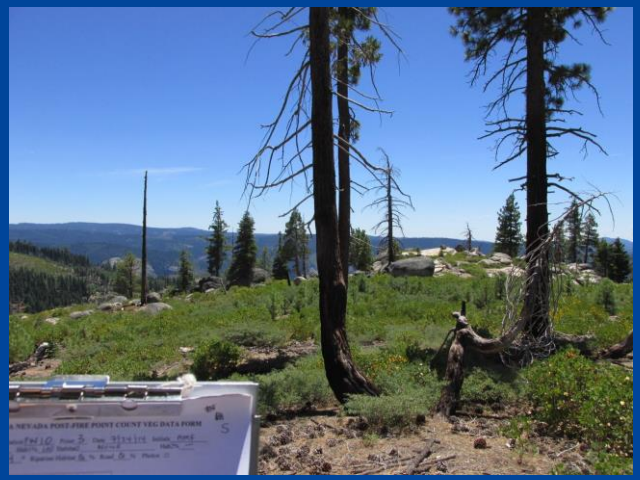
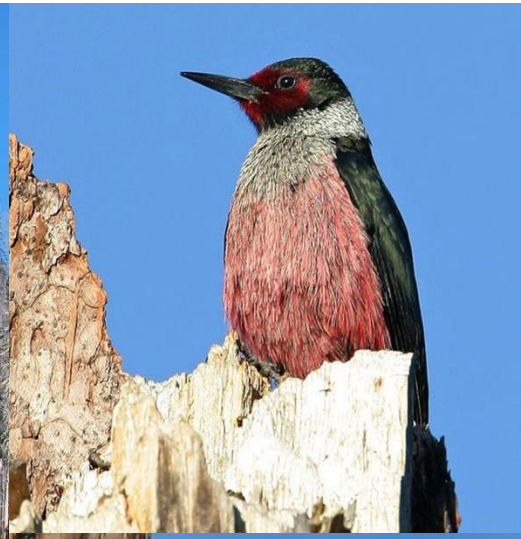
Using birds to monitor the effectiveness of post-fire restoration in central Sierra Nevada fires

Alissa Fogg and Ryan Burnett, Point Blue Conservation Science
Zack Steel, UC Davis
8 November 2017, ACCG Monitoring Symposium, Sutter Creek, CA



Point Blue

Birds in Burns



Post-fire management

Most post-fire management studies are in recent fires focused on cavity nesters … what are the longer term effects?

Nest-site selection by cavity-nesting birds in relation to postfire salvage logging

Victoria A. Saab [a,*], Robin E. Russell [a], Jonathan G. Dudley [b]

Maryellen Haggard, USDA Forest Service, Leavenworth Ranger District, 600 Sherbourne, Leavenworth, Washington 98826

William L. Gaines,[1] USDA Forest Service, Wenatchee National Forest, 215 Melody Lane, Wenatchee, Washington 98801 Email: wgaines@fs.fed.us

Effects of Stand-Replacement Fire and Salvage Logging on a Cavity-Nesting Bird Community in Eastern Cascades, Washington

Comparing the effect of salvage logging on birds in the Mediterranean Basin and the Rocky Mountains: Common patterns, different conservation implications

Josep Rost [a,*], Richard L. Hutto [b], Lluís Brotons [c,d], Pere Pons [a]

[a] *Departament de Ciències Ambientals, Universitat de Girona, Campus de Montilivi, 17071 Girona, Catalonia, Spain*
[b] *Avian Science Center, University of Montana, 32 Campus Drive, Missoula, MT 59812, United States*
[c] *Àrea de Biodiversitat, Centre Tecnològic Forestal de Catalunya, Carretera vella de Sant Llorenç de Morunys, km 2, 25280 Solsona, Catalonia, Spain*
[d] *Centre for Ecological Research and Applied Forestries (CREAF), Autonomous University of Barcelona, Bellaterra, Catalonia, Spain*

Birds as indicators of ecological change

- Birds are near the top of the food chain
- Need a diversity of habitat structures and seral stages to complete life cycle
- Easy to survey with one rapid repeatable protocol linked to vegetation data
- Respond quickly to change

Point Blue

Monitoring Question – ecological effectiveness

Did the quality/quantity of habitat for T&E, sensitive or desired species change?

Did the local abundance of T&E, sensitive or desired species change?

