Landscape Science for Forest Planning

Thomas D. Sisk, Northern Arizona University

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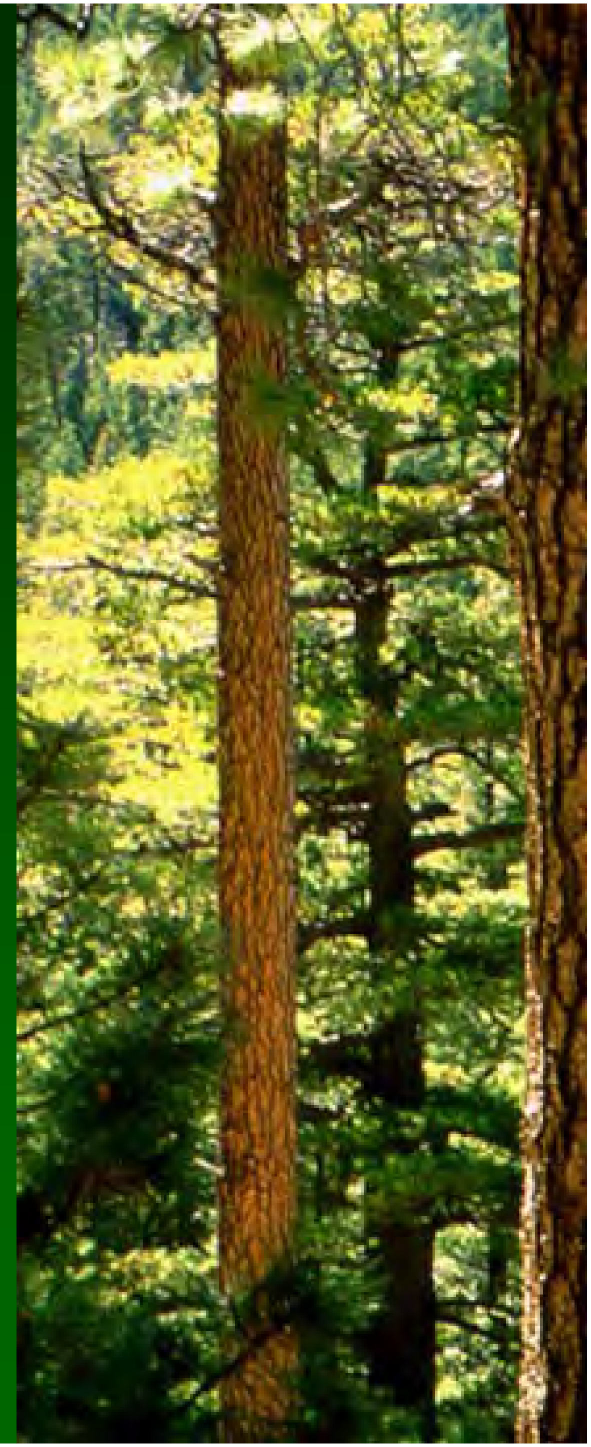
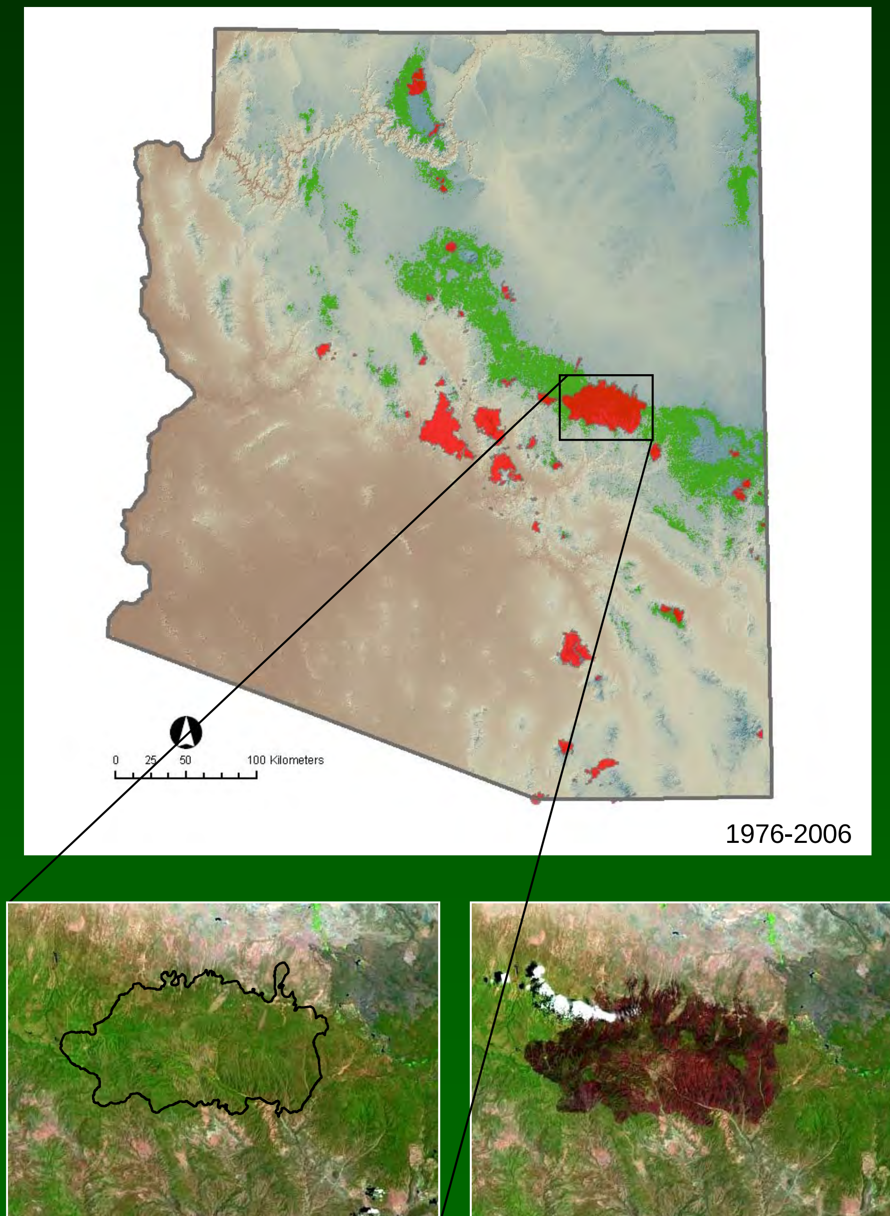
- The Landscape Context
- Landscape Assessments and Planning
  - Spatial Data to Support Planning
  - Modeling Fire, Wildlife, Watershed
- Participatory Analysis and Collaboration
  - Scenario-building
  - Forest Treatment Models
- Thoughts on the Science/Policy Interface

The *State of the Science:*

Practical



Landscape Context: Increased threat of uncharacteristic fire



Why "Landscape"?

