The habitat quality of CP43: Prairie Strips and other conservation features for birds in Corn Belt agricultural landscapes

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Funding: USDA FSA 19CPT0010516, AG-3151-P-14-0065, AG-3151-P-16-0255, AG-3151-P-17-0108

Image: Cherokee Co., Iowa; ISU, Omar de Kok-Mercado


Image: Jasper Co. Iowa; Blake Preston


Image: Story Co., Iowa; ISU, Drake Larsen


Image: Jasper Co., Iowa; ISU Anna MacDonald

USDA

United States Department of Agriculture

CRP-CLEAR PRAIRIE STRIP PRACTICE (CP-43) - DECEMBER 2019

The prairie strips practice establishes diverse perennial vegetation, oriented linearly within row crops fields. Prairie strips may not exceed 25% of the cropland area per tract and range from 30-120 feet in width. Machinery traffic is allowed on locations that replace turn rows on the perimeter of the field. Prairie strips reduce soil erosion, improve water quality and provide wildlife habitat.

How are Prairie Strips Different?

Allows a conservation planner to work with a client to establish perennial vegetation in locations to reduce erosion and intercept water flow, while making it farmable.

A combination of NRCS practice standards

- 327 Conservation Cover
- 332 Contour Grass Strip
- 386 Field Border
- 393 Filter Strip

Where can Prairie Strips be placed?

In row crop production systems:

- Around the field
- Through the field
- In terrace channels
- Next to waterways
- Pivot corners

More Information

For more information, contact your local service center and USDA Farm Service Agency office: **farmers.gov/service-locator**.

Source: USDA Farm Service Agency

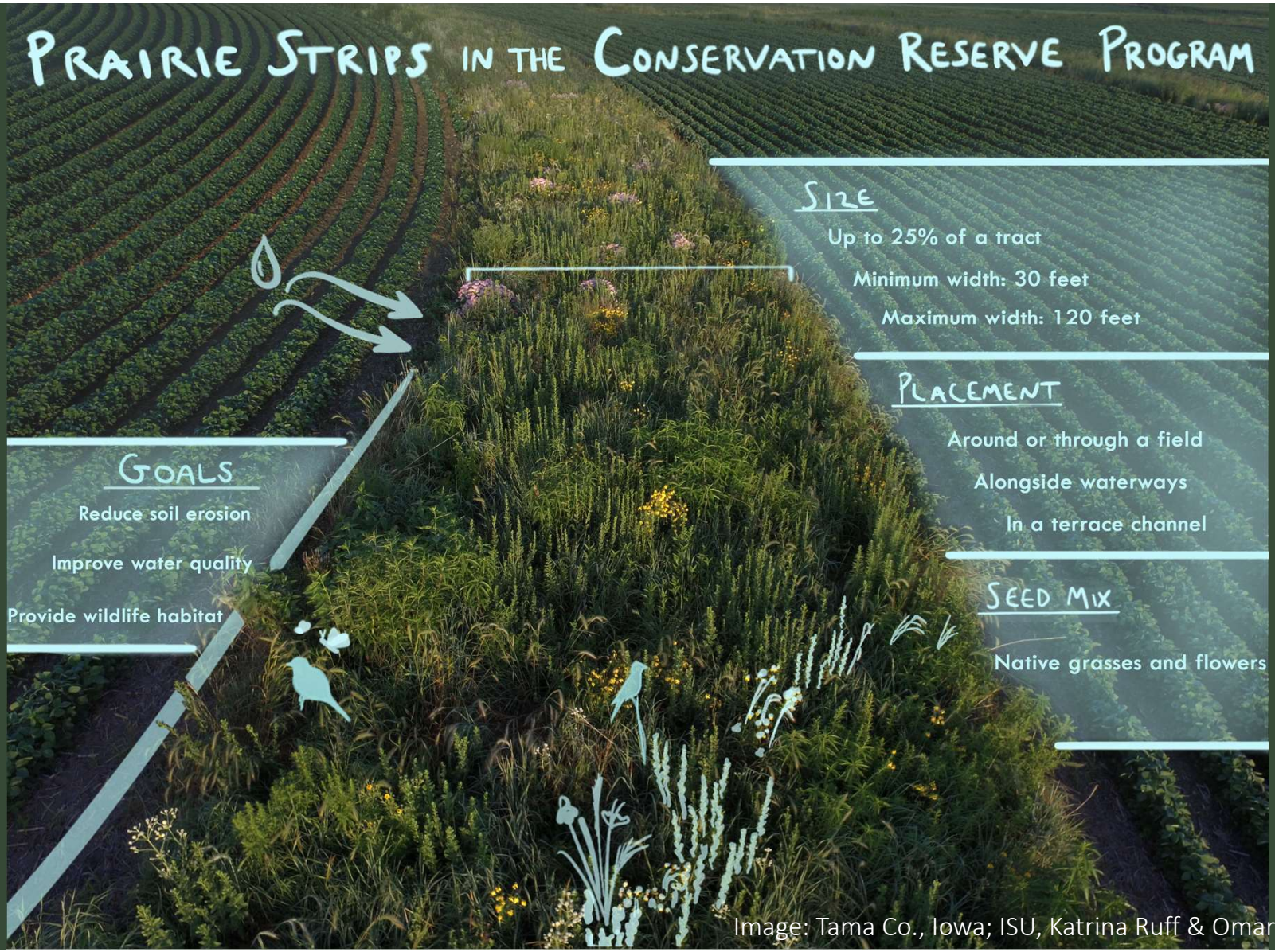


Image: Tama Co., Iowa; ISU, Katrina Ruff & Omar de Kok-Mercado

Catchment-scale research starting in 2007 at Neal Smith NWR (STRIPS1)

Catchments 1-9 acres in size

Research funded by: Leopold Center for Sustainable Agriculture, National Science Foundation, USDA Forest Service, USDA-NIFA, USDA-SARE

Image: Jasper Co., Iowa; ISU, Anna MacDonald

Key Findings from STRIPS1 Research

Strategically adding 10% prairie to no-till corn-soy fields:

- 95% reduction in sediment loss[a]
- 37% reduction in water runoff[a]
- 77% reduction in phosphorus runoff and 70% reduction in nitrogen runoff[a]
- 70% reduction in subsurface nitrate concentrations (not tiled) [a]
- 75% reduction in nitrous oxide emissions at footslope position[b]
- 0.07 t/ac/yr increase in soil organic carbon or (in top 15 cm)[c]
- More than triple pollinator and double bird abundance[a]
- Influence on crop yield proportionate[a,d]
- No additional weed problems in cropfields[e]
- Cheaper, more flexible than terraces; cost comparable to cover crops[f]

Sources: [a]Schulte et al. 2017; [b]Iqbal et al. 2015; [c]Dutter 2022; [d]Damiano & Niemi 2021; [a]Hirsh et al. 2013; [a] Tyndall et al. 2013

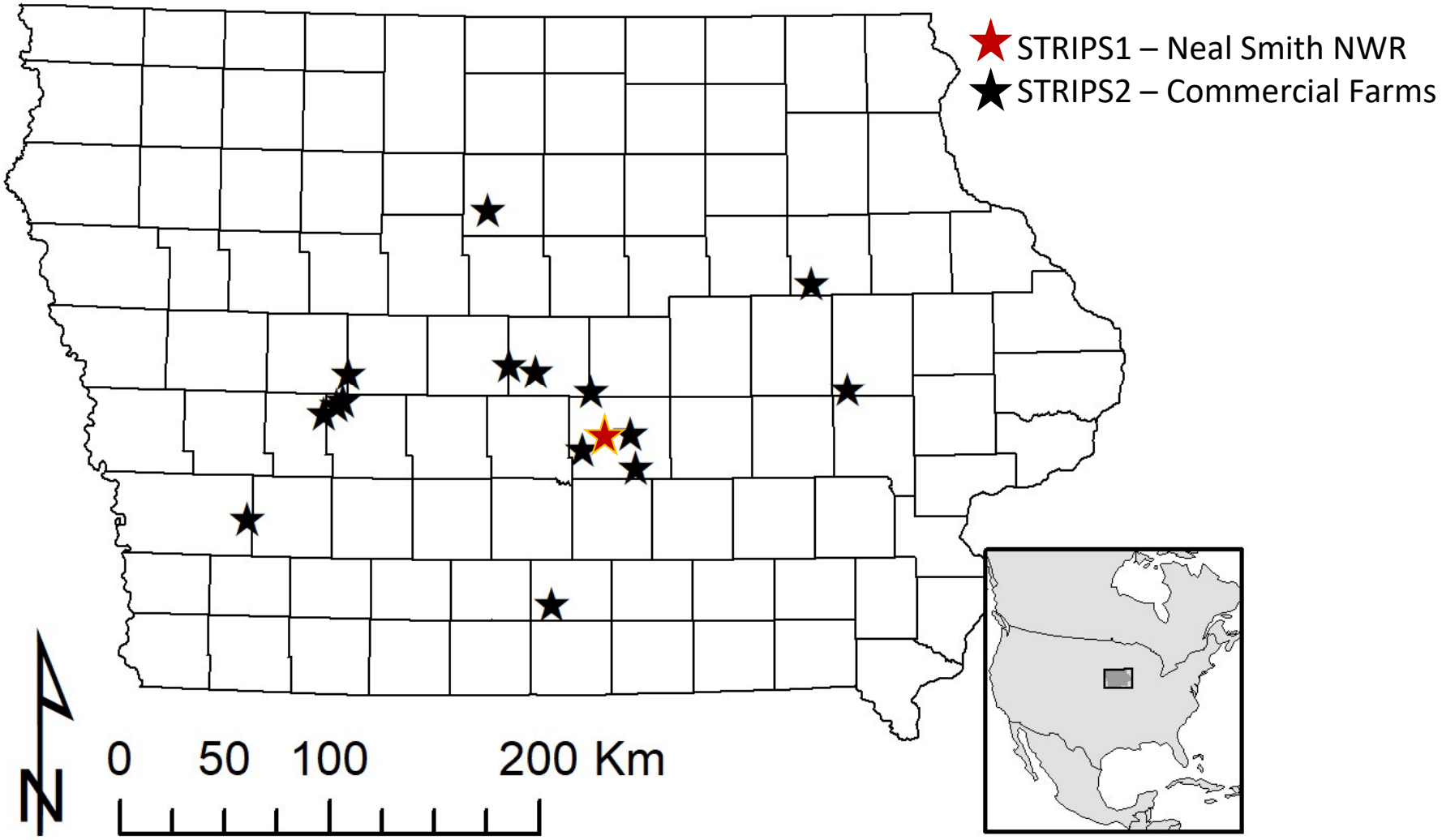
Do the same benefits accrue on farmers' fields?

