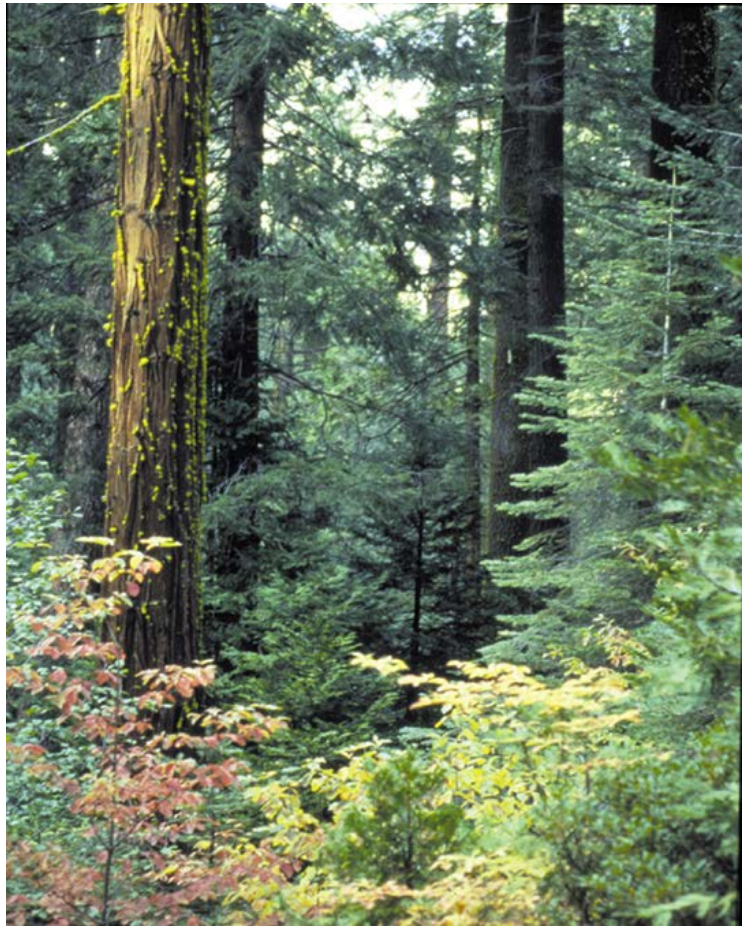
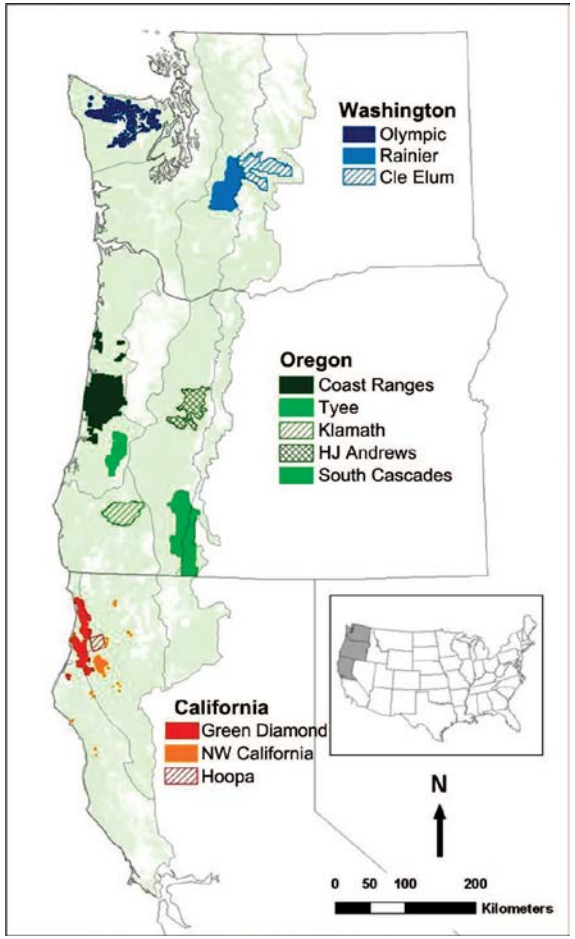
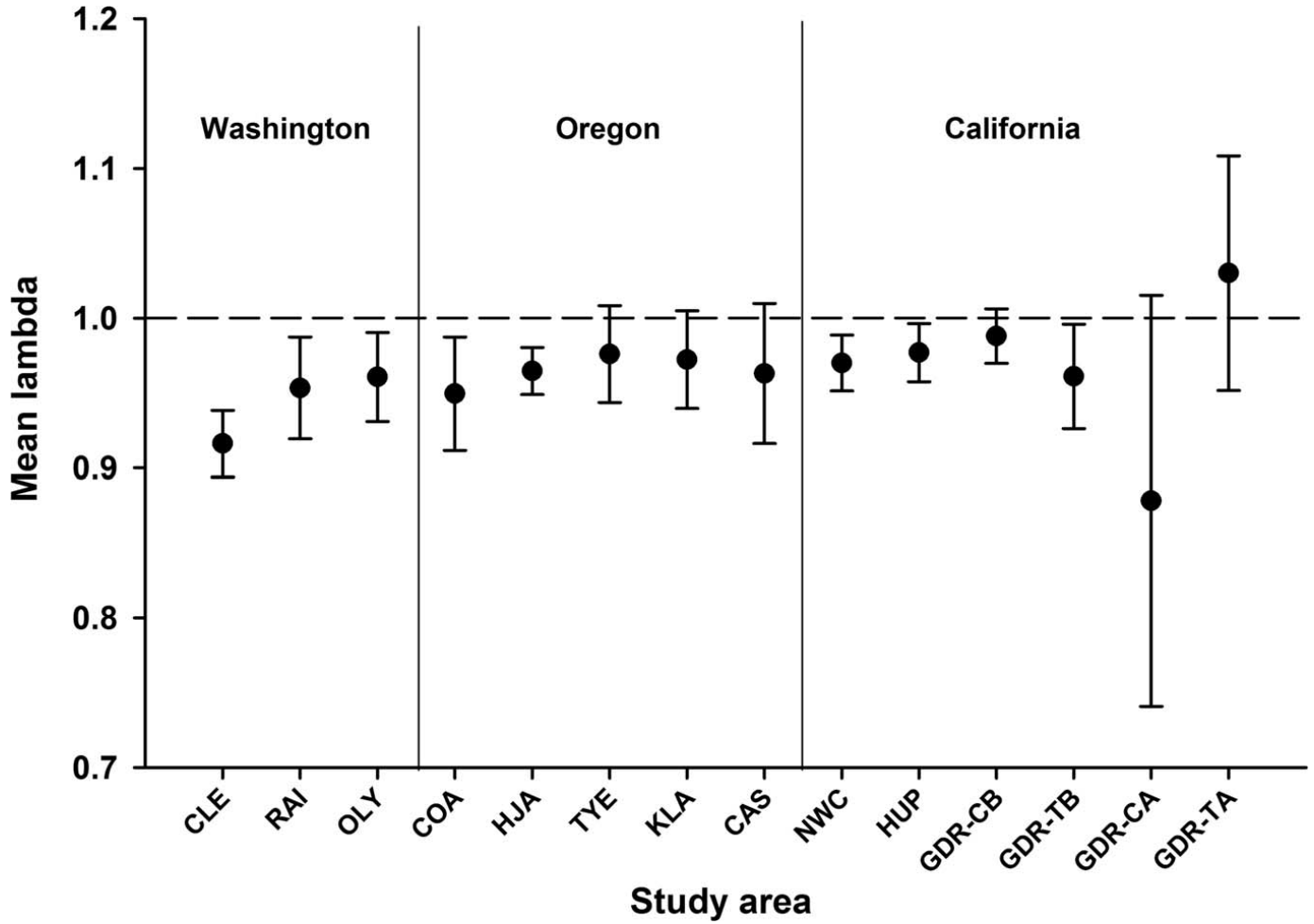
New Insights from Recent Research on Spotted Owl-Fire Associations



John J. Keane – Pacific Southwest Research Station, USDA Forest Service, Davis, CA

Northern Spotted Owl – Conservation Status

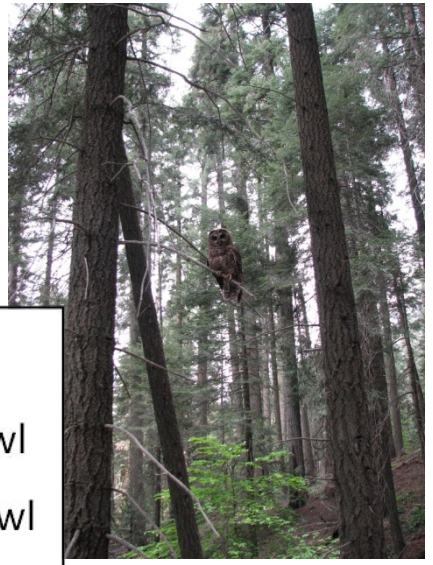




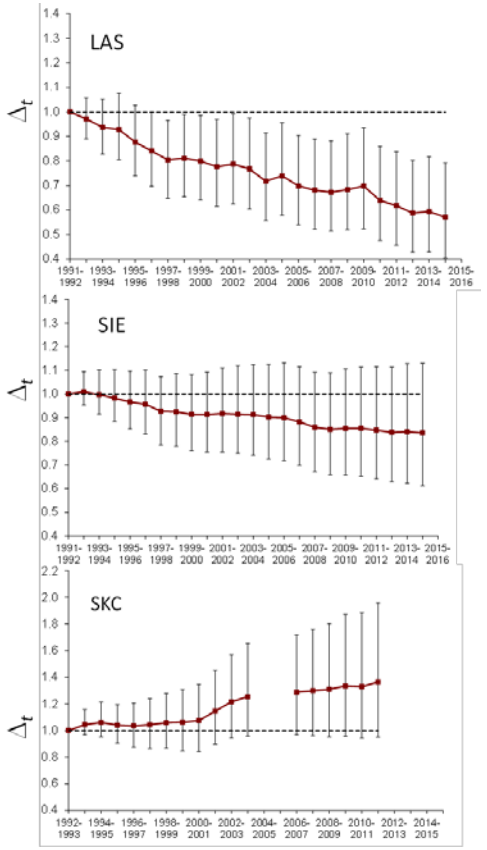
-Nesting/Resting Habitat
-Barred Owls

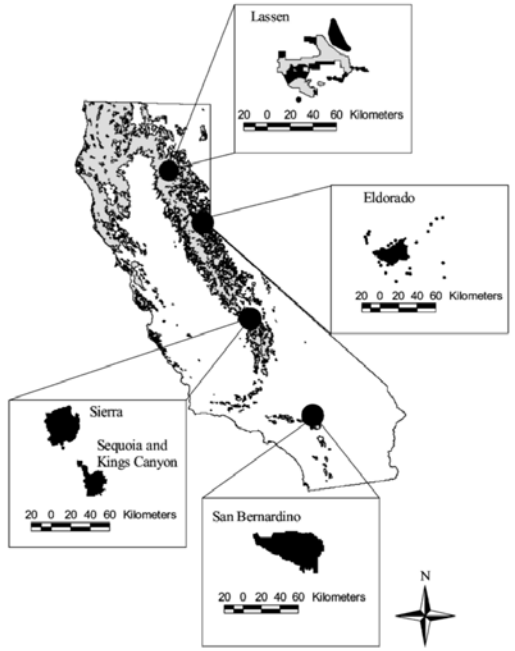
Estimated mean rates of population change (lambda) and 95% confidence intervals for Northern Spotted Owls. (Dugger et al. 2016).