Point Blue

Methods

2004 Freds Fire

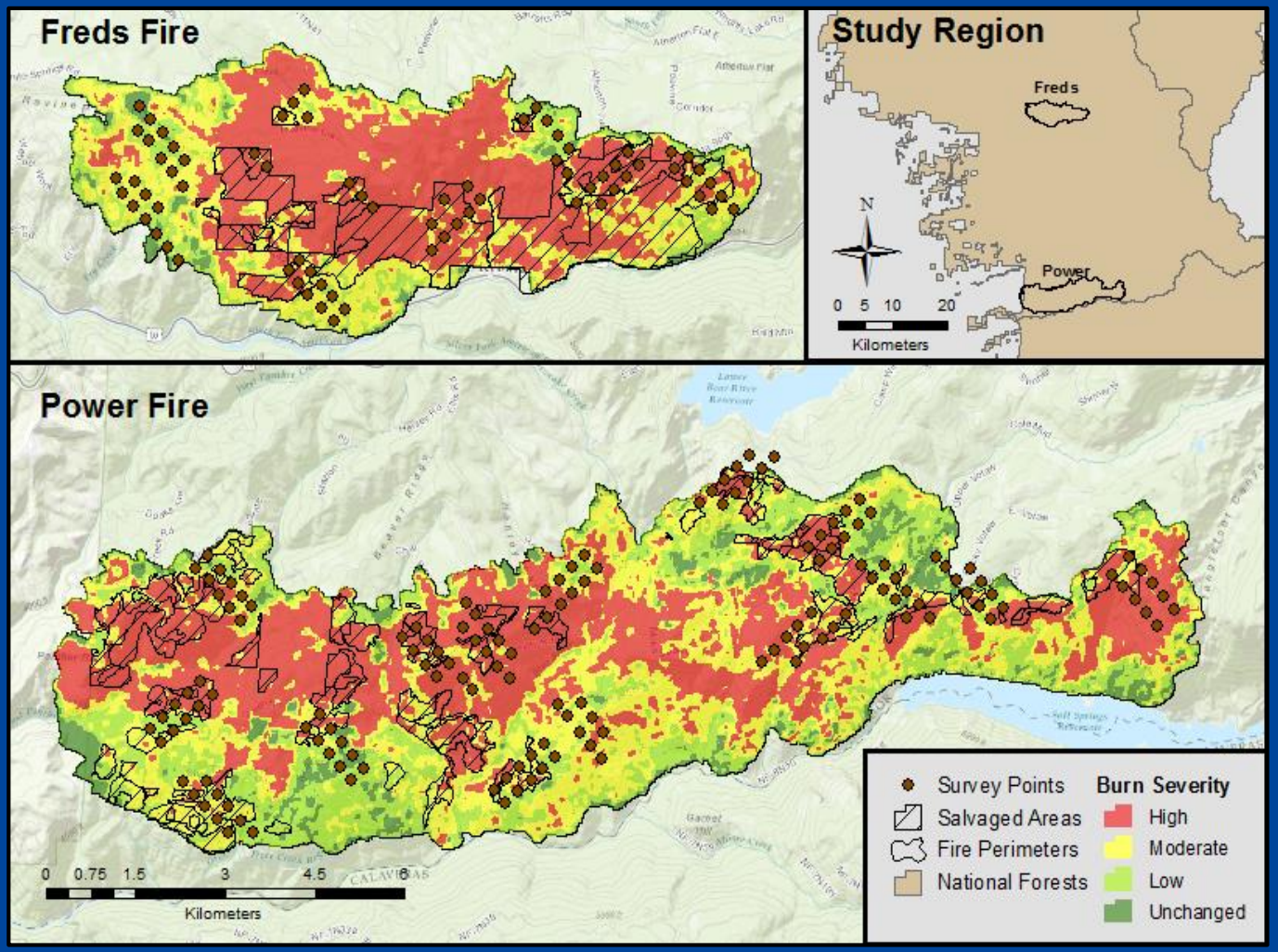
- 76 points

2004 Power Fire

- 148 points

<u>Surveyed for birds 2014-2016</u>

- Recorded all birds seen or heard
- Vegetation surveys 2014-2015



Point Blue

Analysis

Two mixed effects models looking at post-fire management

1. Abundance ~ year + salvage + severity + salvage*severity + replanting + 1|point

2. Abundance or richness ~ year + herbicide + BA snags + 1|point

Guild approach:

Early Seral Forest (ESF)	Post-fire Snag (PFS)	Open Mature Forest (OMF)
Mountain Quail	Lewis' Woodpecker	Western Wood-Pewee
Dusky Flycatcher	Hairy Woodpecker	Olive-sided Flycatcher
Spotted Towhee	Black-backed Woodpecker	Warbling Vireo
Green-tailed Towhee	White-headed Woodpecker	American Robin
Fox Sparrow	Northern Flicker	Nashville Warbler
Chipping Sparrow	House Wren	Yellow-rumped Warbler
Yellow Warbler	Mountain Bluebird	Chipping Sparrow
MacGillivray's Warbler	Western Bluebird	Black-headed Grosbeak
Lazuli Bunting		Western Tanager

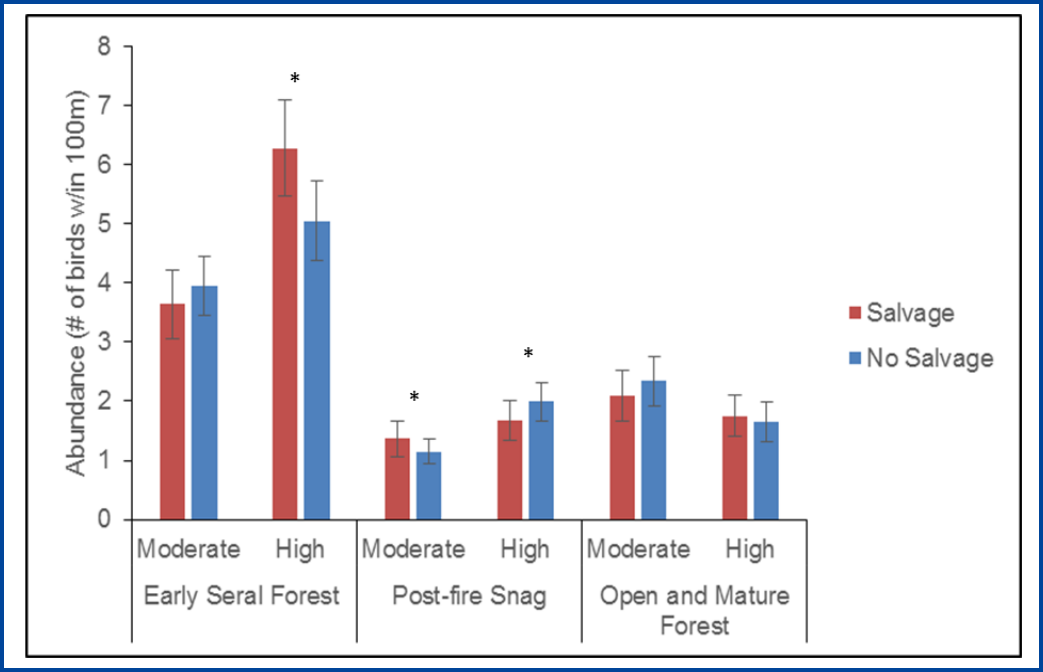
Results

Salvage

+ shrub birds at high severity

+ snag birds at moderate severity

- snag birds at high severity

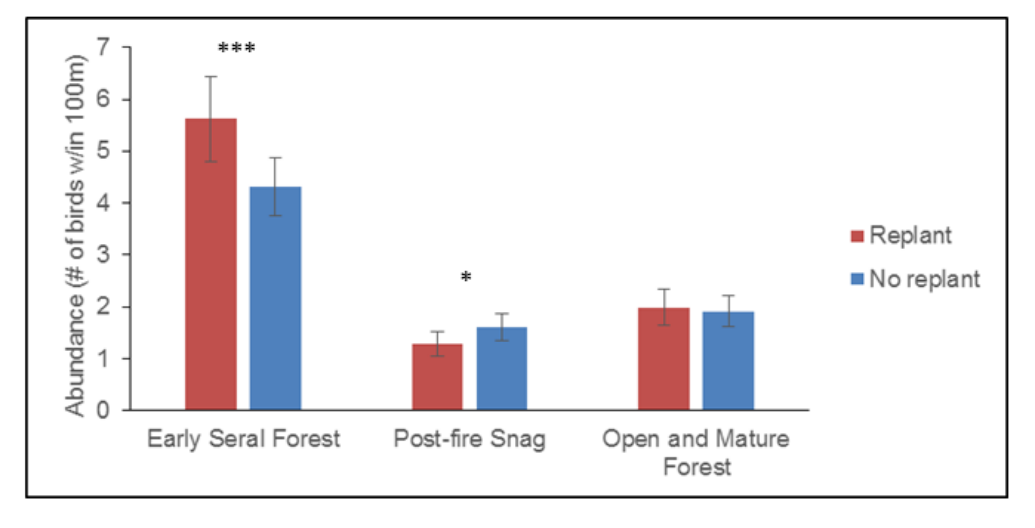


