Cheatgrass and Dieoff Mapping in the Northern Great Basin

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Presented to the USGS Climate and Land Use Change Executive Committee

July 19, 2012

U.S. Department of the Interior
U.S. Geological Survey

Land Change Mapping

- **M**onitor by developing maps that reflect historical and recent conditions
- **A**ssess vulnerable and sustainable systems using statistical analysis and year-to-year comparisons
- **P**redict using satellite data, weather data, future climate data, and geophysical and biophysical variables integrated into ecological models

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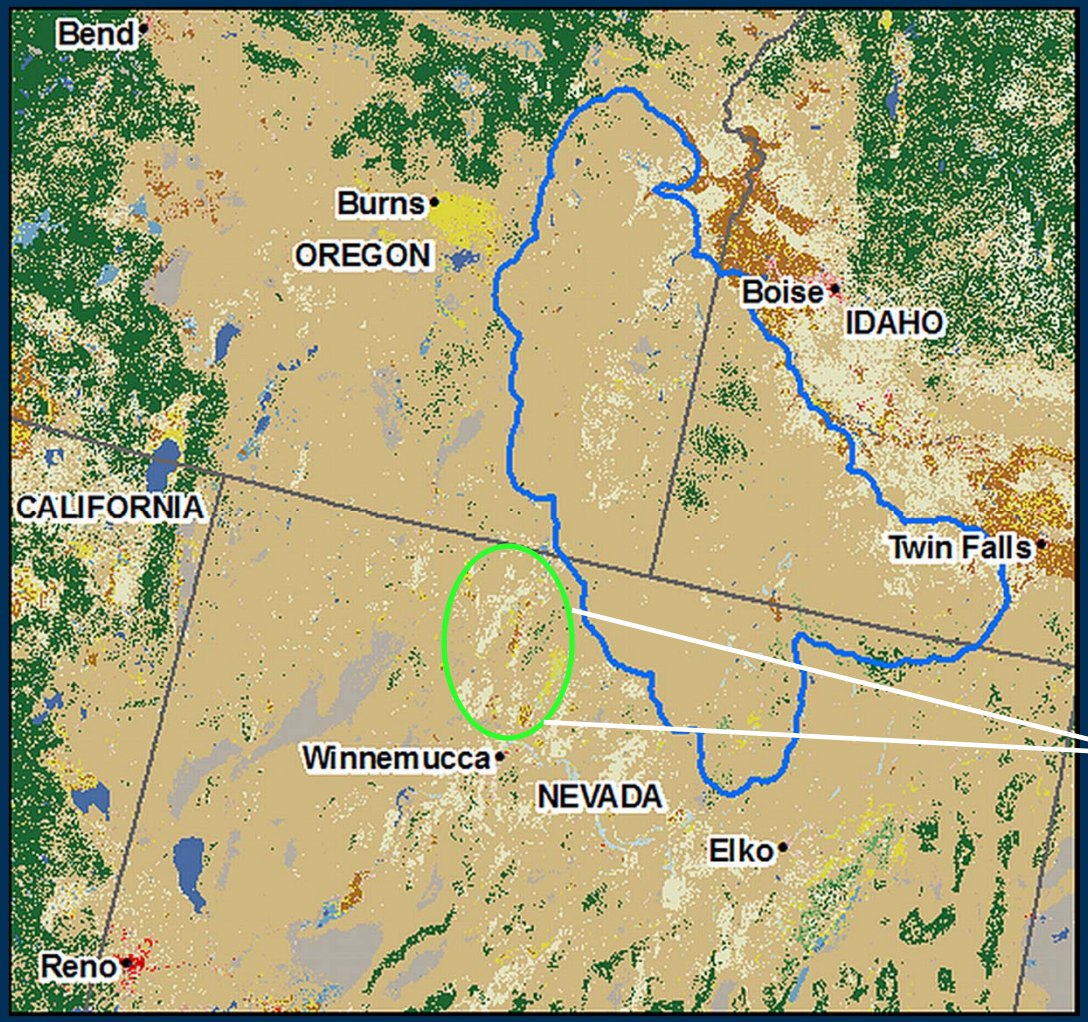
Study Area



The story started when BLM personnel spotted underperformance on our performance maps adjacent to the Owyhee Uplands that agreed with field-observed cheatgrass dieoff.

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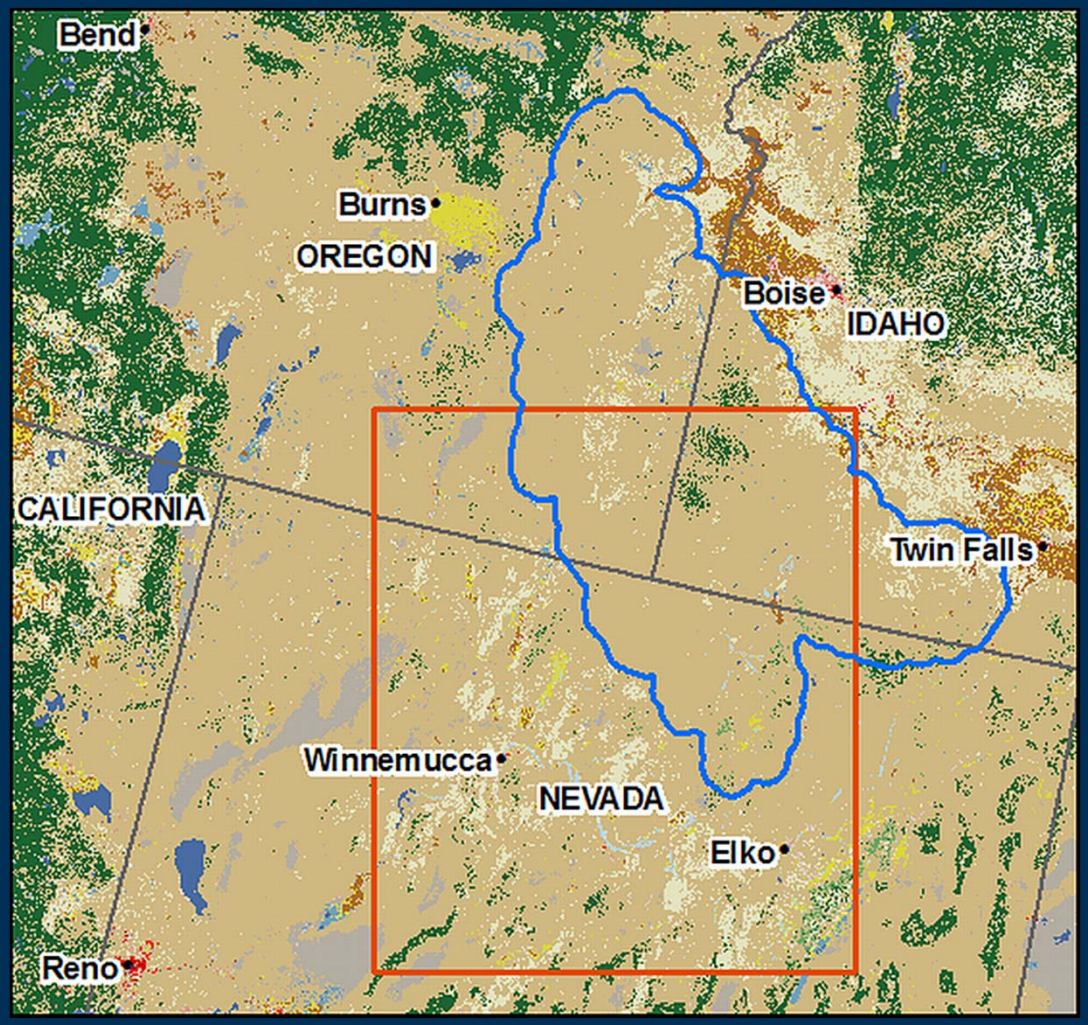
Study Area



With BLM funding, we initiated a cheatgrass dieoff pilot study inside the red boundary that spanned the years 2000 to 2010.

