Migratory Bird Ecology and Management

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COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY
ESF
1911
STATE UNIVERSITY OF NEW YORK

Waterfowl & Wetlands @ ESF

Waterfowl and Wetlands at SUNY ESF: Courses We Teach

Ornithology – every Spring
Ecology and Management of Waterfowl – Fall every other year (odd years)
Wetlands Conservation and Management for Wildlife - Spring every other year (even years)
Wetlands Monitoring and Assessment – Field Course – Summer every other year (even years)

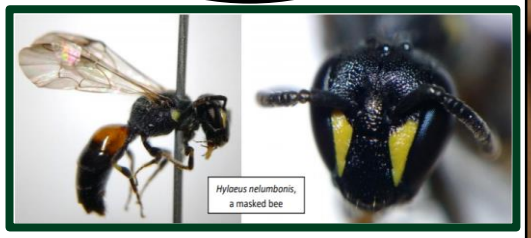
Ecology and Management of Waterfowl class – Fall 2021 at Northern Montezuma Wildlife Management Area

Waterfowl and Wetlands at SUNY ESF: Hands-on experiences

Unique field experiences

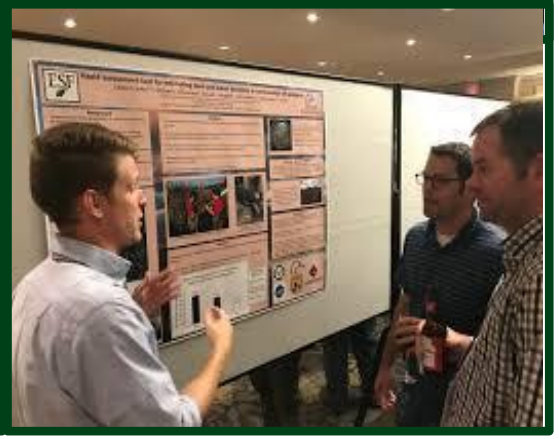
Waterfowl banding

Waterfowl and Wetlands at SUNY ESF: Honors, MS, MPS, PhD (not just ducks!)

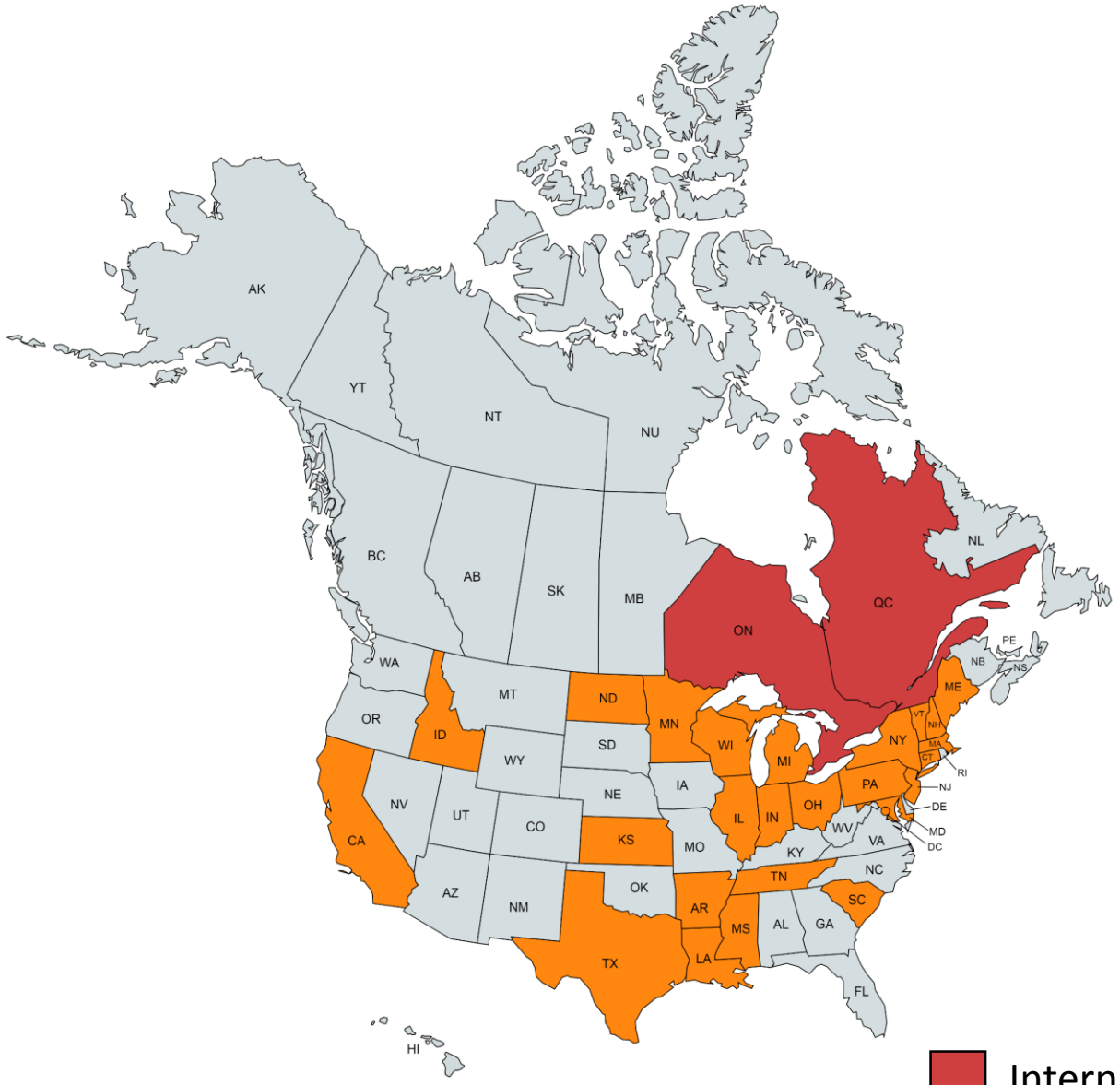


Adirondack Center for Loon Conservation

Waterfowl and Wetlands at SUNY ESF: Collaborations and Placement of Graduates



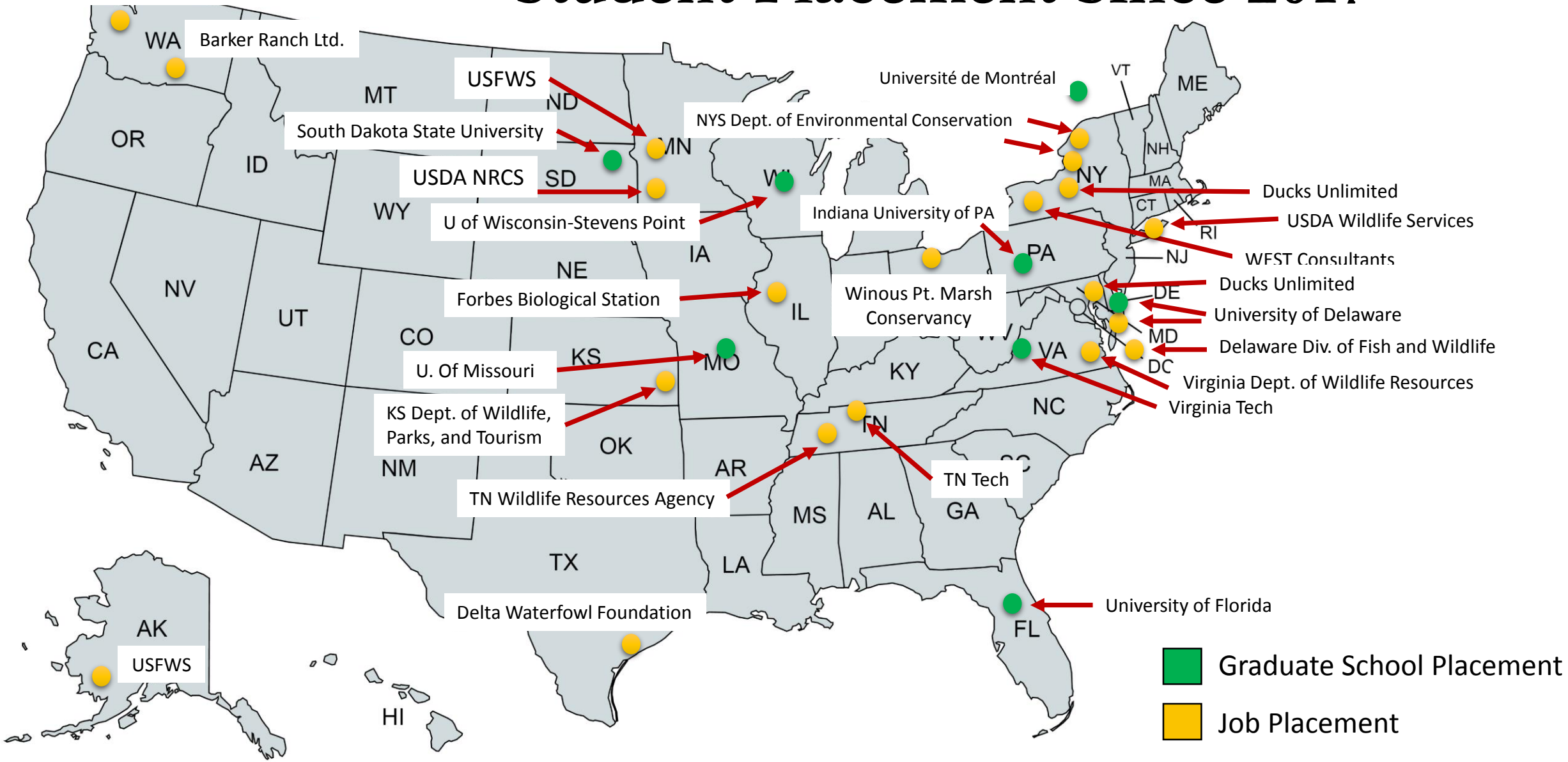
Where we work



International Collaborators

United States Collaborators

Waterfowl and Wetlands @ ESF
Student Placement Since 2017

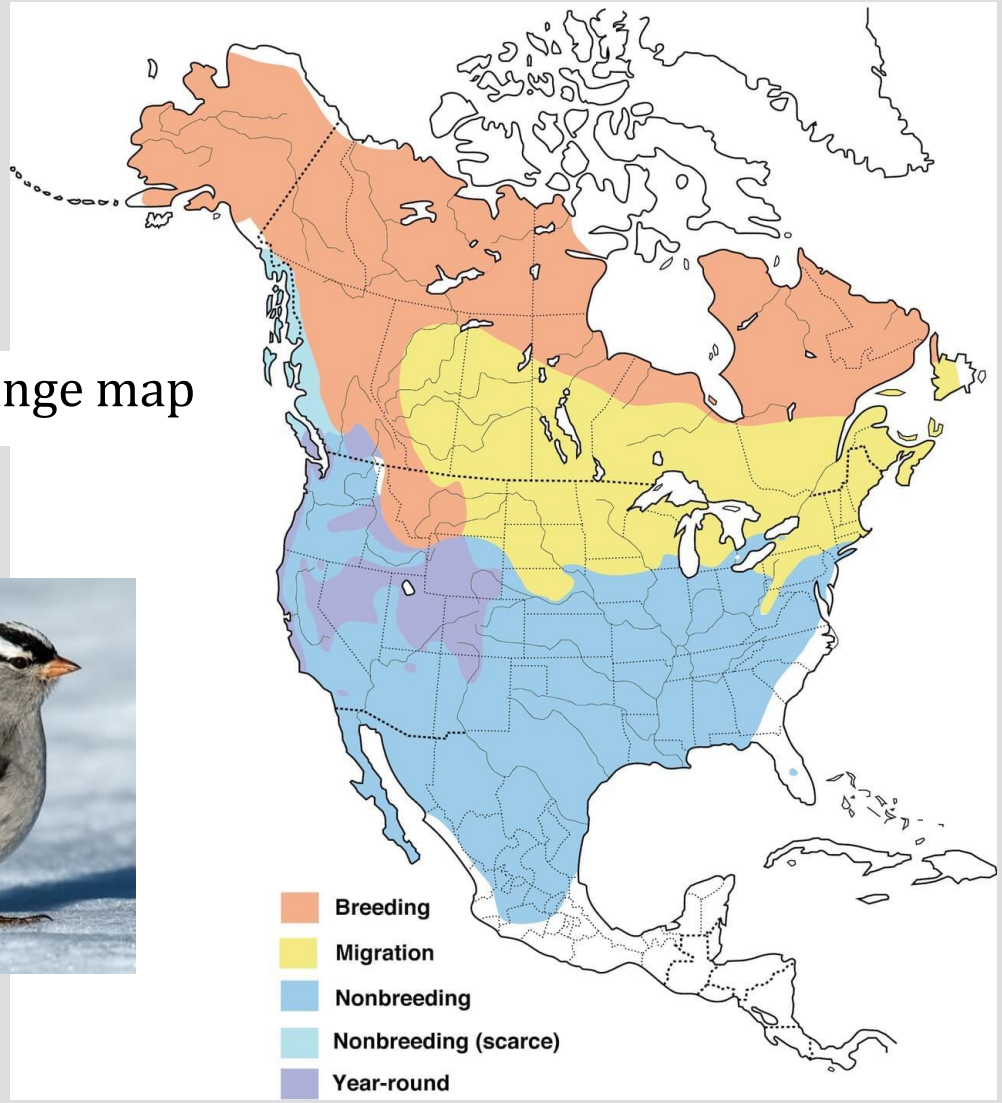


Migratory Bird Basics

Species migrate between breeding and non-breeding areas

Understanding habitat on breeding, migration, and non-breeding areas is vital to ensure their life history requirements are met