*Error bars = 95% confidence intervals; significance noted as *** = P < 0.001, ** = P < 0.01 and * = P < 0.05.*

Replanting

+ shrub birds

- snag birds

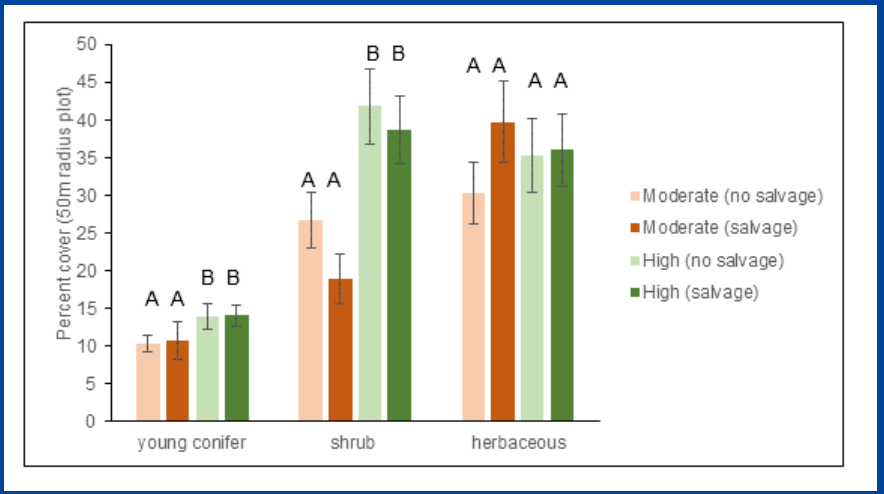


Point Blue

Vegetation variables

Most differed between moderate and high severity

Salvage vs. unsalvaged were similar EXCEPT more snags at unsalvaged points



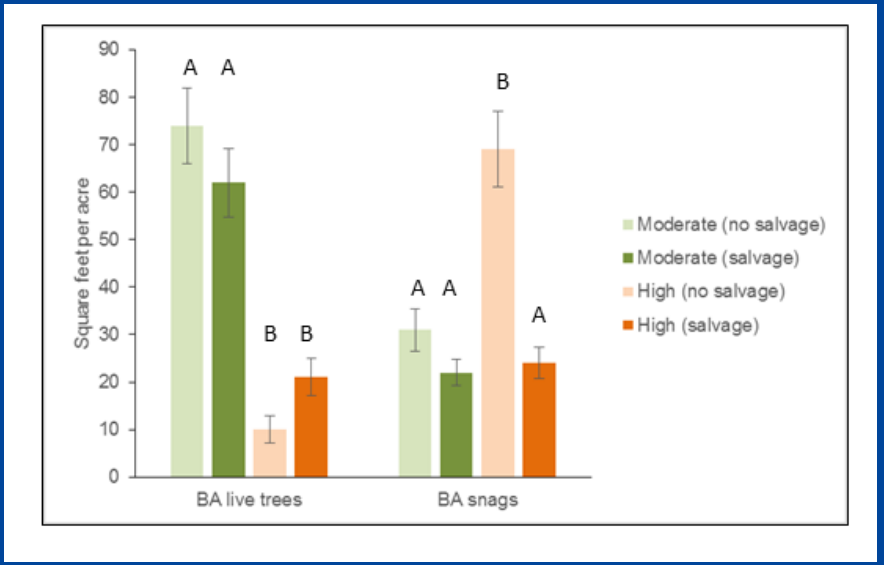


Figure 8. Differences in vegetation covariates at plots (N = 167) that had burned at moderate or high severity and salvage logged or left untreated. Letters above each covariate denote significant differences in burn severity or salvage logging ($P < 0.05$; two-way ANOVA). Error bars represent standard errors.

