Minnesota Breeding Bird Atlas

Following the Field Work:

Generating Products for the Minnesota Breeding Bird Atlas

Minnesota Breeding Bird Atlas

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&
Dr. Gerald Niemi
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As well as Jan Green, Kim Rewinkel,
Jane Reed, **Nick Walton**, Ed Zlonis
and many, many, many others

Minnesota
Breeding
Bird Atlas

Bonnie Sample

MNBBA Program Manager 2008-2014

Minnesota Breeding Bird Atlas

Outline

- Quick Overview of MNBBA
- Product Development
  - Quality Control of Data
  - Species Distribution Maps
  - Analysis to address basic ecological questions
  - Species Accounts
  - Development of Website
  - Eventual Book Publication

Minnesota Breeding Bird Atlas

MNBBA Overview

Funding Support:

- **Environment and Natural Resources Trust Fund** ($900K for field work; $300K for production of final products)
- **USFWS** ($146K)
- **MNDNR** ($20K)
- **MOU** ($60K)
- **MN Audubon** ($105K of in-kind support)
- **UM-NRRI** (Significant in-kind support)

TOTAL: $1,531,000 minimum

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MNBBA Overview

Overall Time Frame (13 years)

- **Field Preparation: 2008**
- **Field work: 2009-2013**
- **Field Wrap Up:** Fall 2013-June 2014
- **Data Review:** Fall 2013-Fall 2015
- **Model Development**: 2009-2013
- **Data Analysis:** July 2014-June 2017
- **Website Design:** Fall 2016-November 2017
- **Website Launch:** November 2017
- **Book Writing:** January 2018-August 2019
- **Book Publication:** Anticipate Spring-Summer 2021

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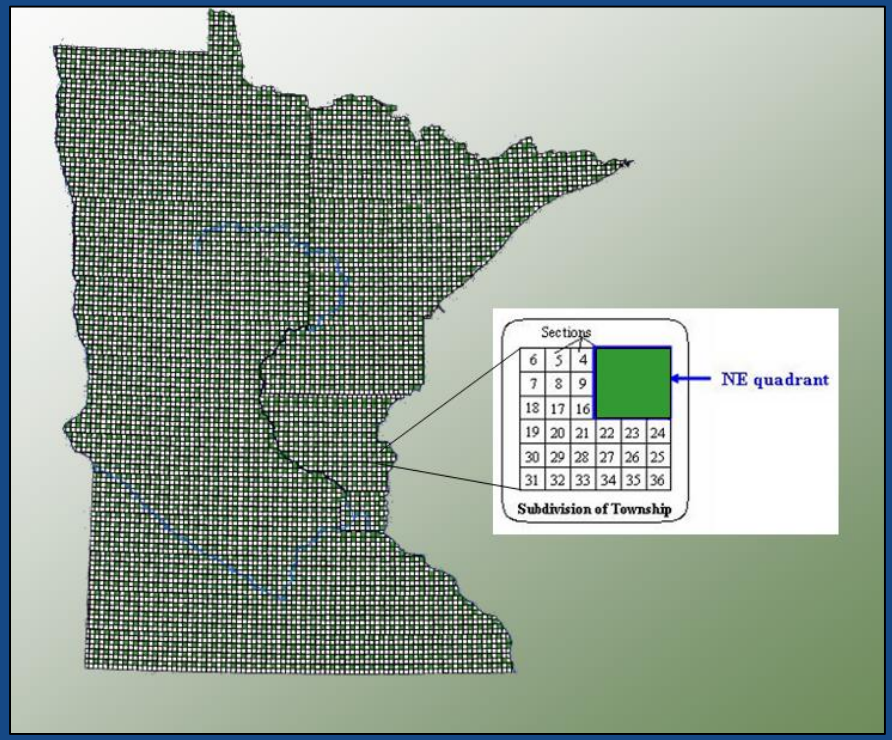
MNBBA Overview

Sampling Design

- Each township in the state was divided into four - 9 mi^2 blocks.
- The 9 mi^2 block in the NE quadrat of each township was delineated as the **PRIORITY** block.
- There were 2,352 priority blocks; 9,774 total blocks.



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MNBBA Overview

Sampling Methods

Data collection method #1: Field Volunteers

- Relied on hundreds of volunteers to collect data from 2,352 priority blocks as well as from other non-priority blocks as time and interest allowed.

Data collection method #2: Paid Field Staff

- Skilled field observers hired to survey priority blocks in remote locations.

MNBBA Overview

Data collection method #3: Solicited Data

- Collected data from surveys that provided data on less common species, species difficult to survey, or species from areas difficult to access. Examples included:
  - ✓ Great Lakes Owl Surveys
  - ✓ Minnesota Biological Survey
  - ✓ Colonial bird counts
  - ✓ Game surveys

MNBBA Overview

Data collection method #4: Point Counts

- Relied on skilled field observers hired for their expertise in identifying bird songs to conduct 3, 10 minute point counts in each priority block.
- Provides an unbiased sampling of breeding species using a random process that insures equal and consistent coverage across the state
- Addresses the question: What is the distribution and abundance of breeding birds in Minnesota?

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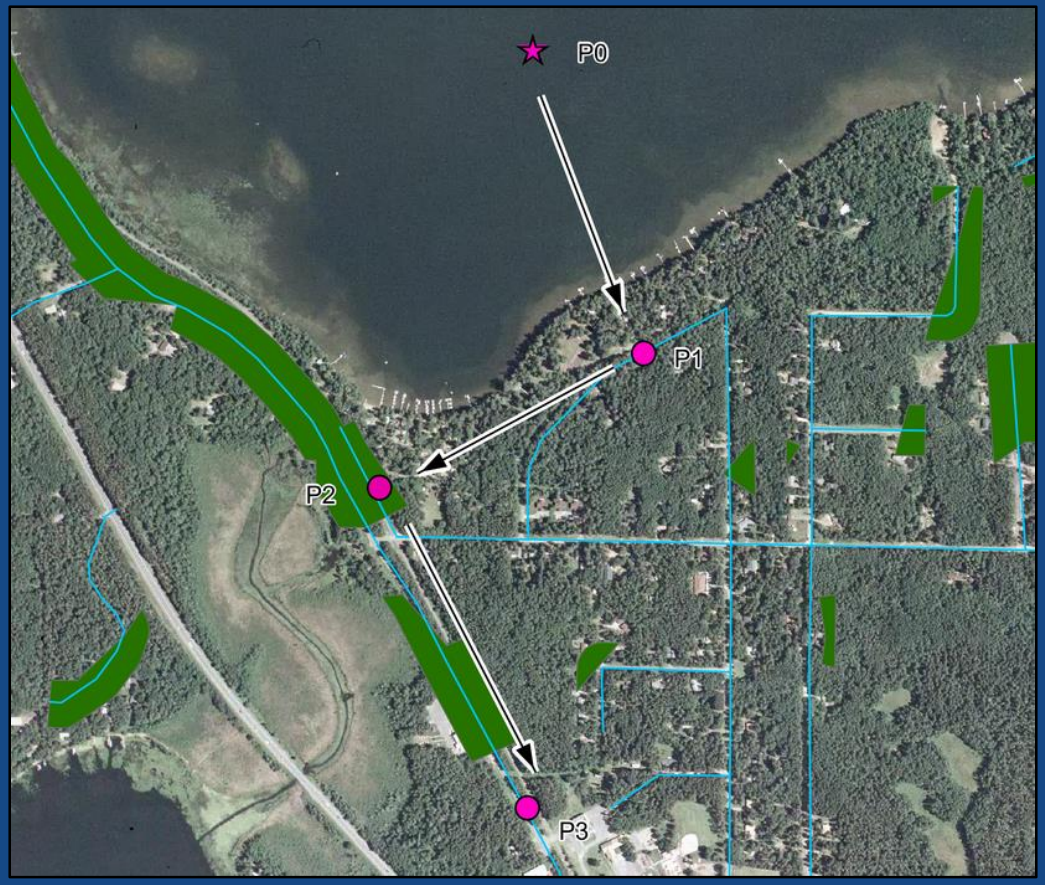
MNBBA Overview



Selection of MNBBA Point Counts

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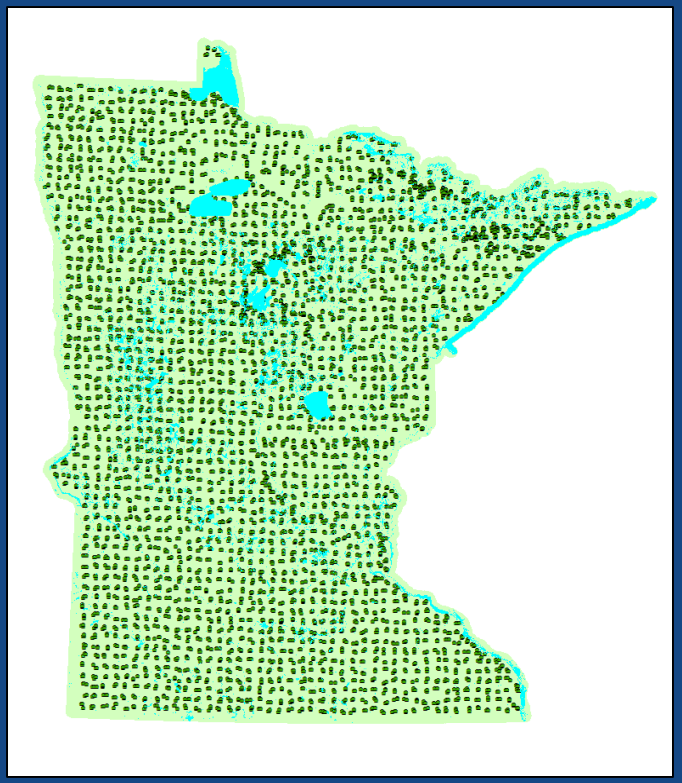
MNBBA Overview

9,100 10-minute Point Counts (2009-2013)

- **MN BBA: 7,080 counts** *(most on roads)*
- **BWCAW: 864 counts** *(off-roads)*
- **National Forests: 961 counts** *(off-roads)*
- **Agassiz Lowland Subsection: 195 counts** *(off-roads)*
- **>99% of townships were censused**



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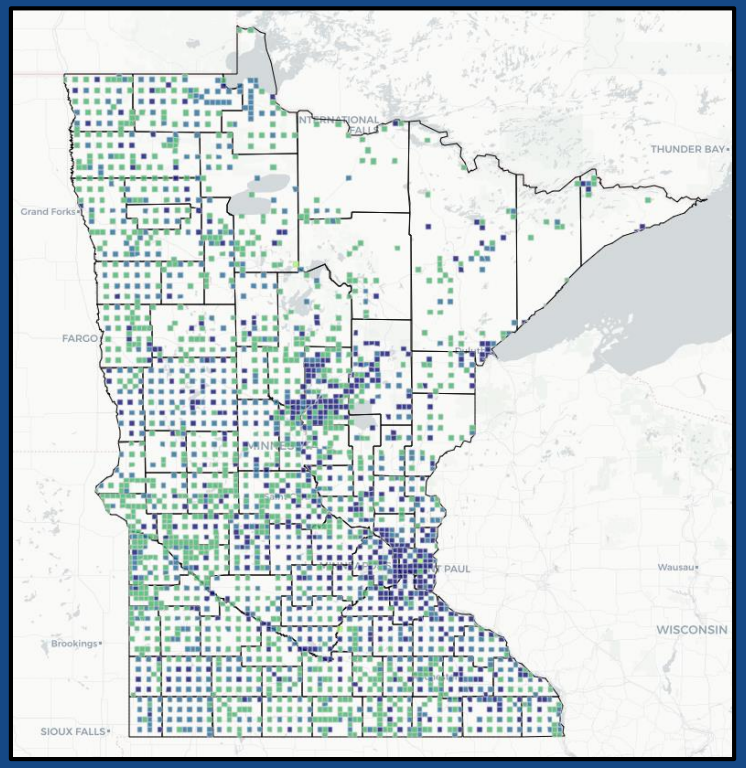
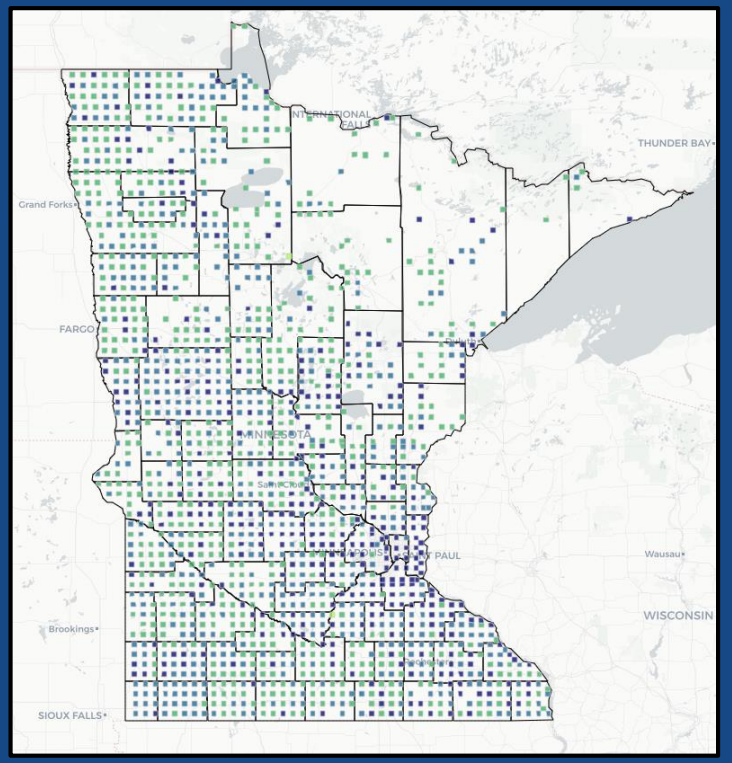
MNBBA Overview

Value of Point Counts: Unbiased Sampling





House Wren

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MNBBA Overview

RESULTS

- **> 140,000 detections for ~ 230 species from the point counts**
- **Total of ~380,000 breeding evidence records for 249 species**

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Once the fun is over the work begins

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Product Development

Step #1:

Data Review

Quality Products depend on Quality Data

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Data Review

Overall Approach

- Evolved during the course of the Atlas

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Data Review

Technical Review Committee

- Members took responsibility for reviewing MNBBA data for different bird families
- Recommended changes to be made
- Group was most active the first years of the atlas

Minnesota Breeding Bird Atlas

Data Review

Additional Reviews

- Several other staff also contributed time to reviewing records as well as a few species experts
- Inevitably we ended up with several independent reviews; none of them entirely comprehensive or consistent with one another
- Needed one individual to take the lead and review all records initially and then seek input from two others: Dr. Gerald Niemi and Jan Green

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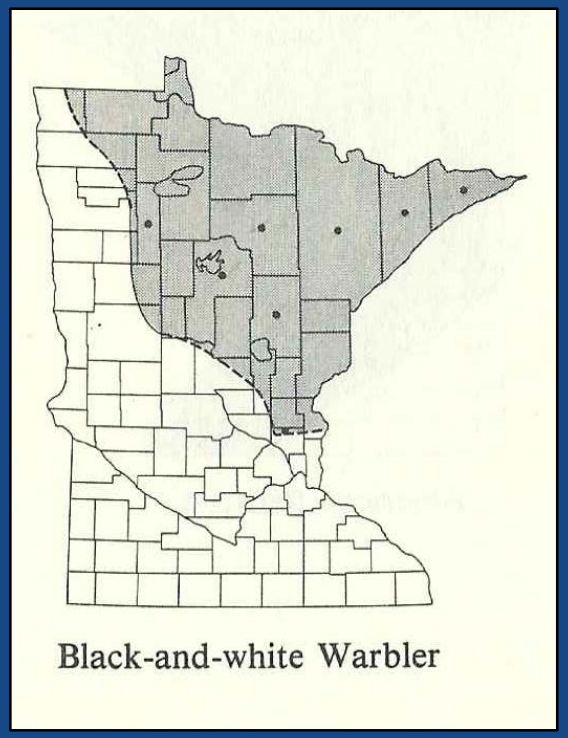
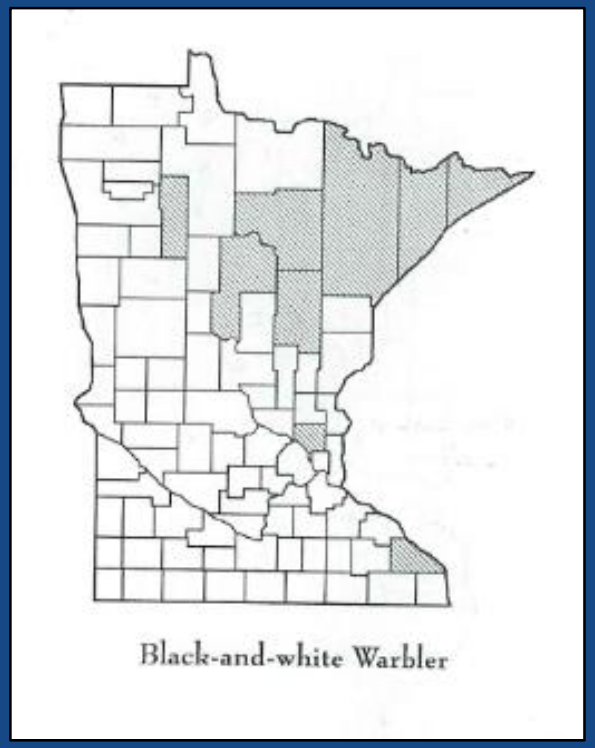
Data Review



Janssen 1987



Hertzel and Janssen 1998

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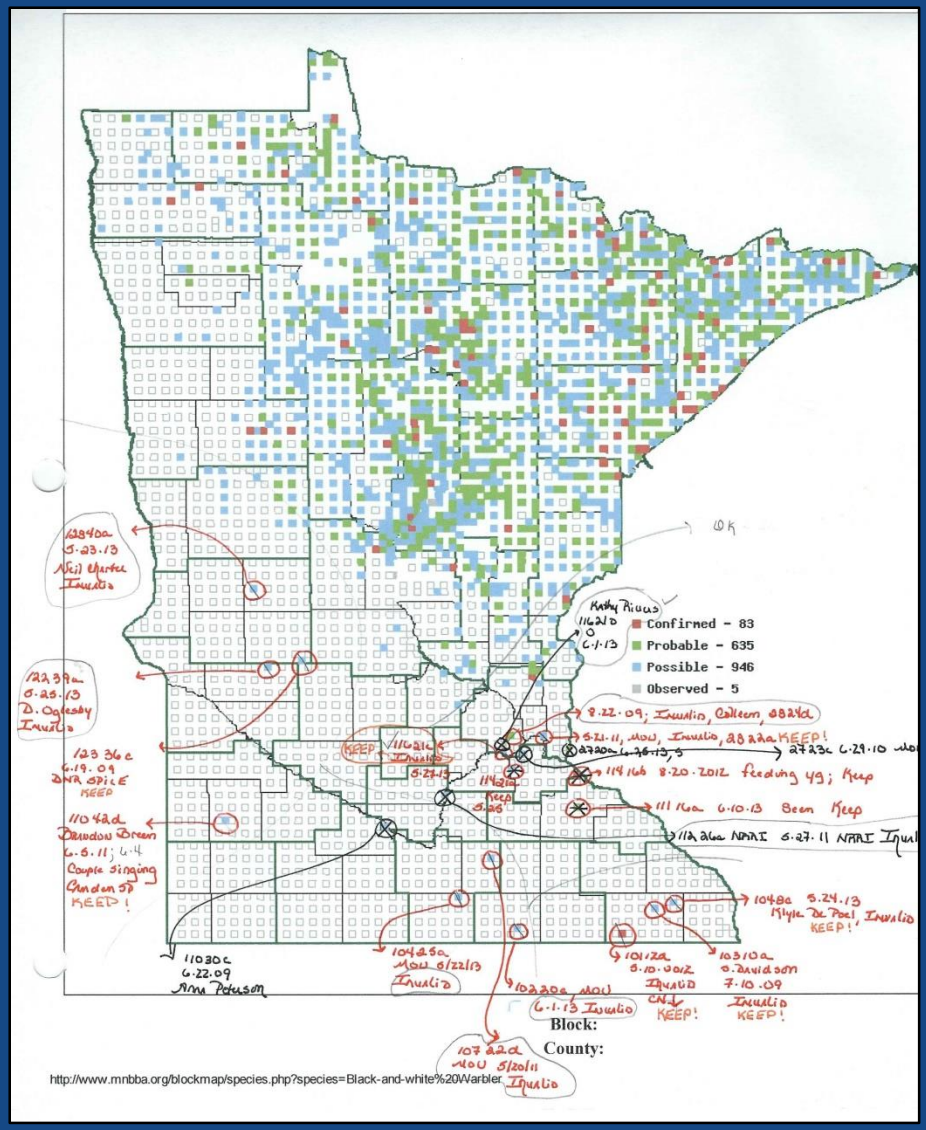
Data Review



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Data Review

Information used in the review

- Dates (Even it if it was within the safe dates for the species)
- NOTES!! NOTES!!
- Comments from other previous reviewers
- Habitat (aerial photos)
- Observer experience
- Conversation/communications with observer
- Other published records

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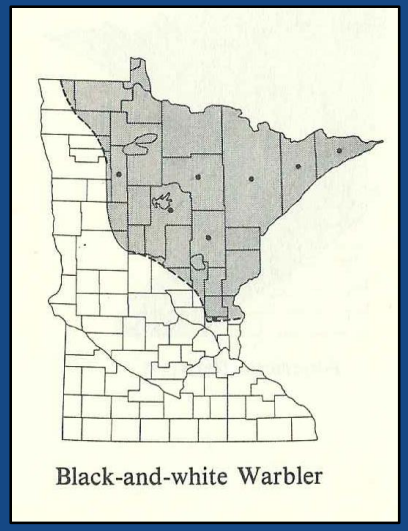
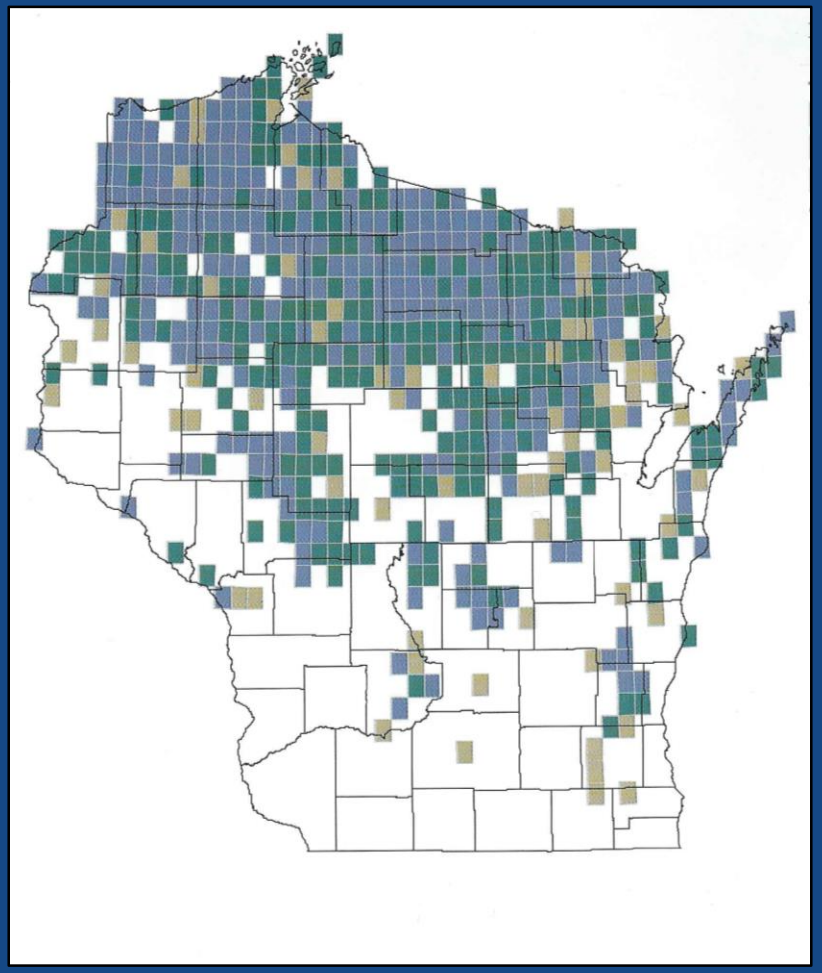
Data Review