White-crowned sparrow range map



Migratory Bird Basics

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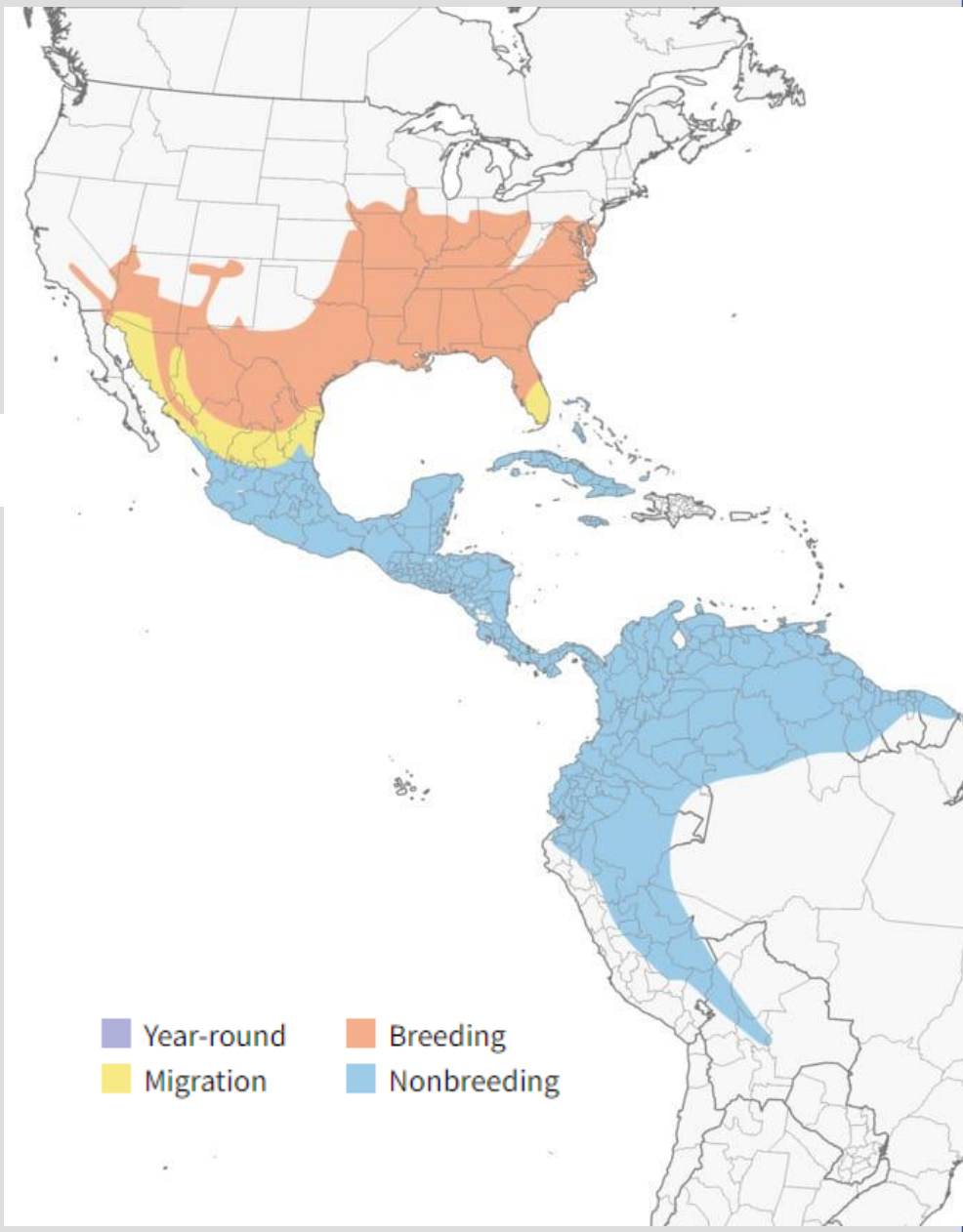
Understanding habitat on breeding, migration, and non-breeding areas is vital to ensure their life history requirements are met

Summer tanager range map



Migratory Bird Basics

Species migrate between breeding and non-breeding areas

Understanding habitat on breeding, migration, and non-breeding areas is vital to ensure their life history requirements are met

Some are harvested like the American wigeon – 600,000 per year in the U.S. alone

American wigeon range map

Migratory Bird Basics

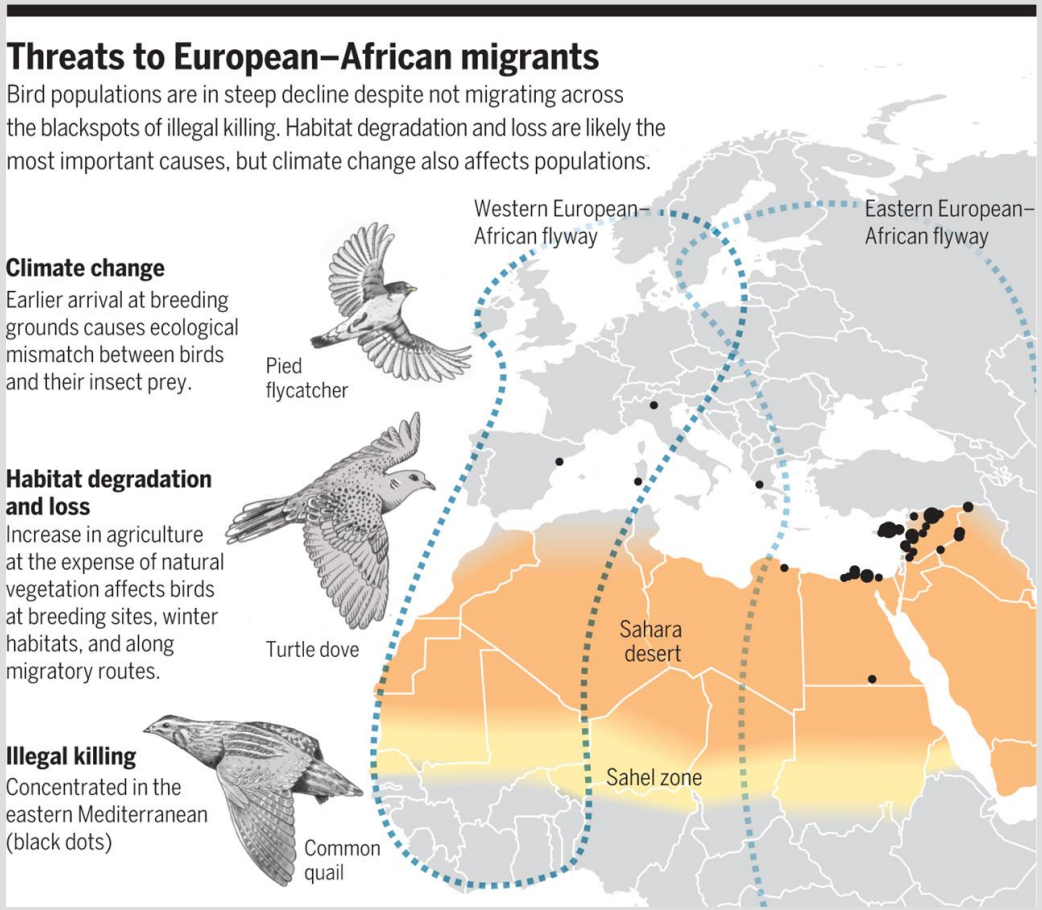
Species migrate between breeding and non-breeding areas

Understanding habitat on breeding, migration, and non-breeding areas is vital to ensure their life history requirements are met

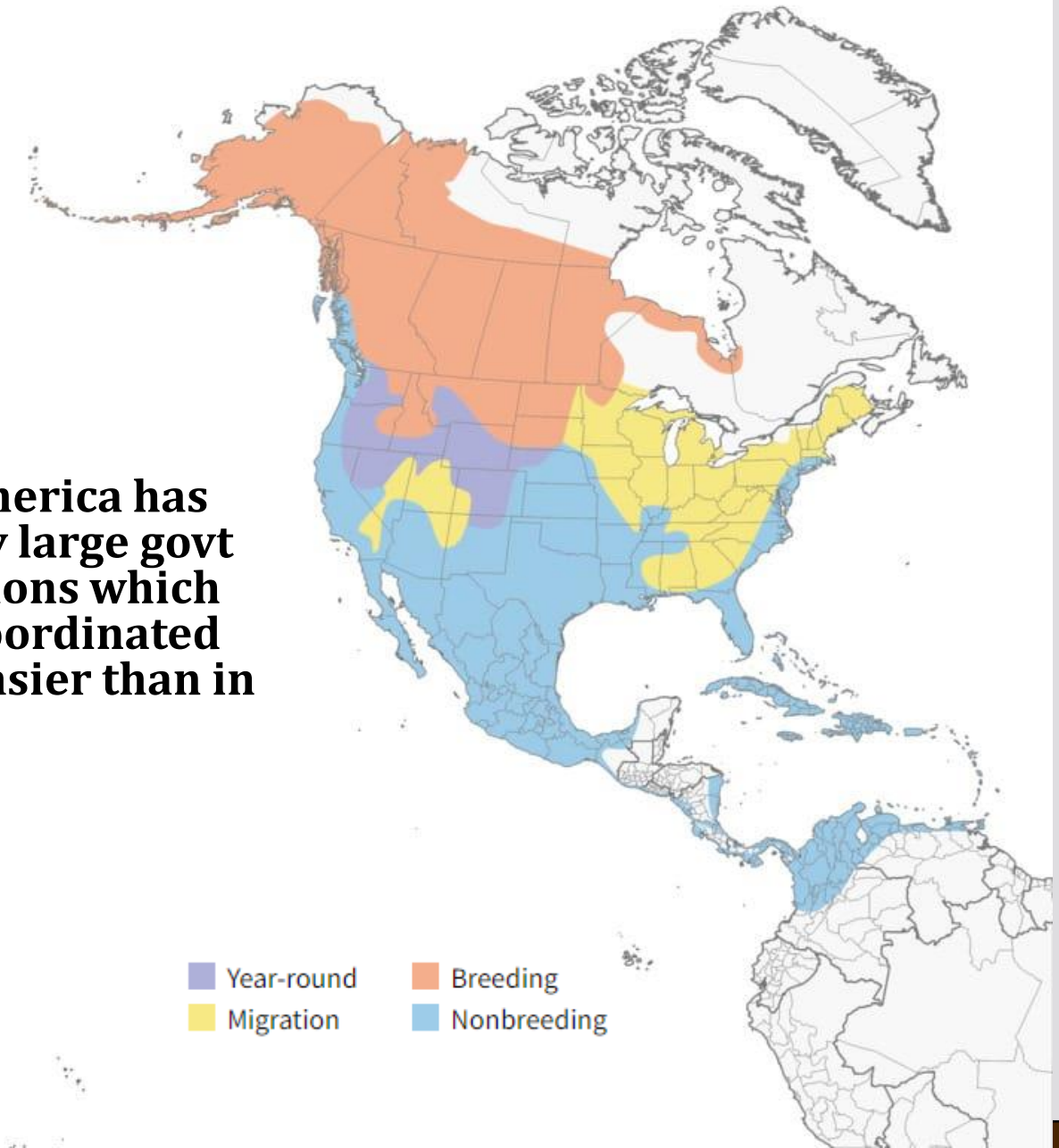
Mourning dove harvest about 11 – 9 million annually!