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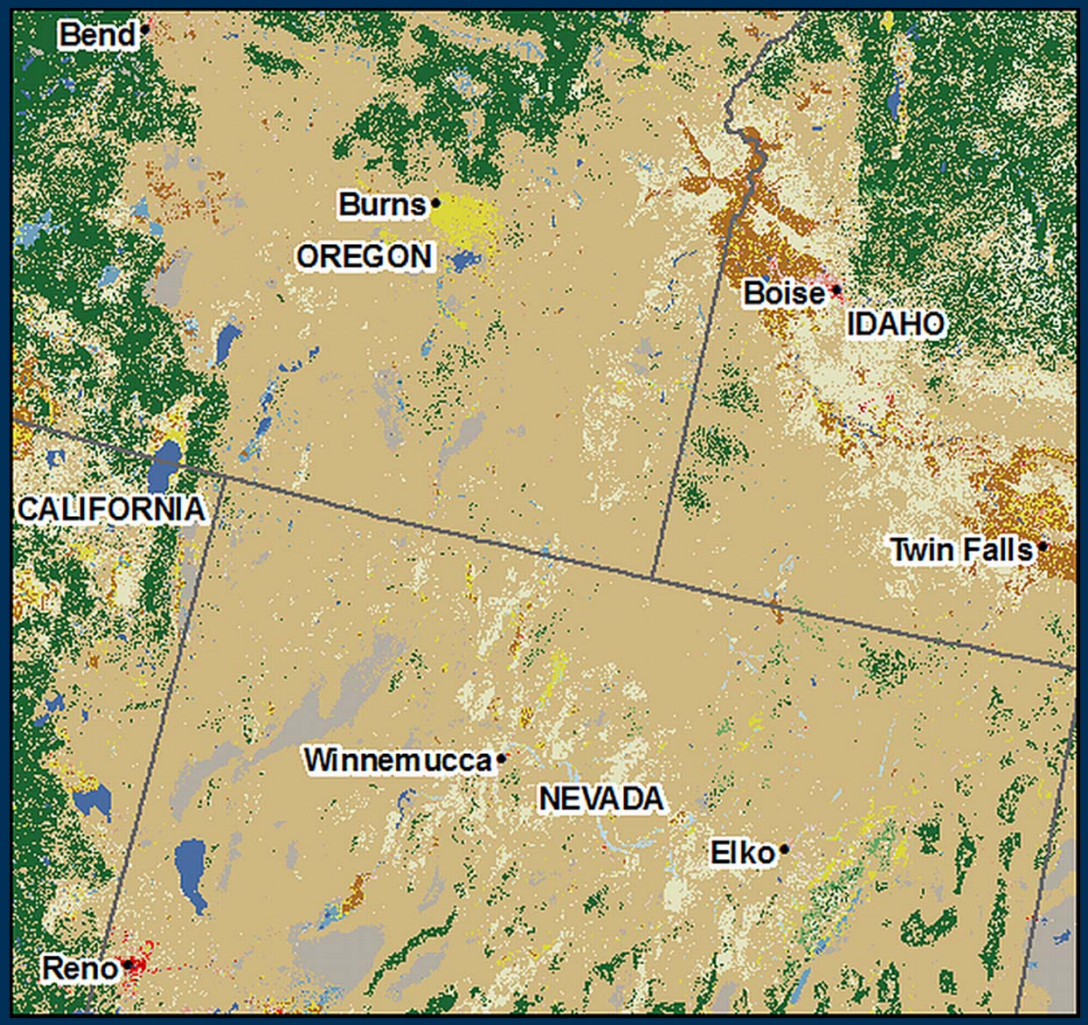
Study Area



After completing the pilot study, we applied for funding from the Northwest Climate Science Center to expand our study area to include the western and central parts of the northern Great Basin.

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Motivation

"The Great Basin…is considered one of the most endangered ecoregions in the United States" (Chambers and Wisdom 2009).

Cheatgrass is a significant driver of change in the Great Basin.

Remote sensing applications, geospatial analyses and advanced spatial modeling efforts can increase understanding of cheatgrass dynamics and help inform adaptive management strategies.

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Problem

- Cheatgrass invades native ecosystems
- Increases fire frequency, severity, and size
- Converts rich, diverse shrub steppe ecosystem to cheatgrass <u>dominated</u> ecosystem (est. 20,000 km^2 in Great Basin)

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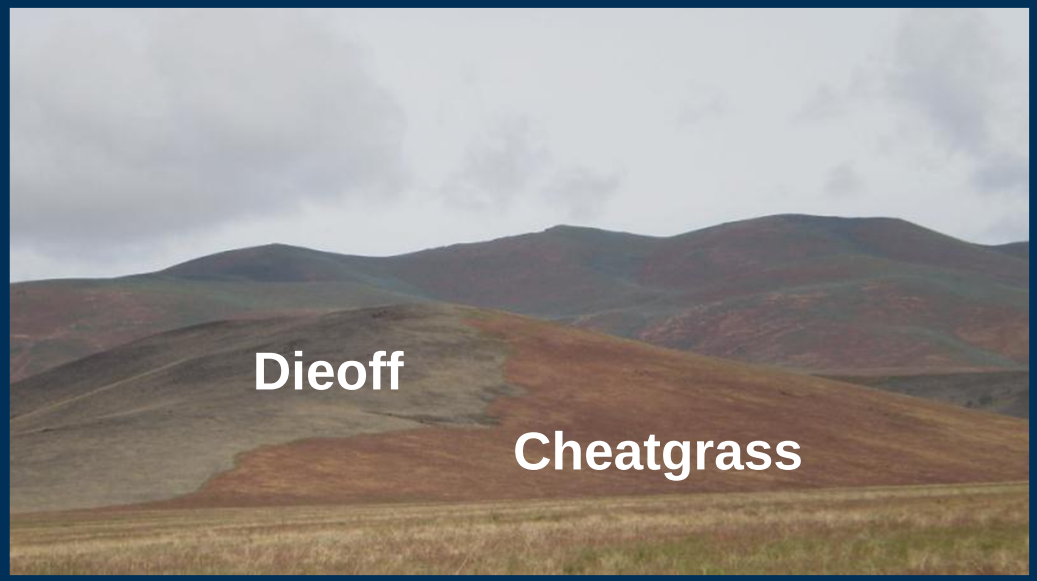
Cheatgrass Dieoff

- Defined as the reduced production, or absence, of cheatgrass in previously invaded areas during years of adequate precipitation.