STRIPS2 research started in 2015

Research funded by: USDA FSA (19CPT0010516, AG-3151-P-14-0065, AG-3151-P-16-0255, AG-3151-P-17-0108), FFAR, USDA-NIFA Foundational (2015-67019-23002) and McIntire-Stennis Program (IOW05534), Walton Family Foundation, The McKnight Foundation,

Image: Wright Co., Iowa; Lynn Betts

Image: Tama Co.; ISU, Tim Youngquist


STRIPS1 – Neal Smith NWR
STRIPS2 – Commercial Farms
N
0 50 100 200 Km

Example STRIPS2 Paired Comparison Site

Soil Health & Carbon Dynamics

Water Quantity & Quality

Vertebrate Wildlife, esp. Grassland Birds

Siting, Establishment & Management

Pollinators & Monarch Butterfly

Market & Non-market Value

Grassland Bird Research Objectives

1. Compare **grassland bird density** in fields with prairie strips to other common on-farm grassy features
2. Compare **nest density** in prairie strips to other common on-farm grassy features
3. Compare **nest survival** across these feature types
4. Inform conservation planning

1. Bird Density Methods

- Bird Point Counts using distance estimation
- May – July, 2015 – 2020
- 12 commercial farms
- Fields: Crops with prairie strips, grass strips, or 100% crops

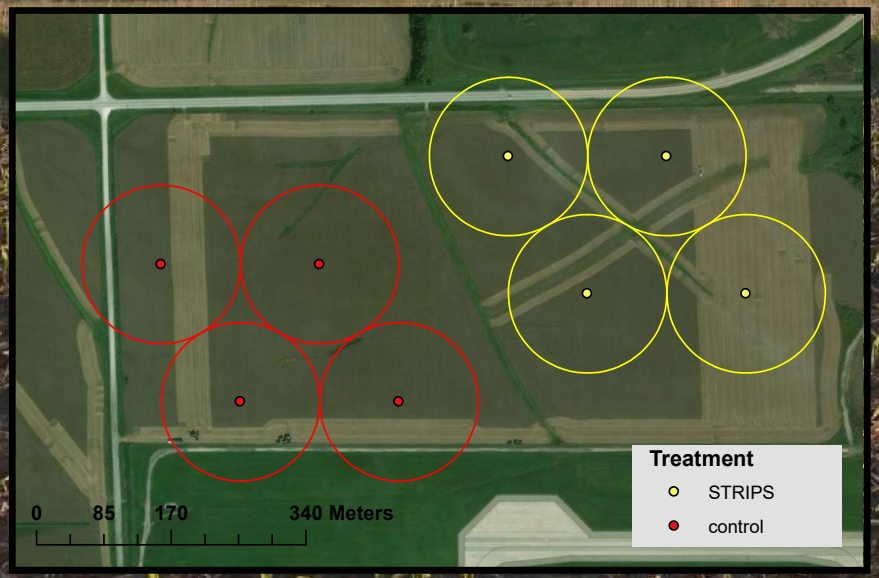


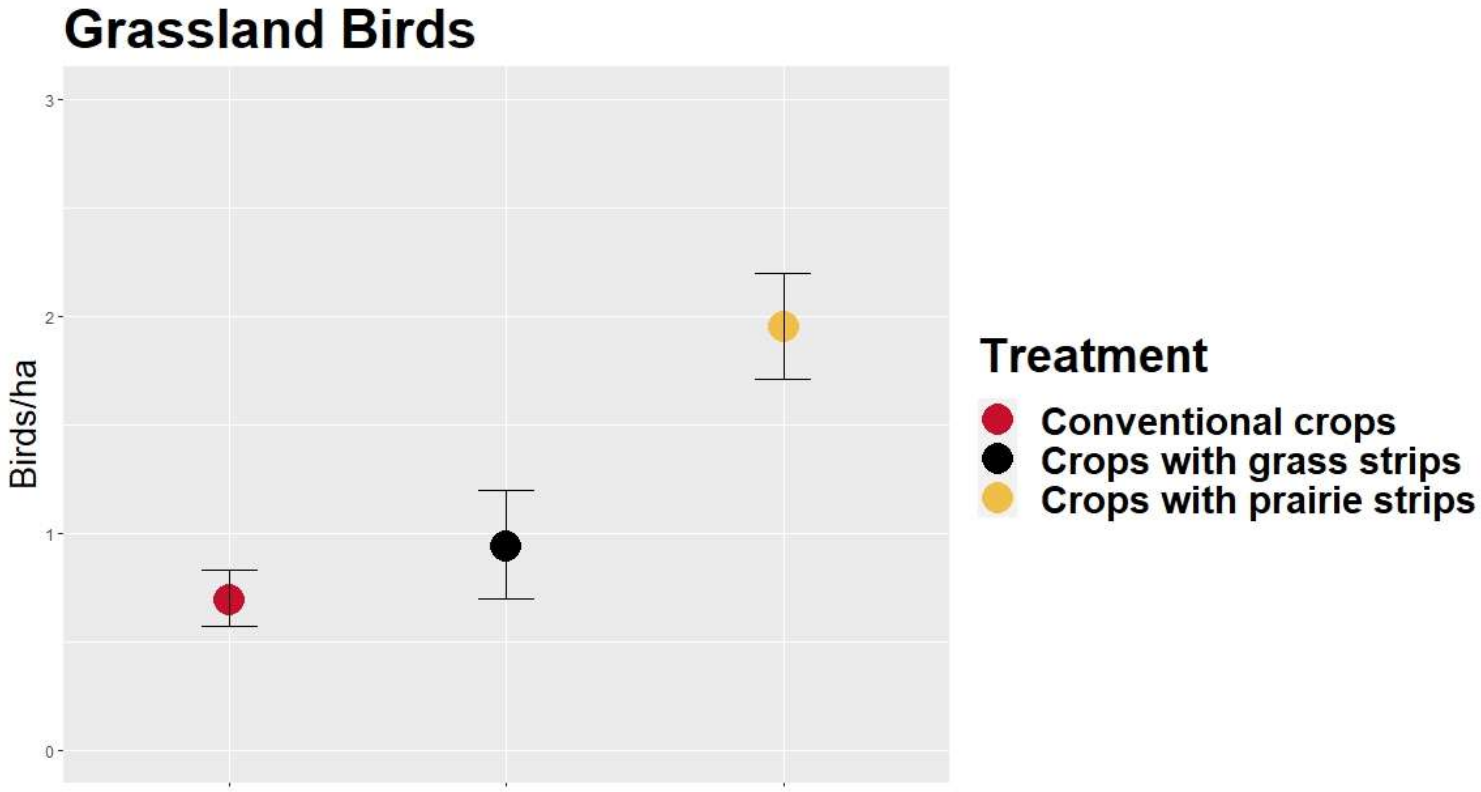
Image: Wright Co.; ISU, Lisa Schulte Moore

1. Bird Density Data Summary

- 16,538 detections of 81 species
- 17 grassland species
- Most common: Red-winged Blackbird, Dickissel, and Common Yellowthroat

Source: Giese, Schulte, Klaver Unpublished data

1. Bird Density



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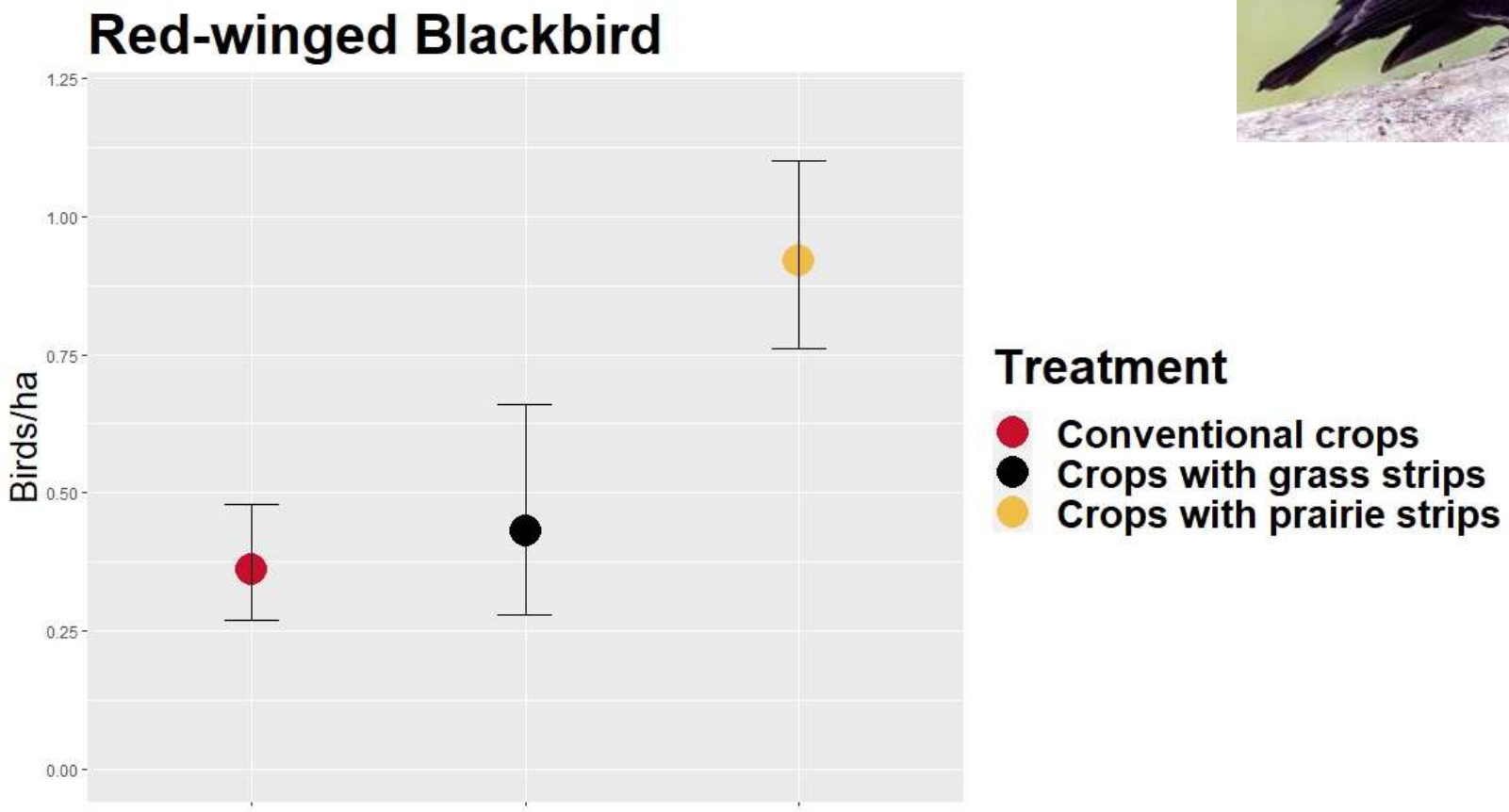

