

# Modeling Black-backed Woodpecker habitat suitability and prioritizing stands for retention at the Rim Fire

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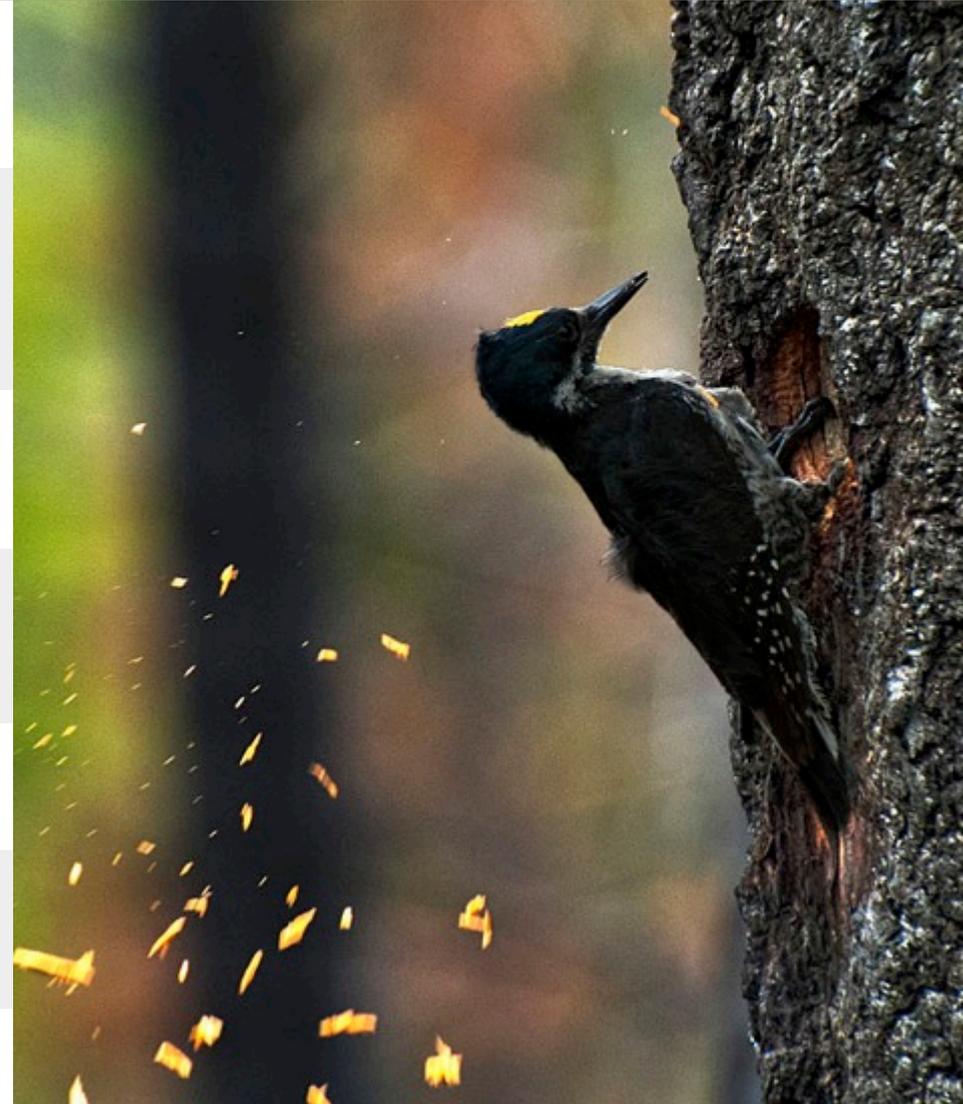
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# Data sources for modeling habitat suitability

## 1. Management Indicator Species (MIS) monitoring

Partnership between Region 5 and IBP

Initiated in 2008; ongoing

During each breeding season we conduct broadcast surveys at 20 survey stations in 50 recent fire areas (<11yo) across the 10-Forest SNEP area



# Data sources for modeling habitat suitability

## 1. MIS monitoring, cont.

### Use Hierarchical Bayesian Occupancy modeling to estimate:

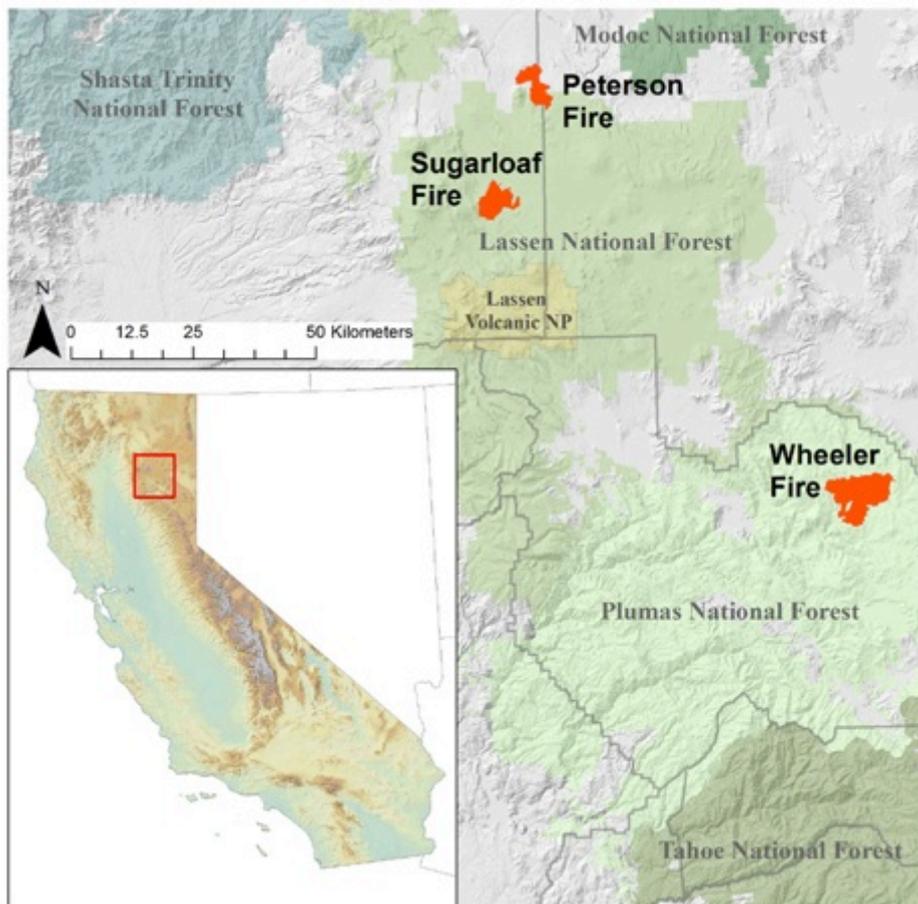
- detection probability and
- occupancy probability