Example:

Rodeo-Chediski Fire of 2002

- Operated at scales that dwarf project-level management
- Analysis should be conducted at the scale at which key ecosystem processes operate – "minimum dynamic unit"

(Pickett and White, 1978)

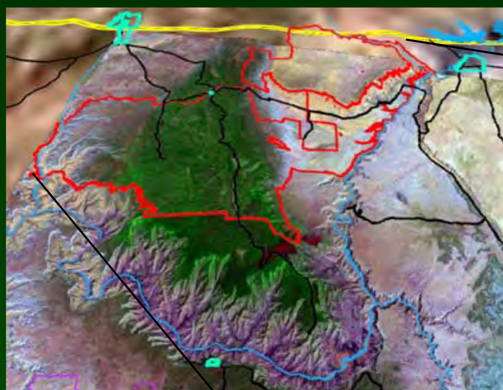
Landscape Context: Increased risk to wide-ranging species

Conservation of wide-ranging animals can be compromised if planning is carried out at scales that fail to capture population dynamics and habitat requirements

Demographic analysis may be impractical or impossible in some situations, however, presence-absence data, available from many monitoring programs, can inform models that predict site occupancy and geographic distribution

This approach can complement PVA by providing insight on viability for less-studied species and over portions of the range where vital rates are not known

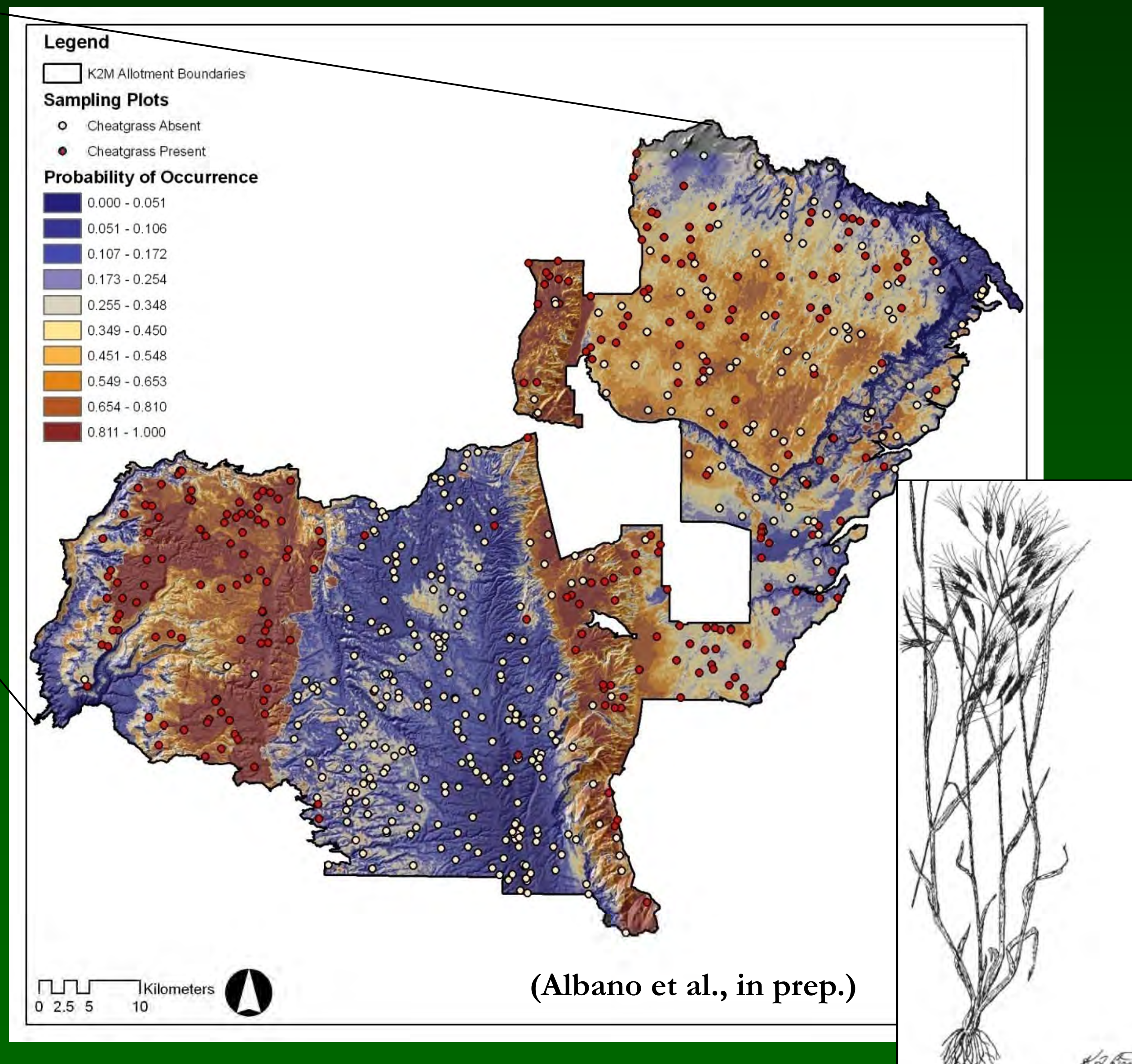
Landscape Context: Biological invasions



Similar techniques can be used for plants:

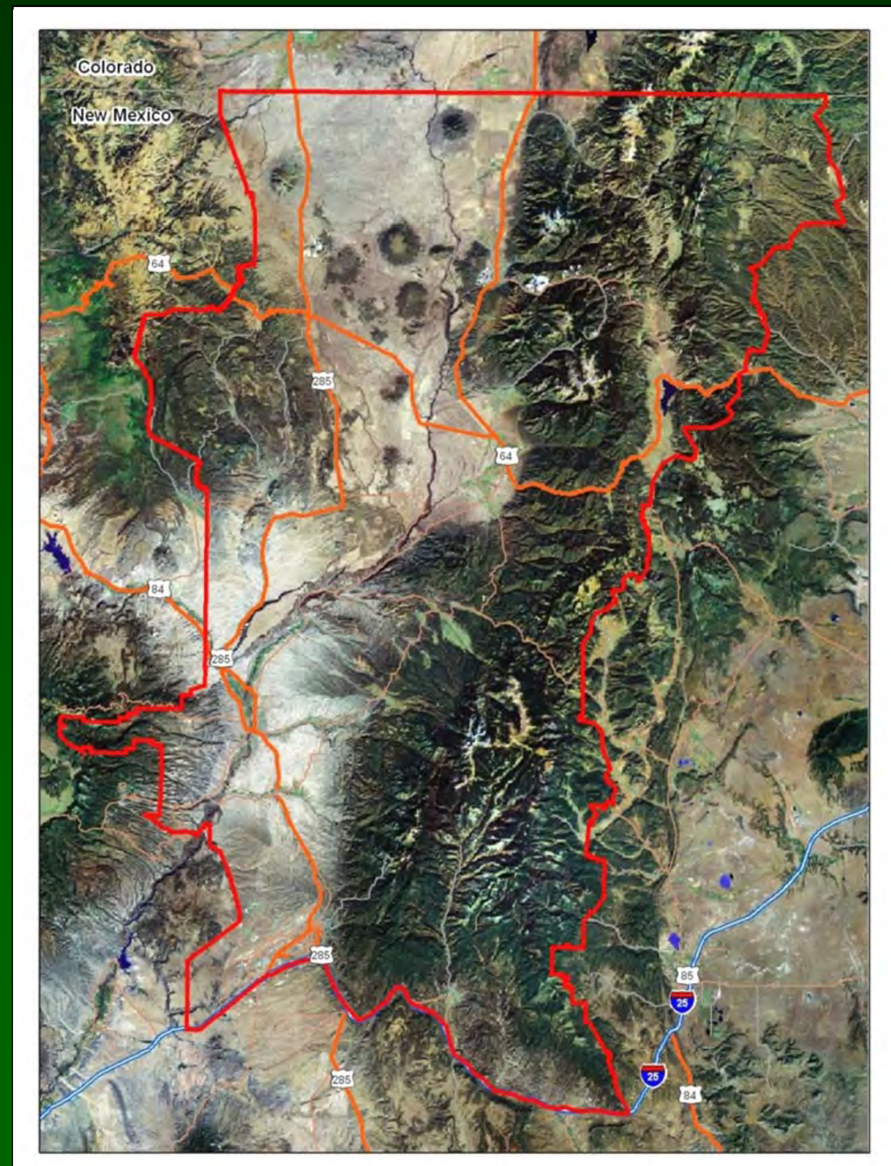
Predicted occurrence of cheatgrass (*Bromus tectorum*) across the 850,000 ac Kane and Two Mile Ranches, North Rim of Grand Canyon

