



Great Basin LCC Webinar Series

Relations among cheatgrass-driven fire, climate and sensitive-status birds across the Great Basin





"When you have a time
when you're sitting back and
thinking, and you're trying
to go to sleep, and you're
thinking what is really the
best thing you'd like to see,
I can see the desert. To me
that's such starkness, that's
such beauty. And there's no
place in America that
represents what I think is
beauty more than this Basin
and Range."

—Harry Reid



Objectives



David Pavlik

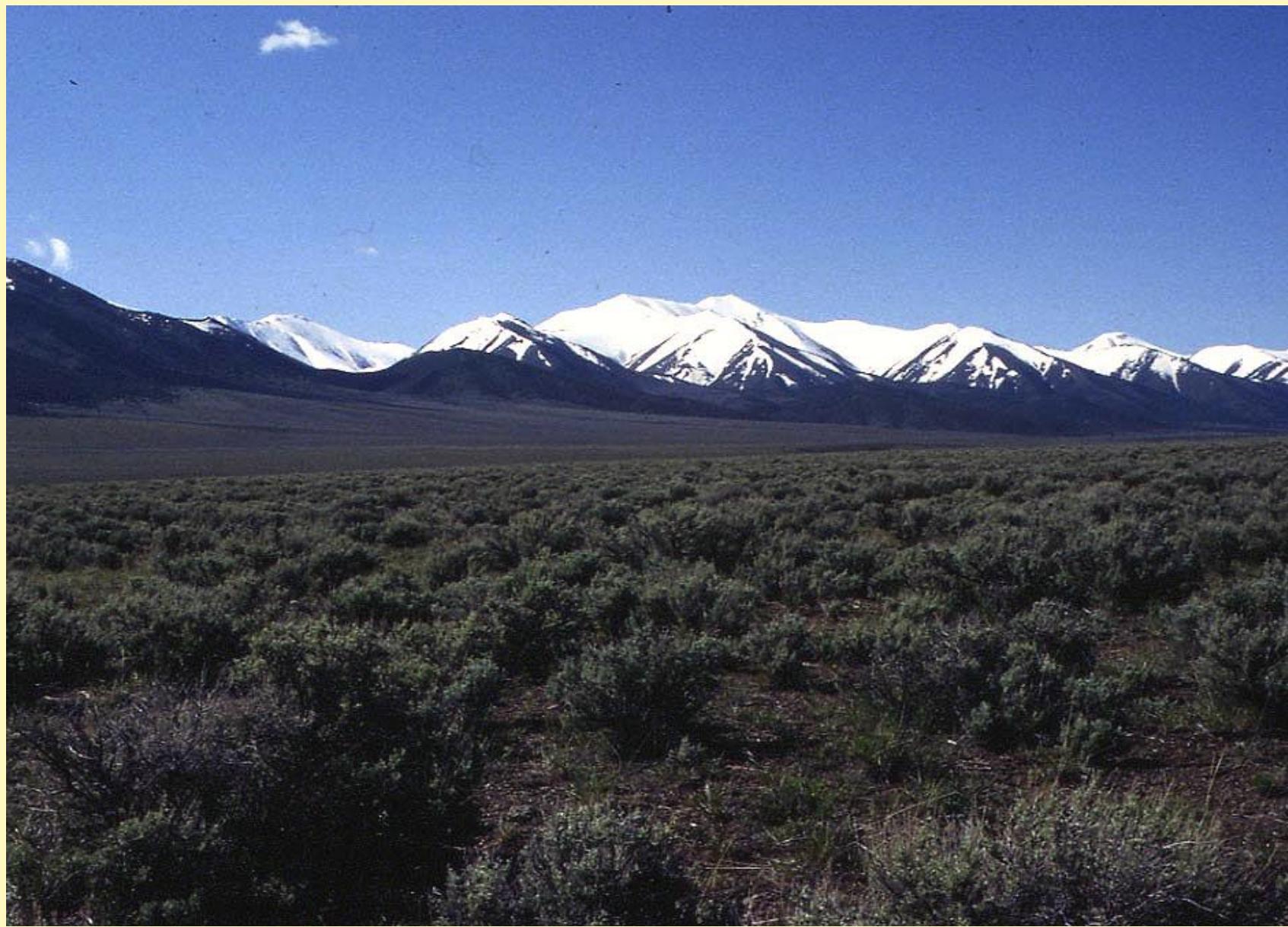
- Model current and future (to 2050) spatial interactions among cheatgrass cover and biomass, precipitation, and fire
- Model current and future cover of sagebrush and herbaceous vegetation
- Examine how projected natural and anthropogenic environmental changes may affect habitat quality for and occupancy of breeding birds in diverse vegetation types

Collaborators and sponsors

- Jennifer Balch
- Bethany Bradley
- Caroline Curtis
- David Dobkin
- Frank Fogarty
- Emily Fusco
- Todd Hopkins
- Ned Horning
- Kavi Koleini
- Matthias Leu
- Ralph Mac Nally
- Russ Norvell
- Mike Pellatt
- John Peterson
- Matt Williamson
- Martha Wohlfeil
- Joint Fire Science Program
- Northwest Climate Science Center
- Southwest Climate Science Center
- Strategic Environmental Research and Development Program
- National Fish and Wildlife Foundation
- Nevada Biodiversity Initiative
- Wilburforce Foundation