Cutright et al. 2006

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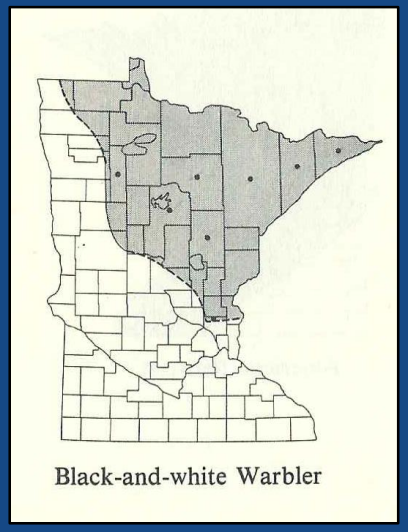
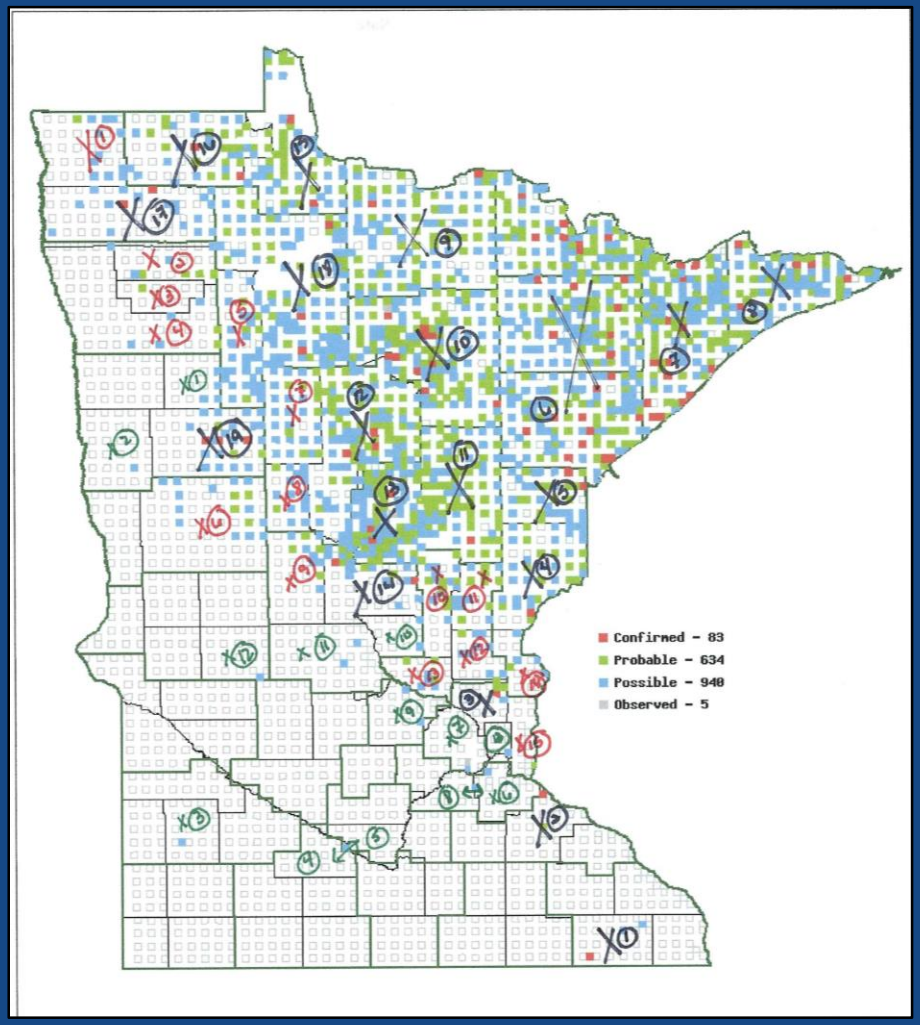
Data Review





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Data Review

Examples of other Species with Unique Challenges

- Flycatchers: late migrants; identification
- Cooper's Hawk vs. Sharp-shinned Hawk
- Dark-eyed Junco vs. Chipping Sparrow
- Chestnut-sided Warbler vs. Yellow Warbler
- Female mergansers with broods

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Data Review: Preparation of Final Database

Note	SPECIES_NAME	21b	O	EVIDENCE_DATE	VALID	REVIEWED	COMMENTS
	Chimney Swift	T28R22a	FL	7/14/2013	1	0	
	Chimney Swift	T29R22a	FL	7/25/2011	1	0	3 adults and 3 young (weak flying, markedly shorter wings than adults over downtown N St.
	Chimney Swift	T47R25b	FL	6/26/2011	1	0	
	Chimney Swift	T111R29a	FY	6/20/2013	1	0	Seen entering and leaving chimney in abandoned building
Change to P per notes	Chimney Swift	T112R26a	P	6/5/2009	1	0	Observed mating; pairing and with juveniles, Numerous open chimneys about Henderson
	Chimney Swift	T138R43d	FY	6/23/2010	1	0	
	Chimney Swift	T152R30b	FY	7/12/2012	1	1	MOU_2012data
Non-breeders; change to O	Chimney Swift	T102R10d	O	6/1/2011	1	0	observed 200+ chimney swifts entering the chimney of the trailhead inn suites (old elemer
Change to X	Chimney Swift	T102R35b	X	6/19/2010	1	0	within City of Jackson, business district, along the river
Change to X	Chimney Swift	T102R45a	X	6/20/2009	1	0	
Change to X	Chimney Swift	T102R45a	X	6/20/2009	1	0	
Change to X	Chimney Swift	T102R45a	X	6/20/2009	1	0	
Change to X	Chimney Swift	T102R45a	X	6/20/2009	1	0	
Change to X	Chimney Swift	T102R45a	X	6/20/2009	1	0	
Change to X	Chimney Swift	T111R23a	X	6/18/2013	1	0	Many birds twittering over the town of Montgomery
Change to X	Chimney Swift	T111R25a	X	6/3/2012	1	0	A number of them seen at the exhibit at the NE corner of CR 24 and CR 113
Change to X	Chimney Swift	T112R20a	X	6/2/2012	1	0	Saw small group of birds fly mostly south through separation between woodlot and smalle
Change to X	Chimney Swift	T113R29a	X	6/27/2012	1	0	
Change to X	Chimney Swift	T115R23a	X	6/9/2009	1	0	Saw several chimney swifts around Shakopee Women's Prison.
Change to X	Chimney Swift	T116R30a	X	7/27/2009	1	0	multiple birds flying over my neighborhood, different times of day
Change to X	Chimney Swift	T116R30a	X	7/28/2009	1	0	multiple birds flying over neighborhood, different times of day
Change to X	Chimney Swift	T118R23a	X	6/28/2013	1	0	groups of multiple swifts seen and heard on several occasions
Change to S	Chimney Swift	T119R29b	S	6/20/2010	1	0	multiple birds flying and calling over Dassel
Change to S	Chimney Swift	T119R29b	S	6/24/2010	1	0	multiple birds flying and calling over Dassel
Change to X	Chimney Swift	T127R33b	X	6/28/2013	1	0	
Change to X	Chimney Swift	T129R29c	X	6/30/2013	1	0	
Change to X	Chimney Swift	T129R29d	X	6/30/2013	1	0	
Change to X	Chimney Swift	T136R48a	X	6/10/2012	1	1	NRRI 2012 export final (QA complete)
Change to X	Chimney Swift	T137R25a	X	7/1/2012	1	0	
INVALIDATED: too early; late spring	Chimney Swift	T137R35b	M: INVALIDATED	5/23/2013	0	1	Major 100-foot brick chimney nearby.
Change to X	Chimney Swift	T149R38a	X	6/29/2012	1	0	flying in village of Gonvick
Change to X	Chimney Swift	T150R41a	X	6/26/2012	1	0	several flying in village of Oklee
Change to X	Chimney Swift	T27R24a	X	6/5/2009	1	1	Point count data via Terry Brown, March 9, 2011
Change to X	Chimney Swift	T28R23c	X	7/19/2010	1	0	Historic Fort Snelling, fenced admin. bldg. just west of Fort (several open chimneys)
Change to X	Chimney Swift	T29R23b	X	6/2/2010	1	0	Seen flying every day. Have not looked for nest site. Possibly at HHH Job Corps.
INVALIDATED: too early; late spring	Chimney Swift	T36R23a	M: INVALIDATED	5/25/2013	0	1	Flying around the town of Grandy.
INVALIDATED: too early; late spring	Chimney Swift	T38R23a	M: INVALIDATED	5/24/2013	0	1	8-10 CHSW flying around over the town of Grasston.
Change to X	Chimney Swift	T39R22a	X	6/19/2011	1	0	
Change to X	Chimney Swift	T40R32d	X	6/30/2013	1	0	

Minnesota Breeding Bird Atlas

Data Review: Preparation of Final Database

Note	SPECIES_NAME	21b	O	EVIDENCE_DATE	VALID	REVIEWED	COMMENTS
INVALIDATED: Still migrating this cold wet spring	Olive-sided Flycatcher	T44R28d	M: INVALIDATED	6/3/2013	0	1	At least 5 individuals calling from tops of conifers on south side of bog-fringed lake.
	Olive-sided Flycatcher	T60R25d	M	6/1/2012	1	0	
	Olive-sided Flycatcher	T61R8a	M	6/24/2012	1	0	
	Olive-sided Flycatcher	T61R9a	M	5/25/2010	1	0	
	Olive-sided Flycatcher	T61R9a	M	5/30/2011	1	0	
	Olive-sided Flycatcher	T61R9d	M	5/31/2013	1	1	NRRI 2013 export
	Olive-sided Flycatcher	T65R13d	M	6/2/2010	1	0	
	Olive-sided Flycatcher	T65R13d	M	6/16/2011	1	0	
INVALIDATED: Late migrants	Olive-sided Flycatcher	T110R20a	O: INVALIDATED	6/10/2013	0	1	
INVALIDATED: likely early fall migrant	Olive-sided Flycatcher	T120R23a	O: INVALIDATED	7/1/2012	0	1	marsh park in residential area
WAS NOT INVALIDATED IN CLO DOWNLOAD: NEEDS TO BE INVALIDATED!! Likely a stalled migrant	Olive-sided Flycatcher	T124R39b	O: INVALIDATE	6/10/2010	CHANGE FROM 1 to 0	0	Not in suitable breeding habitat; likely a very late migrant
	Olive-sided Flycatcher	T150R27b	O	6/10/2009	1	0	
	Olive-sided Flycatcher	T53R13a	O	6/12/2013	1	0	Presumed migrant, singing from top of spruce tree
	Olive-sided Flycatcher	T46R16a	P	6/12/2010	1	0	
	Olive-sided Flycatcher	T50R25d	P	6/22/2010	1	0	
Change to X per notes	Olive-sided Flycatcher	T51R22a	X	6/27/2013	1	0	4 different birds calling loud "quick three beers"
Change to X; observation above	Olive-sided Flycatcher	T51R22a	S	7/8/2013	1	0	
	Olive-sided Flycatcher	T51R25c	P	6/27/2011	1	0	guarding territory from tall branches
	Olive-sided Flycatcher	T59R14a	P	7/7/2013	1	0	Same location one was heard singing July 2, 4-year old burn bordering sedge/stream habita
	Olive-sided Flycatcher	T60R10d	P	6/9/2011	1	0	In a lowland black spruce stand east of Hwy 1 but very close to the hwy.
	Olive-sided Flycatcher	T61R11a	P	6/28/2010	1	0	In a black spruce bog east of Keely Creek about .6 mile south of Hwy 1
	Olive-sided Flycatcher	T61R25c	P	6/1/2012	1	0	
INVALIDATED: Too early	Olive-sided Flycatcher	T135R29a	S: INVALIDATED	6/4/2012	0	1	
	Olive-sided Flycatcher	T154R26a	S	6/22/2013	1	0	
	Olive-sided Flycatcher	T157R28a	S	6/21/2013	1	0	
	Olive-sided Flycatcher	T158R27a	S	6/12/2013	1	0	
	Olive-sided Flycatcher	T158R28a	S	7/1/2012	1	0	
	Olive-sided Flycatcher	T161R38a	S	6/5/2012	1	0	although not usually heard on this BBS route, it was heard twice days apart in the same are
	Olive-sided Flycatcher	T49R17a	S	7/4/2011	1	0	Seen in the top of a dead tree on the Laine Rd a short distance north of the N Cloquet Rd

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Product Development

Step #2:

Final Species Distribution Maps

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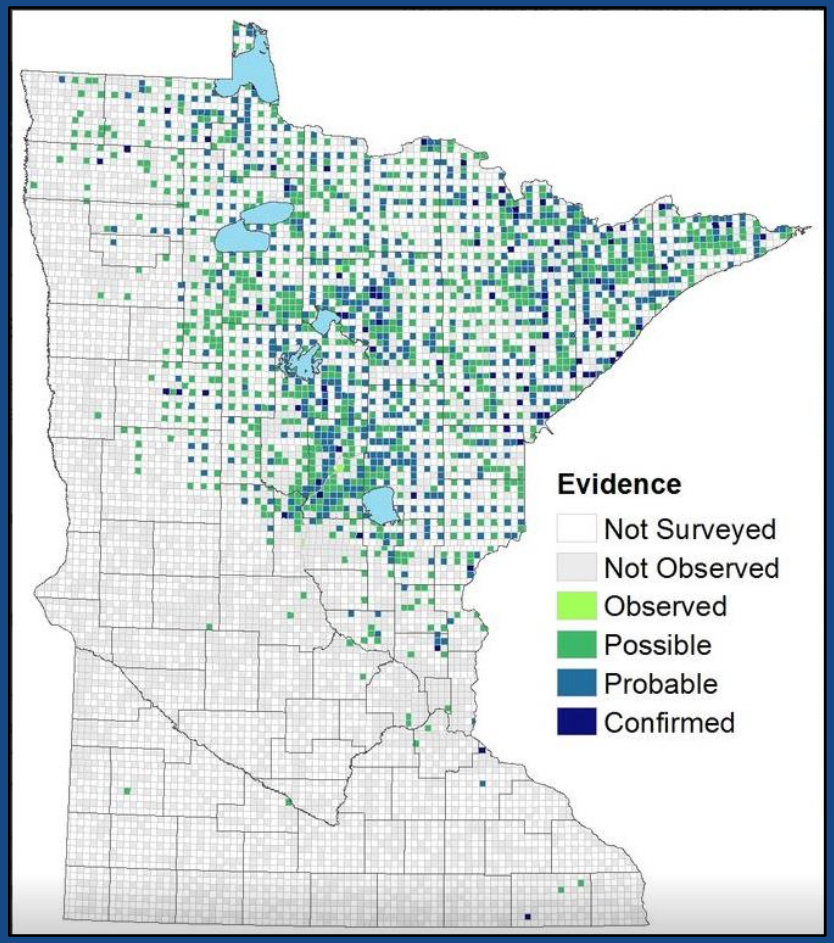
Final Species Distribution Map

Black-and-White Warbler



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Product Development

Step #3:

Analyze data and develop models to address basic ecological questions

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Data Analysis

Overall Approach

- Conducted by graduate students and staff under the direction of Dr. Gerald Niemi
- Multiple iterations of review, feedback, and adjustments with project staff

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Data Analysis

1. Where does a species occur in Minnesota and why?
2. What is the population of a species in Minnesota?
3. What breeding habitats are used by a species in Minnesota?

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Model Development:

Where does a species occur and why?

- What habitats, landscape features, disturbances and climate (weather) factors predict the distribution and abundance of Minnesota birds?

- End Goal: Use the MNBBA point count data to develop a Predicted Distribution Map for as many species as we could to expand our knowledge of their potential distribution beyond the priority blocks

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Model Development:

Where does a species occur and why?

Variables to model distribution and abundance

- Four groups of variables (58)
  1. Land use/land cover (26)
  2. Disturbance (9)
  3. Landscape features (17)
  4. Climate (6)

- Three spatial scales: 200m, 500m, 1000m

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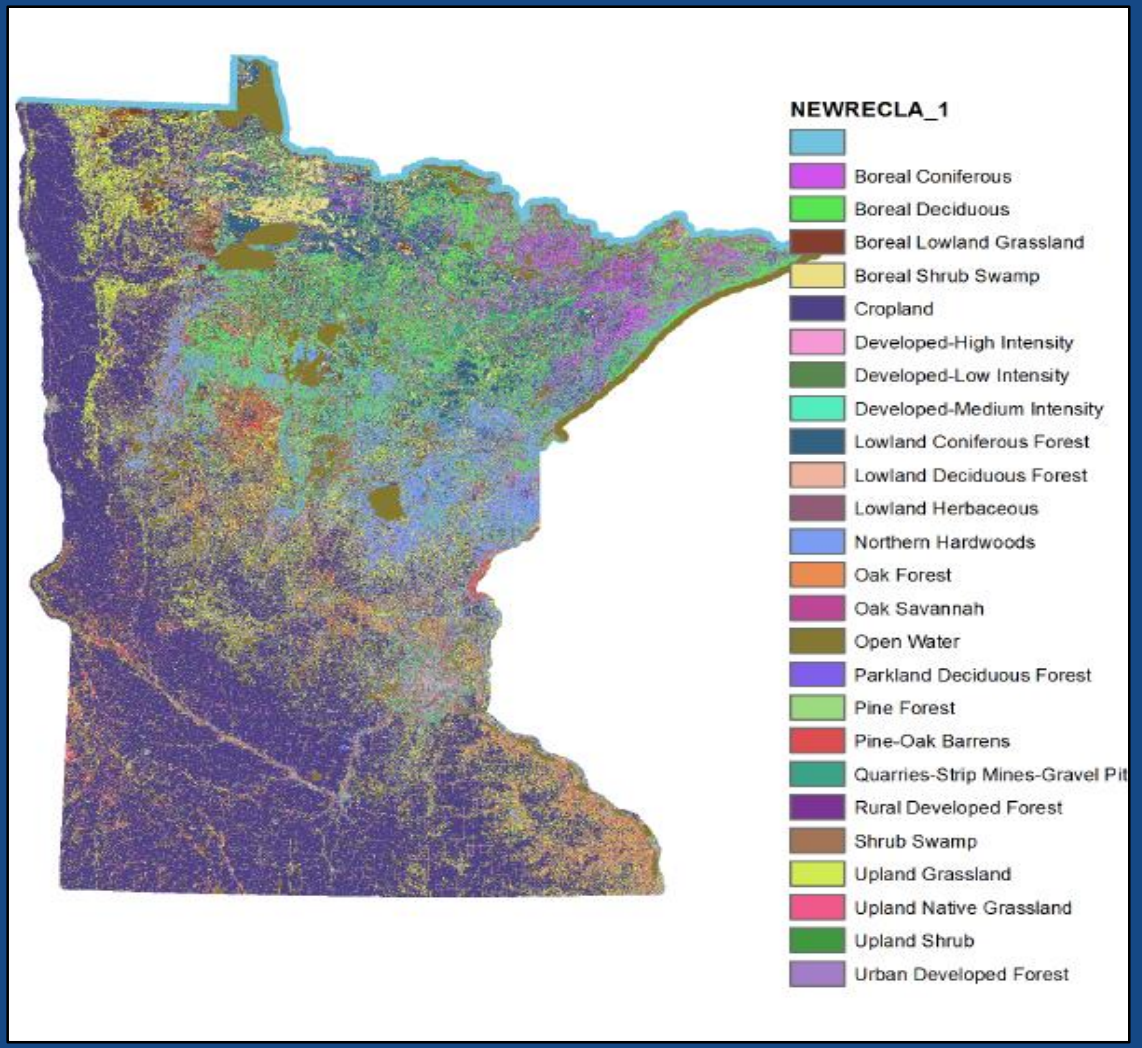
Model Development:

Where does a species occur and why?

Landfire: 26 land cover classes



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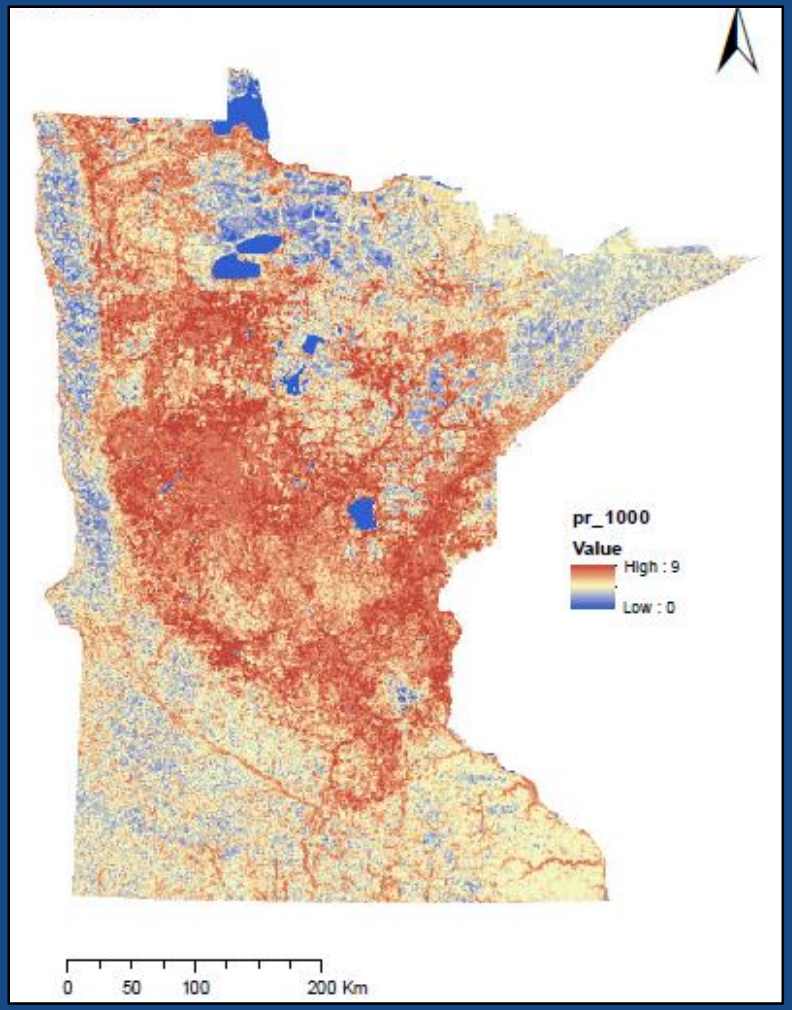
Model Development:

Where does a species occur and why?

Patch Richness at 1000 m scale



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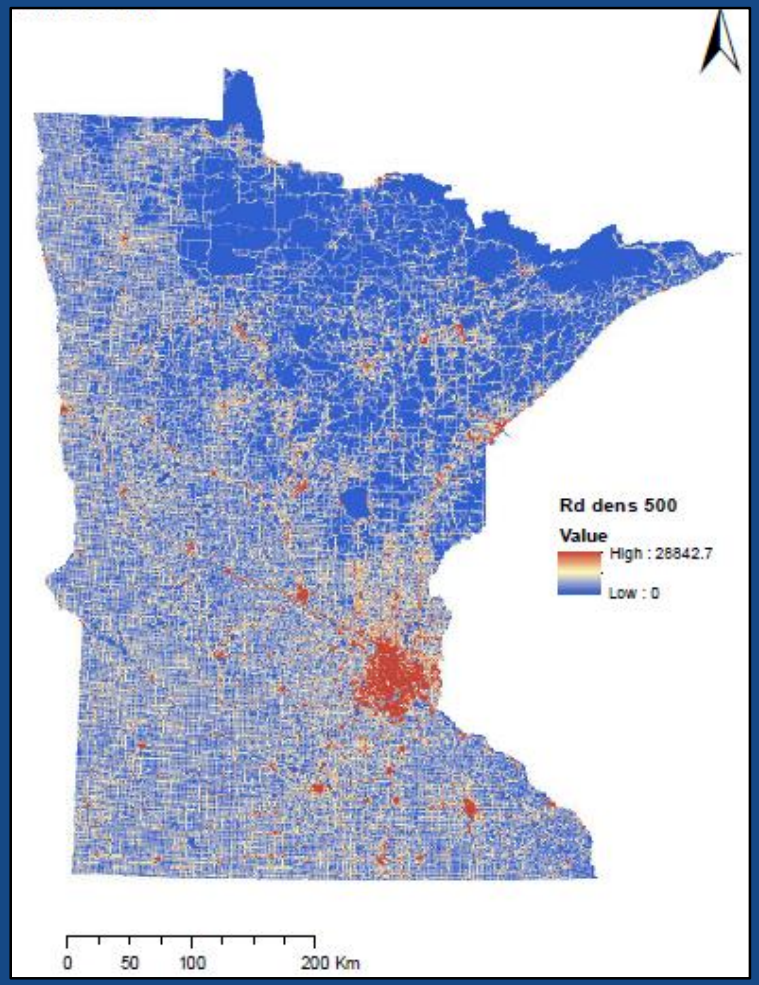
Model Development:

Where does a species occur and why?