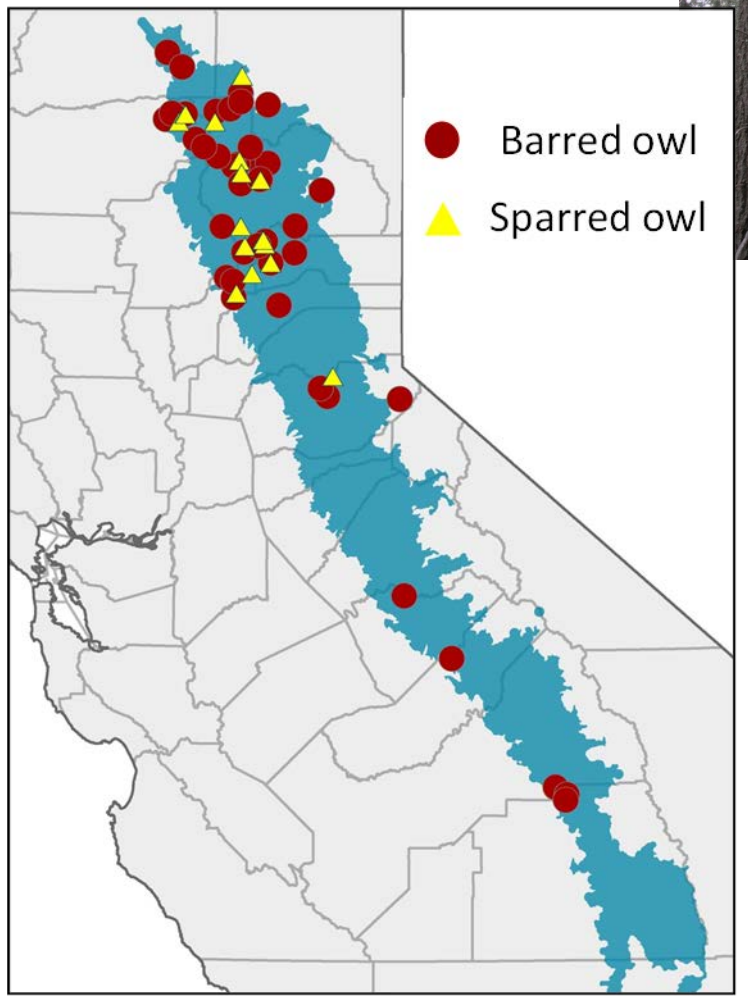
California Spotted Owl – Conservation Status



- Long-term demographic monitoring on 4 study sites across Sierra Nevada indicate significant declines on LAS and ELD, near significant declines on SIE, stable/increasing on SKC.