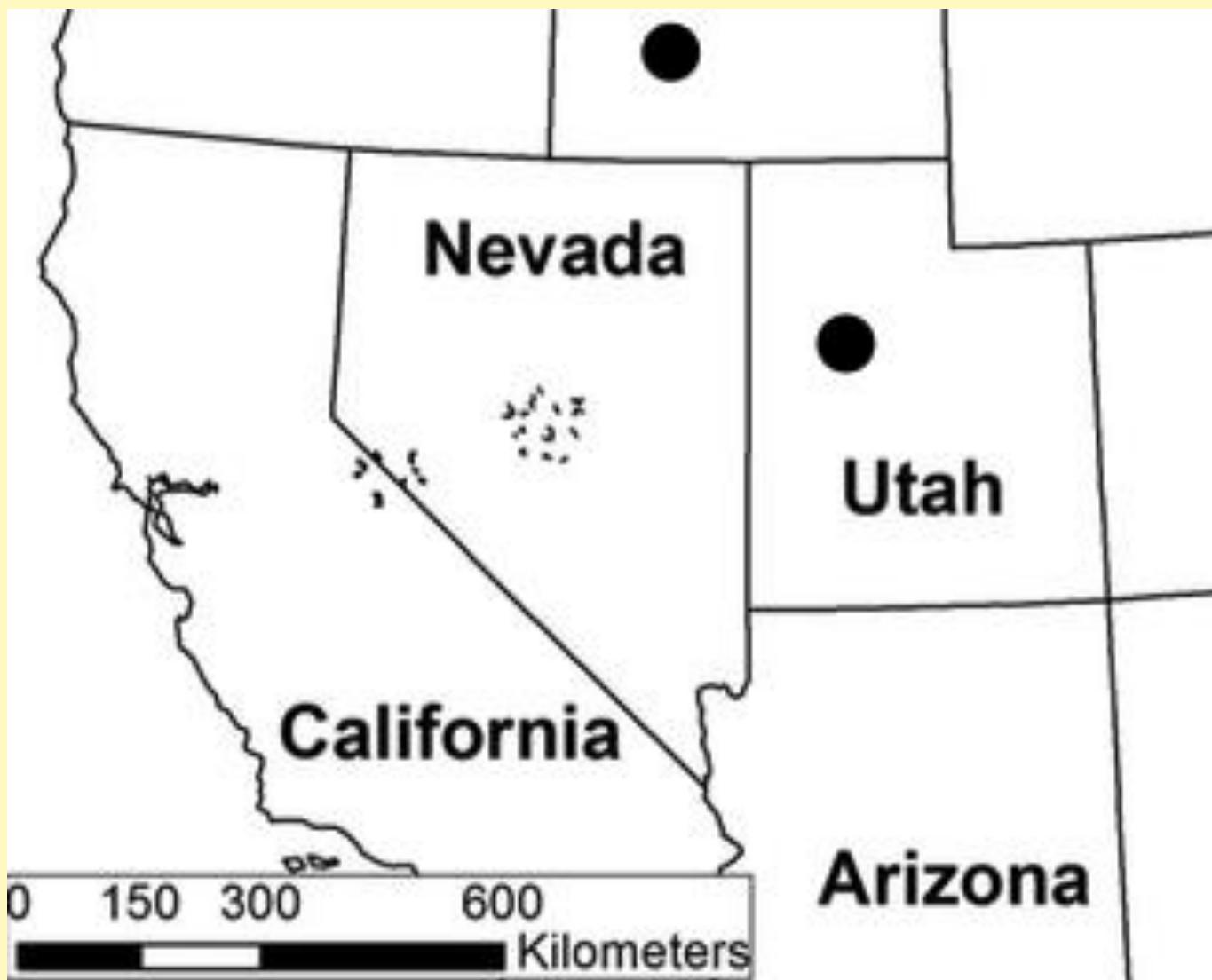
Frank Fogarty



















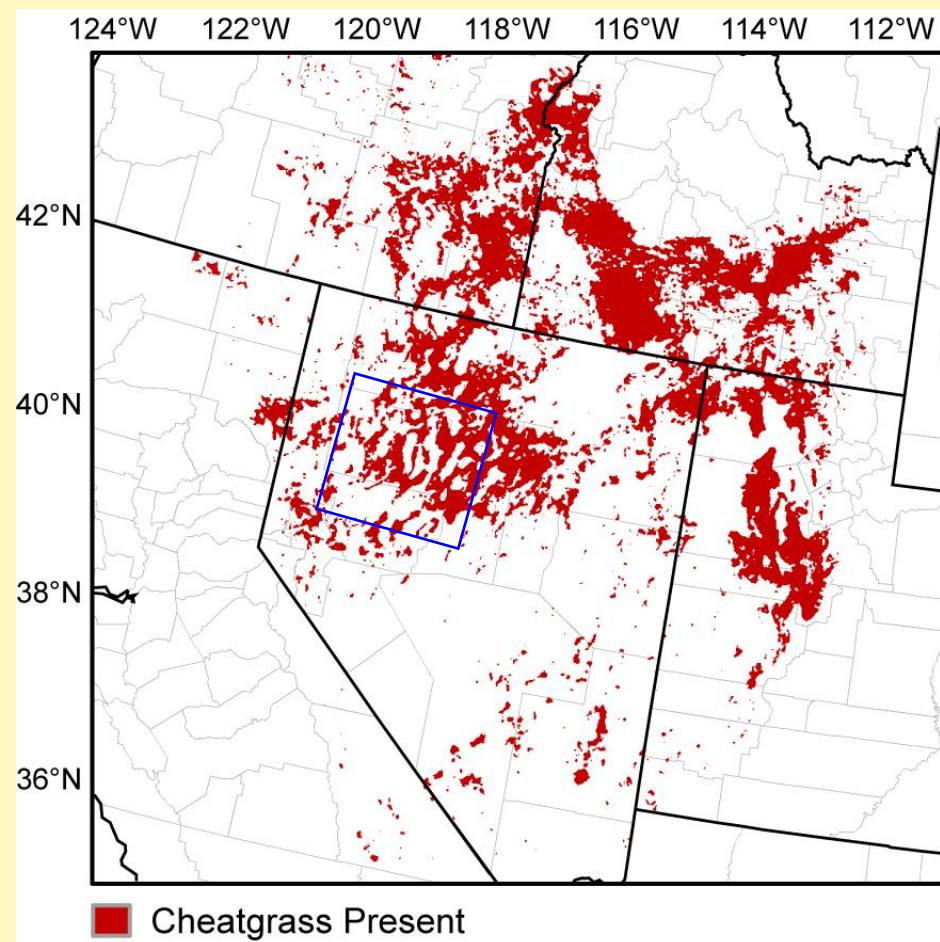
Model accuracy depends on the response variable

- Regional models explained 34% of the variation in continuous percent cover of cheatgrass
- Models of high and low abundance that were based on a criterion of 15% cover for high abundance had 74% accuracy

