

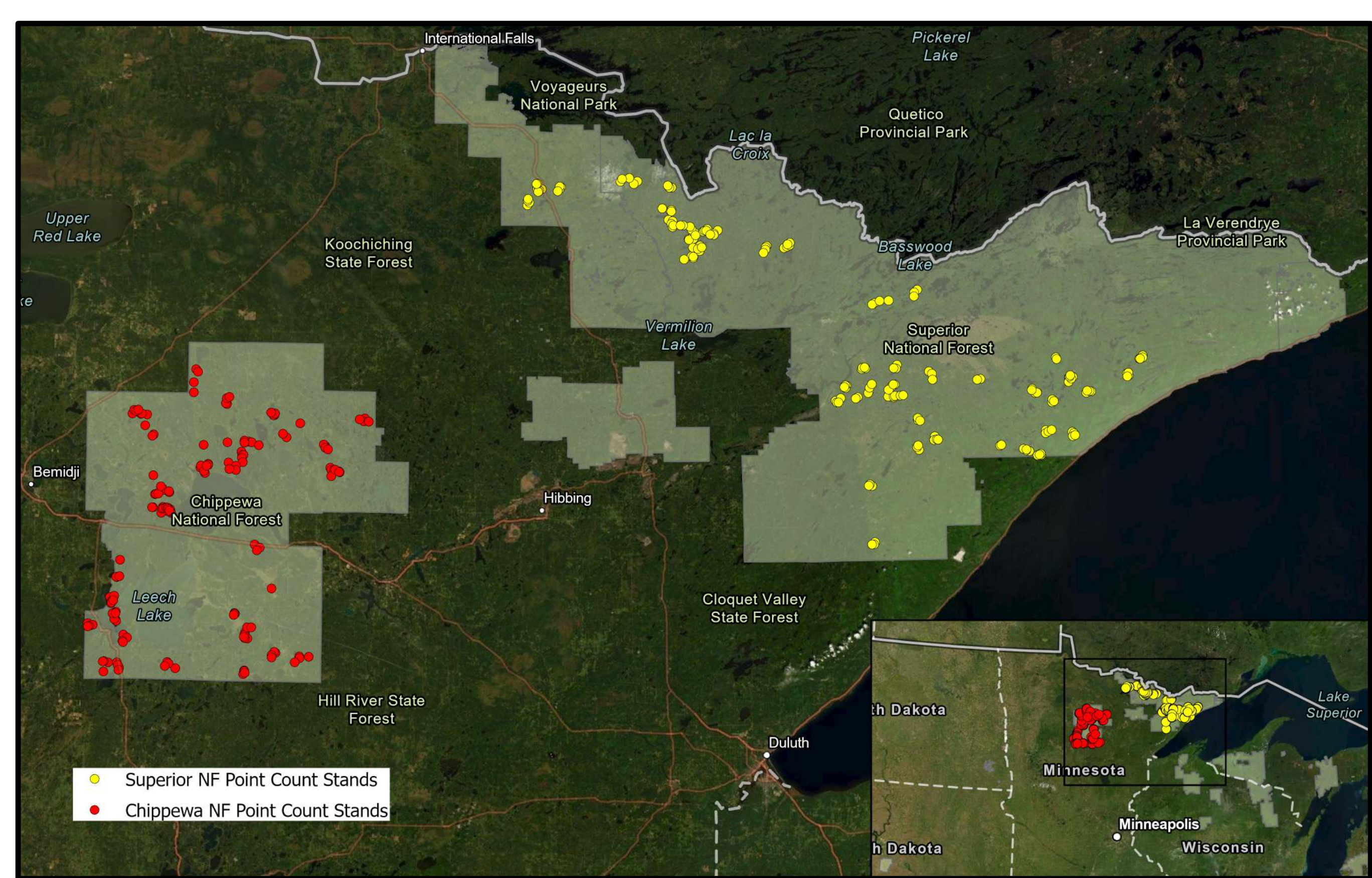
Introduction

- The breeding bird communities of the western Great Lakes region have among the richest species diversity in North America.
- The Minnesota National Forest Breeding Bird Monitoring Program was established in 1995 to collect habitat-specific regional population data in the diverse ecological setting of Chippewa and Superior National Forests.
- Adaptive forest management has the potential to mitigate impacts of climate and land use changes on bird communities by conserving and cultivating critical habitats.