- Cheatgrass dieoff could be seen as a windfall…**BUT**

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Problem

- Cheatgrass dieoff results in:
  - accelerated soil erosion
  - loss of early spring forage for livestock and wildlife
  - unknown recovery pathways.
- Annual dieoff averaged 10,500 km^2 (2000 - 2010)

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Goal and Purpose

- Develop a time series of cheatgrass dieoff maps
- Facilitate an effective monitoring project to provide science-based information on dieoff magnitude and trends
- Provide robust data to inform predictive models and analytical tools for current and future management

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Approach

- Remote sensing
  - eMODIS NDVI 250-meter spatial resolution
- Advanced spatial modeling
  - Regression-tree and decision-tree models
- Geospatial analysis
  - Ecosystem Performance Anomaly development

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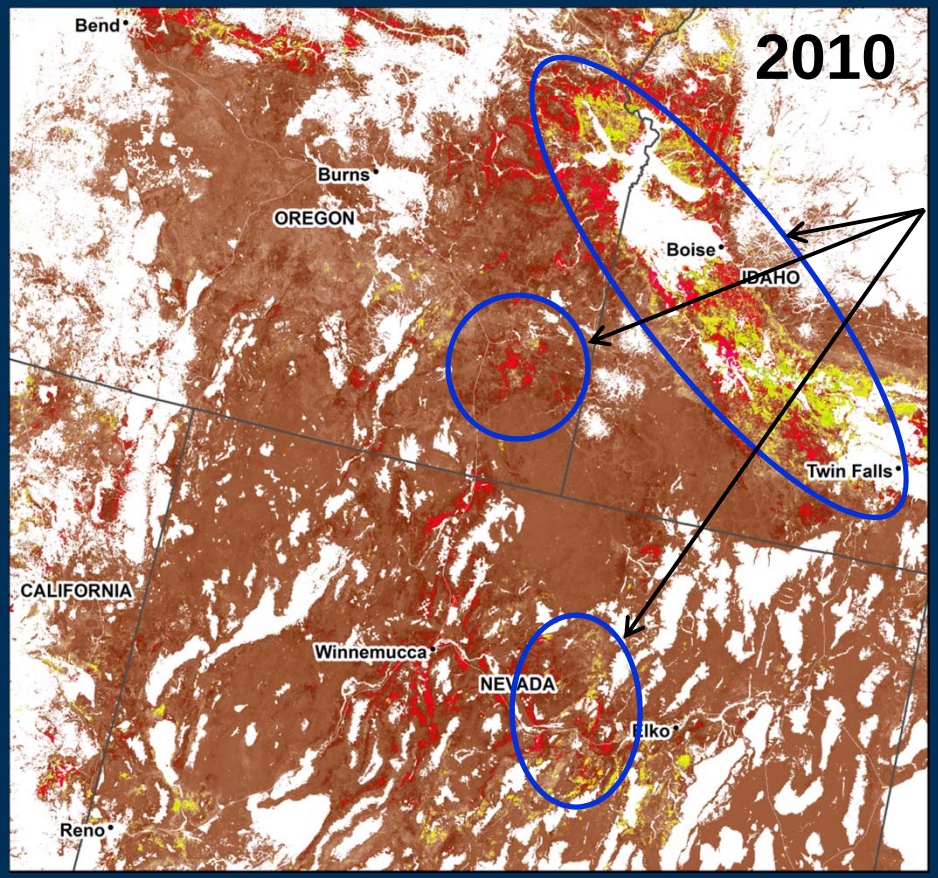
Time series of dieoff results (2000 - 2010)



Areas of high spatial & temporal variability in cheatgrass performance characterize the maps. Underperformance indicates areas of probable dieoff.

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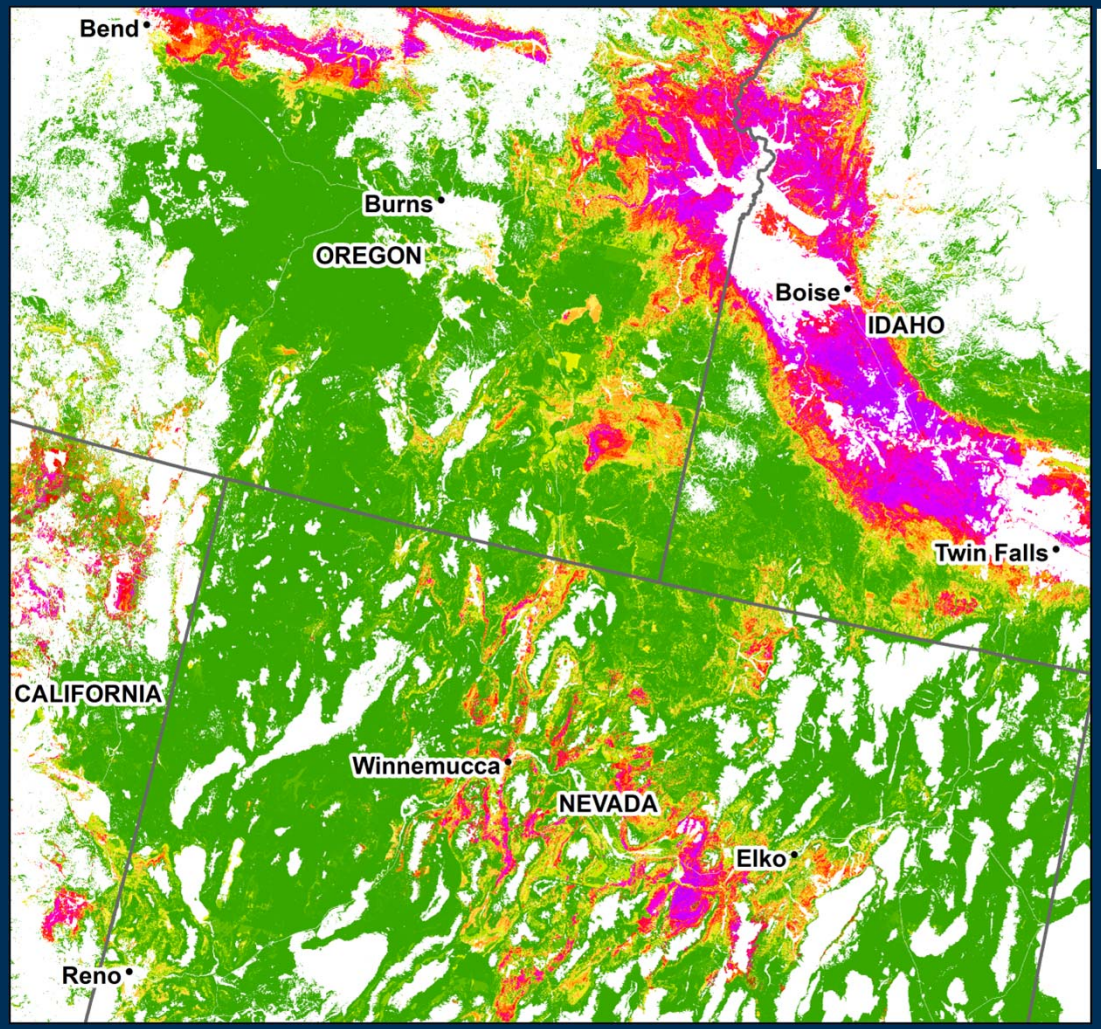
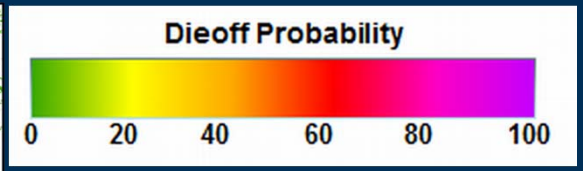
Dieoff probability





Dieoff time-series, topographic, soils, latitude proxy, land cover, and climate data integrated into a decision-tree model to create the probability map.