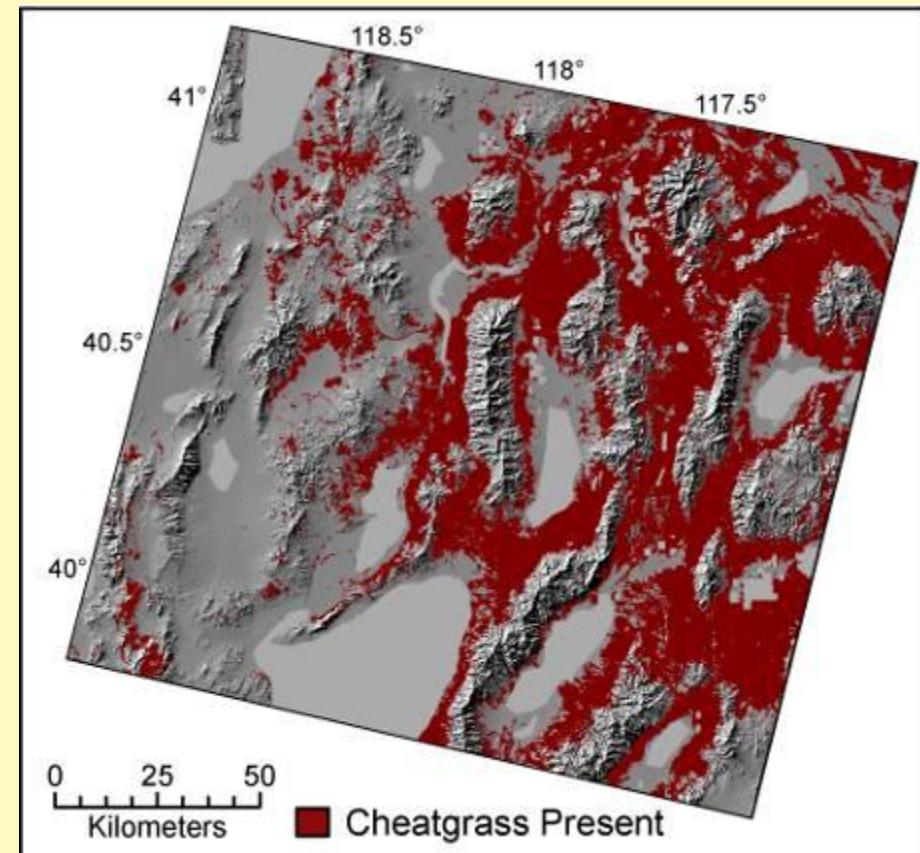


Cheatgrass cover is $\geq 15\%$ over 210,000 km 2 of the Intermountain West

AVHRR data



Landsat data



Changes in fire dynamics



- Areas with high abundance were twice as likely to burn as those with low abundance
- Four times as likely to burn multiple times
- Fires occurred about 10 days earlier in areas with high abundance of cheatgrass
- Fire probability increased considerably at 1–5% cover