as functions of environmental and survey variables



# Modeling occupancy probability

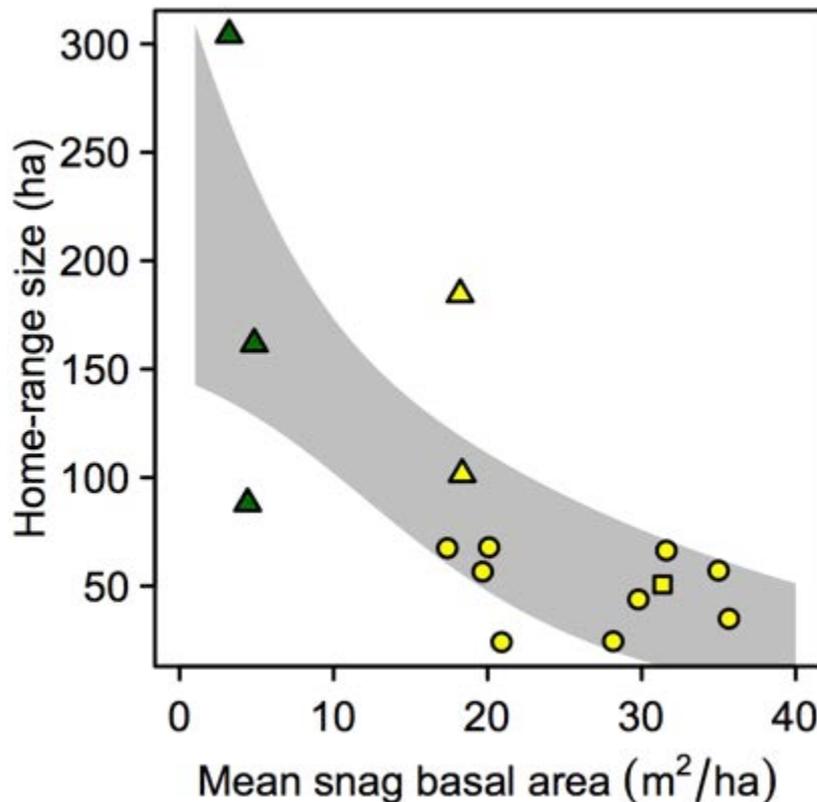
## 2. Intensive study of home range characteristics and foraging habitat selection at 3 fires



## 2. Intensive study, continued

Evaluated numerous habitat variables, as well as woodpecker age and sex, for predicting home range size

Average snag basal area across home range was best predictor, by far



Source: Tingley, M. W., R. L. Wilkerson, M. L. Bond, C. A. Howell, and R. B. Siegel. *In revision*. Home-range size variation in the Black-backed Woodpecker (*Picoides arcticus*). *The Condor*.



# Modeling Black-backed Woodpecker habitat suitability at the Rim Fire

## **PURPOSE:**

Inform selection of retention stands for Black-backed Woodpecker based on the best available scientific information.



# Modeling probability of Black-backed Woodpecker occupancy

Model based on 1,574 broadcast surveys at 87 fires over 4 years

Included these variables:

**Elevation standardized by latitude**

**Fire severity (% change in canopy cover)**

Pre-fire % canopy cover

Years since fire

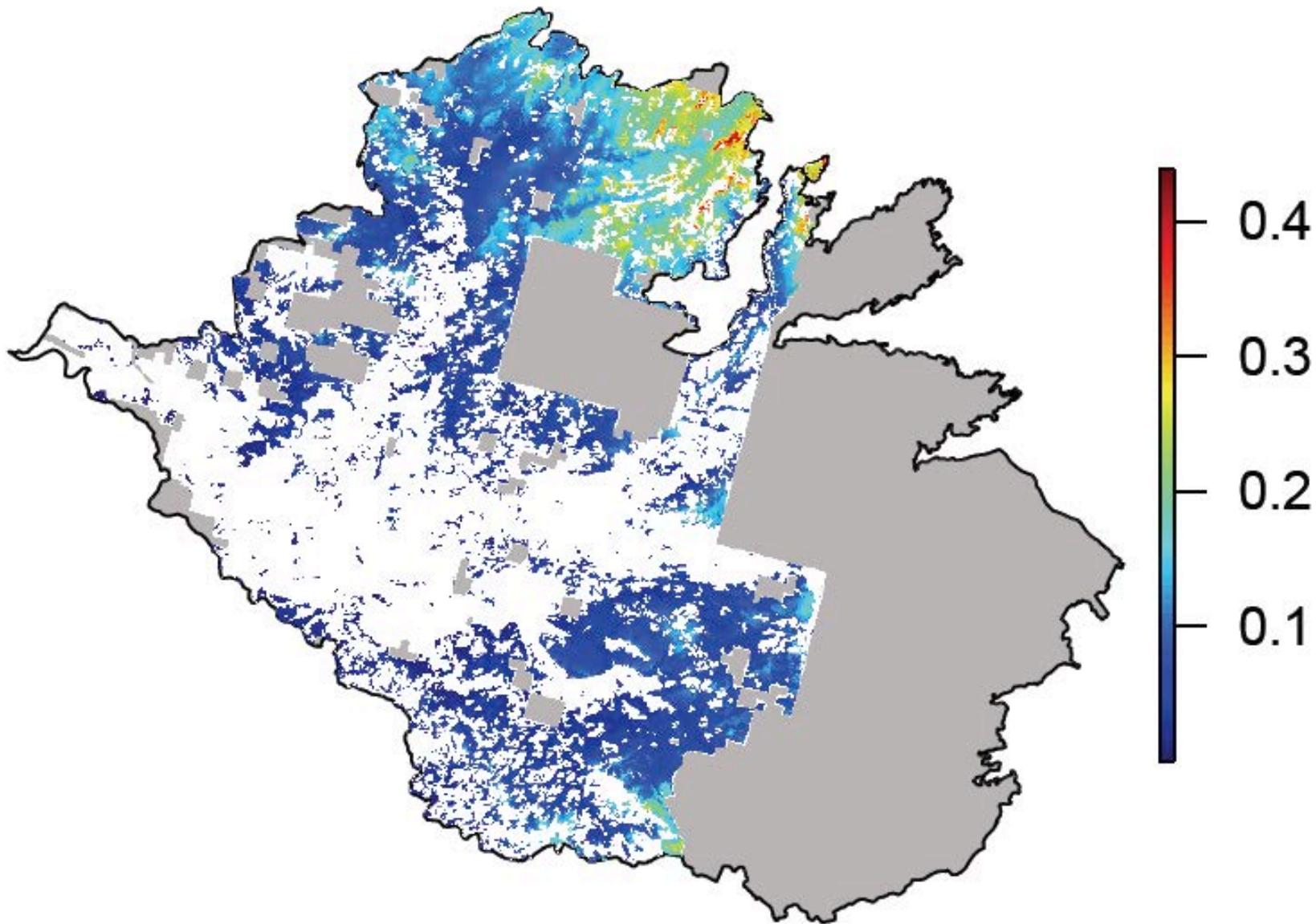
Dominant tree size class

Forest type (CWHR)