Based on presence data from 606 vegetation points monitored by the Grand Canyon Trust



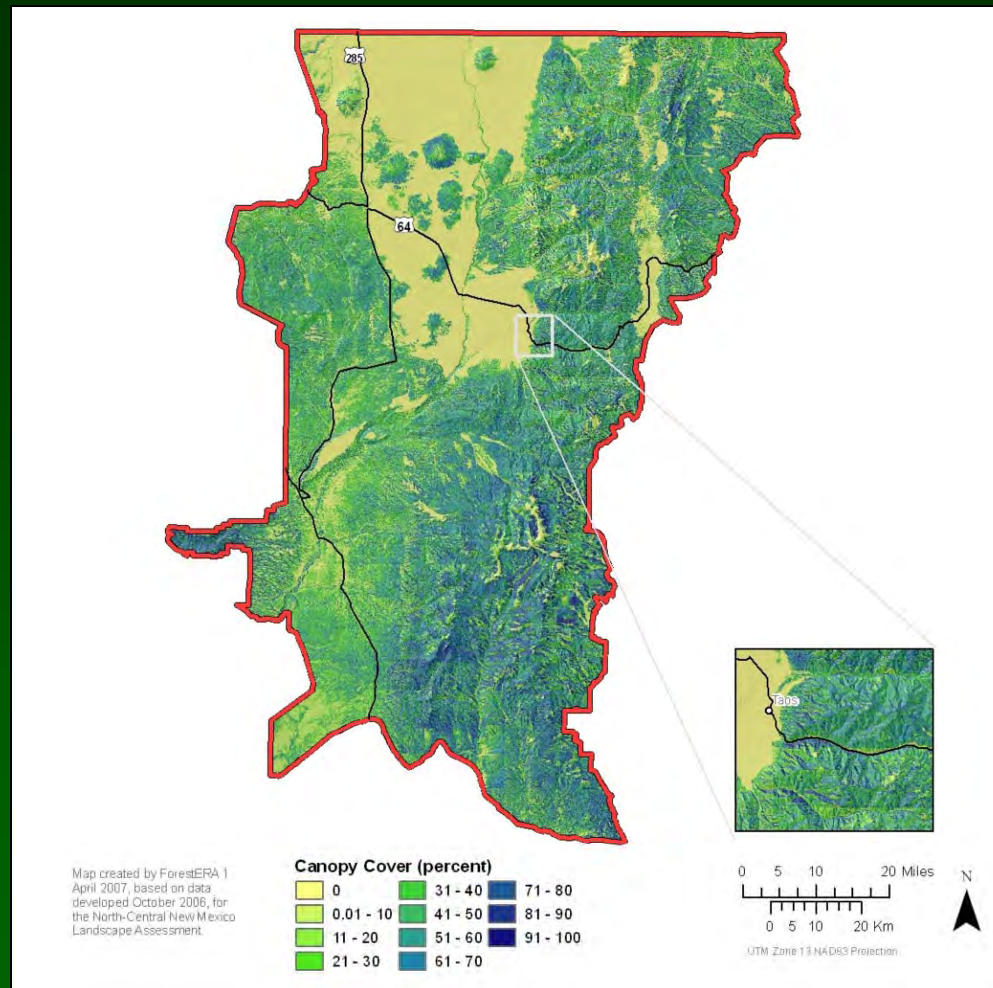
(Albano et al., in prep.)

Interjurisdictional Assessment: Northern New Mexico 2006



Foundational Data Layers: E.g., Canopy Cover

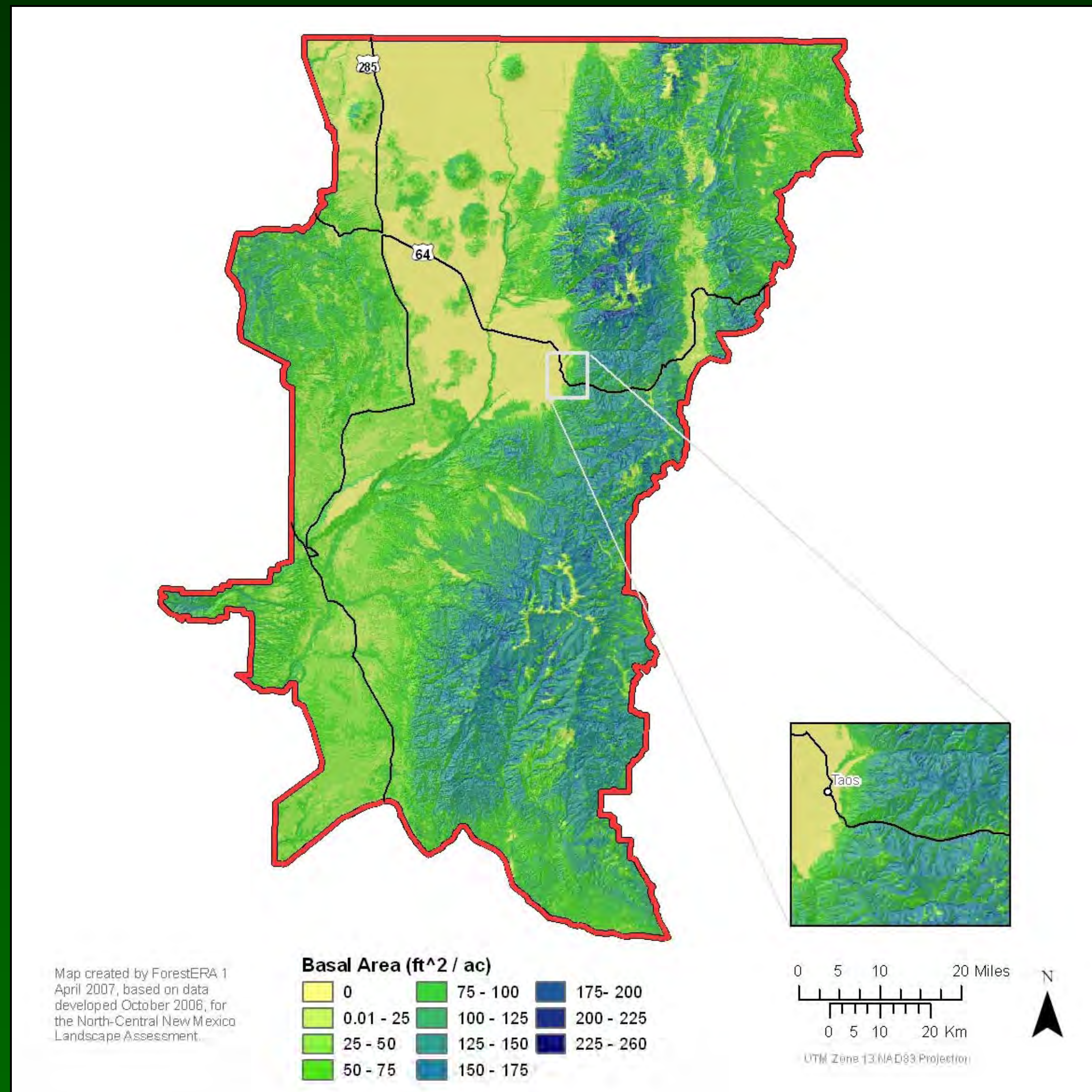
- Developed using widely available imagery and ground data collected by collaborating agencies and scientists
- Independent training data collected for accuracy assessment
- FGDC Metadata standards
- Derived from USGS B/W orthophotos using object-oriented, machine learning analysis; 10-30-m resolution; >80% of the predicted values were within 16% of the actual value (*n* = 343 ground plots)