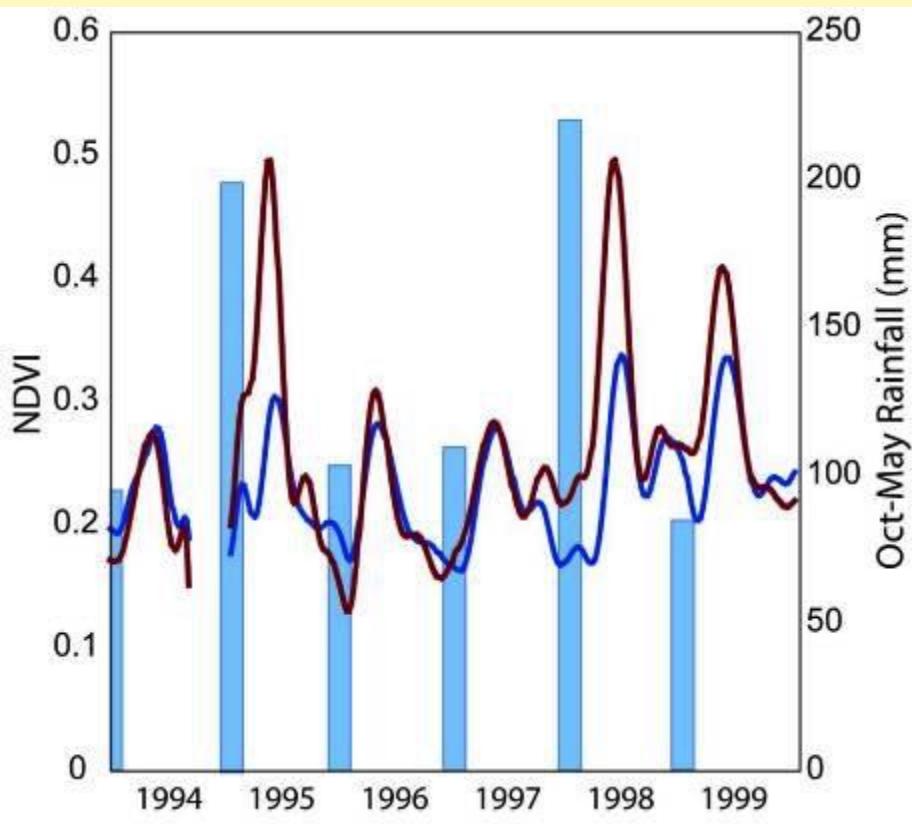
Annual variability

10 times denser
following wet years
than dry years

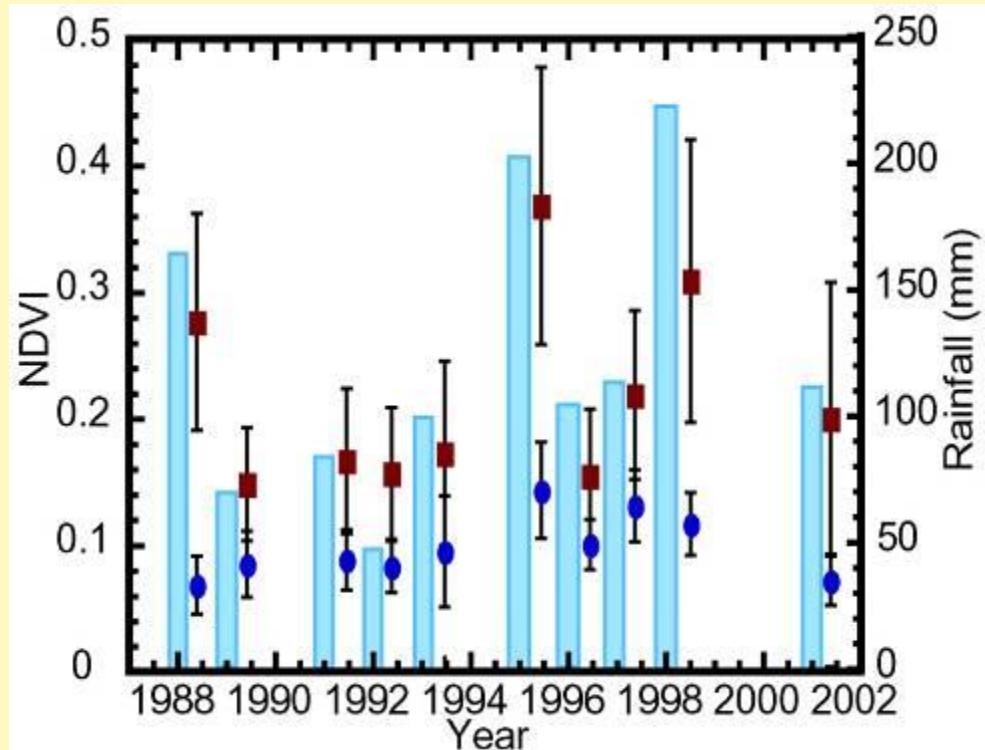


Remote detection of cheatgrass

AVHRR time series



Landsat time series

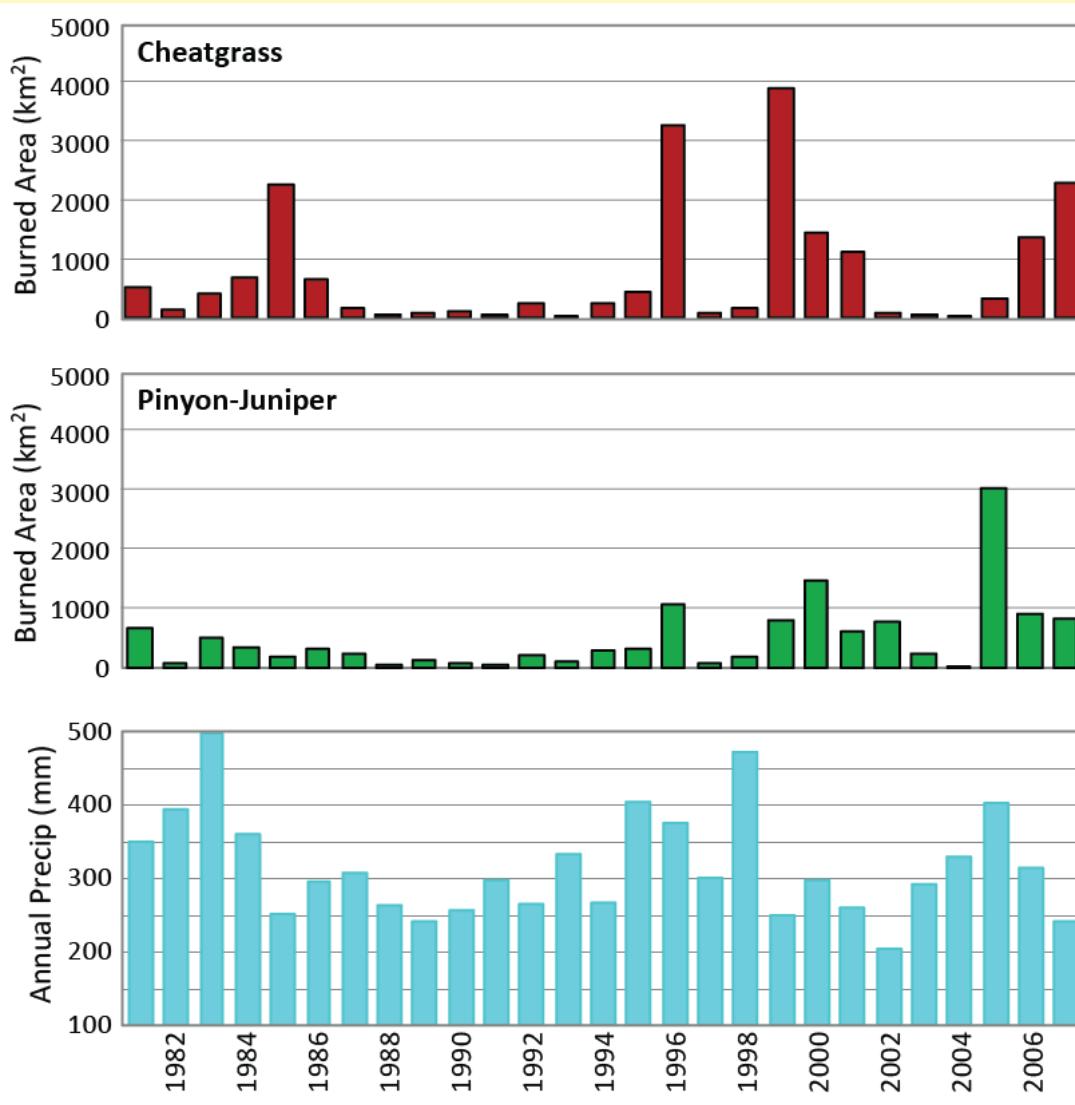


Oct-May precipitation

Cheatgrass

Sagebrush

Climate-fire interactions



- Fires in cheatgrass were related to antecedent wet years ($R^2 = 0.27$)
- Fires in woodlands less so ($R^2 = 0.09$)



Occurrence of cheatgrass

All points

- Elevation (-)
- Burned (+)
- Winter (October–March) precipitation (+)

Not-burned points

- Elevation (-)
- Spring (April–June) precipitation (-)
- [Winter / (winter + spring)] precipitation (+)



Abundance of cheatgrass, all points



- Elevation (+)
- Burned (+)
- Proportion of years grazed (+)
- Winter precipitation (+)
- Perennial grass abundance (-)
- Spring precipitation (-)
- [Winter / (winter + spring)] precipitation (-)



David Pavlik

- Conventional assumption that “sage grouse hate trees” is based on limited and short-term evidence
- Greater Sage-Grouse can move through dense conifers, feed in conifers, and nest under conifers if sagebrush is low quality
- 20–75 years for reestablishment of habitat structure after disturbance
- Many other species are associated with juniper or pinyon and juniper
- Removal of conifers can lead to expansion of cheatgrass



David Pavlik

Central and western Great Basin data

- Central Great Basin: data from 2001–2015, 27 canyons, 4–21 points per canyon
- Western Great Basin: data from 2012–2017, 13 canyons, 8–20 points per canyon
- 100-m radius points, 3 visits
- Point-level covariates: topography, vegetation structure, weather
- Canyon-level covariates: elevational range, area, riparian fragmentation



David Pavlik

- Riparian areas are expected to contract and fragment in the future
- How does the size or fragmentation of riparian areas affect species and communities?