Road density at 500 m scale



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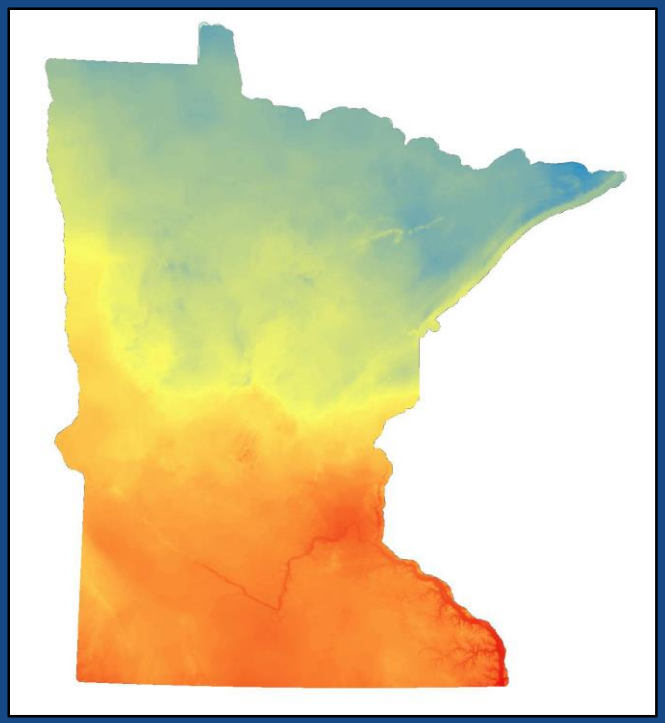
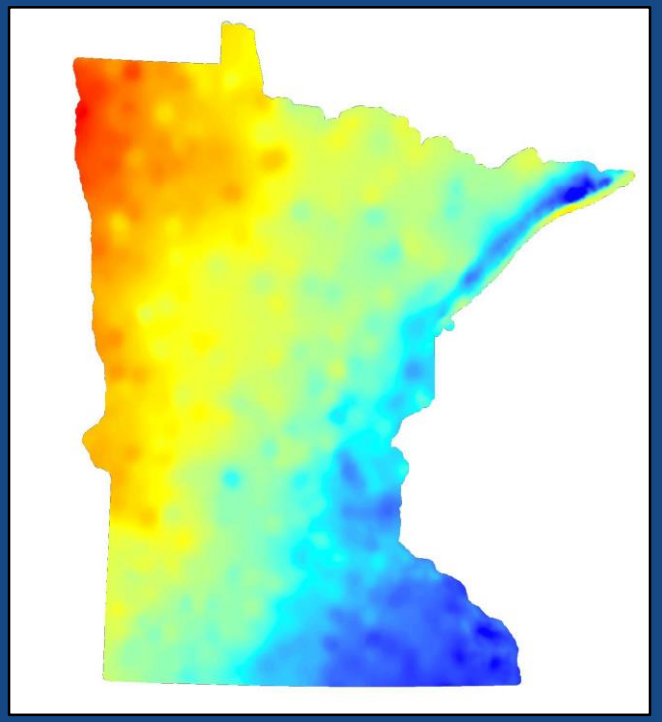
Model Development:

Where does a species occur and why?

Climate variables



Temperature



Precipitation

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Model Development:

Where does a species occur and why?

Three Modeling Strategies – 115 species

1. **Poisson General Linear Model** – point counts, accounts for detection probability and detection distance; allows for population density estimates, **66 species**
2. **Poisson or negative binomial General Linear Model** – point counts, primarily detected visually – **28 species**
3. **Maximum entropy (MaxEnt)** – requires georeferenced points, used point counts and volunteer data, most detected visually – **21 species**

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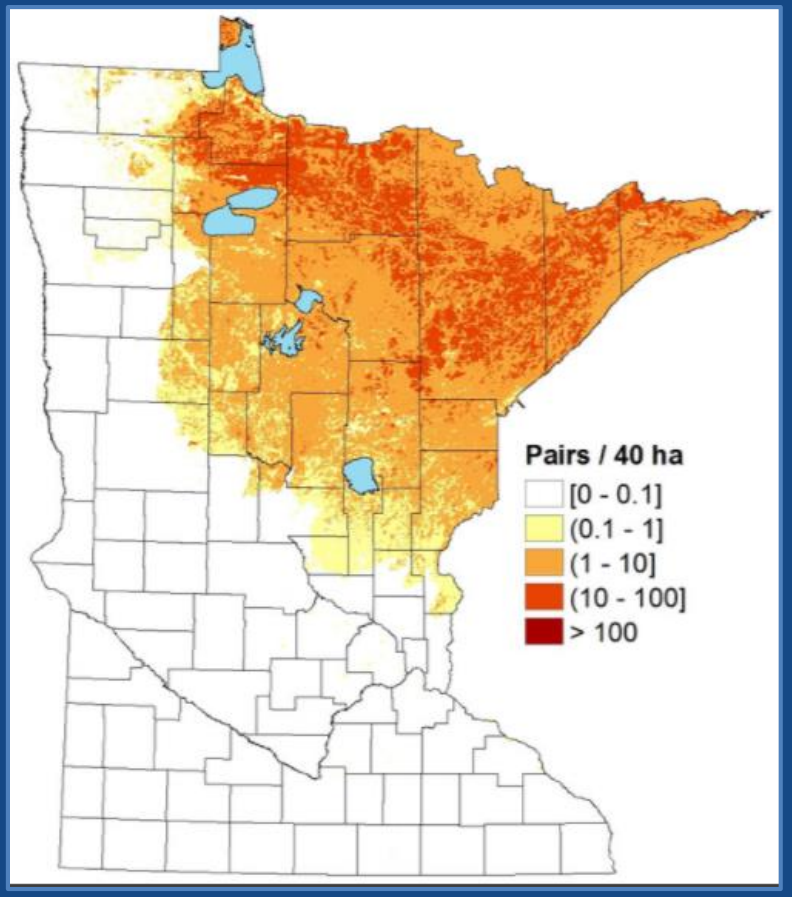
Model Development:

Where does a species occur and why?

White-throated Sparrow

Predicted Breeding Distribution **expressed as pairs per 40 ha**



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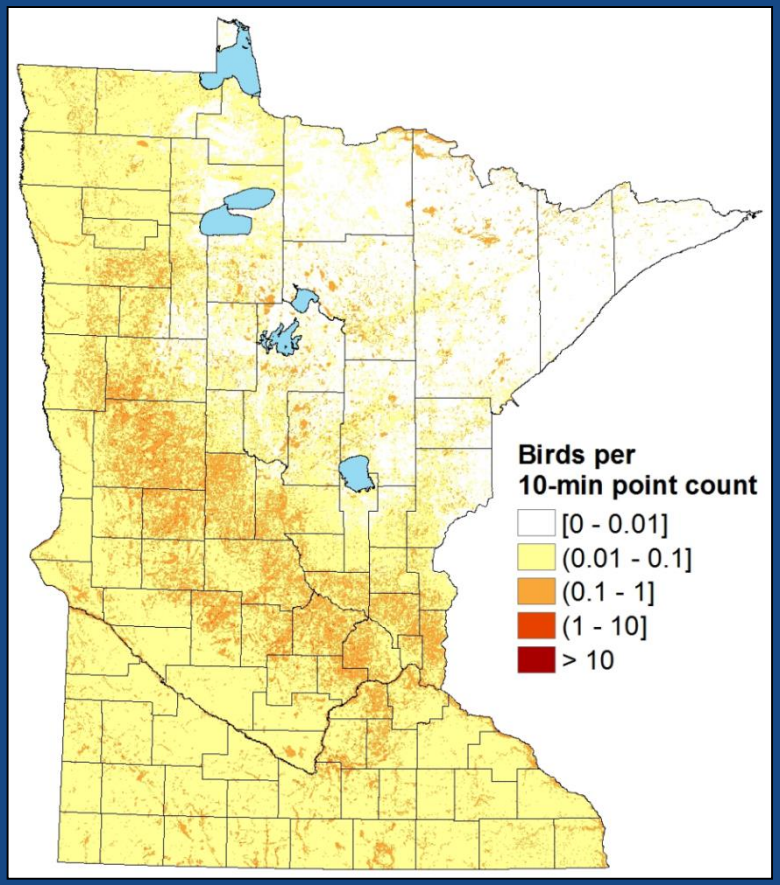
Model Development:

Where does a species occur and why?

Tree Swallow

Predicted Breeding Distribution **expressed as the number of birds that may be detected per 10-minute point count**



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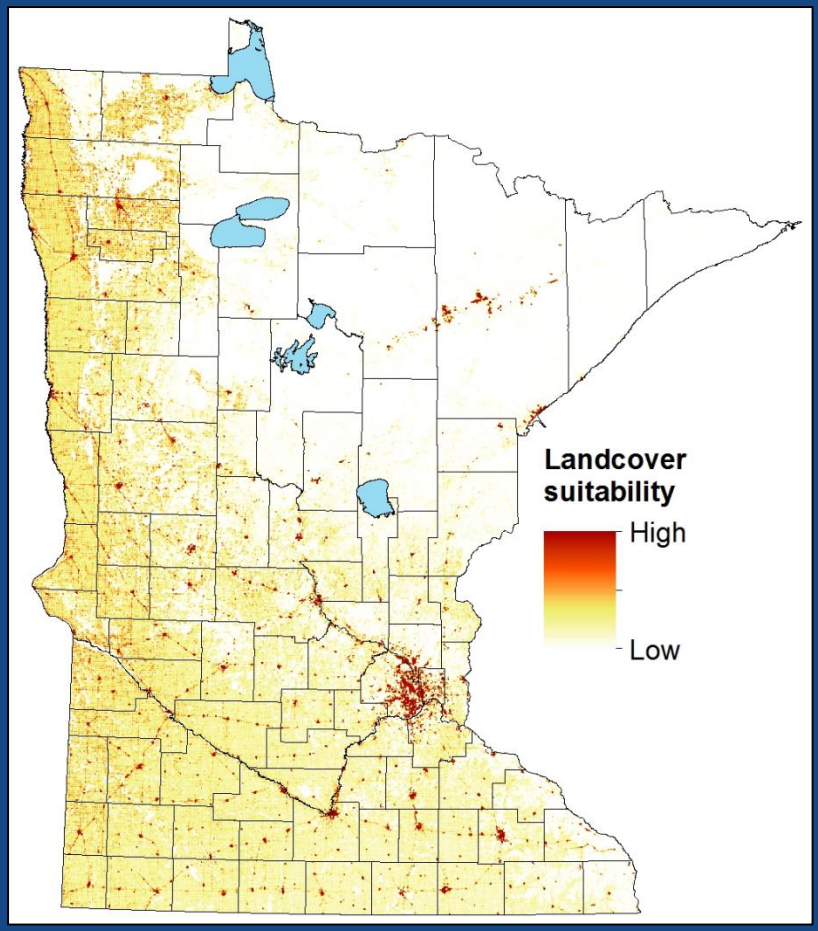
Model Development:

Where does a species occur and why?

Chimney Swift

Predicted Breeding Distribution **illustrated as Landcover Suitability**



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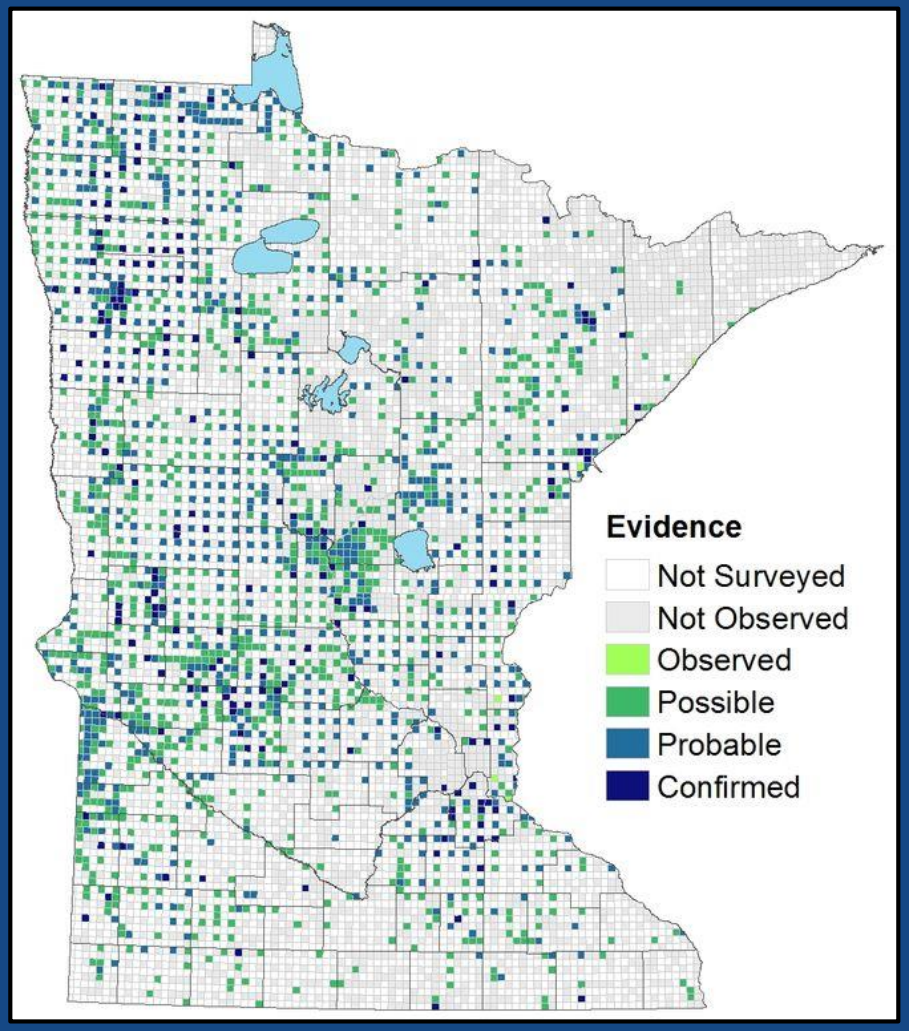
Model Development:

Where does a species occur and why?

Clay-colored Sparrow



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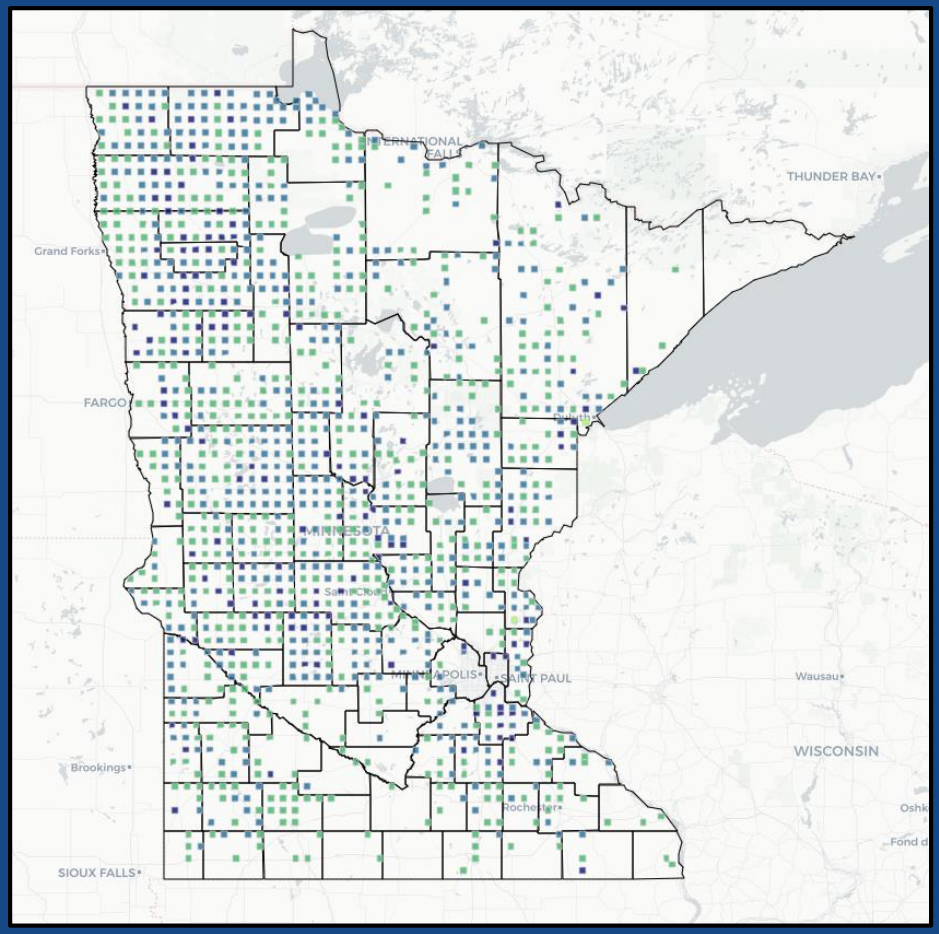
Model Development:

Where does a species occur and why?

Clay-colored Sparrow



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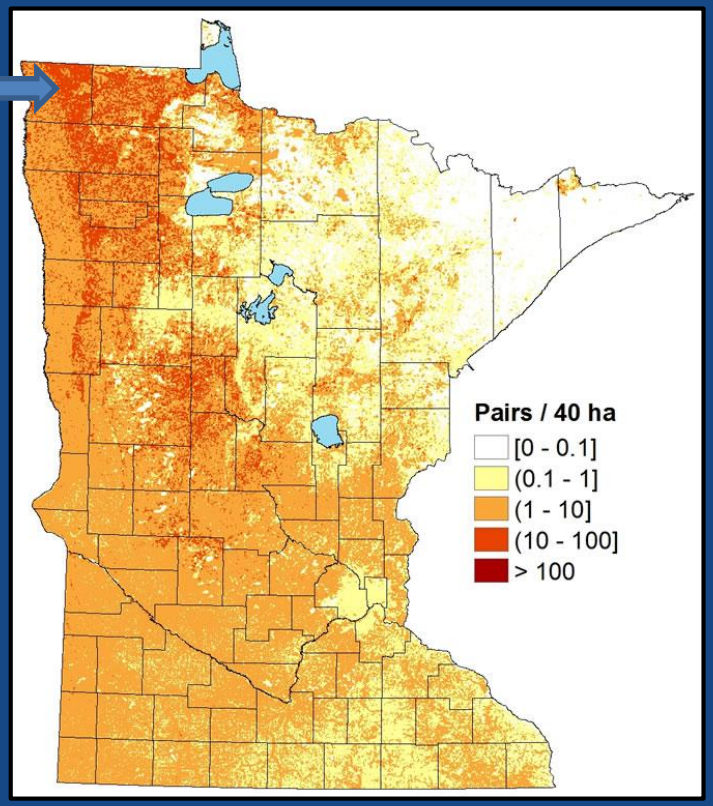
Model Development:

Where does a species occur and why?

Clay-colored Sparrow

Kittson County



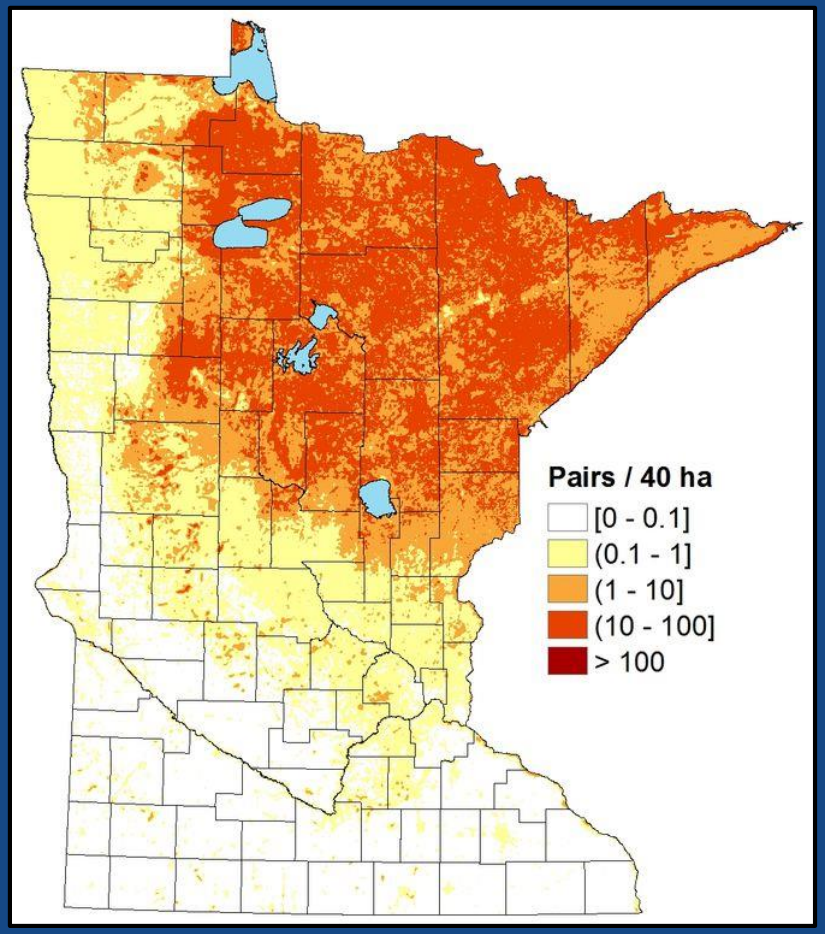
The prediction supports Reverend P. B. Peabody's observation more than 100 years ago that the species "is well-nigh the most abundant summer inhabitant" in Kittson County, occupying the region's "meadow brushland"

Minnesota Breeding Bird Atlas

Model Development:

Where does a species occur and why?

Black-and-White Warbler



Minnesota Breeding Bird Atlas

Model Development:

Where does a species occur and why?

The linear models, in turn, enabled us to generate statewide population estimates using MNBBA data

Minnesota Breeding Bird Atlas

Model Development:

Where does a species occur and why?