Mourning dove

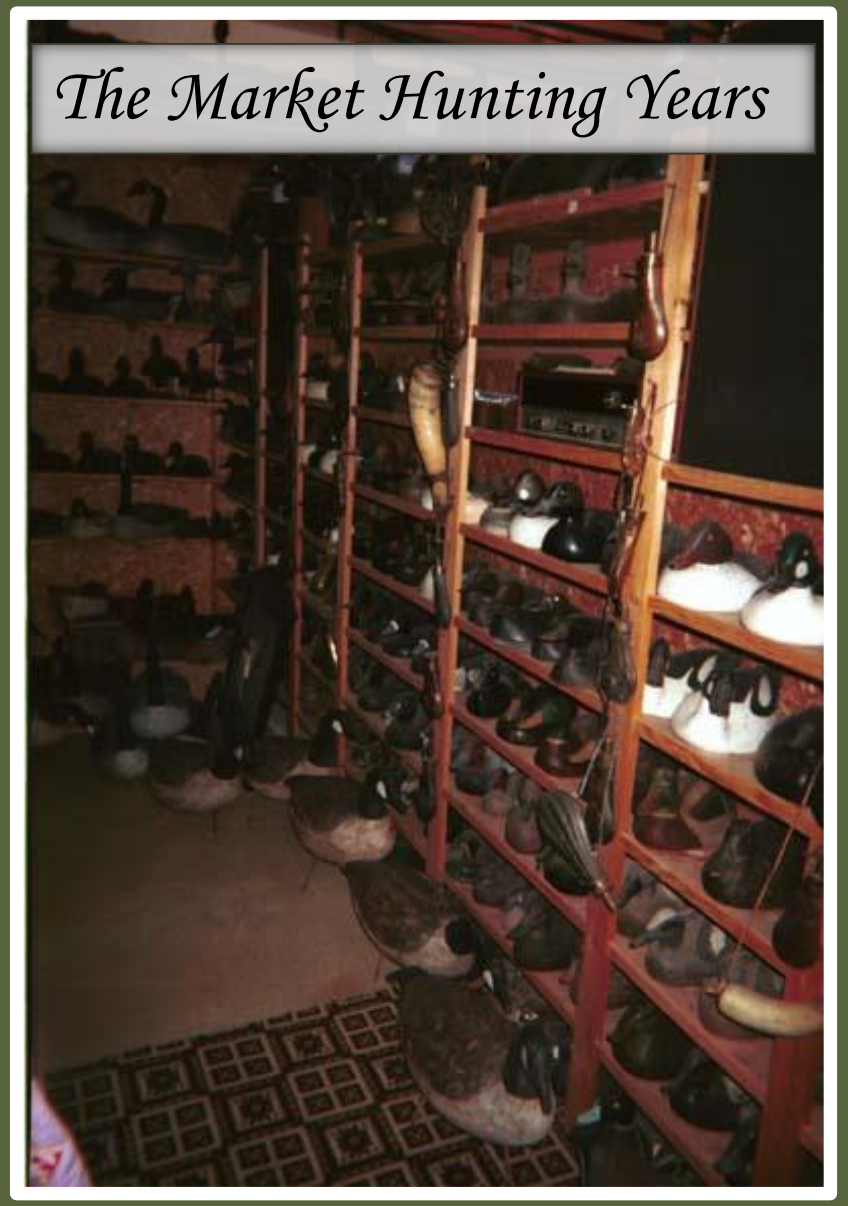
Migratory Bird Basics



North America has relatively large govt jurisdictions which makes coordinated efforts easier than in Europe.



Roots of Bird Conservation Movement



MENU

Blue Points.

Soup.

Venison a la Chasseur. Consomme of Prairie Chicken.

Fish.

Baked White Fish, Port Wine Sauce. Boiled Trout, Lobster Sauce.

Boiled.

Wild Turkey. Leg of Mountain Sheep.

Roast.

Saddle of Antelope. Mountain Sheep. Leg of Venison.
Pheasants. Wild Goose.
Blue Grouse. Mallard Duck. Quail.
Prairie Chicken. Red-Head Duck. Sage Hen. Wild Turkey.
Jack Rabbit. Spotted Grouse. Black Tail Deer.
Plover. Canvass-Back Duck.
Black Bear. Wood Duck. English Hare.
Blue-Wing Teal. Sand-Hill Crane. Squirrel. Opossum.
Ruffled Grouse. Coon. Leg of Elk.
Partridges. Brandt. Cinnamon Bear.
Saddle of Black-Tail Deer. Widgeon.

At The Table

MARKET PRICES

	Retail Price (1884)	w/ inflation
• Pair of Canvasback	$1.00 to $2.75	$64.83
• Pair of Redheads	50¢ to $1.60	$37.72
• Pair of Ruddy Ducks	25¢ to 90¢	$21.22
• Canada Goose	50¢	$11.79

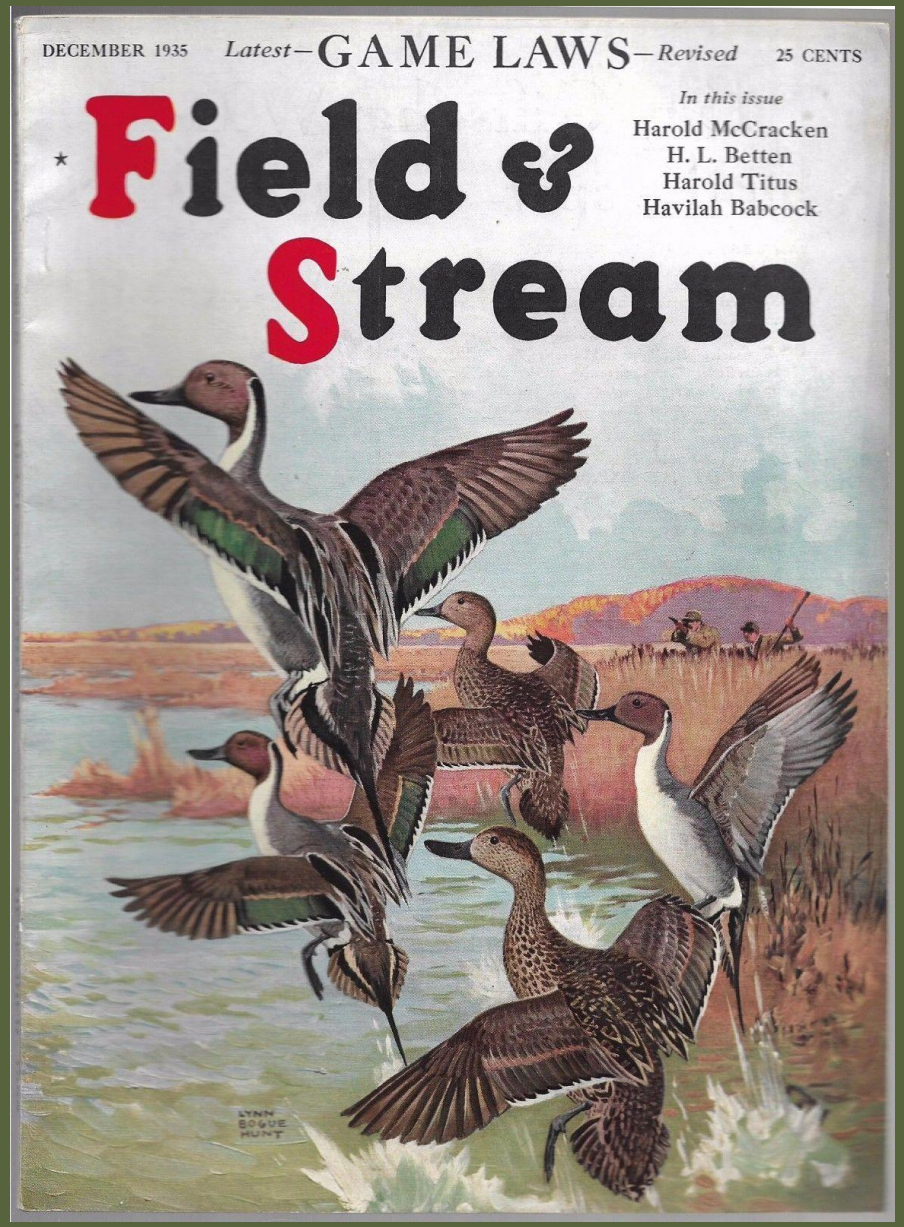
RESTAURANT PRICES

	Table Price (1901)	w/ inflation
• Canvasback	$4.00	$101.79
• Redhead	$3.00	$76.34
• Mallard	$2.50	$63.62
• Ruddy Duck	$2.00	$50.89
• Teal	$1.25	$31.81

W. Grimes. 2009. "Appetite City: A Culinary History of New York"

- Feathers for women's hats had an equal impact on different birds
- the number of birds being killed in Florida alone each year was as high as five million.

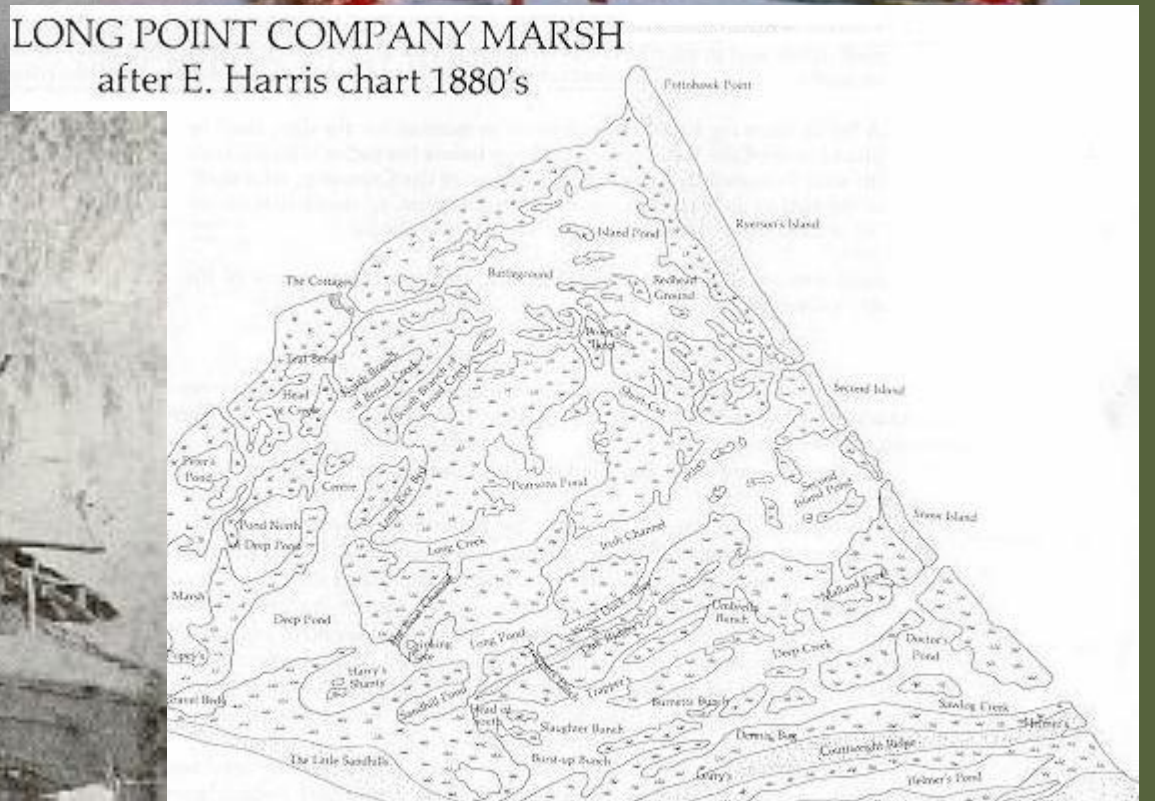
- *Forest and Stream* magazine was an early and influential advocate for the elimination of spring shooting, and in 1894 the publication declared that the sale of game should be outlawed. The magazine's editor, George Bird Grinnell, was a prolific writer and avid hunter who helped bring together sportsmen, other bird enthusiasts, and the scientific community in support of new wildlife conservation laws.



