

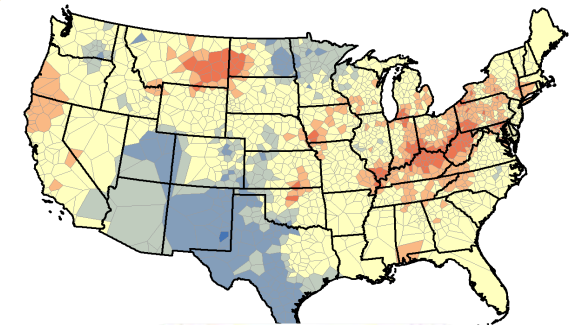
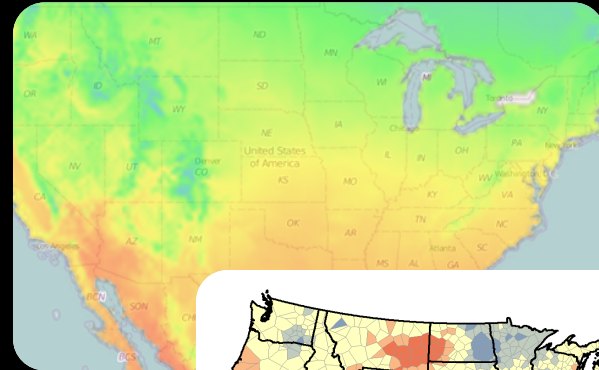
Effects of extreme climate events on avian demographics

P. Heglund, A. Pidgeon, R. Akcakaya, T. Albright,
A. Allstadt, B. Bateman, C. Flather, J. Gorzo,
W. Thogmartin, S. Vavrus, A. Venegas, and
Volker C. Radeloff

US Fish and Wildlife Service, USGS, US Forest Service
University of Wisconsin-Madison,
et al.,

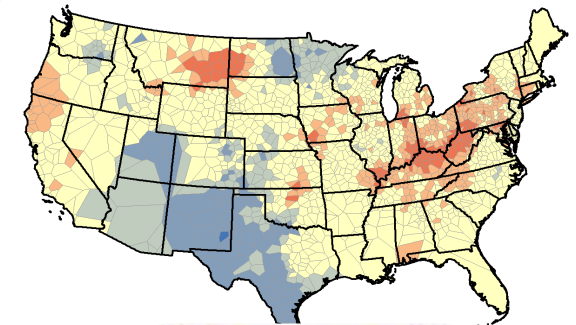
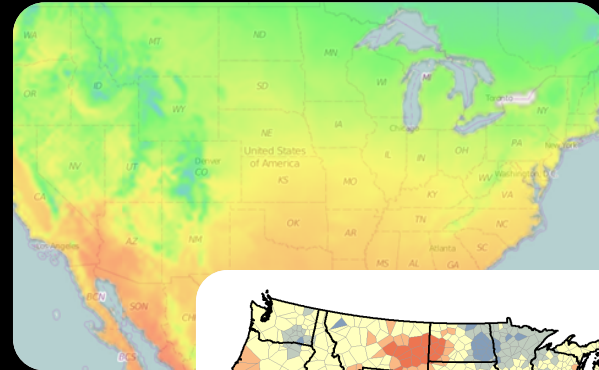
Outline

- I. Extreme climate events
- II. Bird population response
- III. Conservation implications



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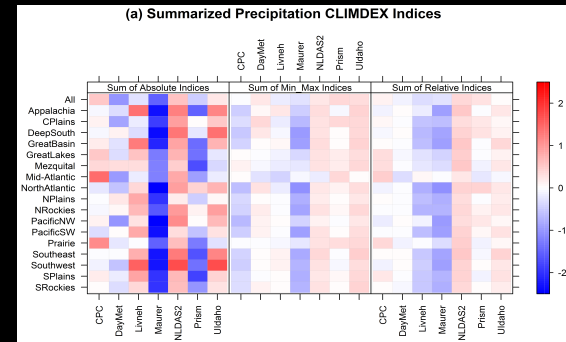


Extreme climate events

Index	Weather Station Data		Climate Model Data BCCA, 19 CMIP5 GCMs, RCP45 and RCP 85	
	Daymet 1980 – 2014 1-km, daily	Maurer 1949 – 2010 12-km, daily	BCCA, 1950 - 2000 12-km, daily	BCCA, 2006 - 2100 12-km, daily
BIOCLIM, annually	Done	Done	Done	Done
CLIMDEX ETCCDI	Done	Done	Done	Done
Monthly and seasonal summaries	Done	Done	Done	Done
SPI	Done	Done	Done	Done
STI	Done	Done	Done	Done
SPEI	Not planned	Done	Done	Done
False springs	Not planned	Done	Done	Done

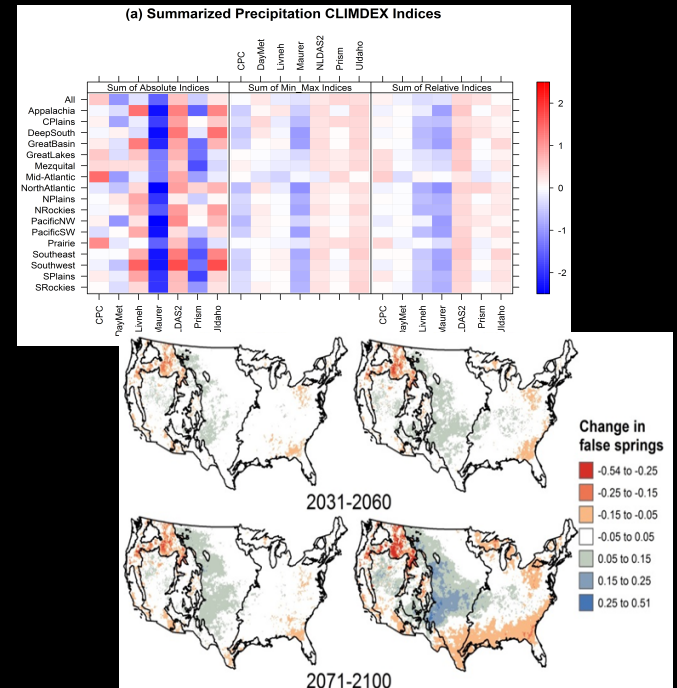
Extreme climate events

- Behnke, et al. Evaluation of downscaled, gridded climate data ... *Ecological Applications*, in press.



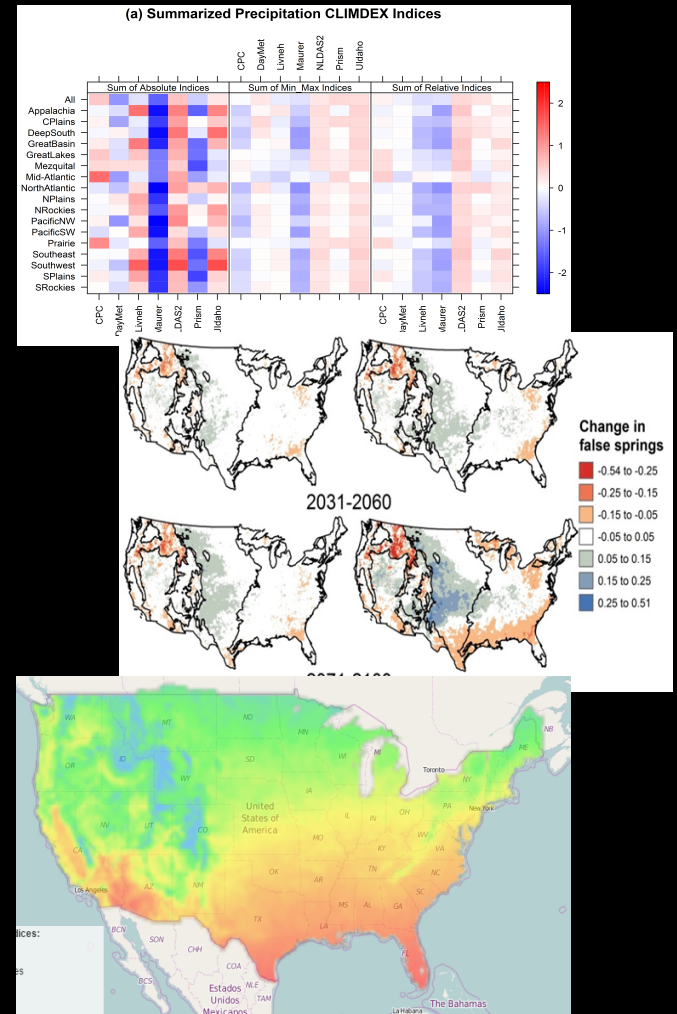
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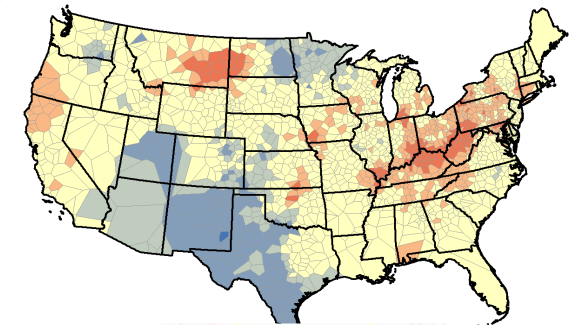
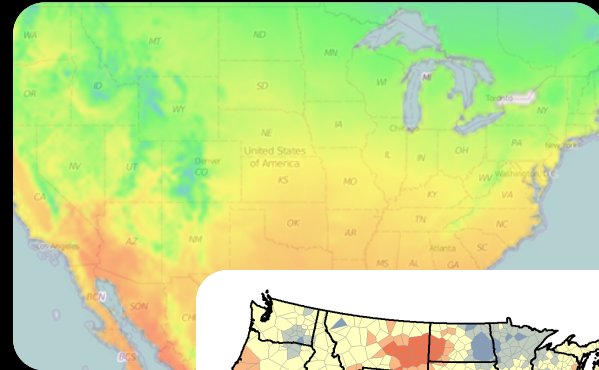
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- Allstadt, et al. *Ecology*, data paper, in review.