Partners in Flight

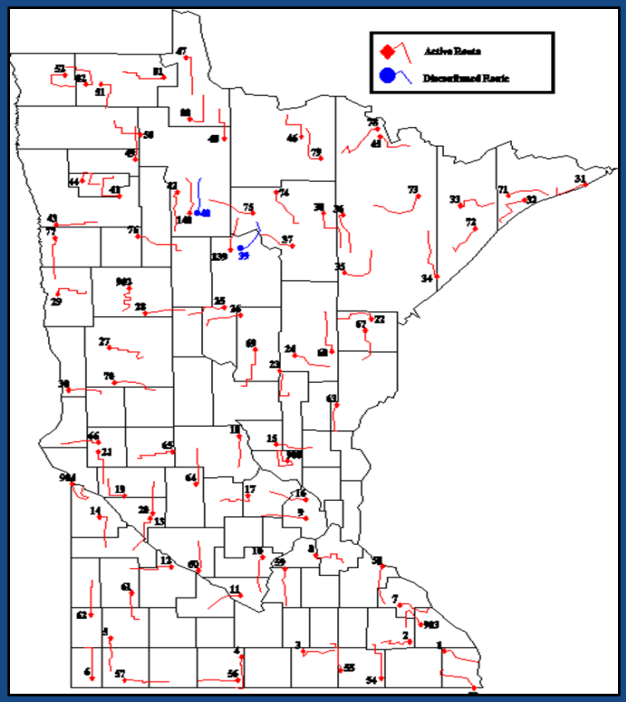
- North America Population Estimates
- State and Province Populations Estimates
- Bird Conservation Region Estimates
- Global Population Estimates

Minnesota Breeding Bird Atlas

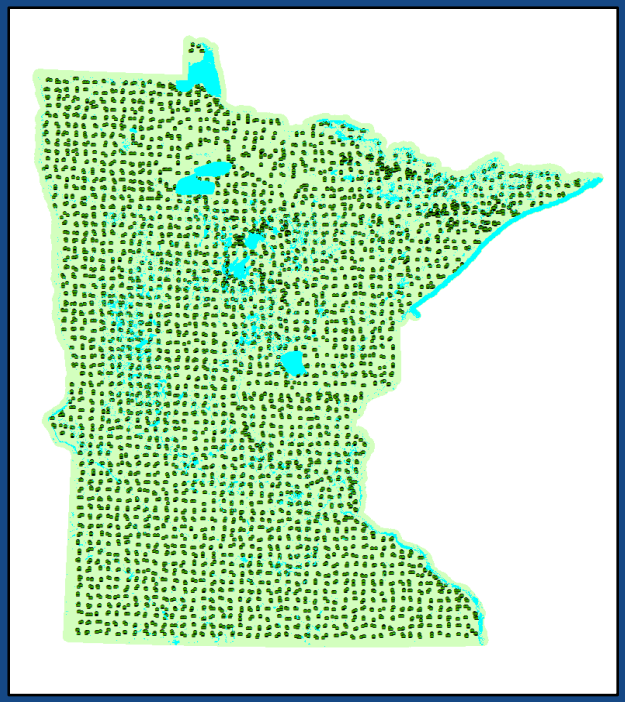
Model Development:

Where does a species occur and why?

PIF: BBS Routes



MNBBA: Point Counts



Minnesota Breeding Bird Atlas

Model Development:

Where does a species occur and why?

MNBBA Estimates derived for 77 breeding species

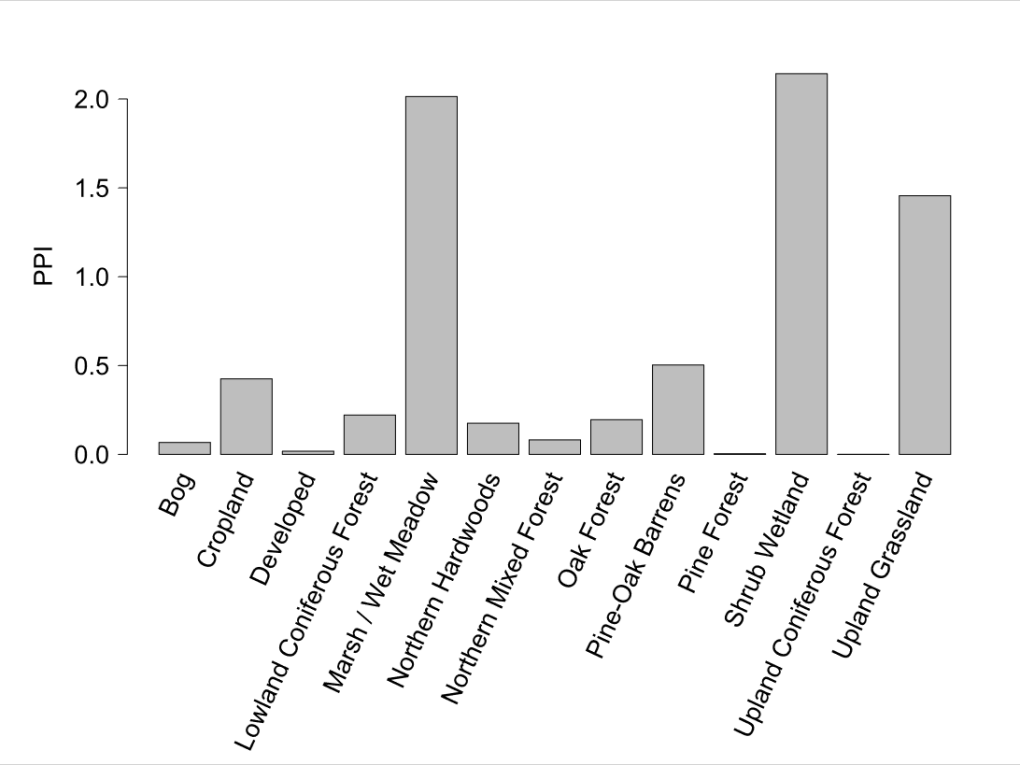
Species	PIF Estimate	MNBBA Estimate
Sharp-tailed Grouse	7,000	NA
Red-eyed Vireo	4.1 million	8.5 million
Horned Lark	1.1 million	12.2 million
Song Sparrow	5.3 million	10.4 million
Red-winged Blackbird	6.2 million	8.8 million
Nashville Warbler	2.2 million	9.2 million
Common Yellowthroat	5.4 million	14.7 million
Yellow Warbler	1.7 million	8.1 million

Minnesota Breeding Bird Atlas

Species Accounts

What breeding habitats are used?

Sandhill Crane



Minnesota Breeding Bird Atlas

Product Development

Step #4:

Prepare Species Accounts

Minnesota Breeding Bird Atlas

Species Accounts

Overall Approach:

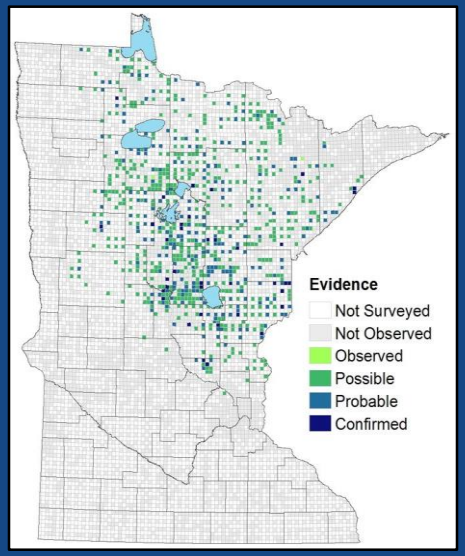
- **Limited the number of Authors**
  - ✓ **227 of the 249 Accounts prepared by two primary authors**
  - ✓ **22 prepared by third author**
  - ✓ **Fourth individual handled all the references (insuring we had correct and up-to-date references; formatting; etc.)**

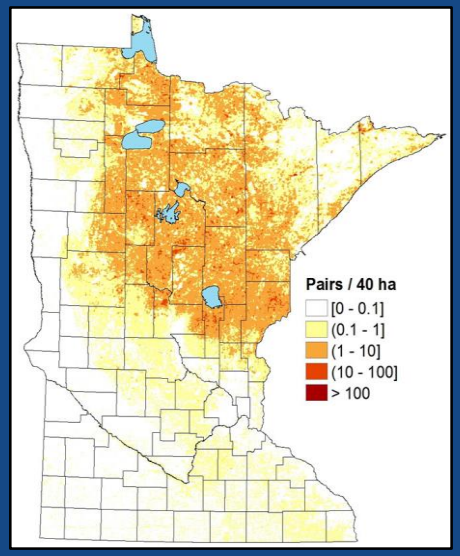
Minnesota Breeding Bird Atlas

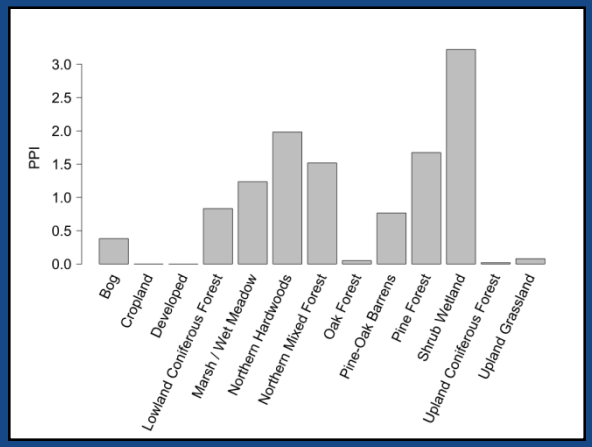
Species Accounts

Started with MNBBA results:

Ed Zlonis







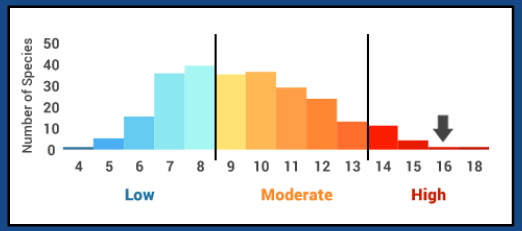
MNBBA Population Estimate: 1.2 million breeding adults

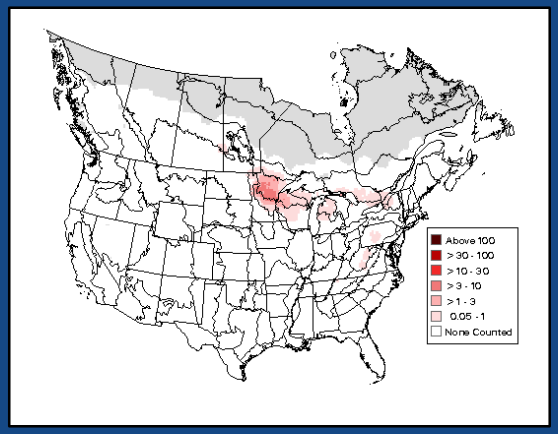
Minnesota Breeding Bird Atlas

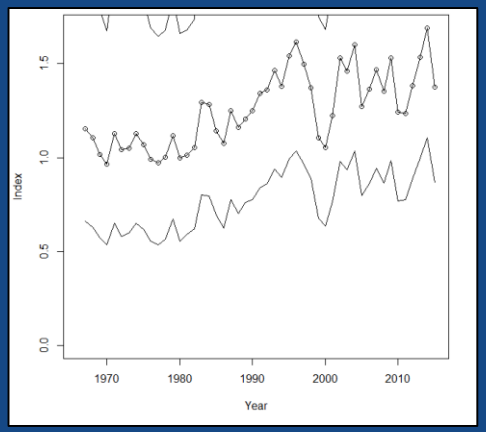
Species Accounts

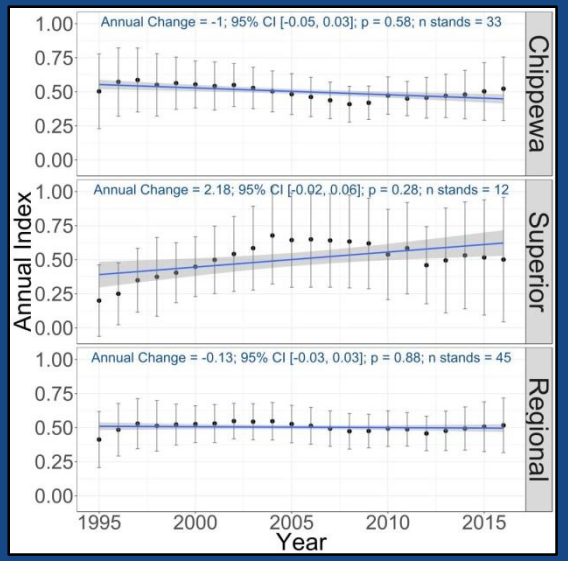
Added Additional Information

Ed Zlonis





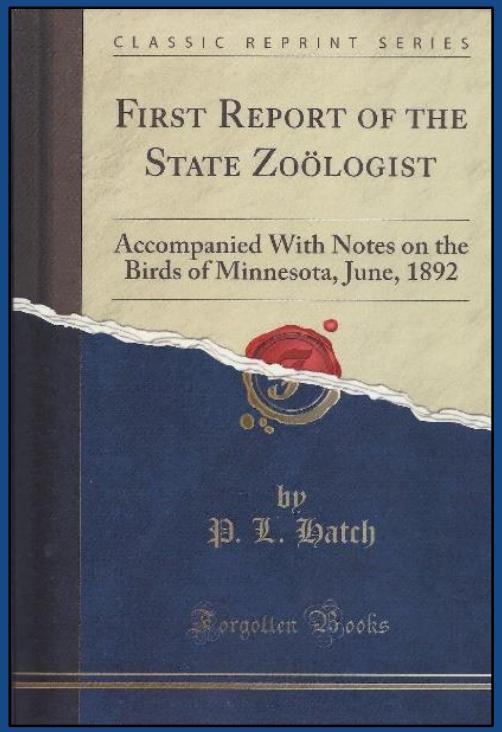




Minnesota Breeding Bird Atlas

Species Accounts

Place MNBBA data in Historical Context



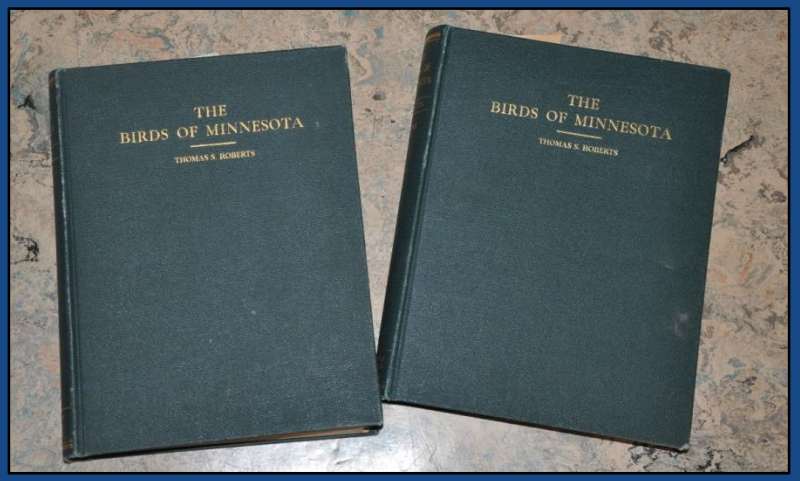
Hatch (1872)

Minnesota Breeding Bird Atlas

Species Accounts

Historical Context

Thomas S. Roberts
(1858 - 1946)

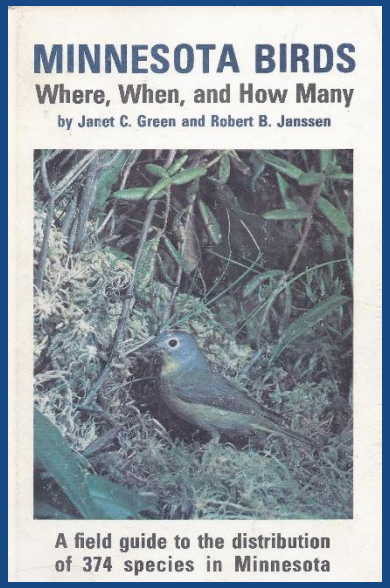


The Birds of Minnesota
(1932, 1936)

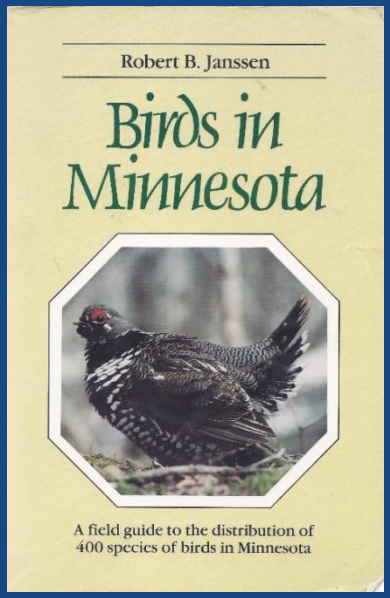
Minnesota Breeding Bird Atlas

Species Accounts

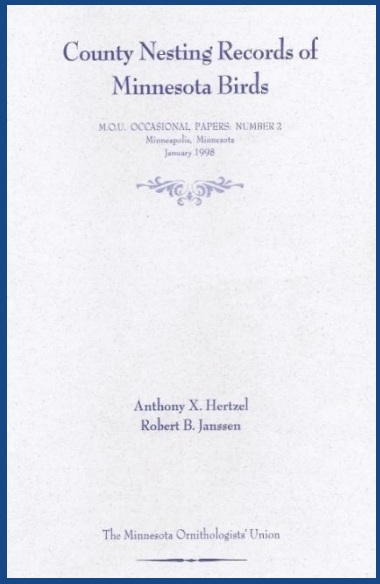
Historical Context



Green and Janssen 1975



Janssen 1987

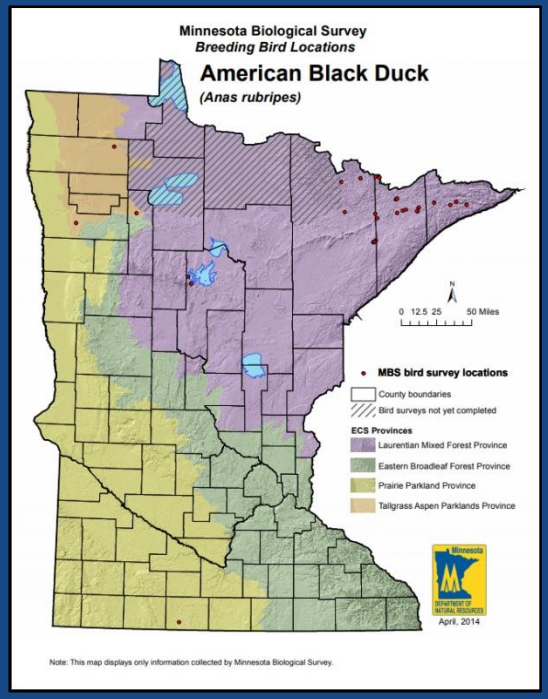


Hertzel and Janssen 1998

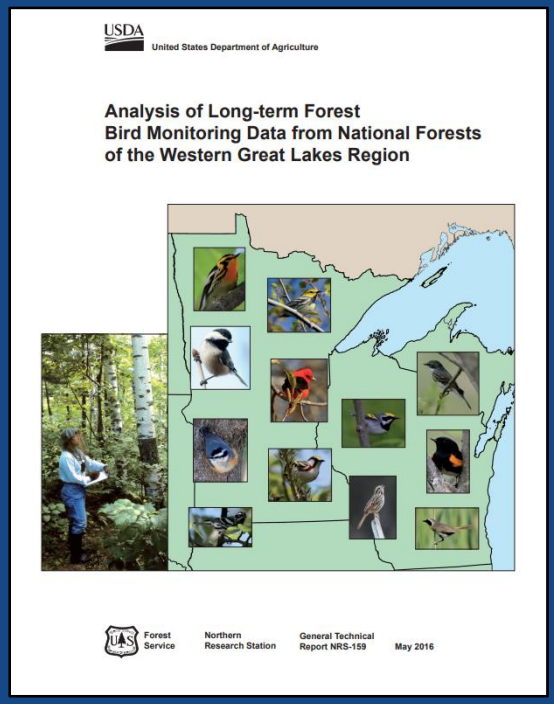
Minnesota Breeding Bird Atlas

Species Accounts

Historical Context



Minnesota County Biological Survey

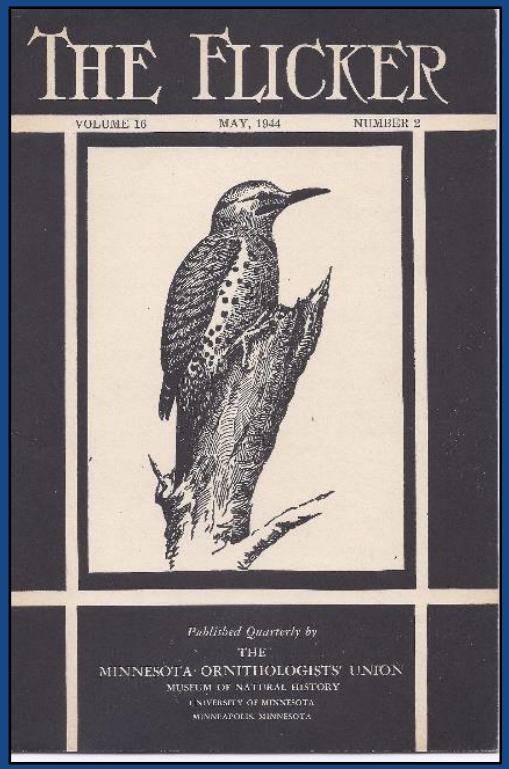


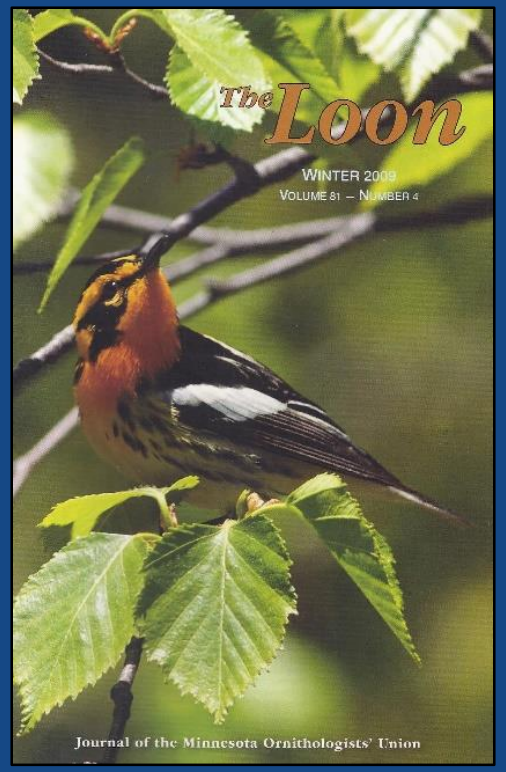
National Forest Monitoring Program

Minnesota Breeding Bird Atlas

Species Accounts

Historical Context





Minnesota Breeding Bird Atlas

Website Development

Step #5:

Website Design and Construction

Minnesota Breeding Bird Atlas

Website Development

Overall Approach:

- Solicited proposals
- Selected a website designer with experience working with biological data (Jane Reed)
- A very collaborative process with all principal staff involved

Minnesota
Breeding
Bird Atlas

Brief tour of the new website's primary features

Minnesota Breeding Bird Atlas

Home | Using the Atlas | Explore the Atlas | Data and Methods | About the Atlas

Explore the habits of the breeding birds of Minnesota

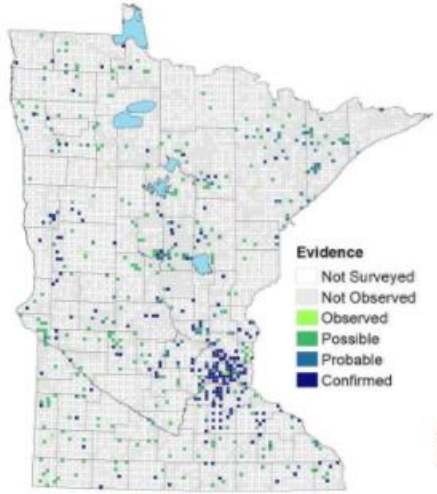
The Minnesota Breeding Bird Atlas (MNBBA) documents the distribution of every species that currently breeds in Minnesota and provides a solid foundation for future conservation efforts.

Species Accounts

Species accounts provide a summary of the 249 birds documented in Minnesota during five summer seasons, from 2009-2013. Read about the history of their presence in Minnesota since the 1800s and their breeding habitats, population status, and conservation. Each account includes maps and graphs depicting surveyed abundance across the state.

Find a Species Account **Learn about Species Accounts**

Interactive Maps



Great Horned Owl
Bubo virginianus

Use our interactive maps to see exactly where the birds of Minnesota have been breeding. Evidence of breeding is scored based on a number of factors. Our interactive map uses these color coded indicators to display likelihood of breeding.