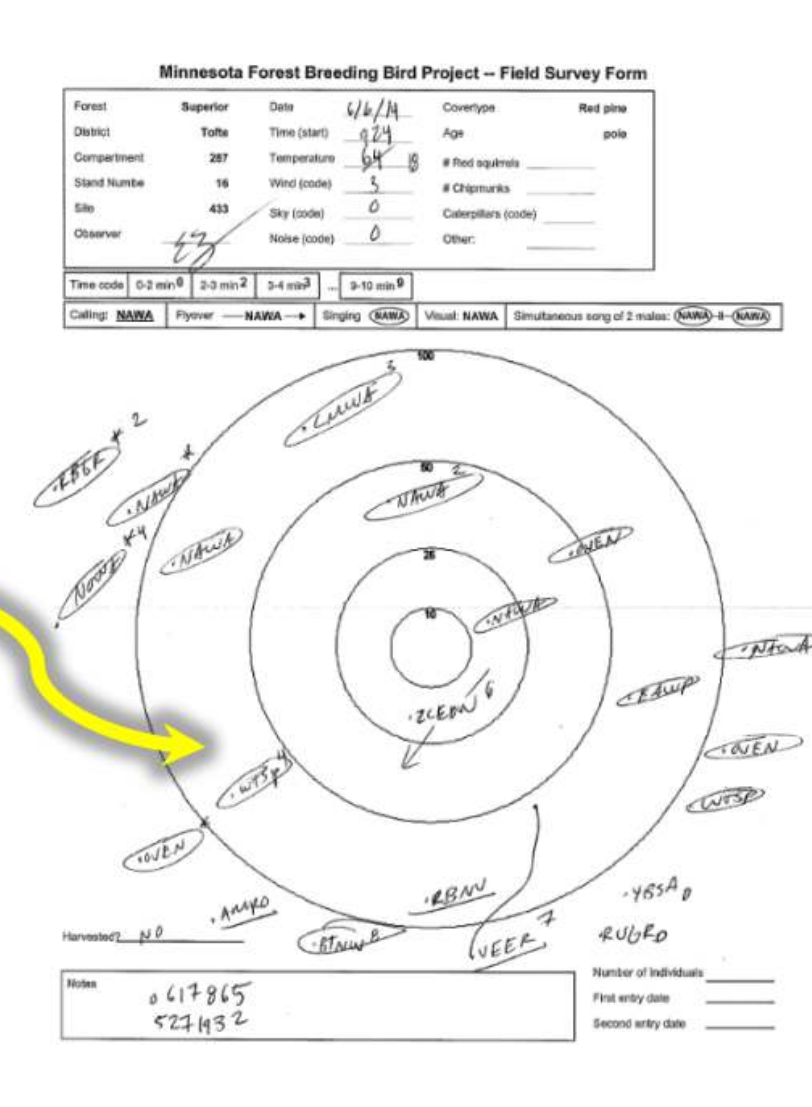
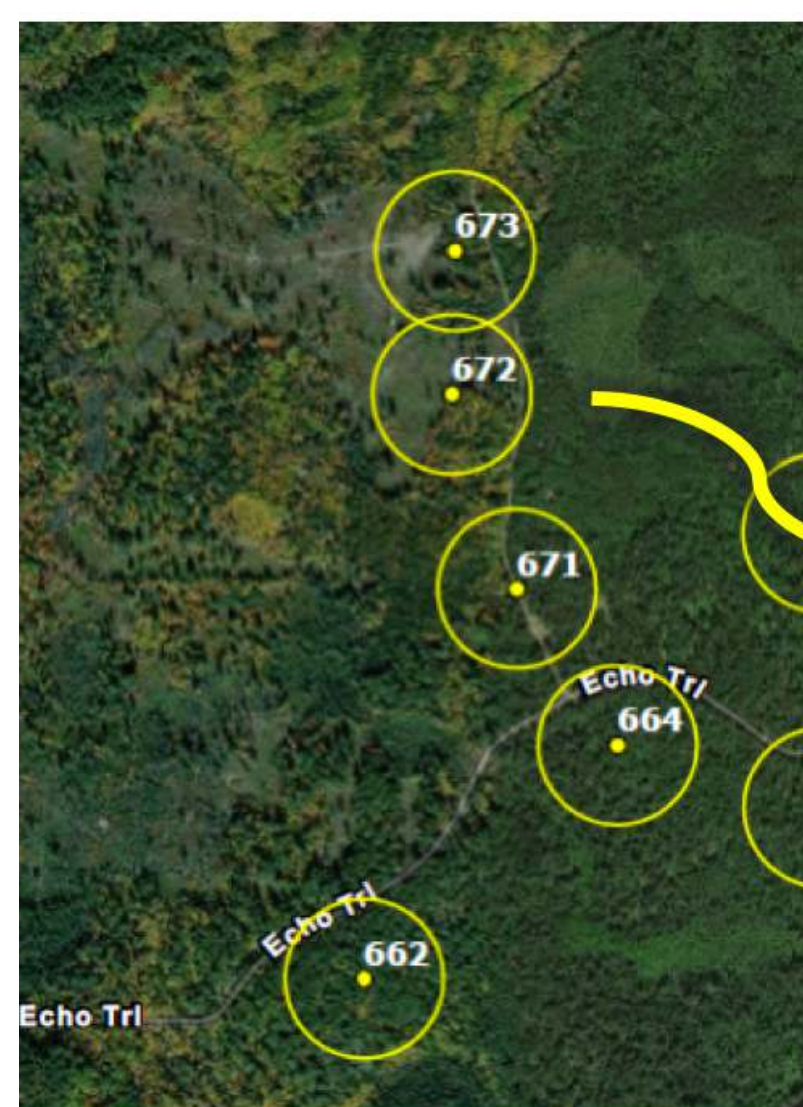
Project Goals