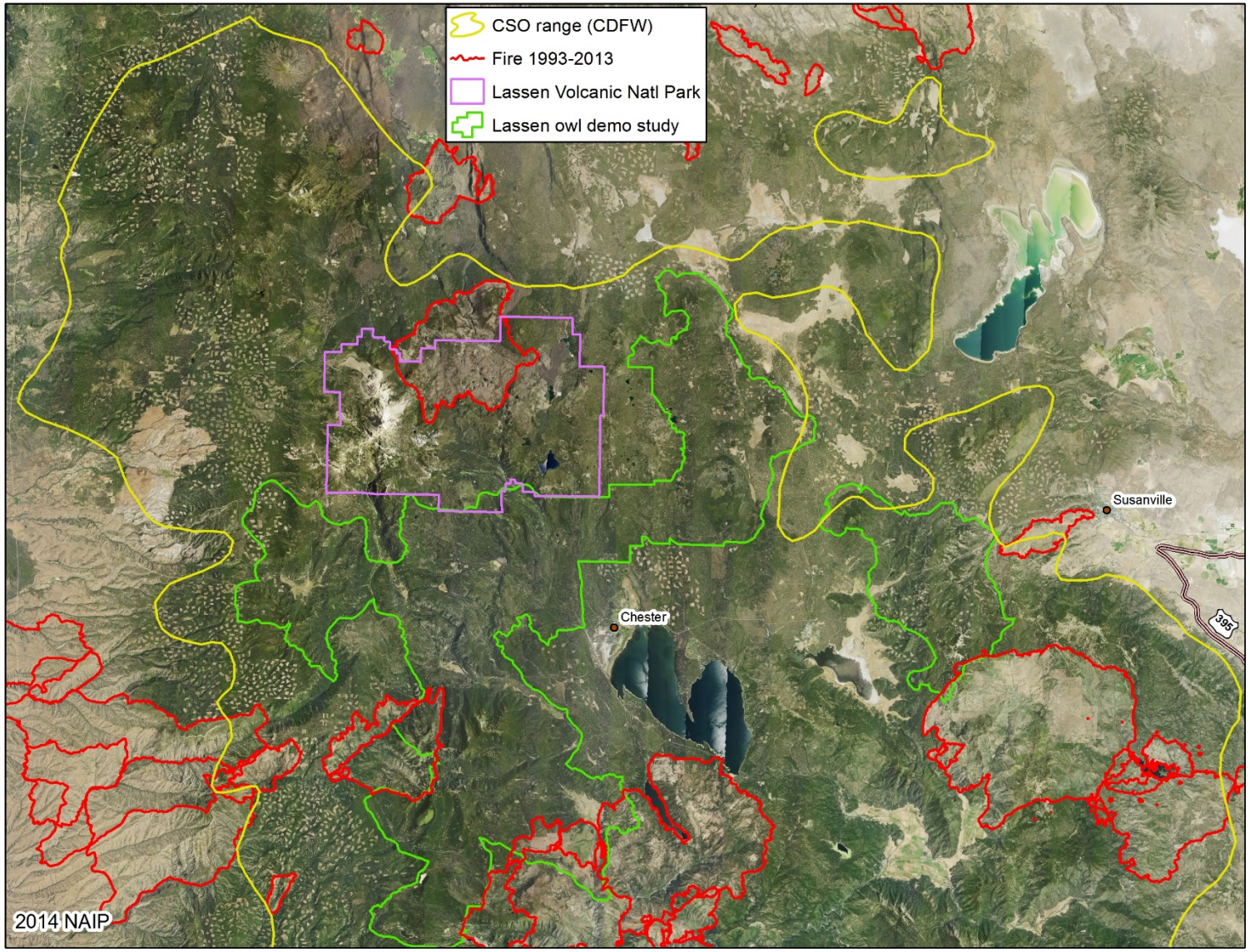




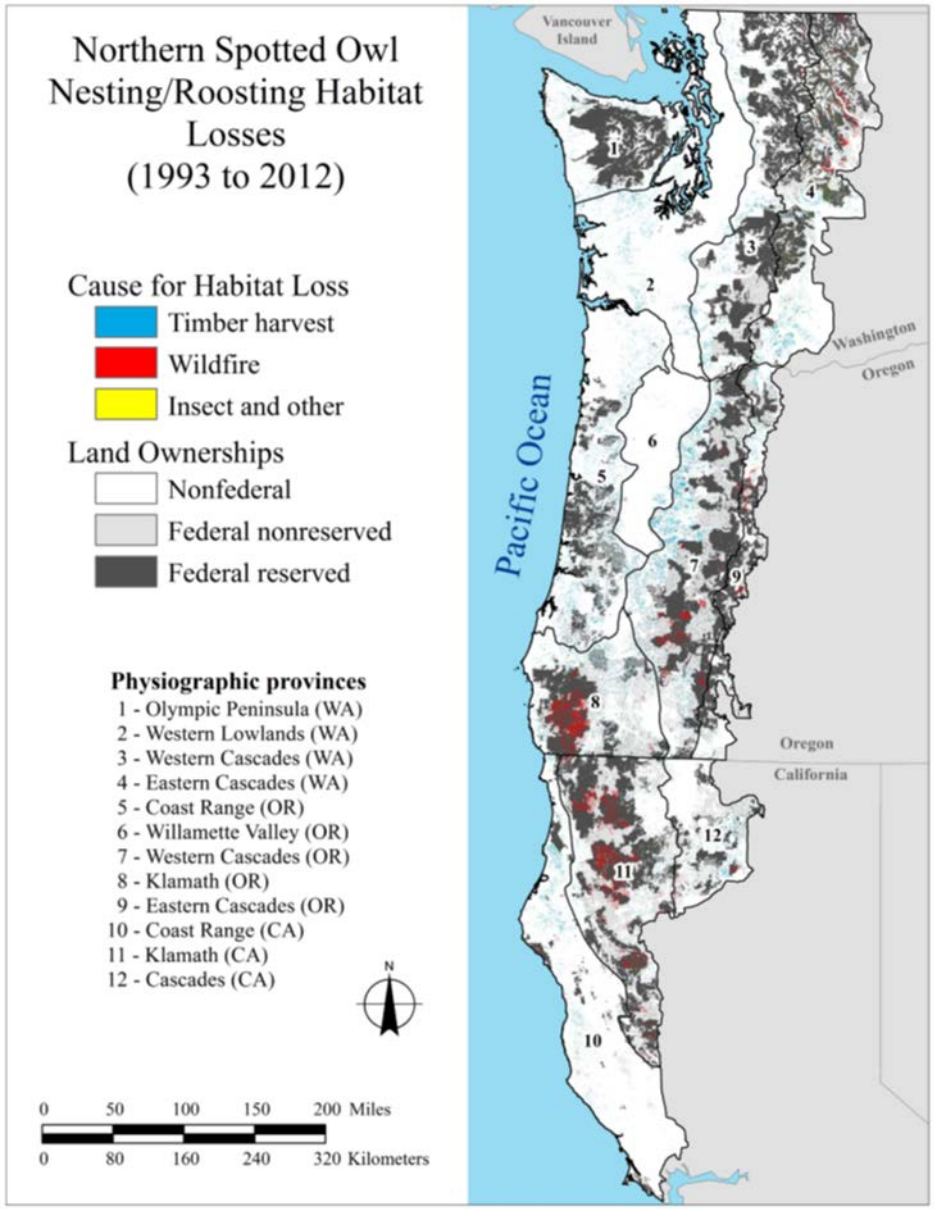


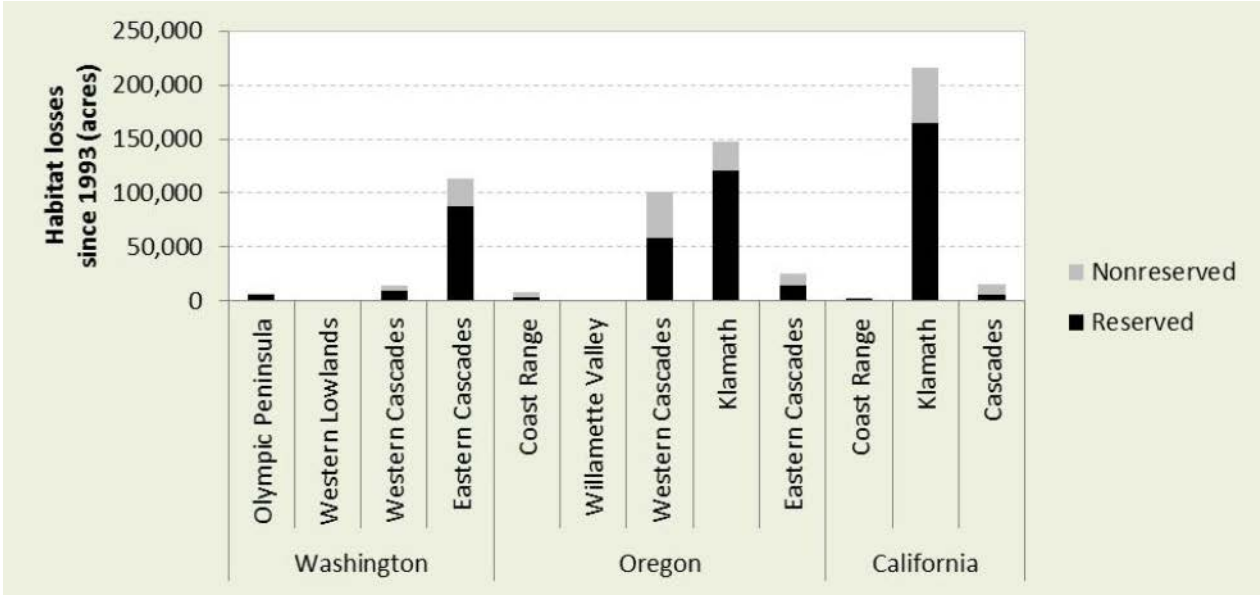
Management Challenge: Integrate Single-species Conservation and Ecosystem Restoration Perspectives

- SPOWs and other species associated with large trees and dense canopy cover
- Legacy context from historic timber harvest and fire suppression
- Current timber harvest, drought effects and wildfire activity.
- Projected future climate scenarios.
- Objective: Increased Forest Resilience.
- Realign forest habitat distribution with key Bio-Physical factors underpinning forest distribution, structure, and function (e.g., LMU, CWD).



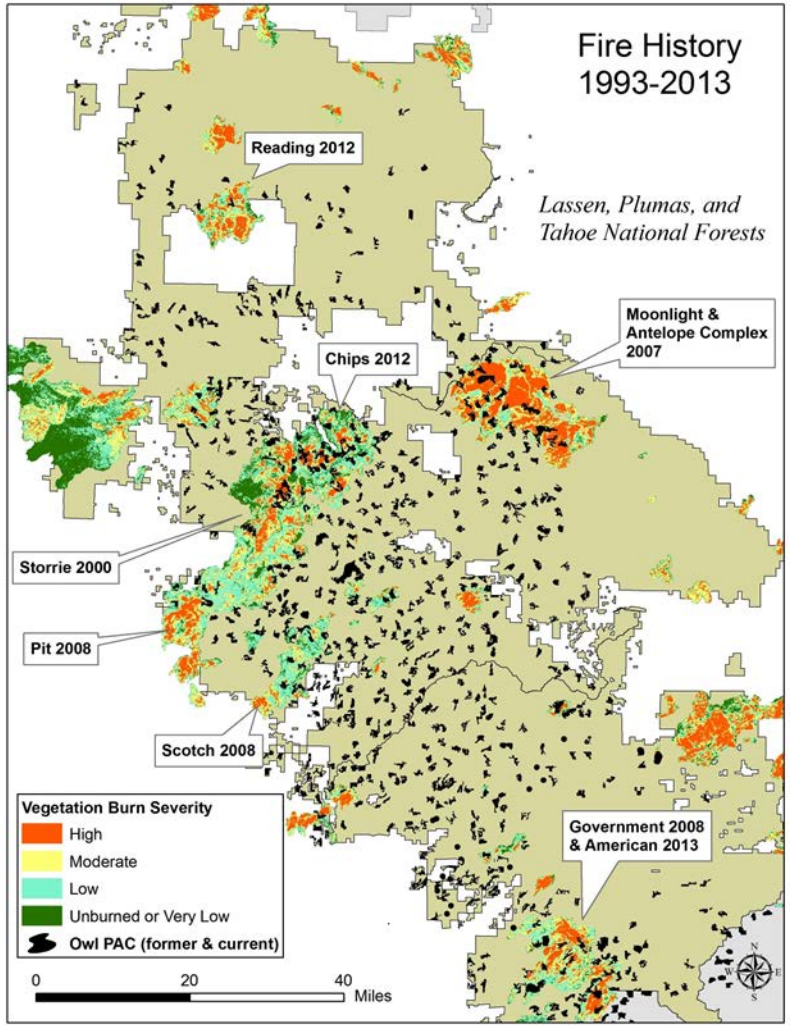
NSO Nest Habitat Loss to Wildfire: 1992-2013