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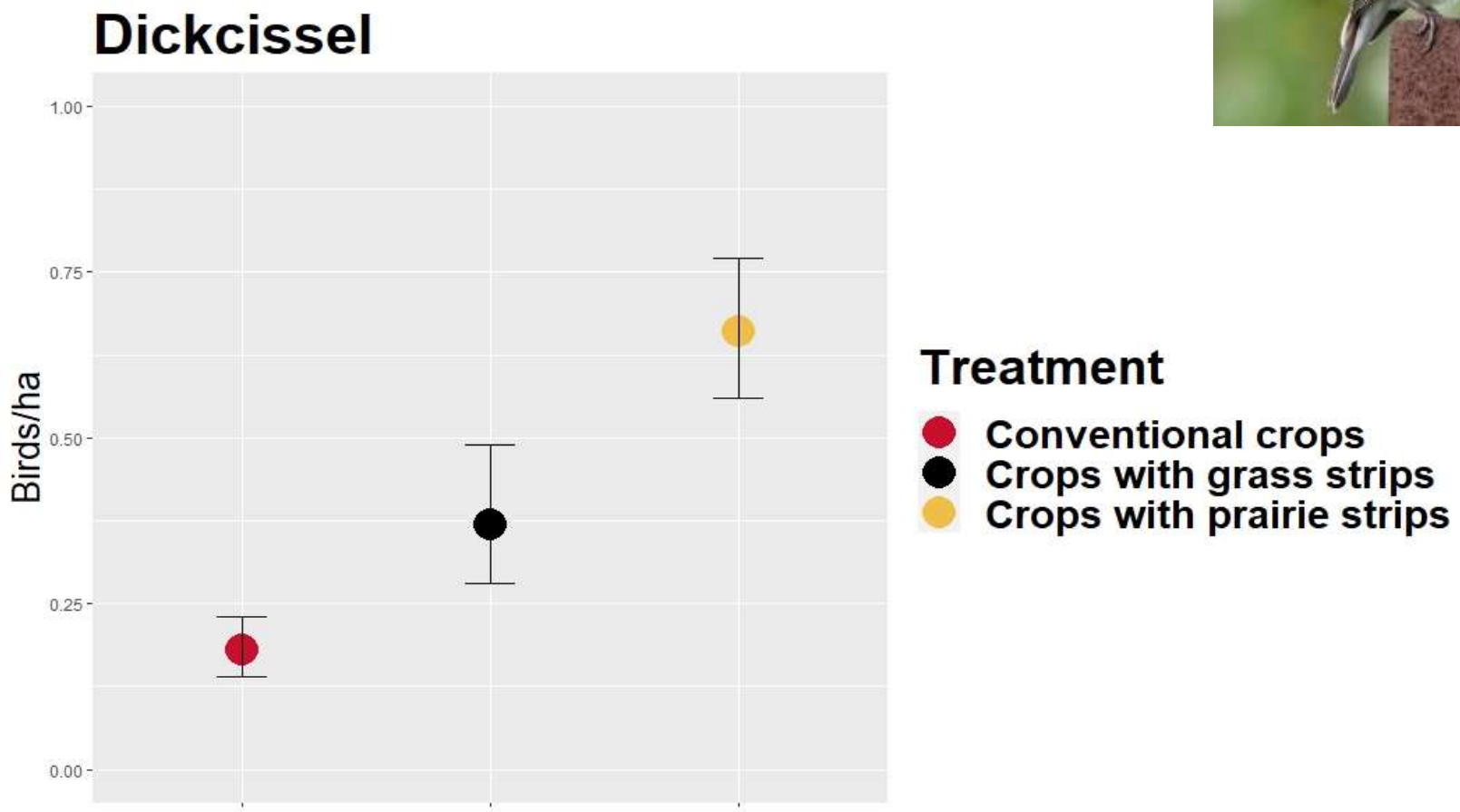

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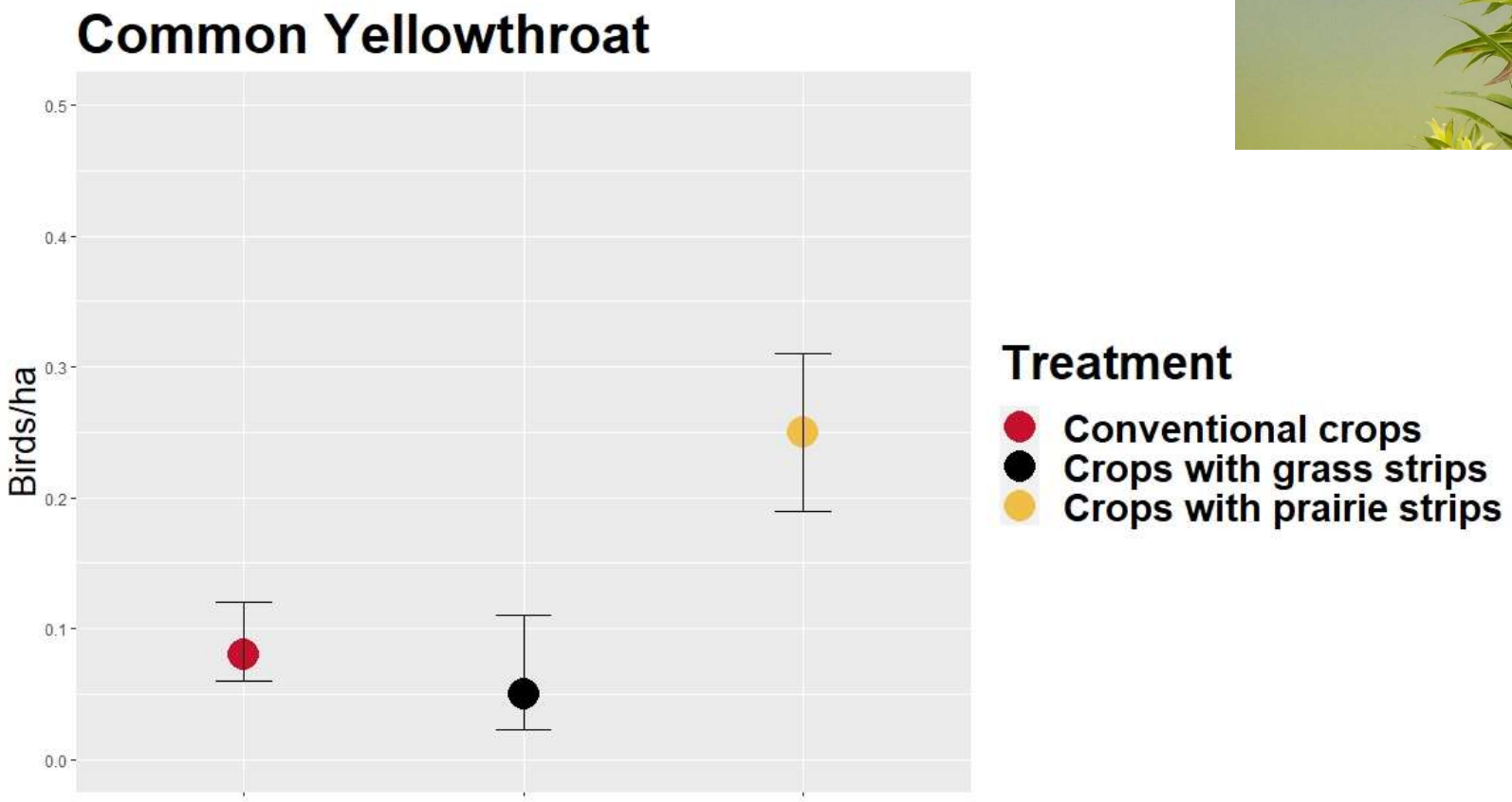
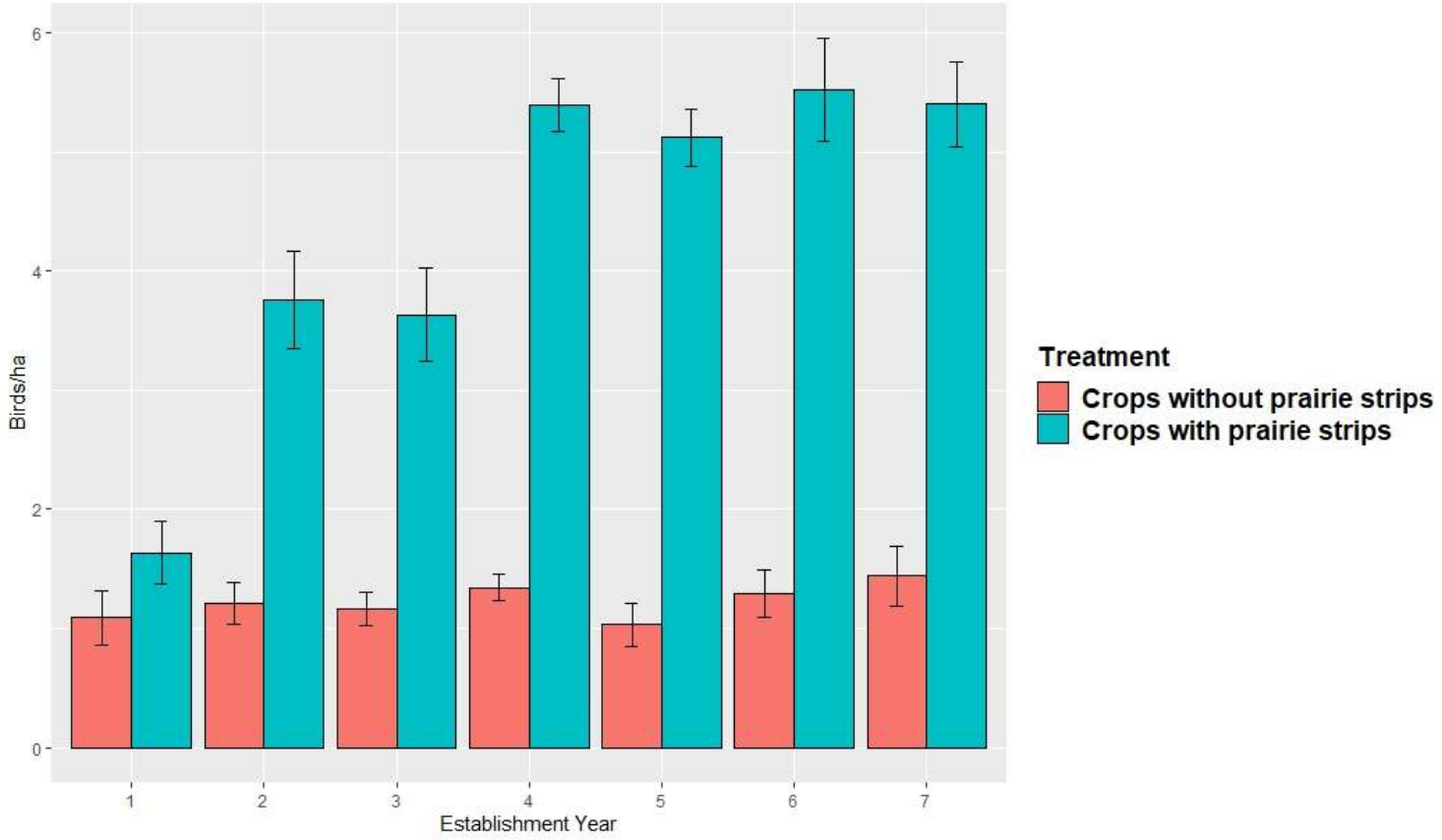


Source: Giese, Schulte, Klaver Unpublished data

1. Bird Density

Grassland Birds by Establishment Year



Source: Giese, Schulte, Klaver Unpublished data

2 & 3. Nest Density & Survival Methods

- May – July, 2015 – 2019
- 11 commercial farms
- Double-observer plot searches in different on-farm vegetation types
- Monitored until success/failure