- Establish a baseline inventory of local forest breeding bird assemblages
- Monitor population changes of forest bird species over time
- Identify bird-habitat associations, particularly those relevant to forest management activities

Surveys

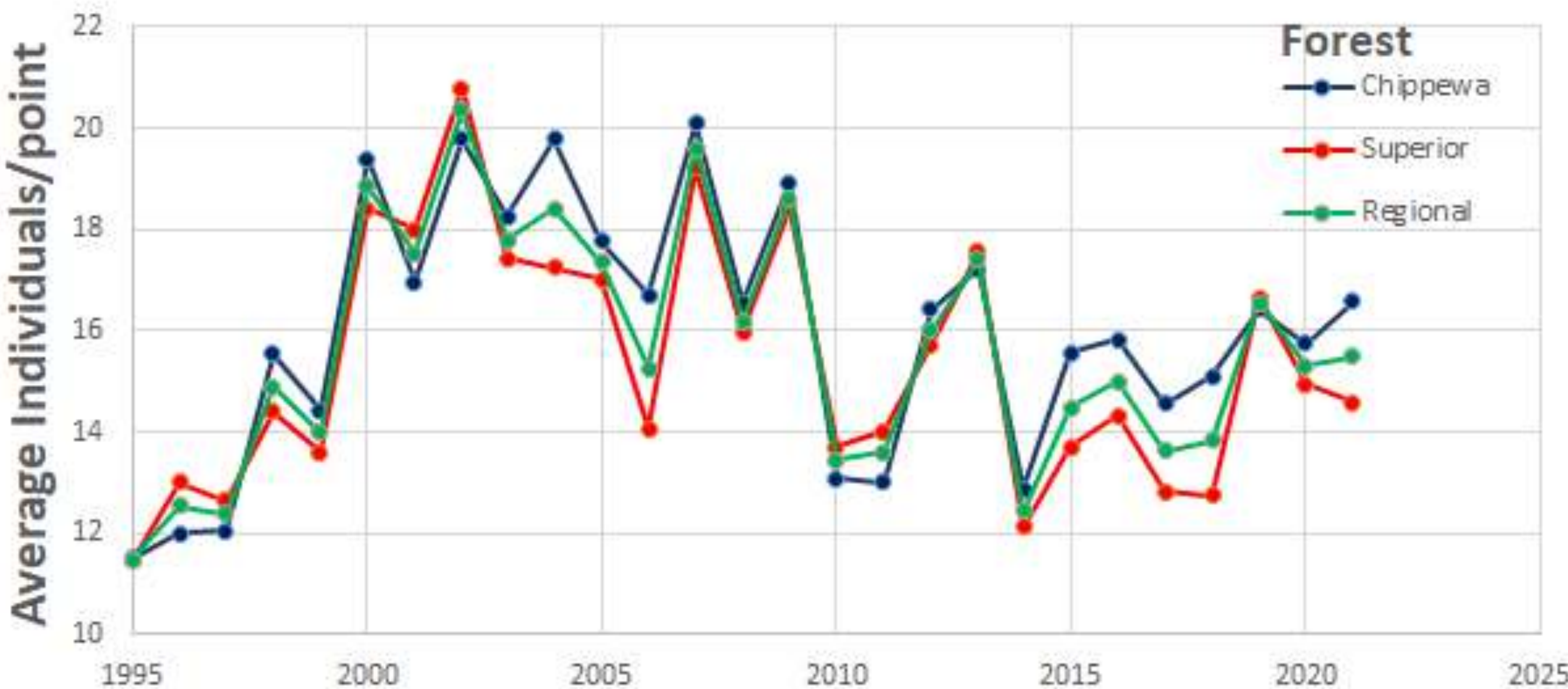


- More than 350 stands (> 1,000 points) within Chippewa and Superior NFs are surveyed annually during the breeding season (June 1 to July 10) using standardized 10-minute point counts.
- Approximately 25,000 points have been surveyed since 1995.