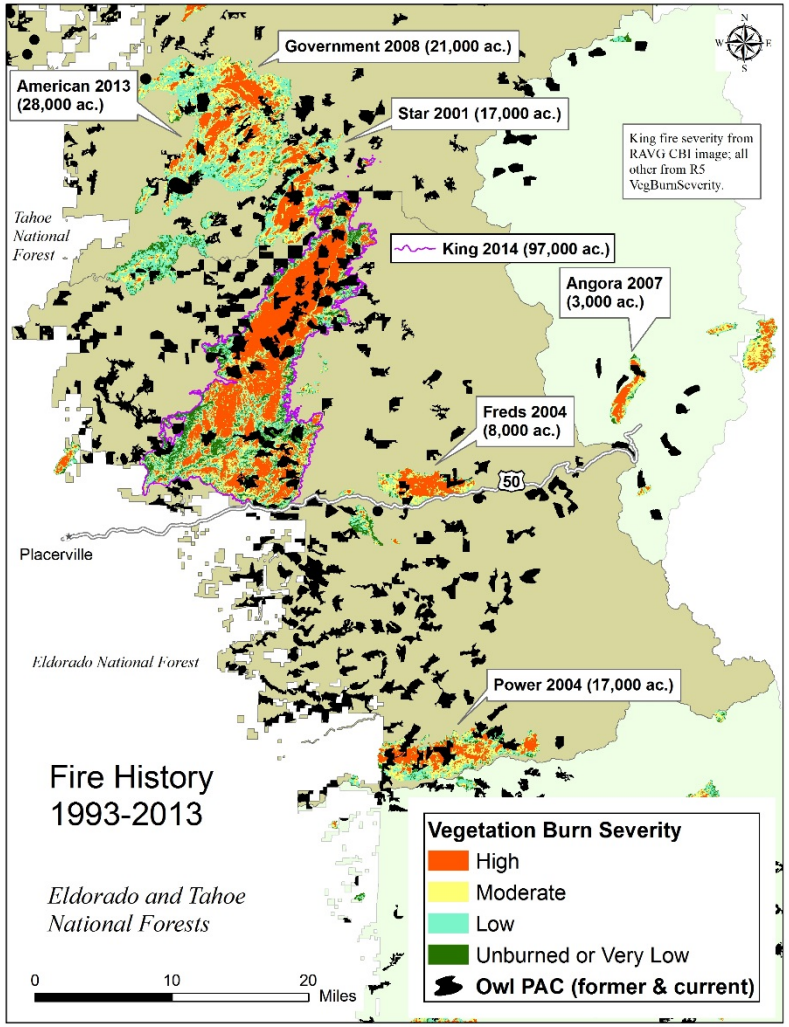


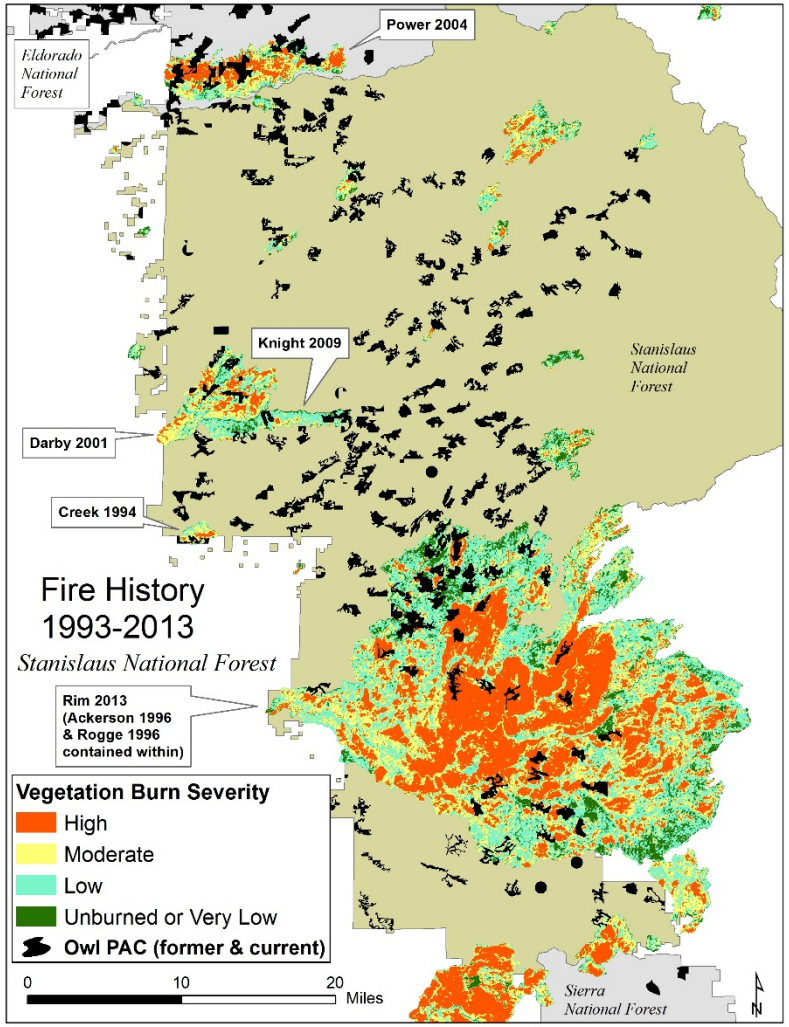


Davis et al. 2016

Wildfire Patterns in the Sierra Nevada: 1993-2013

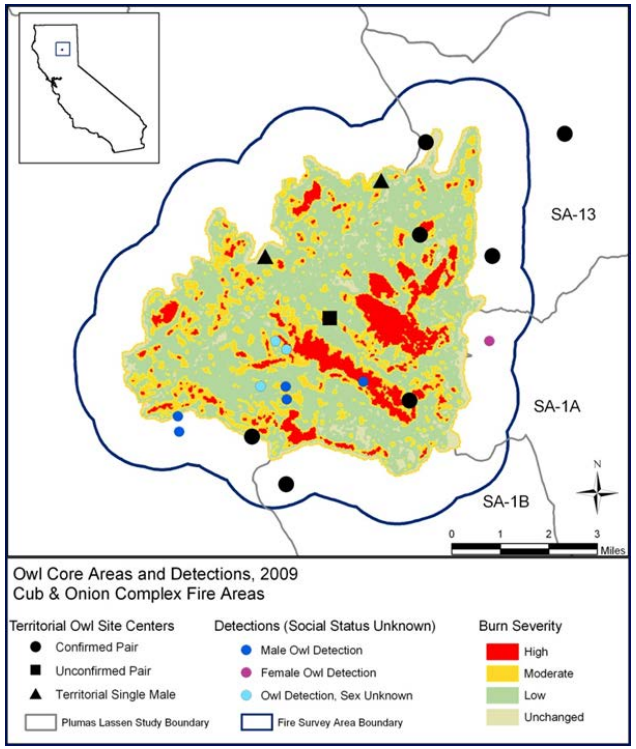


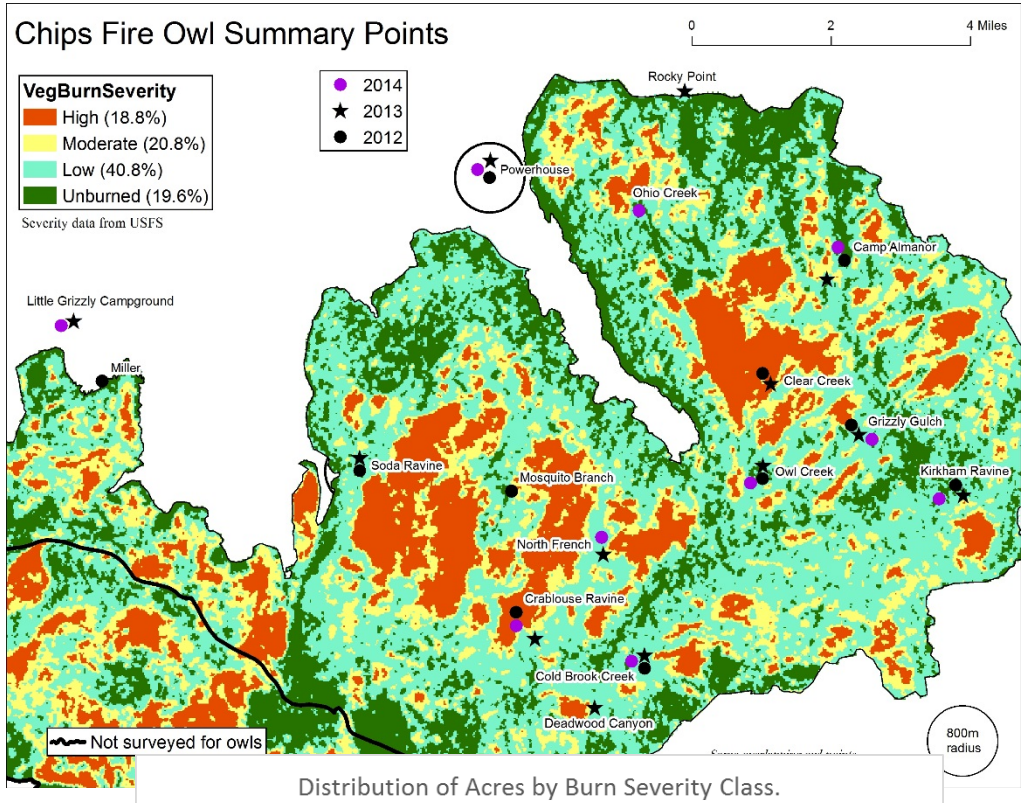


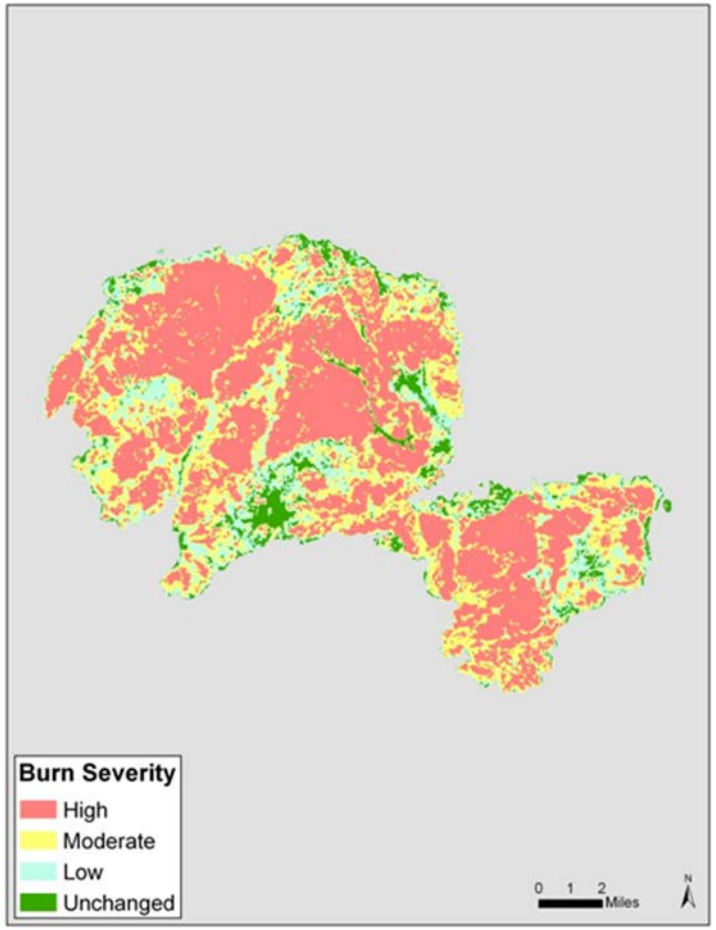


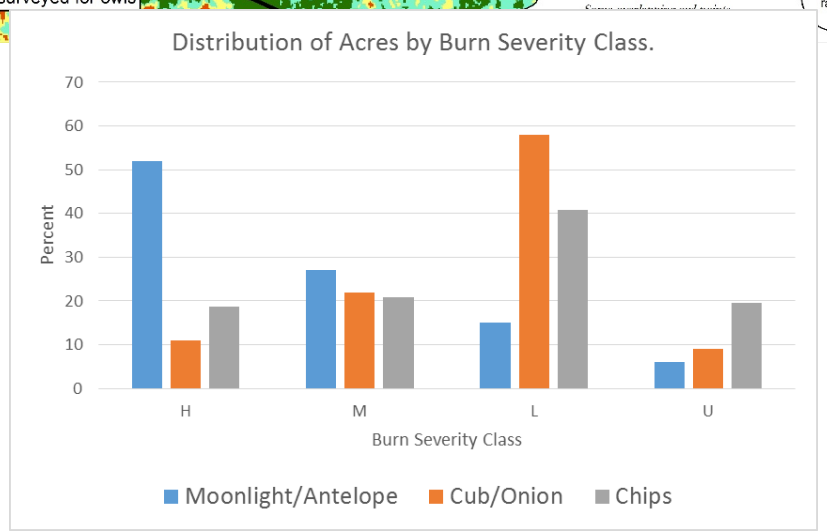
Keane, J.J., In press. 2017

Case Study – Sierra/Cascades

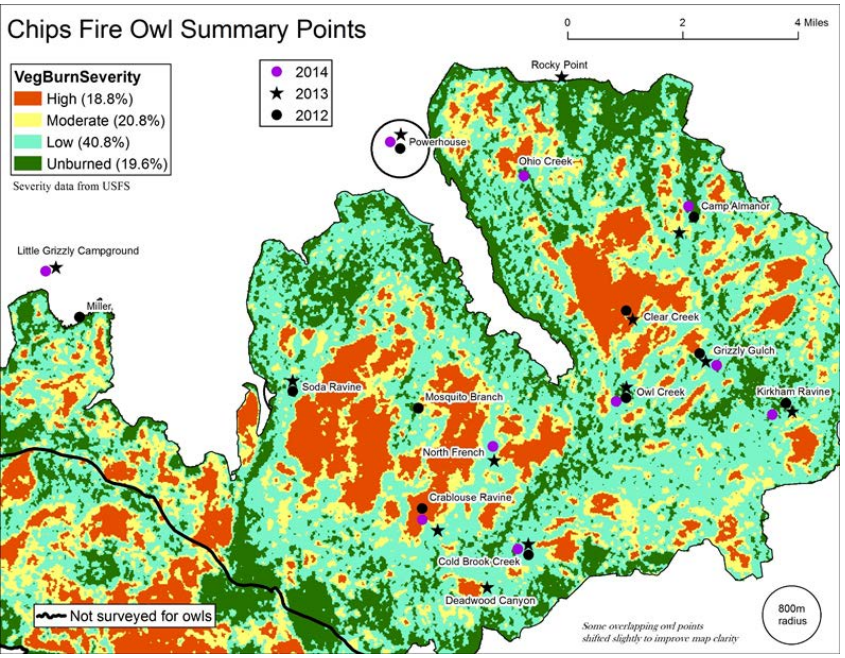


