Interactions between Mixed Severity Wildfire and Forest Types Used by Northern Spotted Owls

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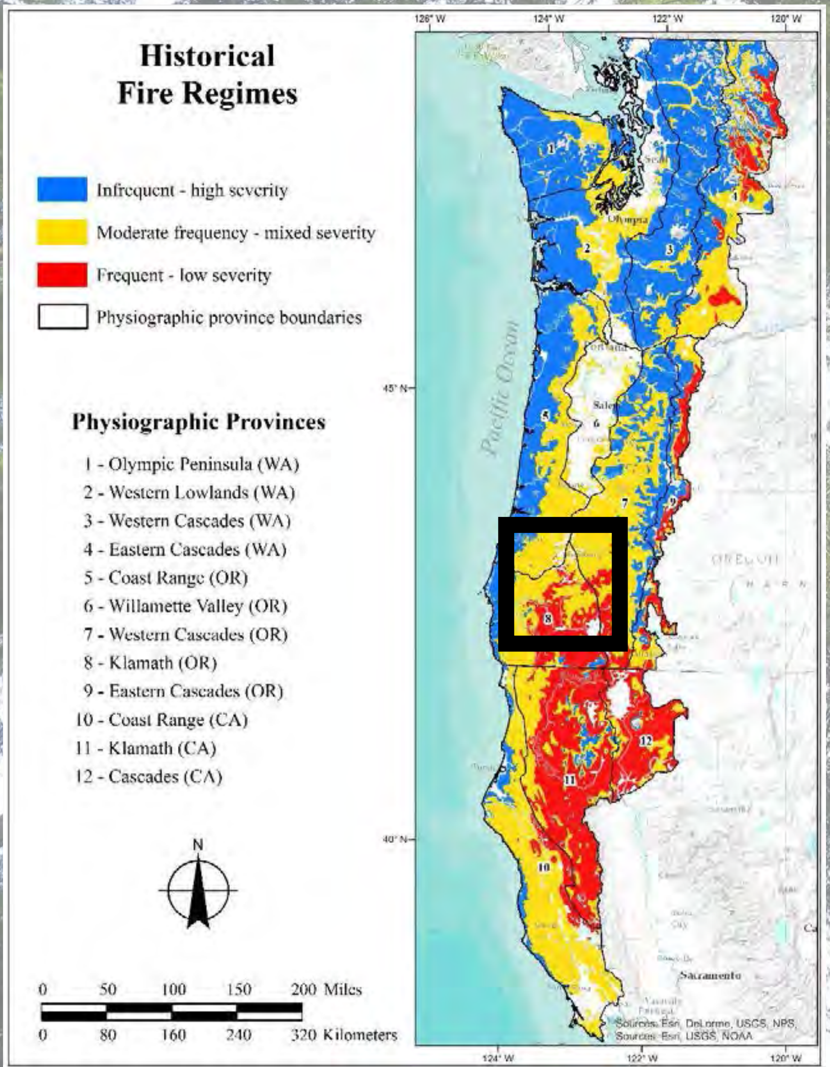
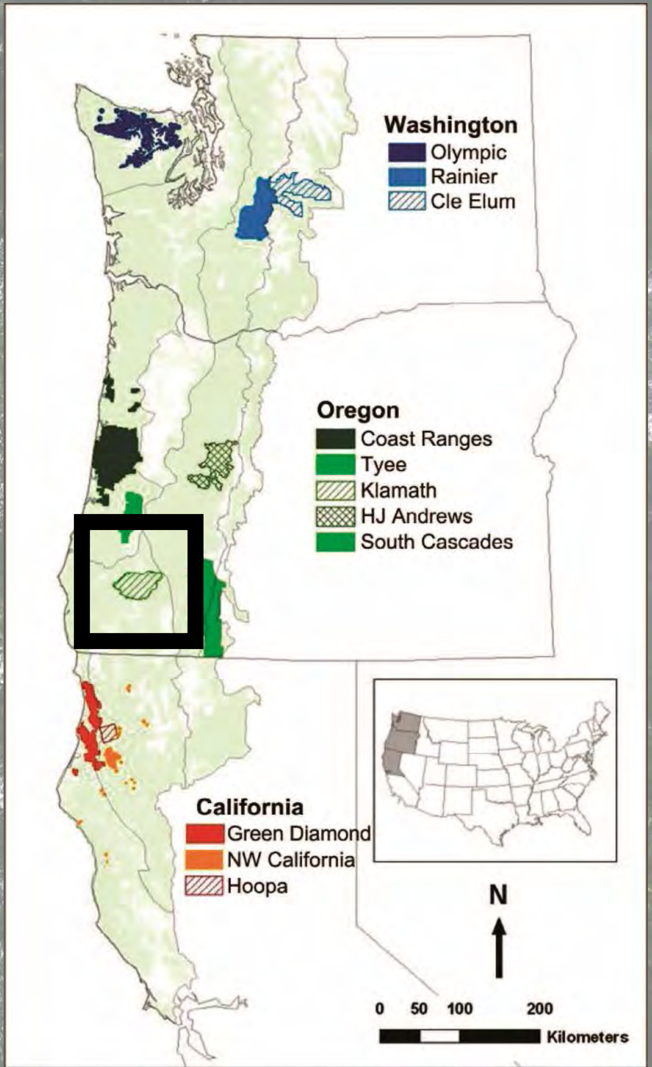
Photograph by Michael Nichols