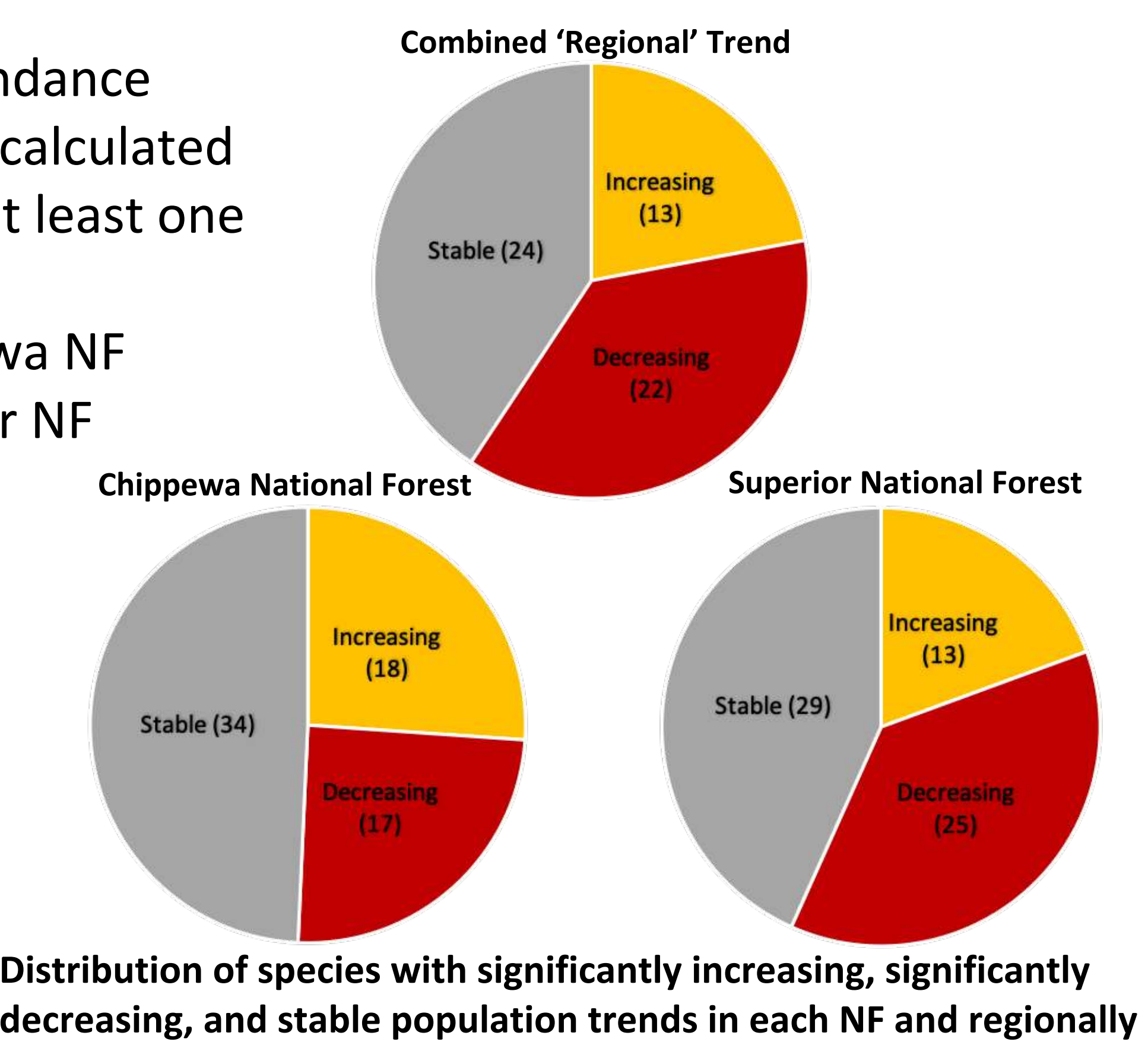
Results

- Over 409,000 individual birds of 166 species have been detected in the 27 field seasons of the monitoring program.



Average number of birds detected per point each year in Chippewa and Superior NFs

- Trends in relative abundance from 1995-2021 were calculated for 77 bird species in at least one NF, including:
 - 69 species in Chippewa NF
 - 67 species in Superior NF
 - 59 species regionally



