

# Three Billion Birds Lost, and what to do about it



Jackie Augustine  
Executive Director



# Outline

What we have lost

How do we know

What is causing the decline

Reason to Hope

What AOK is doing to help

What you can do to help



# What we have lost

303 of 529 species have declined (57%)

<https://www.3billionbirds.org/>

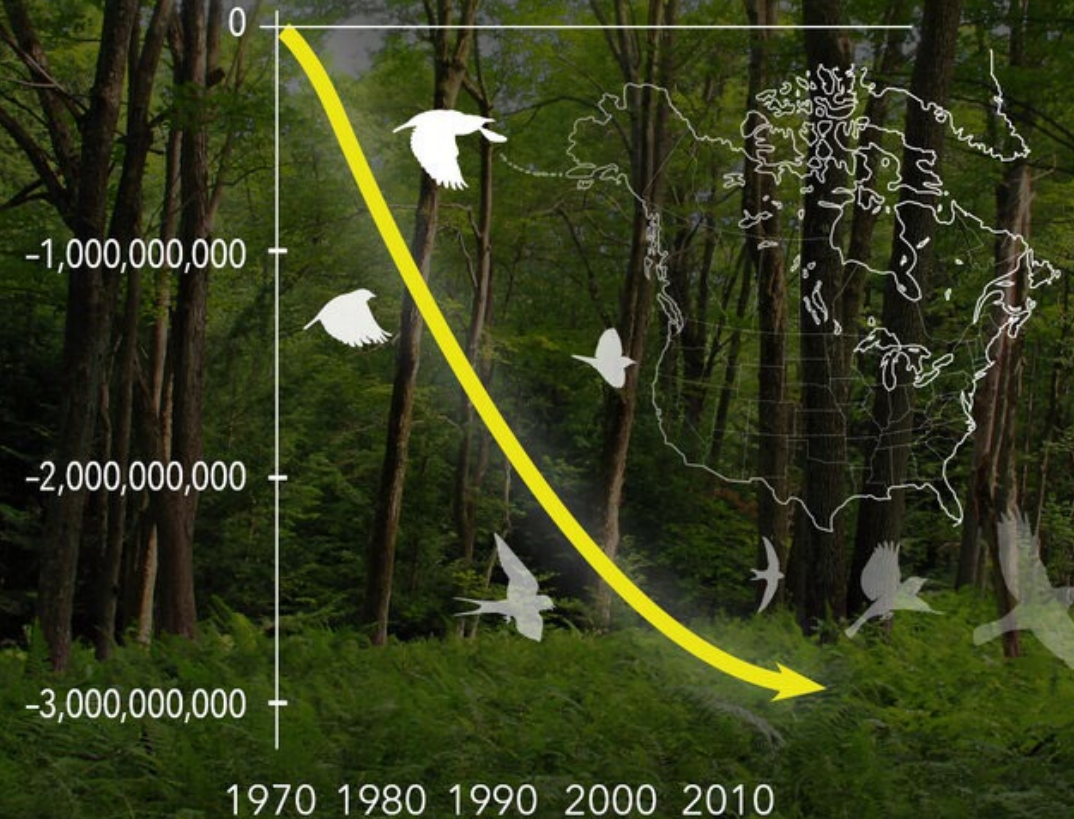


# What we have lost

<https://www.3billionbirds.org/>

# 2.9 billion

birds gone since 1970



# What we have lost

<https://www.3billionbirds.org/>

1 in 4  
Birds Gone  
Since 1970



# Eastern Forest Birds

170

MILLION

EASTERN FOREST BIRDS  
LOST SINCE 1970

-17%

POPULATION  
LOSS IN EASTERN  
FOREST BIRDS  
SINCE 1970



6 IN 10

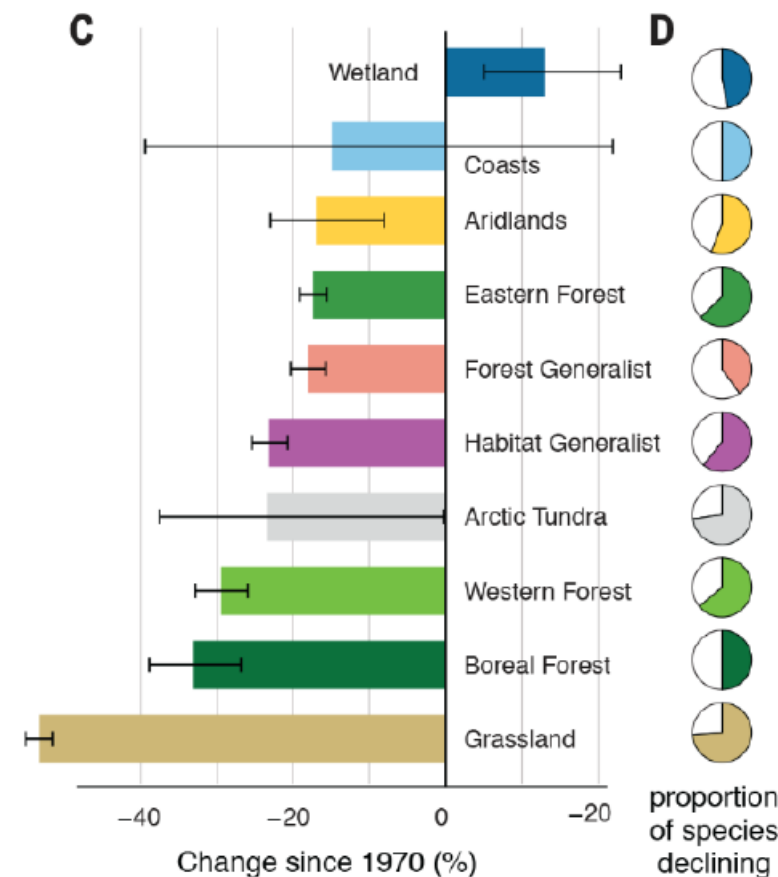
WOOD  
THRUSHES LOST  
SINCE 1970



Wood Thrush by Peter Kennerly; Macaulay Library; Eastern Forest by Nicholap Tenelli; Creative Commons



# Decline in Forest Birds



# Migratory Birds

**2.5**  
**BILLION**  
**MIGRATORY BIRDS**  
**LOST SINCE 1970**

**2 IN 5**  
**BALTIMORE ORIOLES**  
**LOST SINCE 1970**



Baltimore Oriole by Gary Muehlenberger, Oriole by Nicholas Tenaglia, Creative Commons

**-28%**  
**POPULATION LOSS**  
**IN MIGRATORY**  
**BIRD SPECIES**  
**SINCE 1970**

Courtesy of the Cornell Lab of Ornithology. Source: Science, 2019

## Migratory Birds need our help

**419 of 529 species**  
**are migratory**  
**(80%)**

<https://www.3billionbirds.org/>

# Aerial Insectivores

**160**  
MILLION  
AERIAL INSECTIVORES  
BIRDS LOST  
SINCE 1970

**-32%**  
POPULATION  
LOSS IN AERIAL  
INSECTIVORES  
SINCE 1970



**2 IN 5**

BARN SWALLOWS  
LOST SINCE 1970



**Aerial  
Insectivores  
need our help**

Barn Swallow by Chris Rehner / Macaulay Library, Western Kansas River by Bob Wick/Bureau of Land Management



# Grassland Birds

**720**  
MILLION  
GRASSLAND BIRDS  
LOST SINCE 1970

**-53%**  
POPULATION LOSS  
IN GRASSLAND  
BIRDS SINCE 1970

**3 IN 4**  
EASTERN MEADOWLARKS  
LOST SINCE 1970



Eastern Meadowlark by S. Queen/Macaulay Library, Prairie Grasslands by Joshua Mayer/Creative Commons