Xu et al. 2006. Advanced exploratory data analysis for mapping regional canopy cover. Photogrammetric Engineering & Remote Sensing. 72:31-38

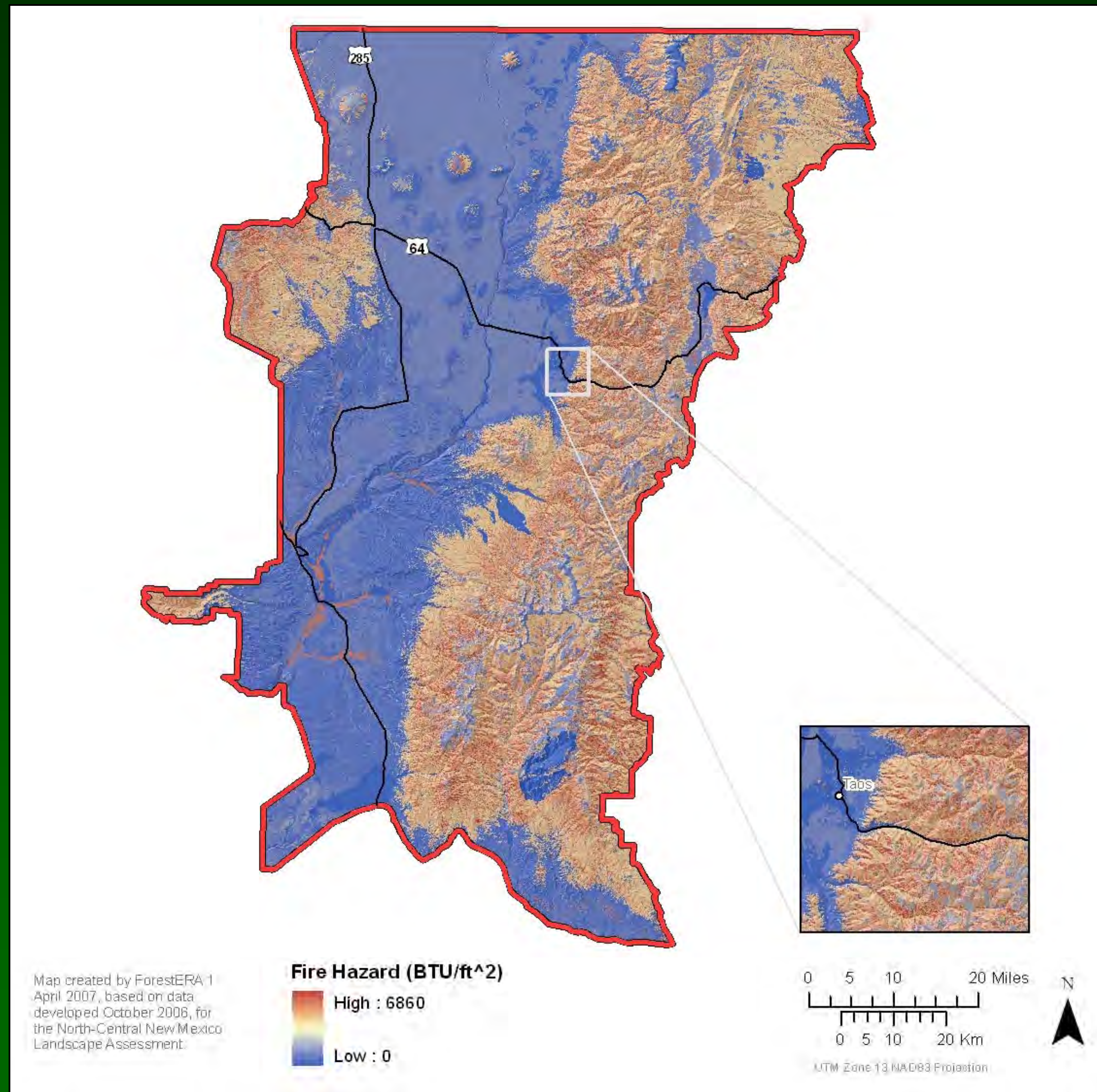
Foundational Data Layers: E.g., Basal Area

- **Multitemporal Landsat 5 TM imagery**
- **30-m resolution**
- **CART methodology incorporating 23 predictor variables, including:**
  - NDVI
  - Topography
  - Principal components
- **Custom training data (*n* = 343 ground plots)**
- **81% of all pixel values were within 5m²/ha**



Derived Data: Fire Hazard

- **Outputs from FlamMap (ver 3.0, Finney et al. 2006) using LANDFIRE and ForestERA input maps from**
- **90th percentile drought weather parameters**
  - **- Low understory fuel moistures**
  - **- Low foliar fuel moistures**
  - **- 30mph wind @225deg**
- **30m resolution**



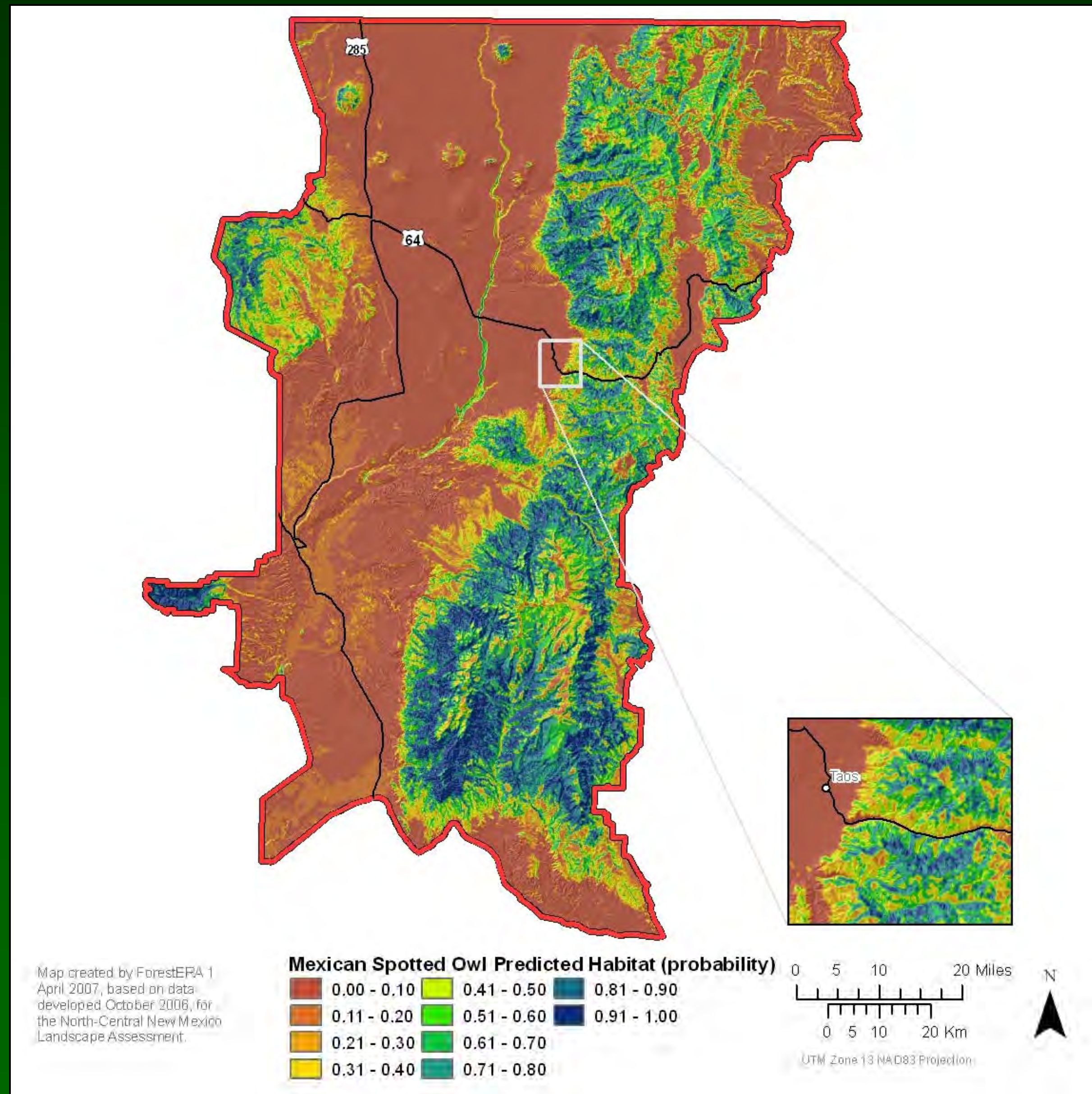
Derived Data: Mexican Spotted Owl Habitat