Model was then interpolated into the Rim Fire footprint



# Probability of Black-backed Woodpecker occupancy (per 30-m pixel)





# Predicting Black-backed Woodpecker density (pairs/100 ha), given occupancy

Second stage of model, based on data from radio-telemetry study

Used only a single variable, **snag basal area**, which explained >50% of home-range size variation in telemetry study

No snag basal area data layer available for Rim Fire, so...

Used 3,237 habitat sample points from telemetry study to model snag basal area as function of:

- pre-fire canopy cover

- burn severity

- stand size class

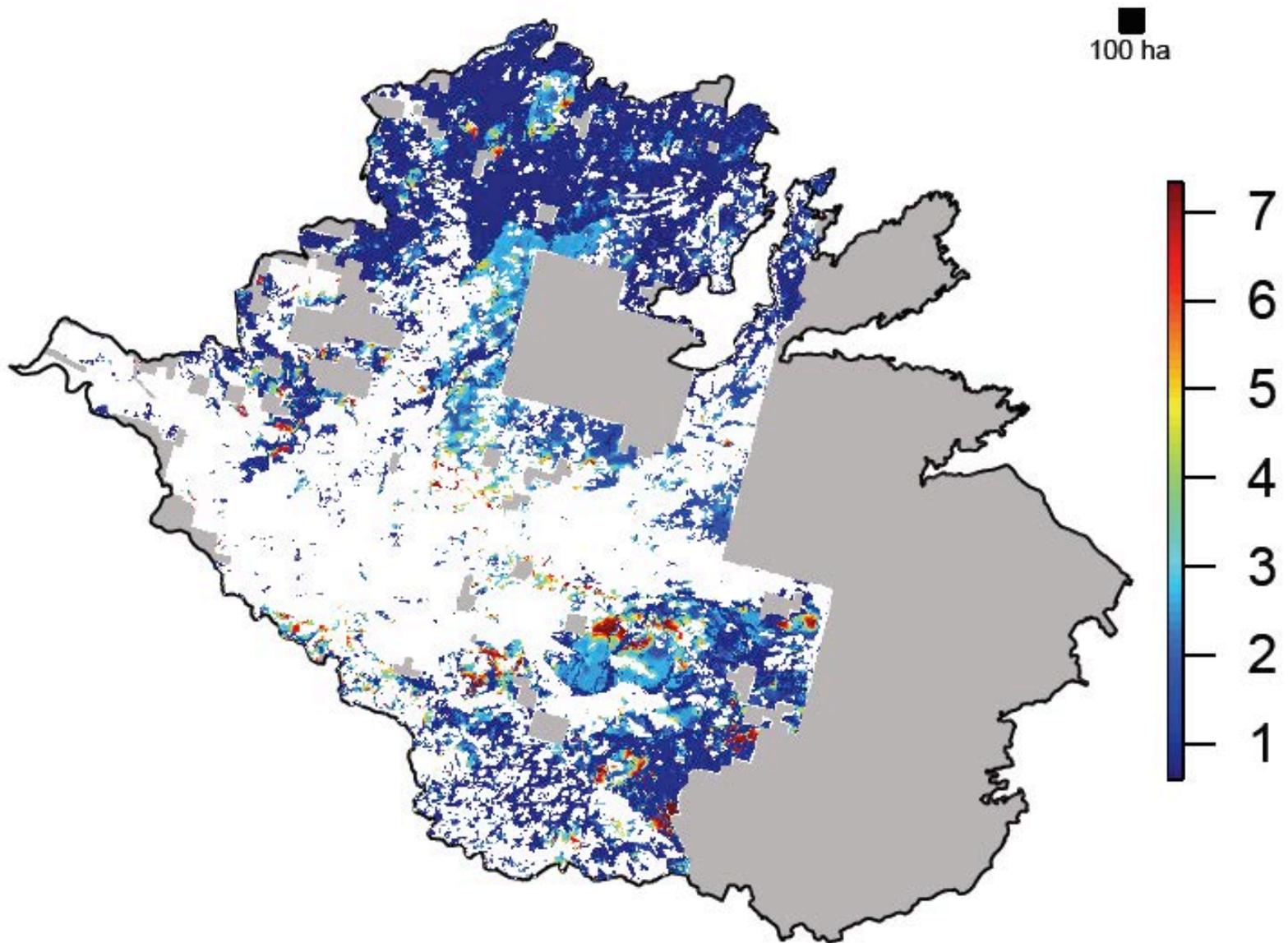
- two-way interactions

Used resulting model to interpolate a snag basal area surface for portions of the Rim Fire with occupancy probability >0



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# Predicted Black-backed Woodpecker density (pairs/100 ha), given occupancy





# Predicting BBWO density (pairs/100 ha), accounting for variable occupancy probability

## Next step:

Predict density as the PRODUCT of

(Occupancy probability) X (predicted density given occupancy)