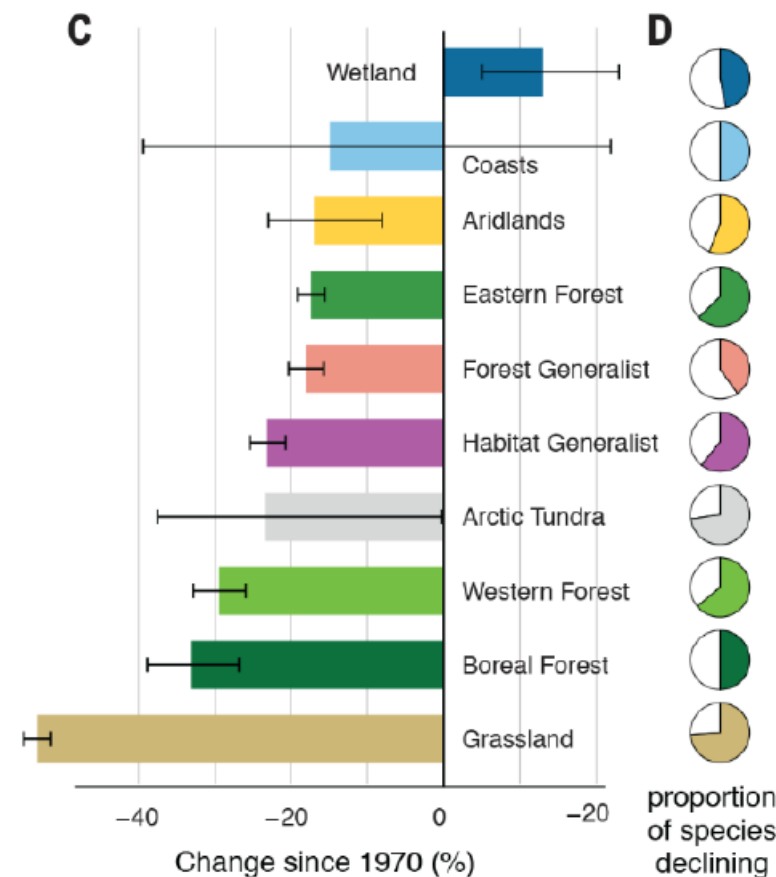
<https://www.3billionbirds.org/>

Courtesy of the Cornell Lab of Ornithology. Source: Science, 2019



# Grassland Birds need our help

74% of  
species  
declined





# 90% of the loss from only 12 families

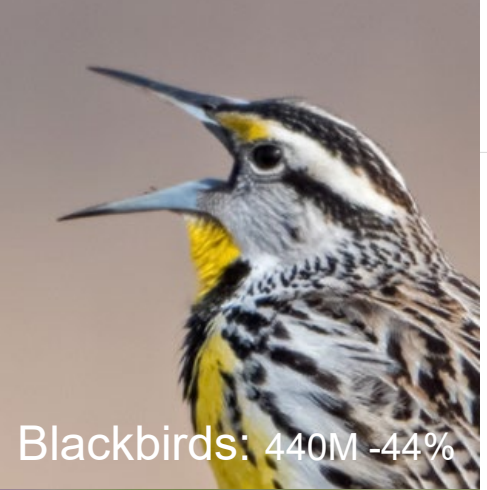
## 38 of 67 families declined



Sparrows: 862M -38%



Warblers: 617M -38%



Blackbirds: 440M -44%



Old World Sparrows:  
331M -81%



Larks: 182M -67%



Finches: 145M -37%



Swallows  
61M -22%



Nightjars  
39M -55%



Longspurs  
39M -31%



Flycatchers  
88M -20%



Starlings: 83M -49%



Thrashers: 78M -10%

<https://www.3billionbirds.org/>

Photos:  
David Rintoul  
American Bird Conservancy  
Cornell Lab of Ornithology

How do we know?



# How do we know?

Species categorized into 4 categories

**366 species were Landbirds** are birds occupying terrestrial habitats and a few species from primarily terrestrial bird families that use wetland habitats (e.g., Marsh Wren, *Cistothorus palustris*)

**45 species were Shorebirds** including all sandpipers, plovers, stilts, avocets, and oystercatchers

**42 species were Waterfowl** including all ducks, geese, and swans

**77 species were Waterbirds** including colonial-nesting seabirds, herons, beach-nesting species and secretive marshbirds

Also assigned breeding and non-breeding habitat

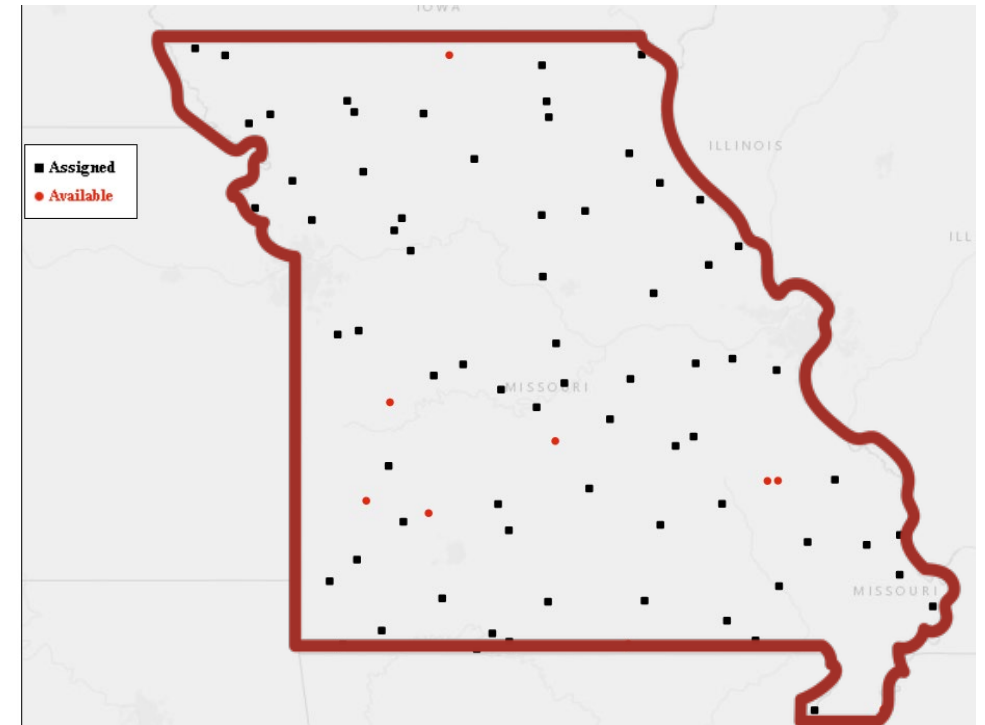
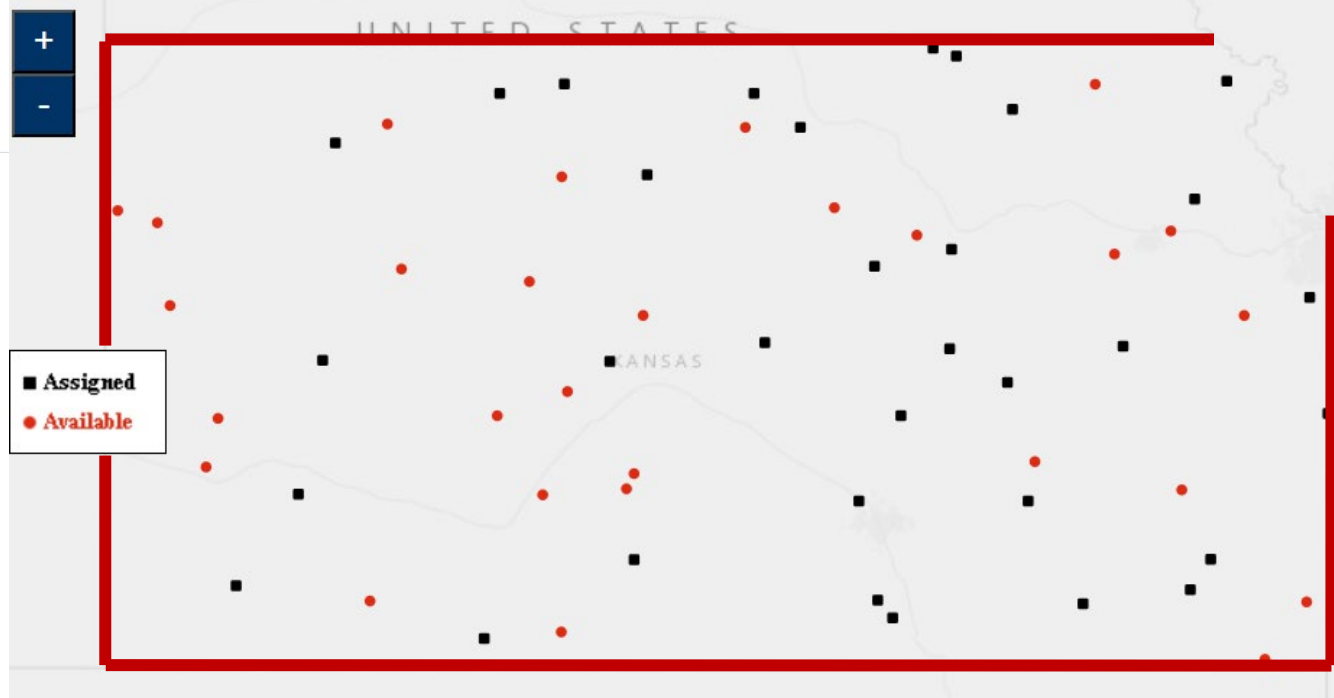
# How do we know?