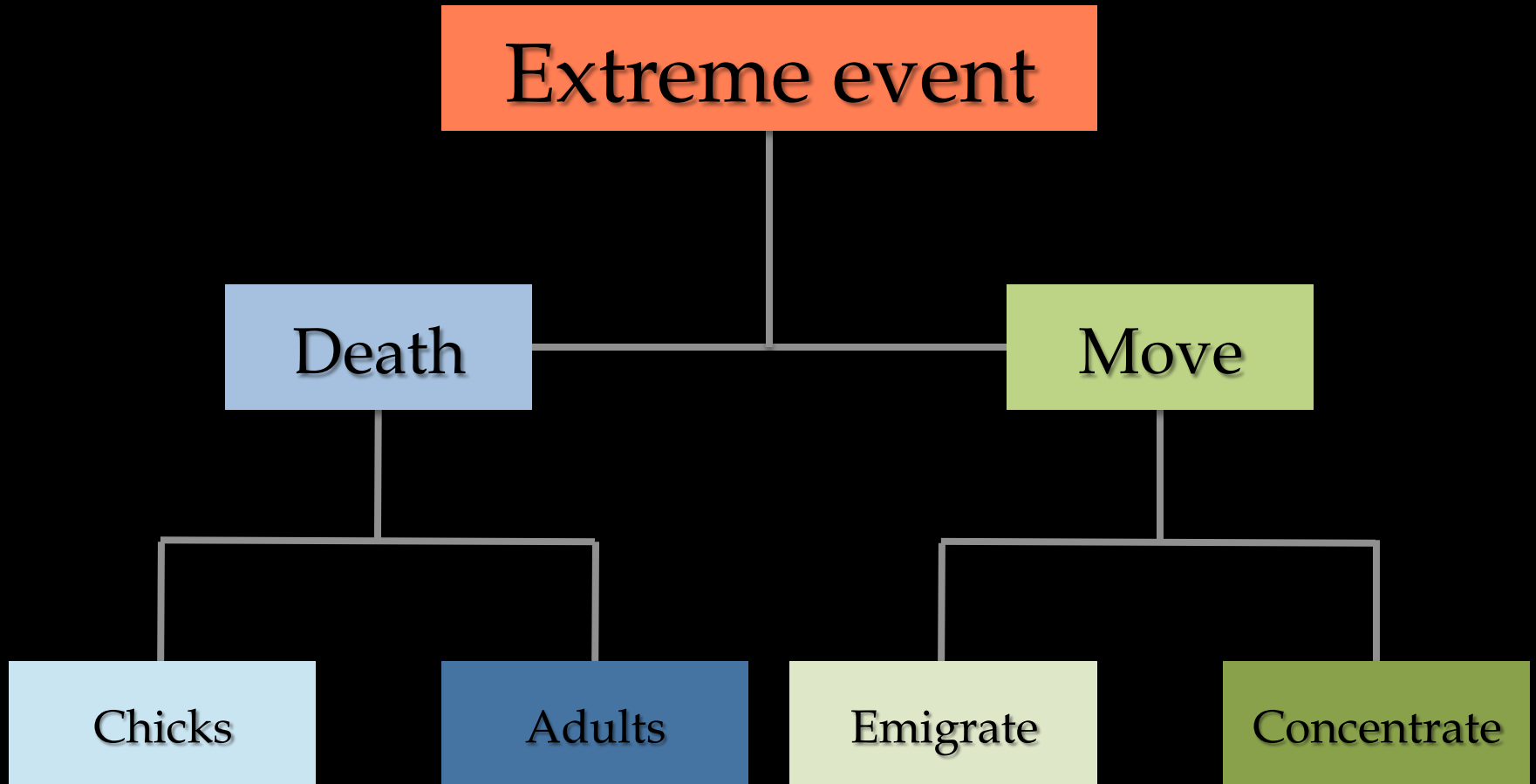


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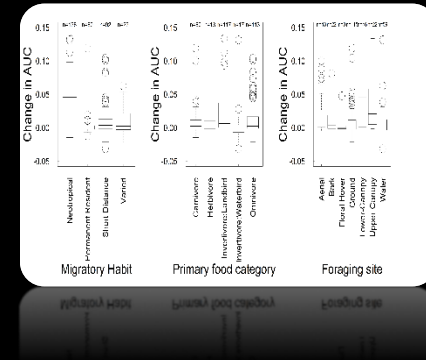


Bird population responses



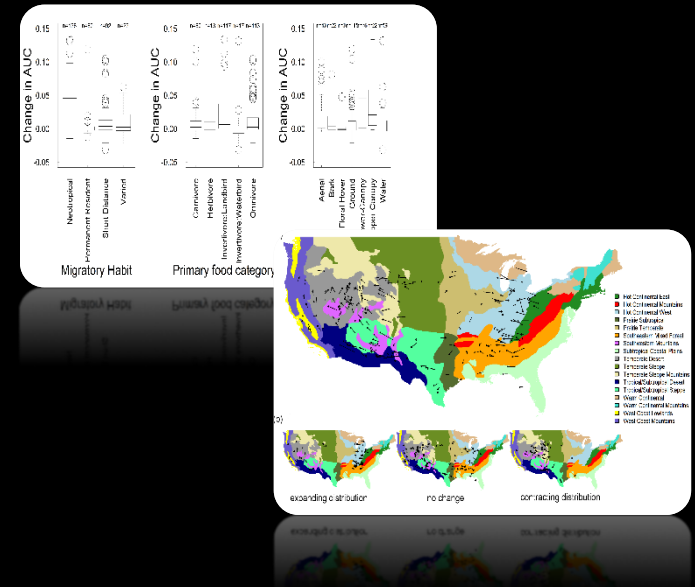
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- Bateman, et al., Long- vs. short-term climate variability and birds. *EcoApps*, *in press*.



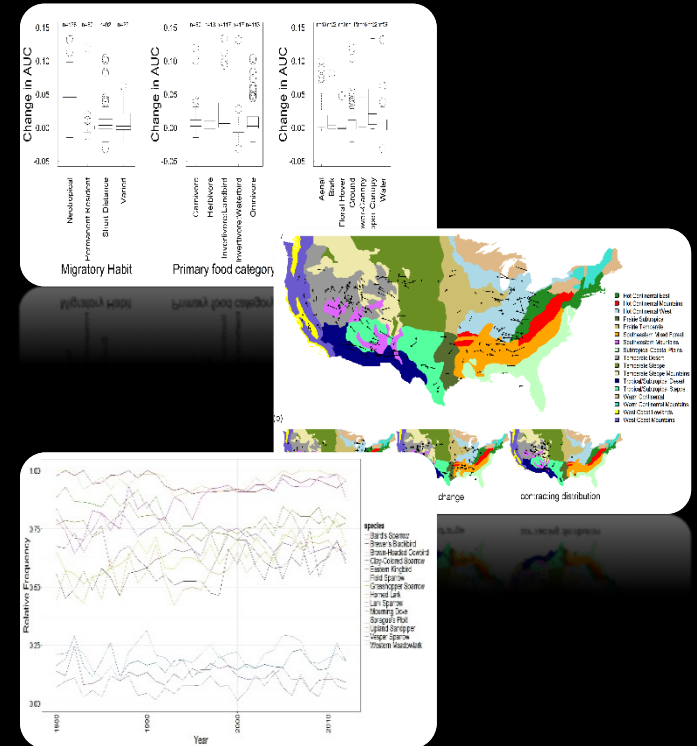
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- Bateman, et al., 2016. Past climate change versus bird distributions. *GCB*, 22: 1130-44.