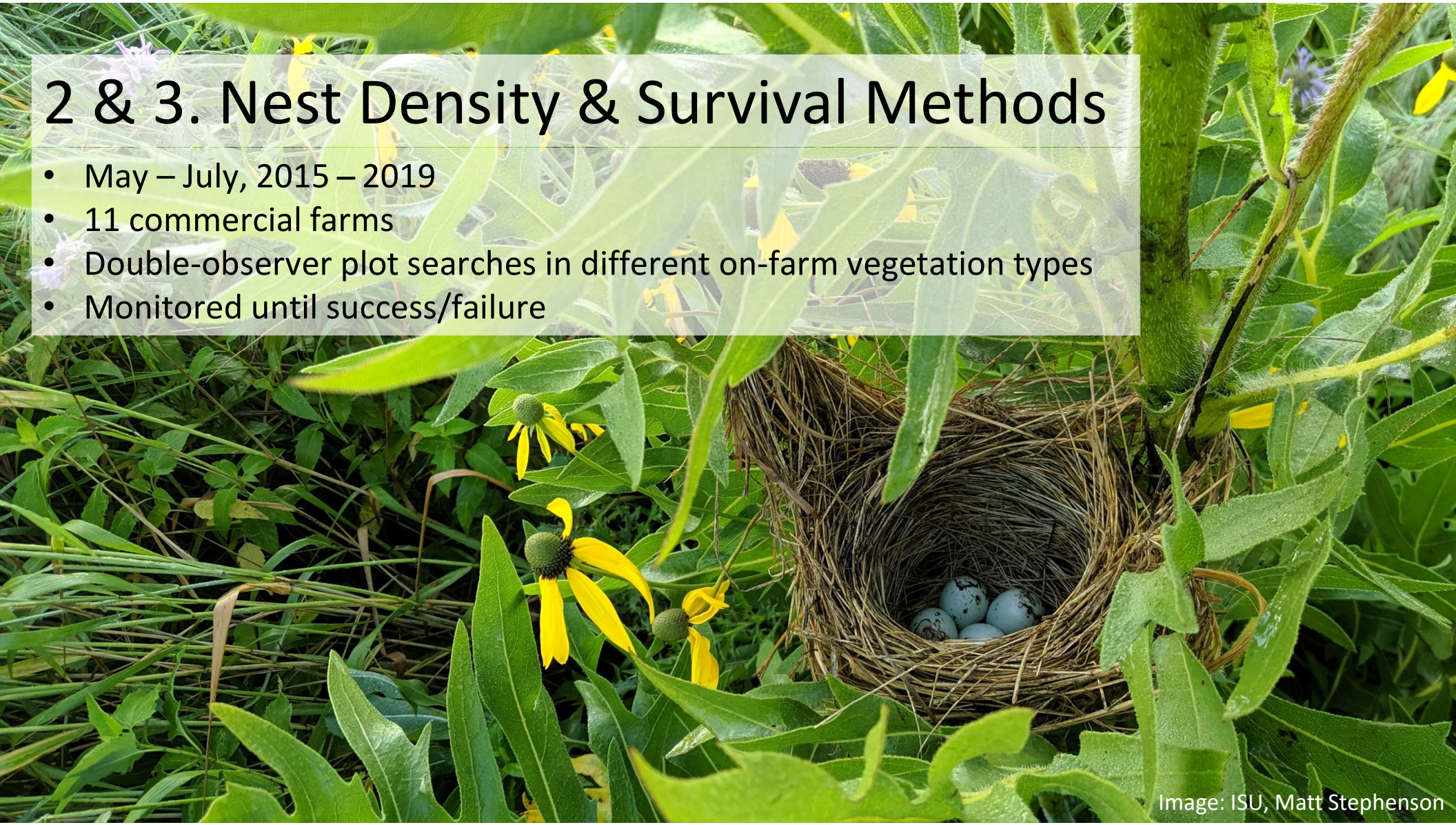


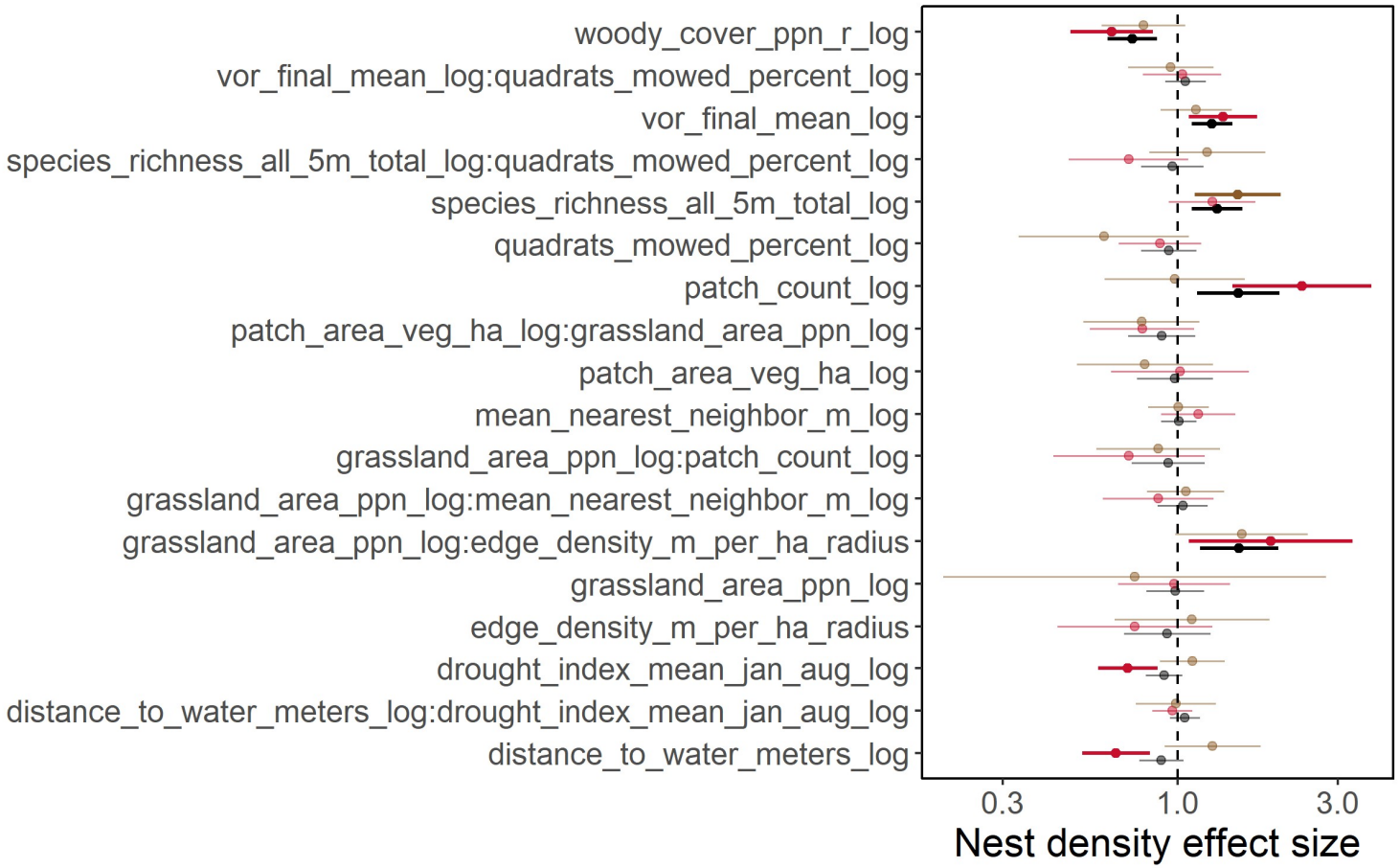
Image: ISU, Matt Stephenson

2. Nest Density Data Summary

- 530 plot-years
- Plots searched weekly for a total of 9-12 times in a season
- 322 nests in plots
- 9 species of grassland-nesting passerines found in plots (*Species of Greatest Conservation Need, “SGCN”)
  - 145 Red-winged blackbird
  - 126 *Dickcissel
  - 21 Vesper sparrow
  - 11 *Common yellowthroat
  - 10 *Meadowlark spp.
  - 6 American goldfinch
  - 4 *Grasshopper sparrow
  - 4 Song sparrow
  - 1 *Sedge wren