## Examined 529 species

- 76% of all species that regularly breed in the US and Canada
- 95-99% total breeding abundance

## Trend Data from the

- Breeding Bird Survey  
82% of 529 species considered



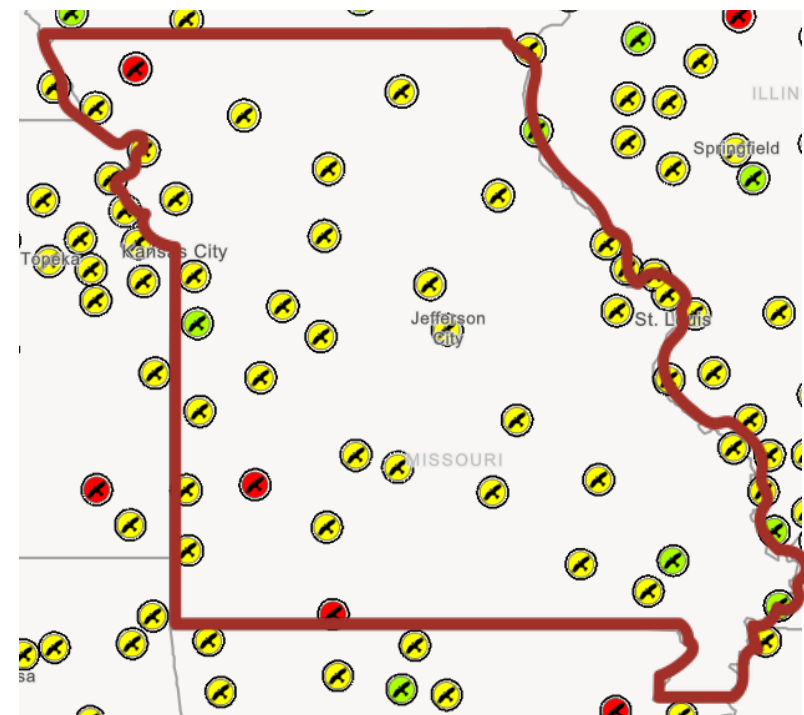
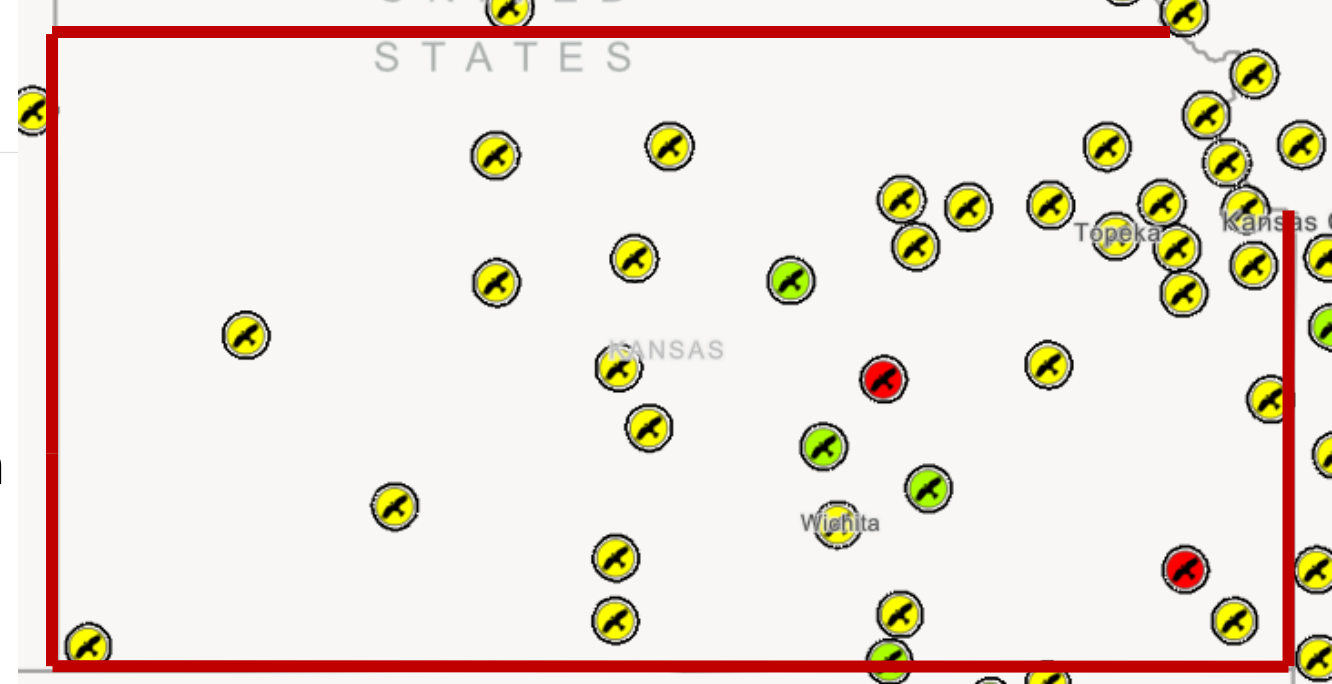
# How do we know?

## Examined 529 species

- 76% of all species that regularly breed in the US and Canada
- 95-99% total breeding abundance

## Trend Data from the

- Breeding Bird Survey
  - 82% of 529 species considered
- Christmas Bird Count
  - 58 species in winter
- 20 species of long-distance migrant shorebirds came from International Shorebird Survey