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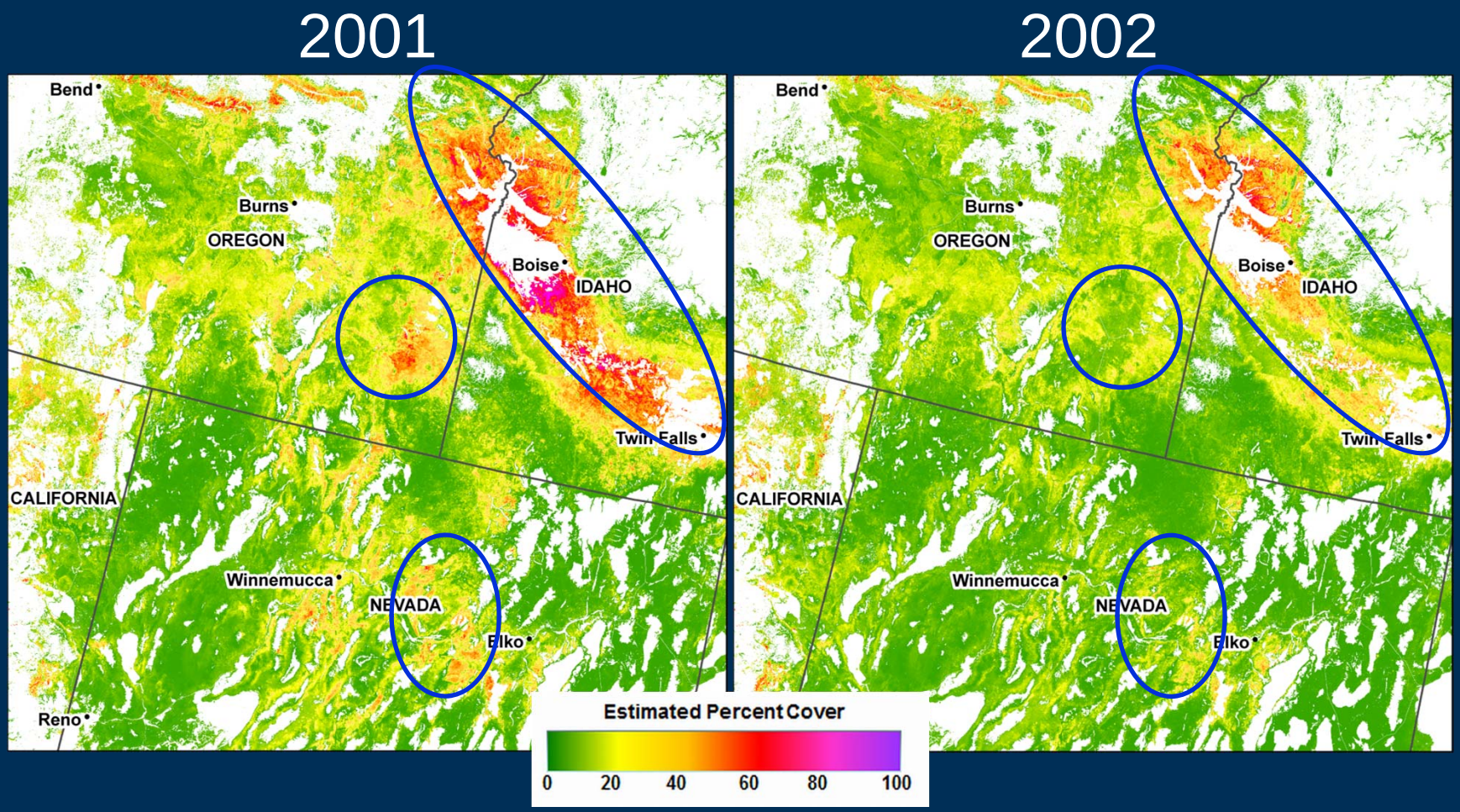
Percent cover maps show high variability



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“Cheatgrass is absolutely the enemy.”

THE WENATCHEE WORLD

In fire country, land managers fight cheatgrass

By Patrick Orr, McClatchy News Service

Monday, March 7, 2011

McClatchy photo

Fire crews battle a grass fire south of Boise, Idaho, near the World Center For Birds of Prey in August 2010. Fire crews with BLM, Boise, and Kuna were able to corral a 200-acre fire burning in a cheatgrass area before it could get to several houses south of Boise.

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Fighting fire with seed: aerial planting to combat cheatgrass

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Wednesday, January 11, 2012

by Scott Neuffer
sneuffer@recordcourier.com

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ENLARGE

Rick Haskell and August Isernhagen fill the hopper with seed on Thursday morning.
Shannon Litz

If revegetation of burned zones in south Douglas County is a battle for the overall health of the land, then cheatgrass is the primary enemy.

“Cheatgrass is absolutely the enemy,” said Eric Roussel, forester, seed bank and biomass specialist with the Nevada Division of Forestry. “What we're doing is competing with the bad guy. We are more than the agency that puts out the fire. We're looking at the bigger picture.”

Roussel joined NDF Forest Health Specialist Gail Durham in the Pine Nut Mountains last week for a massive reseeding operation targeting more than 1,000 acres of private land burned in the Ray May Way and Holbrook fires of 2011.

