

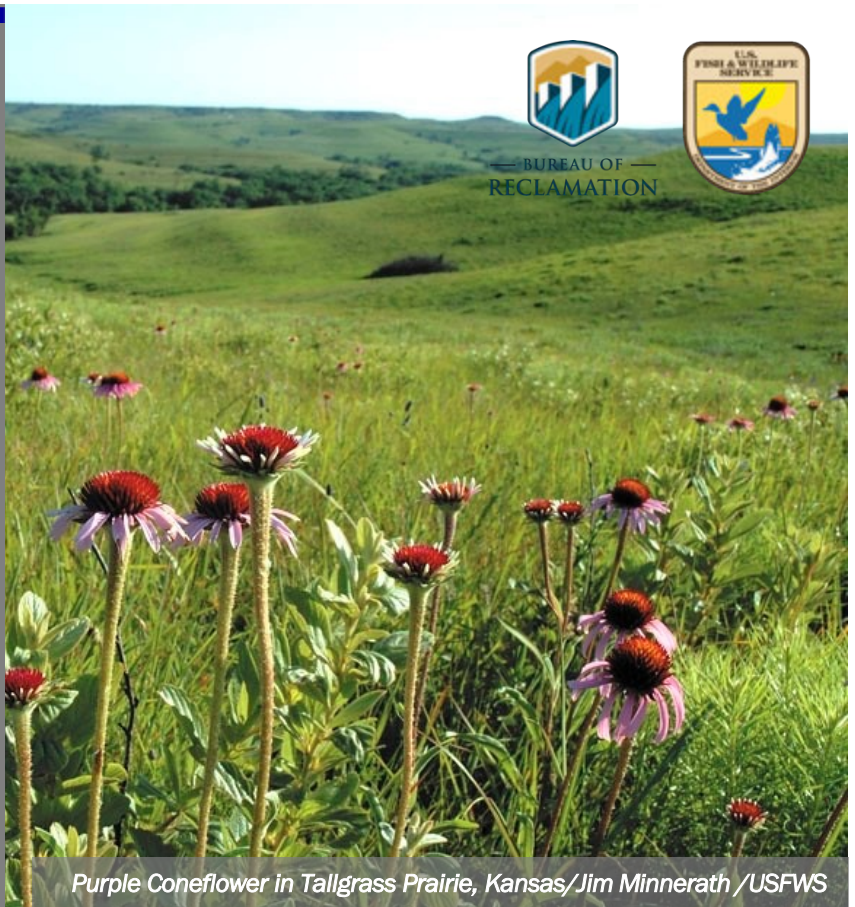
## ACTIONABLE SCIENCE

# Modeling Species-Specific and Scale-Dependent Bird Responses to Drought



DEPARTMENT OF  
**NATURAL RESOURCE  
ECOLOGY AND MANAGEMENT**

Weather extremes such as droughts are predicted to increase in frequency as the planet continues to warm. Droughts influence agricultural productivity, wildlife populations, and increase risk of wildfire. Droughts occur across various time scales, from months to years, each potentially affecting species differently. In particular, grassland birds are persistently declining and negatively affected by droughts, but the variability in species' responses at different scales is not well known. Researchers from Oklahoma State University paired data on bird occurrence and drought indicators to study how drought intensity alters bird distributions in the Great Plains.



*Purple Coneflower in Tallgrass Prairie, Kansas/Jim Minnerath /USFWS*

## KEY ISSUES ADDRESSED

Studies evaluating the influence of drought on wildlife are common; however, less is known about how individual bird species respond to different drought timescales. Research on bird occupancy (i.e., whether a species is present or absent at a location) in response to various drought durations can be beneficial to conservation because it gives insight into species-level response. Additionally, understanding how birds disperse to new locations during unfavorable conditions is important for management. For example, if a significant portion of a bird population moves to novel areas of their range during droughts, these areas could then be considered for conservation management.

## PROJECT GOALS

- Address research gaps in bird literature regarding bird species' responses to drought at different time scales
- Determine which time scales capture the most significant and accurate bird responses to drought (e.g., changes in bird occupancy in an area experiencing drought)

## IM-PECK-ABLE TIMING

Dickcissel occupancy increased in previously unoccupied areas in the middle of their range during 8-month drought windows a new and critical piece of information for Dickcissel conservation.



Grasshopper Sparrow/Scott Somershoe/USFWS

## PROJECT HIGHLIGHTS

**North American Breeding Bird Survey (BBS):** Bird occupancy data from the BBS was important for tracking long-term occurrences of bird species. Collected by thousands of skilled citizen scientists, the BBS is a primary source of reliable quantitative bird occurrence data for over 500 species. Using various filters, researchers narrowed their focus to BBS data on ten Great Plains bird species.

**Standardized Precipitation Evapotranspiration Index (SPEI):** The SPEI uses precipitation and evapotranspiration data to determine drought patterns. It provided researchers flexibility in determining shorter- and longer-scale droughts to understand how bird occupancy and distribution change with drought period and intensity. Researchers used 1-, 4- (short-term), 8-, and 12-month (long-term) drought periods that ended in April or June. These scales aligned with territory establishment and peak nesting of various species and aligned with BBS data collected in May and June.

**Bird Responses to Drought:** Comparing drought data points from the SPEI to bird occupancy data from the BBS, researchers concluded that the occupancy of all bird species decreased in response to drought, but the temporal scale of the response was species-specific.

## Collaborators

- Oklahoma State University
- Michigan State University

CCAST Author: Nicole Williams, University of Arizona, May 2022.

For more information on CCAST, contact Genevieve Johnson ([gjohnson@usbr.gov](mailto:gjohnson@usbr.gov)) or Matt Grabau ([matthew\\_grabau@fws.gov](mailto:matthew_grabau@fws.gov)).

Visit CCAST:



## LESSONS LEARNED

Bird occupancy decreased the most in five species during 8-month and annual drought time periods compared to shorter timescales: Northern Bobwhite (*Colinus virginianus*), Scissor-tailed Flycatcher (*Tyrannus forficatus*), Horned Lark (*Eremophila alpestris*), Dickcissel (*Spiza americana*), and Grasshopper Sparrow (*Ammodramus savannarum*). These birds are from the grassland guild (different species that exploit similar resources). This guild has experienced recent population declines, highlighting the relevance of this research for conservation. Further, American Robin (*Turdus migratorius*) and Western Kingbird (*Tyrannus verticalis*) abundance decreased the most during shorter drought periods (1 and 4 months), highlighting bird species response variability. Researchers did not determine the exact mechanisms driving bird occupancy responses across timescales. However, they hypothesized that long-term drought may drive movement, reduced reproduction, or mortality, whereas short-term drought may change bird behavior (e.g., longer foraging times to find suitable food in unfavorable conditions) which may reduce detectability.

## NEXT STEPS

- Research the specific mechanisms of different bird species responses to drought
- Identify Dickcissel dispersal areas and determine their differences from other sites
- Continue sharing and communicating research findings with managers and the public to improve awareness and conservation of birds

For more information on this project, contact Samantha Cady: [smcady@okstate.edu](mailto:smcady@okstate.edu)



A Nesting Western Kingbird/Timothy J. O'Connell