David Pavlik

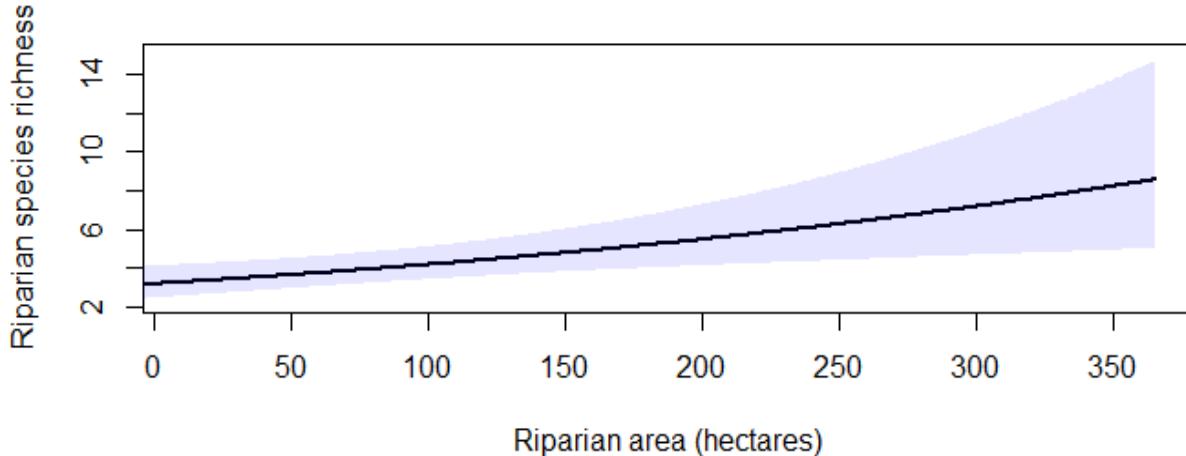
Inferences to date



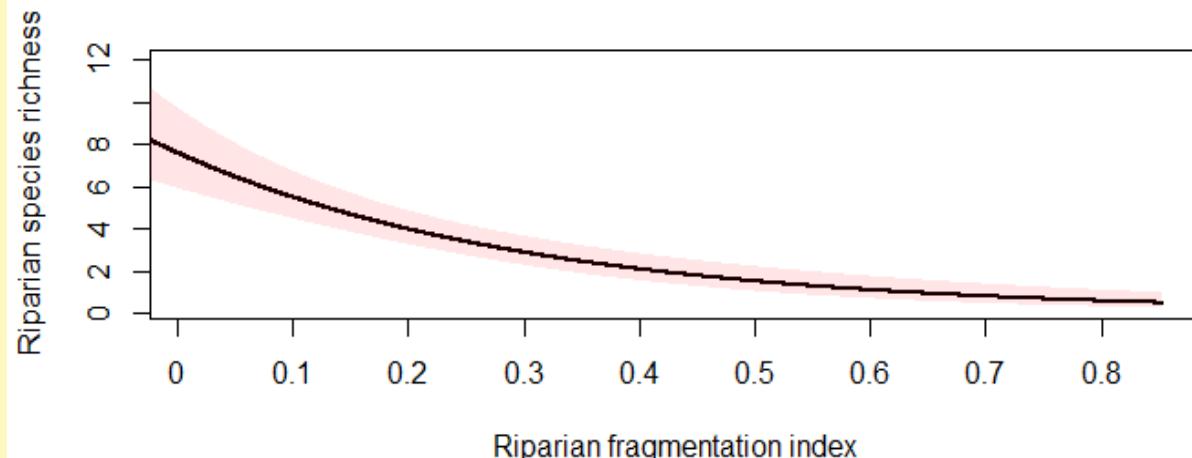
- For species richness and most individual species' detections
 - Positive effect of riparian area
 - Negative effect of fragmentation
- Fragmentation explained more variance than area
 - Total and riparian species richness
 - 11 of 16 individual species
- Magnitude of effects varies among species