# How do we know?

## Population Size Data

**344 landbird species from Partners in Flight**

**12 waterfowl species from the 2017 USFWS Waterfowl Status Report**

**14 waterfowl species from the 2007 Seaduck Joint Venture Report**

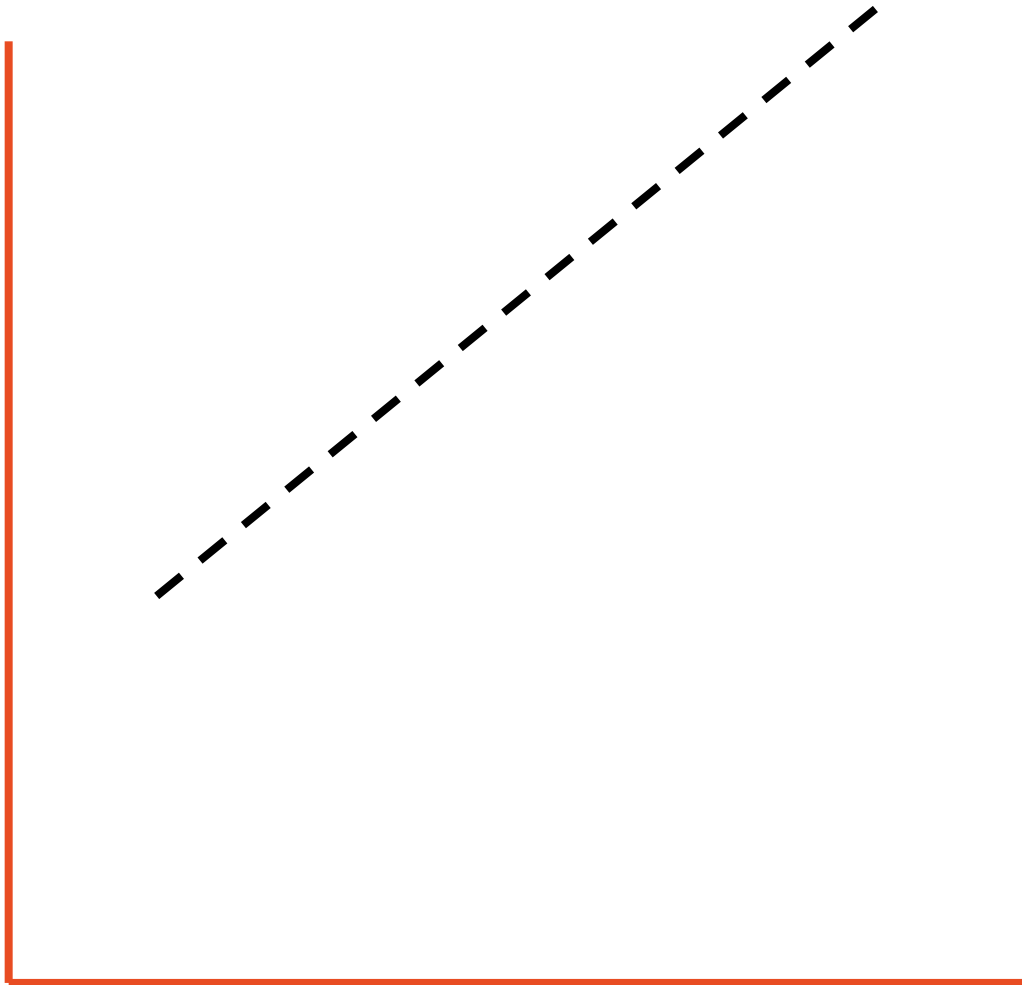
**45 shorebird species from the Shorebird Flyway Population Database**

**33 species from Birds of North America accounts**

**7 goose species from Conservation of Arctic Flora and Fauna**

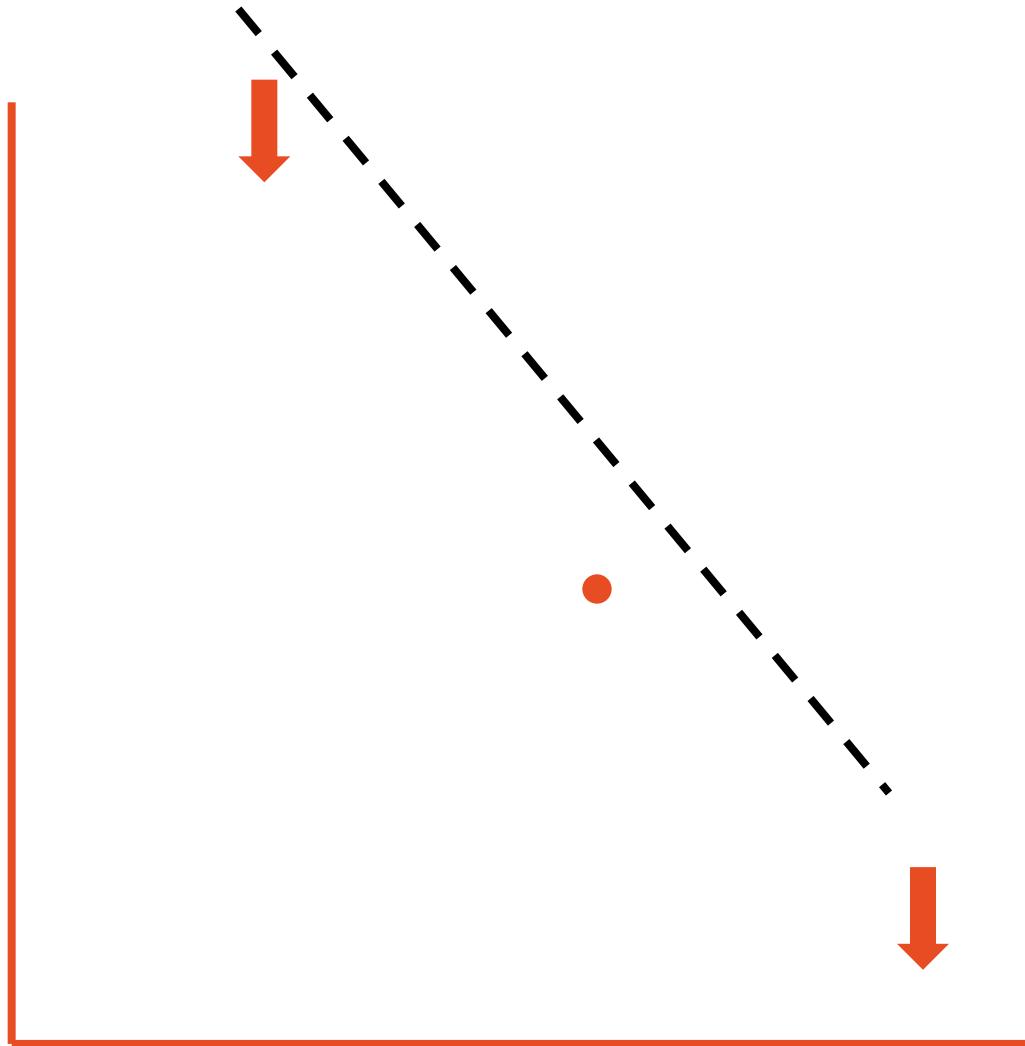
**17 landbirds from the Avian Conservation Assessment Database**

# How do we know?





# How do we know?



# How do we know?

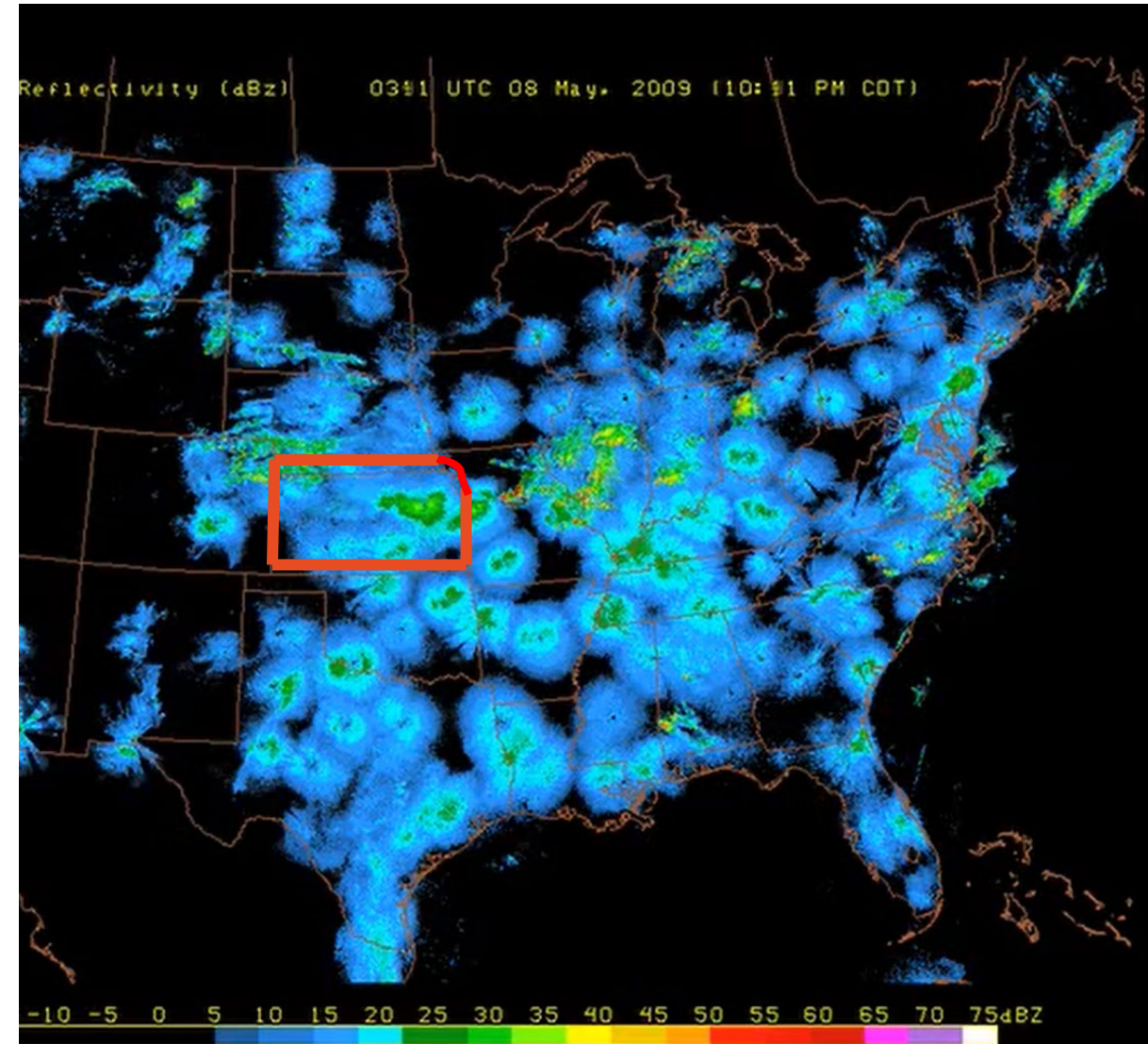
Migrating birds detected with NEXRAD Radar