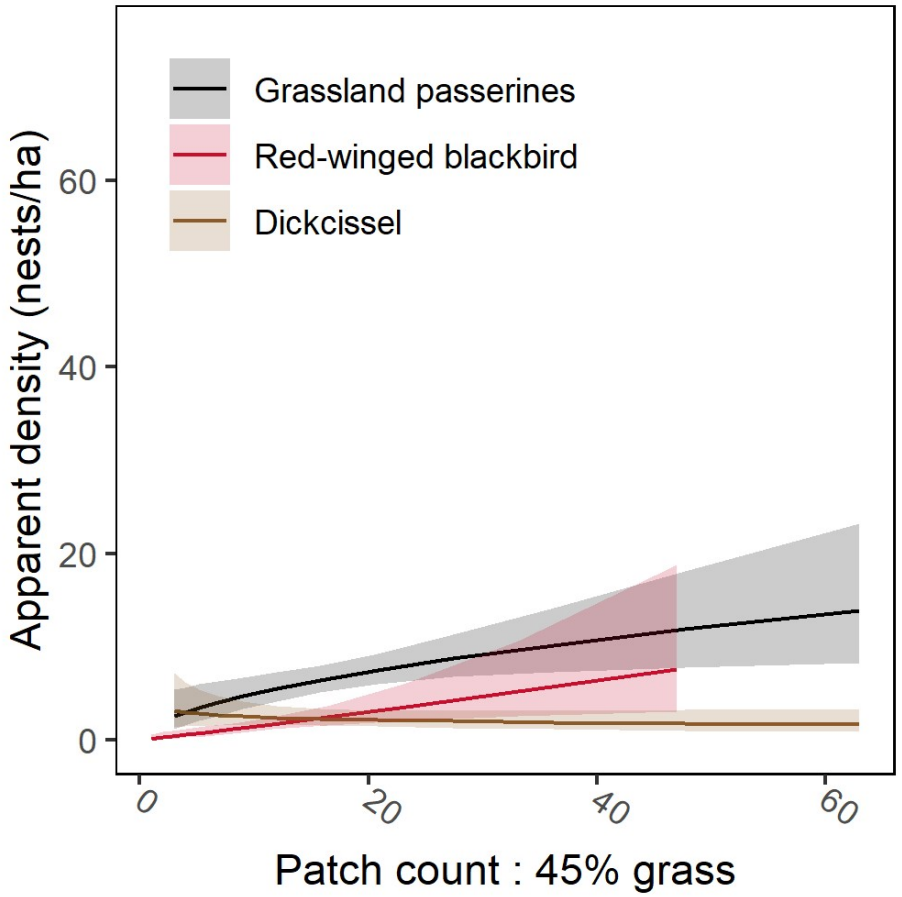
Source: Stephenson 2022

2. Nest density: Effect sizes



Source: Stephenson 2022

2. Nest density: Habitat configuration



Source: Stephenson 2022

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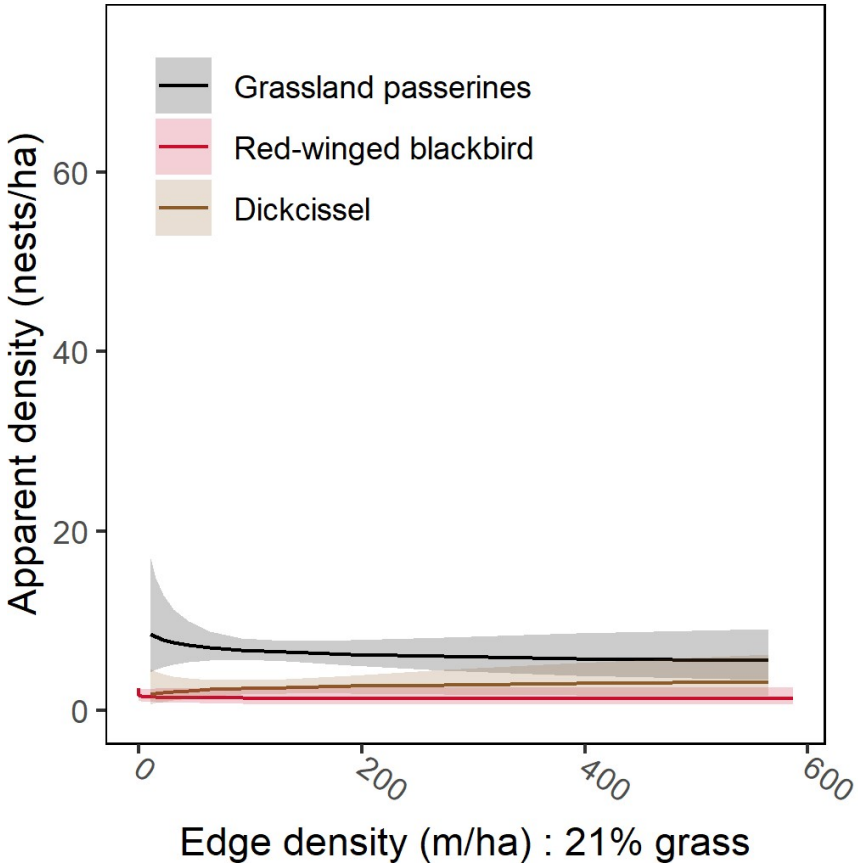
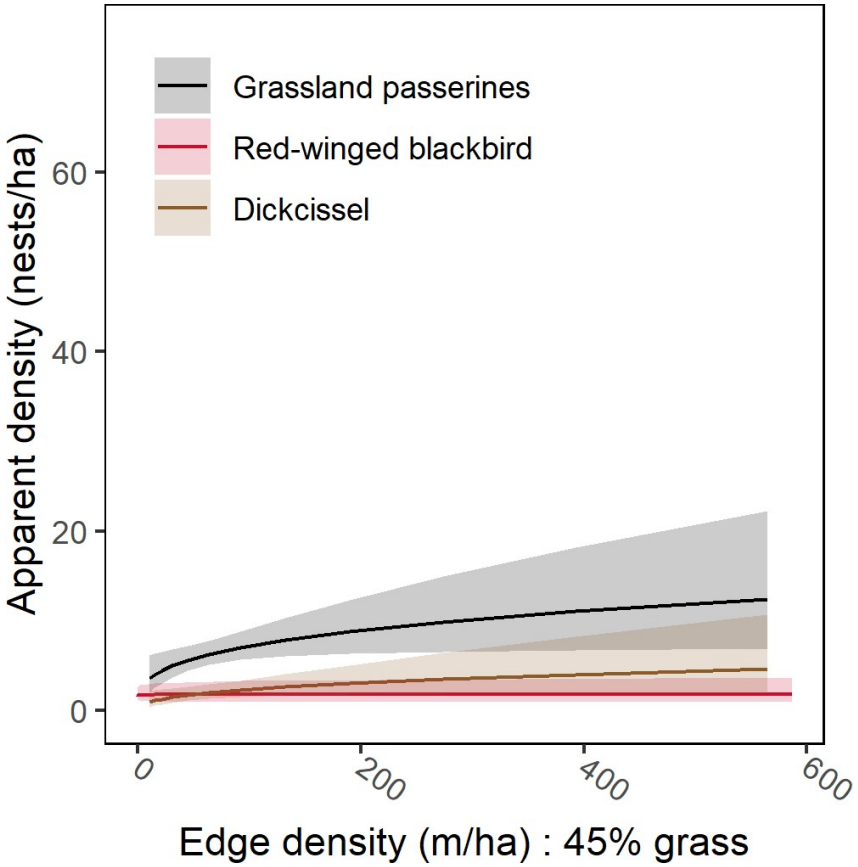
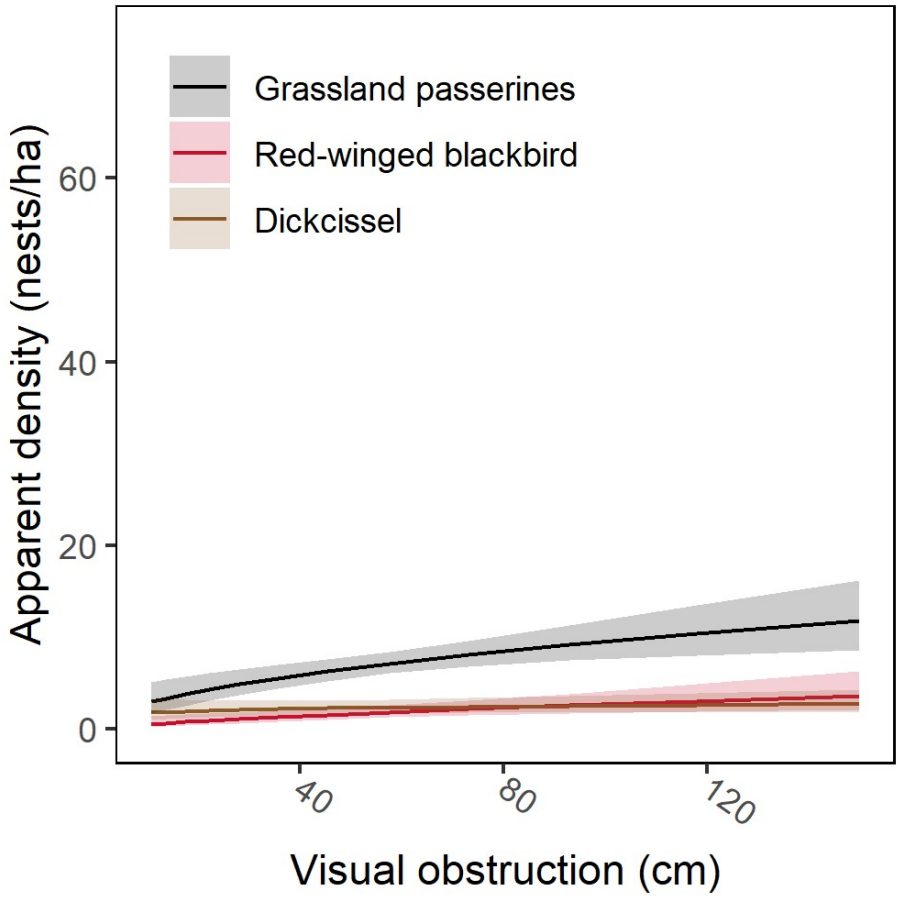




Source: Stephenson 2022

2. Nest density: Vegetation



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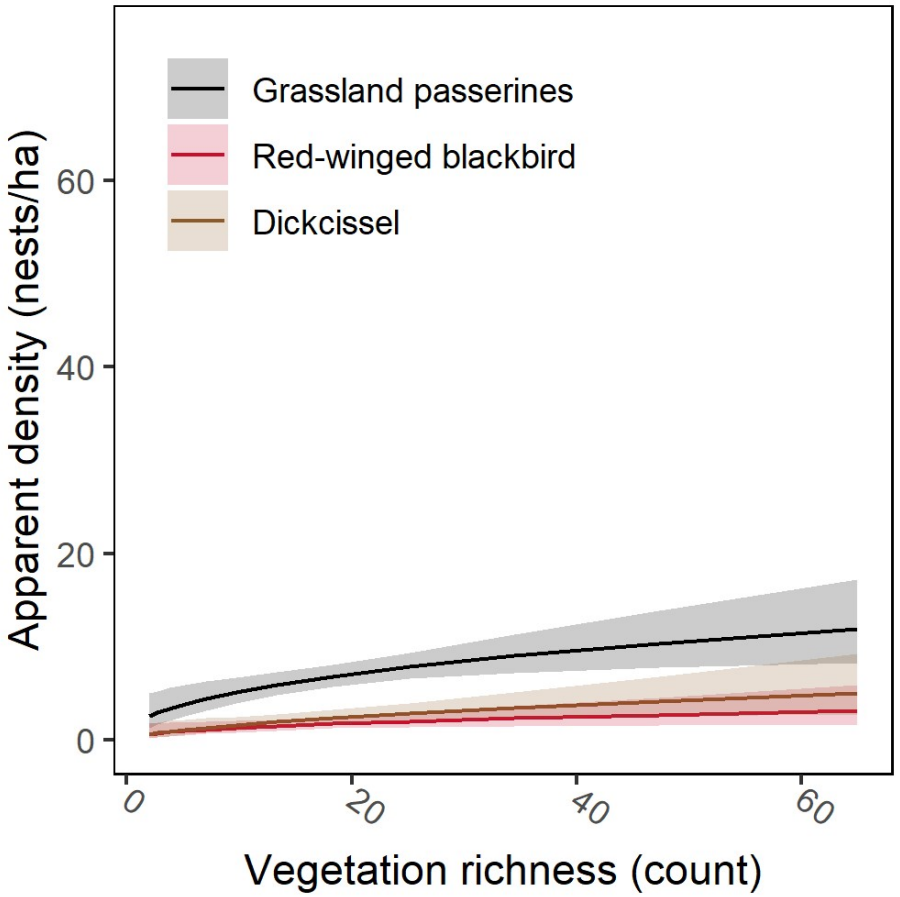
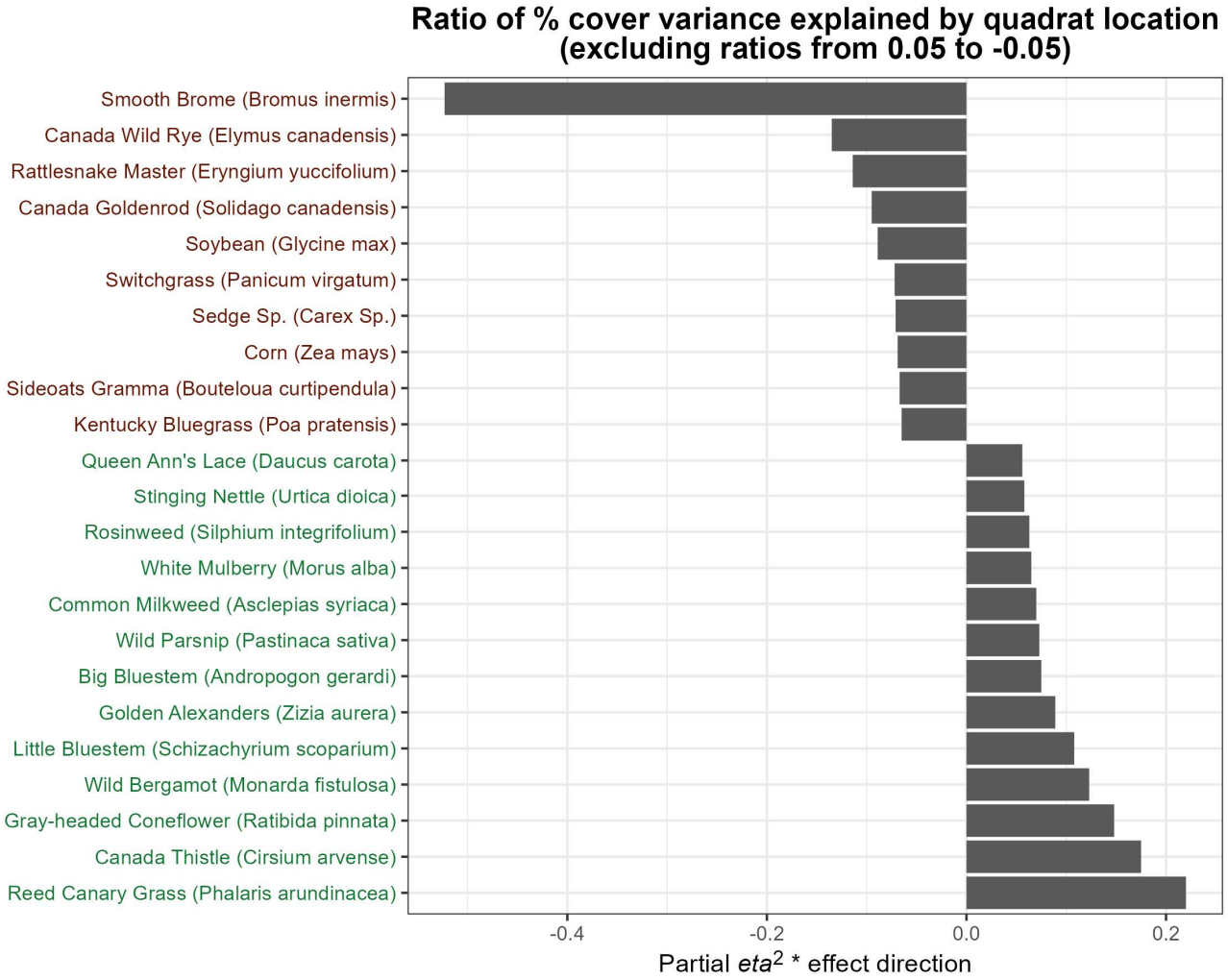