https://www.ducks.org/conservation/public-policy/the-migratory-bird-treaty-centennial

- Florence Merriam Bailey, who as a Smith College student in 1886 organized a local chapter of the Audubon Society, combined their activism with work that pushed others to appreciate the beauty of birds in their natural habitats. Bailey's *Birds Through an Opera-Glass*, published in 1899, helped non-experts spot, identify and appreciate bird life, and over the course of her ornithology career she'd write six birding books focused primarily on birds of the southwestern United States.

Long Point Company By-laws June 7, 1881



Migratory Bird Treaty 1918

- Proponents
- National Audubon Society
- Camp Fire Club of America
- Boone and Crockett Club
- Prominent business leaders
  - e.g. Henry Ford

- Prior versions
- Weeks-McLean Act 1913
- 1916 (Canada and US)
- Economic reasons – insect control for food for the war effort

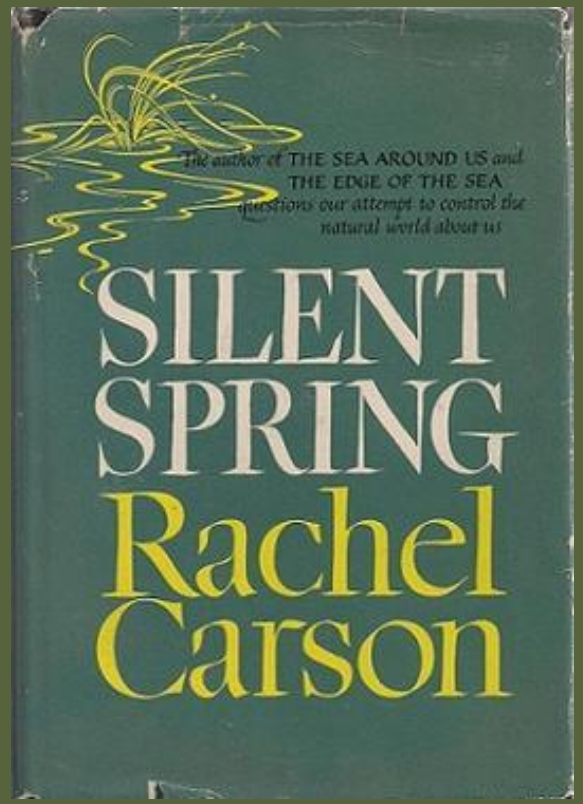
Migratory Bird Treaty 1918

- In order to authorize the "taking" of waterfowl and other migratory birds, the law established the first federal hunting seasons and bag limits along with a permit system for scientific collections. In addition, it protected threatened species such as the wood duck, and banned market hunting, spring shooting, and the use of shotguns larger than 10-gauge.

- 1919- Missouri v. Holland, the high court upheld the MBTA

Environmental Movement

- Birds in the environmental movement



https://www.scientificamerican.com/article/rachel-carson-silent-spring-1972-ddt-ban-birds-thrive/

Environmental Movement

- Nixon creates EPA
- Clean Air and Clean Water acts
- Nixon's Endangered Species Act of 1973 that all endangered species — including grasses, flowers and trees — were included on the list.

https://time.com/5345913/endangered-species-act-history/

Migratory Bird Law

- Incidental Take

The Trump Administration reinterpreted the MBTA to regulate only intentional acts that kill birds, and finalized an action to **exclude incidental take in the administration's final days in January 2021**. Dec 21, 2021

With the final rule, FWS has effectively reinstated its position that "incidental take" — **the harming or killing that results from, but is not the purpose of, carrying out an otherwise lawful activity** — is prohibited by the MBTA, and persons that cause incidental take can be prosecuted criminally. Oct 7, 2021

https://www.natlawreview.com/article/revocation-trump-administration-s-migratory-bird-treaty-act-rule-takes-effect

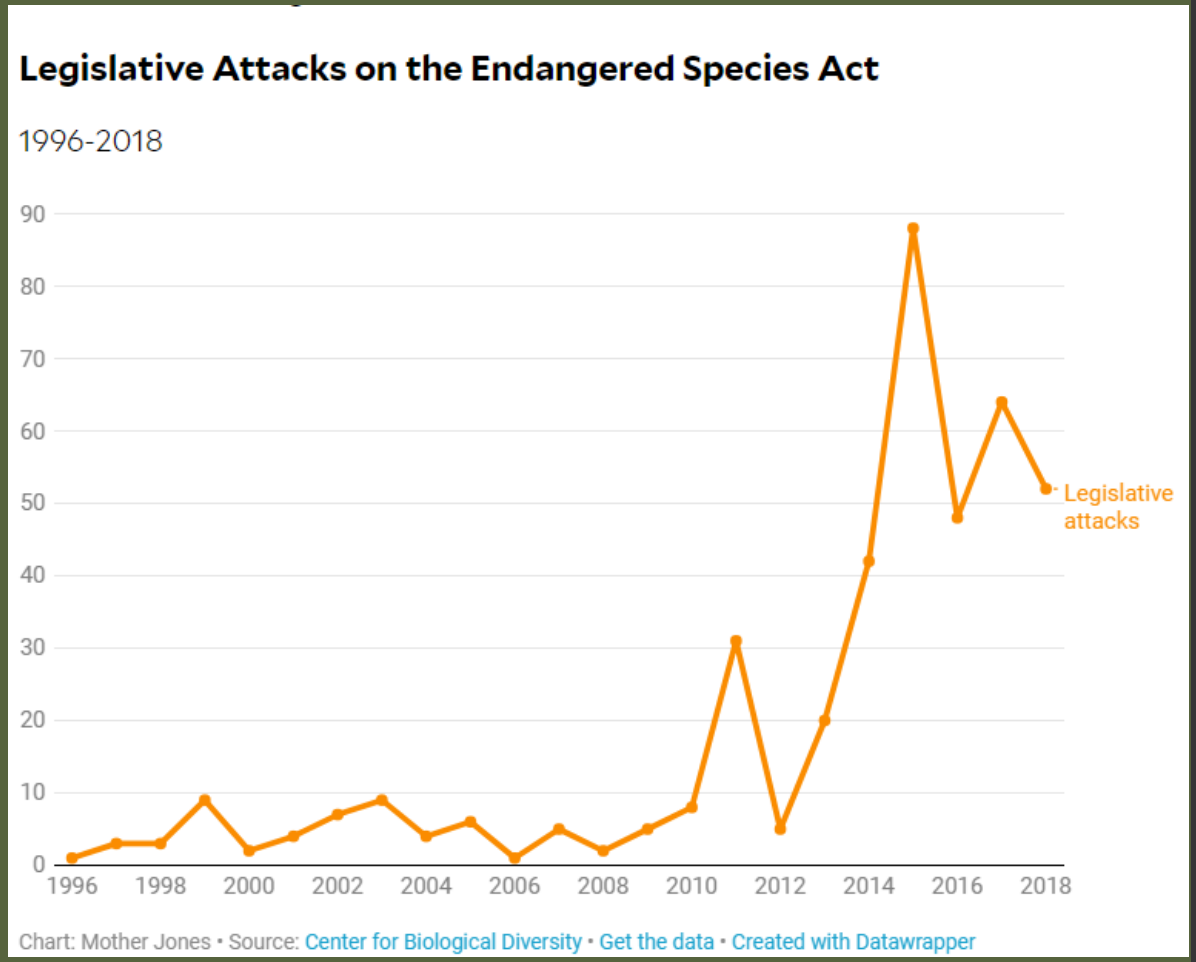
Migratory Bird Law

- Bald and Golden Eagle Protection Act of 1940 + amendments
- **prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald or golden eagles, including their parts (including feathers), nests, or eggs.**

https://www.fws.gov/law/bald-and-golden-eagle-protection-act#:~:text=The%20Bald%20and%20Golden%20Eagle,)%2C%20nests%2C%20or%20eggs.

Migratory Bird Law

- Endangered Species Act – initially 1966
- Definitions of T and E
- Broadly applied the term “Take” prohibitions
- Required Federal agencies to use their authorities to conserve listed species and on those of “Special Concern”
- Made matching funds available to states with cooperative agreements



https://www.fws.gov/library/collections/endangered-species-act-milestones

North American Waterfowl Mgmt Plan

- Initially in 1986 - https://nawmp.org/
- Many revisions thereafter – model for conservation partnerships

North American Waterfowl Mgmt Plan

- 2012 revision included people as the 3rd leg of the stool along with healthy waterfowl populations and conservation of habitat for waterfowl

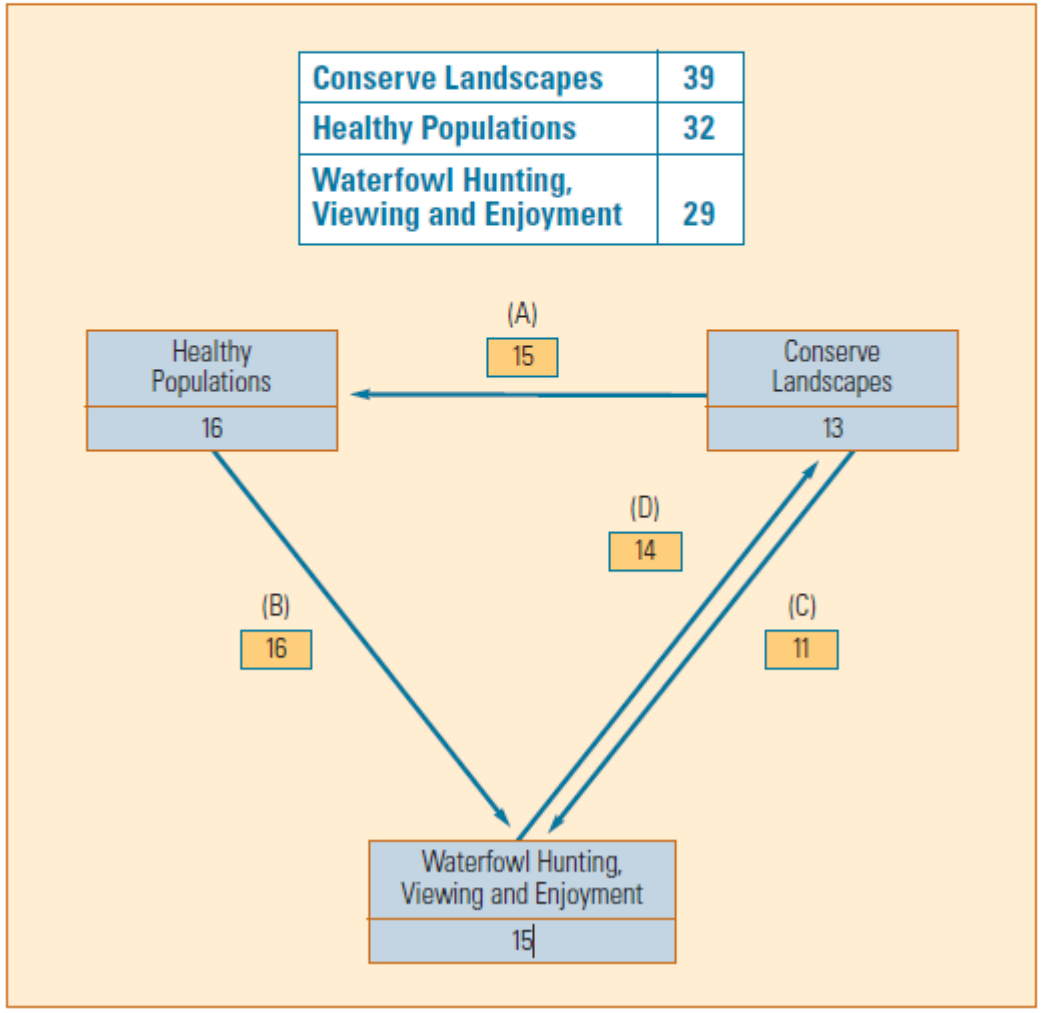
The utilities, reflected by arrows, convey the following relationships:

"A" represents the value that landscape conservation makes to healthy populations.