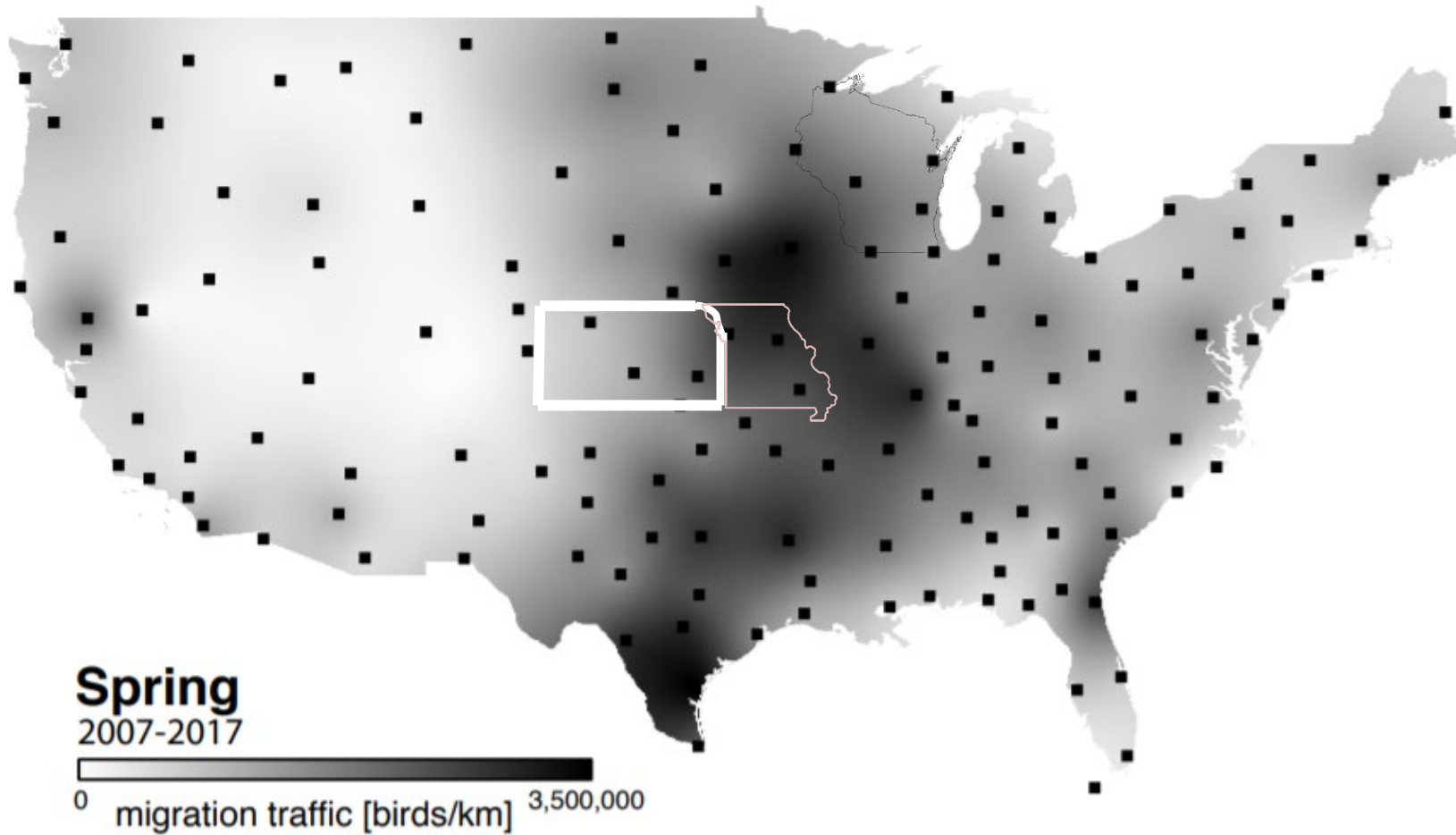
amount, speeds, and directions of birds aloft as a function of altitude

1 March – 1 July because fewer insects in the atmosphere

<https://www.smithsonianmag.com/smart-news/how-doppler-radar-can-track-bird-migrations-180952834/>

Birdcast.info





**Fig. S6.** Cumulated nocturnal migration traffic (biomass passage) MT in spring (1 Mar – 1 Jul) averaged over 11 seasons (2007-2017). Darker colors indicate more migratory biomass passage MT. Values give the numbers of birds passing per 1 km transect perpendicular to the migratory direction per spring season. Radar reflectivity was converted to bird numbers under the assumption of a constant radar cross section of 11 cm<sup>2</sup> per bird. Ordinary kriging was used to interpolate between radar stations. Dots indicate locations of radar station sites.



# What is causing the decline

**Habitat loss**

YELLOW-THROATED VIREO

1-4 billion birds die from  
free-roaming cats *annually*



## What is causing the decline

Habitat loss

**Free-roaming cats**

Photo from (c) Vishnevskiy Vasily/Shutterstock  
Data from Loss et al. 2013 Nature Communications 4:1396

~600 million birds die from collisions

- (range 365-988 million birds)
- 44% at residences

## What is causing the decline

Habitat loss

Free-roaming cats

**Collisions with glass**



Photo from <https://www.bigbendnature.com/2011/05/>  
Data from Loss et al. 2014 Condor 116:8-23