Symposium: Wildfire and Spotted Owls: It's a Burning Issue
September 25, 2017

Spotted owl population monitoring

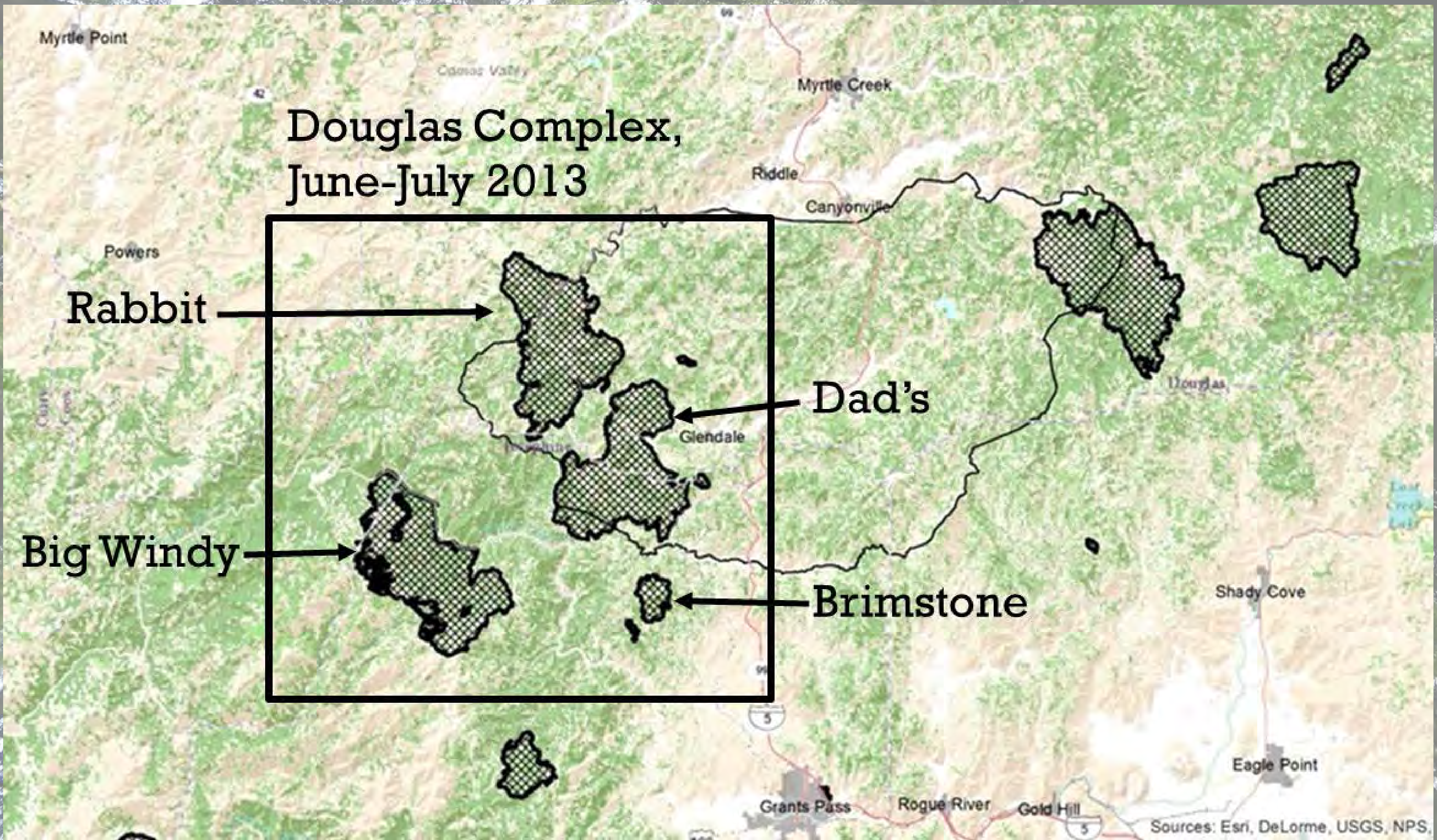




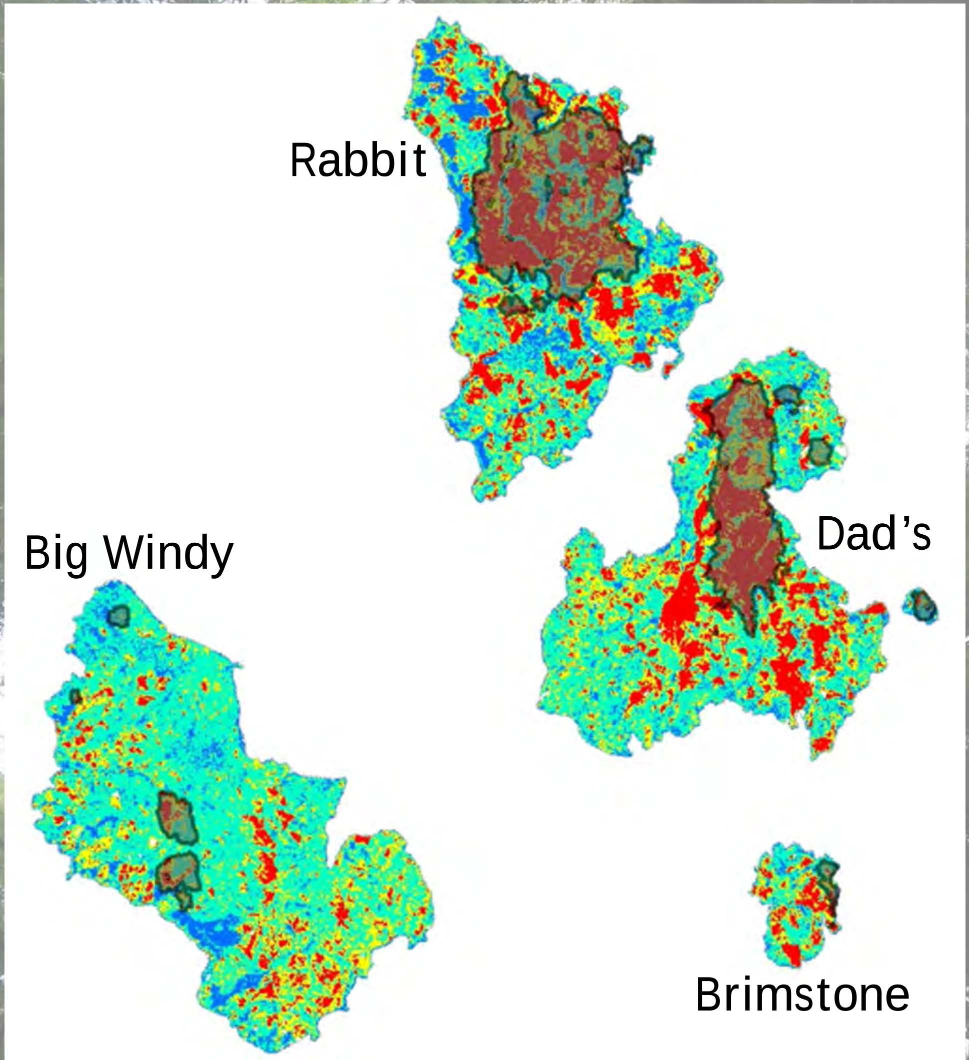
Klamath study area

- Oregon and California Lands Act of 1937

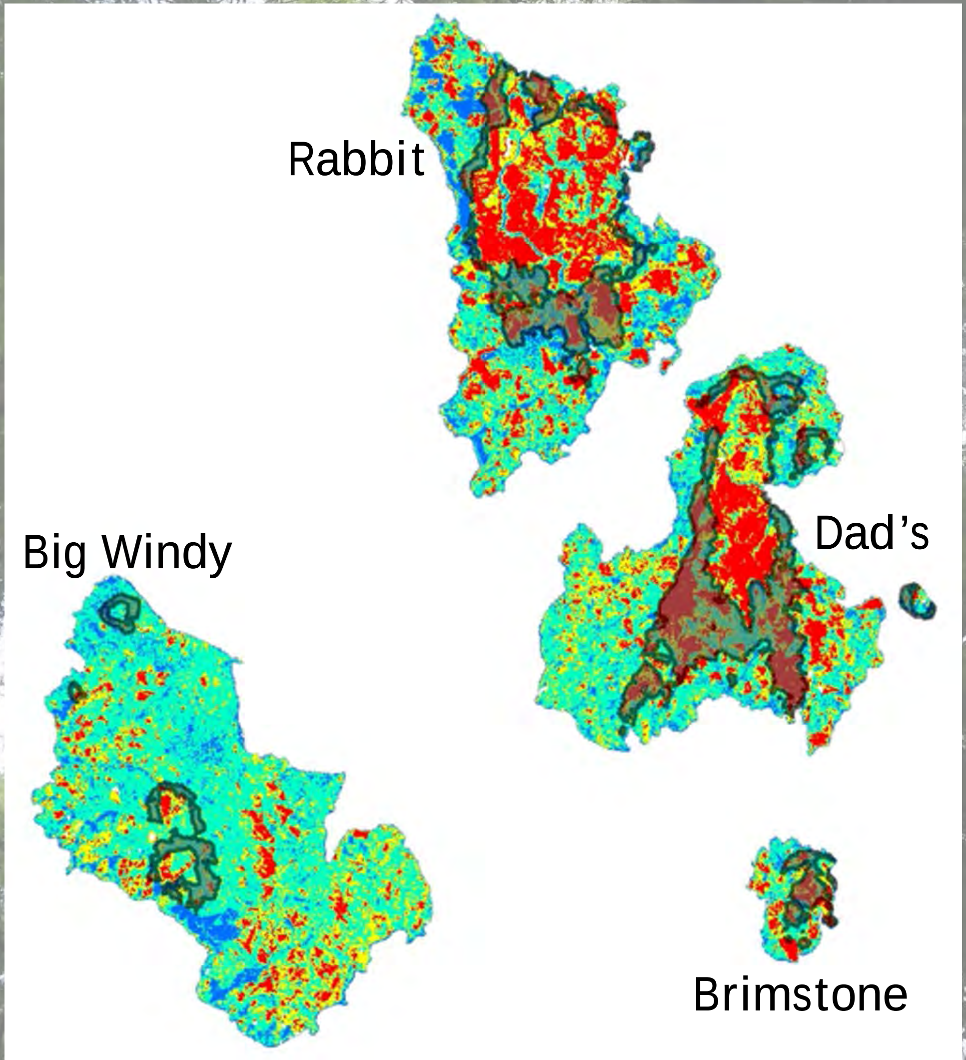
Large wildfires since 2013



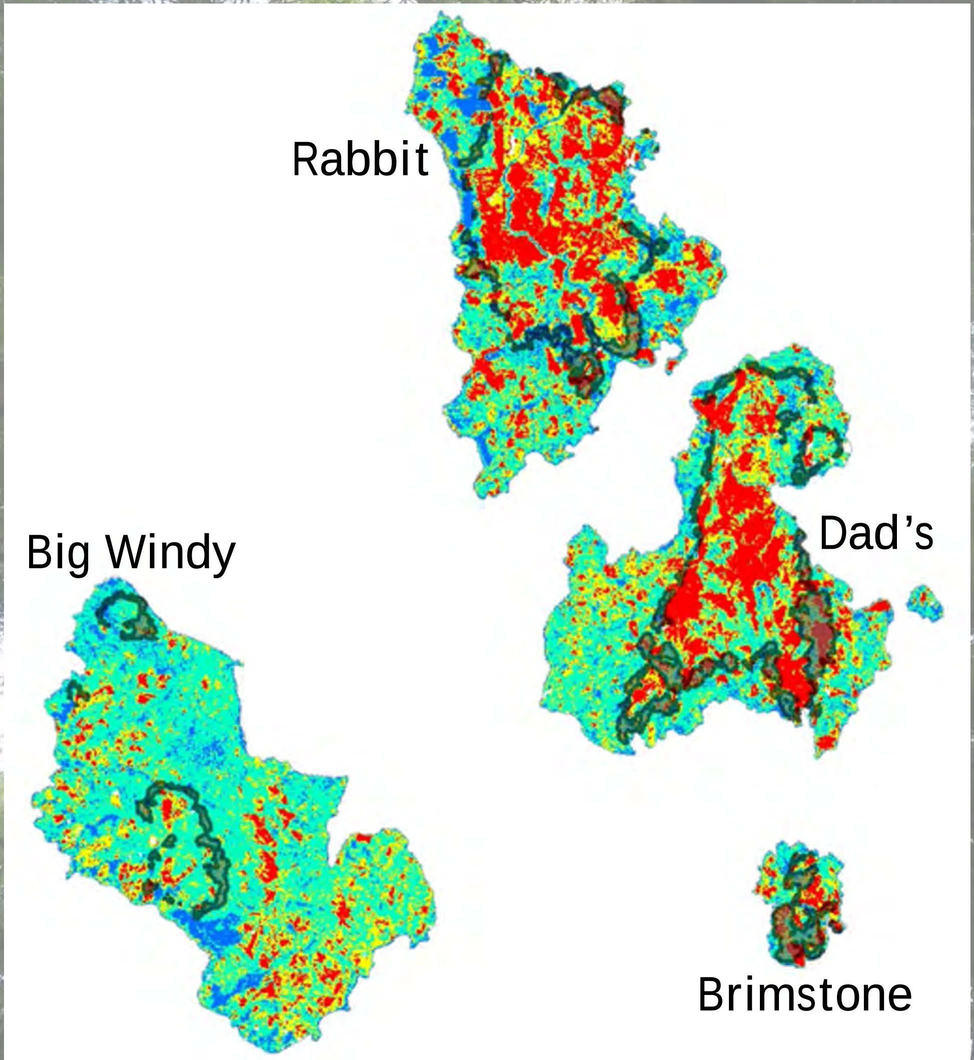
