline.org/article/engaging-the-fire-before-it-starts-a-case-study-from-the-2017-pinal-fire-arizona/

O'Connor, C.D., Calkin, D.E., Thomnpson, M.P. 2017. An empirical machine learning method for predicting potential fire control locations for pre-fire planning and operational fire management. International Journal of Wildland Fire, 26: 587-597.

Dunn, CJ, Thompson, M, Calkin, DE (2017). A framework for developing safe and effective large-fire response in a new fire management paradigm. Forest Ecology and Management, 404: 184-196. http://dx.doi.org/10.1016/j.foreco.2017.08.039

Rodriguez y Silva F, Martinez JRM, Gonzalez-Caban A (2014) A methodology for determining operational priorities for prevention and suppression of wildland fires. International Journal of Wildland Fire 23(4), 544-554.

Why increase analytics in wildfire planning?

1. Address near and long-term wildfire risk
   a) Expand decision space
   b) Improve safety and effectiveness of wildfire response
   c) Response commensurate with values at risk
   d) Efficient use of resources at national, regional and local-level

2. Align land management actions with wildfire response
   a) Hazardous fuels reduction
   b) Prescribed fire
   c) Forest restoration

3. Improve shared-governance in wildfire management
   a) Stakeholder engagement
   b) Cross-jurisdictional management
   c) Communication with stakeholders