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Shrub steppe fires cause severe damage to vegetation

scienceblog.com/community/older/archives/E/usgs409.html

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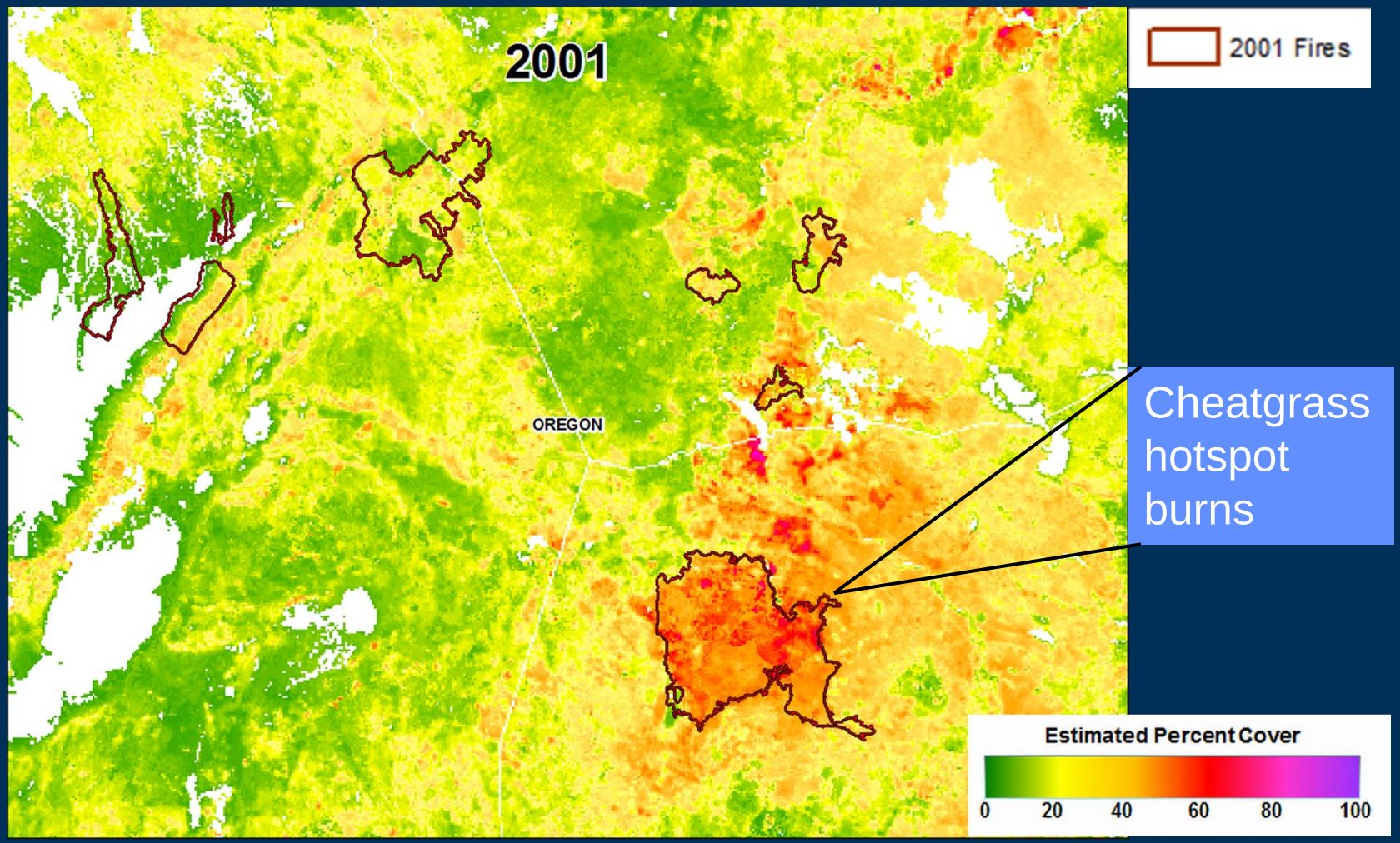
Fires overlain on cheatgrass percent cover maps



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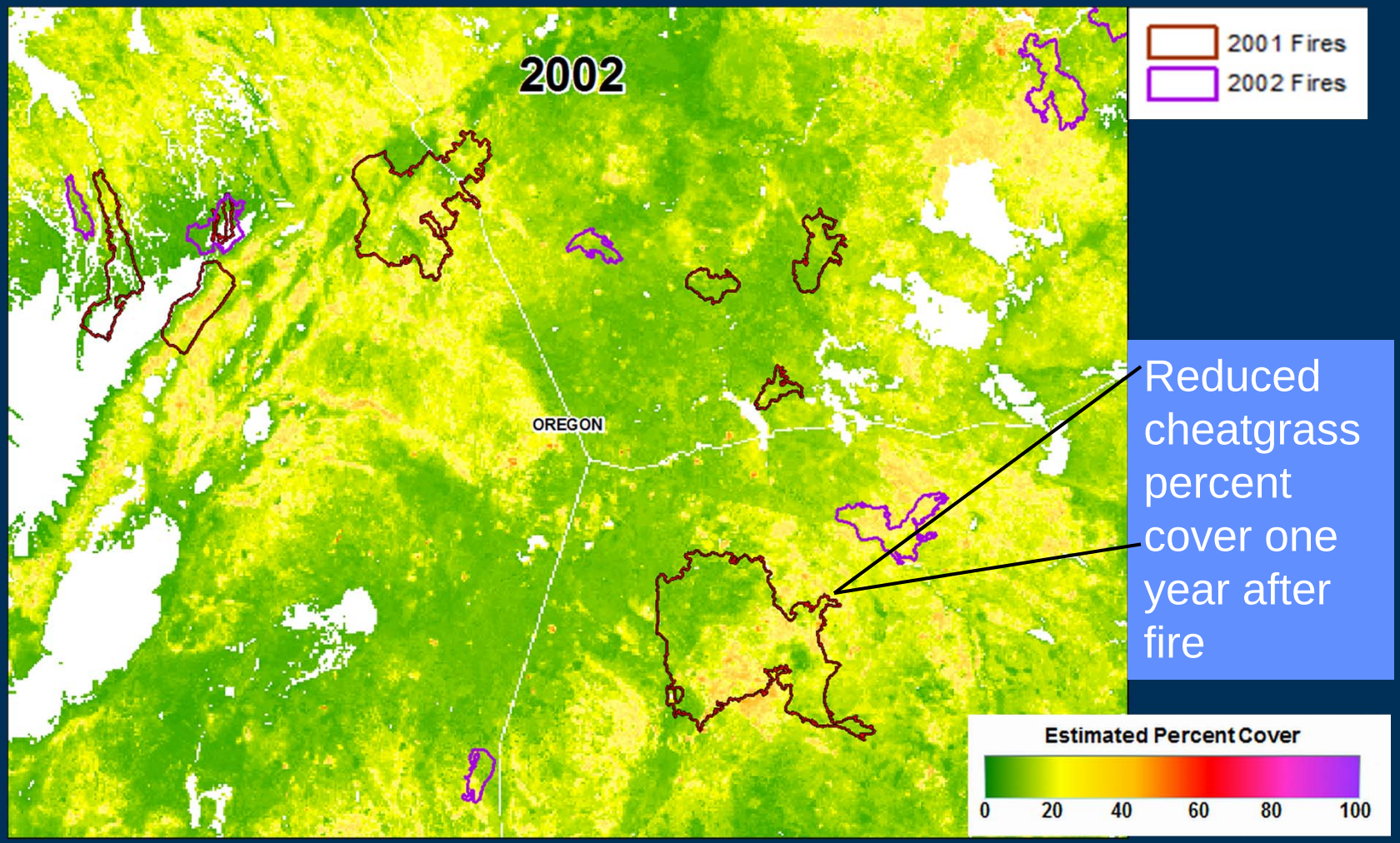