- Autologistic regression and multimodel inference

- Strong ForestERA-derived predictors:
    - Basal area
    - Tree density

- n = 125 locations
- AUC = 0.92
- NR^2 = 0.72

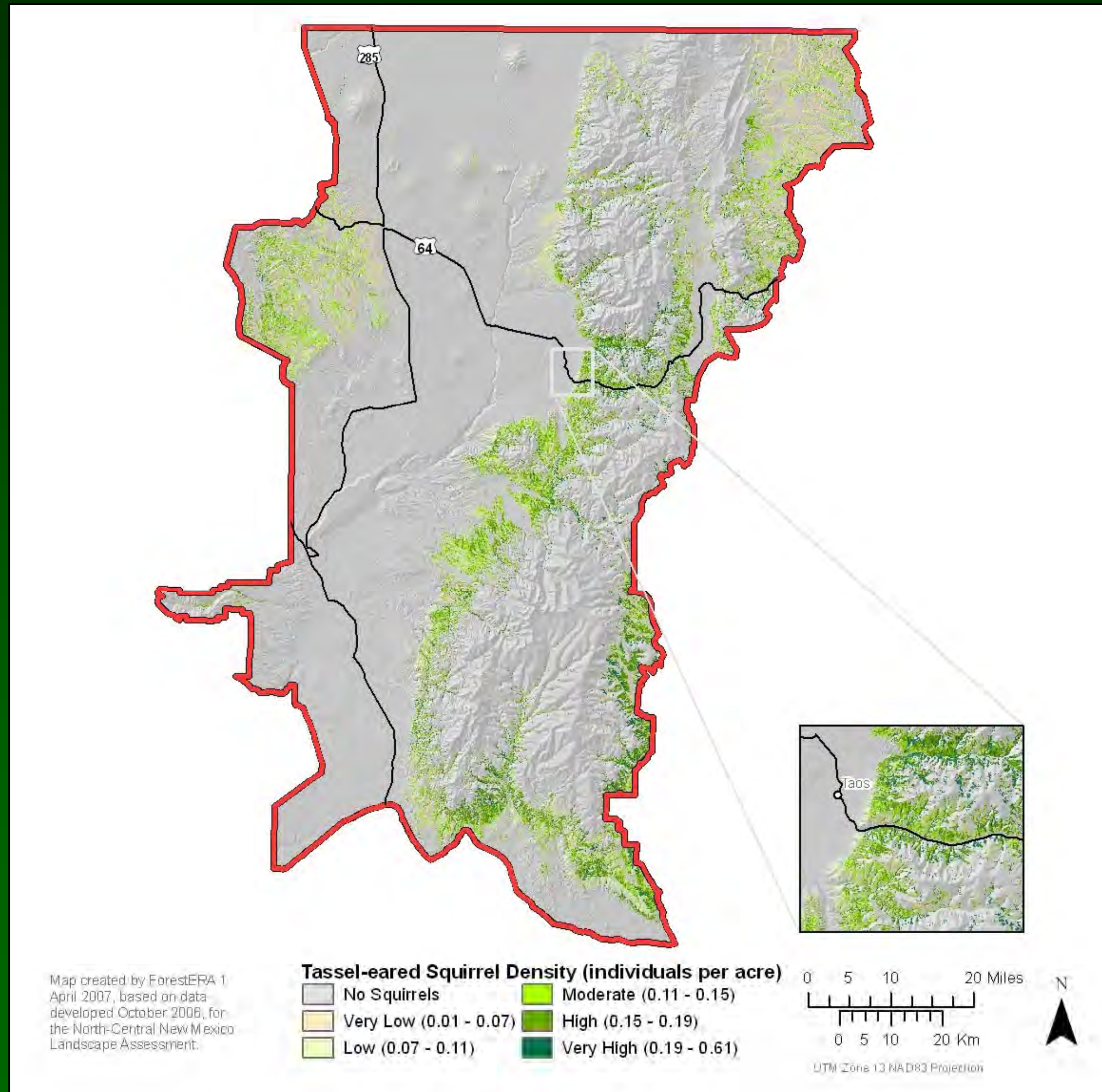
Prather et al. 2007. Real versus perceived conflicts between restoration of ponderosa pine forests and conservation of the Mexican Spotted Owl. Forest Policy & Economics 10:140-150.



Derived Data: Tassel-eared Squirrel Density

- Density and juvenile recruitment in ponderosa pine vegetation only
- Multiple linear regression and multimodel inference
- Strong ForestERA-derived predictors:
  - Basal area
  - Canopy cover
- Training = 25 sites in N. AZ
- Validation = 24 sites in NM
- R^2 = 58%

Prather et al. 2006. Landscape models to predict the influence of forest structure on Tassel-eared Squirrel populations. Journal of Wildlife Management 70:722-730.