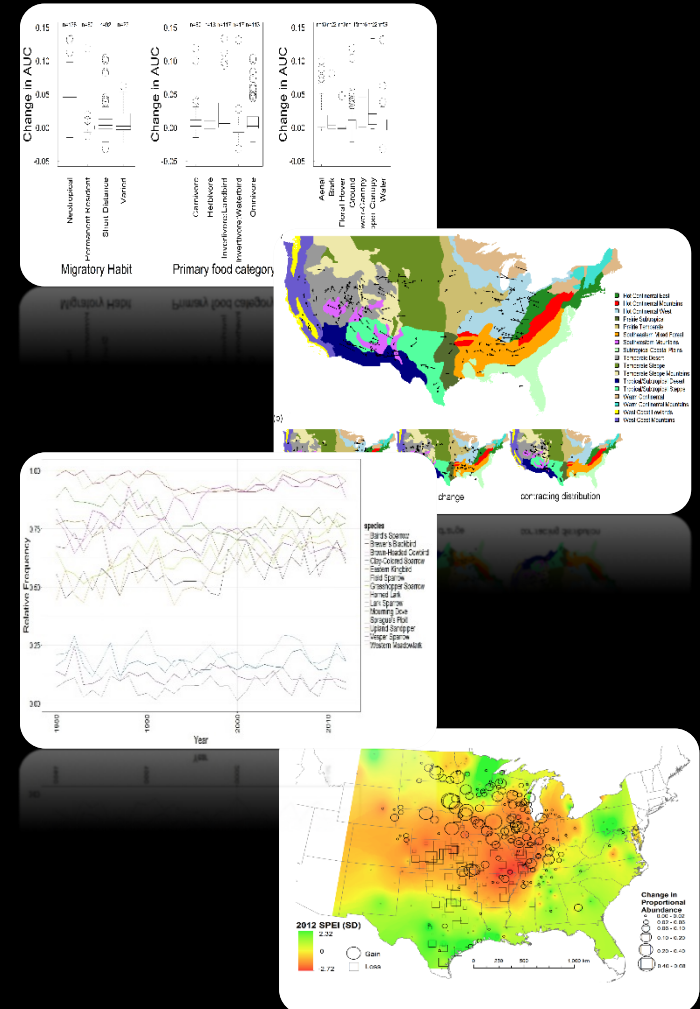
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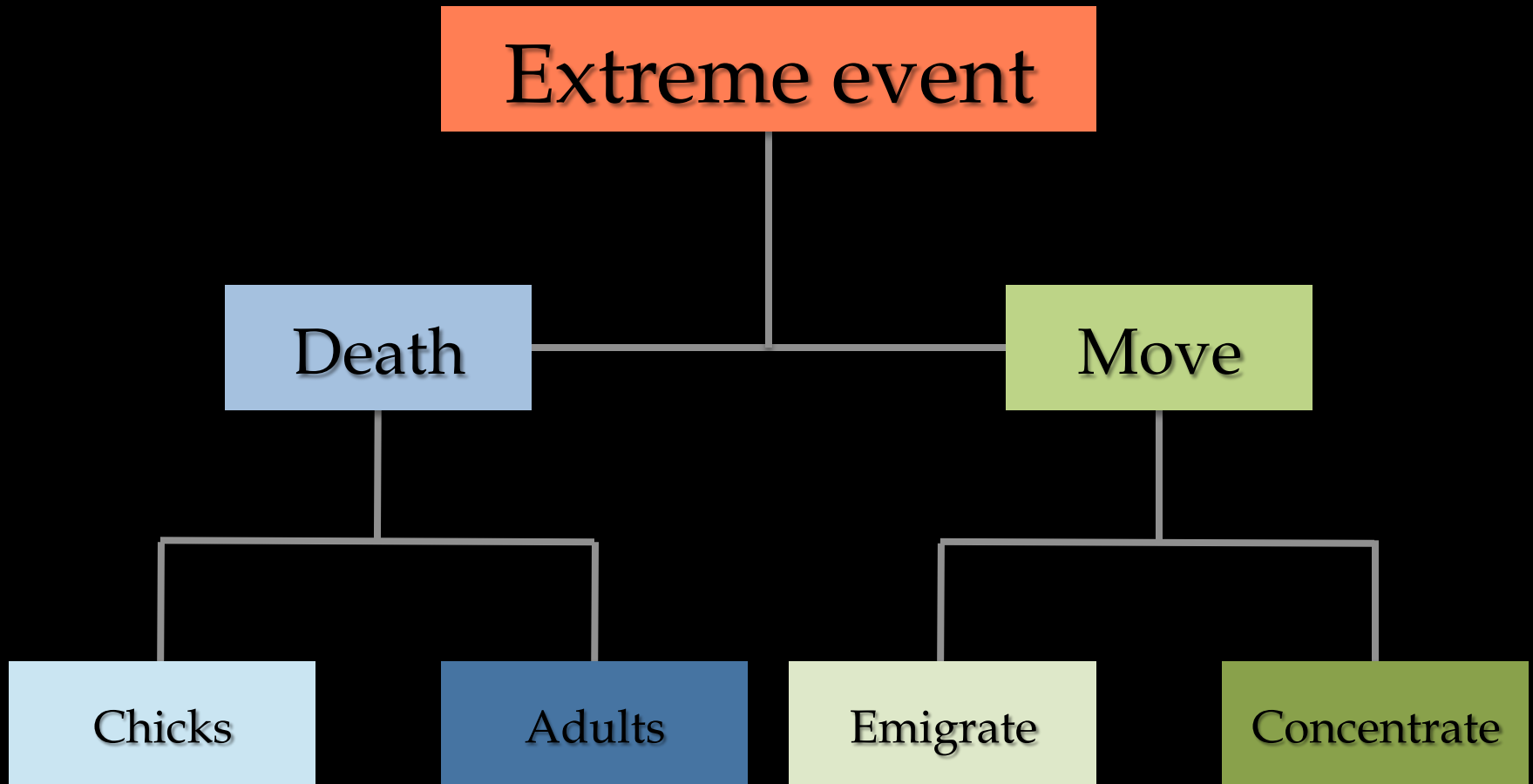


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- Bateman, et al., 2016. Past climate change versus bird distributions. *GCB*, 22: 1130-44.
- Gorzo, et al., Grassland bird response to weather. *Condor*, in press.
- Bateman, et al. 2015. Range edges and irruptive species during extreme weather. *Lands. Ecol.*, 30: 1095-1110.



Bird population responses



Bird population responses

- Bayesian Hierarchical Modeling with INLA

$$\log(\lambda_{i,t}) = R_i + \omega_{i,t} + I_{i,t} \eta + \delta_{i,t} + (1 \lambda_{i,t-1} + N(0, \sigma_i^2)) \\ + V + \rho \sum_{i \neq j} w_{i,j} (v_i - V)$$

- Modeling a 20-year climate extreme versus the median year

Bird population responses

Species	Local SPEI	Range-wide SPEI	Dec-May La Niña	Dec-May El Niño
Northern Cardinal	1.1	1.1	-0.2	0.2
Ruffed Grouse	-0.5	-6.8	5.2	-2.9
Rose-Breasted Grosbeak	1.5	1.2	-1.3	0.9
Indigo Bunting	-0.1	0.3	0	0
Grasshopper Sparrow	-4.3	5.3	0.6	-0.6
Lark Sparrow	3.3	6.2	2.5	-2.6
Dickcissel	-15.9	23.6	5.7	-4.1