"B" reflects the value that healthy populations play in perpetuating waterfowl hunting, viewing and enjoyment.

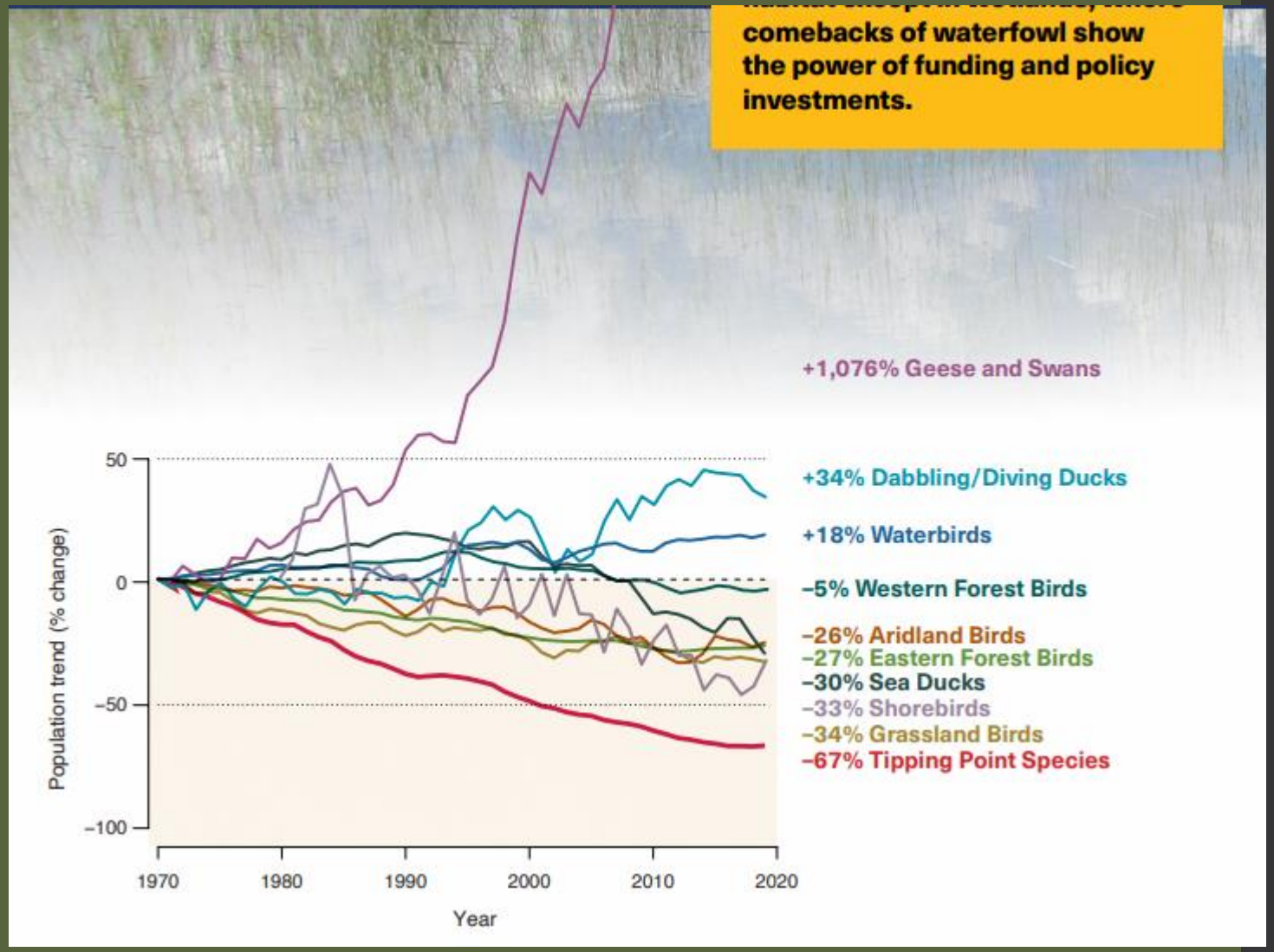
"C" represents the value of conserving landscapes in helping to perpetuate waterfowl hunting, viewing and enjoyment.

"D" represents the role that waterfowl hunting, viewing and enjoyment play in helping conserve landscapes.



North American Wetlands Conservation Act

- The funding vehicle to meet NAWMP objects
- This model has worked for waterfowl
- BUT – other birds are not doing as well

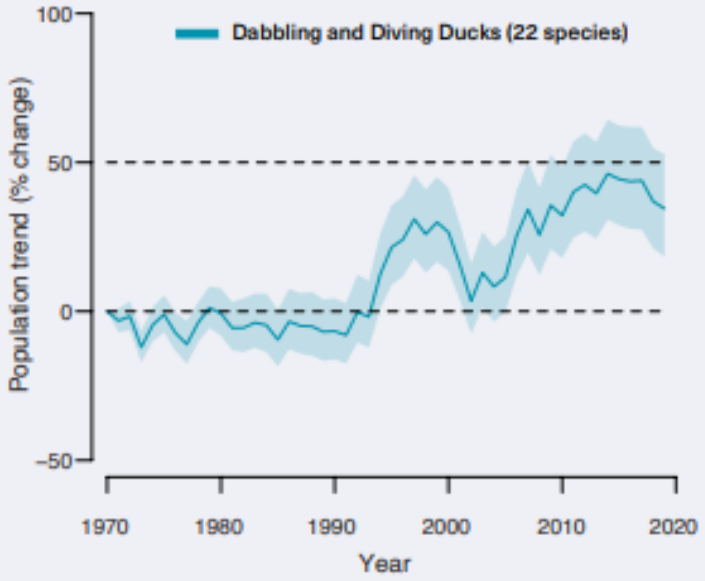


North American Wetlands Conservation Act

STATUS: Decades of population growth driven by conservation policy and cleaner water

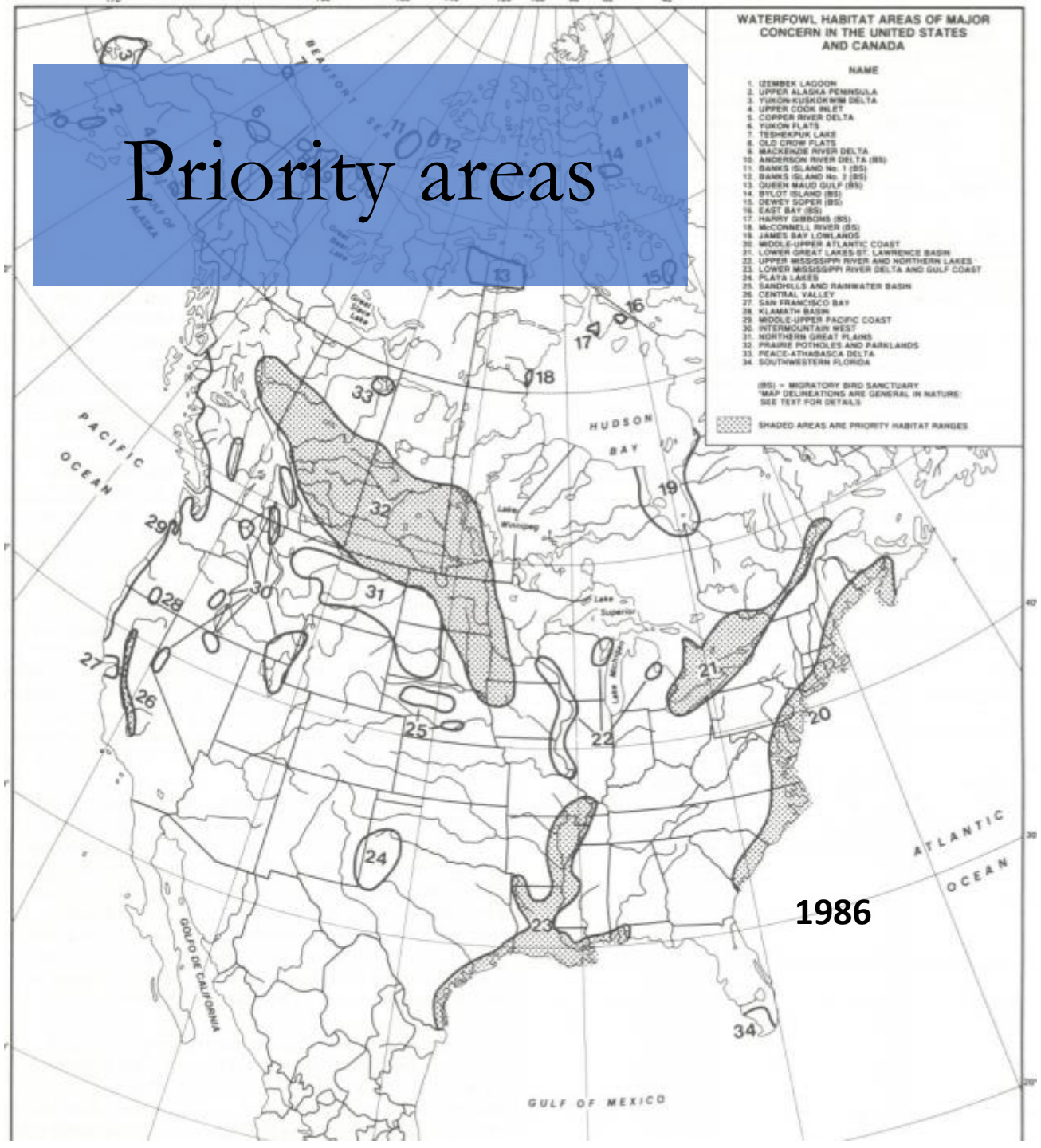
The long-term recovery of waterfowl and waterbird populations is largely due to successful policy (such as the North American Wetlands Conservation Act and U.S. Farm Bill conservation programs), along with coordinated efforts by public-private partnerships under the North American Waterfowl Management Plan.