Point Blue

Herbicide Effects in Freds Fire

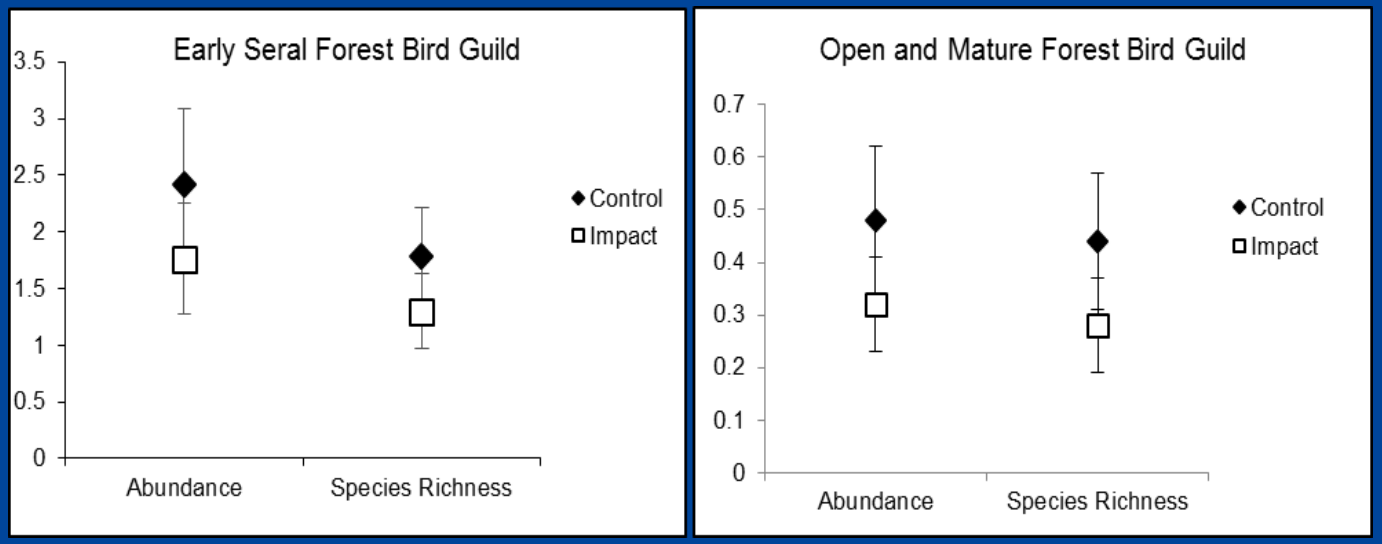


Figure 9. Early Seral Forest and Open and Mature Forest bird guild abundance and species richness (within 50m of the observer) for points affected by herbicide treatments and corresponding control points in the Freds Fire. Error bars are 95% confidence intervals

ESF abundance (*P*=0.05) and richness (*P*=0.04) higher at control points

OMF abundance (*P*=0.09) and richness (*P*=0.07) higher at control points

Shrub cover averaged 43% (SD=30) at control sites and 8% (SD=7) at treated sites

Point Blue

How can we interpret these results?