Species richness, 19 riparian species

Modeled effect of riparian area on riparian species richness



Modeled effect of riparian fragmentation on riparian species richness

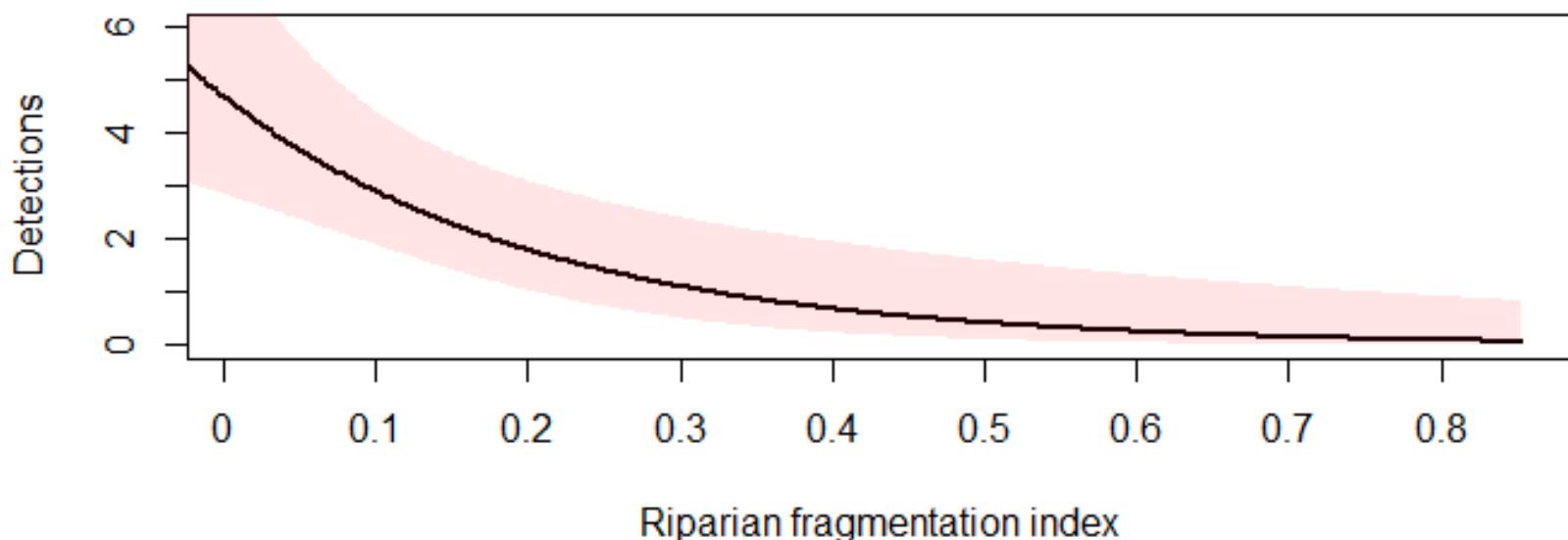


- Larger effect and greater confidence in estimates of effect of fragmentation
- Fragmentation is associated with a more rapid, exponential decline
- No obvious thresholds