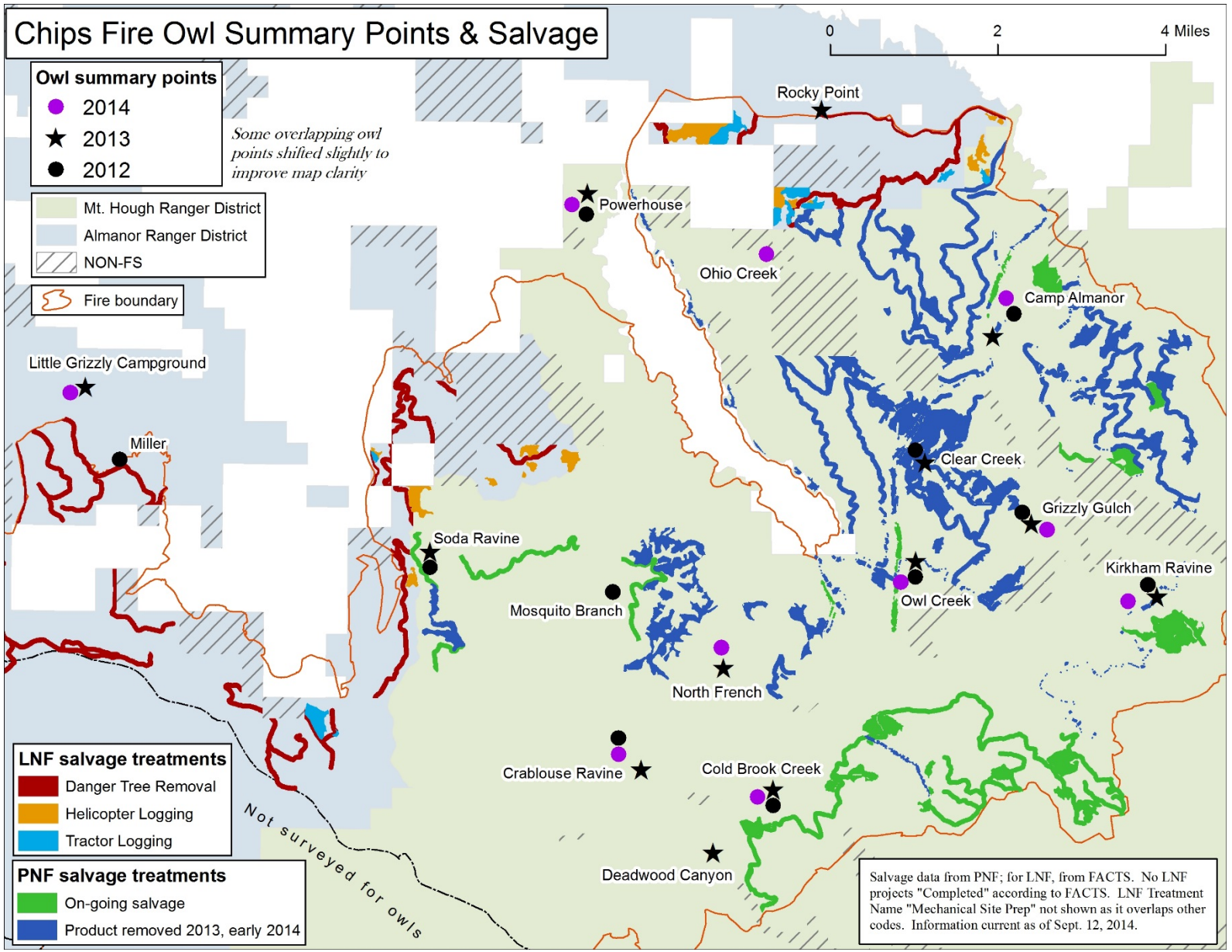




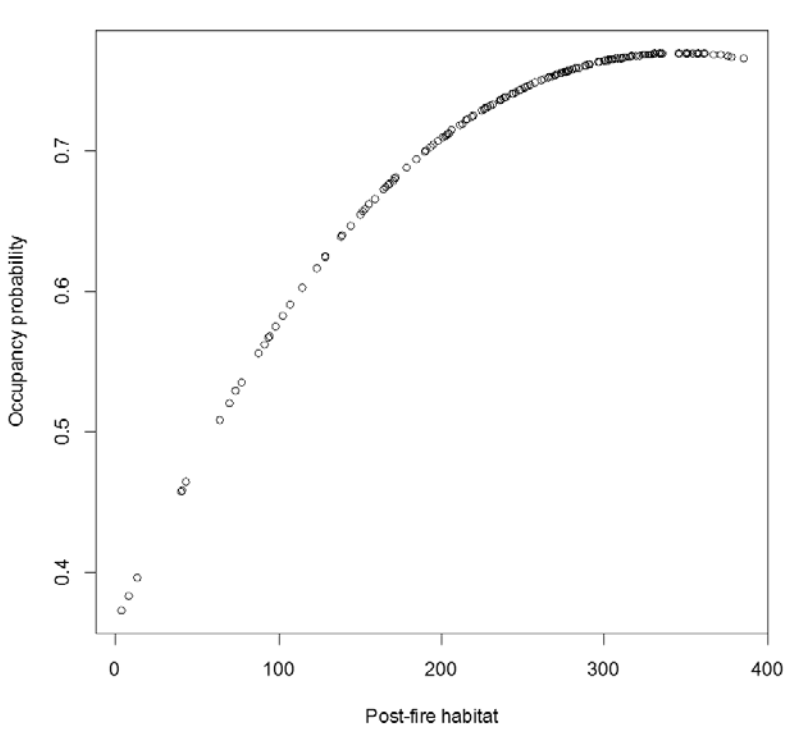


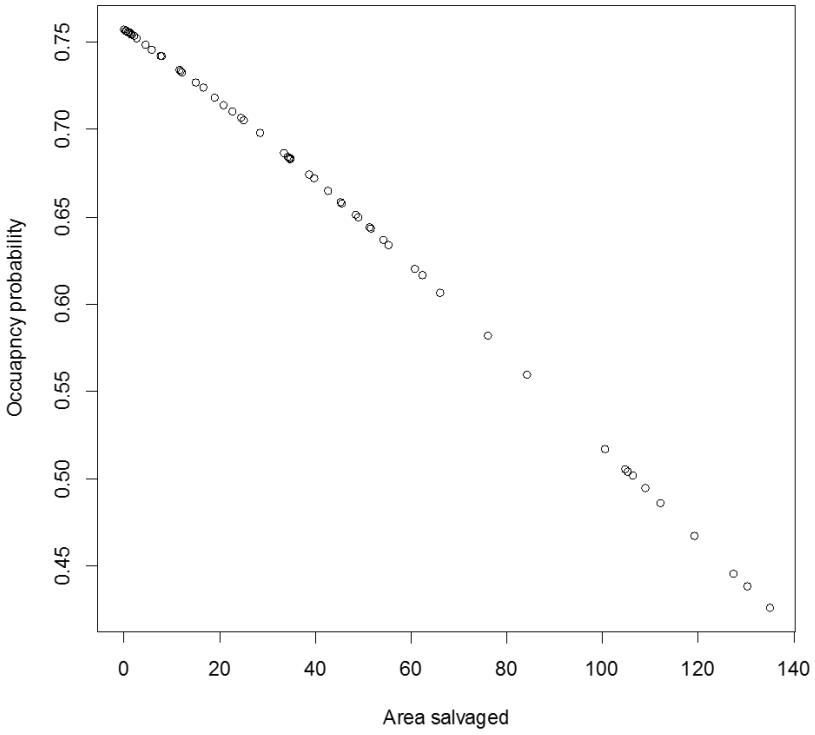
Case Study – Sierra/Cascades





Case Study – Sierra/Cascades

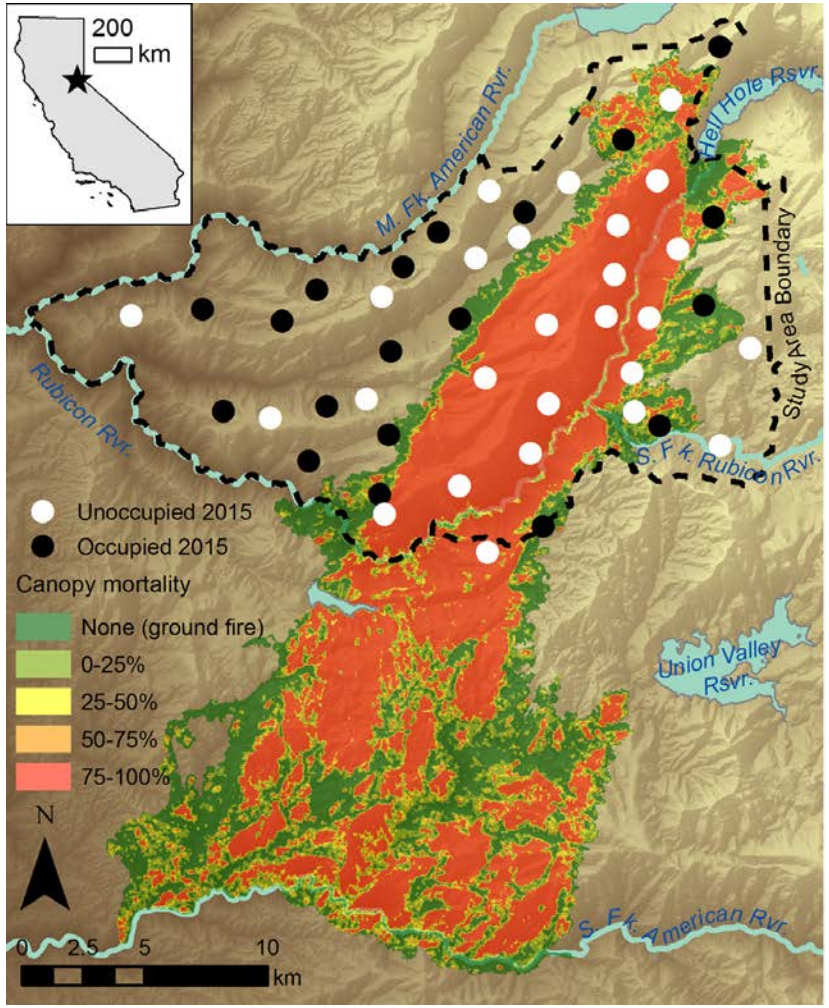


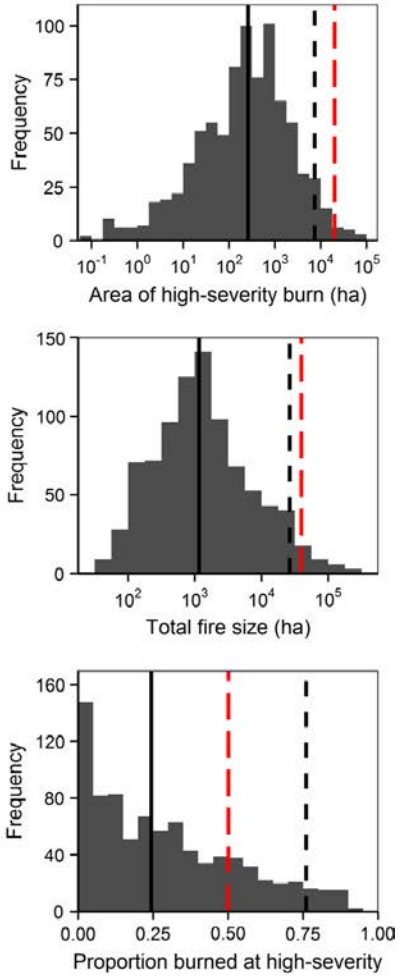


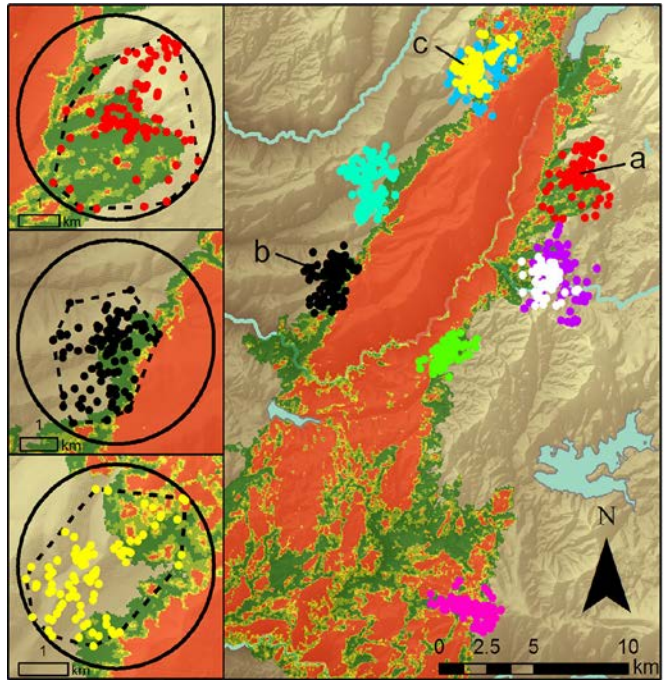
Post-fire occupancy probability a function of the sum suitable habitat that was unburned or burned at low/moderate severity.