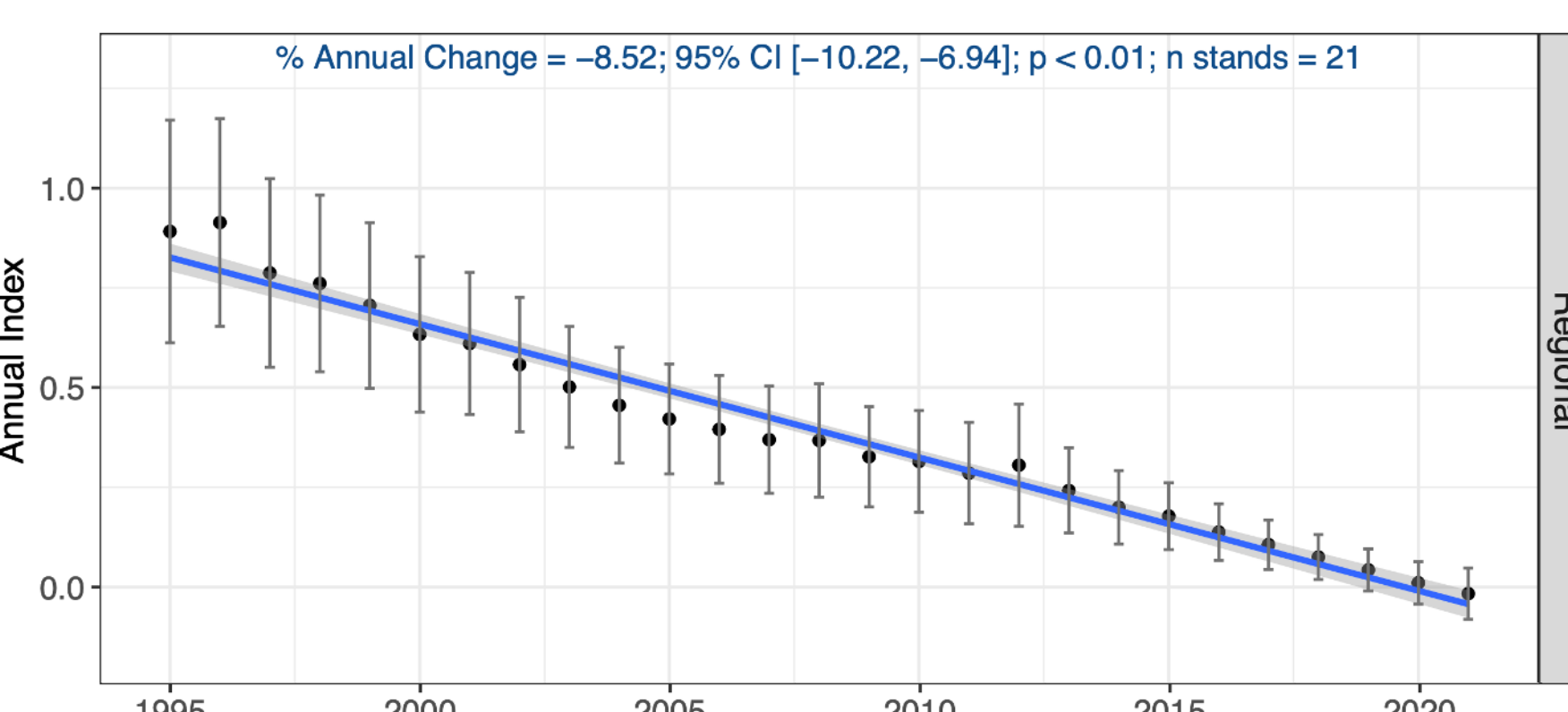
Distribution of species with significantly increasing, significantly decreasing, and stable population trends in each NF and regionally