## Final step:

Ensure minimum patch size to be useful to BBWOs

Place 200-m buffer around all habitat with predicted BBWO density > 0

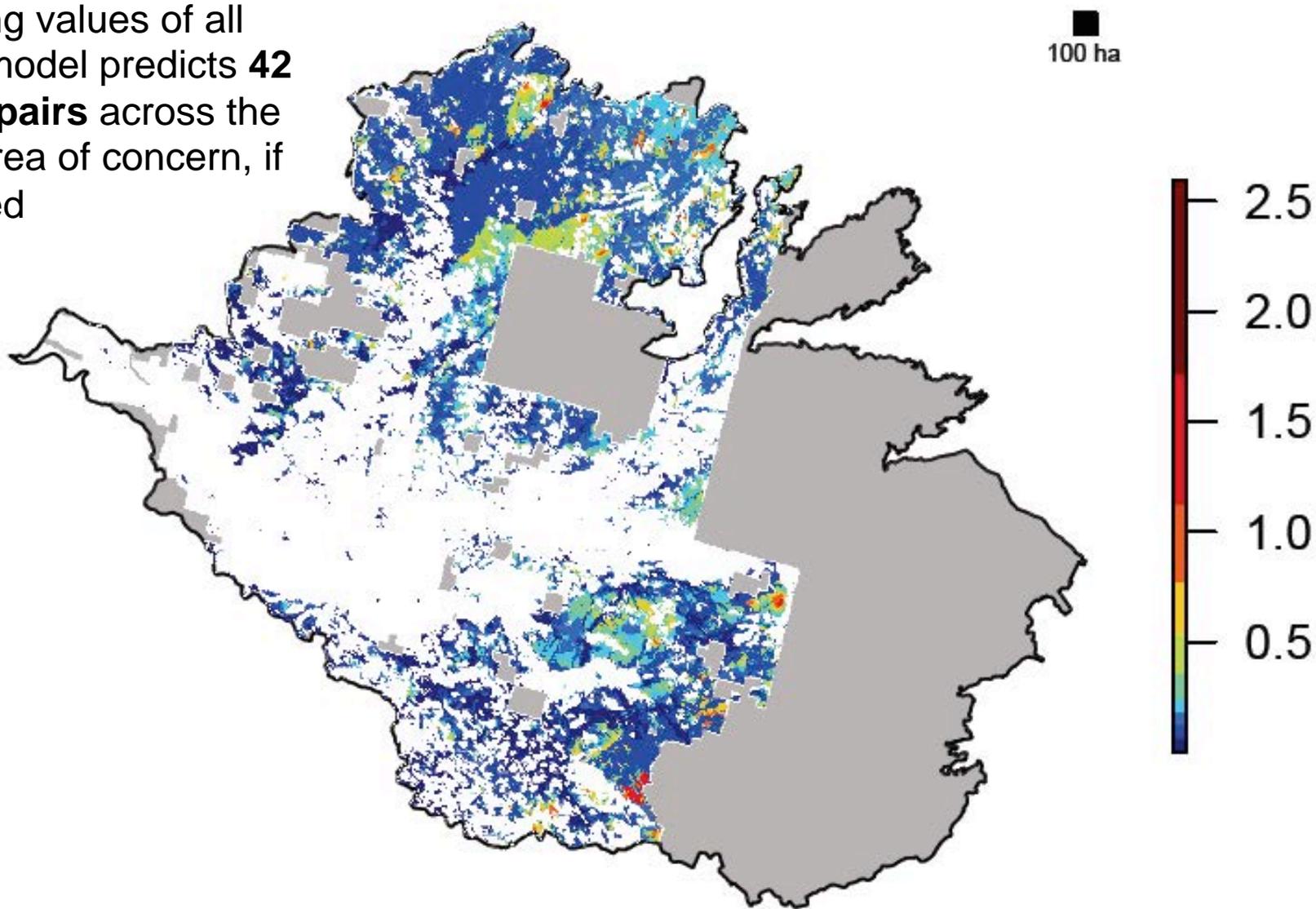
Habitat patches too small to support a BBWO home range, and > 200 m from other habitat patches were discarded



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# Predicted BBWO density (pairs/100 ha), accounting for variable occupancy probability

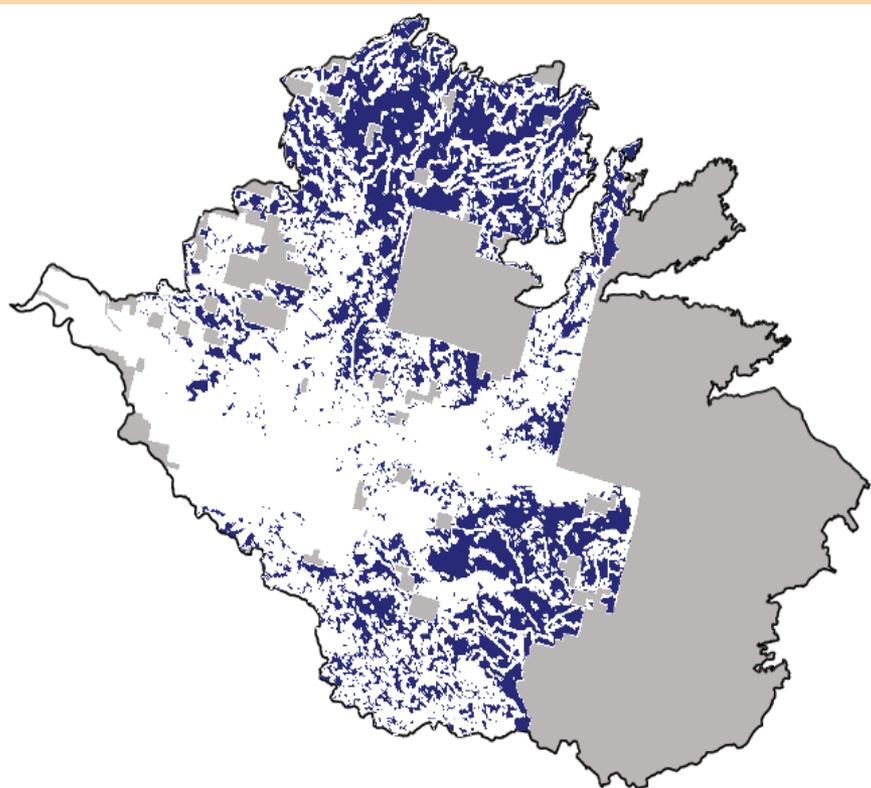
Summing values of all  
pixels, model predicts **42  
BBWO pairs** across the  
entire area of concern, if  
untreated