# What is causing the decline

Habitat loss

Free-roaming cats

Collisions with glass

**Toxic pesticides – insect declines**

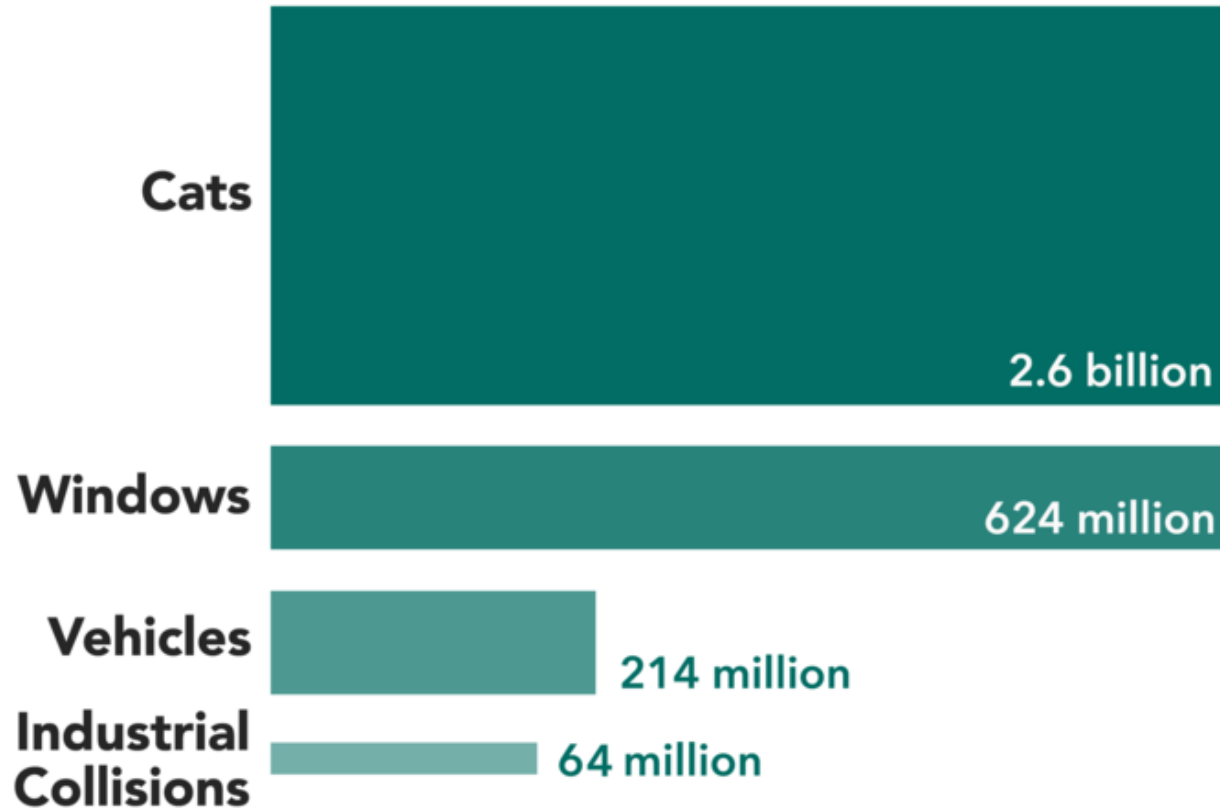
**Climate Change**



Photo from  
<https://www.niehs.nih.gov/health/topics/agents/pesticides/>

## What's Killing North America's Birds?

Per-year estimates of mortality. Source: Loss et al. 2015



## What is causing the decline

Habitat loss

Free-roaming cats

Collisions with glass

Toxic pesticides – insect declines

Climate Change



Reason to Hope...



Reason to Hope...

**Woodpeckers**

**+14  
MILLION**

**WOODPECKERS  
GAINED SINCE 1970**

**THANKS TO CONSERVATION EFFORTS**



Reason to Hope...

Woodpeckers

**Raptors**



**+15  
MILLION**

**RAPTORS  
GAINED  
SINCE 1970**

**THANKS TO  
CONSERVATION  
EFFORTS**

Reason to Hope...

Woodpeckers

Raptors

**Waterfowl**

**+35  
MILLION**

**WATERFOWL  
GAINED  
SINCE 1970  
THANKS TO  
CONSERVATION  
EFFORTS**



# What AOK is doing to help



## Audubon of Kansas' 3-Fold Mission

### Advocacy

Advancing environmentally-conscious legislation

- Supporting wetland conservation
- Encouraging proper energy siting
- Supporting initiatives to conserve declining species



Photo by Barry Jones

# What AOK is doing to help



## Audubon of Kansas' 3-Fold Mission

### Advocacy

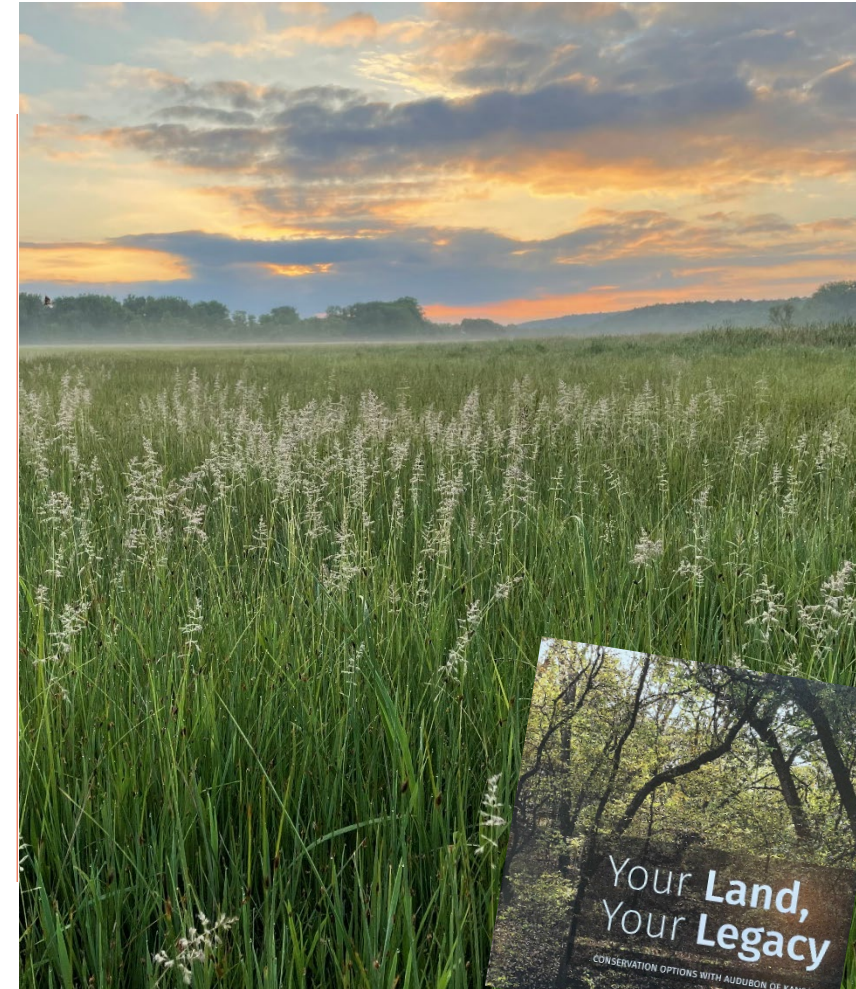
Advancing environmentally-conscious legislation

- Supporting wetland conservation
- Encouraging proper energy siting
- Supporting initiatives to conserve declining species

### Conservation

Demonstrating conservation practices through our sanctuary program

- Hutton Niobrara Ranch Wildlife Sanctuary
- Achterberg Wildlife-Friendly Demonstration Farm
- Mount Mitchell Heritage Prairie Park



# What AOK is doing to help



## Audubon of Kansas' 3-Fold Mission

### Advocacy

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- Mount Mitchell Heritage Prairie Park

### Education

People will not protect what they don't know

- Prairie Wings*
- Celebration of Cranes
- Lek Treks Prairie-Chicken Festival
- Nature Adventurepack



# What you can do

Create Habitat





# What you can do

Create Habitat

**Keep cats indoors**



<https://www.birdsbesafe.com/blogs/news/birdsbesafe-products-shown-to-be-highly-effective-in-science-study-in-scotland>

# What you can do

Create Habitat

Keep cats indoors

**Make windows safer**



# What you can do

Create Habitat

Keep cats indoors

Make windows safer

**Plant native plants**

96% of land birds feed insects to their chicks



Photo by Christopher Ciccone

NEW YORK TIMES BESTSELLER

# NATURE'S BESTHOPE

A New Approach  
to Conservation That  
Starts in Your Yard

DOUGLAS W. TALLAMY  
Author of *Bringing Nature Home*

"If you have a backyard, this book is for you."  
—Richard Louv, author of *Last Child in the Woods*

# Bringing Nature Home

UPDATED AND EXPANDED


How You Can  
Sustain Wildlife  
with Native Plants

Douglas W. Tallamy  
With a Foreword by Rick Darke

**“PEST-FREE”!**

Oaks: 557 species of caterpillars

Ginkgo: 5 species of caterpillars

A close-up photograph of a bird's nest. The nest is constructed from a dense layer of dry, brown straw and twigs. In the center, there are four white eggs with prominent reddish-brown spots. In the foreground, a single, fluffy, reddish-brown nestling is visible, its head turned towards the right. The nestling has a dark, patterned patch on its back and a yellowish beak.