Habitat Associations Models

+ shrub cover

+ snags

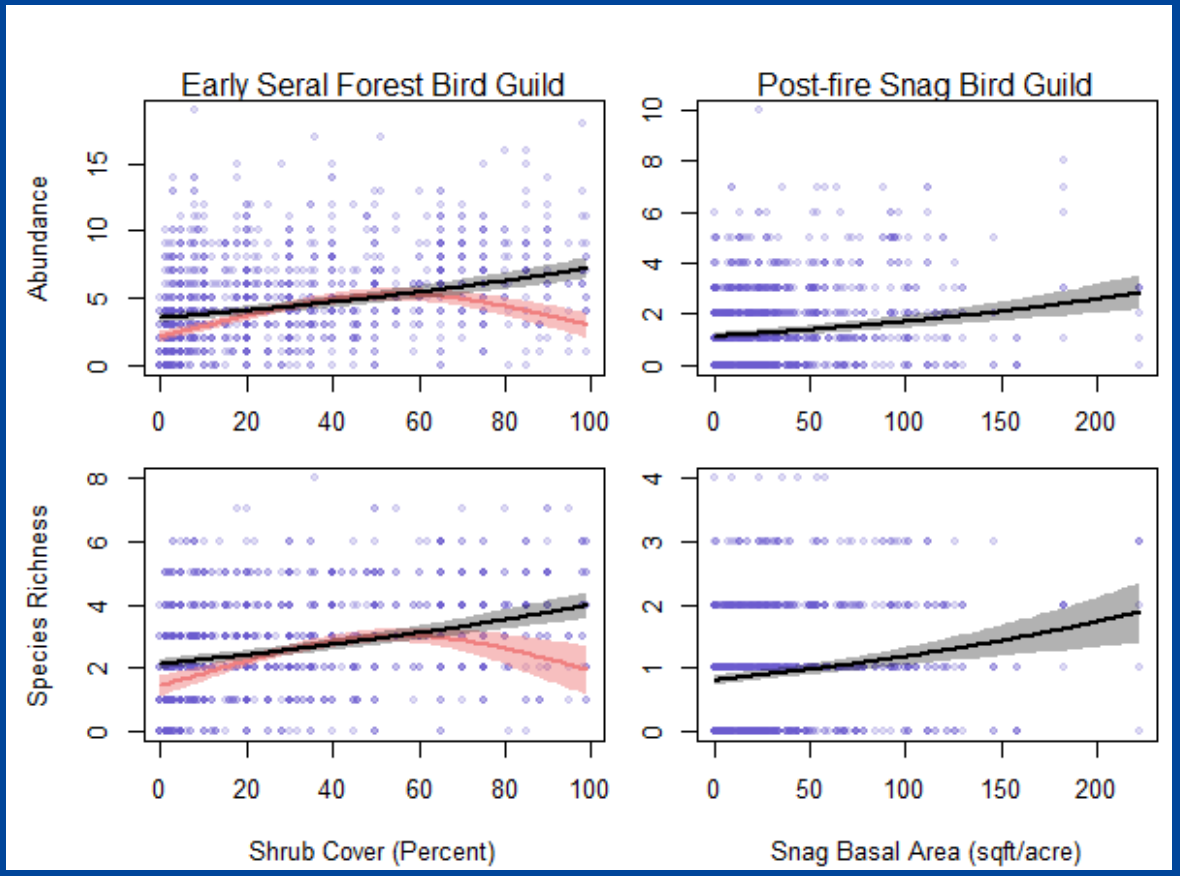


Figure 4. Marginal effects of select predictor variables on guild abundance (within 100m of the point; top row) and species richness (within 100m of the point; bottom row). Plots in the left column show alternative models of linear (gray curve) and quadratic (red curve) relationships between shrub cover and the Early Seral Forest bird guild. The right column shows modeled linear relationships between snag basal area and the Post-fire Snag bird guild. 95% confidence intervals of effect estimates (red and gray shaded areas) are also shown.

Point Blue

High Severity Patch Size

What is the effect of distance to edge of high severity patch for the bird community?

- Unmanaged areas

Edge Lovers: Western Tanager, Western Wood-Pewee, Olive-sided Flycatcher, Yellow-rumped Warbler

Edge Avoiders: House Wren, Green-tailed Towhee, Lazuli Bunting, Fox Sparrow, Bewick's Wren