# Predicting effects of roadside hazard removal and treatment of management units

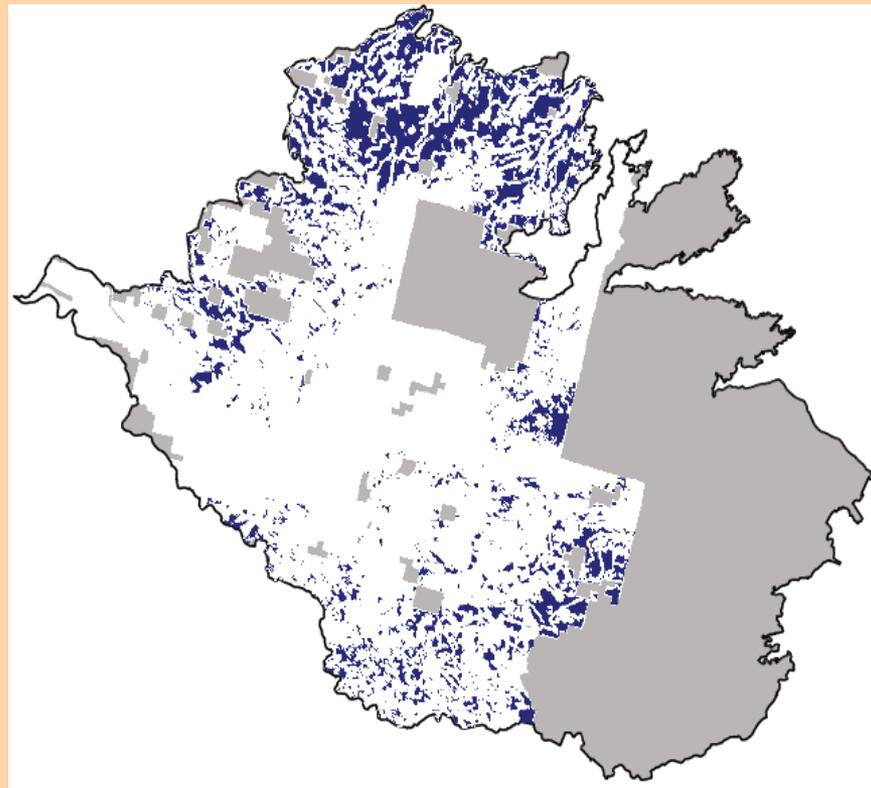
## Proposed hazard-tree removal:

Reduces predicted BBWO population from 42 pairs to 37 pairs  
▶ 12% reduction



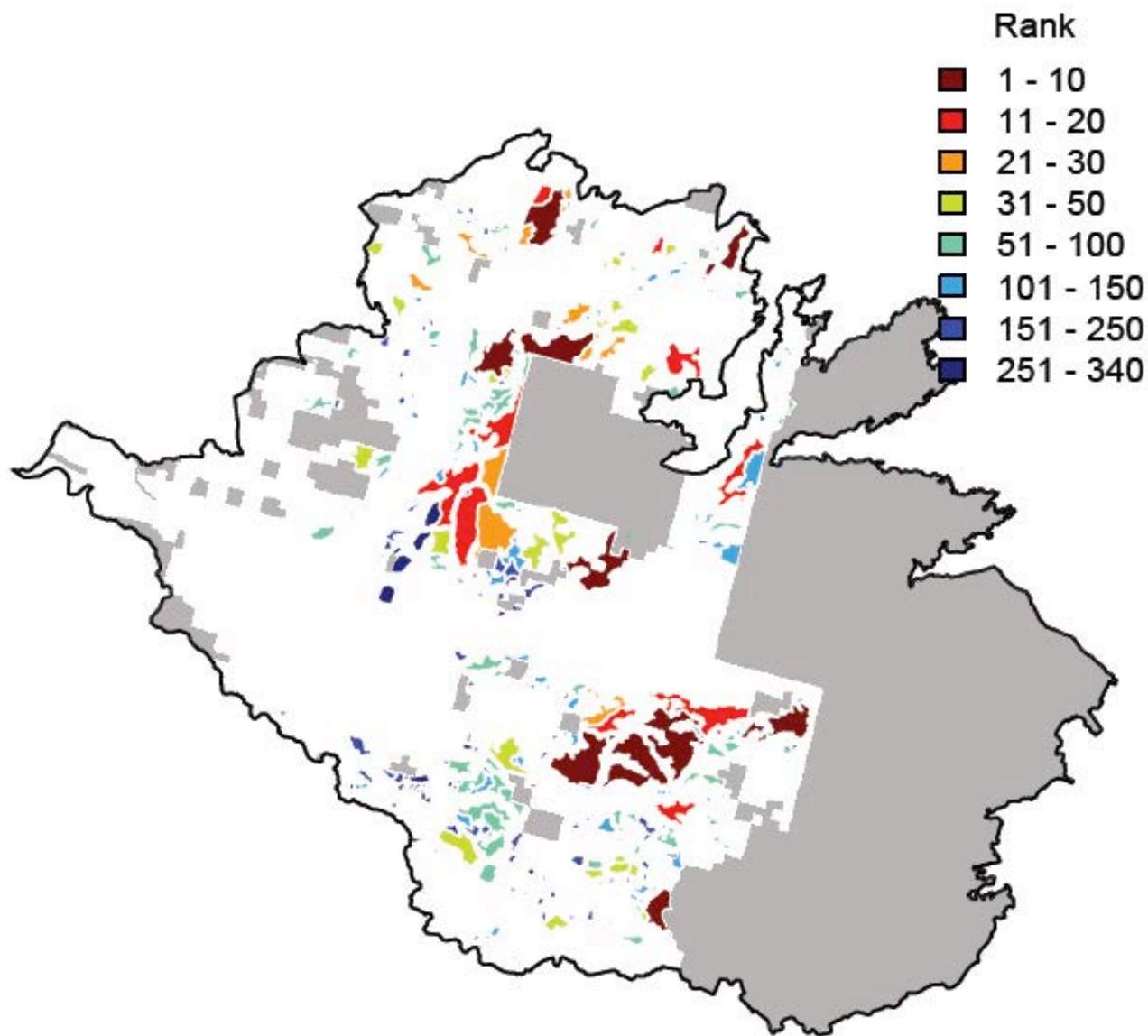
## Proposed hazard-tree removal plus proposed management:

Reduces predicted BBWO population from 42 pairs to 16 pairs  
▶ 62% reduction

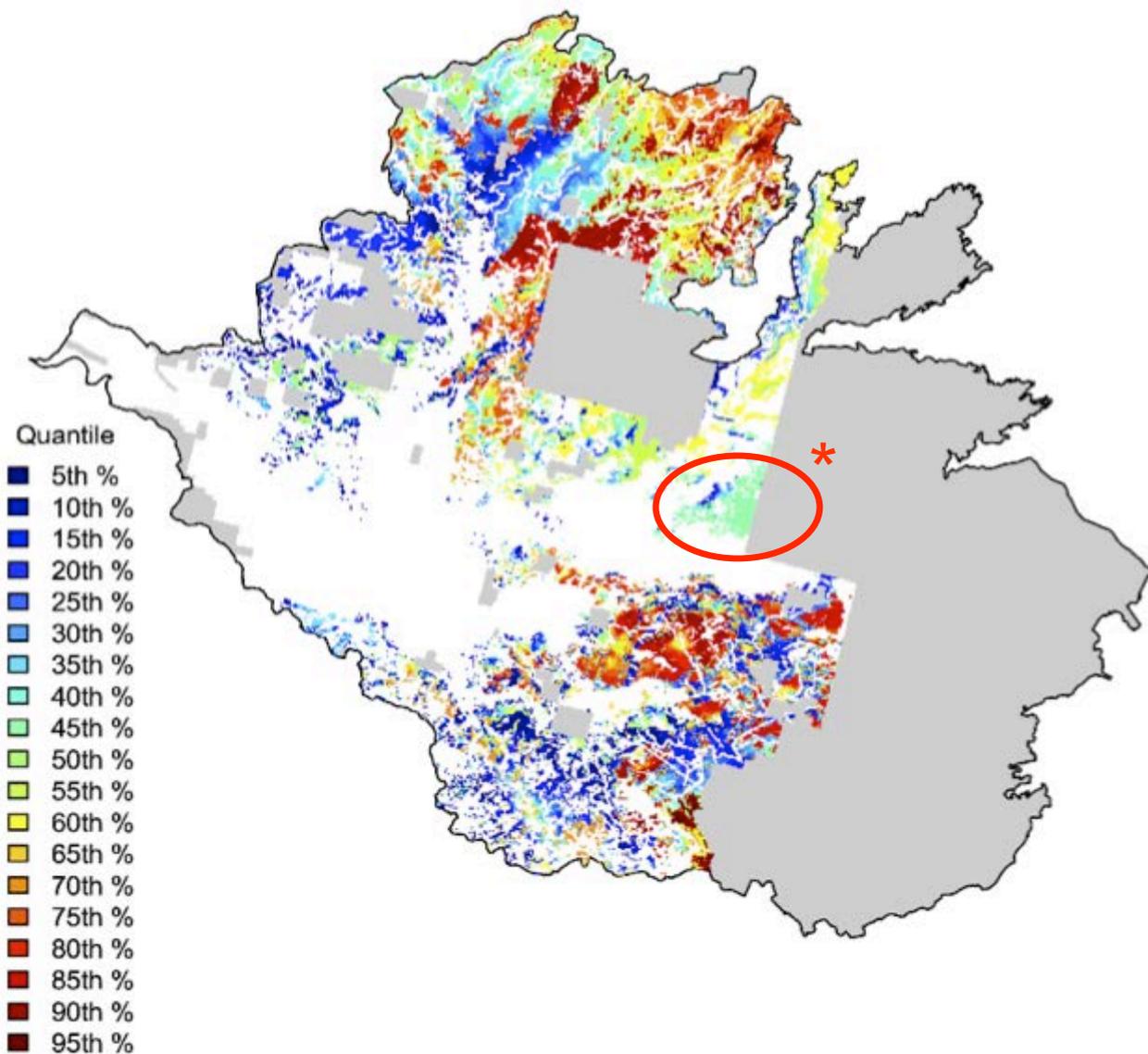




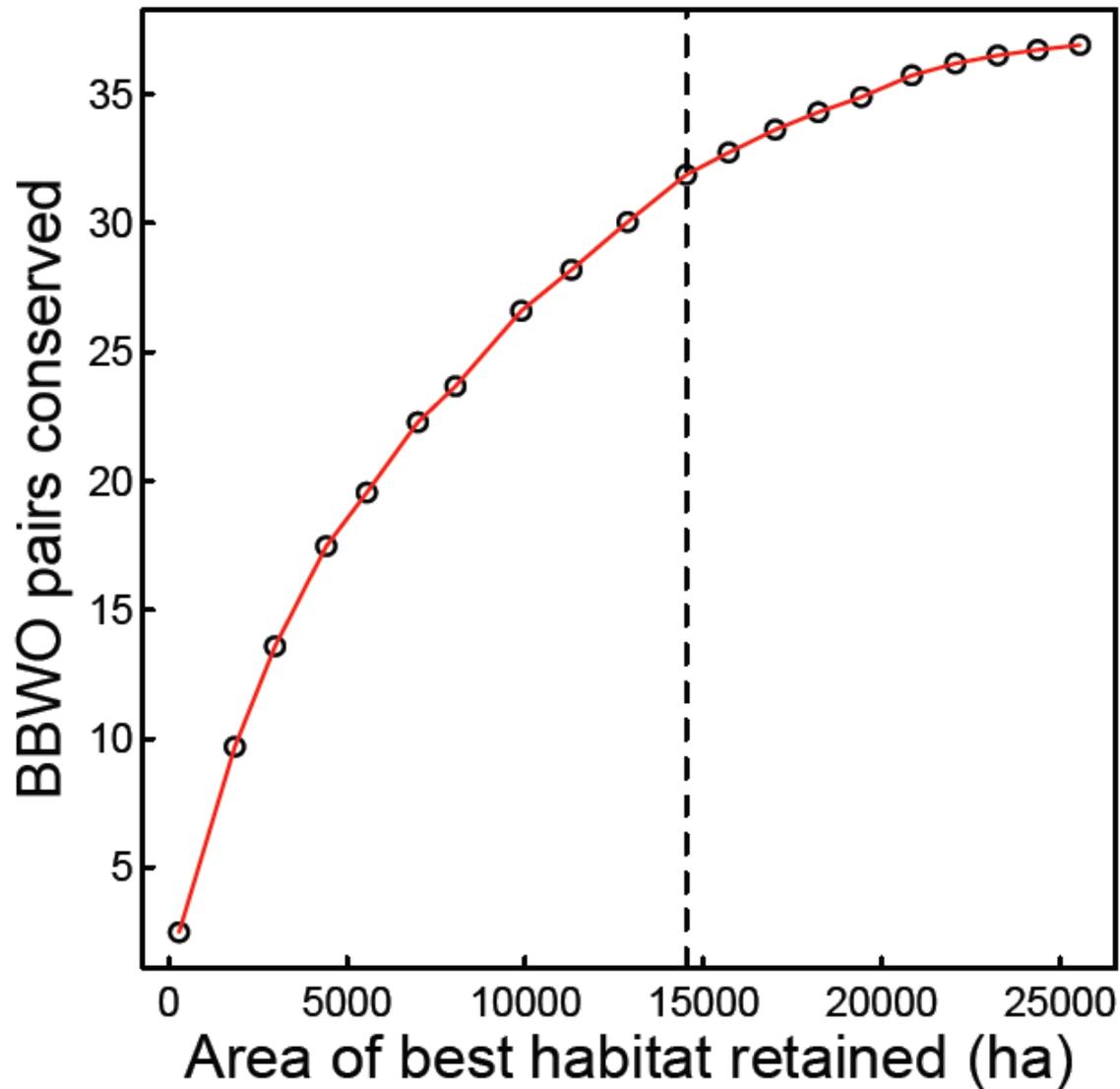
# Proposed management units, ranked by no. of BBWOs predicted to occupy them if untreated