Guilds

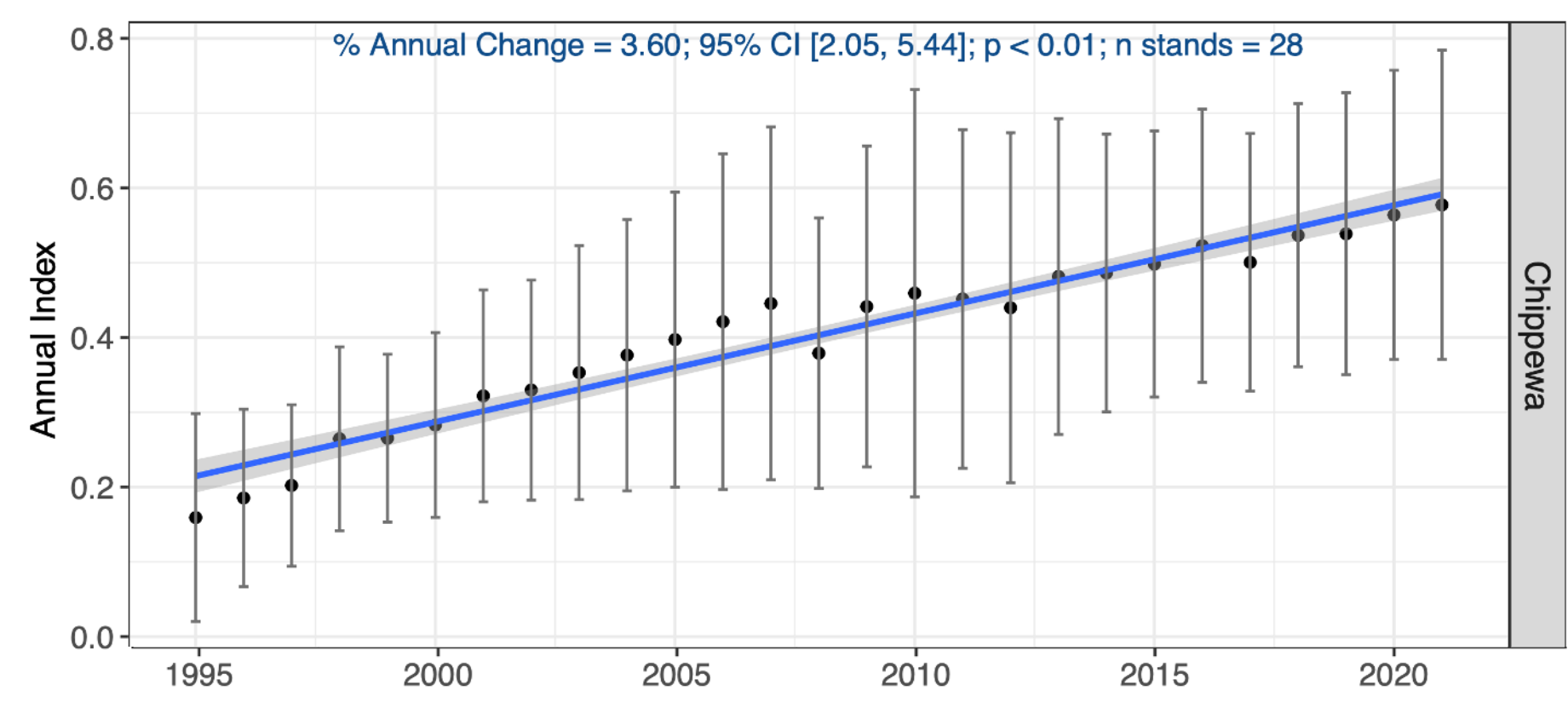
Chippewa National Forest																												
Habitat Guilds	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Coniferous forest species	2.4	2.4	2.6	2.9	2.7	2.7	2.8	2.9	3.0	3.0	3.0	3.1	3.1	3.3	3.1	3.5	3.0	3.0	2.8	2.8	2.7	2.7	2.6	2.6	2.5	2.5	2.4	
Deciduous forest species	12.4	13.1	13.1	13.2	14.4	14.9	15.3	15.7	15.9	16.4	16.6	16.6	16.5	16.5	15.8	14.9	15.6	15.8	15.1	14.9	14.9	14.8	14.8	14.5	14.5	14.4	14.3	
Early-successional species	3.9	4.2	4.3	4.5	4.6	4.6	4.7	4.7	4.9	5.0	5.0	4.9	4.9	4.9	4.7	4.5	4.5	4.4	4.4	4.4	4.4	4.5	4.4	4.5	4.5	4.6	4.6	
Lowland-conifer species	2.6	2.7	2.9	3.1	2.9	2.8	2.9	2.9	3.0	3.0	3.1	3.1	3.1	2.9	3.3	3.4	3.0	2.8	3.1	3.1	3.1	3.0	3.0	3.0	3.0	3.0	2.9	
Mixed forest species	3.5	3.4	2.5	2.7	2.6	2.7	2.8	2.9	3.0	3.1	3.1	3.2	3.2	3.1	3.2	3.4	3.1	3.1	3.0	3.0	3.0	3.0	2.9	2.9	2.8	2.8	2.8	
Migration Guilds	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Long-distance migrants	17.6	18.6	18.8	19.3	20.3	20.7	21.1	21.6	22.0	22.5	22.8	22.7	22.7	22.6	22.0	21.4	21.5	21.6	21.1	20.9	21.0	20.9	20.8	20.7	20.7	20.6	20.6	
Permanent residents	1.6	1.9	2.1	2.3	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.9	2.8	2.9	2.8	2.8	2.8	2.7	2.7	2.7	2.7	2.6	2.6	2.5	2.5	2.5		
Short-distance migrants	6.9	7.1	7.8	8.3	8.0	8.0	8.3	8.4	8.7	8.8	8.9	8.7	8.7	8.4	8.4	8.5	7.8	7.5	7.3	7.1	6.9	6.6	6.5	6.3	6.1	6.0		
Nesting Guilds	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Canopy nesting species	4.9	5.2	5.5	5.9	5.7	5.8	6.0	6.1	6.2	6.3	6.4	6.3	6.3	6.4	6.1	6.5	5.9	5.7	5.7	5.6	5.6	5.5	5.5	5.4	5.4	5.3	5.3	
Cavity nesting species	1.5	1.6	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.6	2.6	2.6	2.5	2.5	2.6	2.4	2.4	2.4	2.3	2.2	2.2	2.2	2.1	2.1		
Ground nesting species	10.9	11.2	11.8	12.5	12.5	12.6	12.9	13.3	13.7	14.0	14.2	14.1	14.2	13.7	14.2	13.8	13.7	13.5	13.7	13.6	13.6	13.5	13.4	13.4	13.3	13.3	13.2	
Shrub nesting species	8.9	9.4	9.4	9.6	10.2	10.5	10.7	10.8	11.0	11.2	11.3	11.1	10.9	11.0	10.2	9.9	9.8	9.7	9.4	9.2	9.1	9.0	8.8	8.7	8.6	8.5	8.4	