Source: Stephenson 2022

Nest location preference



Source: Stephenson 2022

3. Nest Survival Data Summary

- From 2015-2019 we located and monitored 1604 bird nests from 29 species on 11 sites in central Iowa
- Nest data sets large enough to model DSR:
  - Red-winged blackbird (781 nests)
  - Dickcissel (304 nests)
- Grassland passerines (1269 nests)
  - Nine species
  - Five of which are state Species of Greatest Conservation Need

Source: Stephenson 2022

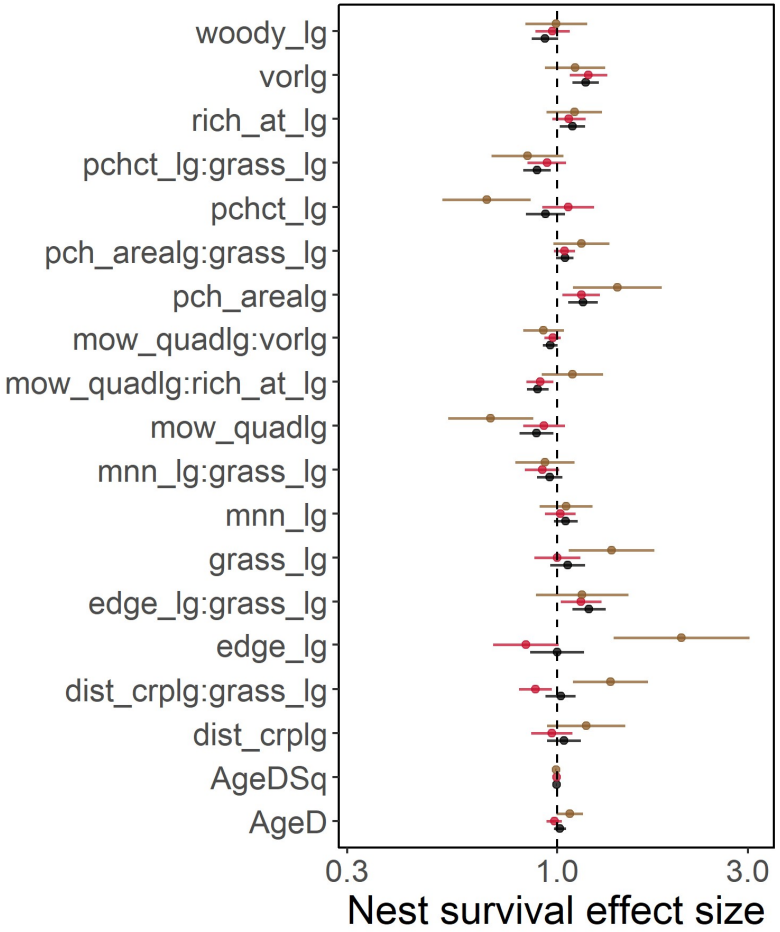
3. Nest survival Data Summary

- Red-winged blackbird (781)
- *Dickcissel (126)
- Vesper sparrow (67)
- *Common yellowthroat (48)
- *Meadowlark spp. (44)
- American goldfinch (16)
- *Grasshopper sparrow (6)
- *Sedge wren (3)
- Song sparrow (2)
- American robin (66)
- *Brown thrasher (33)
- Cedar waxwing (1)
- Chipping sparrow (2)
- Eastern bluebird (1)
- *Eastern kingbird (1)
- Gray partridge (1)
- Gray catbird (10)
- Killdeer (11)
- Lark sparrow (1)
- *Loggerhead shrike (1)
- Mallard (1)
- Mourning dove (3)
- Northern cardinal (3)
- Rose-breasted grosbeak (1)
- Ring-necked pheasant (15)
- Spotted sandpiper (3)
- *Upland sandpiper (7)
- Wild turkey (1)
- *Yellow-billed cuckoo (1)