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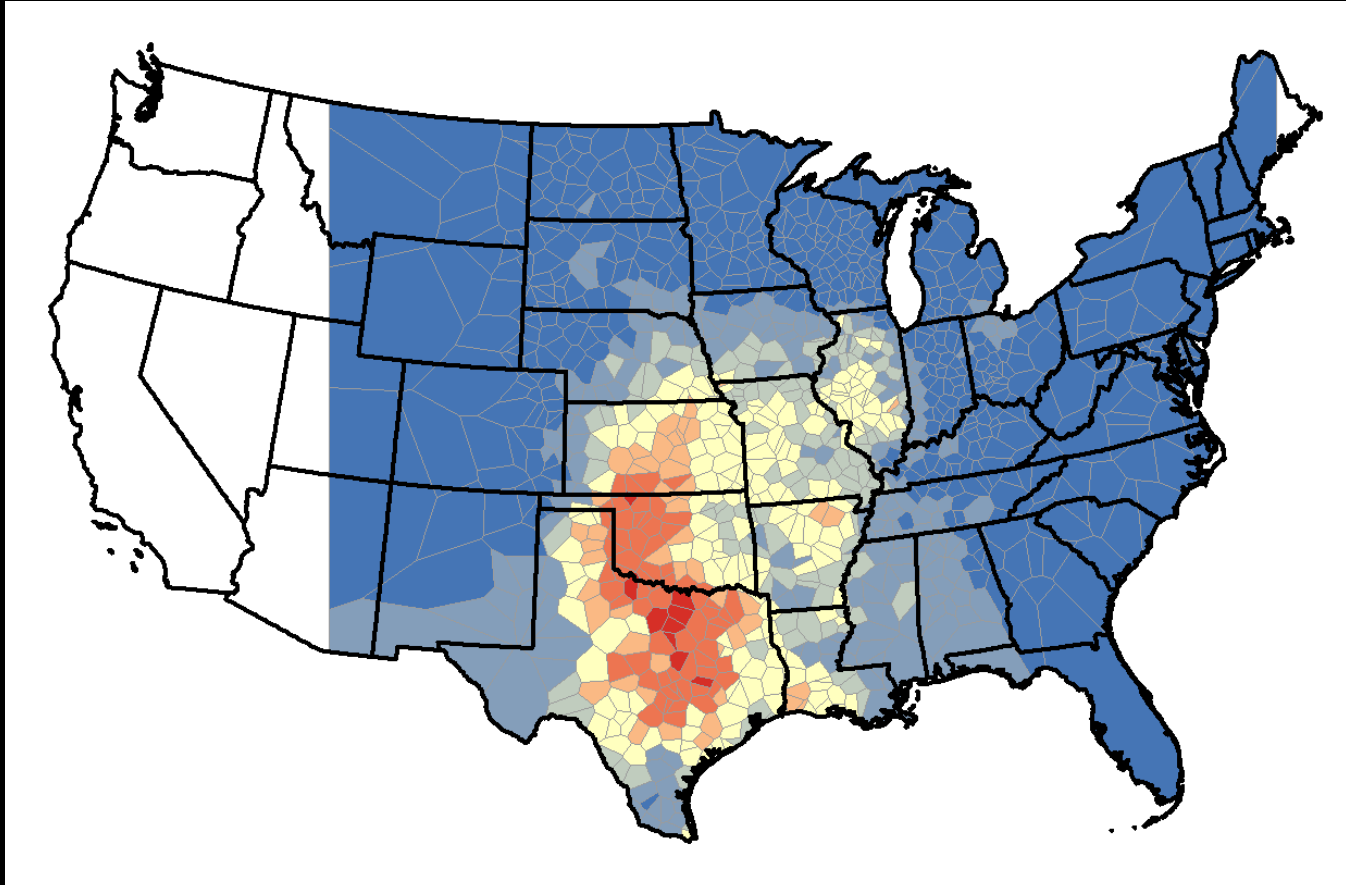
Bird population responses

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$$\log(\lambda_{i,t}) = R_i + \omega_{i,t} + I_{i,t} \eta + \delta_{i,t} + (1 \lambda_{i,t-1} + N(0, \sigma_i^2)) \\ + V + \rho \sum_{i \neq j} w_{i,j} (v_i - V)$$

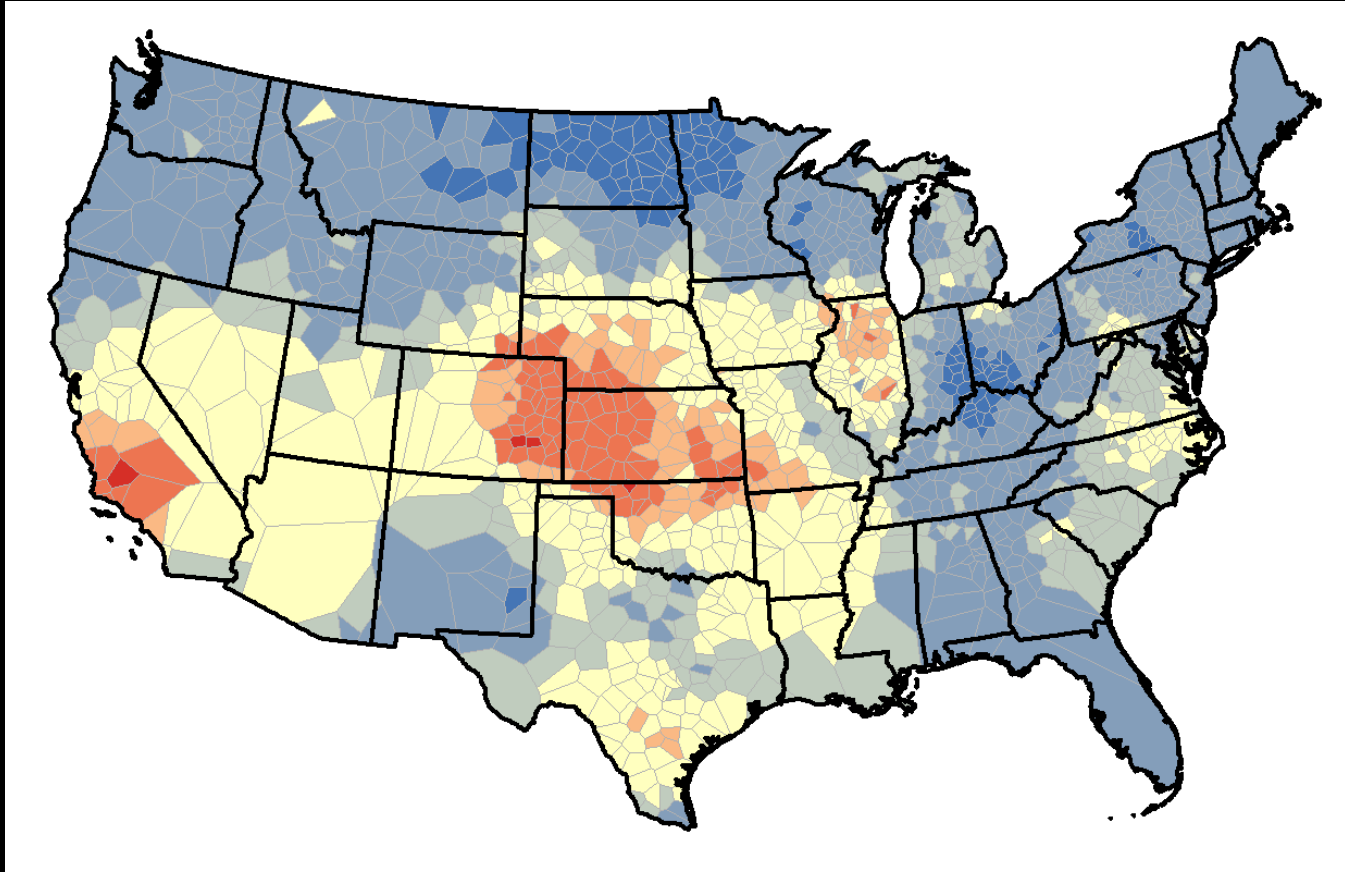
- Modeling a 20-year climate extreme versus the median year