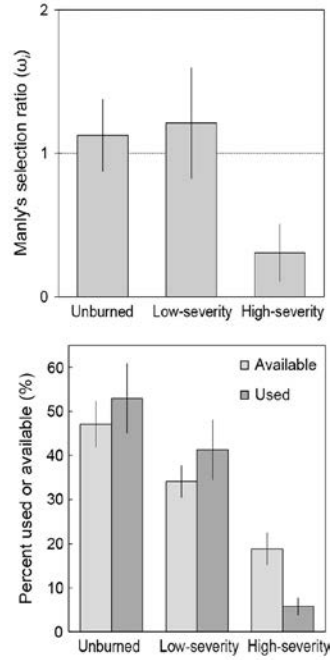
Post-fire occupancy probability negatively affected by salvage logging.

Case Study – Sierra Nevada: King Fire





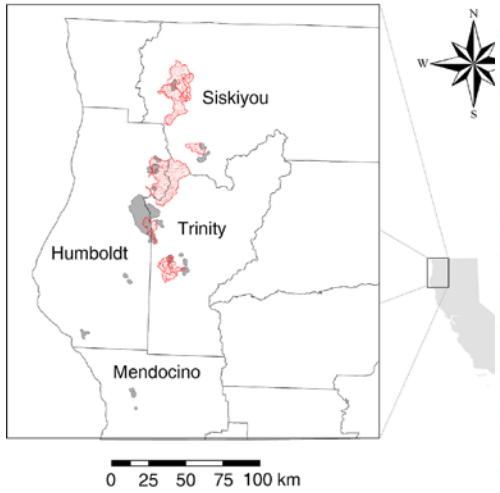


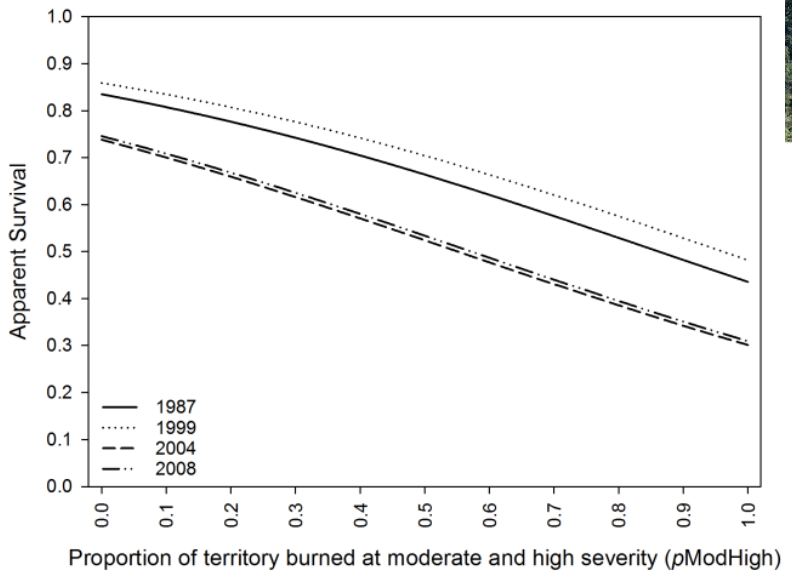


- High-severity patch size
- Habitat use

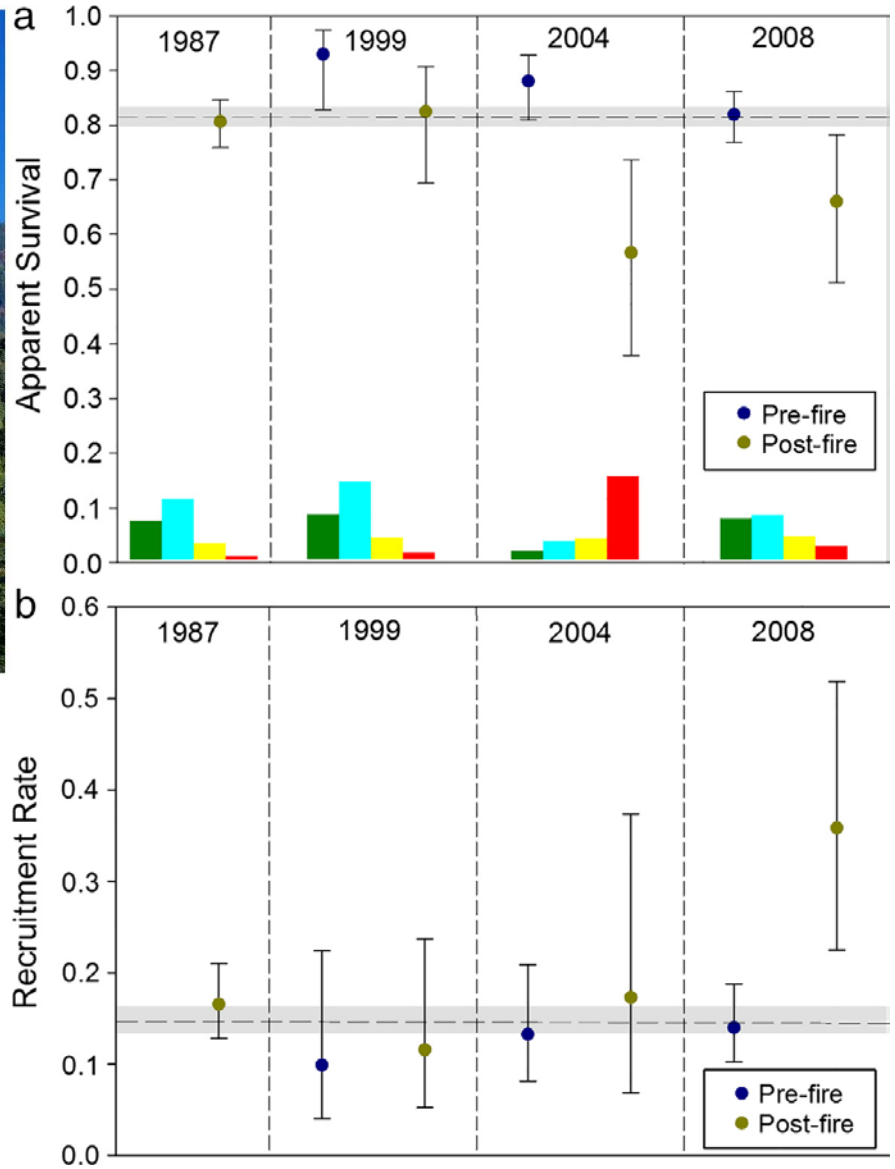
Jones et al. 2016

Case Study – Klamath





- Occupancy vs Survival
- Territory Quality
- Landscape Context



Rockweit et al. 2017

Overview of Results from Spotted-Owl Response to Fire Research

Table 1. Effects of fire on different estimates of spotted owl demography. Fire severity used in each study is denoted by low(low), moderate(mod), severe(sev) and all (low, moderate and severe pooled). Studies cited are as follows: (1) Jenness et al. 2004 (2) Lee et al. 2012 (3) Roberts et al. 2011 (4) Clark 2007 (5) Gaines et al. 1997 (6) Tempel et al. 2015 (7) Bond et al. 2008 (8) Baker 2015 (9) Lee et al. 2013 (10) Lee and Bond 2014 (11). Bond et al. 2016 (12) Clark et al. 2012 (13) Ganey et al. 2014 (14) Bond et al. 2002 (15) Jenness 2000 (16) Wolfe et al. 2016 (17) Tempel et al. 2016.

Subspecies	Occupancy	Survival	Habitat Use	Productivity
	positive[12(low-mod)]	positive	positive[4(low), 8(all)]	positive
Northern	neutral[4(low)]	neutral[14(all)]	neutral	neutral[4(all),14(all),16]
	negative[4(sev),5(sev),12(all)]	negative[4(lall),24(all)]	negative	negative[5(sev)]
	positive	positive	positive[7(all),11(mod)]	positive[16(sev)]
California	neutral[2(sev),3(all), 10(sev),17(sev)]	neutral[14(all),16(sev)]	neutral[11(all)]	neutral[7(low-mod),14(all),16(sev)]
	negative[6(sev),9(sev),10(sev),23(sev),17(sev)]	negative[16(sev)]	negative[7(sev)]	negative[16(sev)]
	positive	positive	positive[13(mod-high)]	positive
Mexican	neutral[1(all),15(all)]	neutral[14(all)]	neutral	neutral[1(all),14(all),15(all)]
	negative[1(all)]	negative	negative	negative[1(all)]

Wolfe, J.D. 2016. A Briefing Paper on the Science Directly Related to the Effects of Fire on Spotted Owls and their Habitat. Report to the WKRP. 14 July 2016

Owl-Fire Research Synopsis

Key Findings:

- Primarily neutral-positive effects of low-moderate severity fire.
- High-severity fire effects are context dependent. A component of mixed-severity fire regimes. Evidence indicates thresholds exist where proportions of overall fire and patch sizes start have negative effects, but not clear at current time.
- Evidence indicates salvage logging has negative effects on burned landscapes for spotted owls.
- Value of post-fire landscapes to owls likely a function of maintaining adequate amounts of dense habitat and large trees for nesting/roosting interspersed with a mix of other habitat classes that may provide for key prey species and/or a diverse prey assemblage.

Caveats:

- Owl responses variable, likely reflect differences across studies in terms of response variables measured, definition of fire effects, pre-fire landscape conditions, geographic variation in owl response.
- Different definitions of burn effects, total amounts, suitable habitat only, etc.
- Short-term owl responses.
- Effects of Barred Owls.