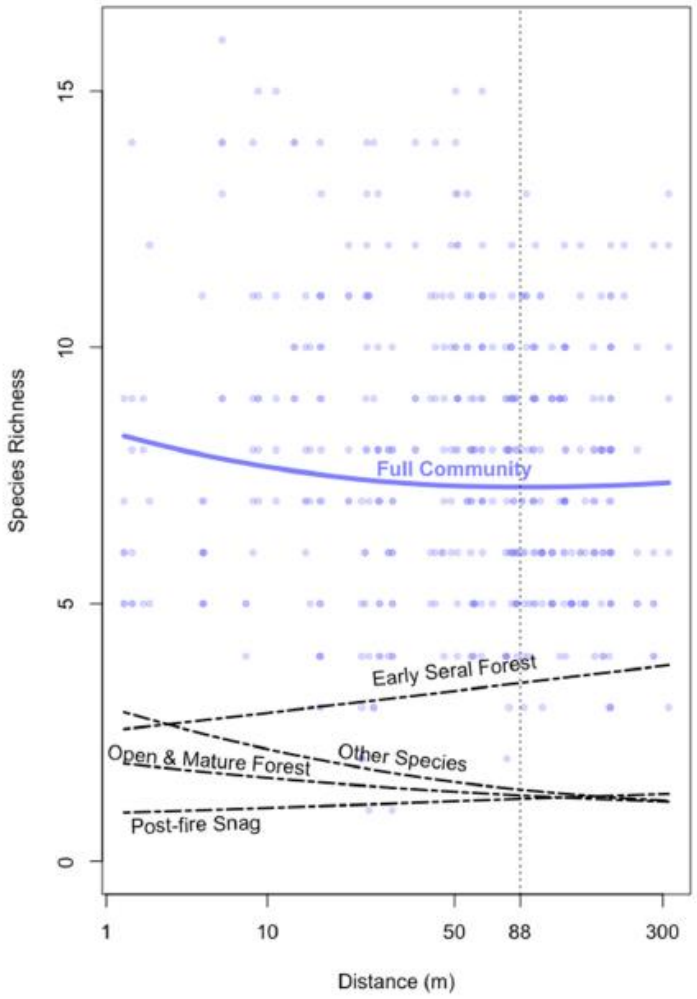


Figure 6. Modeled effect of distance to high severity edge on species richness. Blue points represent individual surveys within unmanaged high severity areas, and the blue curve represents the mean predicted richness across the range of distances sampled. The predicted richness of each of our three focal guilds and the non-focal species combined are also plotted as dashed lines. The summed area under the guild curves is equal to the full community curve above. The distance at which community richness is predicted to be at a minimum is indicated by a vertical dotted line.

Point Blue

Summary … 10-12 years post-fire

Salvage logging had a positive effect on the shrub-nesting birds

Salvage in high severity areas had a negative effect on cavity nesters but a positive effect in moderately burned areas

Replanting had a positive effect on the shrub-nesting birds

Replanting had a negative effect on the cavity-nesting birds

Recent herbicide treatments had a negative effect on shrub and open mature forest birds

Edges of high severity patches hold higher bird diversity

Shrub-associated species prefer interior high severity patches

Point Blue

How can we use this information?

Salvage

Higher snag retention, especially of those tree species and size classes that stand longer

Ensure snags are retained in patches to help break up the homogeneity of a salvaged, replanted stand

Salvage is good for the shrub birds possibly because they are adapted to take advantage of shrub fields that burn repeatedly at high severity

How can we use this information?

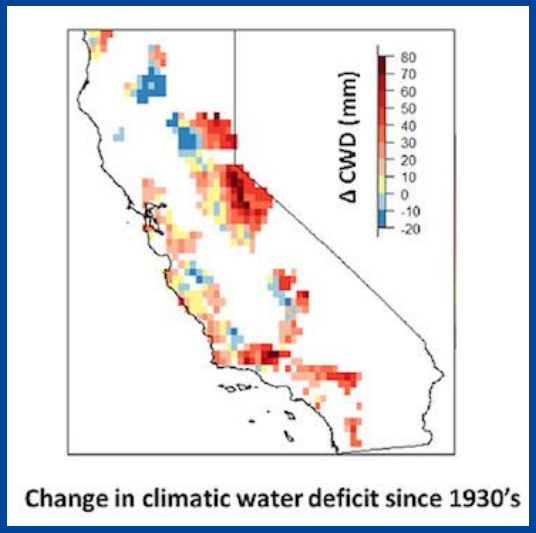
Accelerating forest cover and controlling competition

Target treatments near mature tree patches to reduce fuels in the event of future high-severity fire

Target replanting and competition control treatments where conifers will occur under future climate projections

Complete treatments outside the nesting season

Consider using prescribed fire or managed wildland fire to control fuels



Change in climatic water deficit since 1930's

McIntyre et al. 2015. PNAS 201410186

Learn More

Google ‘Sierra Nevada Postfire Avian Monitoring’

http://data.prbo.org/apps/snamin/index.php?page=fire-home-page

Thank You!

Funded and supported by Eldorado National Forest

Becky Estes, Chuck Loffland, Rick Hopson, Dawn Lipton, Tony Valdes

Numerous intrepid field technicians

Point Blue