MacGillivray's Warbler



Modeled effect of riparian fragmentation on detections

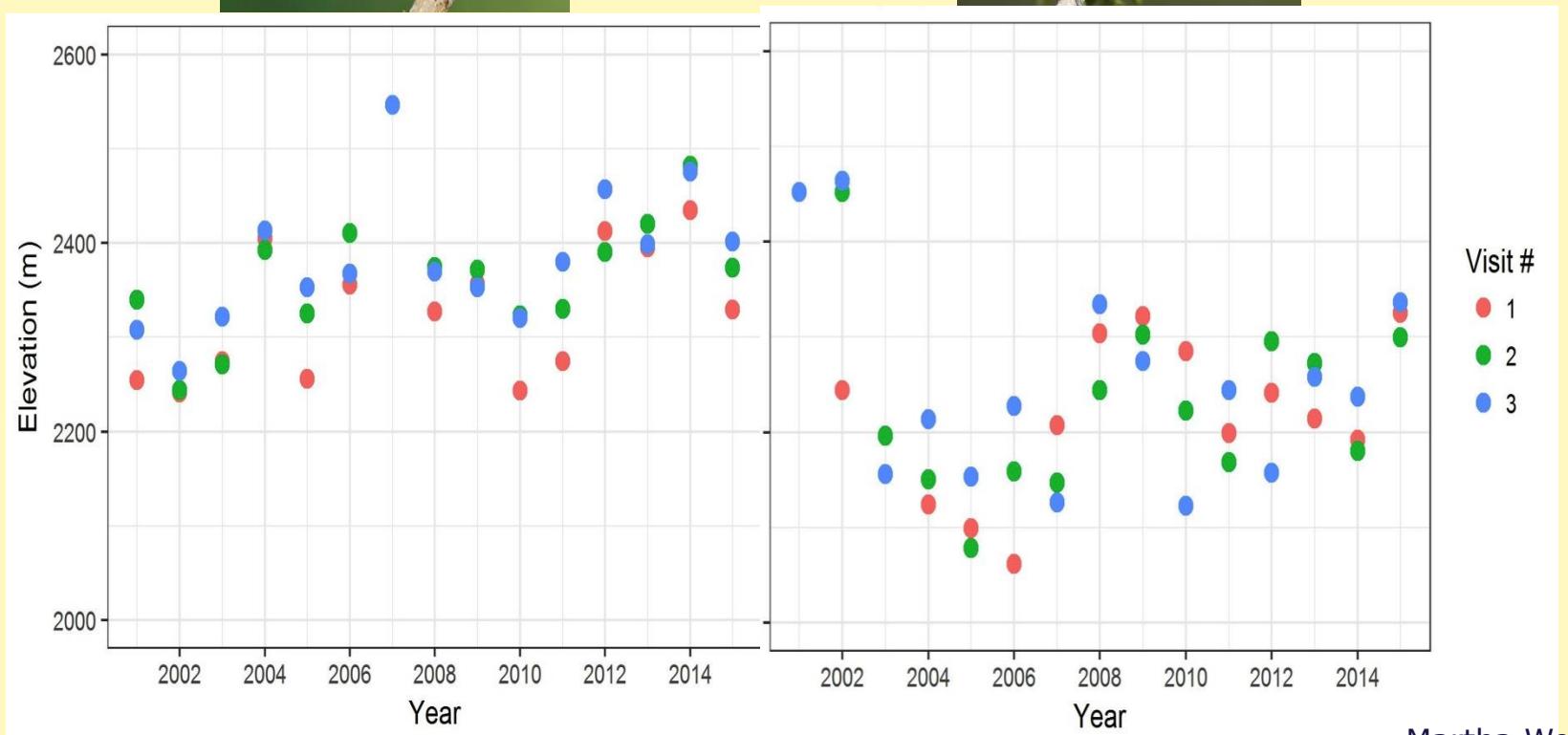


Within-season elevational movement

Warbling Vireo



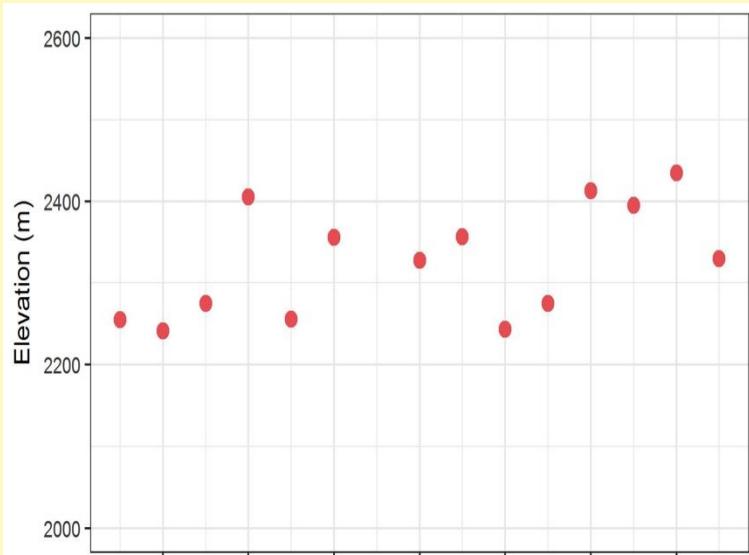
Blue-gray Gnatcatcher



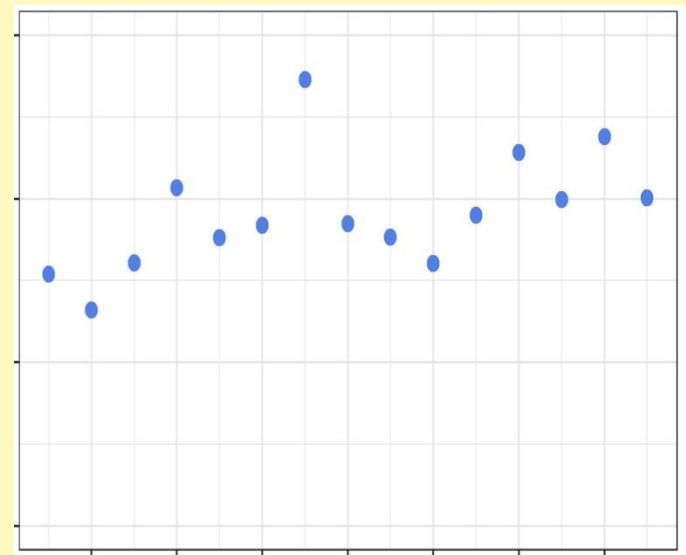
Visit 1



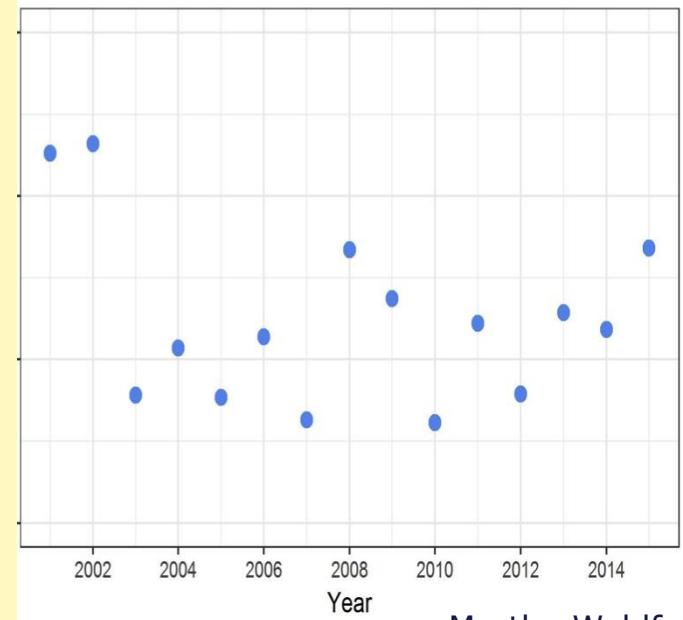
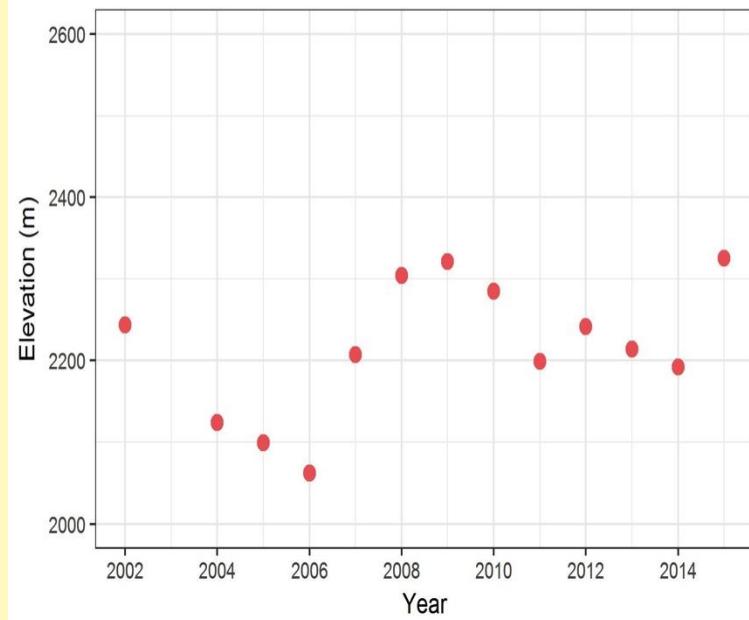
Apparent
upslope
movement