Reduced cheatgrass percent cover one year after fire

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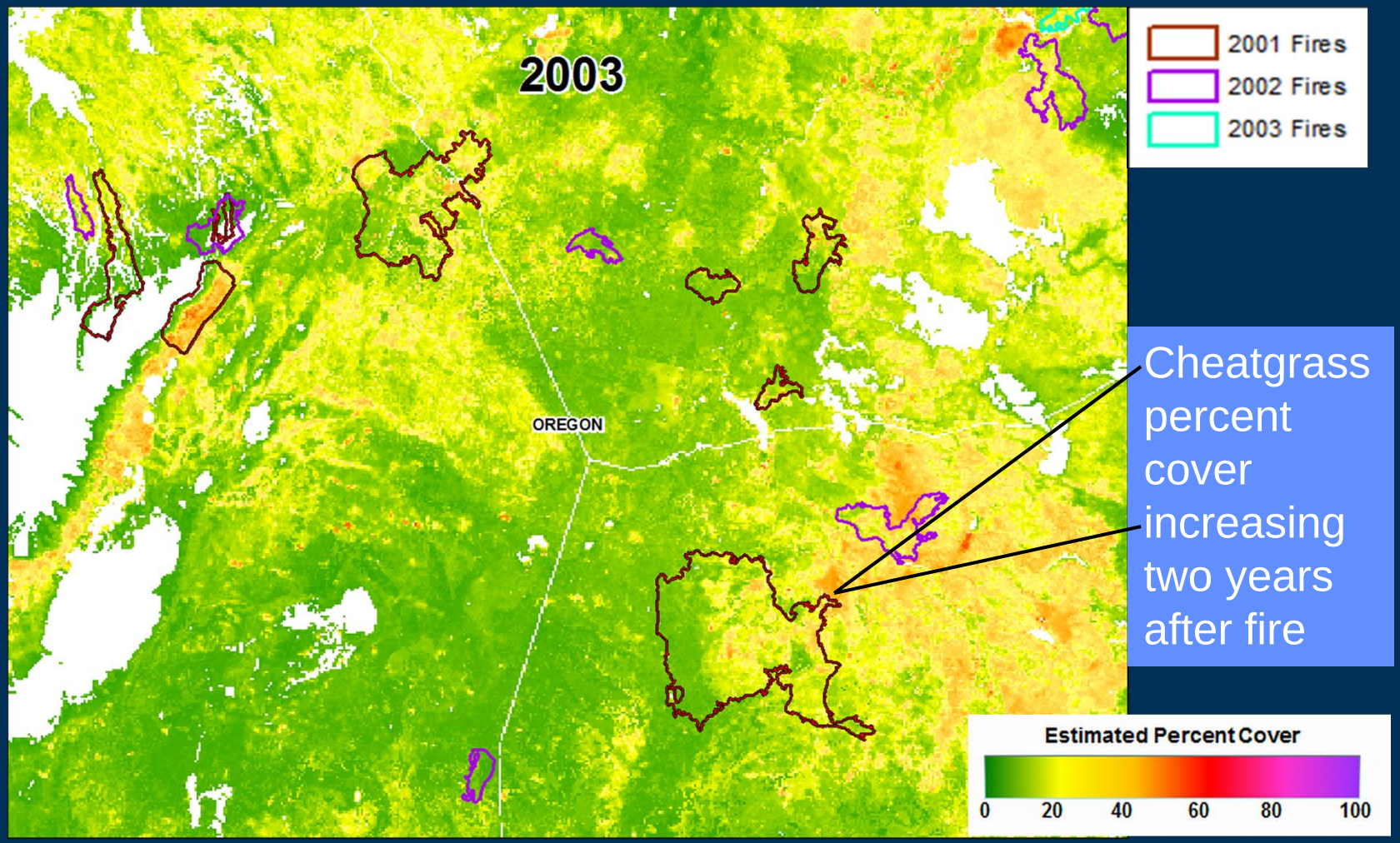

Cheatgrass percent cover increasing two years after fire

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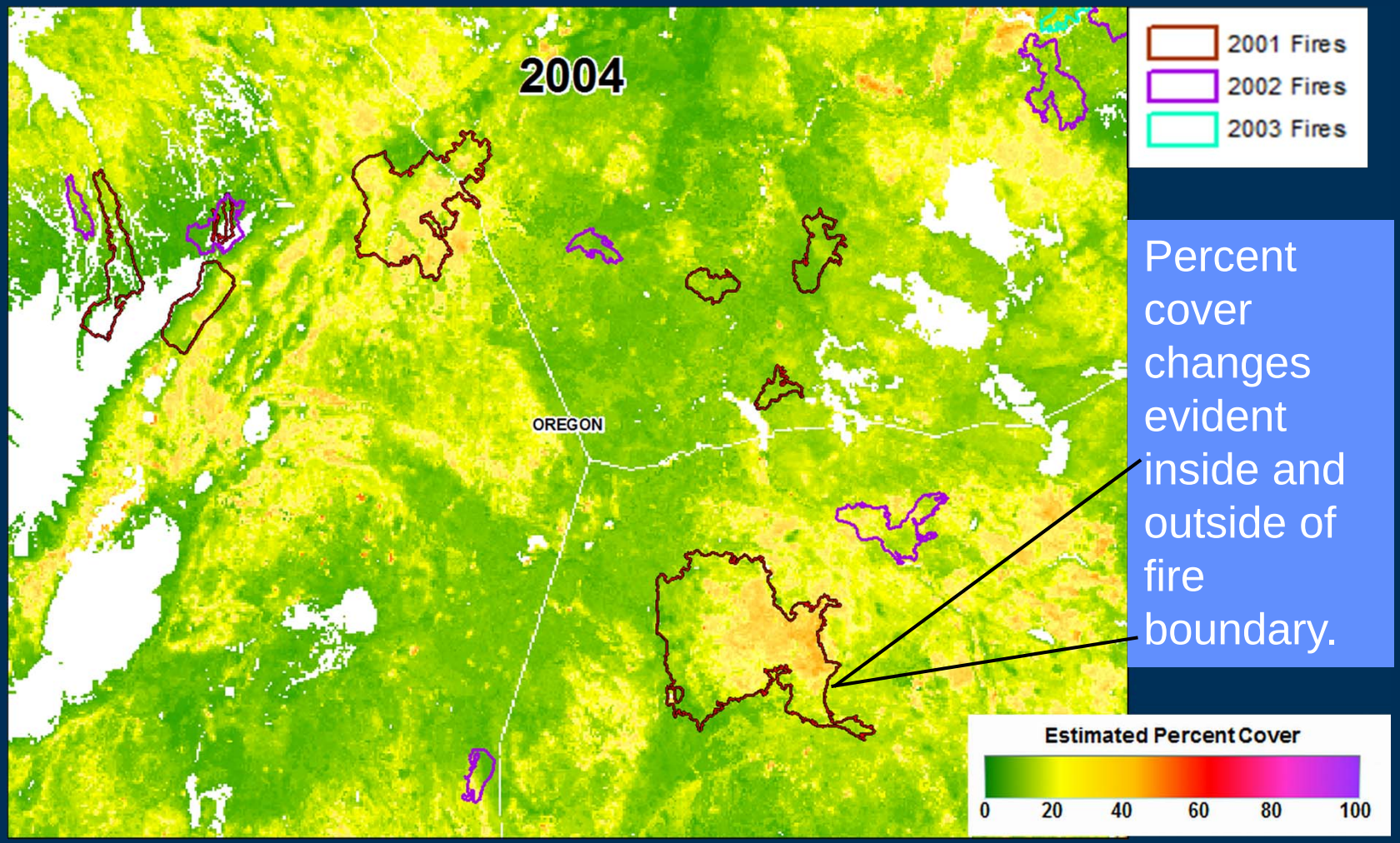

Percent cover changes evident inside and outside of fire boundary.