- Decades of dedicated funding for habitat conservation made possible by quality science

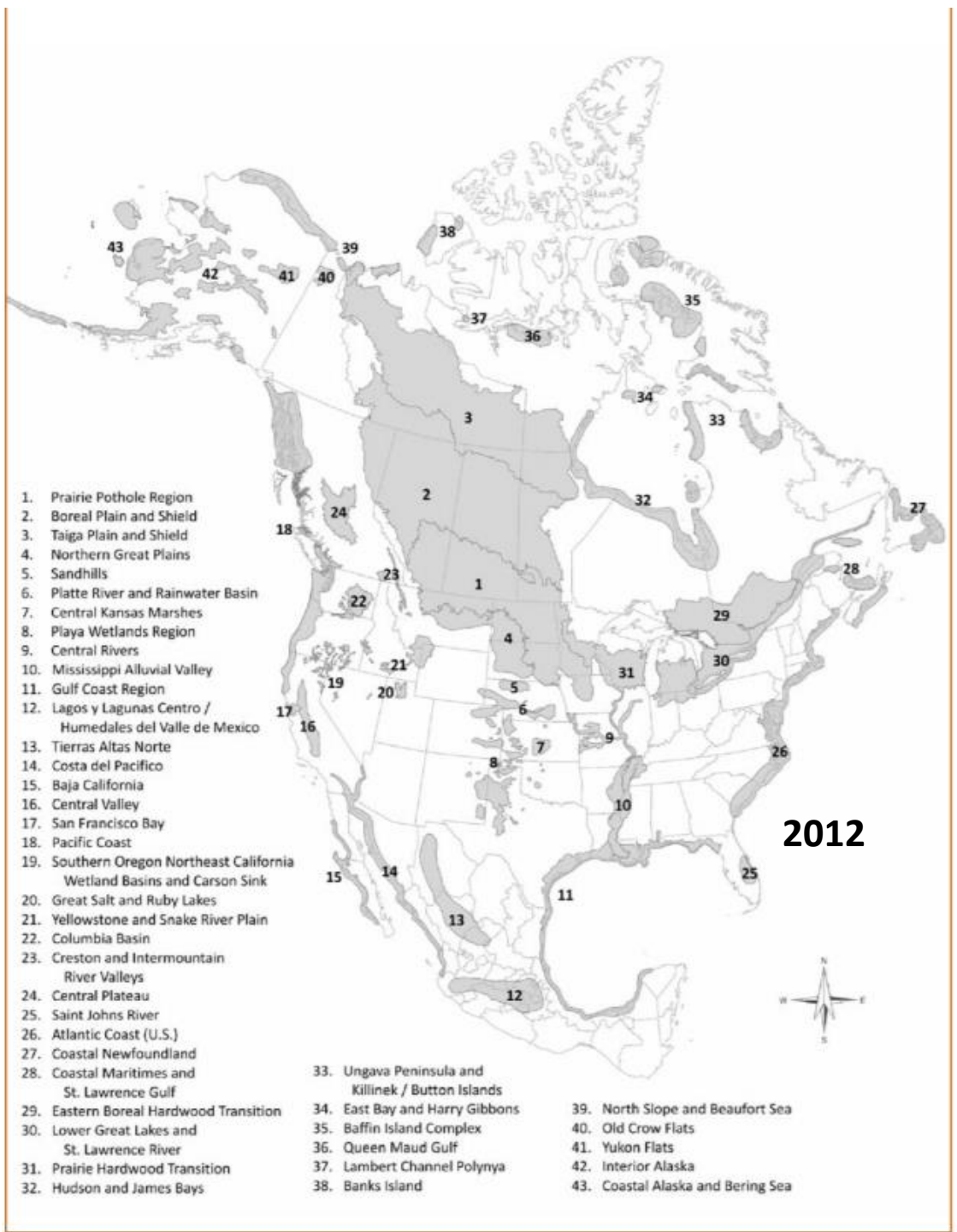


Despite their decades-long gains, ducks continue to face pressures from grassland habitat loss, wetland drainage, coastal wetland loss, and climate change impacts. Recent droughts have tipped duck populations downward—underscoring the need for continued conservation investments to keep duck populations healthy and resilient.

Priority areas



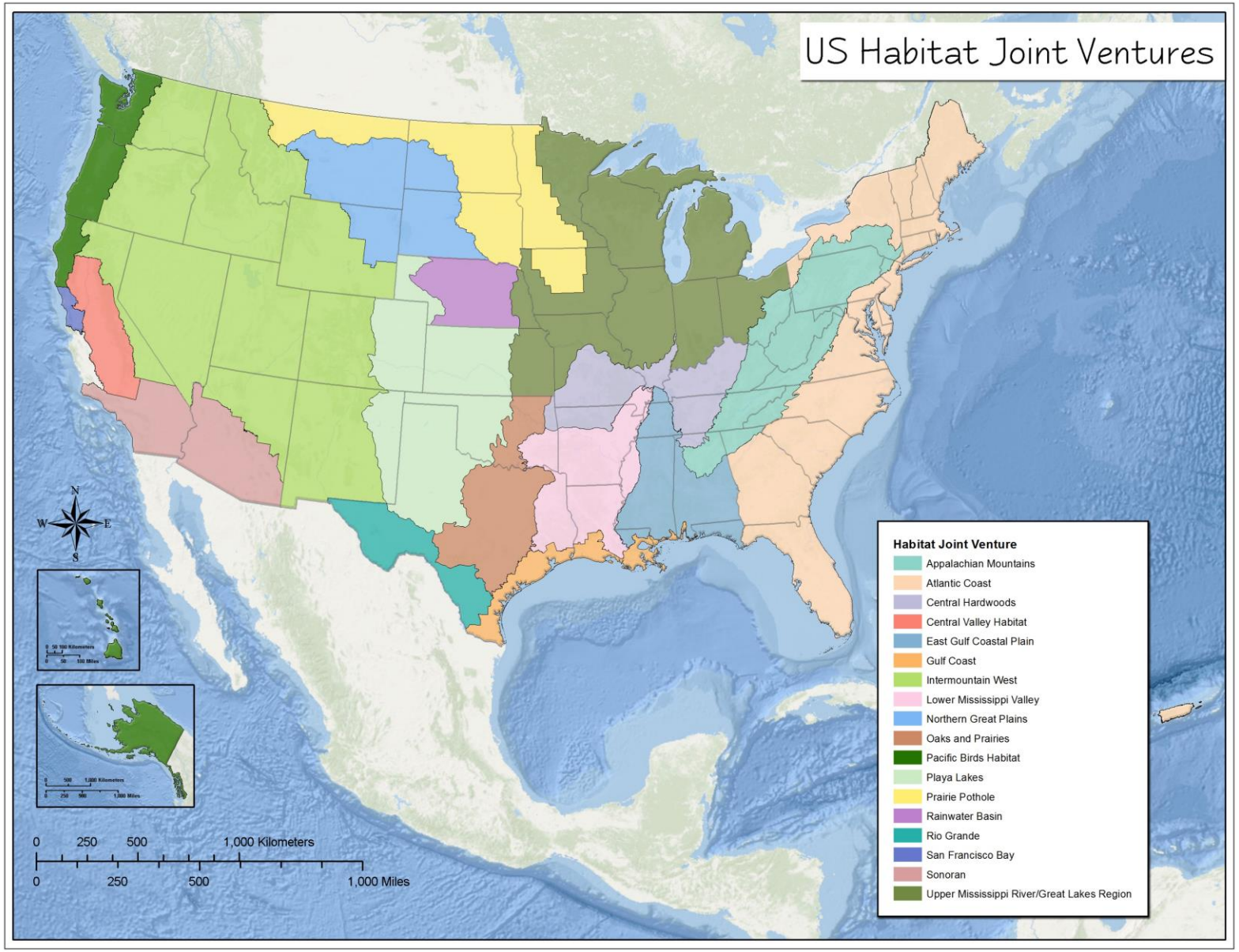
1986



2012

Joint Ventures

- **Broad geographic areas with similar ecology, species, and threats**
- **Each Joint Venture functions independently and develops their own priorities and strategic plans unique to their region.**



Joint Ventures

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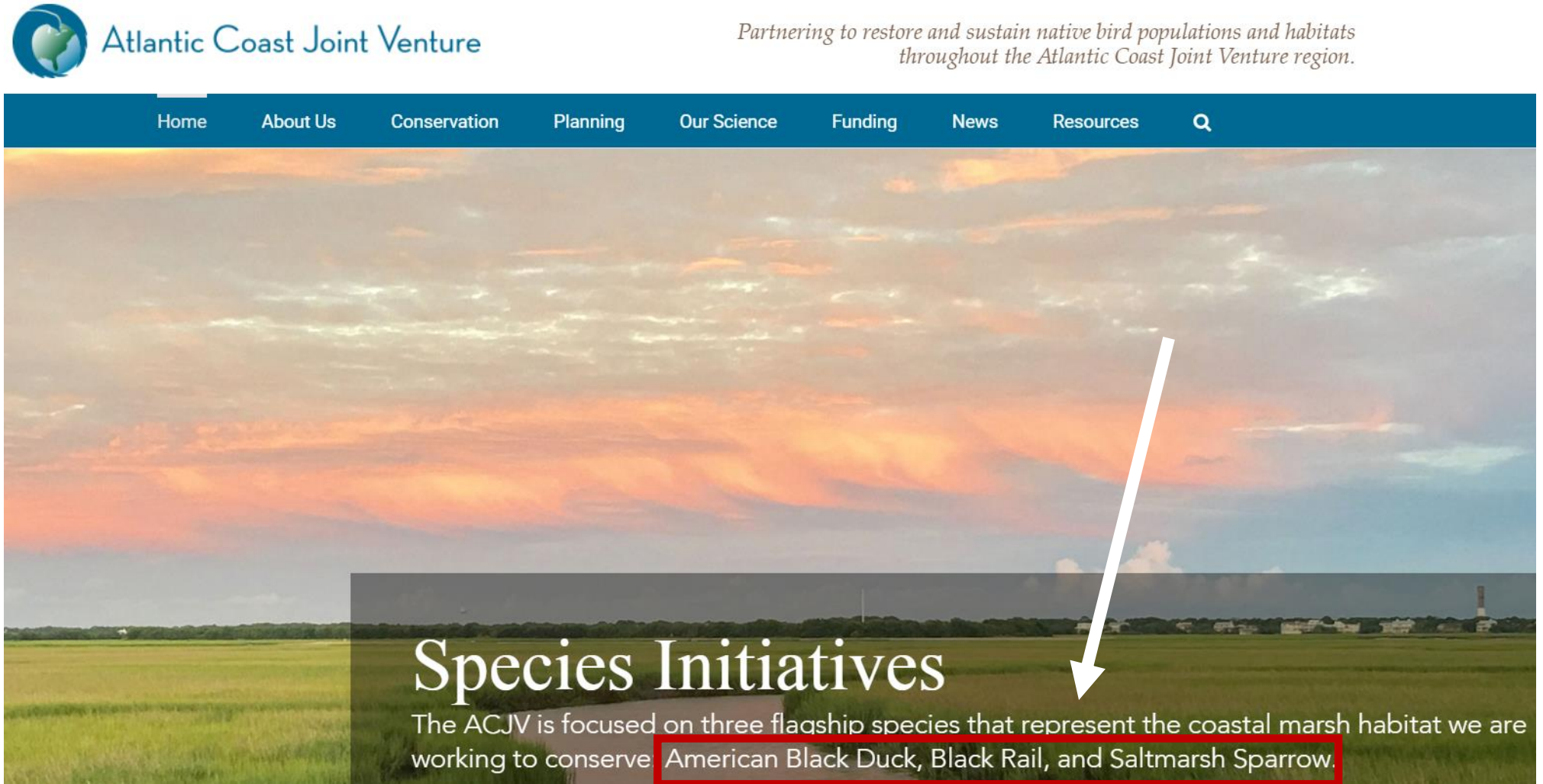
Upper Midwest and Great Lakes JV