Nest parasites	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	
Superior National Forest																												
Habitat Guilds	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Coniferous forest species	2.1	2.8	2.8	3.0	3.0	3.0	3.1	3.2	3.3	3.5	3.4	3.5	3.6	3.6	3.6	3.5	3.6	3.5	3.4	3.4	3.4	3.5	3.3	3.3	3.2	3.1	3.1	
Deciduous forest species	10.8	11.1	11.5	11.6	12.1	12.3	12.5	12.7	12.8	13.0	13.2	13.0	12.8	12.4	12.3	12.0	11.7	11.5	11.4	11.3	11.2	11.0	11.2	11.0	11.0	11.0	11.0	
Early-successional species	5.1	5.2	5.3	5.4	5.6	5.8	5.9	6.0	6.1	6.4	6.3	6.2	6.1	6.1	5.9	5.7	5.5	5.2	5.2	5.0	5.0	4.9	4.8	4.6	4.5	4.4	4.4	
Lowland-conifer species	4.0	4.2	4.3	4.5	4.5	4.6	4.7	4.9	5.0	5.1	5.1	5.1	5.1	5.2	5.1	5.1	5.0	5.0	5.0	4.9	4.8	4.7	4.9	4.6	4.6	4.5	4.4	
Mixed forest species	2.4	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.8	2.9	3.0	3.0	3.0	3.0	2.9	2.8	2.8	2.8	2.7	2.7	2.6	2.5	2.4	2.4	2.4	2.3	2.3	
Migration Guilds	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Long-distance migrants	18.1	18.7	19.1	19.4	19.9	20.3	20.6	20.9	21.2	21.7	21.7	21.5	21.2	20.9	20.6	20.2	19.9	19.4	19.3	19.2	19.0	19.0	18.7	18.7	18.6	18.6	18.6	
Permanent residents	1.9	2.0	2.1	2.2	2.4	2.4	2.5	2.6	2.8	2.9	2.9	3.0	3.0	3.0	2.9	2.9	2.8	2.8	2.8	2.8	2.7	2.7	2.7	2.7	2.7	2.7	2.7	
Short-distance migrants	6.9	7.2	7.3	7.7	7.8	8.1	8.3	8.5	8.8	9.0	9.1	9.0	9.0	9.1	8.8	8.7	8.3	8.1	7.9	7.6	7.4	7.1	6.5	6.3	6.1	6.0	6.0	
Nesting Guilds	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Canopy nesting species	3.8	4.0	4.1	4.3	4.3	4.5	4.6	4.7	4.8	5.0	5.0	5.1	5.2	5.2	5.2	5.3	5.1	5.2	5.1	5.0	5.0	4.9	5.0	4.8	4.8	4.7	4.6	
Cavity nesting species	1.3	1.4	1.5	1.5	1.7	1.8	1.9	2.0	2.1	2.2	2.2	2.3	2.2	2.2	2.2	2.1	2.0	2.0	1.9	1.9	1.8	1.8	1.7	1.6	1.6	1.5	1.4	
Ground nesting species	14.3	14.7	14.9	15.4	15.7	16.0	16.2	16.6	16.9	17.2	17.2	17.1	16.9	16.8	16.6	16.3	15.9	15.5	15.5	15.3	15.0	14.8	14.8	14.4	14.4	14.1	13.8	
Shrub nesting species	7.6	7.7	7.9	8.1	8.3	8.5	8.7	8.8	8.9	9.2	9.2	9.0	8.8	8.6	8.4	8.1	7.9	7.7	7.6	7.5	7.5	7.4	7.4	7.2	7.2	7.0	7.0	