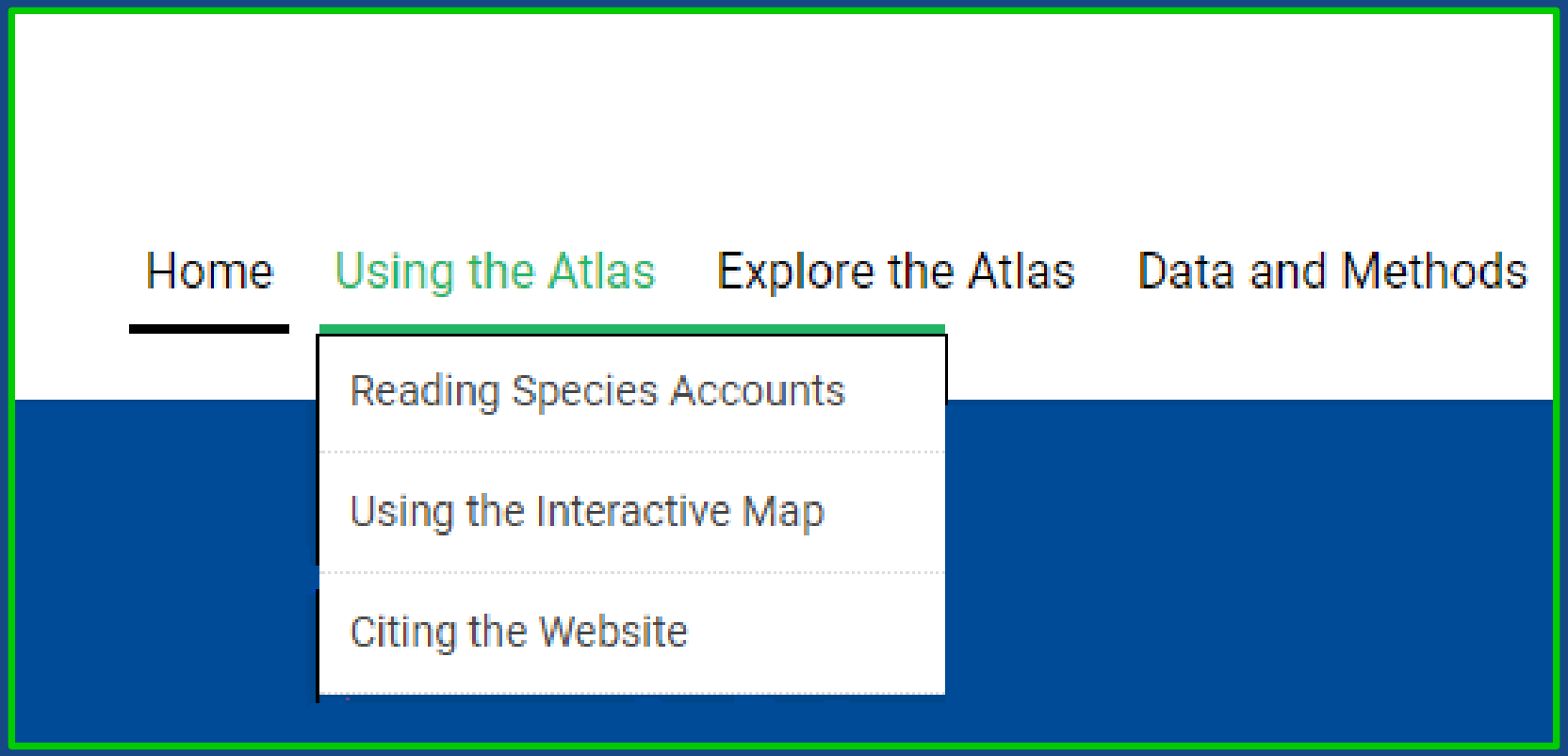
Use Interactive Map **Map Tutorial** **Read about our Methods**

Contact Us
info@mnbirdatlas.org

The Minnesota Breeding Bird Atlas Website was a collaborative project led by Audubon Minnesota and the University of Minnesota, Natural Resources Research Institute. Major funding was provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR).

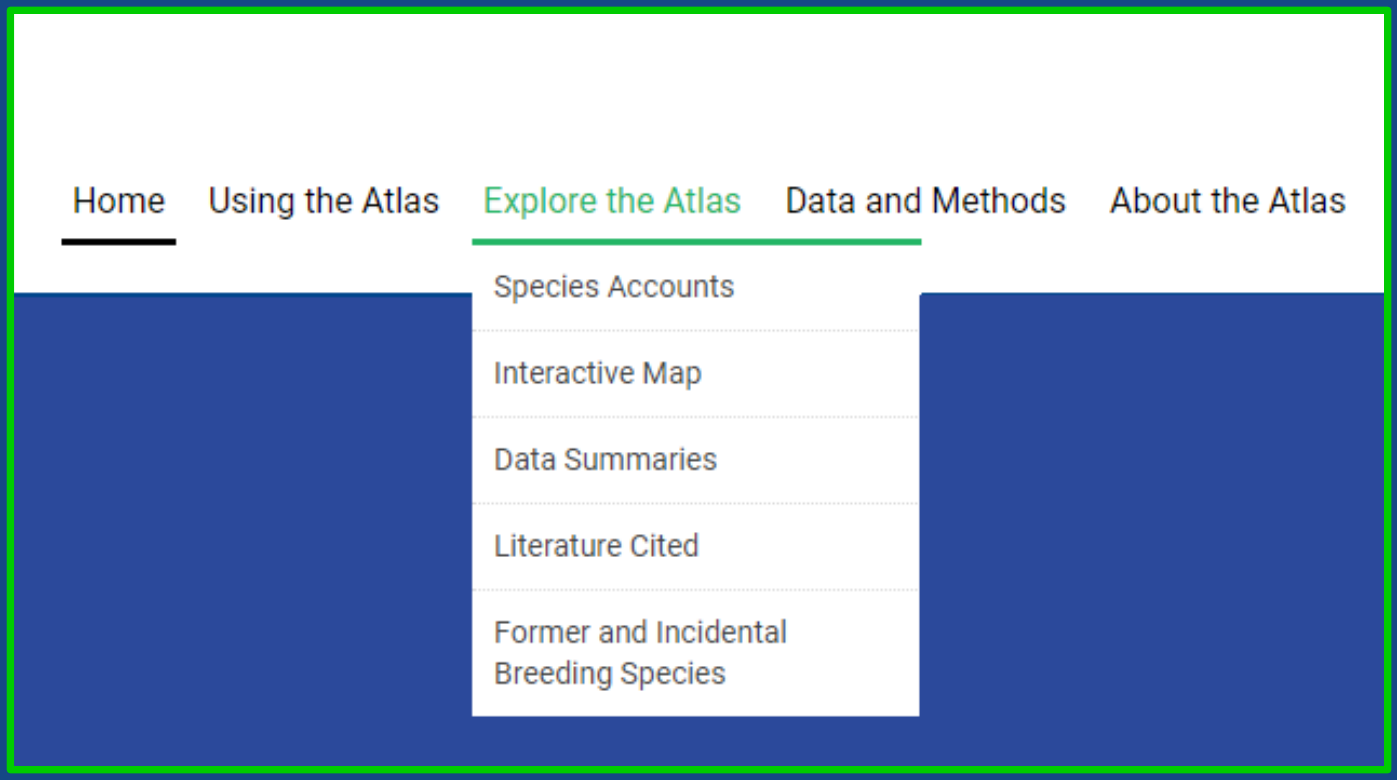
Minnesota Breeding Bird Atlas

Using the Atlas



Minnesota Breeding Bird Atlas

Explore the Atlas



Minnesota Breeding Bird Atlas

Data Summaries

	All Blocks					
Species	**Observed**	**Possible**	**Probable**	**Confirmed**	**Total**	**Total Records**
Canada Goose	245	955	129	1289	2618	4877
Mute Swan	1	1	0	0	2	4
Trumpeter Swan	67	281	180	244	772	1173
Wood Duck	51	662	263	762	1738	2828
Gadwall	11	93	69	28	201	280
American Wigeon	6	25	14	3	48	55
American Black Duck	10	32	8	12	62	73
Mallard	188	1110	440	1028	2766	5229
Blue-winged Teal	29	504	275	159	967	1524

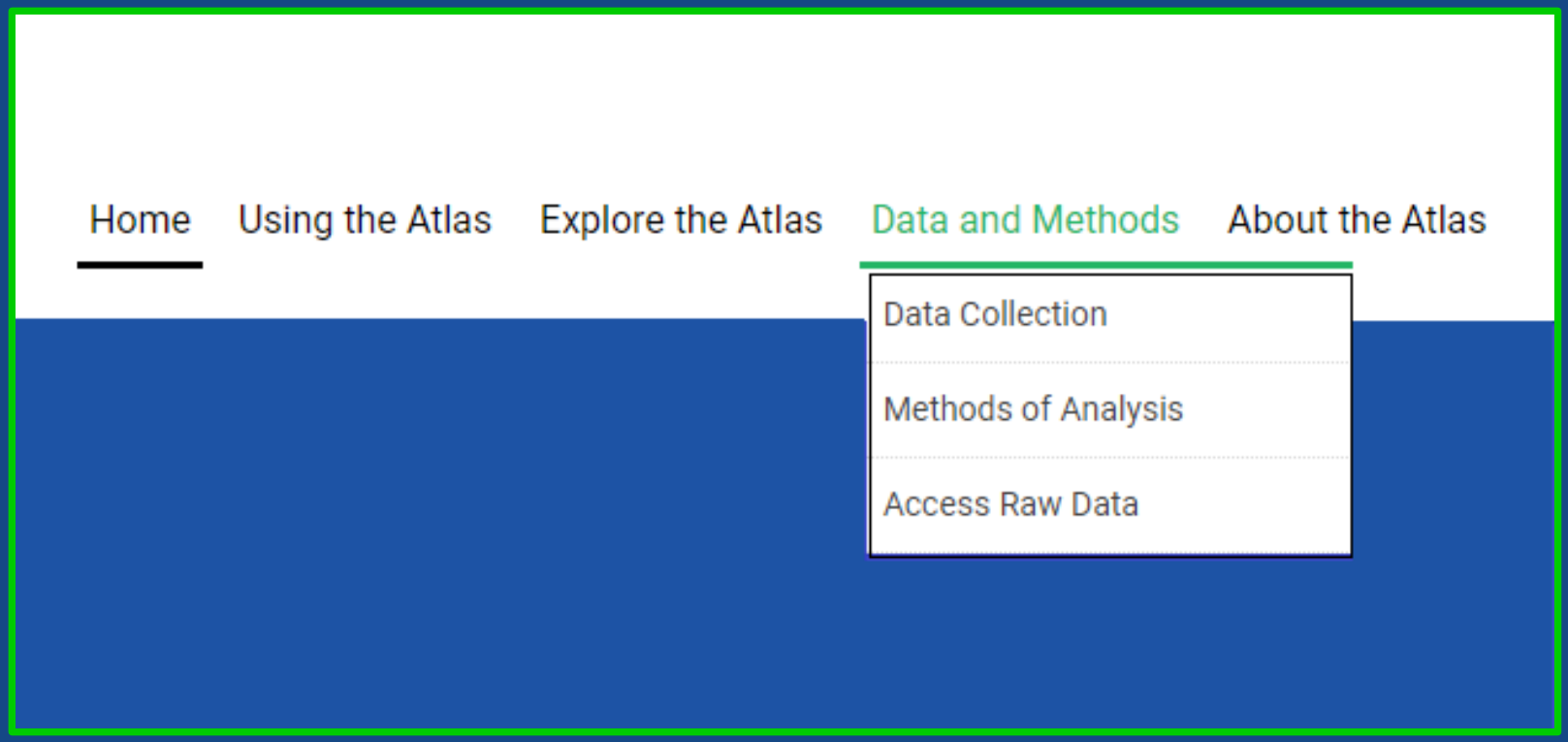
Minnesota Breeding Bird Atlas

Data Summaries

	Priority Blocks							Point Counts	
Species	Observed	Possible	Probable	Confirmed	Total	Total Records		All	Random
Canada Goose	195	445	69	684	1393	2862		808	278
Mute Swan	0	1	0	0	1	3		0	0
Trumpeter Swan	43	106	82	110	341	540		18	3
Wood Duck	36	311	98	473	918	1529		108	39
Gadwall	6	45	29	12	92	127		15	7
American Wigeon	5	10	3	3	21	25		0	0
American Black Duck	4	10	5	8	27	36		0	0
Mallard	165	533	230	533	1461	2875		577	175
Blue-winged Teal	21	248	143	99	511	826		111	23

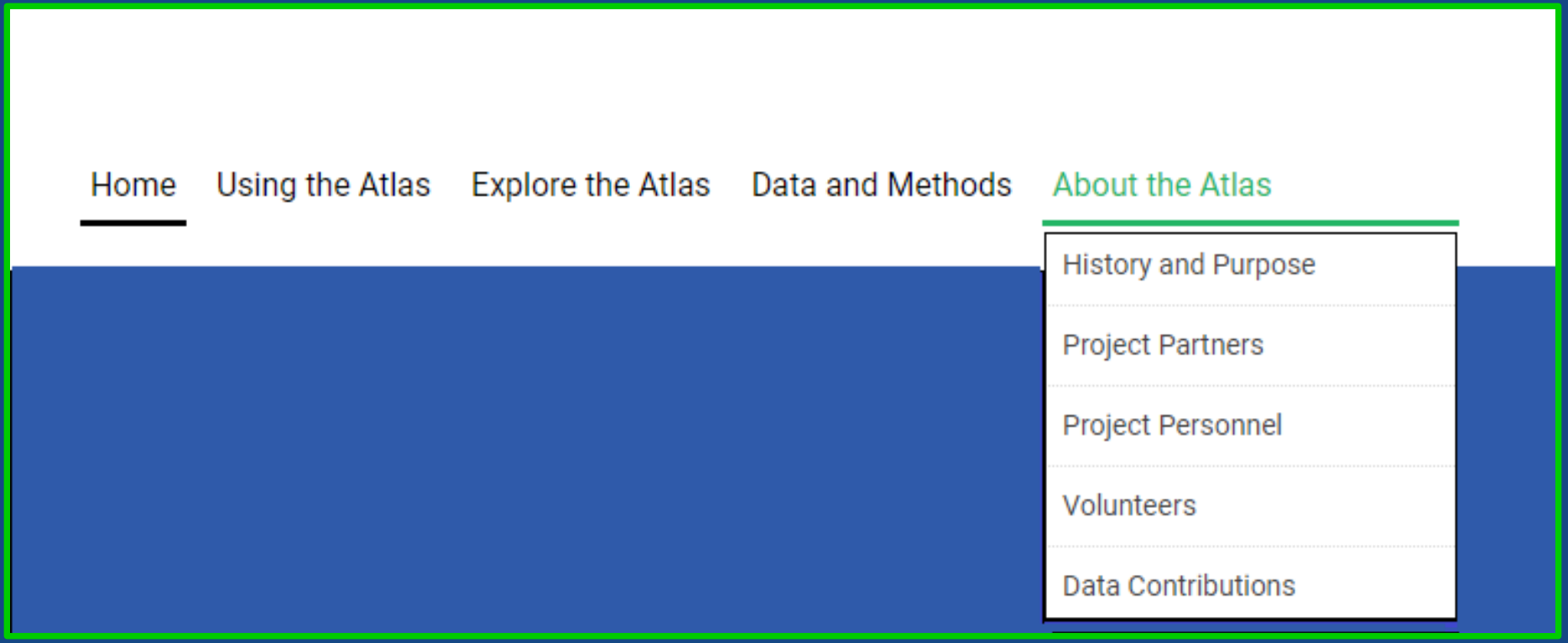
Minnesota Breeding Bird Atlas

Data and Methods



Minnesota Breeding Bird Atlas

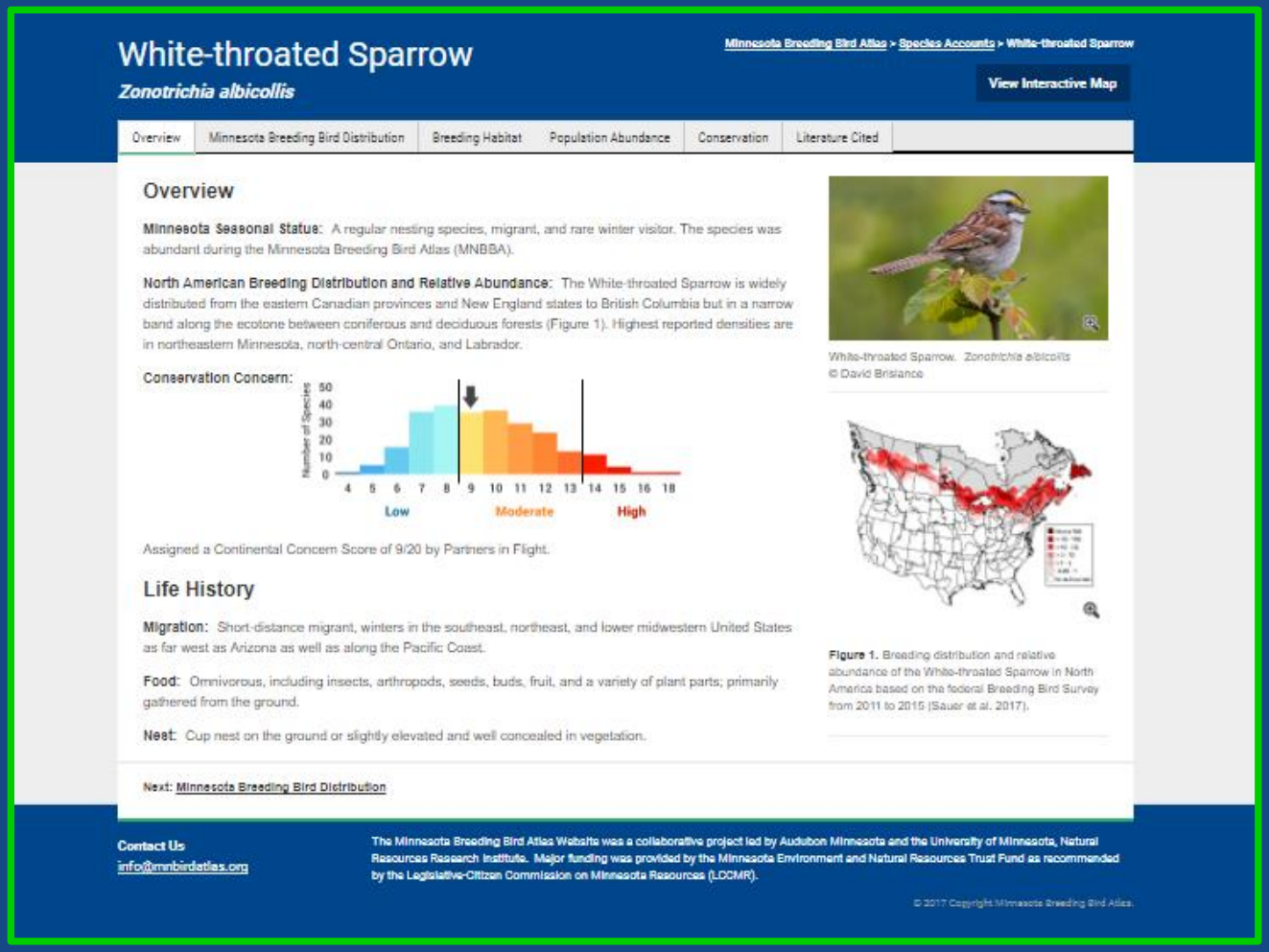
About the Atlas



Minnesota Breeding Bird Atlas

Species Accounts

Overview



White-throated Sparrow

Zonotrichia albicollis

Minnesota Breeding Bird Atlas > Species Accounts > White-throated Sparrow

View Interactive Map

Overview | Minnesota Breeding Bird Distribution | Breeding Habitat | Population Abundance | Conservation | Literature Cited

Overview

Minnesota Seasonal Status: A regular nesting species, migrant, and rare winter visitor. The species was abundant during the Minnesota Breeding Bird Atlas (MNBBA).

North American Breeding Distribution and Relative Abundance: The White-throated Sparrow is widely distributed from the eastern Canadian provinces and New England states to British Columbia but in a narrow band along the ecotone between coniferous and deciduous forests (Figure 1). Highest reported densities are in northeastern Minnesota, north-central Ontario, and Labrador.

Conservation Concern:

Assigned a Continental Concern Score of 9/20 by Partners in Flight.

Life History

Migration: Short-distance migrant, winters in the southeast, northeast, and lower midwestern United States as far west as Arizona as well as along the Pacific Coast.

Food: Omnivorous, including insects, arthropods, seeds, buds, fruit, and a variety of plant parts; primarily gathered from the ground.

Nest: Cup nest on the ground or slightly elevated and well concealed in vegetation.

White-throated Sparrow. *Zonotrichia albicollis*
© David Brisance

Figure 1. Breeding distribution and relative abundance of the White-throated Sparrow in North America based on the federal Breeding Bird Survey from 2011 to 2015 (Sauer et al. 2017).

Next: Minnesota Breeding Bird Distribution

Contact Us
info@mnbirdatlas.org

The Minnesota Breeding Bird Atlas Website was a collaborative project led by Audubon Minnesota and the University of Minnesota, Natural Resources Research Institute. Major funding was provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR).

Minnesota Breeding Bird Atlas

Species Accounts

Minnesota Breeding Distribution

White-throated Sparrow

Minnesota Breeding Bird Atlas

Zonotrichia albicollis

Overview | Minnesota Breeding Bird Distribution | Breeding Habitat | Population Abundance | Conservation | Literature Cited

Minnesota Breeding Bird Distribution*

In the late 1800s and early 1900s, Roberts (1932) described the White-throated Sparrow as "a common summer resident in the evergreen forests from Isanti County northward." Its westward distribution included eastern Kittson and central Marshall Counties, plus tamarack bogs in Isanti, Otter Tail, and Sherburne Counties. Despite difficulty in finding nests, confirmed nesting was documented in the late 1800s and early 1900s in Cass, Cook, Isanti, Itasca, Lake of the Woods, Marshall, and St. Louis Counties as well as Itasca Park and the Lake Mille Lacs area. Most of the nests Roberts confirmed for this species were substantial documentations, such as nests with eggs, young unable to fly, or young just ready to leave the nest. The exceptions were in Cook County, where he stated the "brood of young just able to fly," and in Lake of the Woods County, where he reported only a nest.

Green and Janssen in 1975 emphasized the White-throated Sparrow's primary breeding distribution in the northeastern and north-central regions of the state. They also suggested it had marginal presence in the southern and western fringes of these areas. They added confirmed nests beyond those reported by Roberts for Anoka, Beltrami, Hubbard, and Pine Counties. Inferred nesting was also included for Carlton County. Janssen's (1987) findings reinforced the distribution described by both Roberts and Green and Janssen. He confirmed nesting in 11 counties since 1970 in Aitkin, Beltrami, Cass, Clearwater, Cook, Crow Wing, Hubbard, Koochiching, Lake, Mille Lacs, and St. Louis. Later Hertzel and Janssen (1998) included a total of 13 counties with confirmed nesting since 1970 by adding Marshall and Roseau Counties.

The Minnesota Biological Survey (MBS) (Minnesota Department of Natural Resources 2016) recorded 1,805 breeding season locations and substantiated breeding observation locations previously suggested by both Green and Janssen (1975) and Janssen (1987). Their observations reinforced that the major range of the species is in the northeastern and north-central parts of the state. However, they also included locations from northwestern, west-central, central, and east-central Minnesota, including the following counties: Becker, Chisago, Douglas, Mahnomen, Otter Tail, Polk, and Stearns.

Minnesota Breeding Bird Atlas

Species Accounts

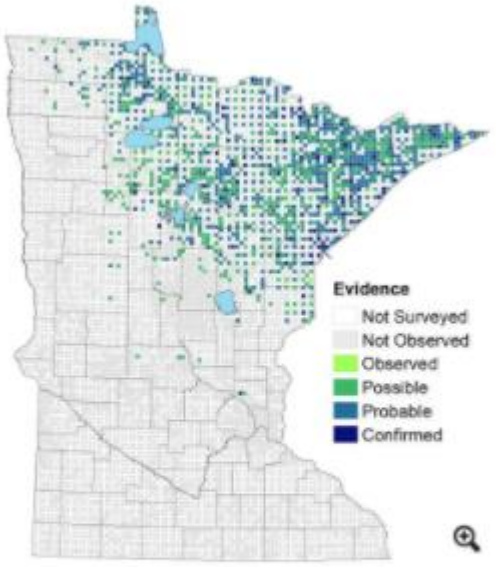


Figure 2. Breeding distribution of the White-throated Sparrow in Minnesota based on the Breeding Bird Atlas (2009 – 2013).