Visit 3

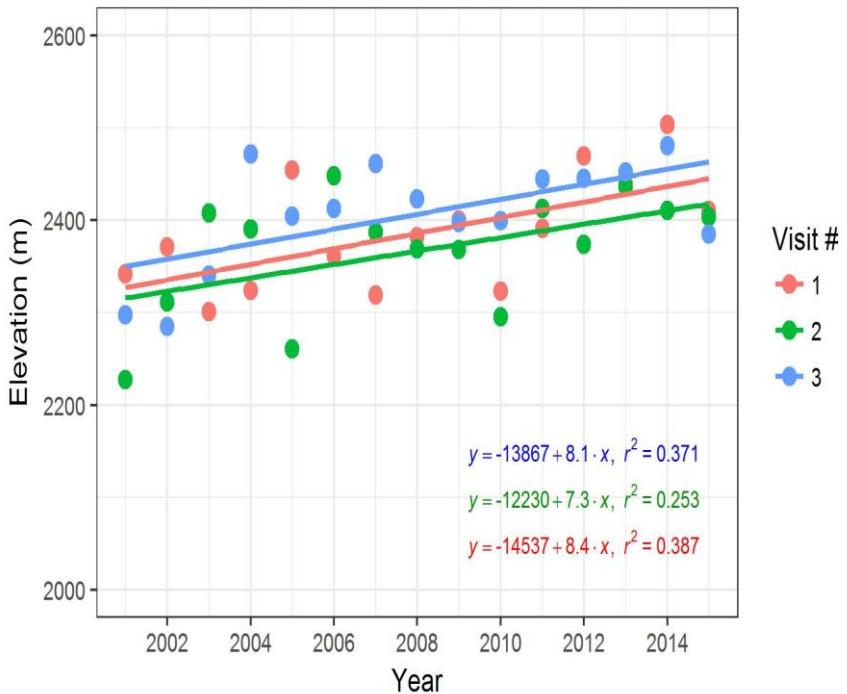


No
apparent
movement

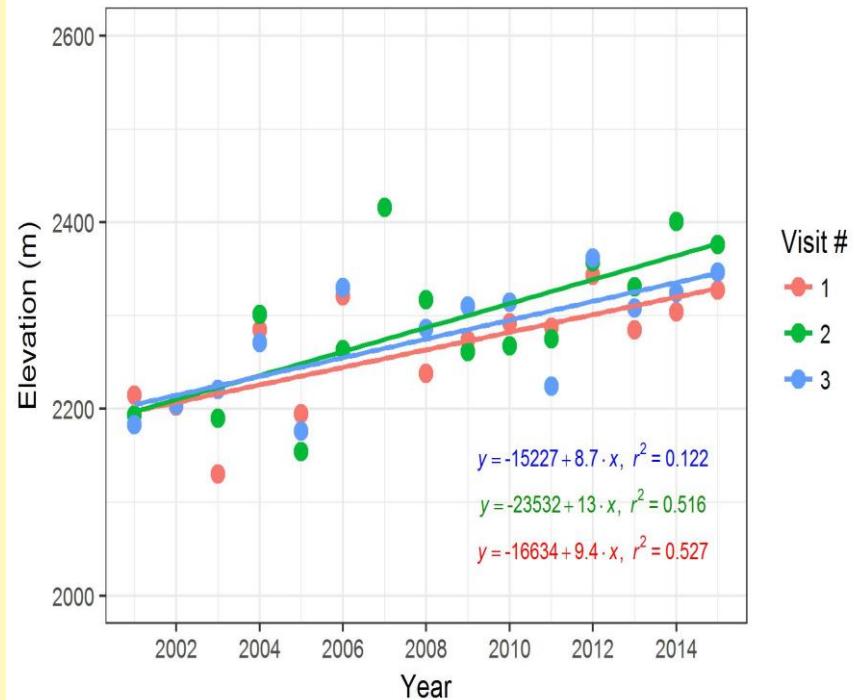


Elevational movement among years

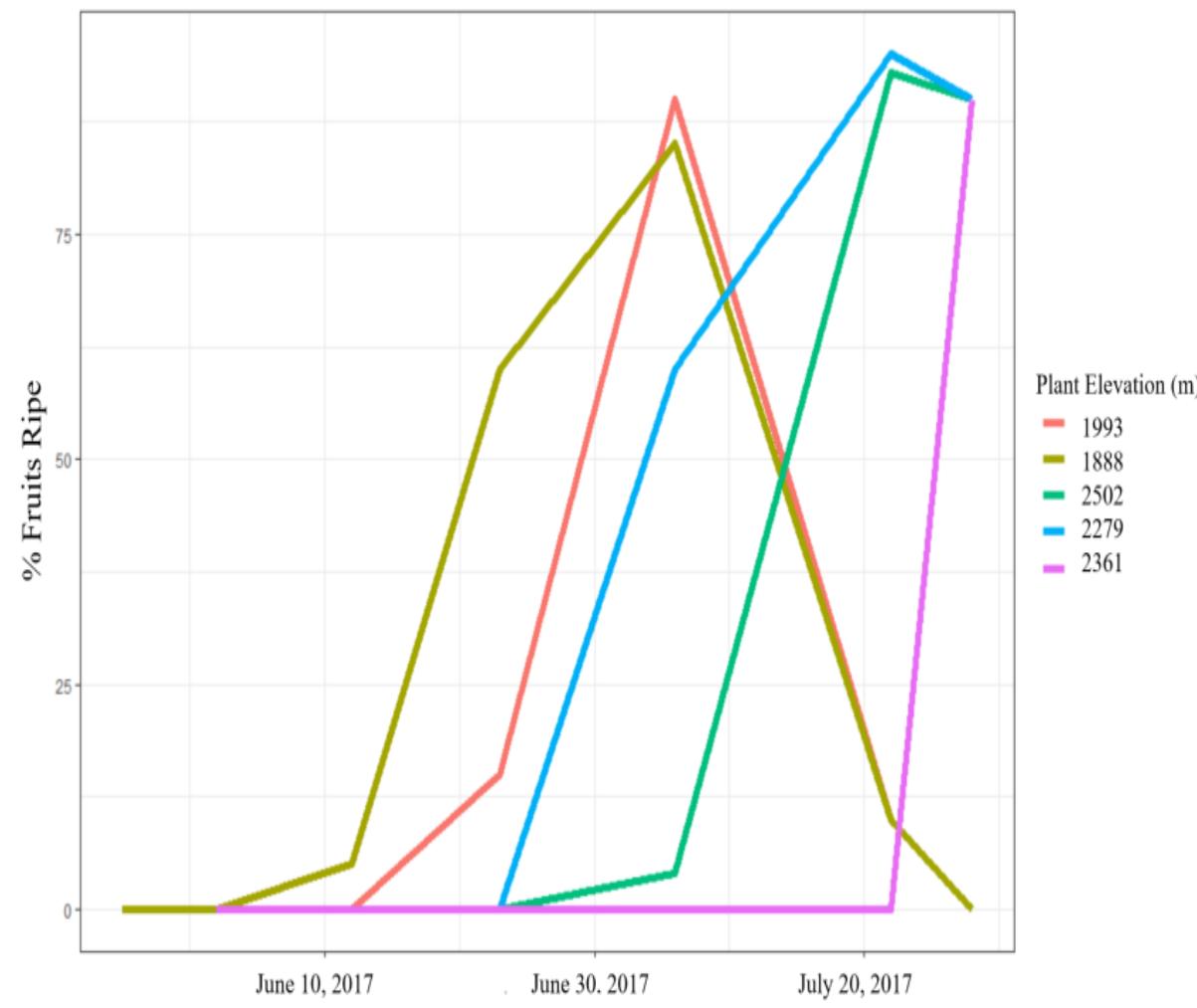
MacGillivray's Warbler: Central Great Basin



Yellow Warbler: Central Great Basin



Elevational movement may reflect plant or insect phenology





RELATIONS AMONG CHEATGRASS-DRIVEN FIRE, CLIMATE AND SENSITIVE-STATUS BIRDS ACROSS THE GREAT BASIN

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A recording of today's webinar and slides from the presentation will be available at www.GreatBasinLCC.org.

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