Bird population responses



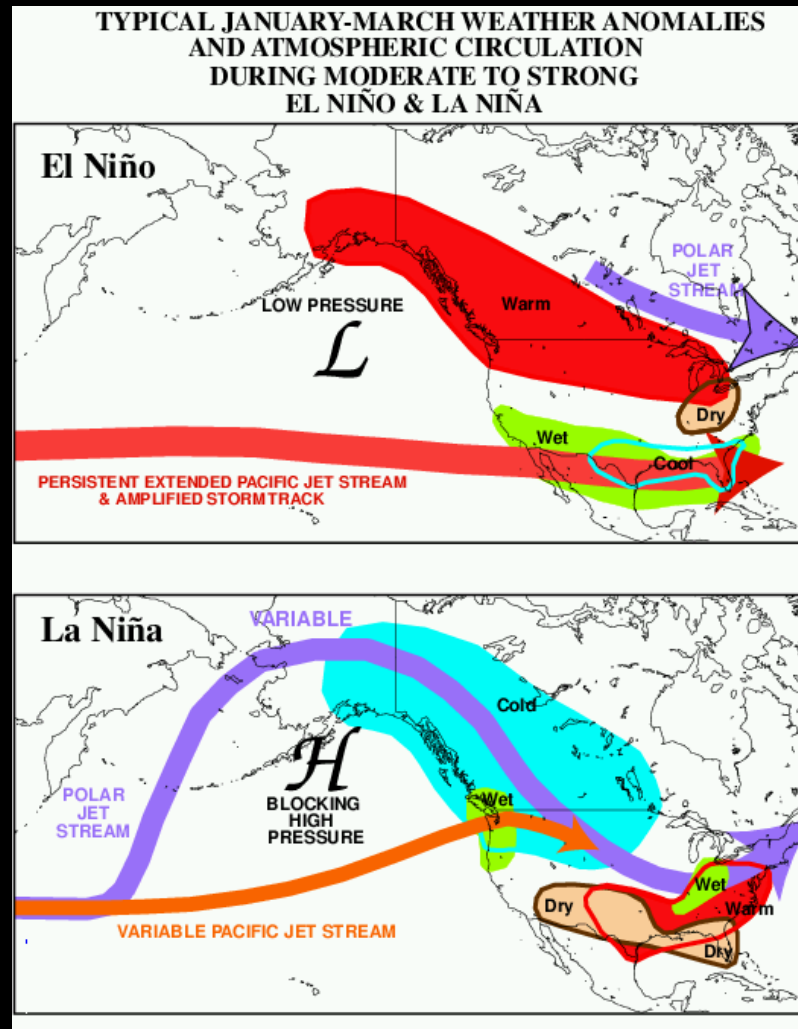
Dickcissel Rangewide SPEI

Bird population responses

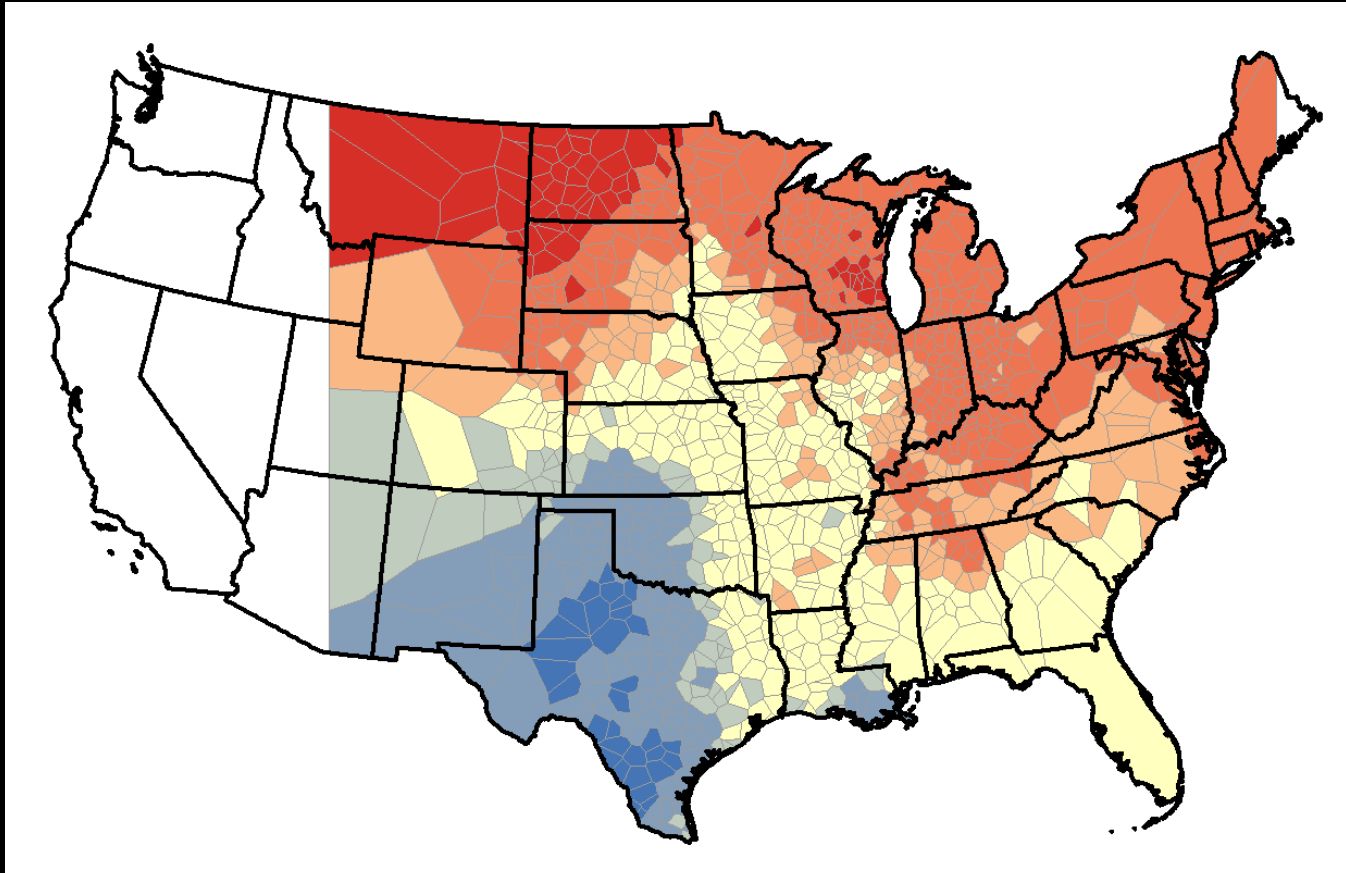


Grasshopper Sparrow RW-SPEI

Bird population responses

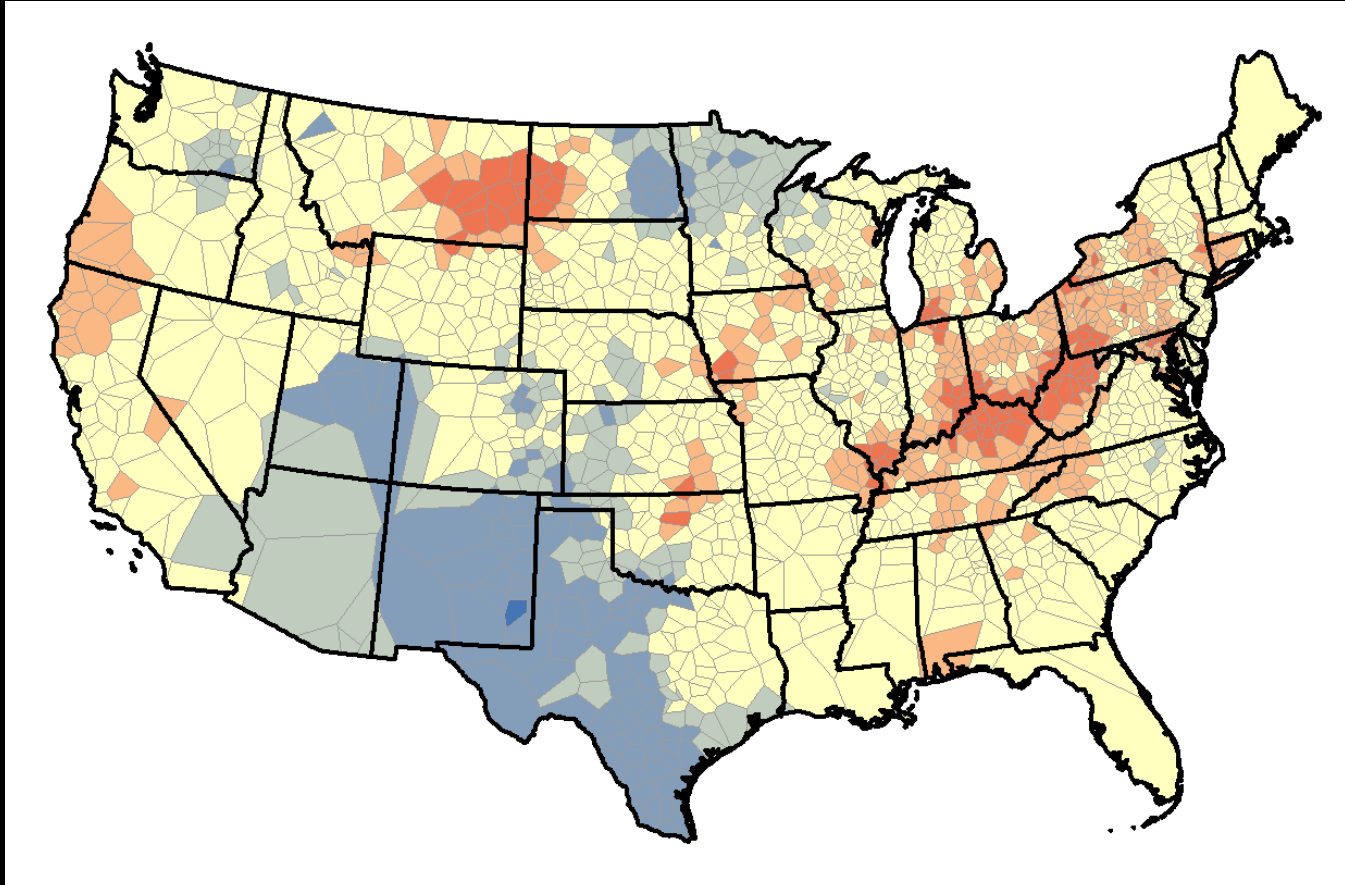


Bird population responses



Dickcissel ENSO

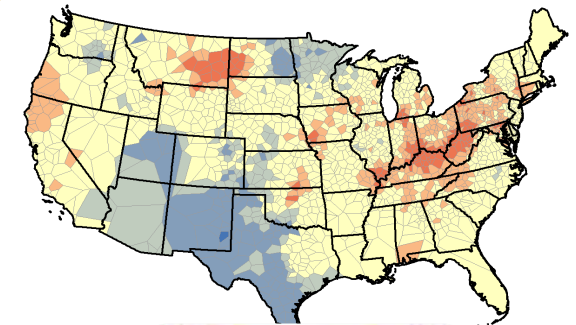
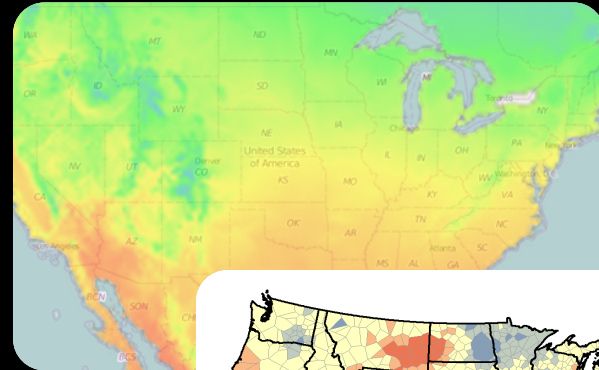
Bird population responses