Nestling  
chickadees eat  
390-570  
caterpillars per  
day, or...

...over 9,000  
caterpillars until  
they fledge

# What you can do

Create Habitat

Keep cats indoors

Make windows safer

Plant native plants

**Leave the leaves**



Photo by Schizoform (Creative Commons)

A close-up photograph showing numerous moth caterpillar pupae. The pupae are elongated, segmented, and have a glossy, reddish-brown to orange-brown color. They are arranged on a light-colored, textured fabric surface. Some pupae show signs of being recently hatched, with small white particles or debris on their bodies.

94% of moth caterpillars pupate in the ground or in leaf litter

# What you can do

Create Habitat

Keep cats indoors

Make windows safer

Plant native plants

Leave the leaves

**Reduce herbicides and pesticides**





# What you can do

Create Habitat

Keep cats indoors

Make windows safer

Plant native plants

Leave the leaves

Reduce herbicides and pesticides

**Be an advocate for wildlife**

ENDANGERED SPECIES ACT





# What you can do

- Get involved
- Share information
- Get others involved



Never underestimate the power of a small group of committed people to change the world. In fact, it is the only thing that ever has!"  
**-Margaret Mead**



**Jackie Augustine**

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785-537-4385

**Audubon of Kansas:**

**Advocacy – Conservation – Education**

<http://audubonofkansas.org>

Scan the code with your cell phone's camera to sign up for our free email newsletters!



**3 billion birds lost**

<https://www.3billionbirds.org/>

**Photos from Dave Rintoul**

<https://drintoul.myportfolio.com/>

Rosenberg, KV et al. 2019 Decline of the North American avifauna. Science 10.1126/science.aaw1313  
Loss, SR, T Will, PP Marra 2015 Direct Mortality of Birds from Anthropogenic Causes. Annual Review of Ecology, Evolution, and Systematics 46:99-120

# Boreal Forest Birds

**500**

**MILLION**

**BOREAL FOREST BIRDS**

LOST SINCE 1970

**-33%**

**POPULATION LOSS  
IN BOREAL FOREST  
BIRDS SINCE 1970**

**9 IN 10**

**EVENING GROSBEAKS  
LOST SINCE 1970**



Evening Grosbeak by Yves Doreau/Macaulay Library/Boreal Project/CC BY/UT/Science Commons

**18 species each  
lost >10 million  
birds**

**Table S2.**

Net change in abundance across North American bird families, 1970-2017. Taxonomy and common names of families follow (*100*); families listed in order of greatest decline. Net change in abundance expressed in millions of breeding individuals, with upper and lower 90% credible intervals (CI) shown. Percentage of species in each group with negative trend trajectories also noted.

Family	Common Name	N Spp	Net Abundance Change (Millions) & 90% CI			Percent Change & 90% CIs			% Spp in Decline
			Change	UC90	LC90	Change	LC90	UC90	
Passerellidae	New World Sparrows	38	-862.0	-925.7	-798.6	-38.0%	-40.1%	-35.8%	87%
Parulidae	New World Warblers	44	-617.5	-737.8	-509.0	-37.6%	-42.0%	-33.0%	64%
Icteridae	New World Blackbirds	18	-439.8	-467.8	-412.4	-44.2%	-45.9%	-42.4%	83%
Passeridae	Old World Sparrows	2	-331.0	-374.6	-290.2	-81.1%	-82.7%	-79.4%	50%
Alaudidae	Larks	1	-182.0	-207.2	-157.8	-67.4%	-70.9%	-63.7%	100%
Fringillidae	Finches and Allies	13	-144.6	-189.2	-91.9	-36.7%	-45.9%	-23.8%	62%
Tyrannidae	Tyrant Flycatchers	26	-88.2	-107.3	-69.5	-20.1%	-23.7%	-16.2%	50%
Sturnidae	Starlings	1	-83.2	-94.7	-72.6	-49.3%	-52.4%	-46.0%	100%
Turdidae	Thrushes	11	-77.6	-114.2	-38.1	-10.1%	-14.6%	-5.0%	55%
Hirundinidae	Swallows	8	-60.8	-86.7	-31.4	-22.1%	-30.1%	-11.9%	75%
Caprimulgidae	Nightjars	5	-39.3	-44.0	-34.9	-55.0%	-58.0%	-51.5%	60%
Calcariidae	Longspurs	5	-39.3	-79.0	34.3	-31.2%	-60.5%	26.8%	80%
Odontophoridae	New World Quail	5	-21.1	-32.6	-10.0	-51.6%	-61.2%	-35.7%	80%
Laridae	Gulls, Terns	22	-20.1	-27.6	-13.3	-50.5%	-58.4%	-39.9%	73%
Apodidae	Swifts	4	-19.2	-21.4	-17.1	-65.3%	-68.1%	-61.6%	100%



Family	Common Name	N Spp	Net Abundance Change (Millions) & 90% CI			Percent Change & 90% CIs			% Spp in Decline
			Change	UC90	LC90	Change	LC90	UC90	
Trochilidae	Hummingbirds	8	-18.9	-36.0	-2.2	-17.0%	-27.7%	-2.6%	63%
Mimidae	Thrashers and Allies	10	-18.3	-22.1	-14.6	-19.4%	-22.9%	-16.0%	80%
Regulidae	Kinglets	2	-17.9	-47.6	12.1	-7.1%	-17.7%	5.0%	50%
Scolopacidae	Sandpipers	32	-15.4	-19.9	-11.1	-38.4%	-46.7%	-28.6%	72%
Cardinalidae	Cardinals and Allies	14	-10.8	-20.6	-1.0	-3.3%	-6.3%	-0.3%	43%
Laniidae	Shrikes	2	-10.3	-11.6	-9.0	-69.0%	-72.2%	-65.7%	100%
Cuculidae	Cuckoos	4	-8.9	-10.5	-7.4	-47.9%	-53.6%	-41.5%	75%
Motacillidae	Pipits, Wagtails	2	-8.1	-12.7	-2.4	-29.0%	-44.0%	-8.6%	100%
Corvidae	Jays, Crows	16	-6.6	-11.8	-1.2	-6.5%	-11.4%	-1.1%	69%
Phylloscopidae	Leaf Warblers	1	-6.4	-16.3	0.7	-50.4%	-76.8%	5.6%	100%
Paridae	Tits, Chickadees	10	-5.3	-11.4	0.8	-4.9%	-10.2%	0.7%	70%
Alcidae	Auks	11	-4.6	-16.8	9.0	-15.9%	-45.8%	33.4%	45%
Icteriidae	Yellow-breasted Chat	1	-3.9	-5.4	-2.5	-21.2%	-28.0%	-13.9%	100%
Ardeidae	Herons	12	-3.4	-4.4	-2.4	-28.0%	-34.1%	-21.2%	58%
Remizidae	Penduline-Tits	1	-2.6	-4.0	-1.4	-42.0%	-53.2%	-28.0%	100%
Charadriidae	Plovers	8	-1.9	-3.1	-0.9	-38.6%	-47.4%	-32.0%	88%