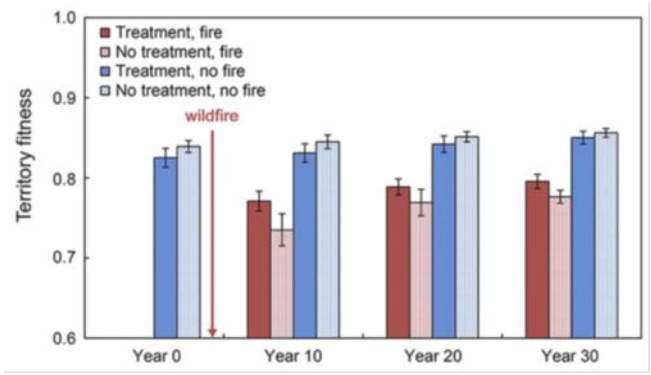
Mechanical Treatments and Thinning

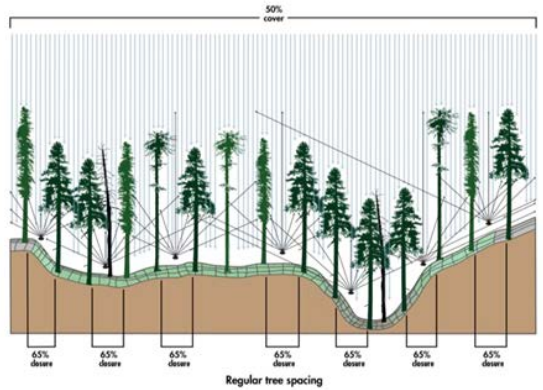
- Thinning, variable density prescriptions
- Context dependent effects: can create favorable habitat for some key prey species (e.g., dusky-footed woodrat), detrimental to other species (e.g., flying squirrels, red tree voles).
- Scale-dependent: surrounding forest patches (e.g., flying squirrels)
- Owl territory and landscape scale: effects likely dependent on amounts of nesting/roosting habitat in conjunction with diversity of early-seral and other habitat types.
- Evidence for owl persistence in some heavily managed landscapes (e.g., GDR) where key nesting/roosting habitat features are retained.

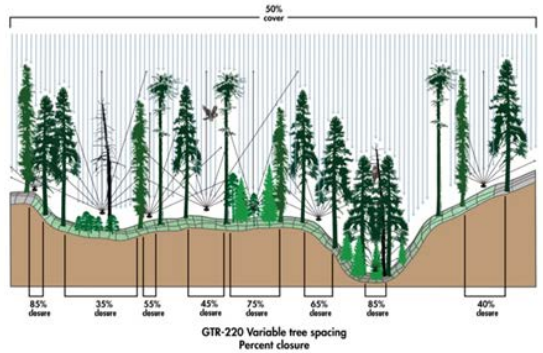
Fire-Habitat Simulations – Landscape Restoration Strategies

Simulation Studies:

- Number of simulation studies that have projected fire effects on owl habitat.
- Generally reported negative treatment effects on habitat but may realize positive effects should a high-severity fire occur
- Models sensitive to assumptions regarding fire frequency and behavior.

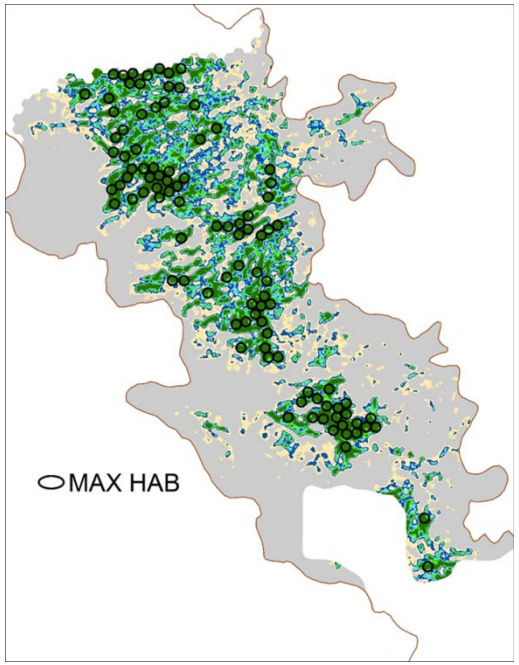






Landscape Management Strategies:

- Focus on forest resilience
- Restore to some level of desired habitat diversity
- Realign forest habitat distribution with underlying biophysical factors.
- Hypotheses to be tested as to effects on owls



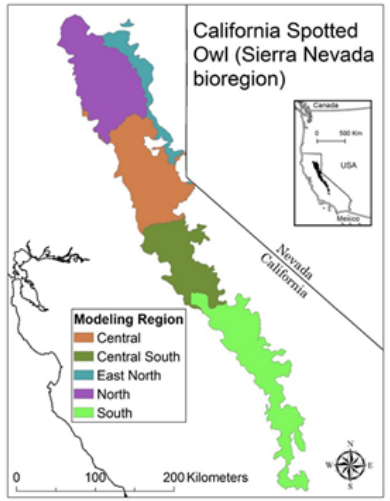
Spatial Optimization Model to Assess Trade-offs among CSO Habitat and Restoration/Resilience Objectives

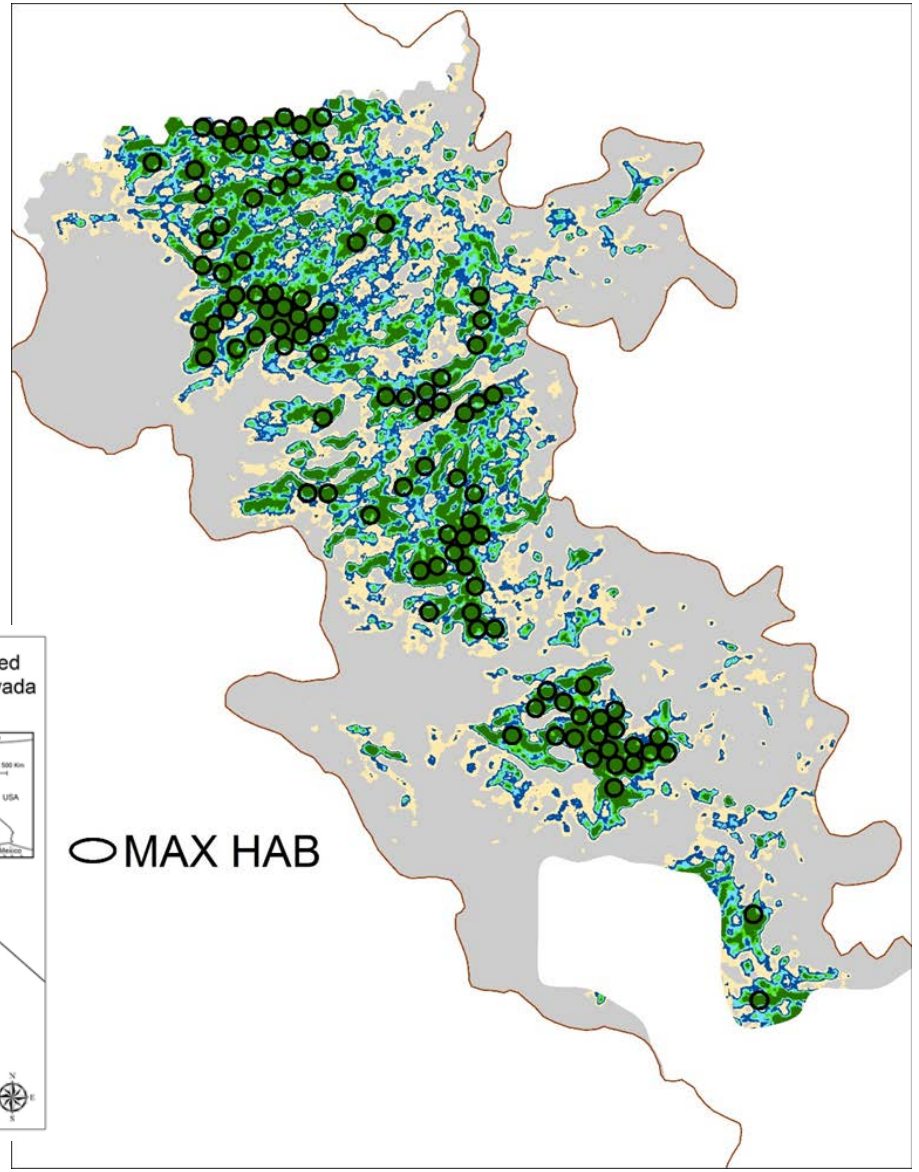
Management Objectives:

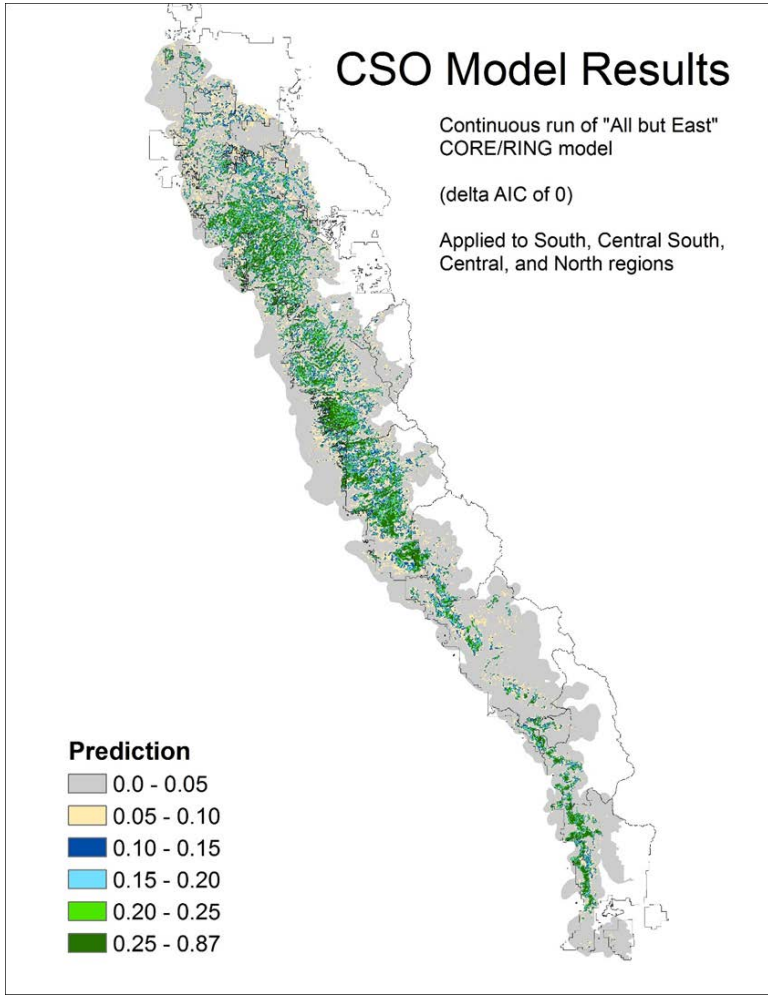
CSO Habitat Suitability

Restoring forest structure and function more in alignment with underlying bio-physical Factors.