# Quantiles of Black-backed Woodpecker habitat suitability



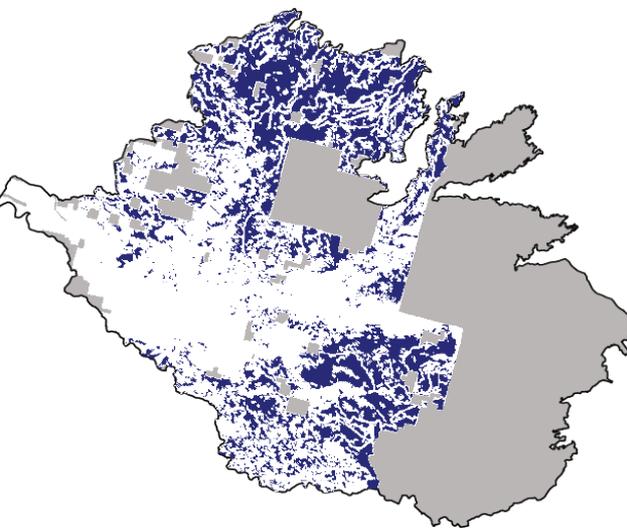
# Amount of top-quality habitat retained versus no. of BBWO pairs conserved





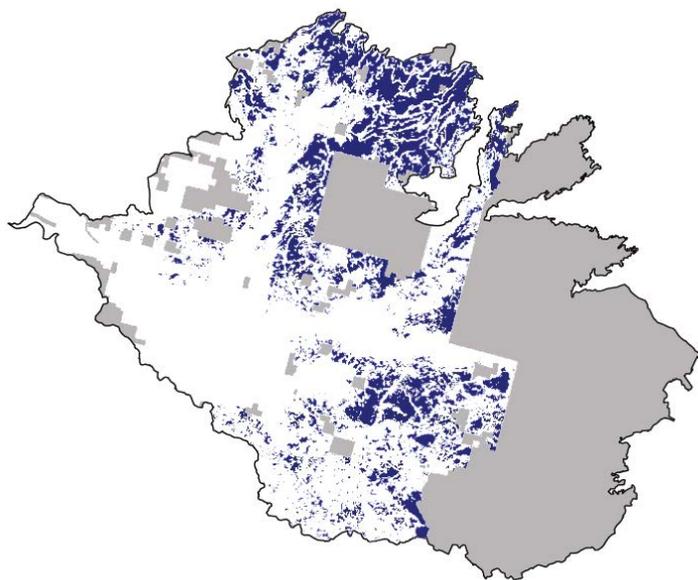
# Quantiles of Black-backed Woodpecker habitat suitability – visualizing scenarios

Retaining habitat for  
88% of predicted pairs



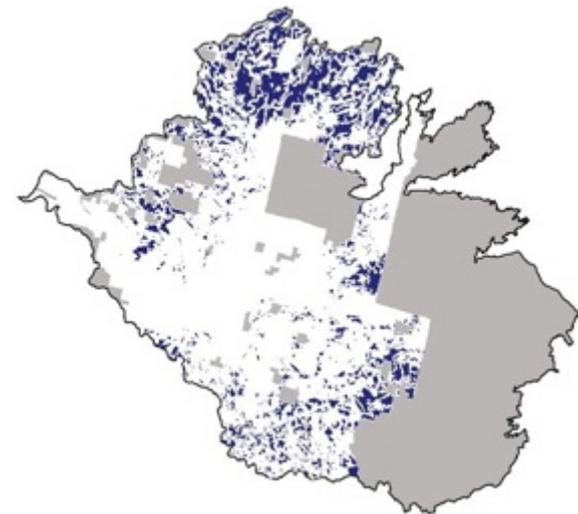
Roadside hazard removal  
only

Retaining habitat for  
75% of predicted pairs



Prioritizing retention strictly by  
BBWO habitat suitability

Retaining habitat for  
38% of predicted pairs



Alternative 3  
management proposal



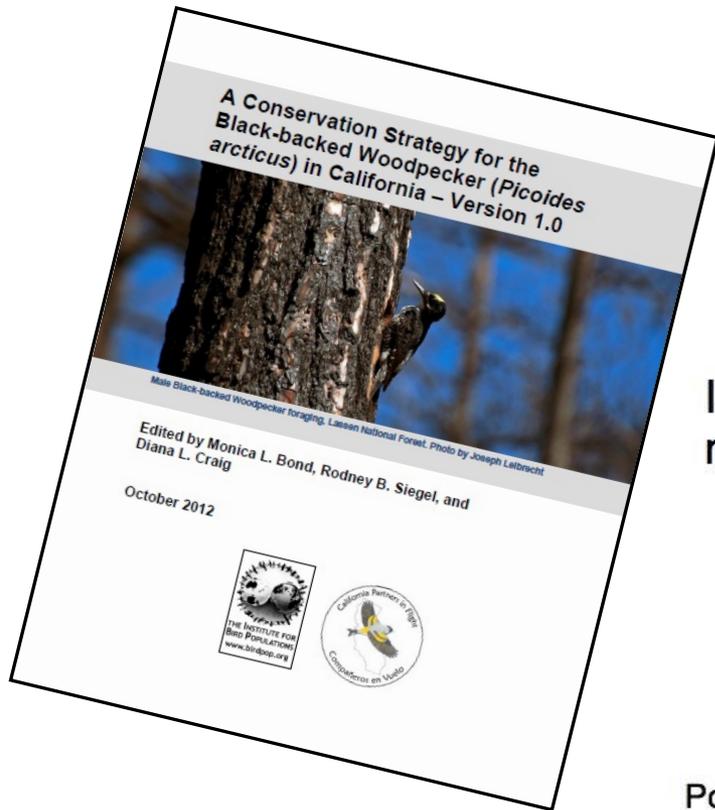
# Recommended habitat retention for Black-backed Woodpeckers

- We recommend retaining enough habitat to support at least 75% of the 42 pairs that are predicted to occupy the area if stands were untreated
- The habitat suitability map we developed allows for testing whether different management scenarios can meet this or other goals