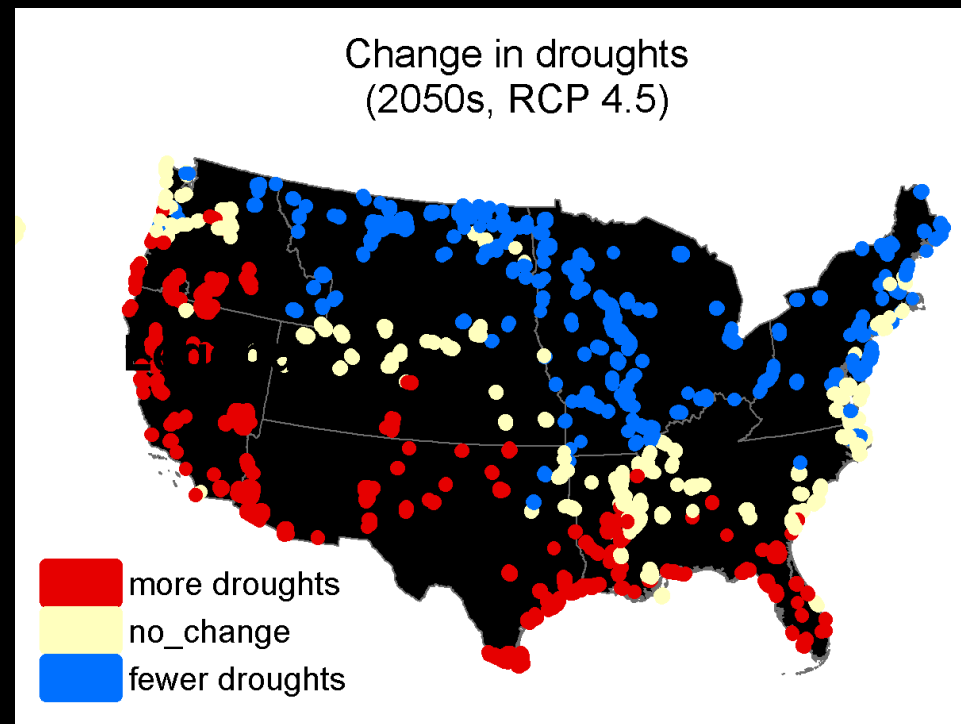
Grasshopper Sparrow ENSO

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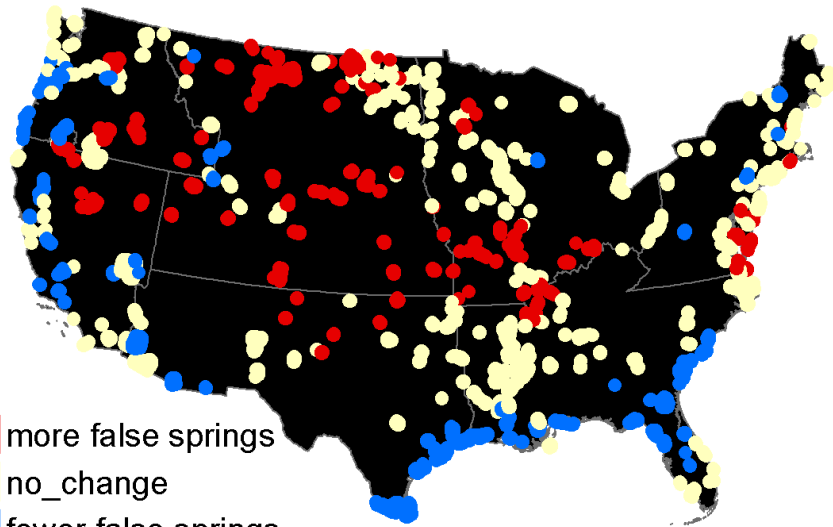
Conservation implications



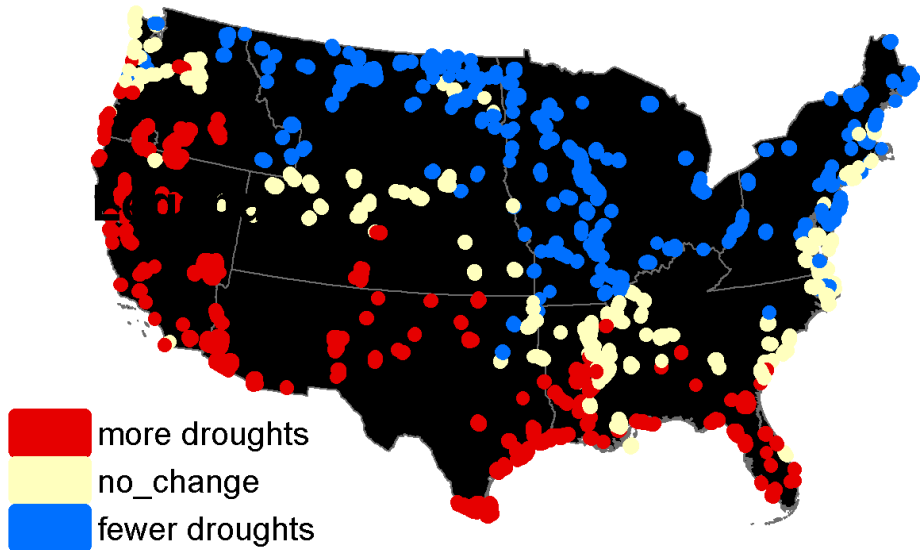
Martinuzzi et al., *in press*,
Biological Conservation

Conservation implications

Change in false springs
(2050s, RCP 4.5)

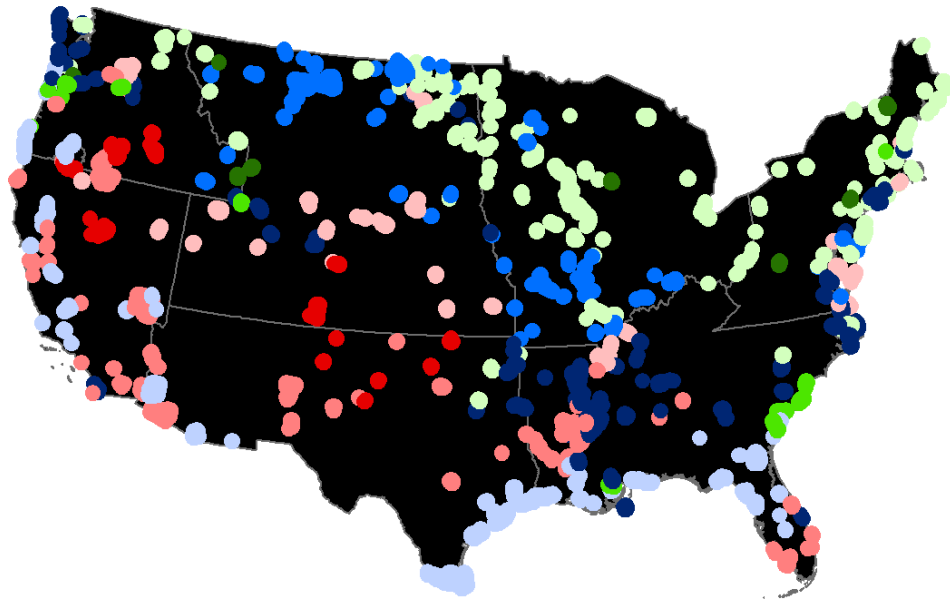


Change in droughts
(2050s, RCP 4.5)



Conservation implications

All variables combined (2050s, RCP 4.5)