Fire growth – Day 1



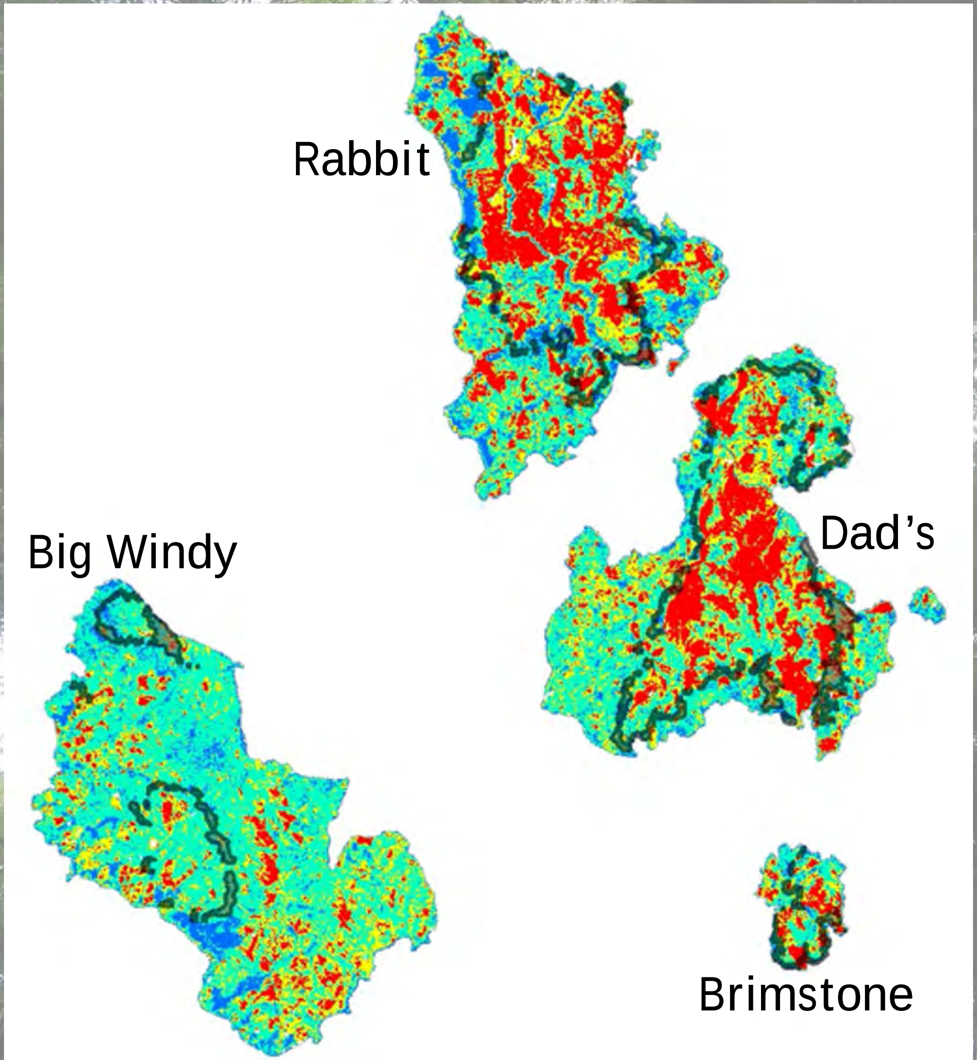
Fire growth – Day 2



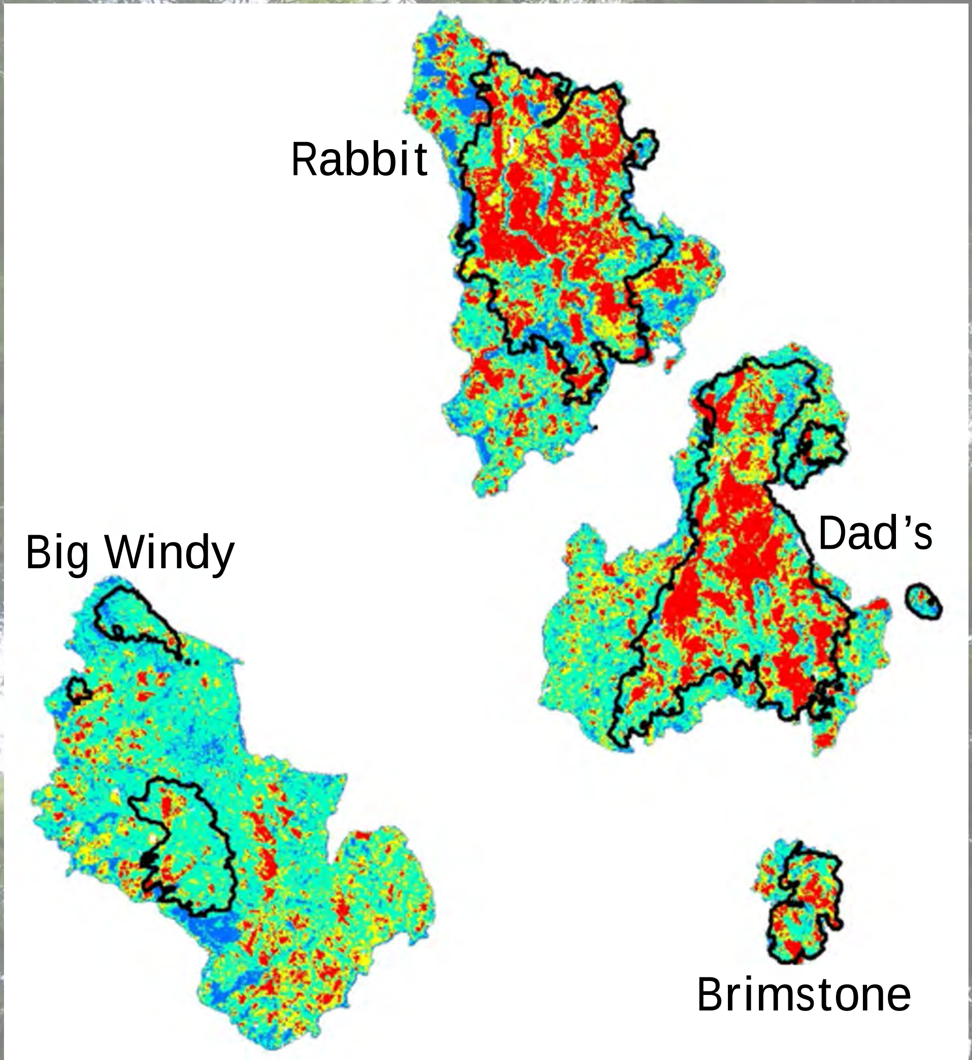
Fire growth – Day 3



Fire growth – Day 4

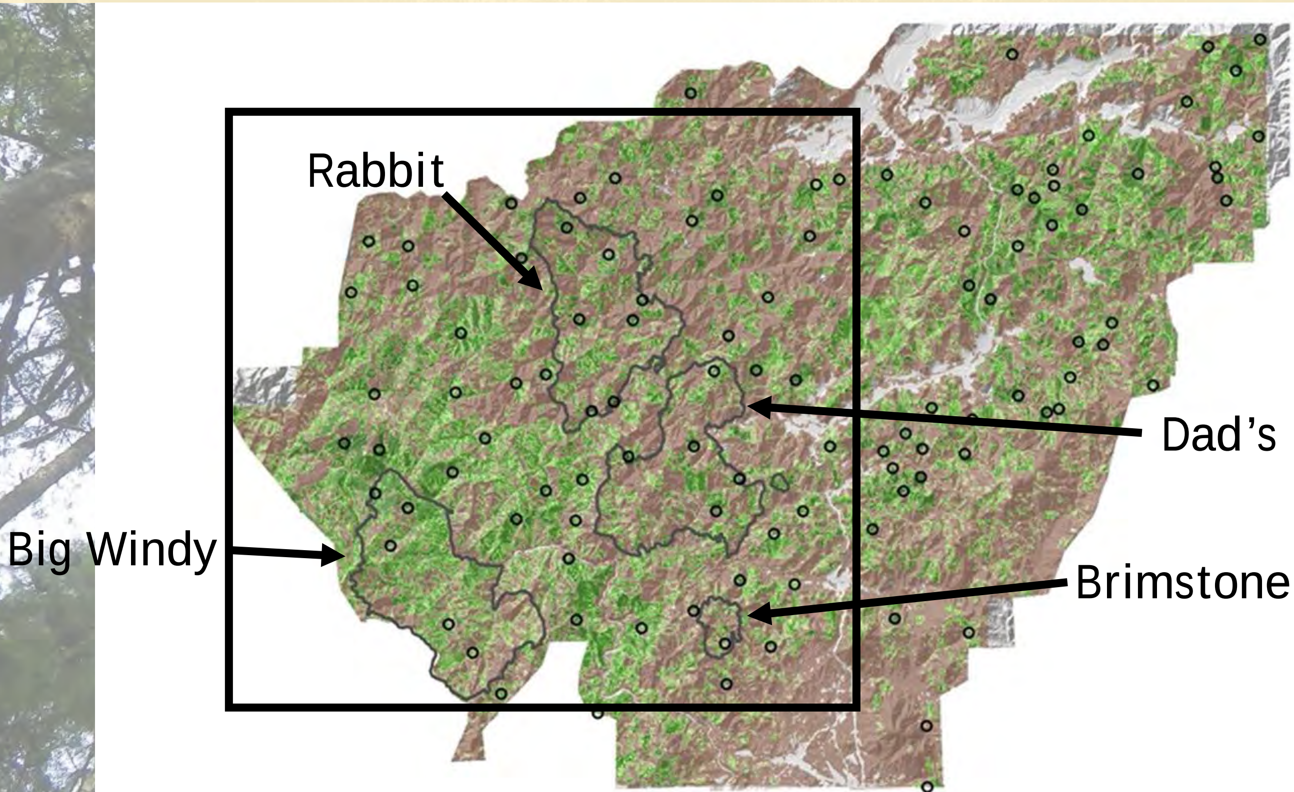


Fire perimeter – After Day 4



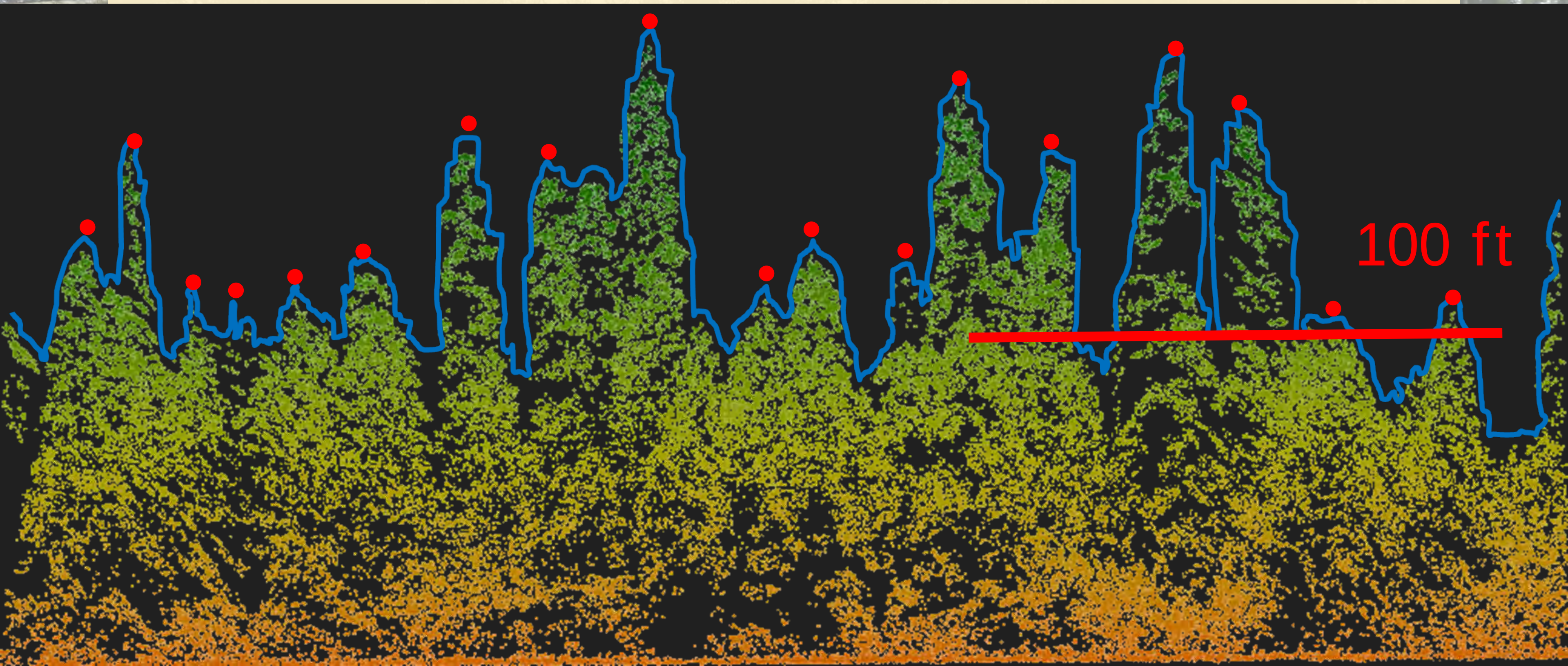
What effect did fire have on forest types suitable for spotted owl nesting and roosting?

