

How Changes in Climate and Land-Use Could Impact

Grassland Bird Abundance & Biodiversity

in the Upper Missouri River Basin

Authors: A. P. Baltensperger, M. D. Dixon, and D. L. Swanson*

*Contact: D.L. Swanson: david.swanson@usd.edu

Read the full study in *Landscape Ecology*: <https://link.springer.com/article/10.1007/s10980-020-01050-4>

RESEARCH OBJECTIVE: We used **20 climate and landscape variables** and current **bird abundance survey data** to determine current bird-habitat relationships in the Upper Missouri River Basin (UMRB). We then used these data and a range of **future climate and land-use scenarios** developed by the U.S. Geological Survey, which emphasize agriculture, bioenergy production and conservation of natural landscapes, **to predict future impacts on the abundance and distribution of grassland birds in the UMRB.**



The Upper Missouri River Basin is a large watershed encompassing most of Montana and South Dakota, portions of Wyoming and North Dakota, as well as corners of Nebraska, Minnesota, and Iowa.



Samuel H. Ordway Prairie in South Dakota is an example of mixed-grass prairie covering substantial portions of the UMRB.



How the LOSS of GRASSLANDS is AFFECTING GRASSLAND BIRDS

Grasslands cover much of the Upper Missouri River Basin (UMRB), but **most natural grasslands have been converted to agriculture and other uses**. Grassland birds are the bird group showing the **greatest population declines** of all North American birds.



GRASSLAND Ecosystems ARE

Grasslands Ecosystems are areas in which the vegetation is dominated by a nearly continuous cover of grasses and forbs. They are the largest ecosystem globally and currently cover approximately 40% of the Earth's ice-free land area.

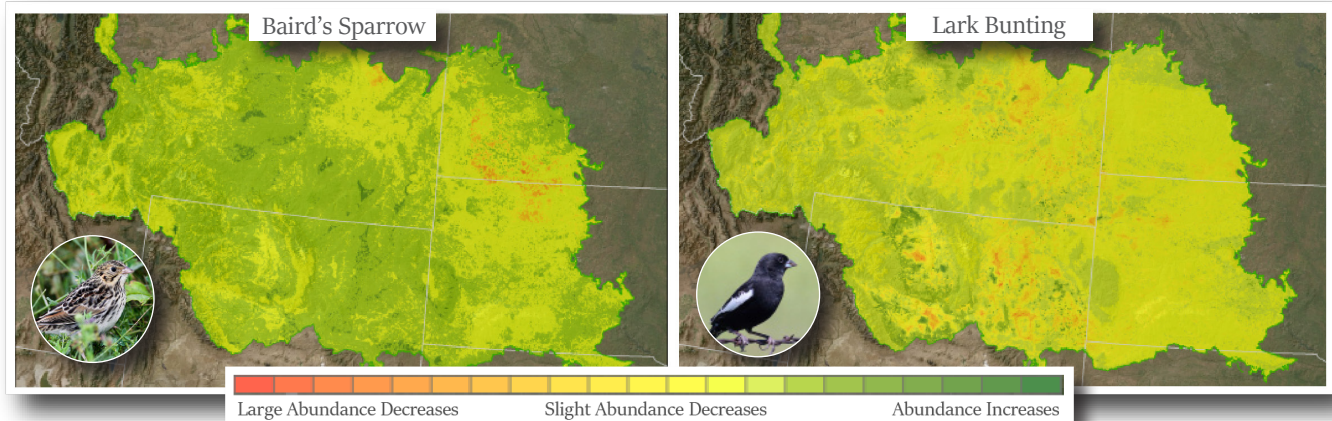
GRASSLAND Birds ARE

Grasslands Birds are birds that breed in and depend upon large open landscapes dominated by grass and forbs. Examples include many songbirds, northern harrier, short-eared owls, and upland sandpipers.

RESEARCH FINDINGS

1. The **most important predictors of current grassland bird abundances** were **distance to forest** (lower abundances of grassland birds with nearby forested areas), **winter temperature, elevation, and summer temperature**.
2. **Average predicted abundances** for grassland birds in the year 2050 **increased for most species**, but eight species showed region-wide decreases in abundance under at least some scenarios.
3. The **general trend** across most species was for **future increases in abundance in the western UMRB and at higher elevations** (see maps below).

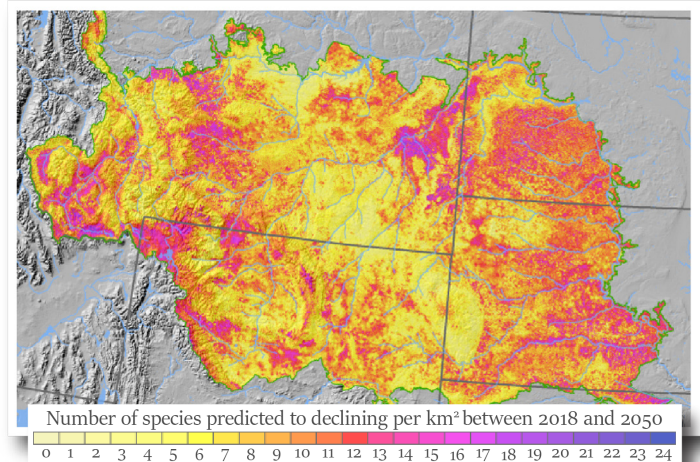
PREDICTED CHANGES IN ABUNDANCE OF BAIRD'S SPARROW AND LARK BUNTING IN THE UMRB



Predicted changes in abundance of two grassland bird species between 2018-2050 under different climate and land-use scenarios. Baird's Sparrows were predicted to increase in abundance in the scenario on the left. Lark Buntings were predicted to decrease in abundance in the scenario on the right.

4. **Current regions of highest abundance** were uniformly **regions of population declines** in the future.
5. **Climate change was a more important predictor** of future bird abundance than land-use change, perhaps because most land-use change has already happened, but also because **broad-scale shifts in suitable climate likely outweigh smaller-scale land-use change**.
6. Regions of **population decline** for many bird species occur in the **southeastern UMRB and in river valleys** (see red and purple areas on the map to the right).

AREAS OF PREDICTED POPULATION DECLINE OF GRASSLAND BIRD SPECIES IN THE UMRB



The IMPLICATIONS of this STUDY

1. Future *climate change may increase populations for many grassland birds*, but this *assumes that grasslands will replace current forested areas*, as grassland bird abundance decreased in areas with nearby forest.
2. Future predicted abundance maps *can identify target areas for conservation action*.
3. Current areas of high abundance appear to be areas of future population declines, so *preservation of appropriate habitats* in these areas *might have a beneficial impact* on grassland birds in the UMRB.

REFERENCE: Baltensperger AP, MD Dixon and DL Swanson. 2020. Implications of future climate- and land-change scenarios on grassland bird abundance and biodiversity in the Upper Missouri River Basin. *Landscape Ecology* 35:1757-1773, DOI: doi.org/10.1007/s10980-020-01050-4.

ACKNOWLEDGMENTS: This work was supported by the National Science Foundation under the EPSCoR Track II cooperative agreement OIA-1632810. Jennifer Timmer of the Bird Conservancy of the Rockies provided access to bird point count data. Terry Sohl at USGS EROS Data Center developed the land-cover scenarios and provided the grassland bird photographs for this publication.