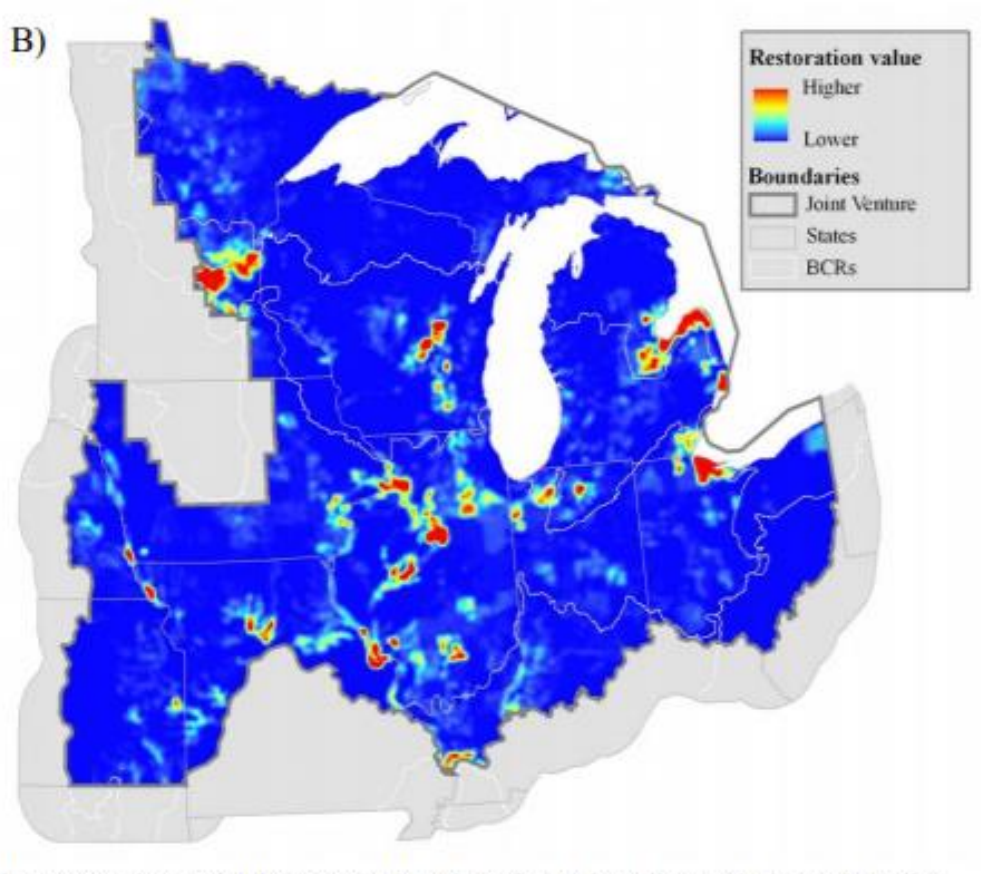
Joint Ventures

- **Each Joint Venture functions independently and develops their own priorities and strategic plans unique to their region.**



How many acres and where?

- Priority species
- Representative species
- For waterfowl - Three components
  - 1/ Regional population goal for each species
  - 2/ Energy demand per individual
  - 3/ Energy supply per unit area of wetland



"Thunderstorm map" that uses county level harvest distribution and hydric soil availability to determine areas of greatest restoration value

How many acres and where?

- Priority species
- Representative species
- For waterfowl - MORE components
  - 1/ Ducks
  - 2/ Recreation
  - 3/ Water Quality
  - 4/ Great Lakes Coast

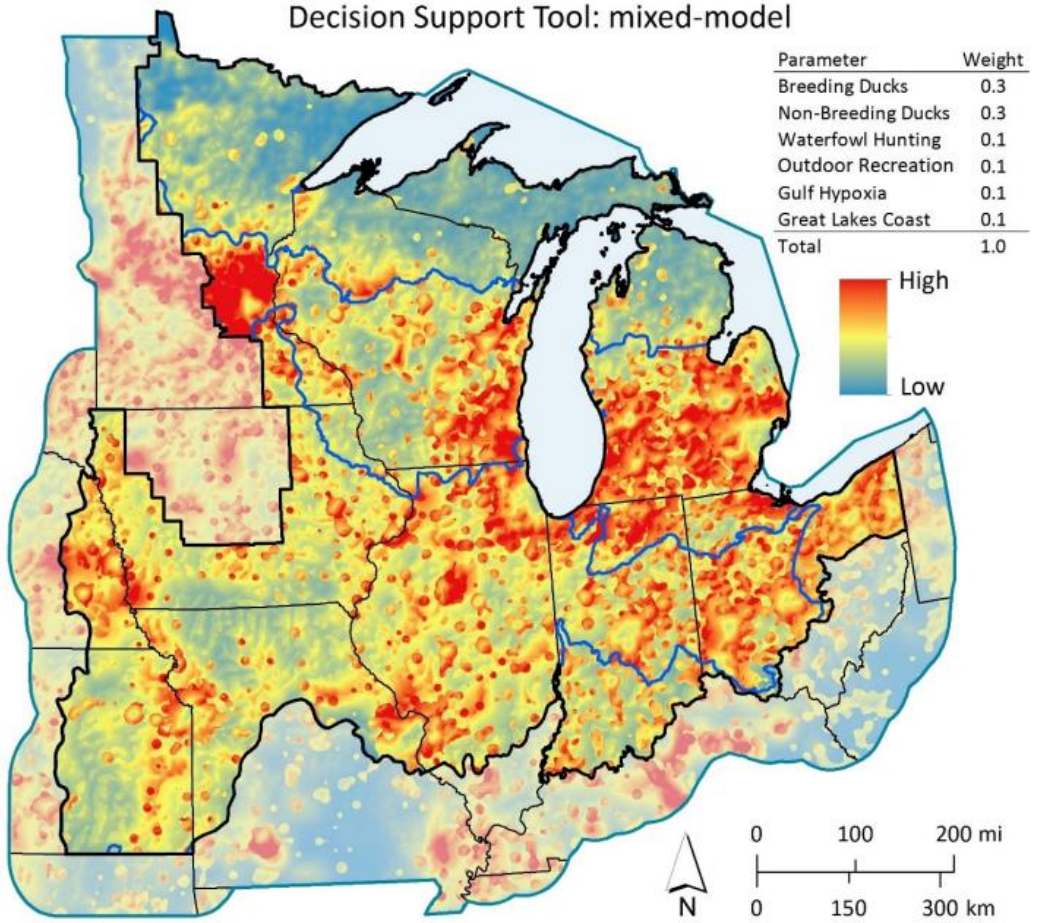


Figure 18. Decision support tool (DST) to target waterfowl habitat conservation in the Upper Mississippi River and Great Lakes Joint Venture (JV) region. The DST is a combination of six parameters, mixing biological (breeding and non-breeding waterfowl habitat) and social (waterfowl supporters and ecological goods and services) model-based maps weighted by regional waterfowl stakeholders. State and BCR boundaries (black and blue lines) designate the State x BCR polygons linked to JV waterfowl habitat retention and restoration objectives (see Tables 17 and 18 in Conservation Delivery).

Table 9. Spring migration and winter use-day goals (current needs + deficit needs) for species commonly occurring in the Upper Mississippi River and Great Lakes Joint Venture (JV) region. Numbers are based on continental population estimates (average for 1994–2003, NAWMP 2004) and estimates of the duration of stay in the JV region during each season (Appendix G).

Guild/foraging habitat	Species	Use days		
		Spring	Winter	Total
Wet mudflat / moist soil plants				
	Blue-winged Teal	41,625,029	0	41,625,029
	Northern Shoveler	7,633,091	0	7,633,091
	Northern Pintail	19,686,675	0	19,686,675
	Green-winged Teal	21,939,032	0	21,939,032
	Total	90,883,827	0	90,883,827
Shallow semi-permanent marsh				
	Wood Duck	38,083,080	10,476,180	48,559,260
	Gadwall	11,137,685	0	11,137,685
	American Wigeon	12,658,056	0	12,658,056
	American Black Duck	10,455,602	9,585,437	20,041,039
	Mallard	129,691,043	167,383,620	297,074,663
	Total	202,025,466	187,445,237	389,470,703
Deep water marsh				
	Mute Swan	954,000	484,200	1,438,200
	Trumpeter Swan	216,000	175,410	391,410
	Tundra Swan	1,000,000	0	1,000,000
	Ring-necked Duck	19,336,412	4,221,450	23,557,862
	Hooded Merganser	6,125,873	6,150,870	12,276,743
	Ruddy Duck	6,437,548	274,050	6,711,598
	Total	34,069,833	11,305,980	45,375,813
Extensive open water				
	Canvasback	7,443,585	11,702,970	19,146,555
	Redhead	12,849,990	7,121,070	19,971,060
	Greater Scaup	14,301,019	3,996,135	18,297,154
	Lesser Scaup	60,578,203	23,400,009	83,978,212
	White-winged Scoter	3,374,657	12,004	3,386,661
	Black Scoter	3,001,785	7,875	3,009,660
	Long-tailed Duck	8,193,905	16,597,629	24,791,534
	Bufflehead	20,298,053	8,673,210	28,971,263
	Common Goldeneye	21,296,386	37,316,160	58,612,546
	Common Merganser	12,453,643	17,614,080	30,067,723
	Red-breasted Merganser	2,174,109	4,193,820	6,367,929
	Total	165,965,335	130,634,962	296,600,297
All cover types	Total	495,458,161	329,398,150	824,856,311

Duck use days

- Residency time × abundance

So 100 ducks for 10 days =

1,000 Duck use days (DUDs)

Daily Energy Requirements

Table 10. Body mass, estimated resting metabolic rate (RMR), and daily energy requirement (DER) for waterfowl commonly occurring in the Upper Mississippi River and Great Lakes region during migration and winter.

Species	Body mass (kg)[a]	RMR (kJ/day)[b]	DER (kJ)[c]
Mute Swan	11.36	2,549	7,646
Trumpeter Swan	12.68	2,765	8,294
Tundra Swan	7.26	1,831	5,492
Wood Duck	0.68	317	952
Gadwall	0.97	413	1,238
American Widgeon	0.82	364	1,093
American Black Duck	1.25	498	1,493
Mallard	1.25	498	1,493
Blue-winged Teal	0.46	238	713
Northern Shoveler	0.68	317	952
Northern Pintail	1.03	431	1,294
Green-winged Teal	0.32	182	545
Canvasback	1.25	499	1,496
Redhead	1.11	455	1,366
Ring-necked Duck	0.74	338	1,013
Greater Scaup	1.05	439	1,316
Lesser Scaup	0.83	366	1,099
Surf Scoter	1.00	422	1,266
White-winged Scoter	1.59	594	1,783
Black Scoter	1.14	463	1,390
Long-tailed Duck	0.95	407	1,222
Bufflehead	0.48	245	735
Common Goldeneye	1.08	445	1,336
Hooded Merganser	0.73	334	1,003
Common Merganser	1.65	611	1,834
Red-breasted Merganser	0.71	327	981
Ruddy Duck	0.54	269	808

[a]Body mass (kg) based on adult males (Bellrose 1980).
[b]RMR = $422*W^{0.74}$ where W is body mass in kg (Miller and Eadie 2006). One kiloJoule (kJ) = 0.24 kilocalories (kcal) or 4.18 kJ / kcal.
[c]DER = RMR*3 (Prince 1979).