*Species of Greatest Conservation Need

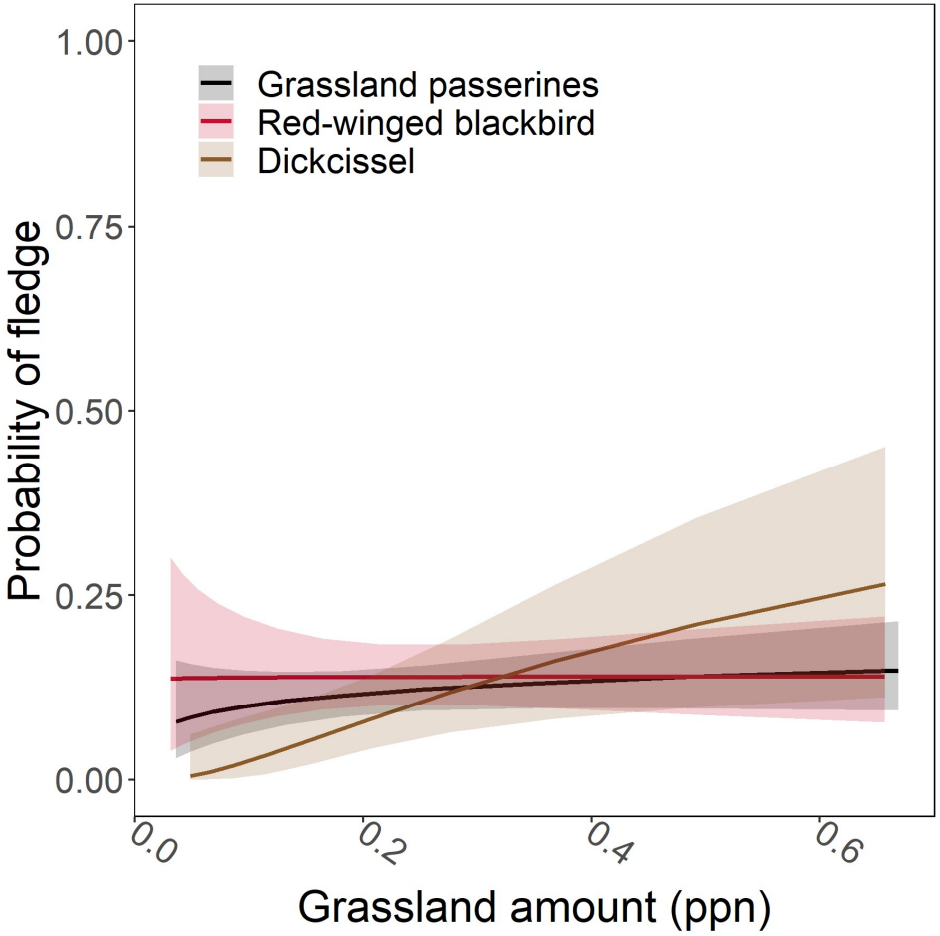
Source: Stephenson 2022

3. Nest survival: Effect sizes



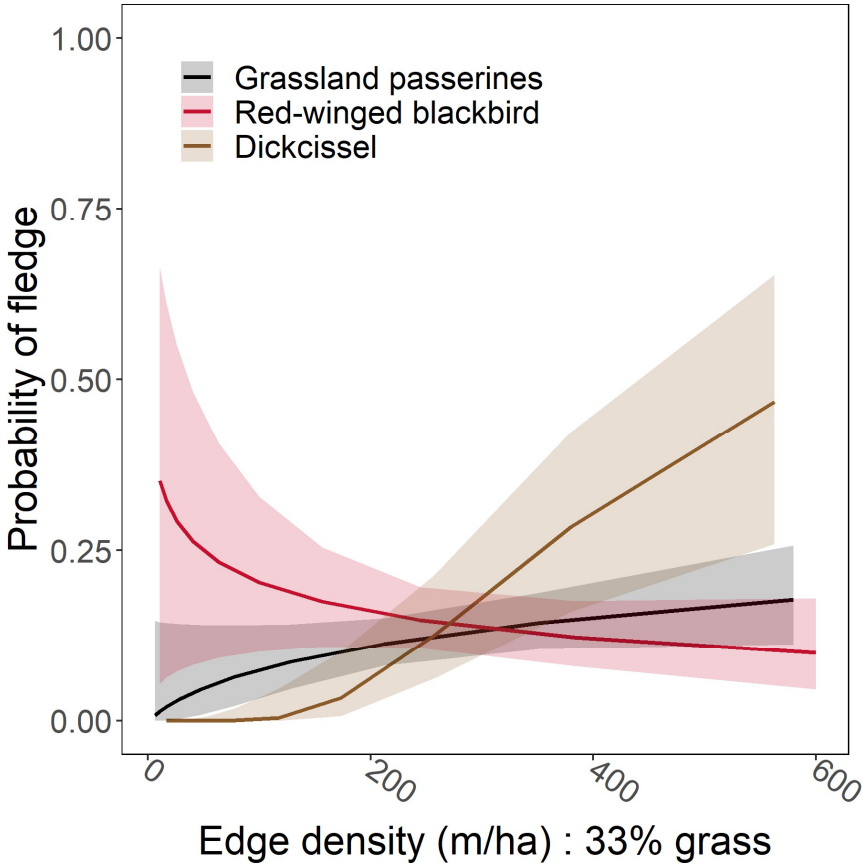
Source: Stephenson 2022

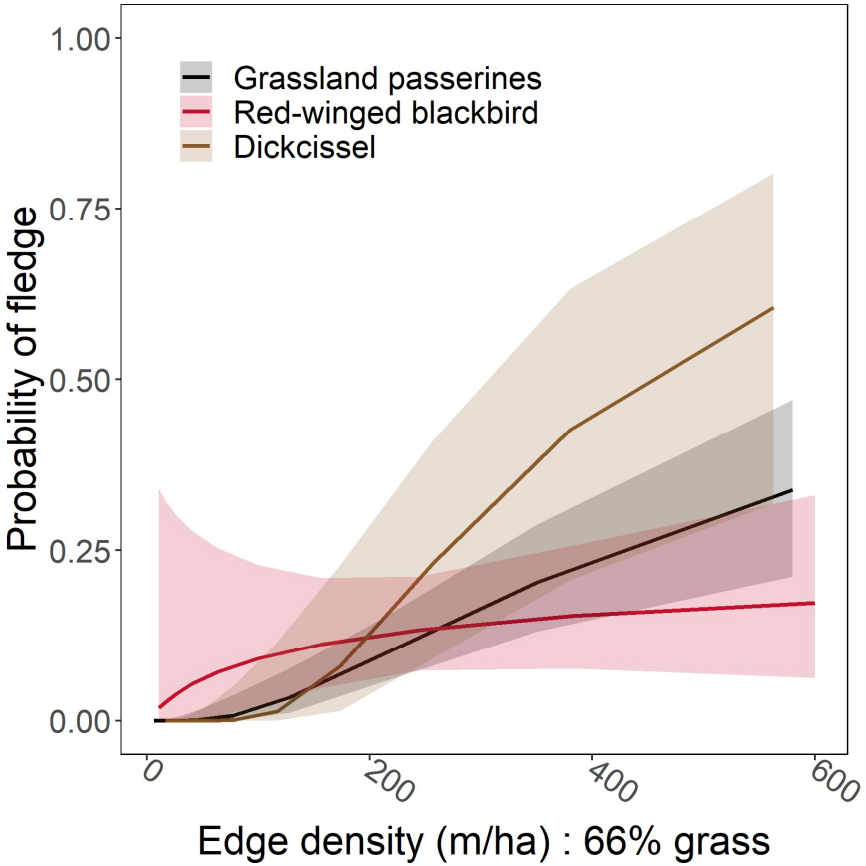
3. Nest survival: Habitat amount



Source: Stephenson 2022

3. Nest survival: Habitat configuration





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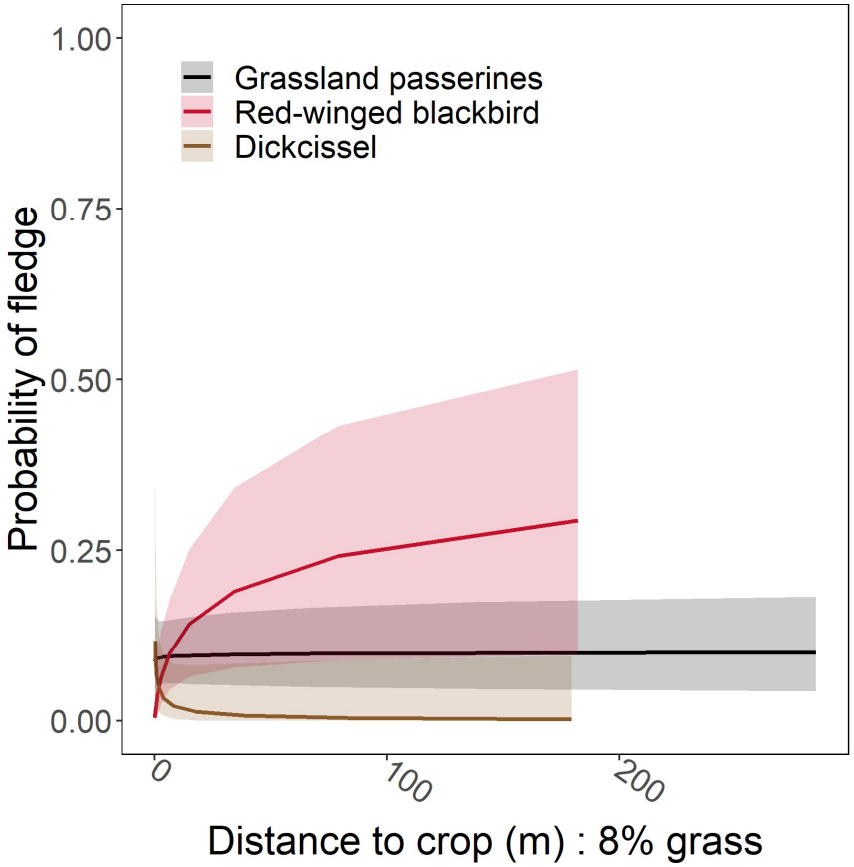
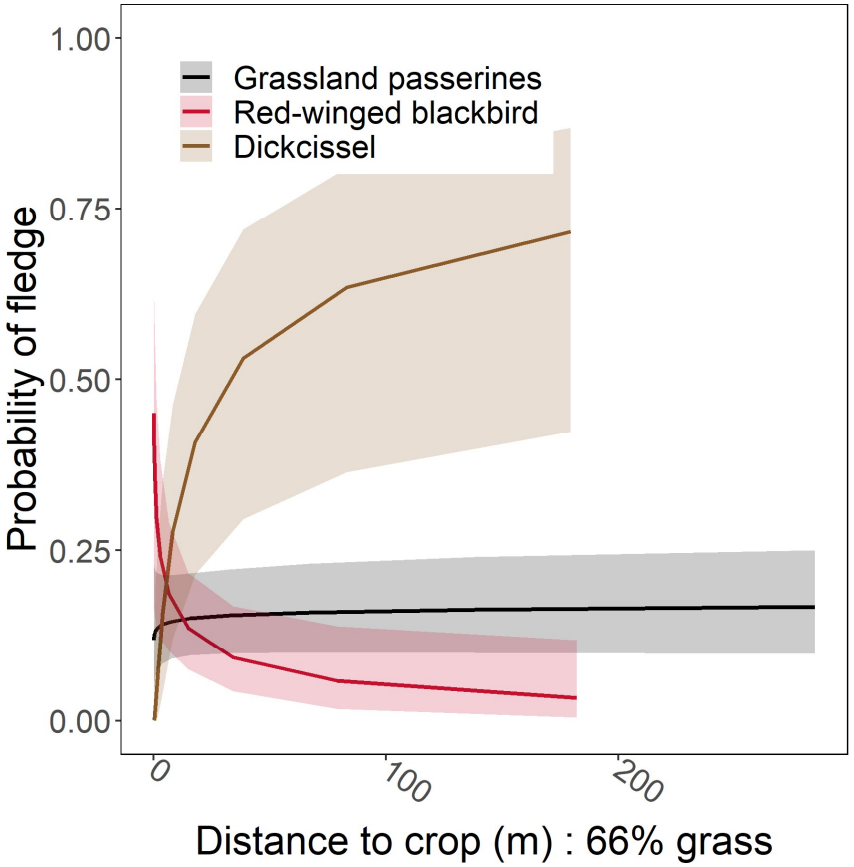
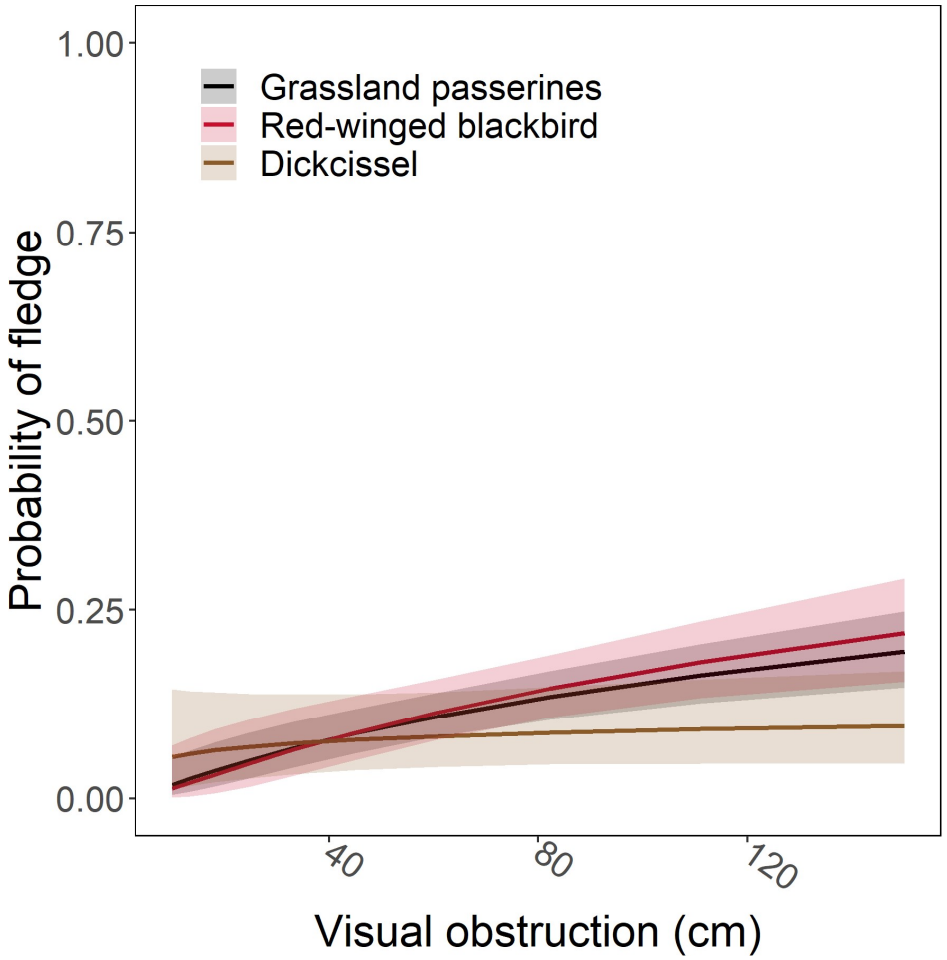




Source: Stephenson 2022

Nest survival: Vegetation



Source: Stephenson 2022

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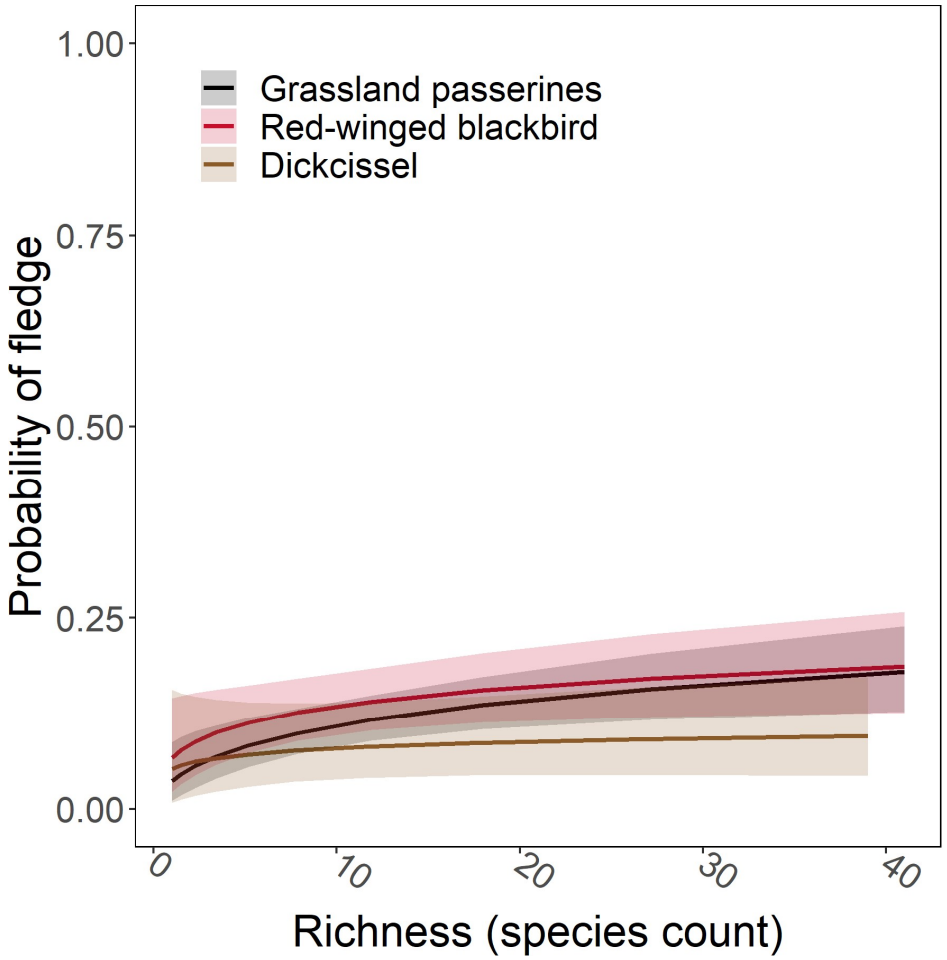
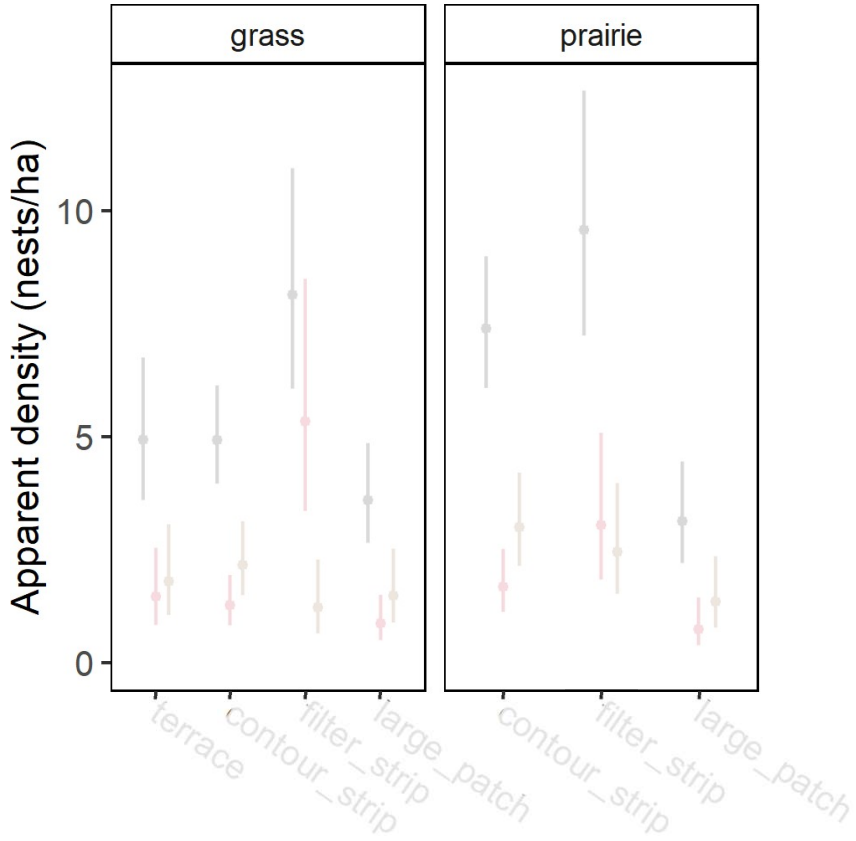