Estimated annual indices from 1995-2021 for breeding bird habitat, migration, and nesting guilds with a stretched color scheme applied

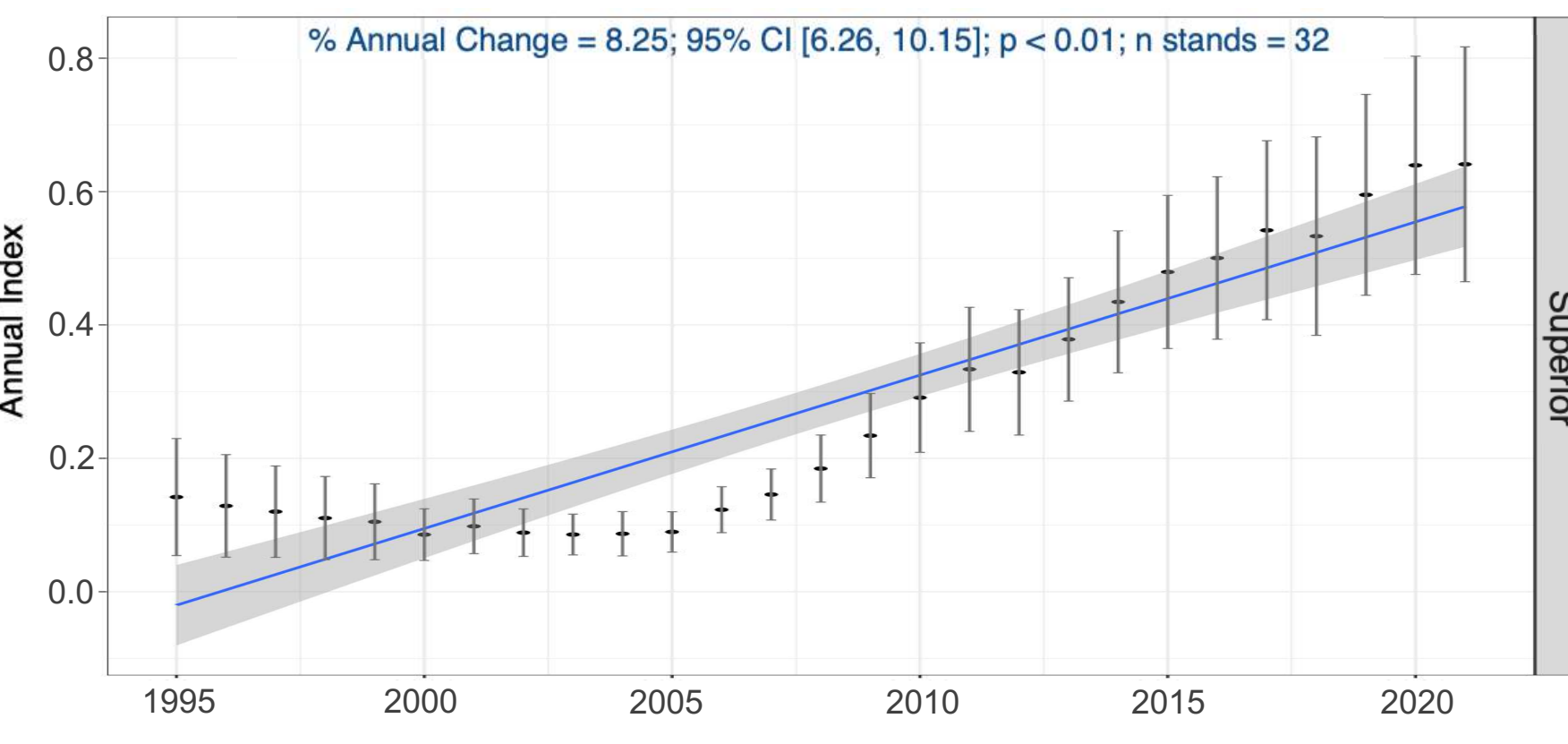
Species of Interest



Connecticut Warbler has shown one of the most consistent declines of any species in the monitoring program. The species is most common in mature, lowland coniferous forest comprised of widely scattered black spruce and tamarack trees. In 2021, only one individual was detected during surveys.



Canada Warbler is a species of conservation concern that has shown increasing population trends. This increase is suspected to be associated with a combination of thinning, wind, and insect disturbances that have occurred in some stands.



Tennessee Warbler are considered spruce budworm specialists. Recent population increases in this species are likely an indicator of local spruce budworm outbreaks that have been occurring in and around Superior NF since 2010.

Discussion

- While overall trend results indicate that the majority of breeding bird species analyzed have either stable or increasing trends, the consistent declines in several species and species guilds are concerning.
- Lowland conifer specialists, aerial insectivores, and species that require old growth forest continue to significantly decline across the National Forests.
- Recent and future changes to the forested regions of Minnesota will have significant impacts on forest bird populations.
- There are ample opportunities to use forest management to conserve and improve breeding forest bird habitats to ensure the long-term conservation of Minnesota's biodiversity.



Chippewa National Forest
Superior National Forest