- Landscape Management Units (LMUs)
- Climatic Water Deficit (CWD)







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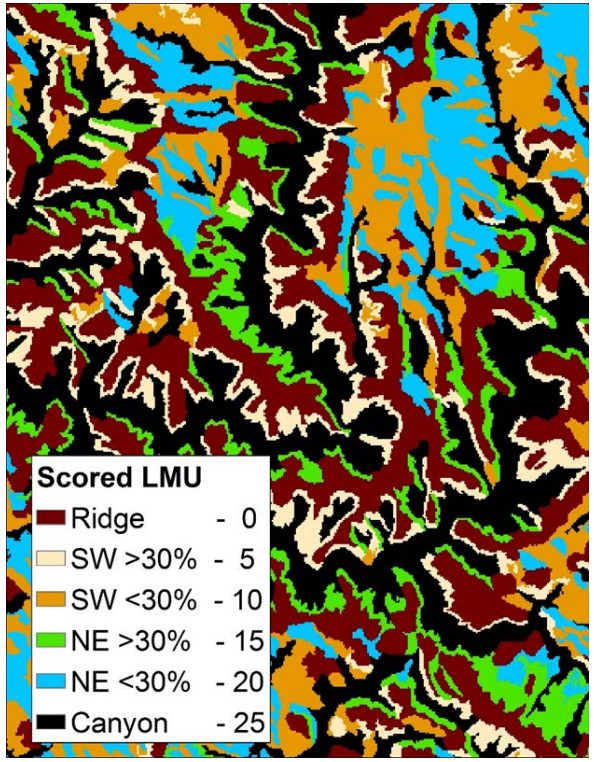
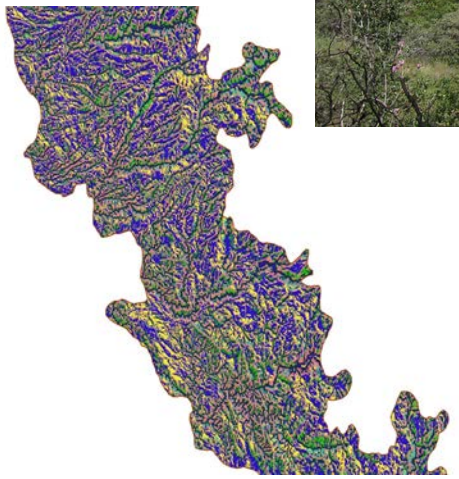
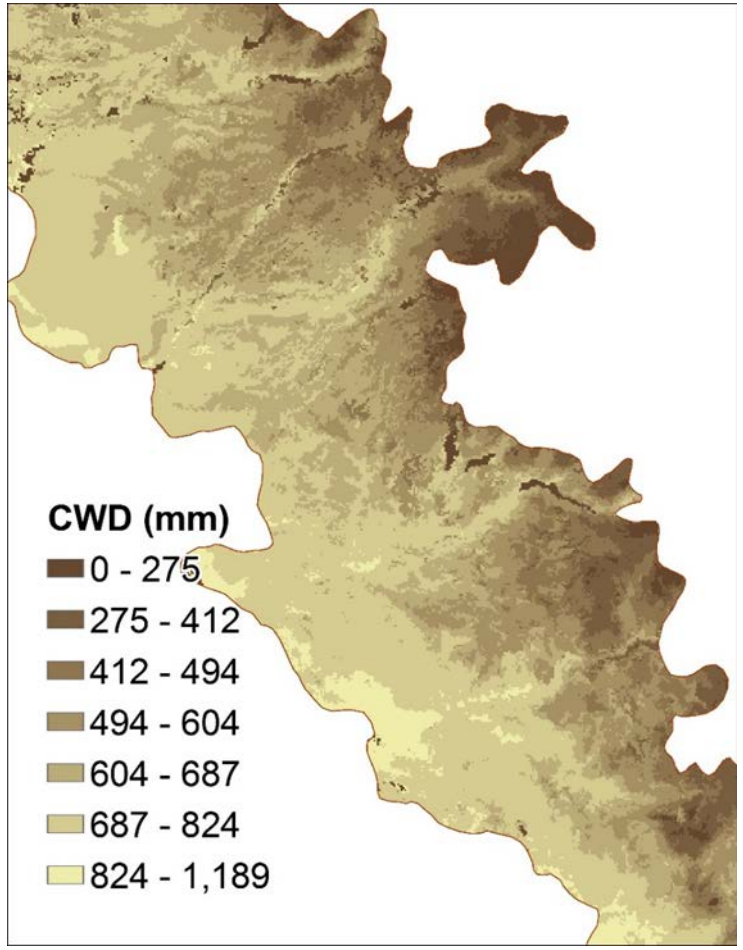


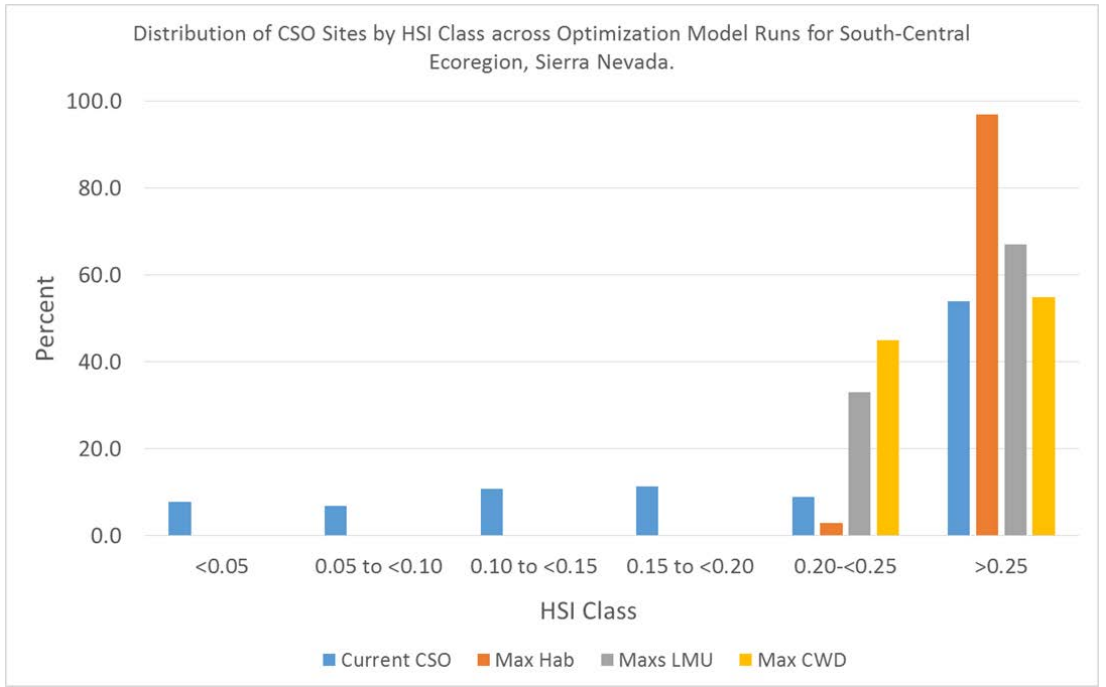


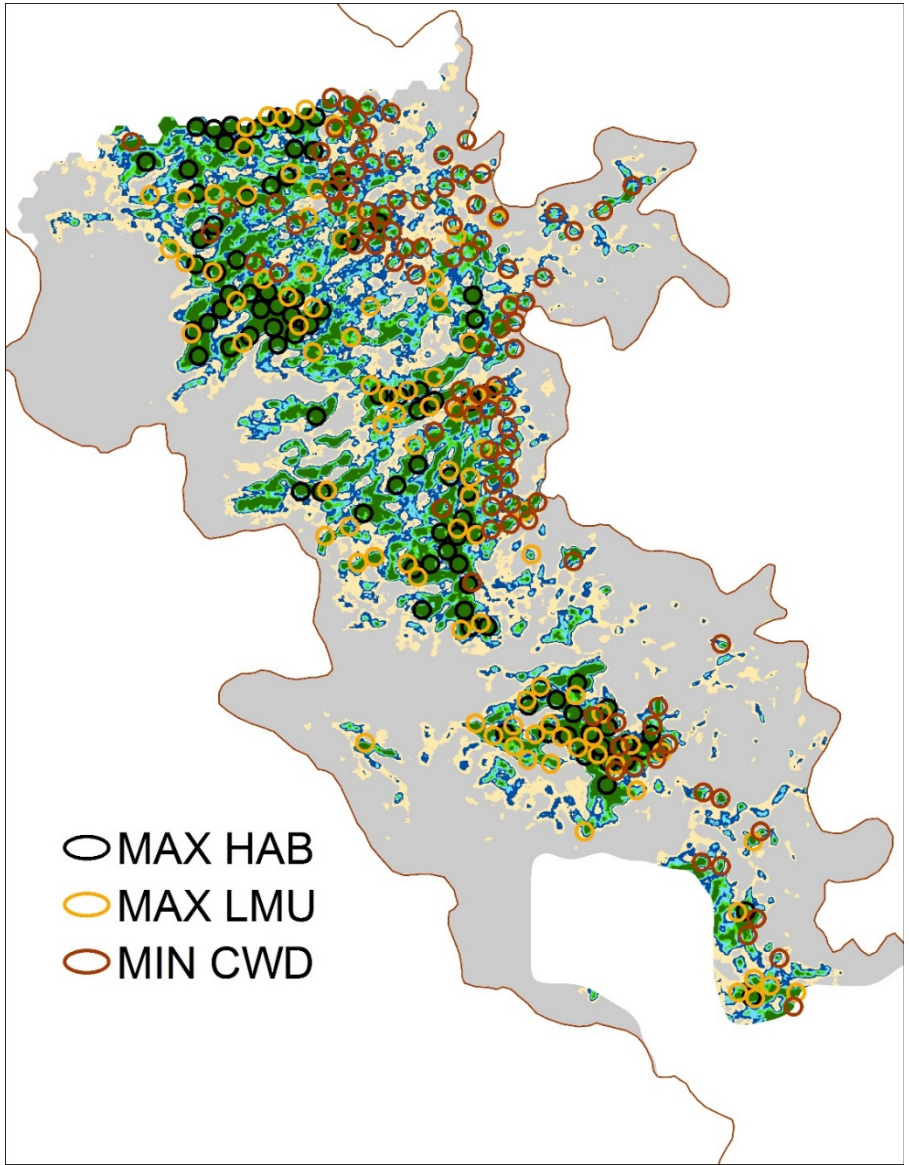
CWD - Annual evaporative demand that exceeds available water, summed annually



Spatial Optimization Model to Assess Trade-offs among CSO Habitat and Restoration/Resilience Objectives

Assess trade-offs across alternative objectives to meet resilience and habitat goals.





Insights for Informing Restoration

Concepts:

- Landscapes that burn at mixed-severity that continue to support owls may serve as templates for the types of restored landscapes that may be more resilient to fire and other ecological stressors.
- Consider the distribution amounts of habitat types, as well as the distribution of patch sizes, edge-areas ratios, etc. at landscape scales, forest structure at patch and stand scales.
- Integrate with underlying biophysical factors and other objectives. Align denser, older forest structure in locations with higher probability of being able to support these structures under current conditions and future climate scenarios.
- Importance of large trees – current, recruitment.
- Acknowledge uncertainty - use above information to generate testable hypotheses and study designs – monitor.
- Consider populations status of spotted owls, especially barred owl effects.

Tools:

- Managed Wildfire, Prescribed Fire, Mechanical Treatments

Research Needs:

- Research Needs: Understand forest structure and habitat distribution at patch and landscape scales. LiDAR-GPS telemetry to understand habitat use in heterogeneous burned landscapes – prey ecology and population dynamics.
- Longer-term effects on spotted owls – occupancy, demographics.
- Spotted-Barred Owl Interactions.