Source: Stephenson 2022

4. Conservation Practice Design

4. Conservation practice estimates: Nest density

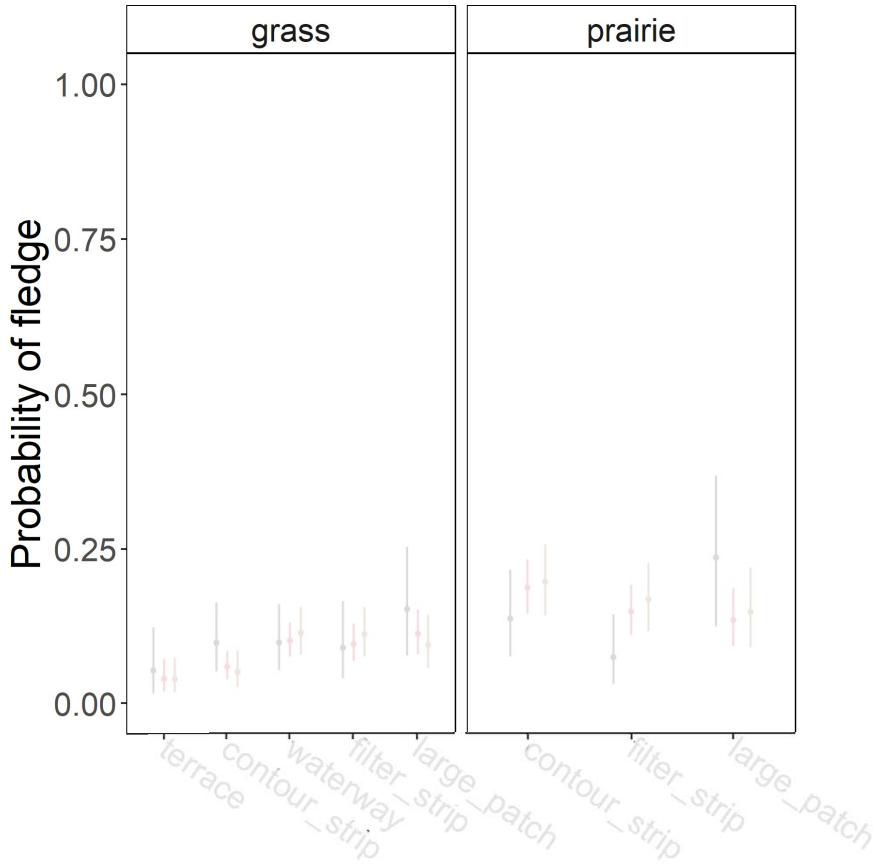
- Prairie contour strips compared to large patch prairie
- Prairie contour strips compared to grass contour strips



Source: Stephenson 2022

4. Conservation practice estimates: Nest survival

- Prairie contour strips compared to large patch prairie
- Prairie contour strips compared to grass contour strips
- Survival was very low in grass contour strips and terraces



Source: Stephenson 2022

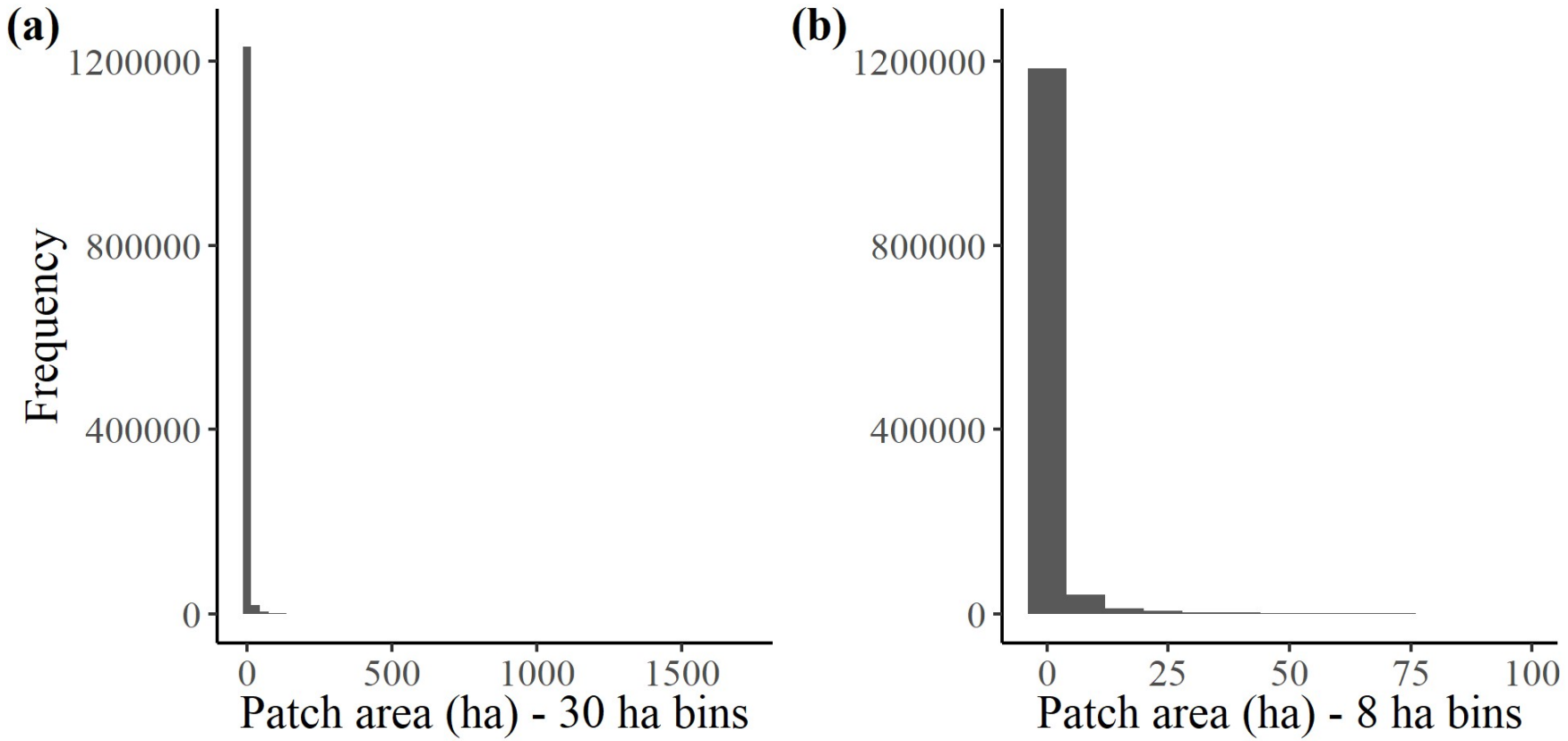
4. Population sinks in Iowa?

- Previous studies estimated nest success rates necessary to sustain a population
  - Red-winged blackbirds > 27.6%
  - Dickcissels 22.9% < *s* < 29.7%
  - Eastern Meadowlark > 29.9 %
  - Common Yellowthroat > 19.5 %
  - Bobolink > 29.4%
- Also depends on fledgling and adult survival

- Our estimates of nest survival in 20 – 150 acre prairies were:
  - Grassland passerines = 13.5% (9.3 – 18.6%)
  - Red-winged blackbirds = 14.8% (9.1 – 21.9%)
  - Dickcissel = 23.6% (12.5 – 36.8%)

Source: Stephenson 2022

4. Grassland patches in Iowa



Source: Stephenson 2022

4. Summary of Grassland Bird Habitat Quality Predictors

- Habitat amount not a sufficient predictor on its own
  - Exception of Dickcissel nests had higher survival with more habitat amount
- Landscapes had higher nest densities with more patches, higher non-crop edge density, and more dense and diverse vegetation

- Nest survival was higher with:
  - Fewer patches
  - Larger patches
  - Higher edge densities
  - Greater distance from crop edge
  - Diverse vegetation
  - Dense vegetation
- Effects of habitat configuration are relative to habitat amount

Source: Stephenson 2022

4. Conservation Practice Design Considerations

- Fields with prairie strips have higher densities of grassland birds than those with grass contour strips, though areas sensitive birds largely absent
- Prairie strips had similar nest density and survival as large patch prairies
  - They are best when fewer, larger, located in more complex landscapes, and have more diverse vegetation
- Prairie strips had similar nest density to and higher nest survival than grass contour strips
- Low survival rates in **grass contour strips** and **grassed terraces** without concomitantly lower density likely makes them ecological traps

Source: Stephenson 2022

4. Conservation Practice Design Considerations

- Large patch prairie restorations are needed for area sensitive birds
- Probably, the larger the better for core prairie habitat areas
- Land acquisition opportunities and budgets are limited
- Prairie strips represent an improvement over low-diversity conservation practices
- The accessibility of the CP-43 represents a major opportunity to improve wildlife habitat across large areas while work continues on dedicated nature reserves

Source: Stephenson 2022

Soil Health & Carbon Dynamics

Water Quantity & Quality

Vertebrate Wildlife, esp. Grassland Birds

Siting, Establishment & Management

Pollinators & Monarch Butterfly

Market & Non-market Value

Additional Key Findings from STRIPS2 Research

Strategically adding prairie strips to commercial farm fields:

- Multiple measures of soil health increase through time within prairie strips, but negligible effects on soil health in adjacent cropland soil[a,b,c]
- Reduces sediment and nutrient concentrations in runoff water including:
  - Total suspended solids by 92% (annually and outside of primary growing season)[d]
  - Total nitrogen by 90% (annually)[d]
  - Total phosphorus by 90% and dissolved phosphorus by 88% (annually)[d]
- Increases abundance, diversity of native pollinators[e]; increases honey bee forage and productivity[f]; does not increase bee exposure to insecticides[g]
- Provide habitat for many grassland birds, but not for for snakes and lizards[h]
- Are one of the most cost-effective conservation practices, especially when located on chronically unprofitable cropland[i]
- Iowans are willing to pay for the environmental benefits[j]

Sources: [a]Dutter 2022; [b]Henning 2022; [c]Nelson 2022; [d]Helmers & Witte, unpublished data; [e]Kordbacheh et al. 2020; [f]Ge et al. 2021, Ge et al. In review; [g]Hall et al. 2022, Hall et al. In review; [h]Stephenson 2022; [i]Audia et al. 2022, Bravard et al. 2022, Summers & Tyndall unpublished data; [j]Khanal et al. 2022

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