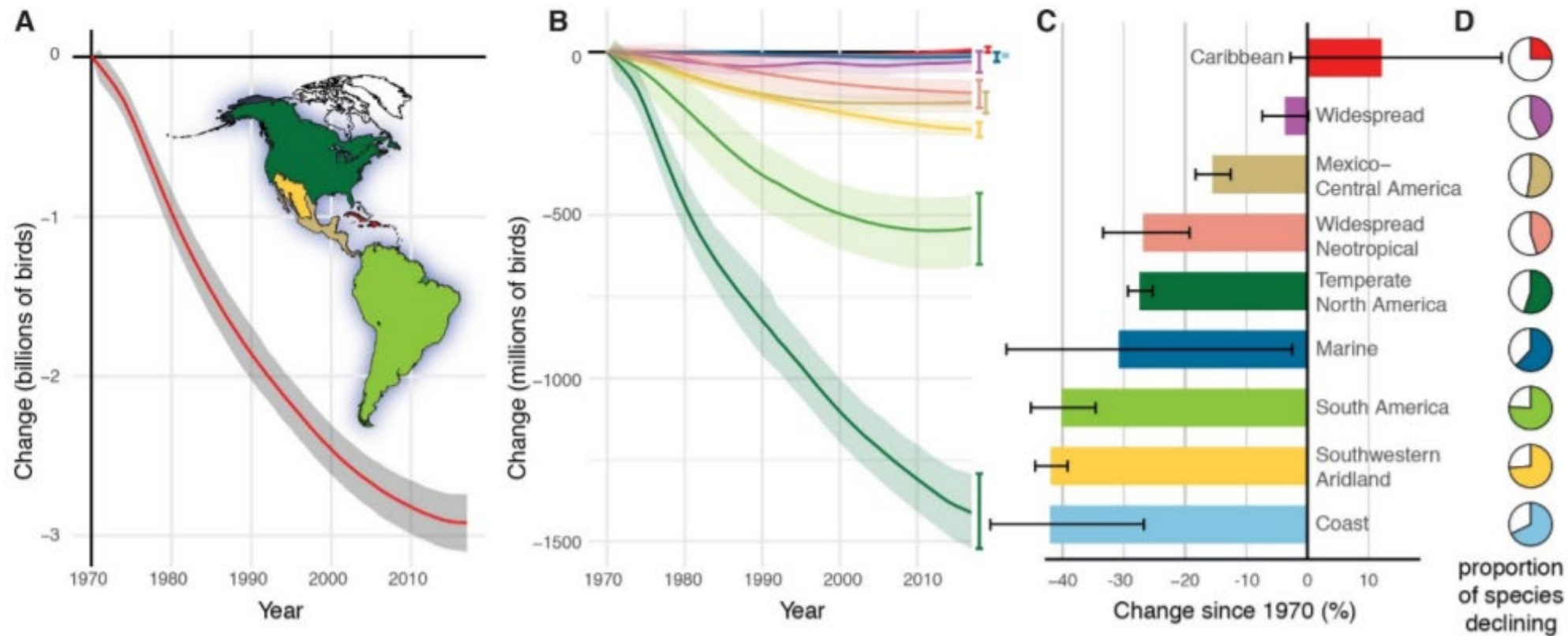


Family	Common Name	N Spp	Net Abundance Change (Millions) & 90% CI			Percent Change & 90% CIs			% Spp in Decline
			Change	UC90	LC90	Change	LC90	UC90	
Alcedinidae	Kingfishers	1	-1.6	-1.9	-1.3	-47.8%	-51.5%	-44.0%	100%
Procellariidae	Petrels	1	-1.0	-3.8	3.7	-33.8%	-79.3%	104.4%	100%
Aegithalidae	Long-tailed Tits	1	-0.9	-1.4	-0.3	-28.4%	-42.5%	-10.7%	100%
Podicipedidae	Grebes	6	-0.7	-2.6	1.9	-10.9%	-35.8%	35.7%	50%
Sylviidae	Sylviid Warblers	1	-0.6	-1.1	-0.3	-27.7%	-38.0%	-15.4%	100%
Cinclidae	Dippers	1	-0.03	-0.05	0.00	-15.5%	-27.2%	-2.0%	100%
Aramidae	Limpkin	1	0.00	-0.02	0.02	-15.0%	-62.1%	89.0%	100%
Ciconiidae	Storks	1	0.01	0.00	0.02	77.6%	18.3%	166.9%	0%
Haematopodidae	Oystercatchers	2	0.01	0.01	0.02	123.7%	59.5%	218.0%	0%
Falconidae	Falcons, Caracaras	6	0.03	-0.49	0.63	0.5%	-9.3%	12.6%	33%
Anhingidae	Anhingas	1	0.03	0.02	0.04	109.1%	66.3%	164.5%	0%
Psittacidae	Parrots	1	0.1	0.0	0.3	>1000%	>1000%	>1000%	0%
Tytonidae	Barn Owls	1	0.1	0.1	0.2	211.6%	132.6%	317.8%	0%
Recurvirostridae	Avocets, Stilts	2	0.2	0.0	0.5	57.5%	16.2%	174.6%	0%
Ptiliogonatidae	Silky Flycatchers	1	0.3	0.0	0.7	26.4%	-3.8%	65.2%	0%
Sulidae	Boobies	1	0.4	0.2	0.7	988.6%	497.0%	1891.7%	0%
Gaviidae	Loons	3	0.4	0.1	0.8	32.6%	11.7%	60.7%	33%
Pandionidae	Osprey	1	0.4	0.3	0.5	304.4%	248.4%	370.3%	0%
Rallidae	Rails, Coots	7	0.6	-1.9	4.2	6.2%	-18.1%	40.5%	57%
Gruidae	Cranes	1	0.7	0.5	0.9	914.5%	743.0%	1119.1%	0%
Pelecanidae	Pelicans	2	0.7	0.5	1.2	810.4%	534.6%	1214.2%	0%





Family	Common Name	N Spp	Net Abundance Change (Millions) & 90% CI			Percent Change & 90% CIs			% Spp in Decline
			Change	UC90	LC90	Change	LC90	UC90	
Phalacrocoracidae	Cormorants	4	0.8	0.4	1.3	152.3%	73.1%	267.3%	50%
Strigidae	Owls	11	1.7	0.5	3.4	15.9%	4.6%	30.1%	64%
Certhiidae	Treecreepers	1	2.5	1.5	3.7	33.6%	20.8%	47.9%	0%
Threskiornithidae	Ibises, Spoonbills	4	2.9	1.4	6.3	332.8%	167.3%	639.4%	0%
Columbidae	Doves, Pigeons	7	3.6	-17.4	43.3	1.9%	-9.0%	23.1%	57%
Accipitridae	Hawks	16	5.5	5.0	6.0	78.9%	71.8%	86.4%	19%
Bombycillidae	Waxwings	2	8.0	2.1	14.6	13.8%	3.6%	25.0%	50%
Cathartidae	New World Vultures	2	9.4	8.3	10.6	265.3%	238.7%	293.6%	0%
Troglodytidae	Wrens	10	13.3	6.5	20.7	13.8%	6.8%	21.5%	40%
Picidae	Woodpeckers	21	13.6	10.2	17.2	18.5%	13.9%	23.4%	33%
Sittidae	Nuthatches	4	14.4	11.0	18.4	66.6%	50.5%	85.0%	50%
Phasianidae	Grouse and Allies	12	15.2	2.9	36.6	24.3%	4.5%	56.4%	33%
Poliioptilidae	Gnatcatchers	2	31.9	12.7	54.5	15.6%	6.2%	26.3%	0%
Anatidae	Waterfowl	42	34.8	24.5	48.3	56.1%	37.9%	79.5%	43%
Vireonidae	Vireos	12	89.9	78.6	102.1	53.6%	46.7%	60.7%	17%



**Fig. S1. Net population change in North American migratory birds grouped by non-breeding biome.** (A) By integrating breeding-season population trajectory and size estimates for 529 species (see Methods), we show the continental avifauna lost > 2.9 billion breeding birds since 1970. Gray shaded region represents  $\pm 95\%$  credible intervals around total estimated loss. Map shows color-coded non-breeding biomes based on primary overwinter distributions of each species (See Methods). (B) Net loss of abundance occurred across all major non-breeding biomes, except Caribbean (see Table 1). (C) Proportional population loss,  $\pm 95\%$  C.I. (D) Proportion of species declining in each biome.





# Audubon of Kansas' 3-Fold Mission

## Advocacy

Advancing environmentally-conscience legislation

- Supporting wetland conservation
- Encouraging proper wind energy siting
- Supporting initiatives to conserve declining species

## Conservation

Demonstrating conservation practices through our sanctuary program

- Hutton Niobrara Ranch Wildlife Sanctuary
- Achterberg Wildlife-Friendly Demonstration Farm
- Mt Mitchell Heritage Prairie

## Education

People will not protect what they don't know

- Celebration of Cranes
- Prairie-Chicken Festival
- Public Outreach