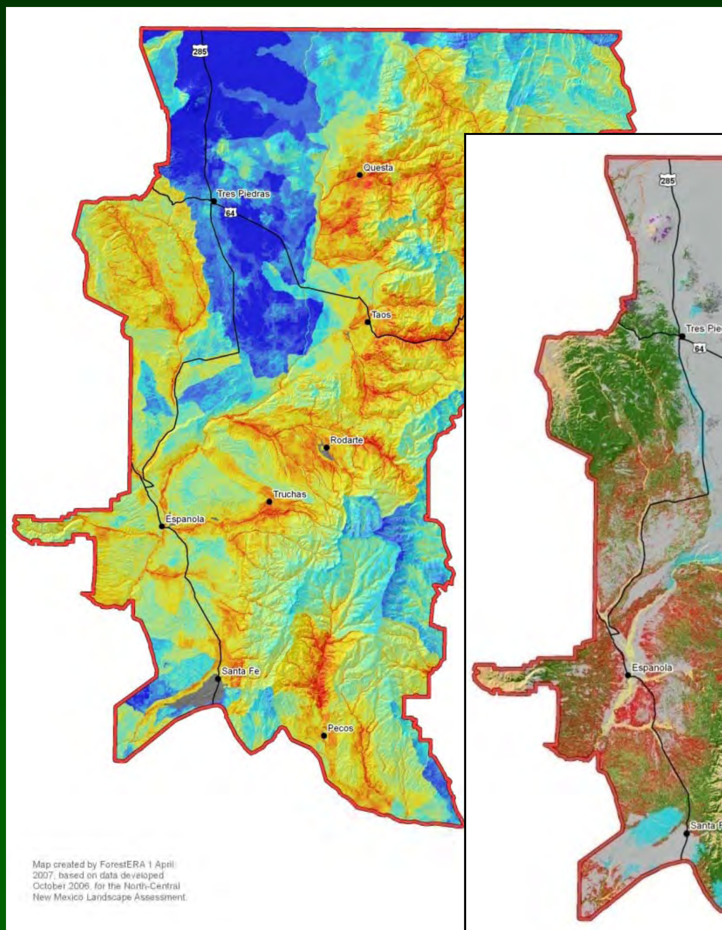


Building Social Capital: **Collaborative process**

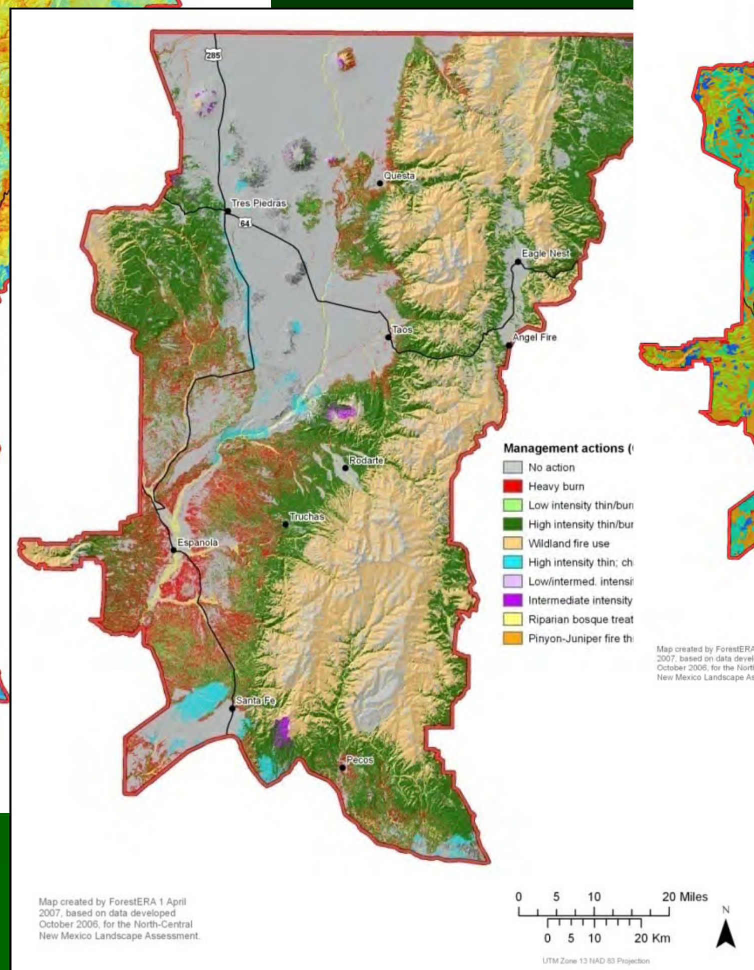
- Collaboration enlists the strengths of science in a focused effort to solve real problems and resolve important issues
- Collaboration results in sharing traditional knowledge and local experience, which can be important in planning
- The gap between science and application is bridged—science becomes more relevant, decisions become more rational

(Paraphrased from Forsythe 2003)