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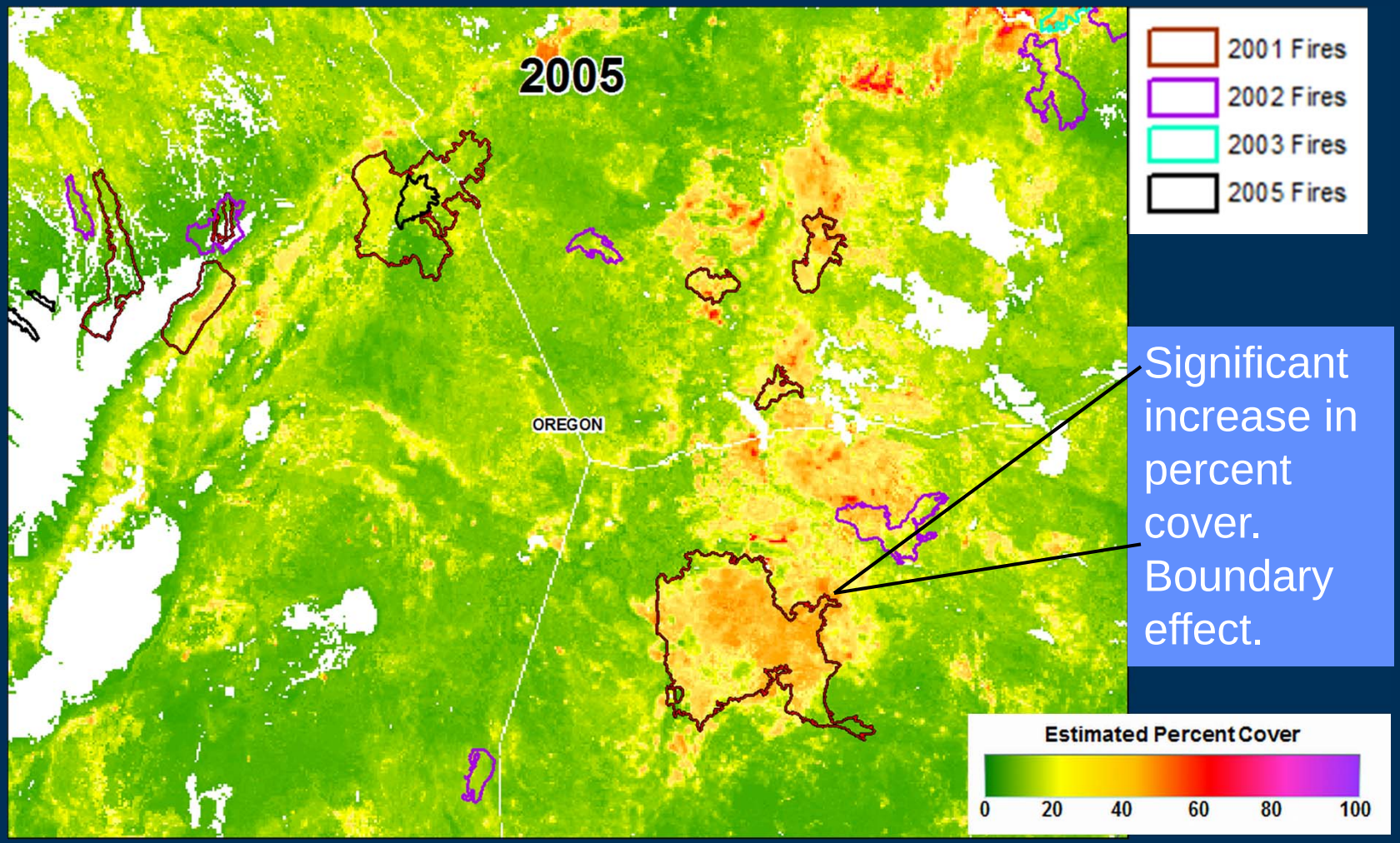

Significant increase in percent cover. Boundary effect.

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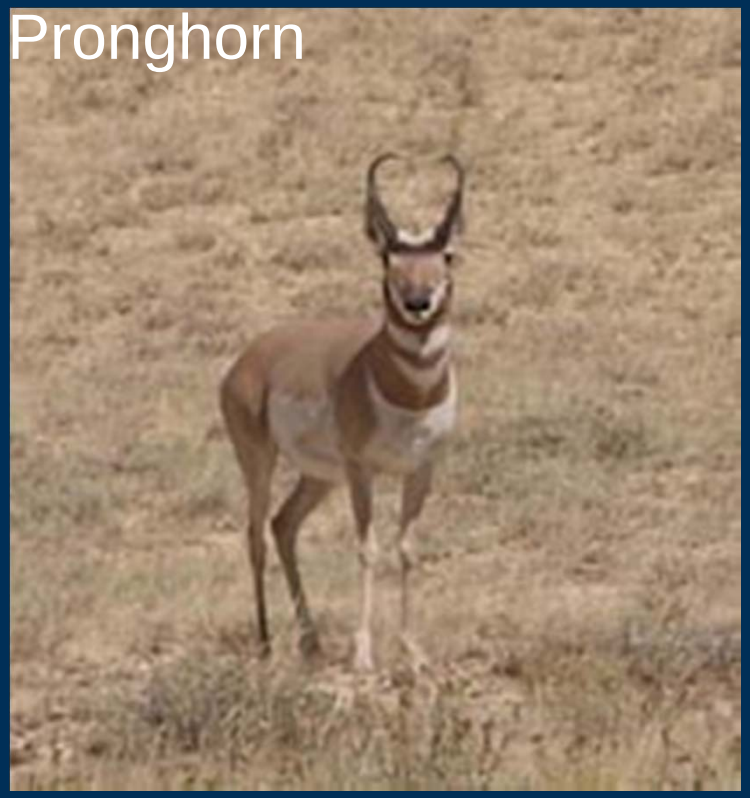
Some sagebrush obligates



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Greater sage grouse is a candidate for inclusion on the Endangered Species list. If listed, this will create new challenges for the BLM.