Print Map

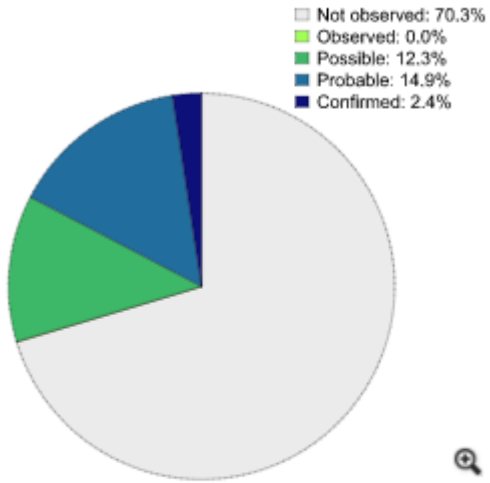


Figure 3. Summary statistics of observations by breeding status category for the White-throated Sparrow in Minnesota based on all blocks (each 5 km x 5 km) surveyed during the Breeding Bird Atlas (2009-2013).

Breeding status	Blocks (%)	Priority Blocks (%)
Confirmed	115 (2.4%)	84 (3.6%)
Probable	711 (14.9%)	444 (19.0%)
Possible	585 (12.3%)	217 (9.3%)
Observed	2 (0.0%)	1 (0.0%)
Total	1,413 (29.7%)	746 (31.9%)

Table 1. Summary statistics for the White-throated Sparrow observations by breeding status category for all blocks and priority blocks (each 5 km x 5 km) surveyed during the Minnesota Breeding Bird Atlas (2009-2013).

Minnesota Breeding Bird Atlas

Species Accounts

Breeding Habitat

White-throated Sparrow

Zonotrichia albicollis

Minnesota Breedin

Overview | Minnesota Breeding Bird Distribution | Breeding Habitat | Population Abundance | Conservation | Litera

Breeding Habitat

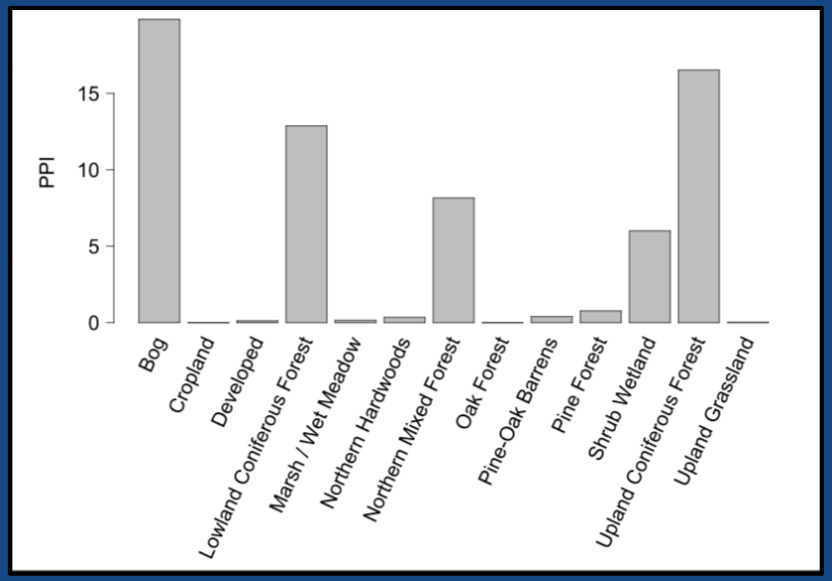
Widely described as a habitat generalist in coniferous and mixed deciduous-coniferous forests with low, dense shrubby ground cover (Falls and Kopachena 2010). In Minnesota, most often found in lowland coniferous forests and in forests regenerating as a result of disturbances such as fire, logging, insects, and wind (Back 1979; Niemi and Pfannmuller 1979; Niemi and Hanowski 1984, 1992; Probst et al. 1992; Lind and Hanowski 2004) (Figure 5).

MNBBA found White-throated Sparrows primarily in bogs, in upland and lowland coniferous forests, mixed coniferous –deciduous forests, and shrub wetlands (Figure 6). The National Forest Bird Monitoring (NFB) program found the species significantly most abundant and most frequent in black spruce-tamarack forests (Niemi et al. 2016). However, White-throated Sparrows were commonly found also in aspen-spruce-fir, regenerating forests, lowland shrubs, and mixed swamp conifer forests. High densities, as noted in Figure 4, were also found in black spruce–tamarack forests and regenerating lowland conifer forests in the Agassiz Lowland Subsection (Nevers et al. 1981; Niemi and Hanowski 1984; Bednar et al. 2016).

Minnesota Breeding Bird Atlas

Species Accounts

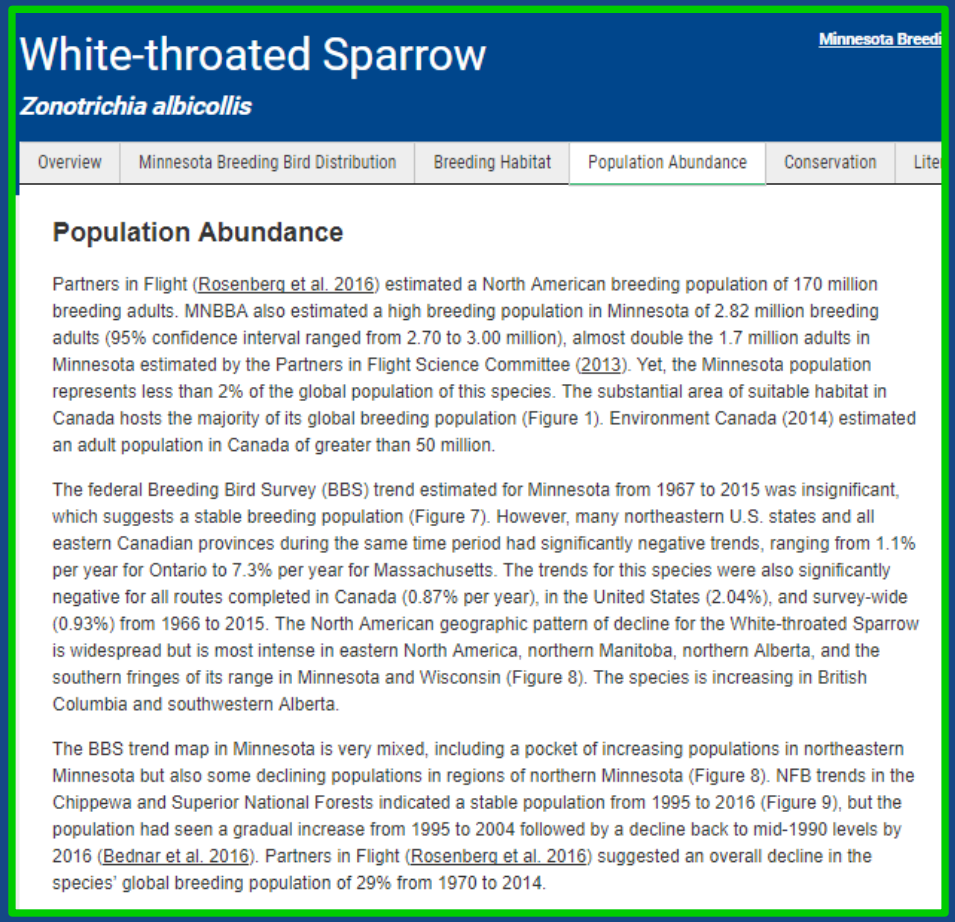
Breeding Habitat



Minnesota Breeding Bird Atlas

Species Accounts

Population Abundance



White-throated Sparrow

Zonotrichia albicollis

Minnesota Breedi

Overview | Minnesota Breeding Bird Distribution | Breeding Habitat | Population Abundance | Conservation | Lite

Population Abundance

Partners in Flight (Rosenberg et al. 2016) estimated a North American breeding population of 170 million breeding adults. MNBBA also estimated a high breeding population in Minnesota of 2.82 million breeding adults (95% confidence interval ranged from 2.70 to 3.00 million), almost double the 1.7 million adults in Minnesota estimated by the Partners in Flight Science Committee (2013). Yet, the Minnesota population represents less than 2% of the global population of this species. The substantial area of suitable habitat in Canada hosts the majority of its global breeding population (Figure 1). Environment Canada (2014) estimated an adult population in Canada of greater than 50 million.

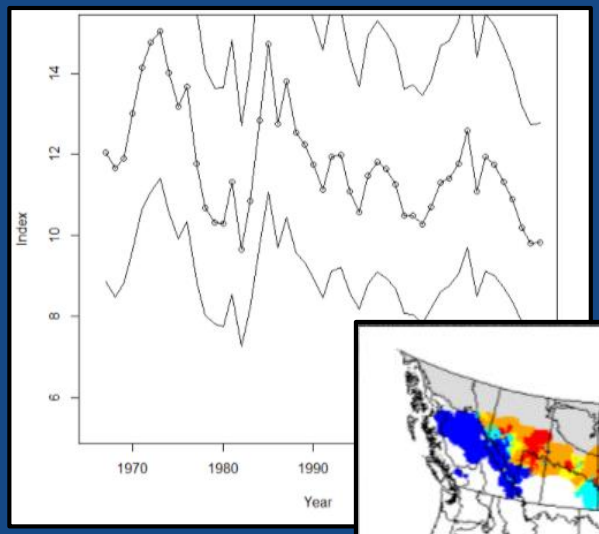
The federal Breeding Bird Survey (BBS) trend estimated for Minnesota from 1967 to 2015 was insignificant, which suggests a stable breeding population (Figure 7). However, many northeastern U.S. states and all eastern Canadian provinces during the same time period had significantly negative trends, ranging from 1.1% per year for Ontario to 7.3% per year for Massachusetts. The trends for this species were also significantly negative for all routes completed in Canada (0.87% per year), in the United States (2.04%), and survey-wide (0.93%) from 1966 to 2015. The North American geographic pattern of decline for the White-throated Sparrow is widespread but is most intense in eastern North America, northern Manitoba, northern Alberta, and the southern fringes of its range in Minnesota and Wisconsin (Figure 8). The species is increasing in British Columbia and southwestern Alberta.

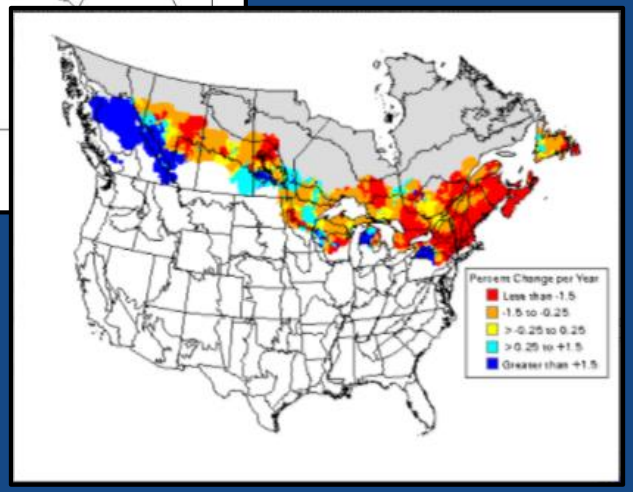
The BBS trend map in Minnesota is very mixed, including a pocket of increasing populations in northeastern Minnesota but also some declining populations in regions of northern Minnesota (Figure 8). NFB trends in the Chippewa and Superior National Forests indicated a stable population from 1995 to 2016 (Figure 9), but the population had seen a gradual increase from 1995 to 2004 followed by a decline back to mid-1990 levels by 2016 (Bednar et al. 2016). Partners in Flight (Rosenberg et al. 2016) suggested an overall decline in the species' global breeding population of 29% from 1970 to 2014.

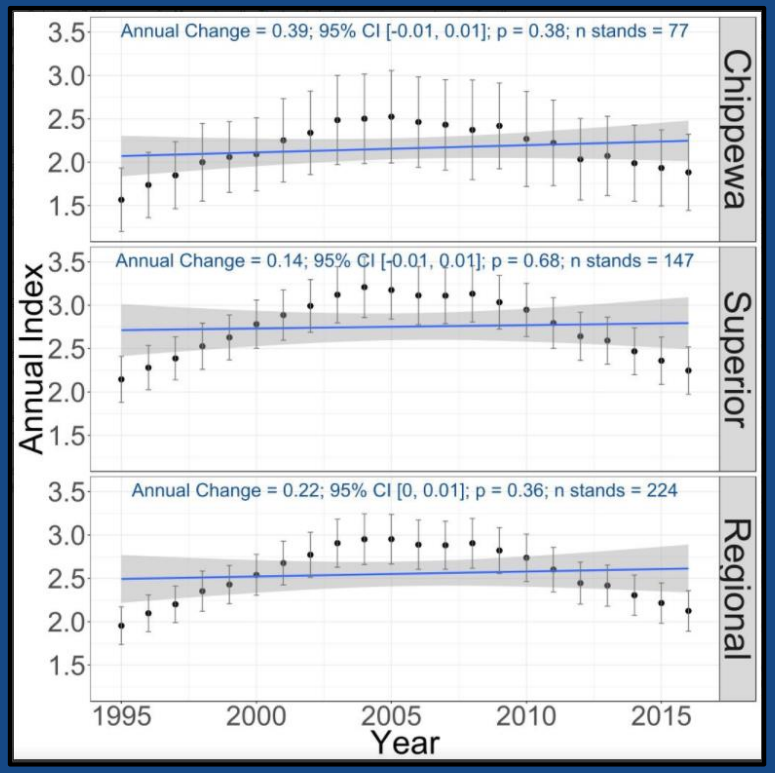
Minnesota Breeding Bird Atlas

Species Accounts

Population Abundance







Species Accounts

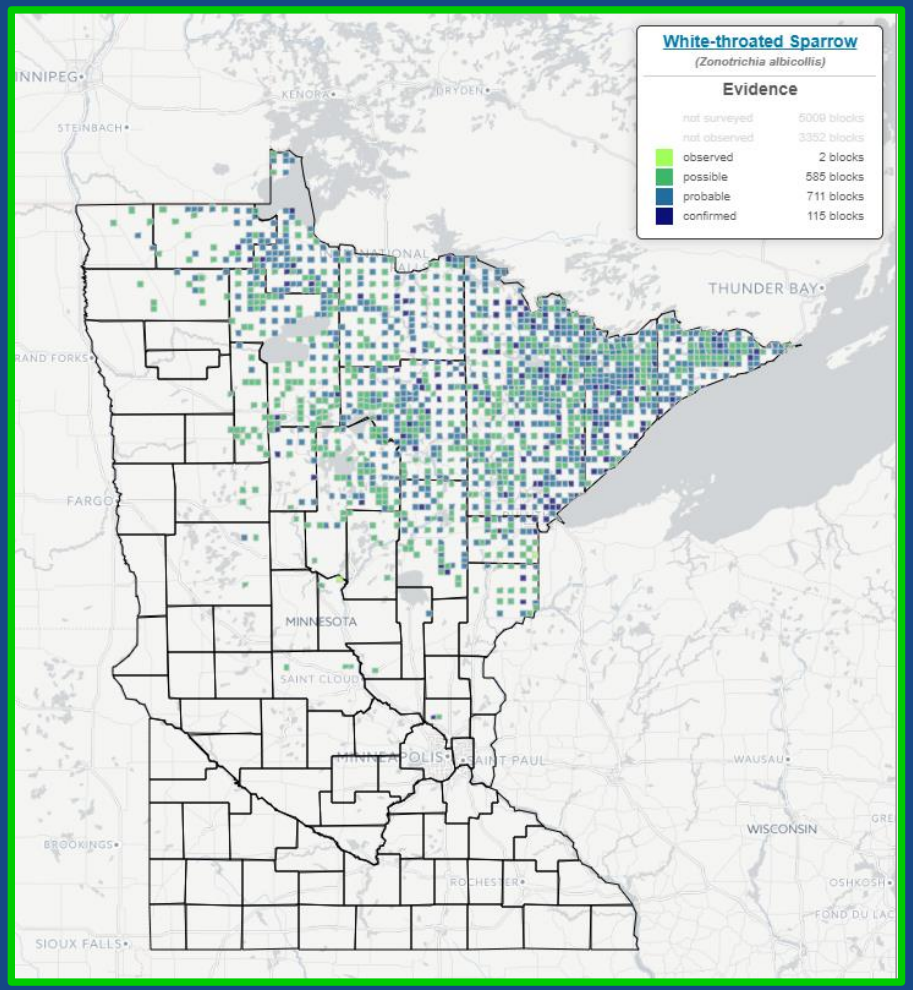
Conservation

Literature Cited

Minnesota Breeding Bird Atlas

Interactive Map

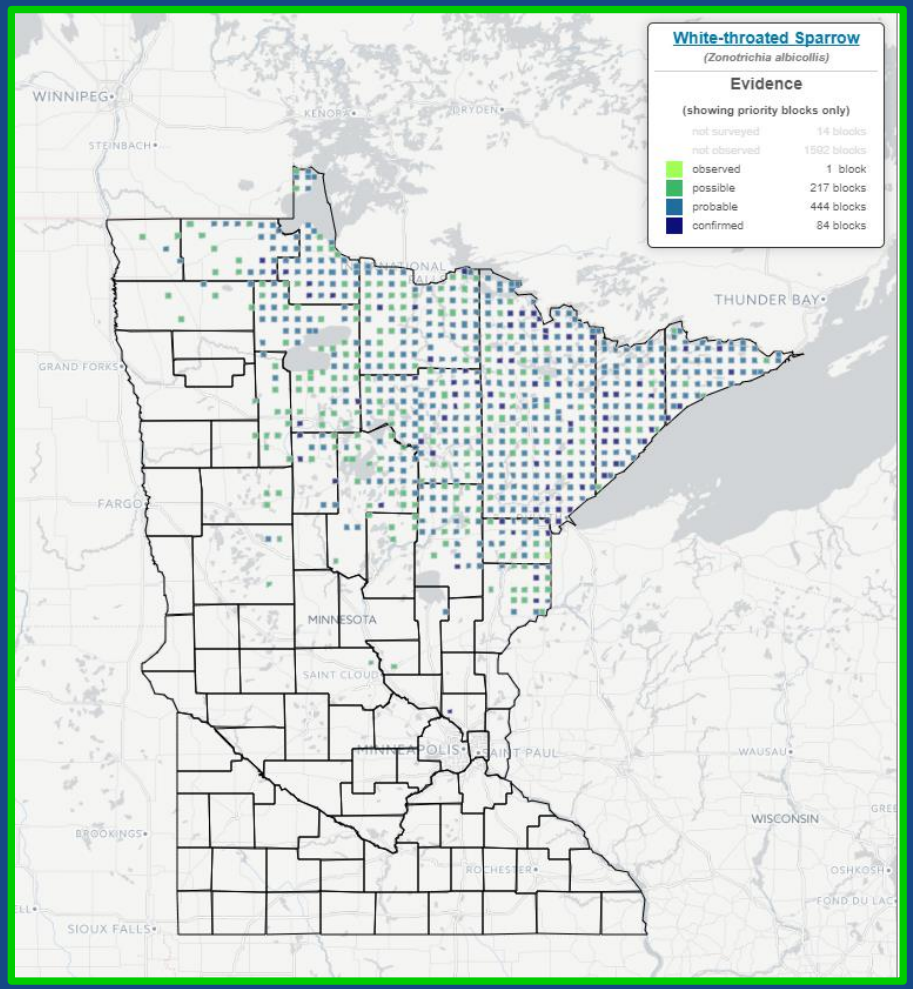
All Blocks



Minnesota Breeding Bird Atlas

Interactive Map

Priority Blocks



Minnesota Breeding Bird Atlas

Interactive Map

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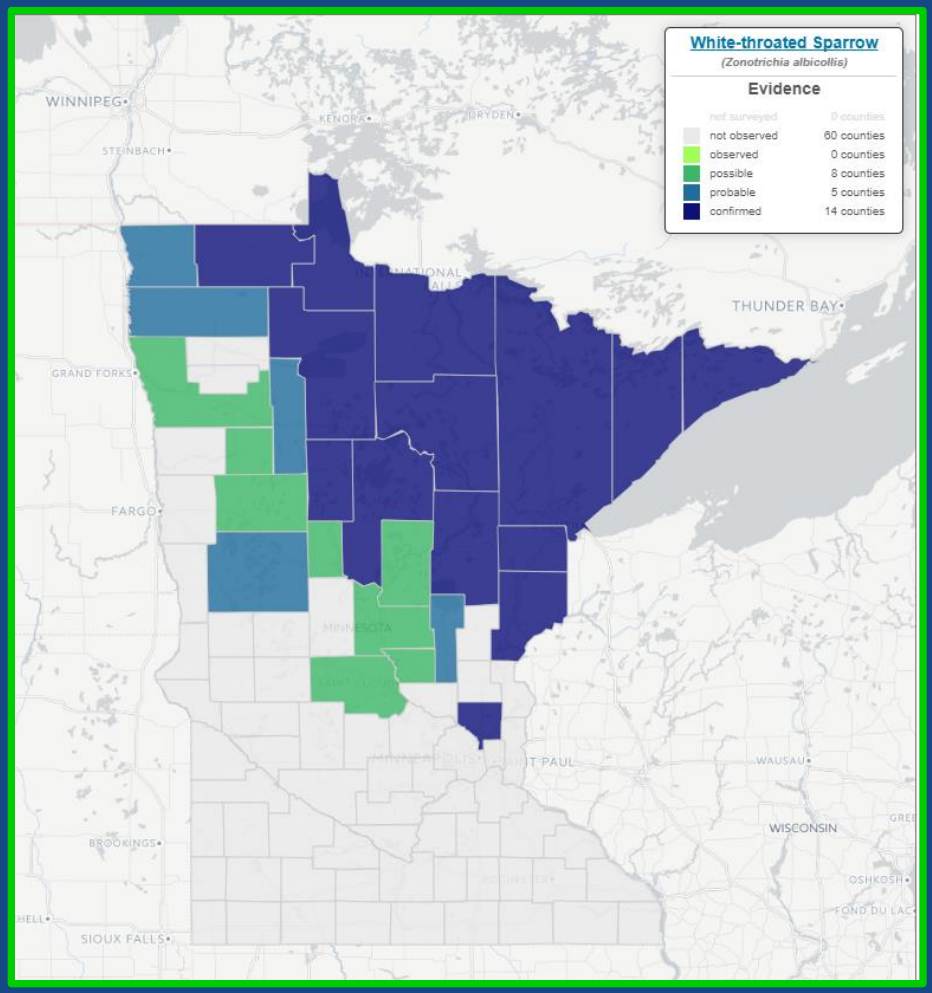
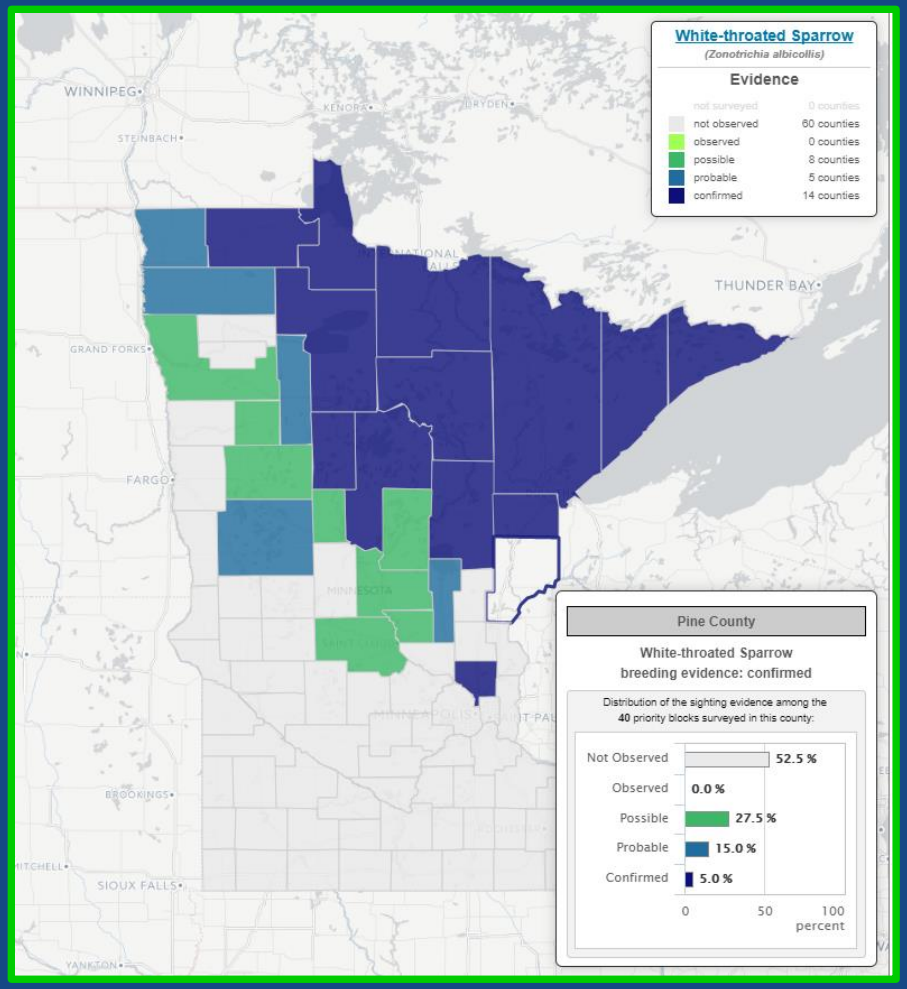