- Model of pre-fire nesting/roosting forest type
- Locations from demographic monitoring
- LiDAR data acquired in 2012



Estimating live tree density

- Canopy height model → canopy maxima (100 ft) → points with 10 m buffer (crowns of large trees)
- Dissolved overlapping buffers → large tree point layer




Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community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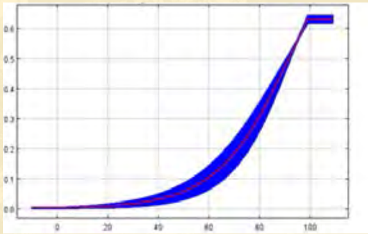
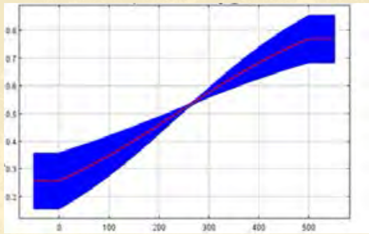
Variables, response curves

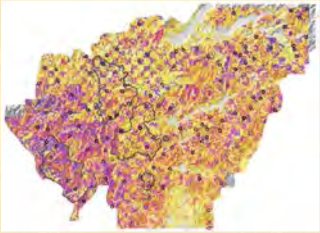
Live Veg Height

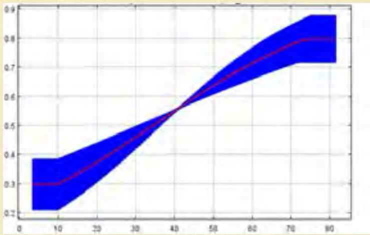


Veg Cover

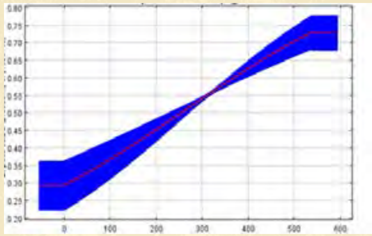


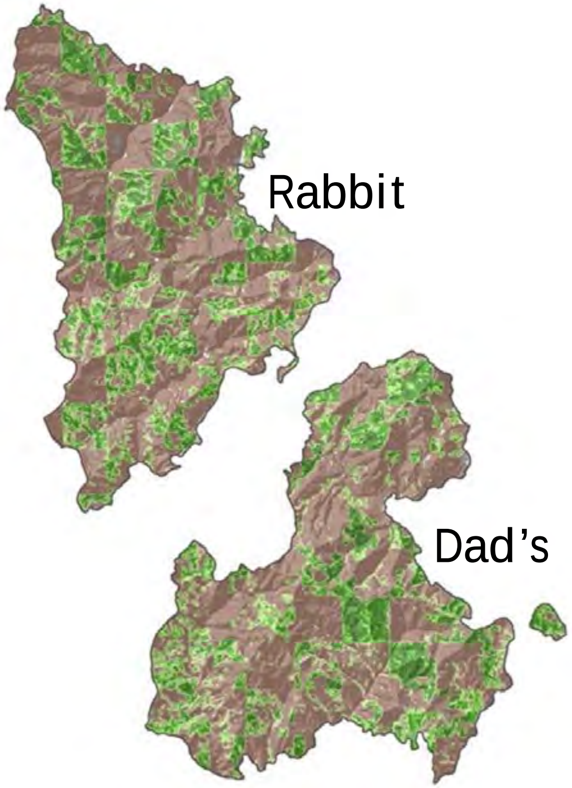
Stand Complexity (Rumple)