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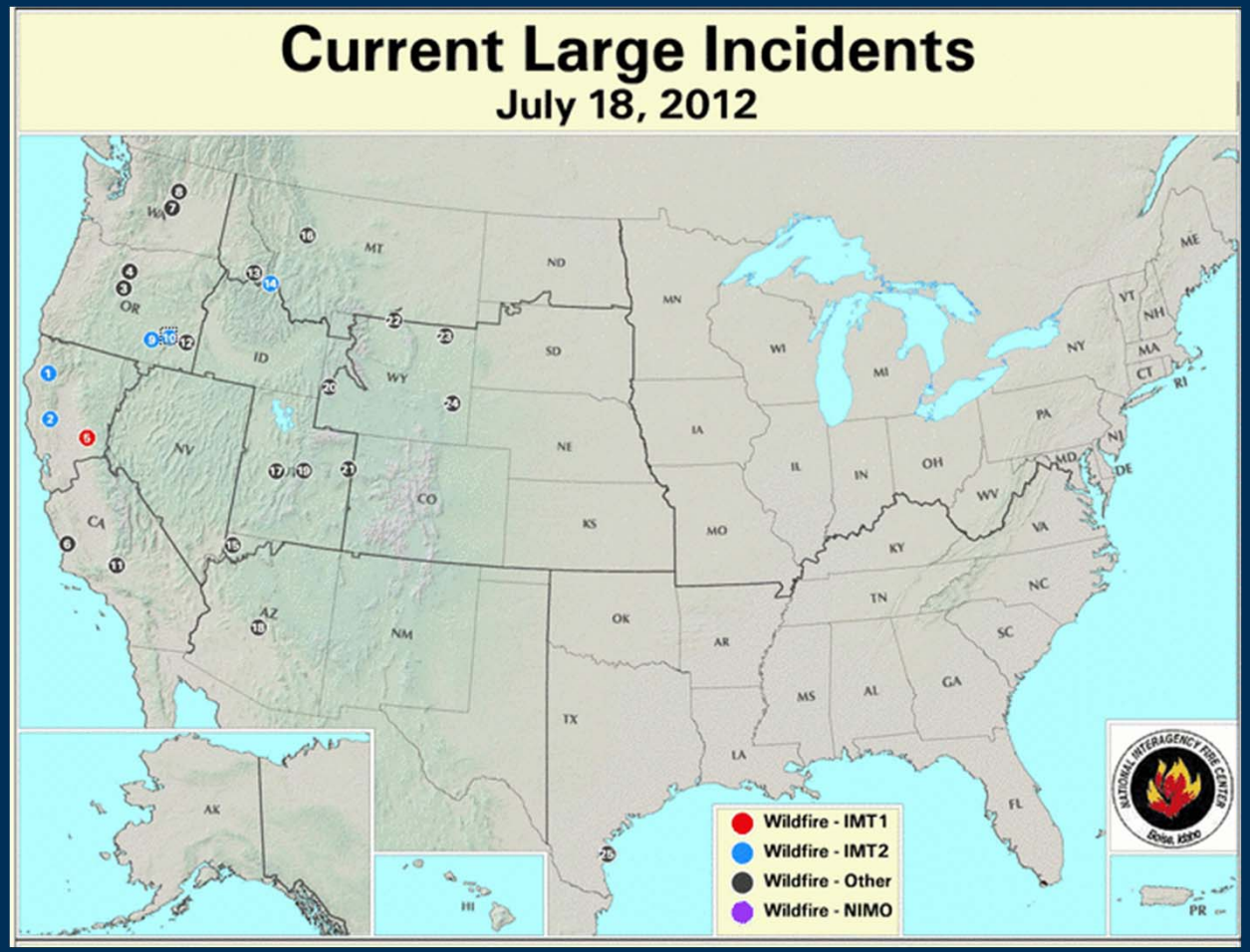
U.S. active large* fires



All but one large fire occurred in the western United States.

***300+ acres in shrub steppe ecosystems**

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Active large fires (July 17, 2012)

About 250,000 acres burning, including 160,000 acres-½ mile from Frenchglen, OR (#8).

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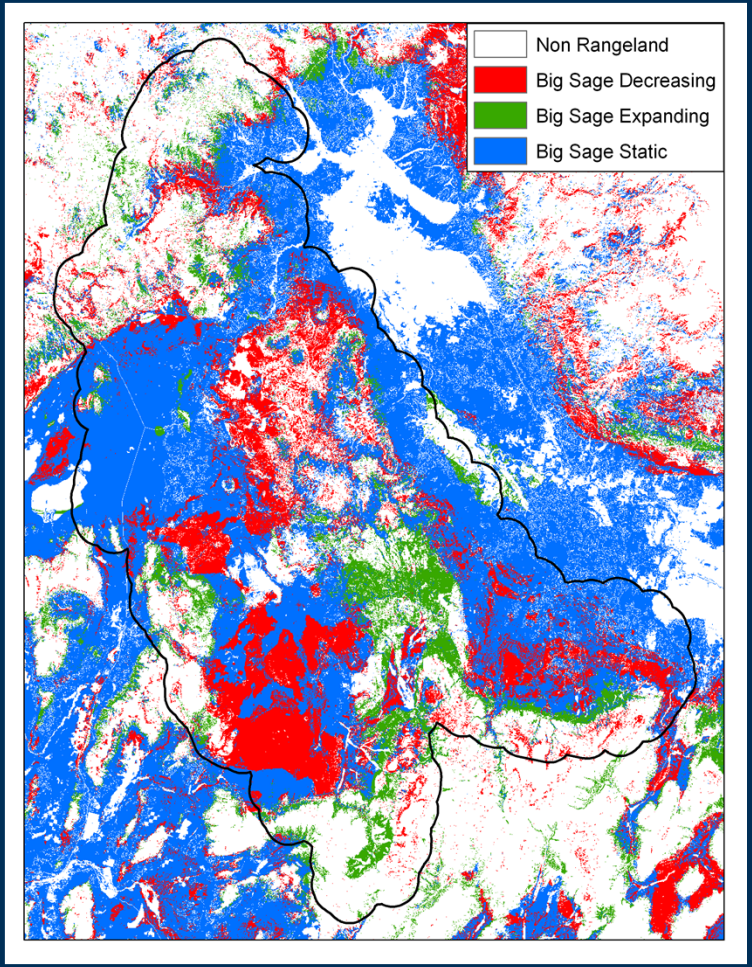
Owyhee Uplands 2040 big sagebrush estimated future distribution

Big Sagebrush land cover model applied to near-term future climate projection.

Same procedure can be used to generate future dieoff probabilities related to climate change.



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Summary

- Inform adaptive management
- Separate weather influences from disturbance and management influences
- Identify vulnerable and sustainable rangeland conditions
- Estimate current and historical conditions and project future conditions

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Future, deliverables, publications,

- Aroga moth defoliating sagebrush. Future project?
- Delivered report and percent cover and dieoff maps to the Northwest Climate Science Center
- Potential collaboration with Todd Hawbaker, USGS fire modeler
- Submitted manuscript on the dynamic start of season growth for cheatgrass
- Manuscript near completion on cheatgrass percent cover
- Planning a manuscript on cheatgrass dieoff

USGS

Funding Acknowledgements

- USGS Land Remote Sensing
- USGS Northwest Climate Science Center
- Bureau of Land Management

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