Minnesota
Breeding
Bird Atlas

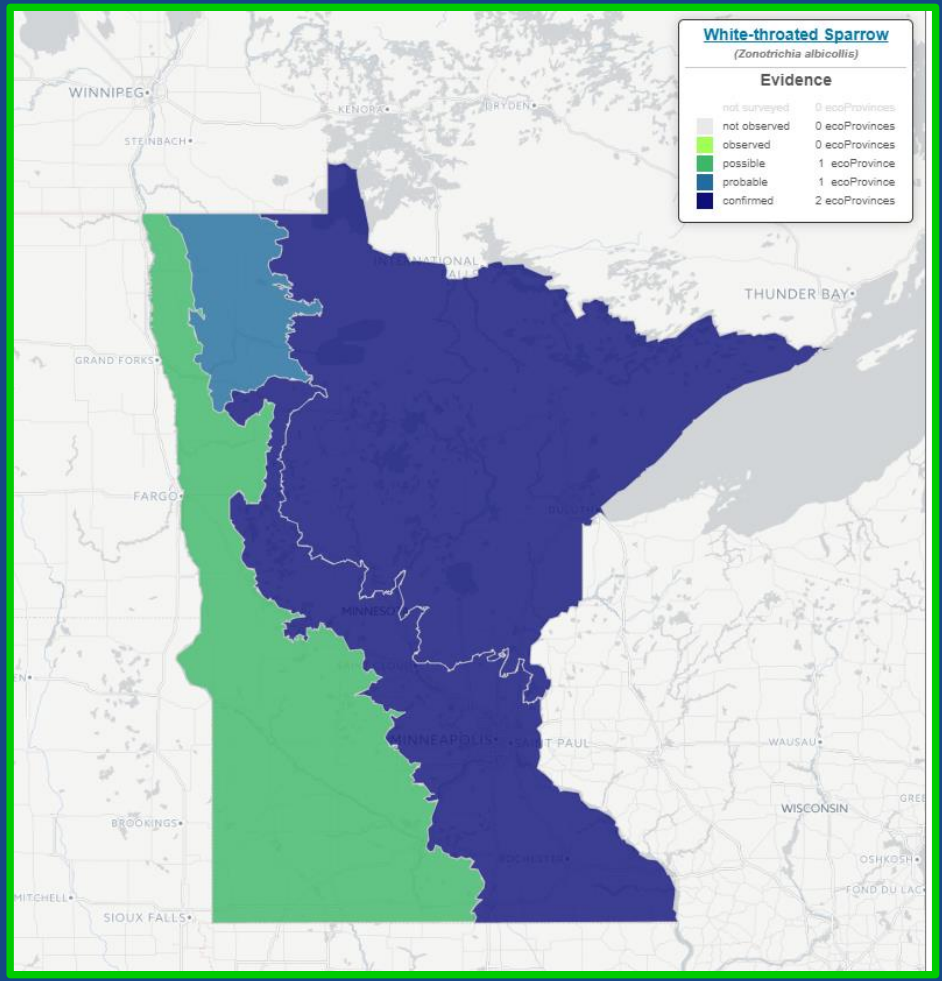
Interactive Map



Minnesota Breeding Bird Atlas

Interactive Map

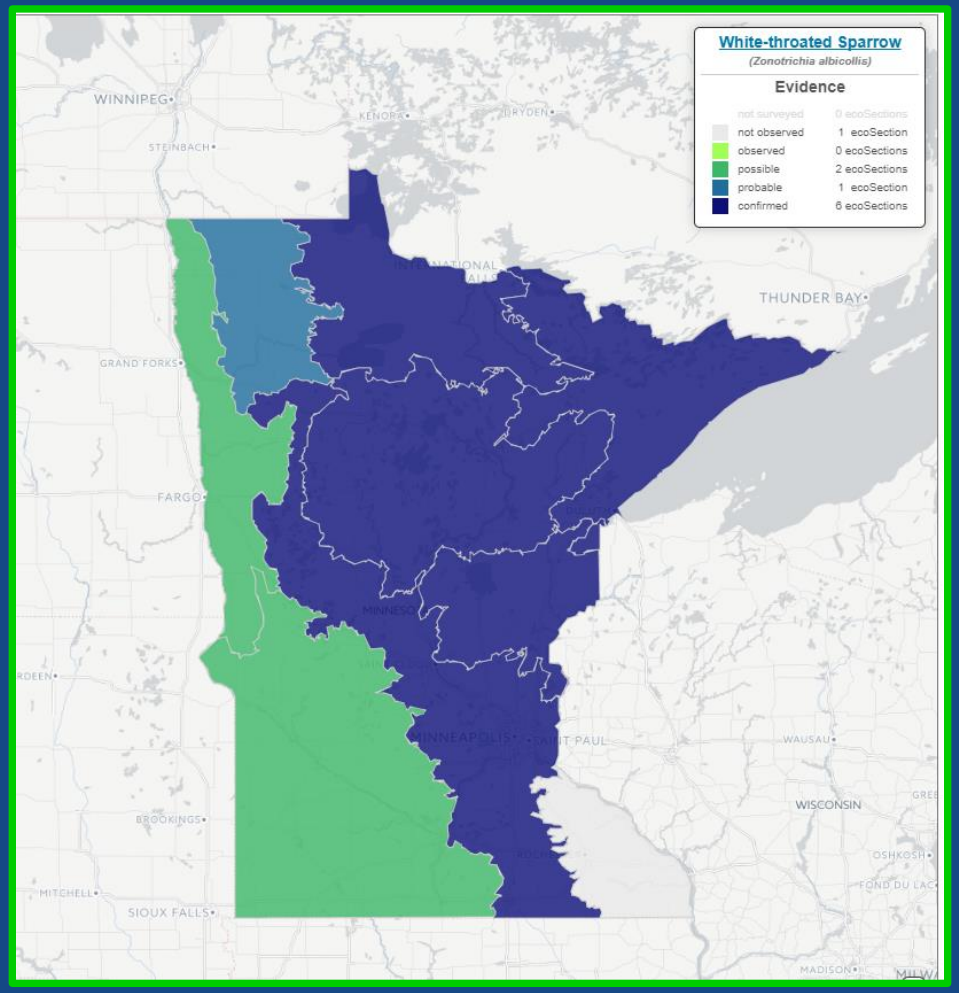
Ecological Provinces



Minnesota Breeding Bird Atlas

Interactive Map

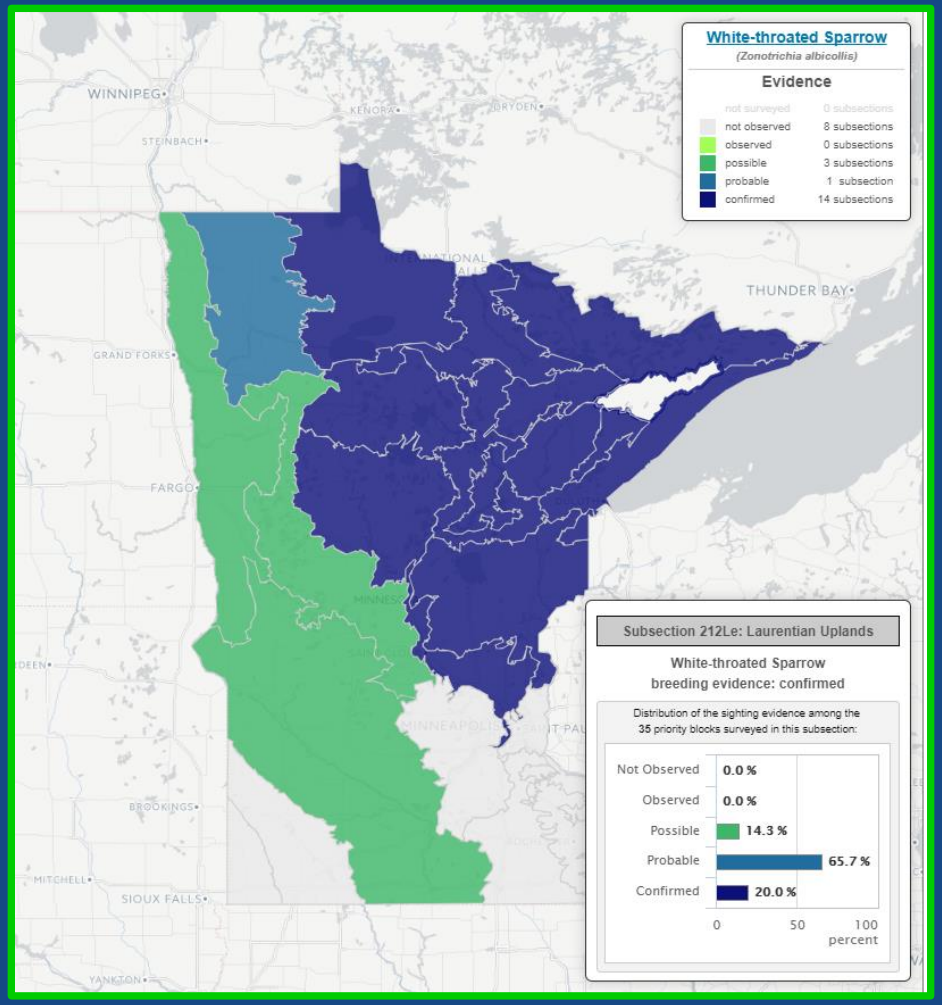
Ecological Sections



Minnesota Breeding Bird Atlas

Interactive Map

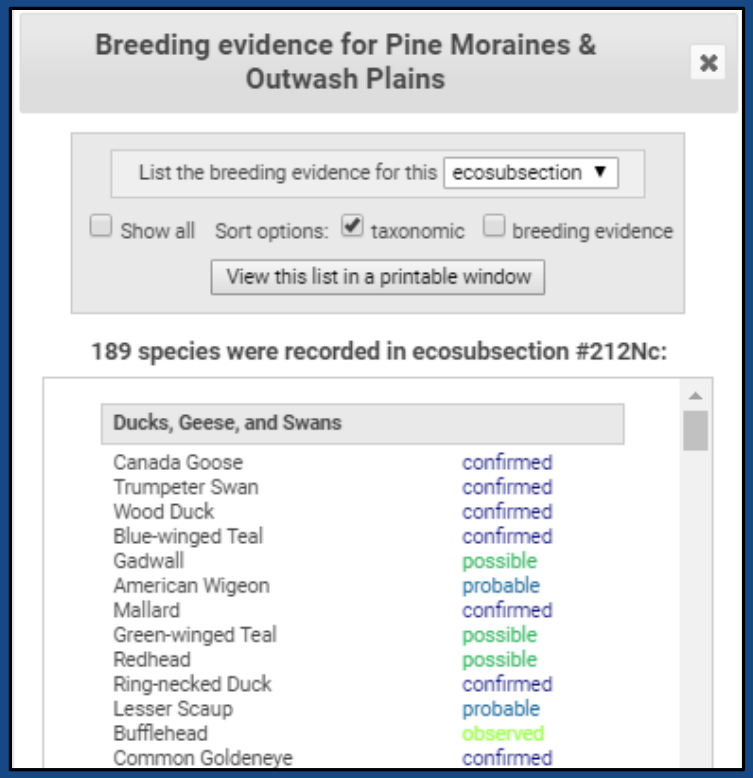
Ecological Subsections

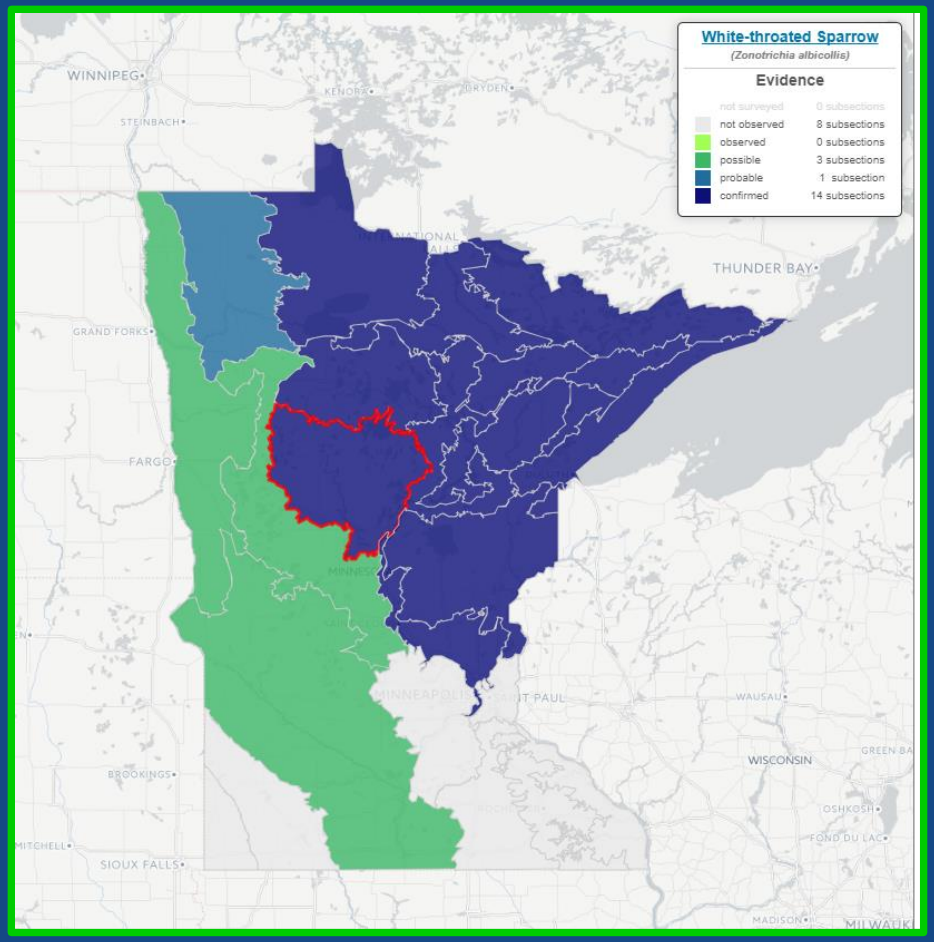


Minnesota Breeding Bird Atlas

Interactive Map

Complete Species List for each geographical unit





Minnesota Breeding Bird Atlas

Interactive Map

Delineate a Custom Area

Breeding evidence for custom region

List the breeding evidence for this custom area

Show all Sort options: taxonomic breeding evidence

View this list in a printable window

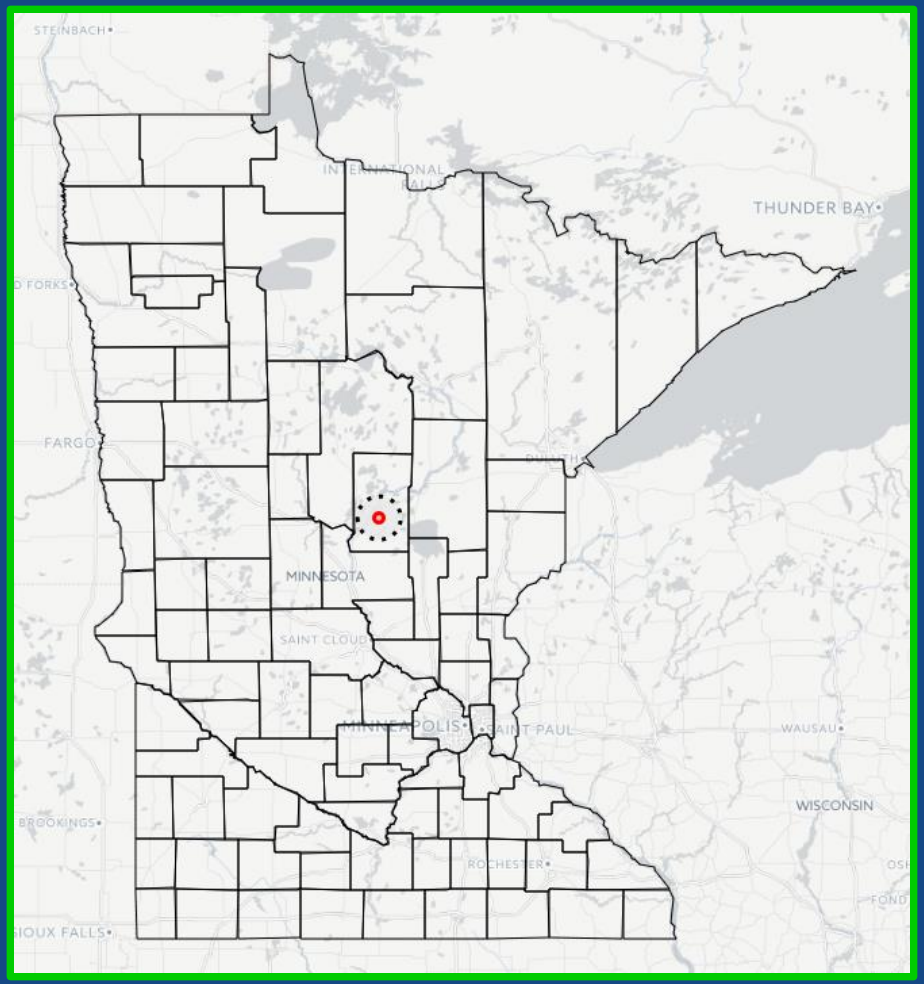
Center: [Lat: 46.37656°, Long: -94.09484°]
Radius: 10 miles

45 blocks have centers inside this circle.

Change the radius of the circle: 10 miles apply

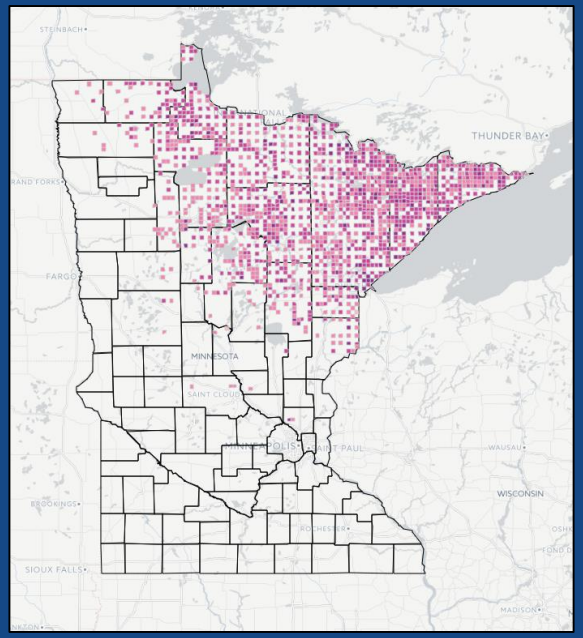
142 species were recorded in this region:

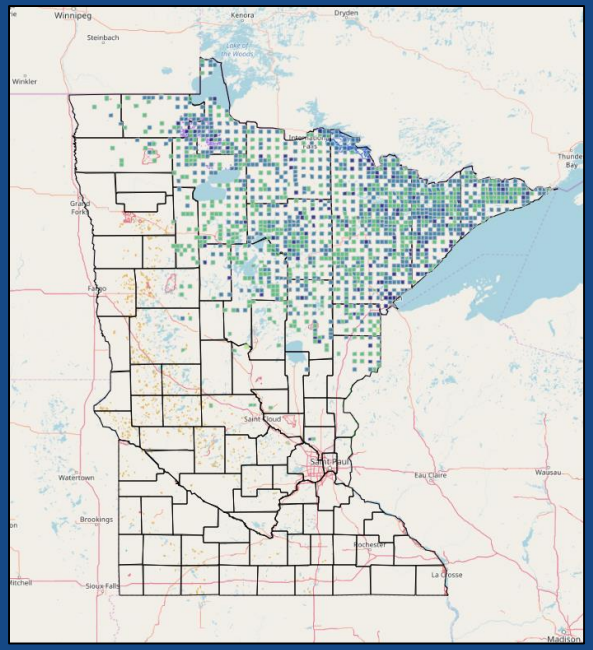
Ducks, Geese, and Swans	
Canada Goose	confirmed
Trumpeter Swan	confirmed
Wood Duck	confirmed
Blue-winged Teal	confirmed
Mallard	confirmed
Ring-necked Duck	confirmed
Common Goldeneye	possible

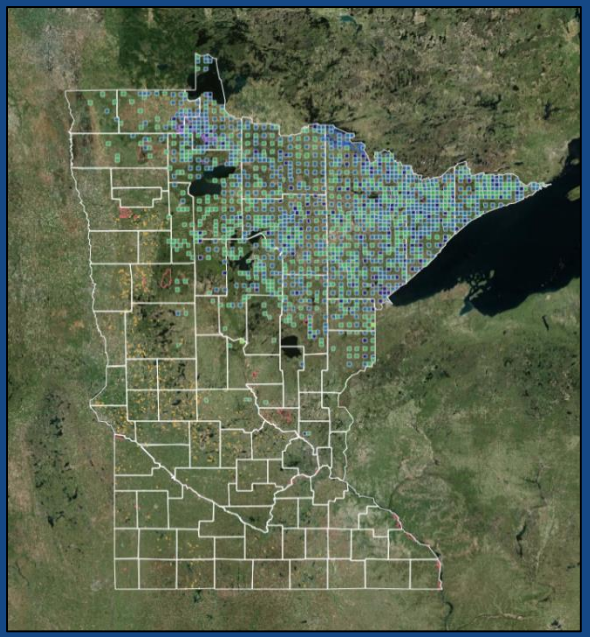


Minnesota
Breeding
Bird Atlas

Interactive Map







Minnesota Breeding Bird Atlas

Product Development

Step #6:

Book Preparation

Minnesota Breeding Bird Atlas

Book Preparation

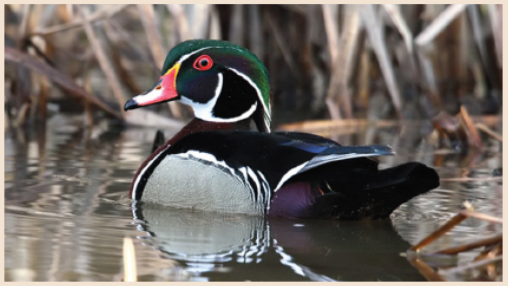
Overall Approach:

- Keeping same authors and collaborators
- Preparing more condensed version of web materials
- Expanding introductory materials
- Adding extirpated species and incidental species not reported during the MNBBA

Minnesota Breeding Bird Atlas

Book Preparation

Wood Duck *(Aix sponsa)*



Migration
A short-distance migrant that winters in the central and southeastern United States. In Minnesota, Wood Ducks may be seen during the winter where there is open water.

Food
A dabbling duck that feeds on aquatic and terrestrial invertebrates, seeds, and fruits.

Nest
A cavity nester that selects large, mature trees in riparian habitats; also uses nest boxes.

Conservation Concern
A game species, the Wood Duck is assigned a Moderate Continental Priority by the North American Waterfowl Management Plan and a Continental Concern Score of 0/20 by Partners in Flight.