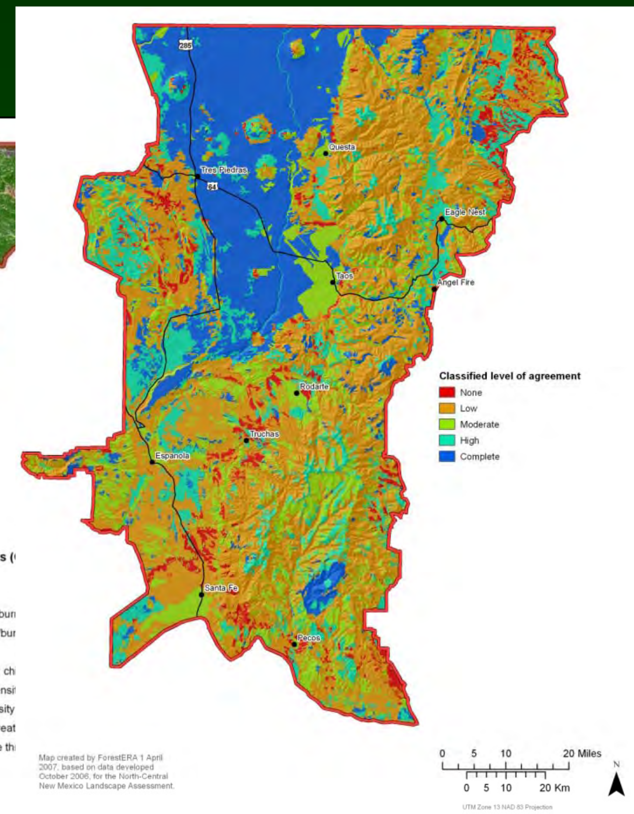
Outcomes of Science-based Collaboration



Priorities

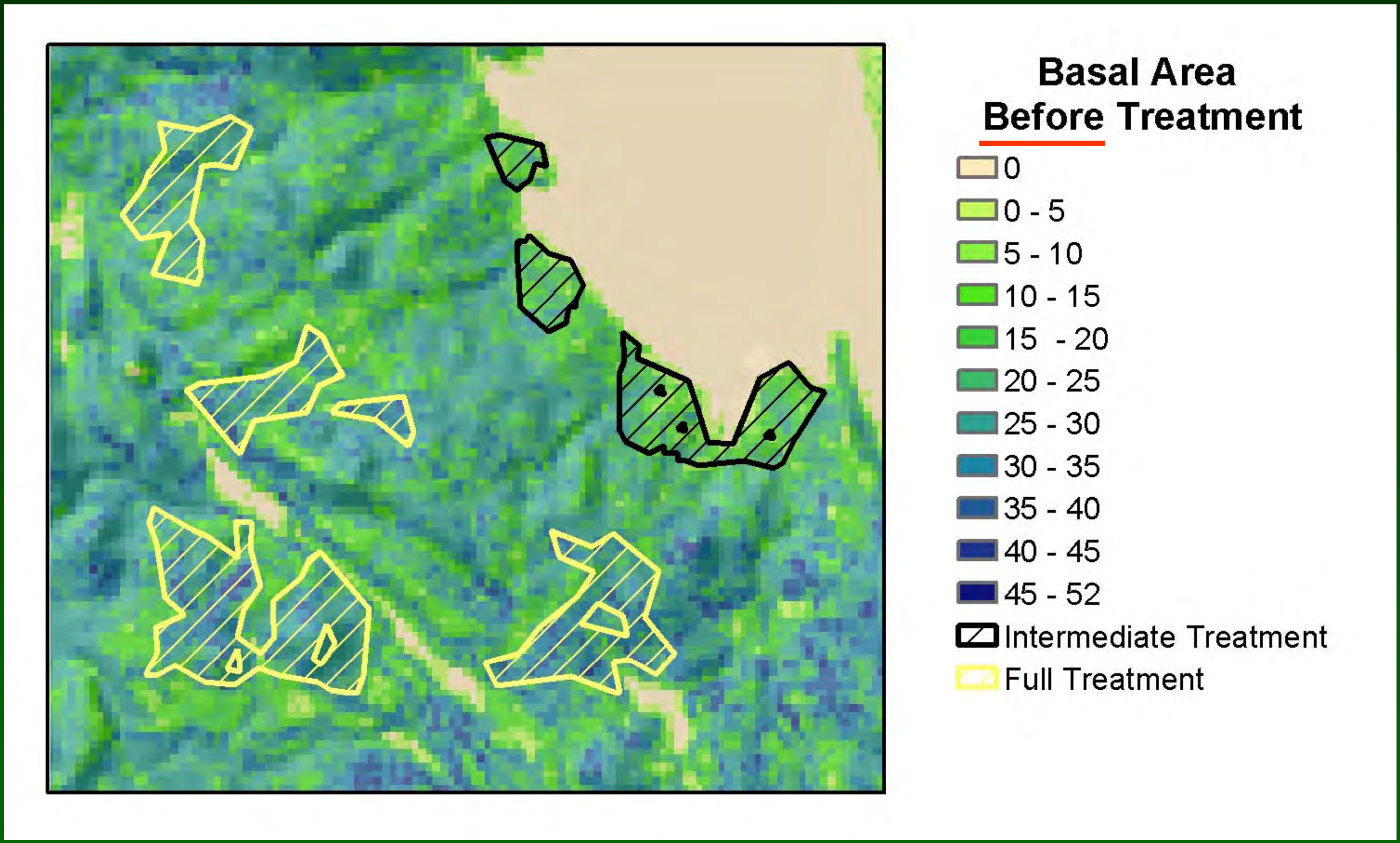


Management Actions

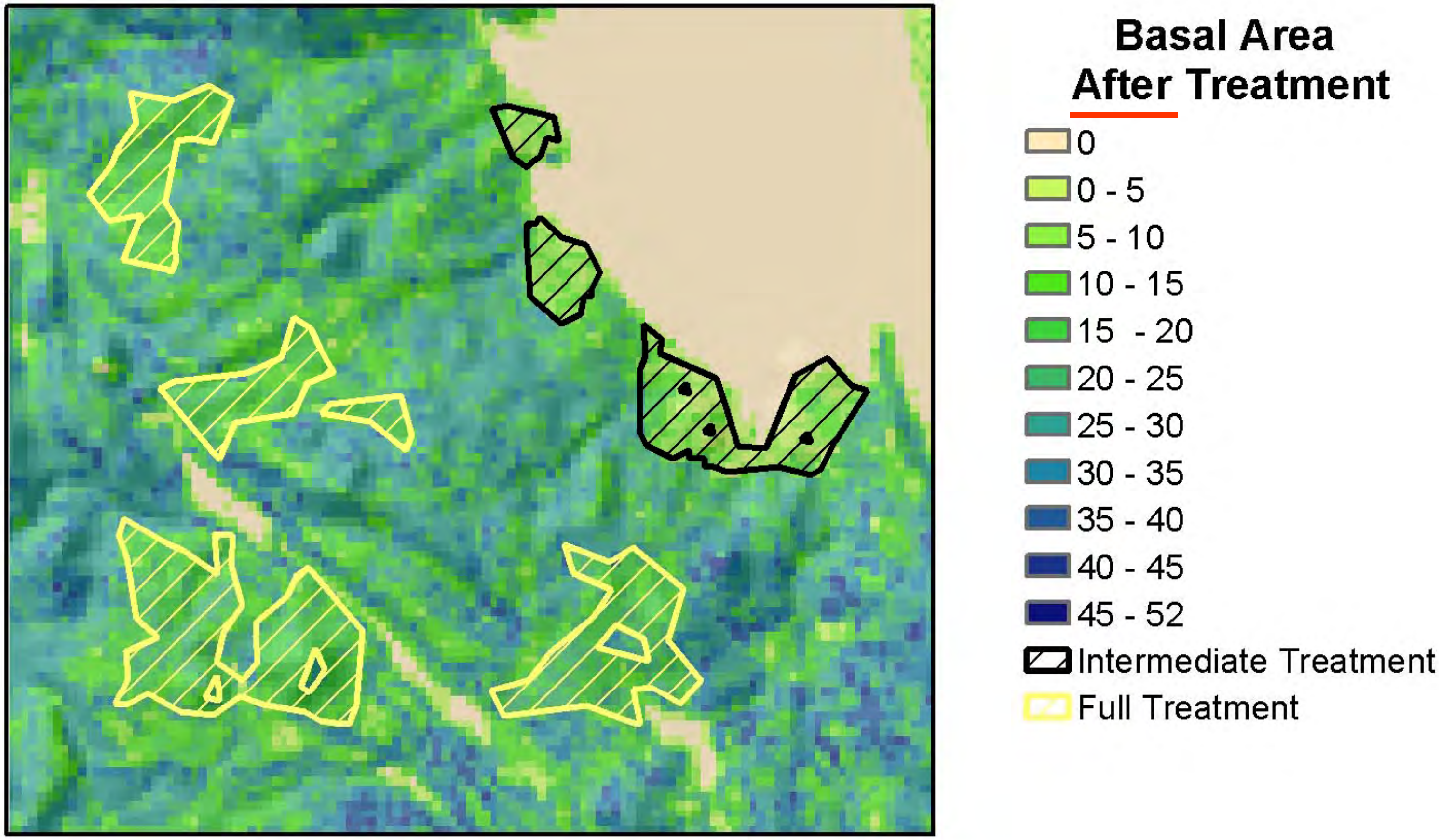


Level of Agreement

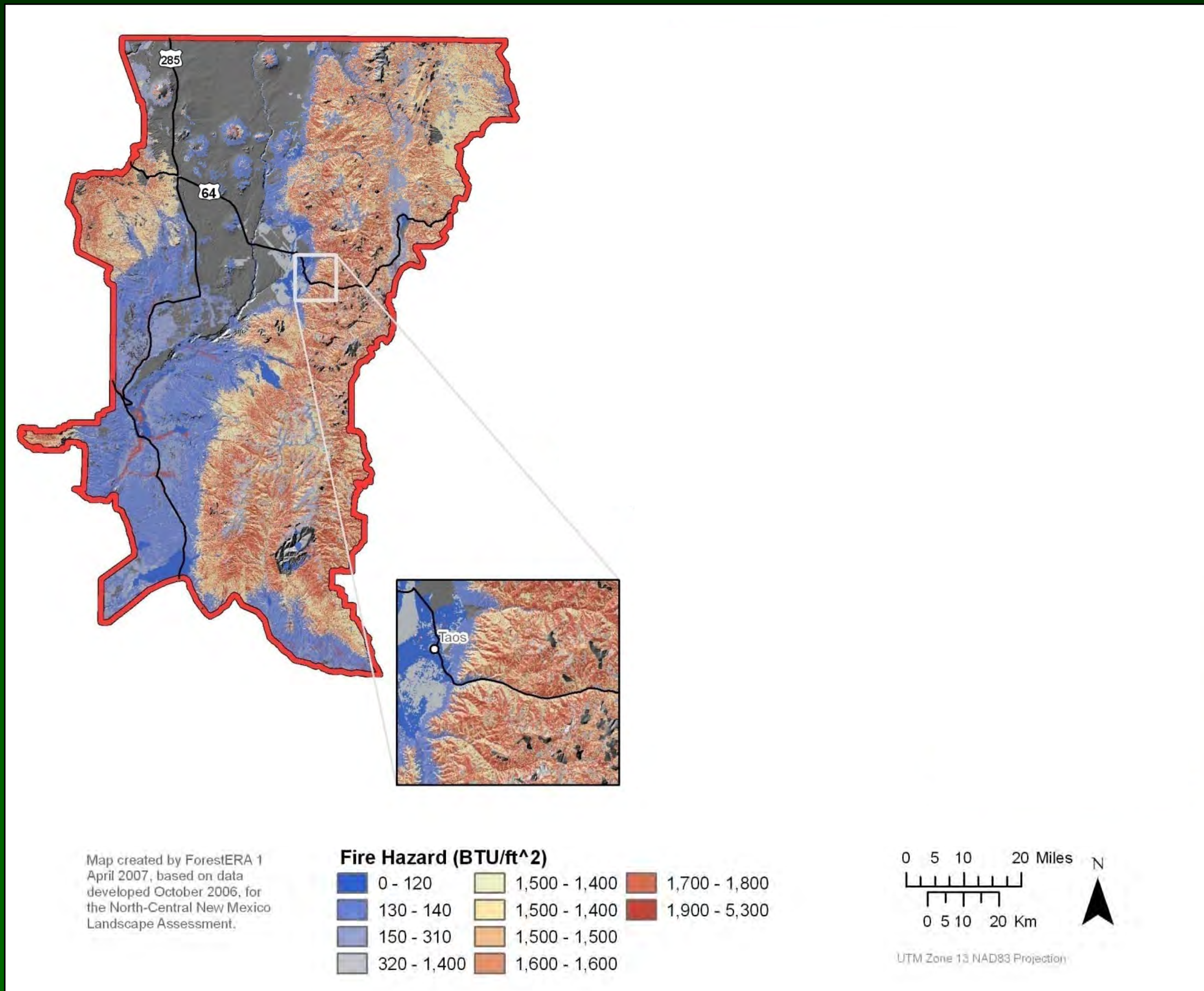
Predicted Effects: Modeling Forest Treatments