# An additional recommendation: Timing of harvest

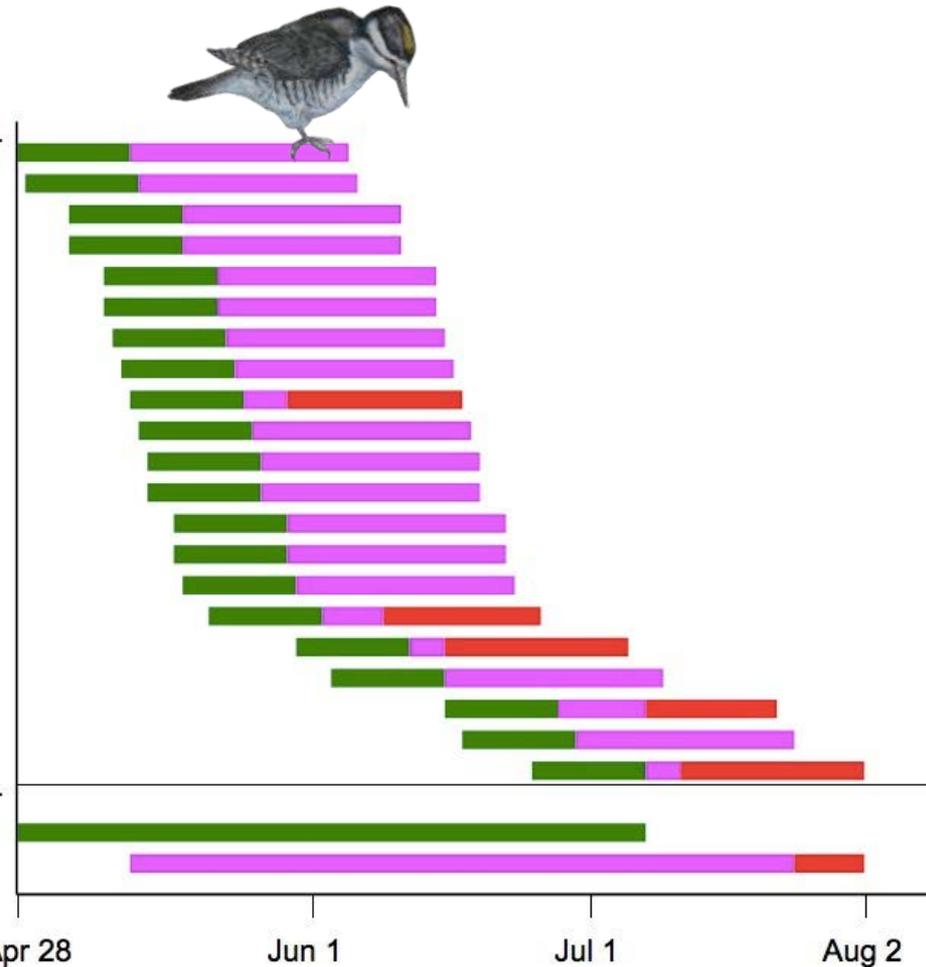
FROM THE 2012 BBWO CONSERVATION STRATEGY:

*Recommendation 1.5. Avoid harvesting fire-killed forest stands during the nesting season (generally May 1 through July 31).*

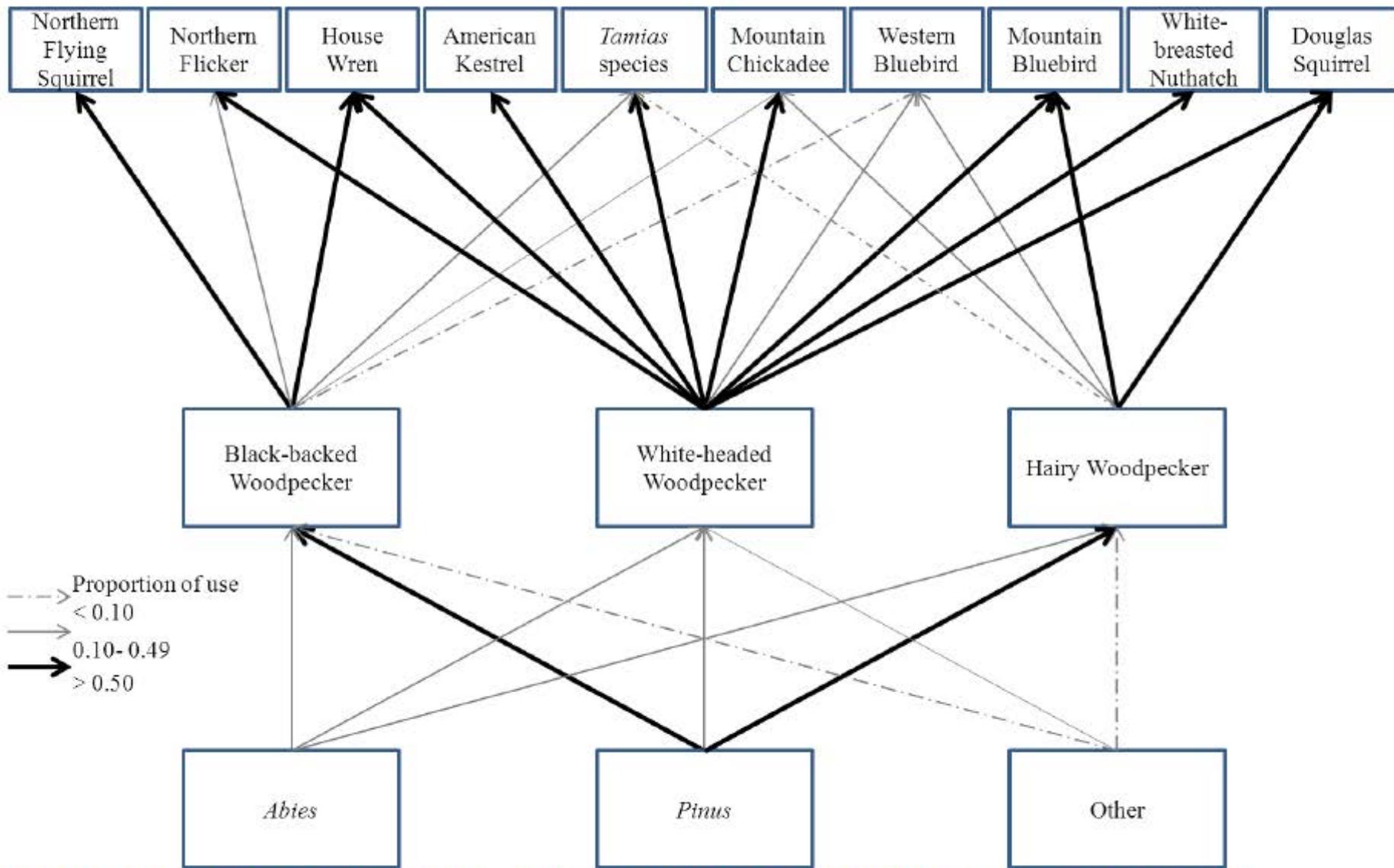


Individual  
nests

Pooled incubation  
Pooled nestling







‘Nest web’ from the Angora Fire.

Source: **Patricia Manley and Gina Tarbill. 2012. Ecological succession in the Angora fire: The role of woodpeckers as keystone species**







# Thank you.



For more information: [http://  
www.birdpop.org/Sierra/bbwo.htm](http://www.birdpop.org/Sierra/bbwo.htm)