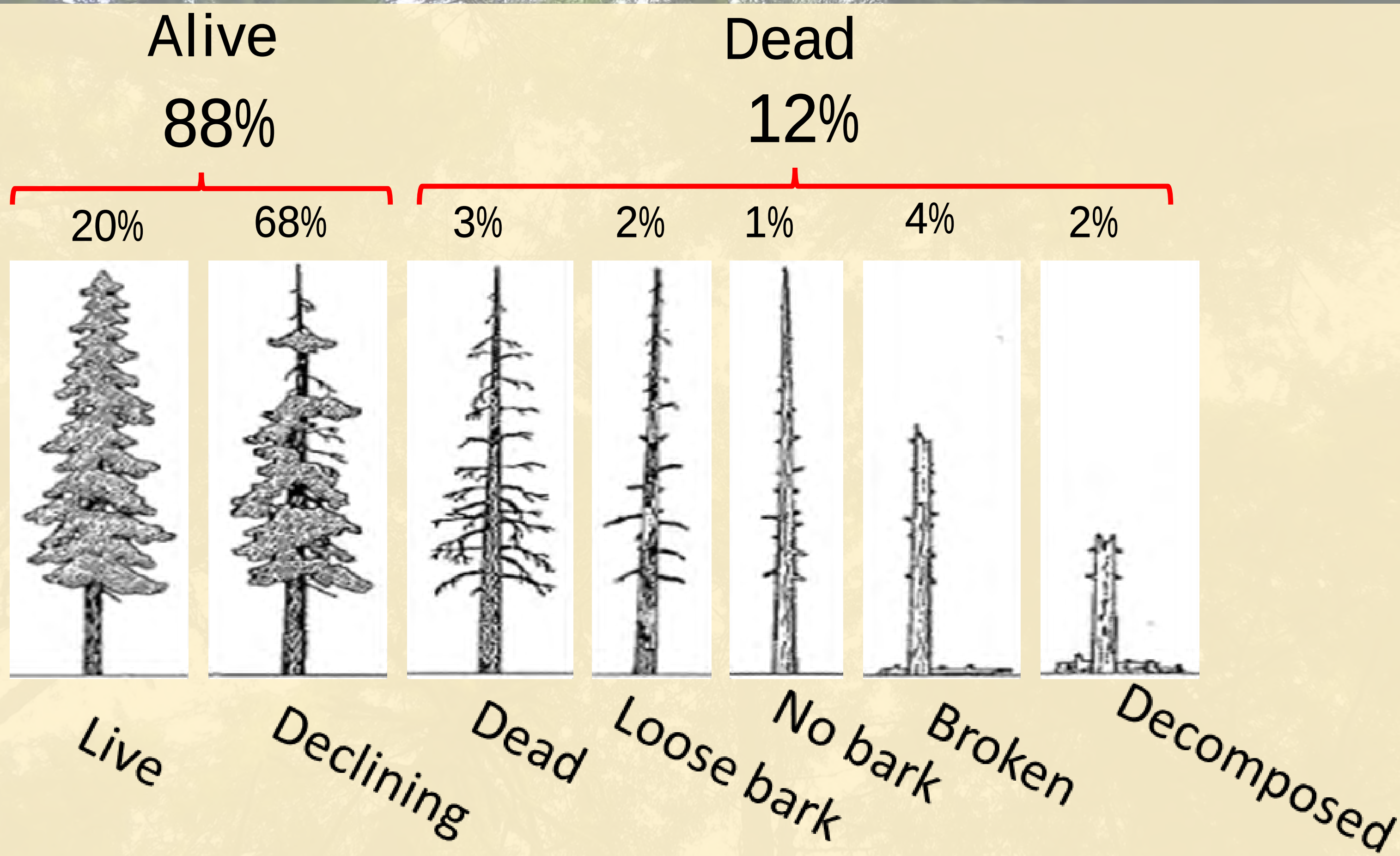
Large Live Tree Density





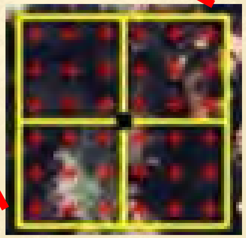
Project algorithm to post-fire conditions

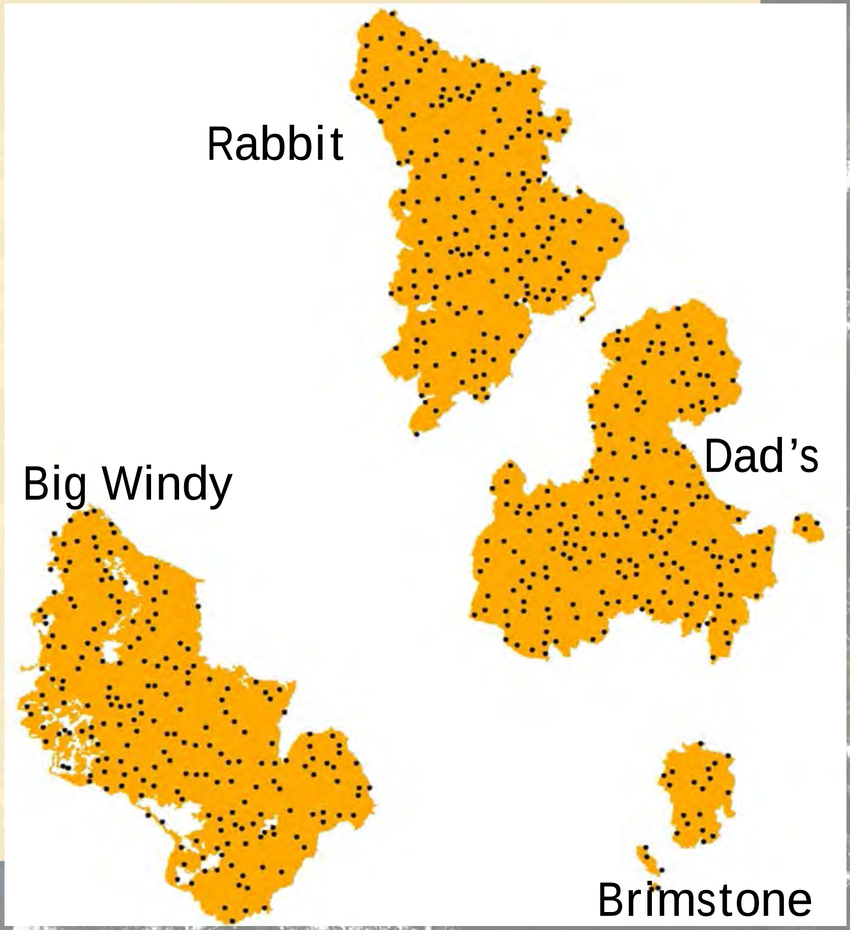
Decomposition stages of nest trees



Estimating density of fire-killed trees

• 186 random plots (30x30 m pixel)