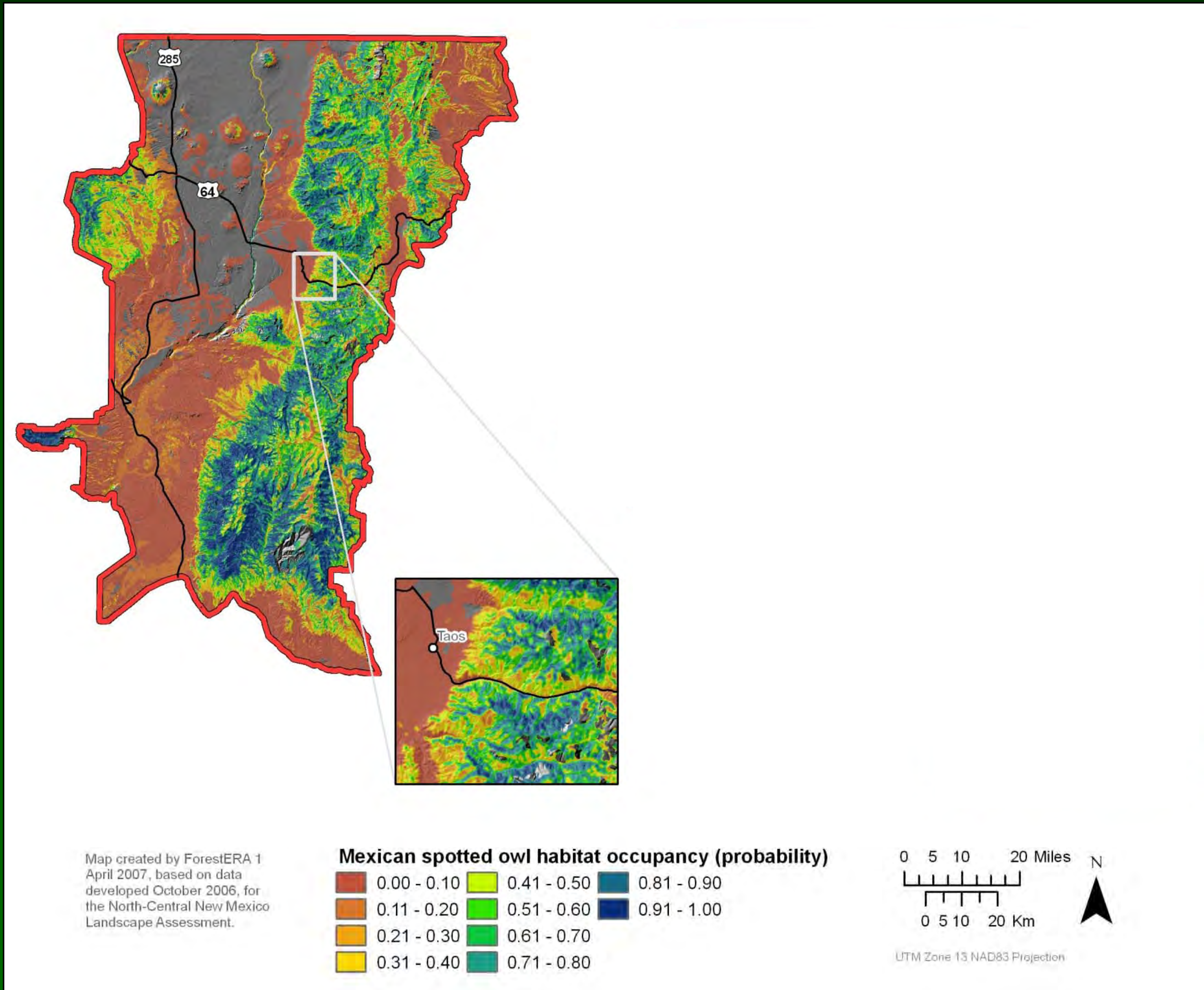
Predicted Effects: Modeling Forest Treatments



Predicted Effects: Landscape-level Fire Hazard

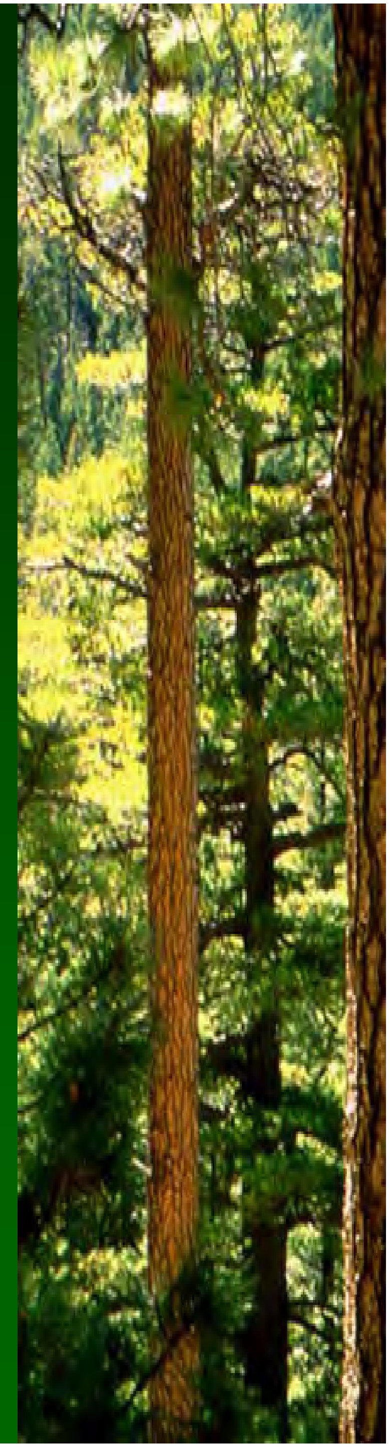


Predicted Effects: Mexican spotted owl habitat



Public Science for Landscape-level Planning

- **Science must be transparent, but not 'dumbed down'**
- **It must be rigorous, repeatable, and defensible so that it will inspire confident action**
- **The public must 'own' the science if they are to trust and accept decisions based on it**
- **The planning process should provide a predictive capacity and allow exploration of alternative scenarios**
- **Science should inform and guide planning, not attempt to dictate decisions**



Acknowledgments

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