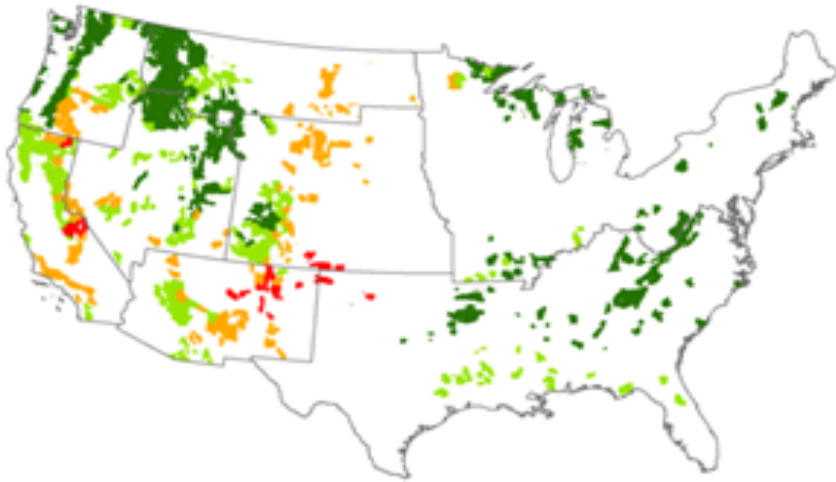


- more extreme warms, more droughts, more false springs
- more extreme warms, more droughts
- more extreme warms, more false springs
- more extreme warms, more droughts, fewer false springs
- more extreme warms, more false springs, fewer droughts
- more extreme warms
- more extreme warms, fewer droughts
- more extreme warms, fewer false springs
- more extreme warms, fewer droughts, fewer false springs

Conservation implications

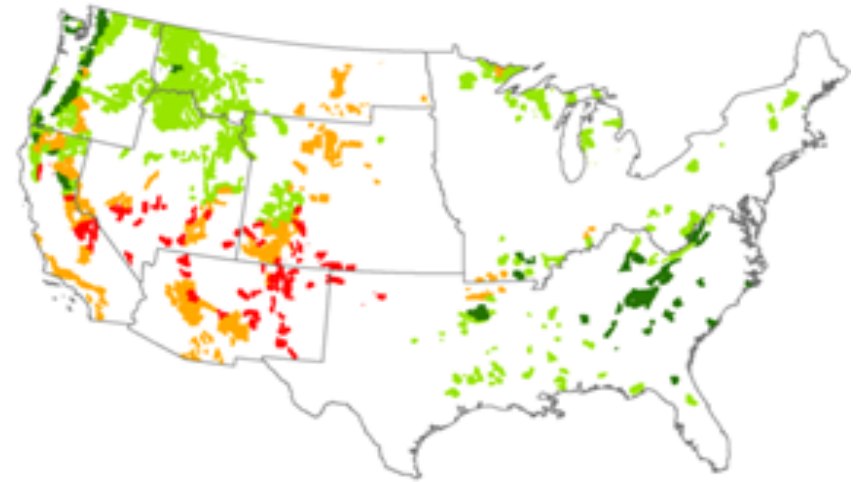
Mid-Century RCP4.5

Number of variables projected to increase
■ zero ■ one ■ two ■ three



Mid-Century RCP8.5

Number of variables projected to increase
■ zero ■ one ■ two ■ three



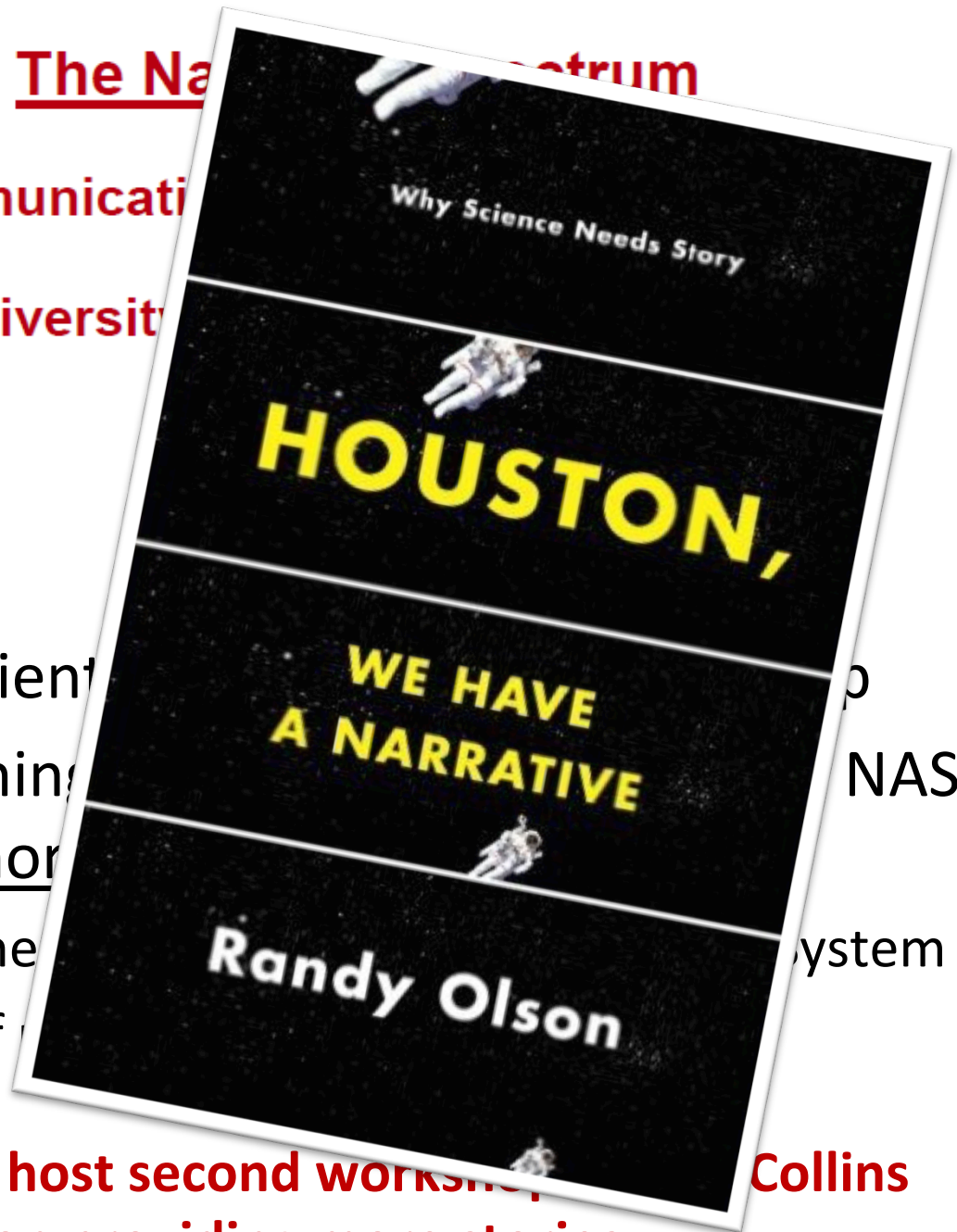


The Narrative Spectrum

Communication

University

- 25 managers and scientists
- USFWS is using training from NASA-funded work into short
 - How extreme weather
 - External Affairs staff



NASA-

system

**This spurred USFWS to host second workshop, Collins
with focus on providing more stories**



The Narrative Spectrum

Communications Training for Scientists

University of Wisconsin- Madison

With

Dr. Randy Olson

- 25 managers and scientists attended the workshop
- USFWS is using training to translate results of our NASA-funded work into short stories
 - How extreme weather may affect N Wildlife Refuge System
 - External Affairs staff using stories in public outreach

**This spurred USFWS to host second workshop in Fort Collins
with focus on providing more stories**





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....share success stories, identify key resources,

The U.S. Fish & Wildlife Service Climate Change newsletter allows our staff to share success stories, identify key resources, and stay up-to-date about our agency's climate change response.

The National Center for Conservation and Science and scientists from across the Service are working together to develop this newsletter, and we welcome your input. Please contact [Kate Freund](#) to help provide content for future editions. You can explore past issues through the links at left.

Stories to be used by Service biologists as they prepare to draft 10 year strategic plan for monitoring:

- effects of management actions
- how climate projections are unfolding
- how habitats and wildlife are responding

Shared Stories and Resources

Interagency Group Seeks Nominees for Climate Adaptation Leadership Award




Communicating Science *for* Conservation Action

Lake Wingra, WI

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Thinking Like Mountains - A Practitioner's Symposium for Continental Conservation Under Climate Change

Date: Monday, July 18, 2016

Time: 8:00 AM - 10:00 AM

Location: Exhibit Hall B

Session Organizer 1:

Anna M Pidgeon

Affiliation 1:

SILVIS Lab, Department of Forest and Wildlife Ecology, UW-Madison

Session Organizer 2:

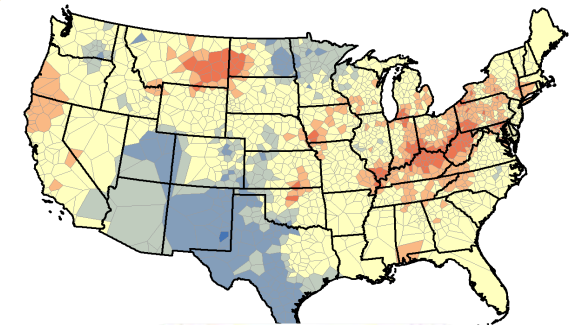
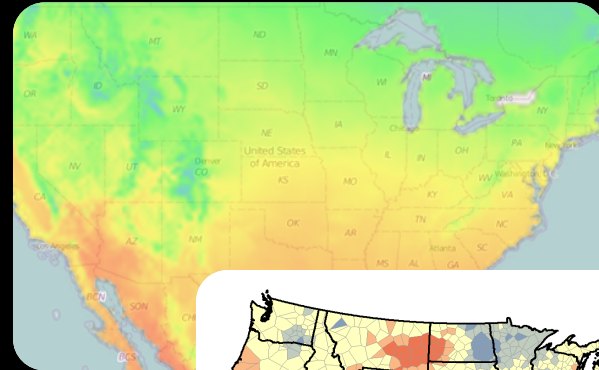
Patricia Heglund

Affiliation 2:

United States Fish and Wildlife Service, La Crosse, Wisconsin

Outline

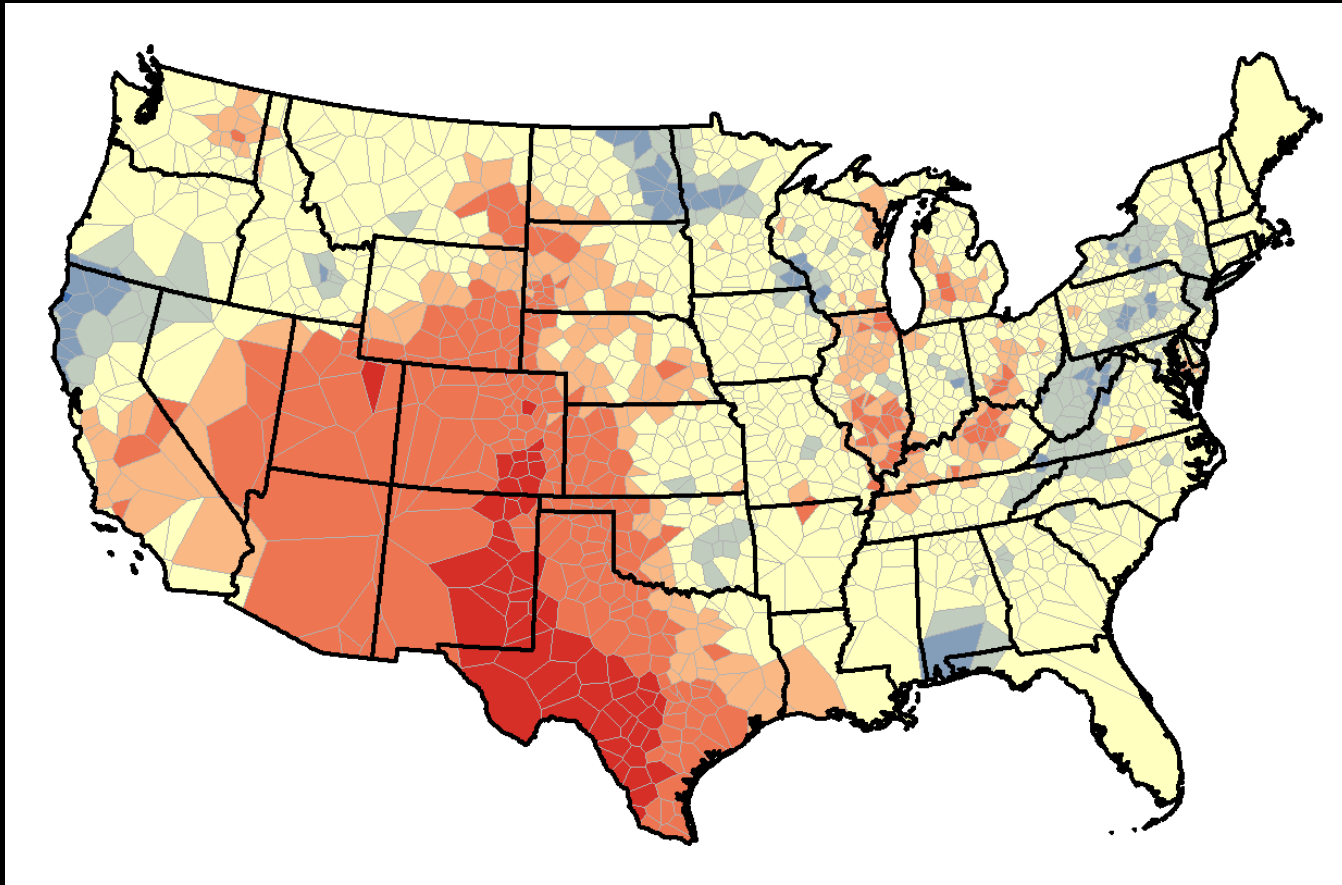
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A map of the United States with a black background. Numerous colored dots (red, blue, green, yellow, pink) are scattered across the map, representing data points. The text "Thank you!" is overlaid in the center in a white serif font.

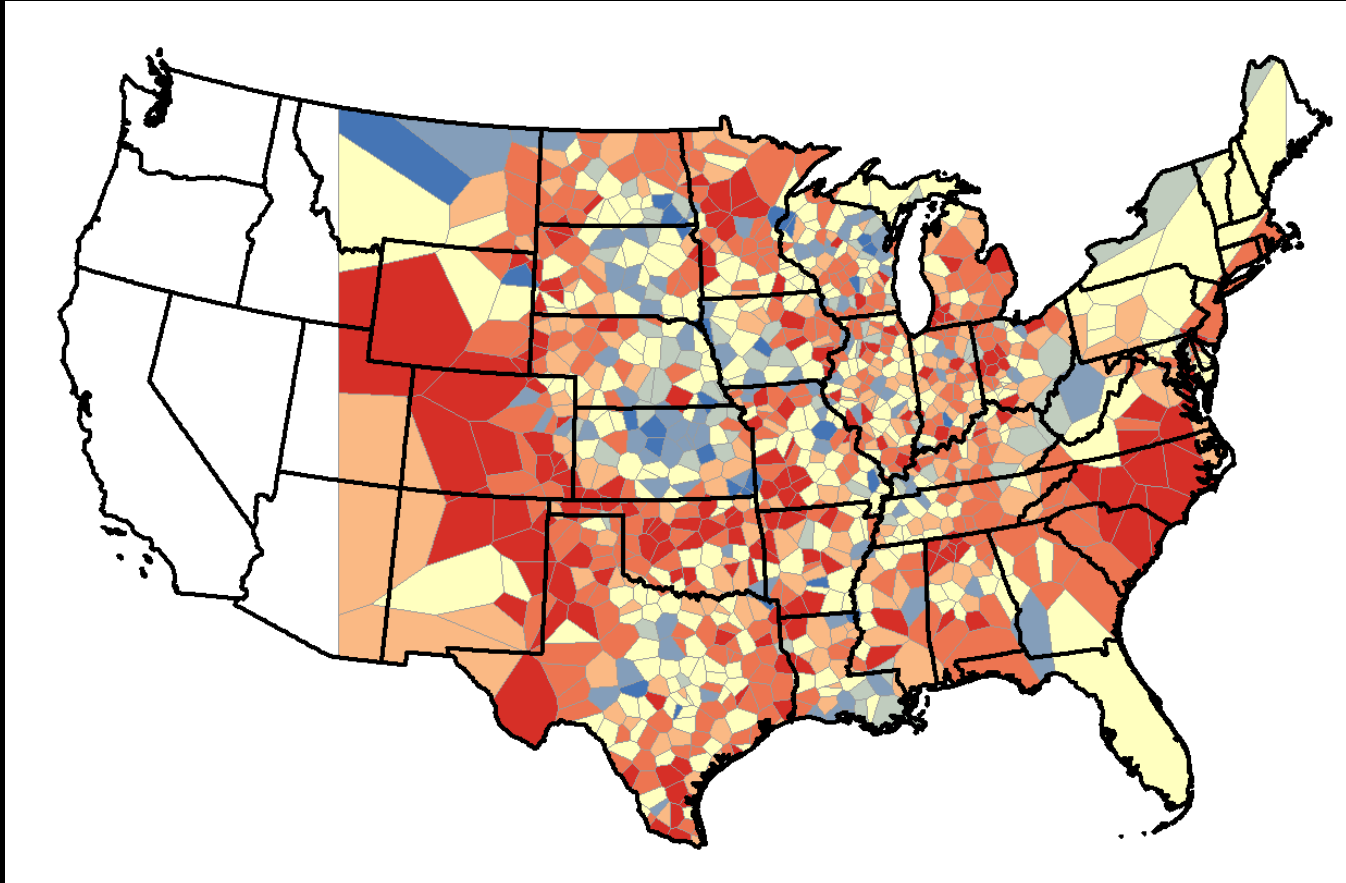
Thank you!

Bird population responses



Grasshopper Sparrow L-SPEI

Bird population responses



Dickcissel Local SPEI