Fire-killed trees by severity

- index of dead canopy cover and randomly killed trees

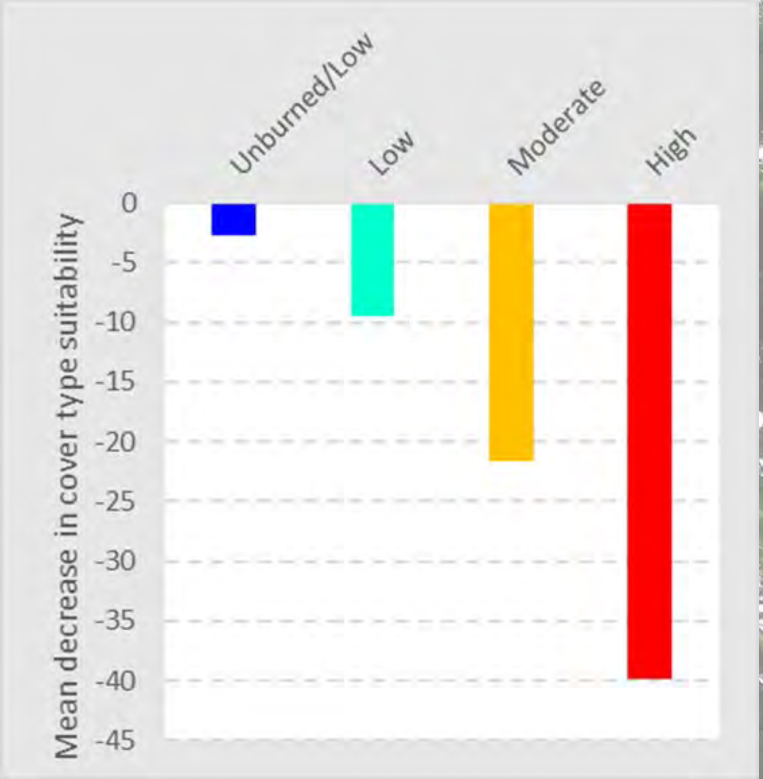
MTBS	Live	Killed	%Mort	NBR2013	NBR2014	%DeltaNBR
Unburned to Low	63,185	2,830	4	0.75	0.68	-9.16
Low	201,943	49,413	20	0.74	0.56	-24.57
Moderate	31,788	40,038	56	0.72	0.30	-58.33
High	5,549	62,348	92	0.75	-0.04	-104.89

Loss of suitable nesting & roosting forest

- Project pre-fire model algorithm to post-fire LiDAR
- LiDAR acquired in 2013 post-fire

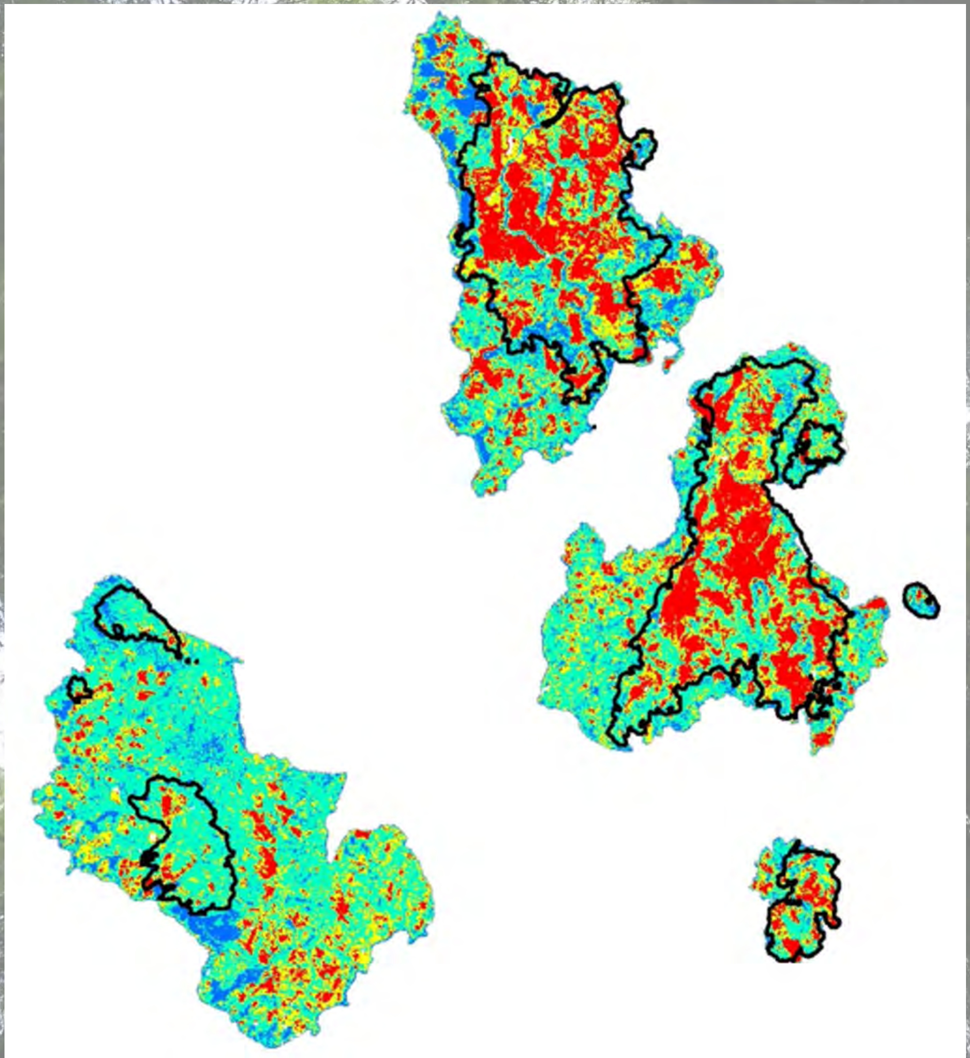
Mean cover type suitability

MTBS	Prefire	Postfire
Unburned to Low	0.22	0.20
Low	0.22	0.21
Moderate	0.10	0.08
High	0.12	0.03