Superlatives abound when describing the male Wood Duck in his full nuptial plumage. Even his scientific name, which means "waterbird in bridal dress," is a pronouncement of the bird's stylish attire. Roberts (1932) was among the bird's many admirers, writing that "the brilliancy, variety, and exquisite pattern of its colors is rivalled by few, if any, of its kind in the world."

The male's iridescent green head crest, bright white markings on the black face, and large red eye are sufficient to distinguish this spectacular bird from every other waterfowl species. Even the female has a subtle elegance with a tear-drop patch of white around the eye and a white chin and throat that contrast with her grayish-brown plumage. The common vocalization we associate with the Wood Duck, "oo-eek, oo-eek", is actually the female's raspy, high-pitched call as she darts through the tree-tops.

A species primarily of the eastern deciduous forest, the Wood Duck is supremely adapted to it tree-dwelling habits. Its slender body enables it to compress itself into small cavities for nesting. Each toe is equipped with a sharp claw that helps the hatchings climb out of the nesting cavity and the adults perch on tree branches. Its eye, larger than that of any other dabbling duck, helps it navigate through the maze of tree-top branches while its short wings and broad tail assist with aerial maneuverability.

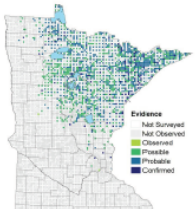


Figure 1. Breeding distribution of the Wood Duck in Minnesota based on the Breeding Bird Atlas (2009-2013).

Minnesota Breeding Bird Distribution

One hundred years ago the future of the Wood Duck was in doubt and its extinction seemed imminent. Like so many waterfowl, prior to the enactment of hunting regulations the birds were harvested year-round, severely depleting populations (Bellrose 1976). At the same time, the loss of cavity trees due to extensive logging also likely contributed to population declines (J. Lawrence, pers. comm.). In Minnesota, Roberts (1932) noted that Wood Ducks were an abundant summer resident in the 1800s but "greatly reduced in numbers" by the early 1900s. Only 1 confirmed nesting record (nest with eggs) was reported from Grant County, while young broods (inferred nesting) were reported in just 5 counties: Aitkin, Clearwater, Hennepin, St. Louis, and Stearns. When the federal Migratory Bird Treaty was passed in 1916, the hunting season on Wood Ducks was immediately closed and remained so until 1941. The response was nearly immediate. Only 16 years later, when Roberts published his treatise on Minnesota birds, he was already witnessing an increase in the number of nesting pairs.

When Green and Janssen (1975) published an updated account of the species' status forty years later, the Wood Duck had become the fourth most abundant nesting duck in the state (Lee et al. 1964). It was scarce, however, in the northeast and was absent from agricultural lands in the Red River valley and southwestern Minnesota. But only 12 years later, Janssen (1987) reported the species was expanding its range in areas where it was formerly absent. Although it remained uncommon in the northeast, breeding had been confirmed in Lake and Cook Counties in the late 1970s. By 1998 Hertzel and Janssen (1998) documented Wood Duck nesting records in all but 5 counties: Beltrami, Benton, Otter Tail, Steele, and Wilkin. Likewise, by 2014, the Minnesota Biological Survey reported the species was widely distributed across the state (Minnesota Department of Natural Resources 2016).

MNBBA participants reported a total of 2,828 Wood Ducks records from 36.1% (1,738/4,820) of the surveyed atlas blocks and from 30.3% (918/3,537) of the priority blocks. Breeding was confirmed in 762 (15.8%) atlas blocks (Figure 1 and Table 1). Reported from every one of Minnesota's 87 counties, breeding evidence was collected from all but 2 counties: Traverse and Red Lake. The density of reports in the Twin Cities metropolitan area and in the Brainerd region reflects, in part, the number of atlas volunteers concentrated in these areas. Despite their statewide distribution, Wood Ducks remained least abundant in the most heavily cultivated regions of the Red River valley and in far north-central Minnesota.

The land suitability map for the species predicts that the most suitable Wood Duck habitat occurs across central Minnesota, from the Twin Cities northwest to the Hardwood Hills Subsection and south throughout southeast and south-central Minnesota (Figure 2). Although Wood Ducks are predicted to be sparse throughout the Red River valley and in the southeast, the rivers and streams in these regions still provide highly suitable habitat for this riparian species.

More than 100 years after many predicted the species' demise, the Wood Duck not only has recovered to the point of reoccupying most of its original breeding range, but populations have expanded north in Canada, west in the Central Plains, and south into Mexico (Hepp and Bellrose 2015). Atlas projects have documented the species' statewide distribution in the nearby states of Wisconsin (Cutright et al. 2006), Michigan (Chartier et al. 2015), Iowa (Iowa Ornithologists' Union 2017), and South Dakota (Dilling et al. 2016). Ontario documented a 53% increase in the probability of observing Wood Ducks between their first atlas (1981-1985) and second atlas (2001-2005). Part of the increase was attributed to the large number of Wood Duck nest boxes recently erected in the province's Northern Shield (Cadman et al. 2007).

Figure 2. Landcover suitability of the Wood Duck in Minnesota based on habitat, landscape context, and climate data gathered during the Minnesota Breeding Bird Atlas (2009-2013) using the MaxEnt modeling approach.

Figure 3. Typical breeding habitat of the Wood Duck in Minnesota (© Lee A. Pfannmuller).

Breeding Habitat

Wood Ducks select mature woodlands that border lakes, streams, rivers, and small wetland pools (Figure 3). Older trees provide nesting cavities, while shallow wetlands provide foraging sites for the adults and young broods. When natural cavities are scarce, the birds take readily to nest boxes. Wetland cover is important, particularly during brood rearing, and may be furnished by overhanging trees and shrubs, by fallen wooden debris, or by aquatic emergent vegetation. Large expanses of open water are generally avoided.

Although nesting cavities adjacent to water are usually preferred, Wood Ducks may nest nearly 2 km from the nearest body of water (Hepp and Bellrose 2015; Baldassarre 2014). A study conducted in Minnesota demonstrated that 70% of radio-marked females stayed within 1 km of the nesting cavity, suggesting that an area of approximately 3 km2 was needed by a single pair during the breeding season (Baldassarre 2014).

Population Abundance

The Wood Duck's forest habitat challenges efforts to effectively monitor long-term population trends and assess population abundance. The well-established Waterfowl Breeding and Habitat Survey, the gold standard for monitoring North American waterfowl populations, more effectively monitors species that nest in wetlands of the open prairies and parklands than birds that breed in woodlands. This international survey does not even tally Wood Ducks.

In light of this dilemma, waterfowl biologists have relied on other tools to monitor the species' population (Davis 2016). The federal Breeding Bird Survey (BBS), for example, was designed to monitor songbirds but can provide a reasonable index of long-term trends for other common and widely distributed species like the Wood Duck. Indeed, since the BBS began in 1966, Wood Ducks have shown a significant, long-term population increase across North America, averaging 1.63% per year through 2015 (Sauer et al. 2017). In Minnesota, the BBS trend data mirrors the national trend, with a significant annual increase of 1.70% per year from 1967 to 2015 (Figure 4).

The principal factors responsible for the species' population growth include strictly managed harvest regulations, protection and restoration of riparian wetlands, and the gradual maturation of forests in the northeastern United States following the abandonment of small farmsteads. In some areas, intensive efforts to establish nest box programs also may be helping local populations.

In Minnesota, waterfowl biologists have another tool to assess Wood Duck populations. Begun in 1968, the state Waterfowl Survey monitors waterfowl populations in a region of western Minnesota (39% of the state) that supports the highest density of lake basins (> 10 acres) outside of the densely forested region of northeastern Minnesota. Data collected by this survey illustrates a steep decline in Wood Duck numbers, particularly since 2001 (Figure 5). Increasingly earlier leaf-out dates that make it more difficult to detect the forest-inhabiting Wood Duck, might explain some of the decline. Nevertheless, the same Minnesota survey also illustrates declines for the two most abundant duck species in the state, the Mallard and Blue-winged Teal (Cordts 2015).

Table 1. Summary statistics for the Wood Duck observations by breeding status category for all blocks and priority blocks (each 5 km x 5 km) surveyed during the Minnesota Breeding Bird Atlas (2009-2013).

Breeding Status	Blocks (n)	Priority Blocks (n)
Confirmed	762 (15.8%)	273 (30.2%)
Probable	263 (5.5%)	98 (4.2%)
Possible	602 (13.7%)	311 (13.3%)
Observed	51 (1.1%)	36 (3.9%)
Total	1,738 (36.1%)	918 (39.3%)

The different Wood Duck population trend lines demonstrated by the Minnesota BBS data and the Minnesota waterfowl survey may indicate that neither monitoring tool is entirely effective for this woodland-dependent waterfowl species, or it may signal that Wood Ducks are doing well at the statewide level but are experiencing local declines in those areas more intensively surveyed by the Waterfowl Survey.

At the state level, wetland quantity and quality are widely cited as factors negatively impacting waterfowl populations. Despite their rebound from nearly devastating declines in the early 1900s, less than ideal wetland conditions in western Minnesota may be influencing Minnesota Wood Duck numbers. Nevertheless, west-central Minnesota still supports some of the highest breeding densities of Wood Ducks in North America (Sauer et al. 2017).

Figure 4. Breeding population trend for the Wood Duck in Minnesota for 1968-2015 based on the federal Breeding Bird Survey (Sauer et al. 2017).

Although a diversity of data is collected on Wood Ducks, an estimate of the species' population size is difficult. More than 20 years ago, Bellrose and Holm (1994) estimated the population at approximately 2.8 million birds. Ten years later, in 2004, the North American Waterfowl Management Plan (2004) placed the estimate at 4.6 million birds. Waterfowl biologists in Minnesota estimate the statewide population at approximately 100,000 birds (Minnesota Department of Natural Resources 2016).

Conservation

The Wood Ducks' recovery is one of the most successful wildlife recovery efforts in North America. Other than the Eastern Bluebird, there is no other bird species for which the general public has been so actively engaged in its restoration. The Wood Duck's ready acceptance of nest boxes led to a plethora of local conservation efforts across the United States focused on building, maintaining, and monitoring Wood Duck nest boxes. At a continental level, the overall reproductive contribution of nest boxes has been estimated at just 4% to 5% (Bellrose 1990), but at the local level their impact can be much higher (Baldassarre 2014). In light of its successful recovery, its wide distribution, and its relatively large population, Partners in Flight (2017) has assigned the species a relatively low Continental Concern Score of 0/20. The North American Waterfowl Management Plan (2004) has designated the Wood Duck a Moderate Continental Priority.

The long-term key to the Wood Duck's survival is the availability of mature forests that provide nesting cavities and the availability of good-quality wetlands located nearby. Forest management practices that emphasize the protection and restoration of riparian forests are one of the most important management tools available. In Minnesota, implementation of site-level forest management guidelines developed by the Minnesota Forest Resources Council is especially critical (Minnesota Forest Resources Council 2015).

A popular species among waterfowl hunters, in the fall of 2015, Wood Ducks comprised approximately 8.0% of the total duck harvest in the United States (a total of nearly 942,000 birds harvested). The 2015 harvest of Wood Ducks in Minnesota comprised nearly 14% (114,020 birds) of the entire harvest (Raftovich et al. 2016). Wood Ducks are one of the most commonly harvested duck species in Minnesota, second only to the Mallard.

Climate change is a major challenge to the species' future. A recent analysis by the National Audubon Society classified the species as "climate threatened" and predicted that the Wood Duck's current breeding range could decline by 69% by the year 2080, forcing birds to move farther north into central Canada (Langham et al. 2015; National Audubon Society 2016). The availability of sufficient mature trees with cavities will be critical in determining if the species can adapt to such change.

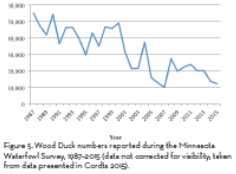


Figure 5. Wood Duck numbers reported during the Minnesota Waterfowl Survey, 1967-2015 (data not corrected for visibility, taken from data presented in Cordts 2015).

Minnesota Breeding Bird Atlas

Book Preparation

Nashville Warbler *(Oreothlypis ruficapilla)*

Minnesota Seasonal Status
A regular breeding resident and migrant in Minnesota. Nashville Warblers were an abundant species during the Minnesota Breeding Bird Atlas (MNBBA).

Migration
Long-distance migrant that overwinters in southern Texas, Mexico, and south as far as Panama; casual winter visitor in the Caribbean.

Food
Gleans insects from foliage.

Nest
On the ground in thick foliage or moss hummocks.

Conservation Concern
Assigned a Continental Concern Score of 9/20 by Partners in Flight; identified as a stewardship species by Audubon Minnesota.

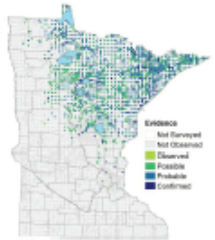


Figure 1. Breeding distribution of the Nashville Warbler in Minnesota based on the Breeding Bird Atlas (2009-2013).

The Nashville Warbler, like the Tennessee Warbler, has little association with Nashville, Tennessee except the type specimen was collected there during its migration through the city. Its species name, ruficapilla, refers to the often hidden rufous-red crown of the male. The olive-green male also sports a bright yellow breast that contrasts with its grayish head and neck. Both sexes have a distinctive white eye-ring, while the female is generally more subdued in coloration, lacks the grayish head, and retains an even fainter reddish crown. Like many warblers, Nashvilles are much easier to identify by song as it flits through the vegetation during migration. Its song, often sung on the top of a conifer during the breeding season, begins with several two-parted notes followed by a trill; commonly described as seebit seebit seebit tititititit.

The Nashville Warbler is one of the most ubiquitous species found in the northern forests of Minnesota. It is found primarily in lowland coniferous forests consisting of black spruce and tamarack trees, but also commonly found in young forests created by logging, forest fire, and insect defoliation as well as edges of forests. The Nashville Warbler is an important Minnesota species because a high proportion of its North American breeding population occurs in the state. Fortunately, it appears to be highly adaptable and its appetite for many harmful insects renders it a valuable bird for the health of Minnesota forests.

Minnesota Breeding Bird Distribution

The Nashville Warbler is historically described as breeding throughout the forested part of the state, especially in the tamarack swamps and the mixed tamarack and spruce swamps (Roberts 1932). During Roberts (1932) time in Minnesota, from the late 1800s to the early 1900s, the species was "sparingly" found in Hennepin and adjacent counties "in and about the numerous large tamarack swamps, but since these have been largely cut off or drained, it has disappeared as a nesting bird." Roberts then reported the breeding range as confined almost entirely to the Canadian Zone, from northern Isanti County on the south, and as far west as the ex-pigeons as landed. We documented breeding activity at seven locations, and all were in tamarack and spruce swamps. They included Aitkin, Becker, and Itasca Counties, plus at Cass Lake, Leech Lake, Itasca Park, and Mille Lacs.

More than 40 years later, Green and Janssen (1975) emphasized that the Nashville Warbler's primary breeding distribution is in north-central and northeastern Minnesota. They added confirmed nesting records from as far south as Anoka County, and additional confirmed nesting in Clearwater, Crow Wing, Itasca, Lake, and St. Louis counties. They also noted that the Nashville Warbler uses tamarack stands in the southern and western regions of its breeding range. In 1981 Janssen reported confirmed nesting in 10 counties since 1970, of which Beltrami, Cook, Hubbard, Lake of the Woods, and Mille Lacs counties were new records. Several years later, Hertzel and Janssen (1998) added confirmed nesting in Koochiching County since 1970.

The Minnesota Biological Survey (MBS) recorded 2,078 breeding season locations during their inventories of counties in the state. Their locations also were dominated by those in northeastern and north-central Minnesota but included breeding observation locations throughout the northwestern counties, including Kittson, Mahnomen, Marshall, and Polk Counties. Observations were also made southwest to Douglas and Otter Tail Counties, and south to Anoka, Chisago, Sherne, and Washington Counties.

The MNBBA further documented the extensive distribution and abundance of the Nashville Warbler in the forested regions of Minnesota but also the struggle to confirm nesting activity (Figure 1). The difficulty in finding nests of this species was a point noted also by Roberts (1932) and many regional breeding bird atlases. A total of 4,370 breeding records of this species were gathered during the MNBBA. The ratio of blocks with confirmed nesting to all the other observations was only 1:14 (104 confirmed blocks to 1,529 blocks where the species was recorded) (Table 1). The MNBBA extended confirmed nesting of the Nashville Warbler to northwest Minnesota, including Marshall, Pennington, and Roseau Counties, and south to Hennepin, Morrison, and Washington Counties. In addition, nesting was confirmed in the east-central region in Carlton and Pine Counties.

It is unknown whether the Nashville Warbler has historically declined in abundance, but Roberts (1932) noted that its range had contracted from the southern portions of its former range in Minnesota due to the loss of forests, especially large tamarack swamps. In Minnesota the species is found more commonly in coniferous forests than deciduous forests. It also responds positively to successional stages in forests following disturbances such as fire, logging, and wind (Pfannmuller 2011). Coniferous forests and forests where there have been disturbances are found primarily in the northeastern, northern, and north-central portions of the state.

The infrequent encounter of this species by early explorers suggests that its population may have expanded more recently. During the 20th century, Minnesota was increasingly cleared of mature upland forests, especially in the northern portions of the species' breeding range. Cadman et al. (1987) similarly concluded that the species had benefited in Ontario from extensive clearing and lumbering operations during the past century. In contrast, extensive development of farmland in the southern portions of the province may have led to local extirpation of its breeding population. Lowther and Williams (2011), in their review of the Nashville Warbler in North America, cited evidence that the species became far more widespread in the early and mid-1800s in New England but then declined again in numbers and contracted its range when forests regrew in the late 19th and early 20th centuries.

Table 1. Summary statistics for the Nashville Warbler observations by breeding status category for all blocks and priority blocks (each 5 km x 5 km) surveyed during the Minnesota Breeding Bird Atlas (2009-2013).

Breeding Status	Blocks (n.)	Priority Blocks (n.)
Confirmed	104 (3.2%)	78 (3.2%)
Probable	723 (22.4%)	402 (20.0%)
Possible	470 (14.6%)	240 (11.9%)
Observed	2 (0.1%)	2 (0.1%)
Total	1,320 (41.0%)	821 (40.8%)

The documentation of nesting in Hennepin, Morrison, and Washington Counties is likely due to a combination of (1) a more liberal definition of confirmed nesting used in breeding bird atlas accounts compared with those used by the Minnesota Ornithologists' Union, and (2) the expanded and more intensive coverage of nesting activity by the MNBBA. It is possible that small populations have always existed in these more southerly locations, but they are likely to be more variable and not present every year.

Breeding Habitat

Roberts (1932) stressed the affinity of the Nashville Warbler for tamarack and spruce swamps, but he also found the warbler "less commonly in second growth and heavy timber on the uplands." The species is widely distributed in many different forest cover types and can be ubiquitous in early-successional, intermediate, and mature forests. The National Forest Bird (NFB) monitoring program in the Chippewa and Superior National Forests reported its highest densities in black spruce–tamarack cover types (Niemi et al. 2016) (Figure 2).

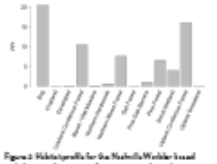


Figure 2. Habitat profile for the Nashville Warbler based on habitats within 200 m of point counts where the species was reported during the Minnesota Breeding Bird Atlas (2009-2013).

The Nashville Warbler was one of the most abundant species in extensive counts in the Agassiz Lowlands Ecological Subsection of northern Minnesota. It occurred in virtually all age classes of lowland coniferous forests, including white-cedar, tamarack, and black spruce (Bednar et al. 2016). The MNBBA data gathered during point counts found high variability of this species' habitat use with most detections made in bog habitats and in upland and lowland coniferous forests. However, mixed deciduous-coniferous forests, pine forests, and shrub-wetlands also were commonly used.

Cutright et al. (2006) in Wisconsin suggested that a common denominator among these habitats "appears to be dense ground cover for nesting," but canopy cover can vary widely. They also highlighted that spruce and tamarack lowlands are reliable places to find the species.

Population Abundance

Partners in Flight (Rosenberg et al. 2016) estimated a North American population of 39 million breeding adults, and the Partners in Flight Science Committee (2013) estimated a Minnesota breeding population of 1.8 million. By comparison, MNBBA estimated a Minnesota population of 2.21 million breeding adults (95% confidence interval was 0.81 – 3.60 million), or 5 times the Partners in Flight estimate.

The federal Breeding Bird Survey (BBS) indicated that northeastern Minnesota has among the highest breeding densities in North America. The MNBBA data suggest the Minnesota population is about 24% of the North American breeding population. Data included in these MNBBA estimates were those from the Agassiz Lowlands Subsection, an area having the most extensive lowland coniferous forest in the lower 48 states. This region has a substantial amount of suitable habitat and relatively high populations. This remote, roadless area is not sampled well by the BBS, which is the primary database used in the Partners in Flight calculations (Sauer et al. 2017). In contrast, the MNBBA did sample many of these roadless areas where the Nashville Warbler breeding populations are high.

The BBS trends from 1967 to 2015 for the Nashville Warbler indicated a stable population in Minnesota (Figure 3). Trends were also stable in Ontario but significantly increasing in Michigan (1.7% per year) and in Wisconsin (1.4% per year) over the same time frame. Trends as estimated by the NFB monitoring program from 1993 to 2017 were significantly increasing in the Chippewa and Superior National Forests and both by 1.4% per year.

Overall NFB population densities based on over 21,000 detections indicated a mean of 70 and 280 pairs per 40 ha in the Chippewa and Superior National Forests, respectively. Variations in density between different habitats were considerable. For example, the Nashville Warbler was present in mature maple-birch upland forest cover types, but densities were relatively low, with 37 and 84 pairs per 40 ha in the Chippewa and Superior National Forests, respectively. In comparison, densities were highest in mature black spruce-tamarack forests, with 304 and 351 pairs per 40 ha in the Chippewa and Superior National Forests, respectively. In the Agassiz Lowlands Subsection of northern Minnesota, densities in black spruce-tamarack forests routinely exceeded 40 pairs per 40 ha (Bednar et al. 2016).

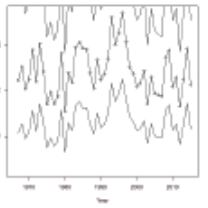


Figure 3. Breeding population trend for the Nashville Warbler in Minnesota for 1966-2015 based on the federal Breeding Bird Survey (Sauer et al. 2017).

Conservation

The recent Partners in Flight (Rosenberg et al. 2016) Continental Concern Score of 9/20 indicated that the Nashville Warbler is not a conservation priority. Lowther and Williams (2011) also maintained that it was of low priority for management because it readily adapts to second-growth and cutover areas.

The high proportion of the breeding population that occurs in Minnesota was a factor identified by Audubon Minnesota (Pfannmuller 2011) in its selection of the Nashville Warbler as a stewardship species. As previously noted, this species may be more common today in Minnesota because it readily accepts recently disturbed forests, such as those resulting from logging, forest fire, and wind. Schulte and Niemi (1998) found that Nashville Warblers were significantly more abundant in recently logged areas compared with similar areas that were recently burned. Zlonis and Niemi (2014) found that Nashville Warblers were equally abundant in managed and wilderness forests in the Superior National Forest of northern Minnesota.

Other factors that have been identified as affecting the species' populations include climate change, collisions with man-made structures (towers and windows), and ground predators of nests (Lowther and Williams 2011). Loss et al. (2014) listed the species as vulnerable to collisions with windows in residences of one to three stories tall. They estimated that this species' risk was 22.6 greater than the risk to an average bird. Langham et al. (2015) and the National Audubon Society (2015) labeled the Nashville Warbler as "climate threatened" in their review of climate sensitivity. They projected that 30% of its current summer breeding range will be lost and shifted northward by 2080. If this occurs, then the two subspecies, one (Oreothlypis ruficapilla ruficapilla) in the northeastern and upper midwestern United States and Canada, and the other in the western United States and Canada (O. r. ridgwayi), are likely to converge in their new northern breeding range. This may answer the question of whether these two subspecies are separate species.

Minnesota Breeding Bird Atlas

Book Preparation

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