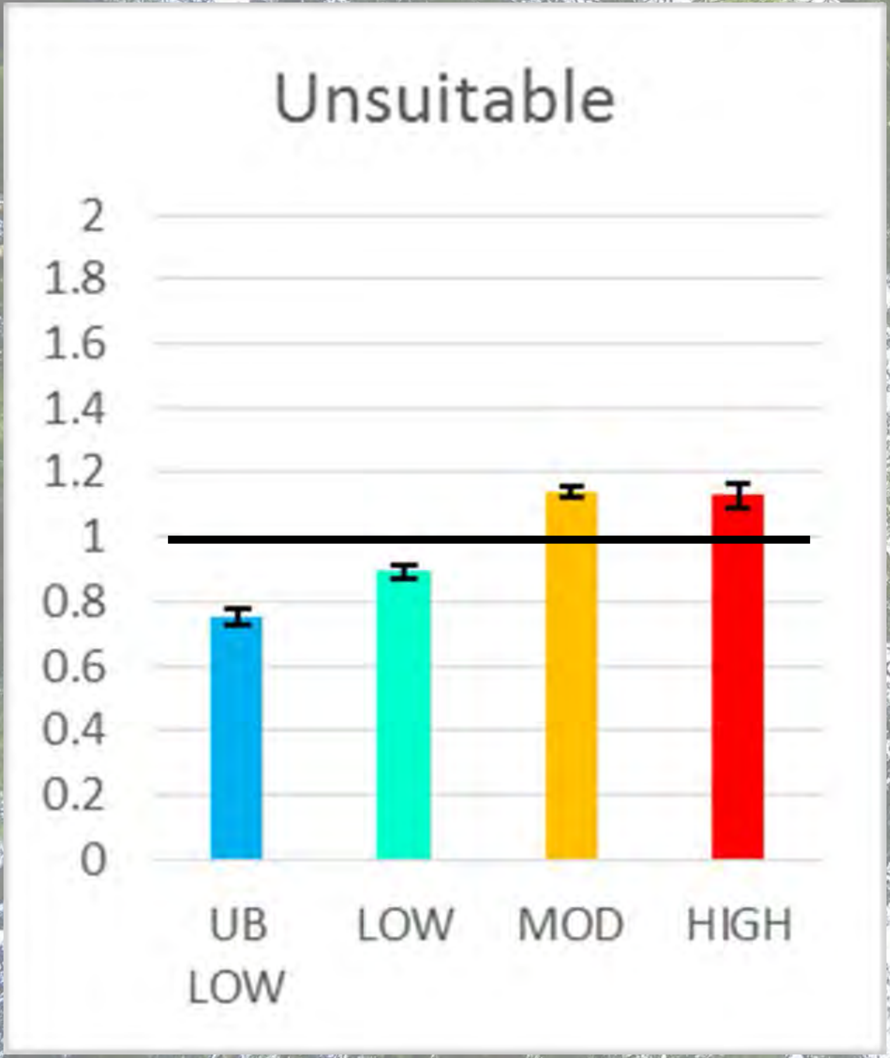


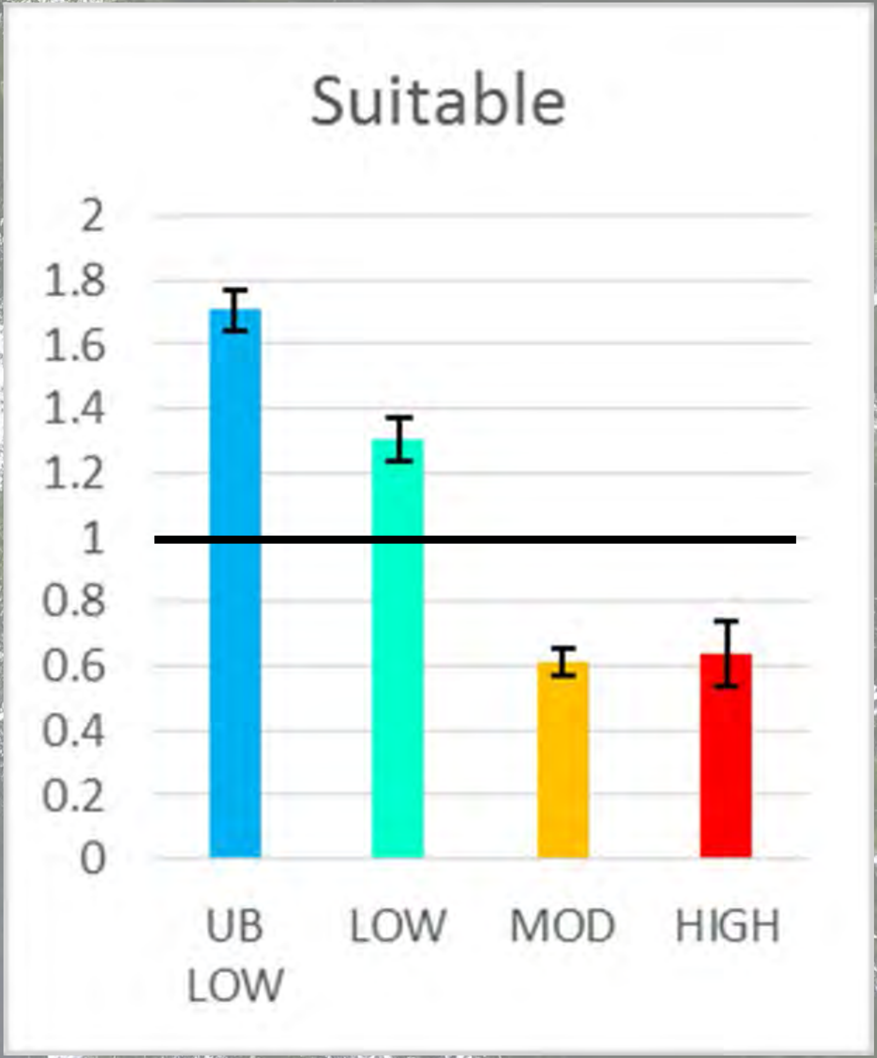
Did nesting/roosting forest burn at lower severity than other forest types?

4 days of fire growth



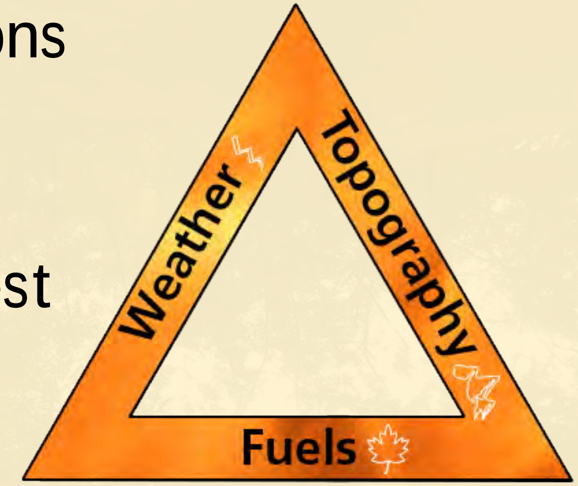
Odds of forest type burning by severity





Why would forests with high fuel loading experience lower fire severity?

- Moderate wildfire weather conditions
- Fire triangle
- Frey et al. 2016
  Insulating effect of old-growth forest
- Lower temperature
- Lower wind speeds
- Higher relative humidity
- Moisture retention: large logs



Frey, S. J. K., A. S. Hadley, S. L. Johnson, M. Schulze, J. A. Jones, and M. G. Betts. 2016. Spatial models reveal the microclimatic buffering capacity of old-growth forests. Science Advances 2:e1501392.

Conclusions

- In mixed severity fire regimes
- High severity wildfire significantly reduce suitability of forests used for nesting and roosting
- Under moderate fire-weather conditions and compared to younger forests
- Structurally complex and old forests are more resistant to high severity wildfire
- Caution is warranted for management actions that reduce these forest conditions

Acknowledgements

- Funding: BLM, USFS
- George McFadden and Bruce Hollen, BLM
  - LiDAR acquisitions pre- and post-fire
- Rob Horn, crew leader on Klamath demographic study area

Questions?