358.32 kcal/day

130.80 kcal/day

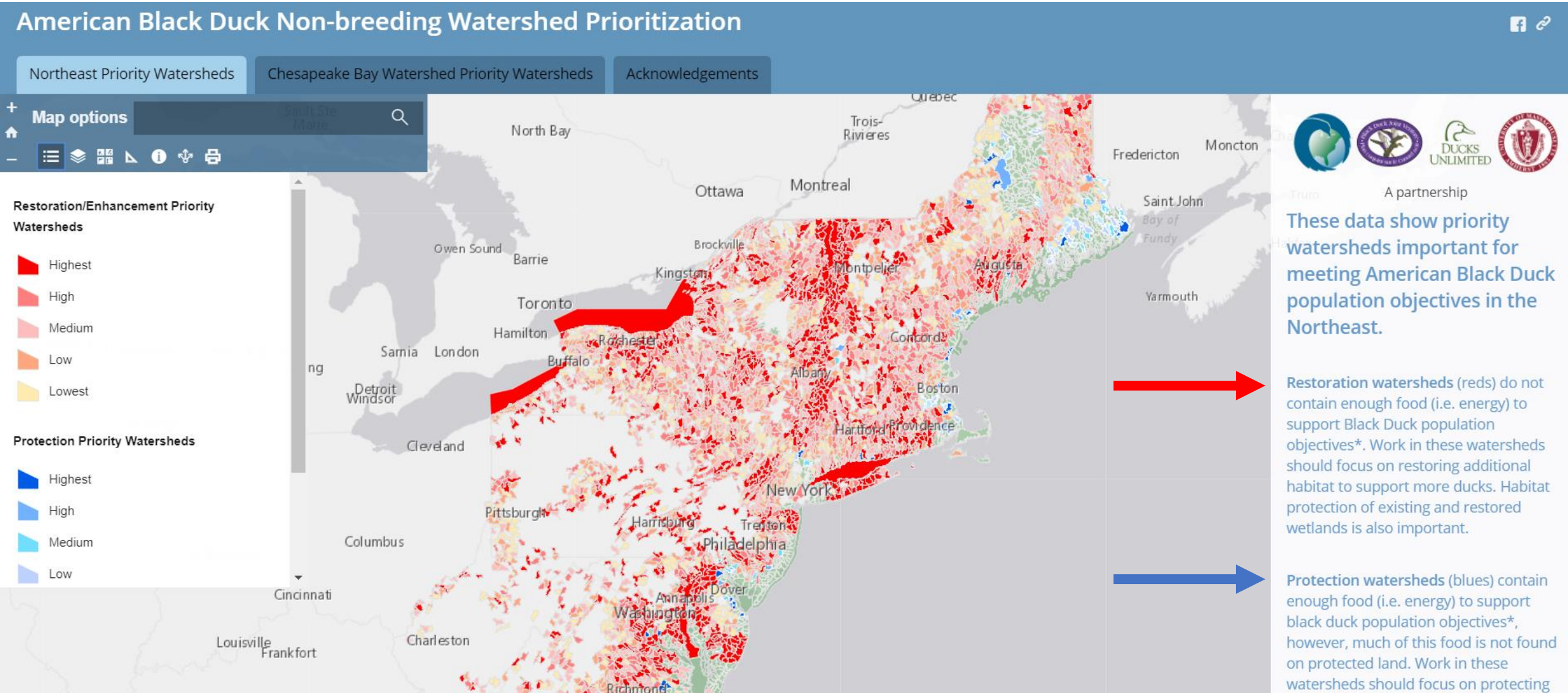
DUD X DER = Duck Energy Days Needed

Table 4.1 Energetic carrying capacity of selected foraging habitats (expressed as duck-energy days/ha [DEDs]) for dabbling ducks

Habitat	Food abundance[a]	Foraging threshold[a]	Food available[a]	TME[b,h,n]	DED[c,o]
Moist soil[d]					
Unmanaged[e]	403	200	203	2.47	1,784
Managed[f]	751	200	551	2.47	4,705
Restored WRP[g]	306	200	106	2.47	970
Harvested crops					
Rice[i]	80	50	30	3.34	384
Soybean[j]	45	50	0	2.65	3
Corn[j]	75	15	60	3.67	748
Milo[j]	156	50	106	3.49	1,258
Unharvested crops					
Rice[k]	6,030	50	5,980	3.34	67,899
Soybean[j]	2,190	50	2,140	2.65	19,299
Corn[j]	6,260	15	6,245	3.67	77,864
Milo[j]	3,051	50	3,001	3.49	35,583
Millet[l]	1,300	10	1,290	2.61	11,472
Bottomland hardwood[m]					
10 % red oak	12	10	2	2.76	56
20 % red oak	38	10	28	2.76	302

- True Metabolizable Energy
- Determine how many acres are needed to satisfy the animals you plan on supporting for X number of days
- Help provide an objective decision-making framework for where and when to provide habitat

Decision support tools – habitat models



Remarkable Recoveries

Waterfowl serve as a model for how habitat protection and restoration can reverse bird declines.

Waterfowl → **56 % increase since 1970**

Waterfowl are one of America's best wildlife success stories, thanks to federal investments such as the Duck Stamp and North American Wetlands Conservation Act that powered waterfowl conservation efforts.

Wood Duck by Linda Rudolph/Macaulay Library

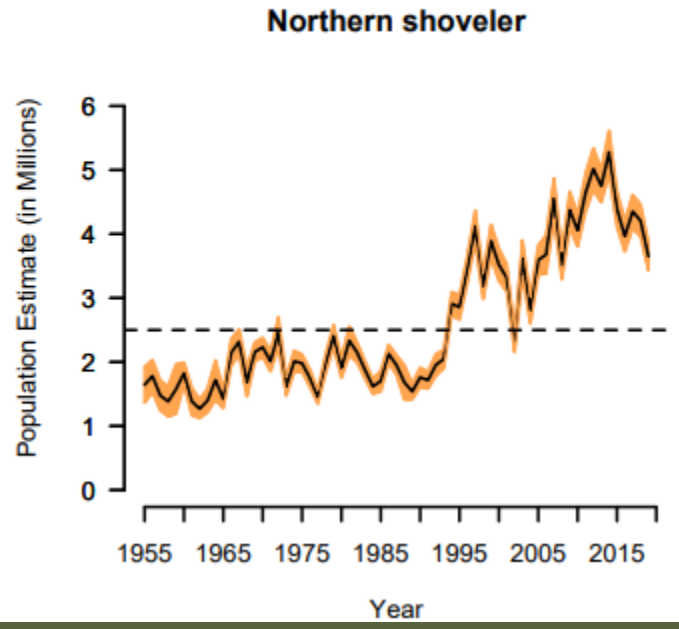
Raptors show what a big difference states can make in species protection.

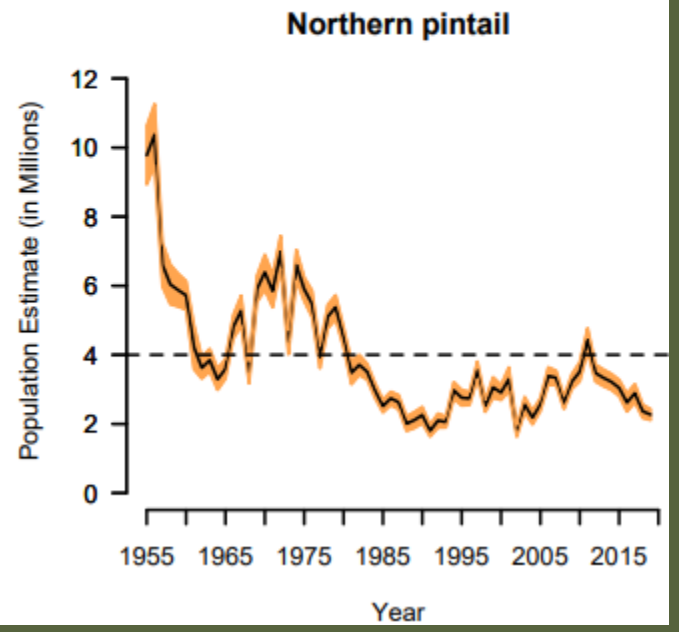
Raptors → **200% increase since 1970**

Hawks, eagles and other birds of prey buck the general trend of declining birds thanks to bans on harmful pollutants such as DDT, as well as strong federal and state protections from shooting.

Cooper's Hawk by John Brehm/Macaulay Library

Status of Ducks



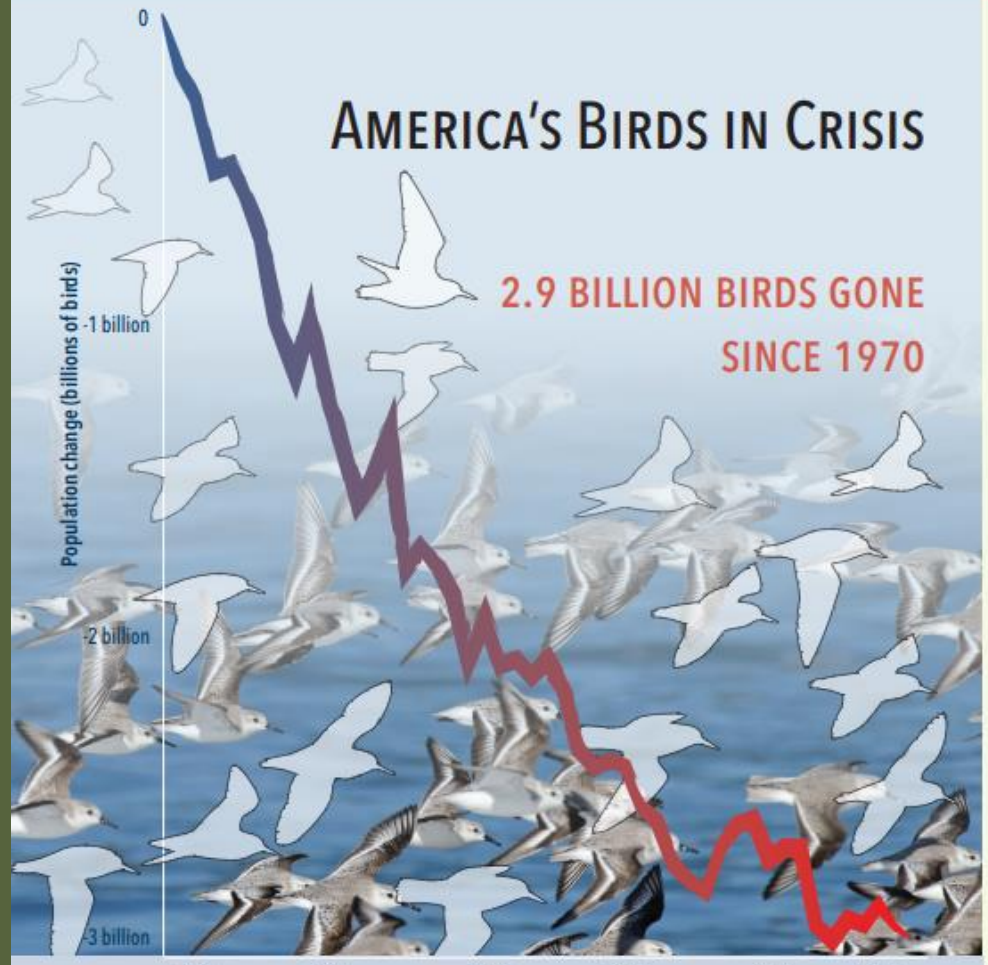


https://www.stateofthebirds.org/2022/wp-content/uploads/2022/10/state-of-the-birds-2022-spreads.pdf

The State of the Birds 2019

United States of America

America's Birds in Crisis

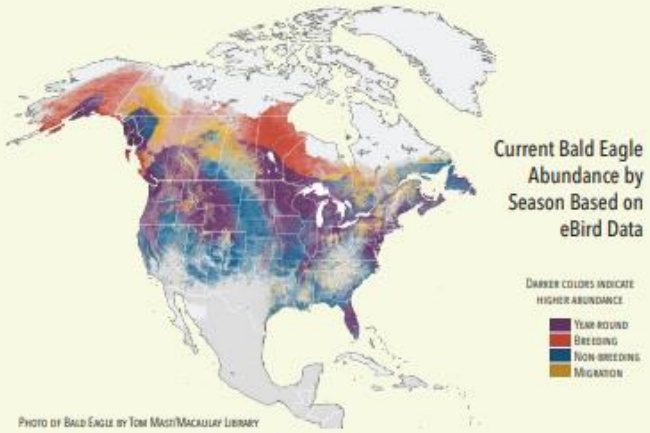


2.9 BILLION BIRDS GONE SINCE 1970

Nearly 30% of our birds have disappeared in the last 50 years: New research published in the journal *Science* shows massive losses among U.S. bird populations–with steep declines in every habitat.

But Conservation Works!

RECOVERY IS POSSIBLE WHEN WE INVEST IN BIRDS



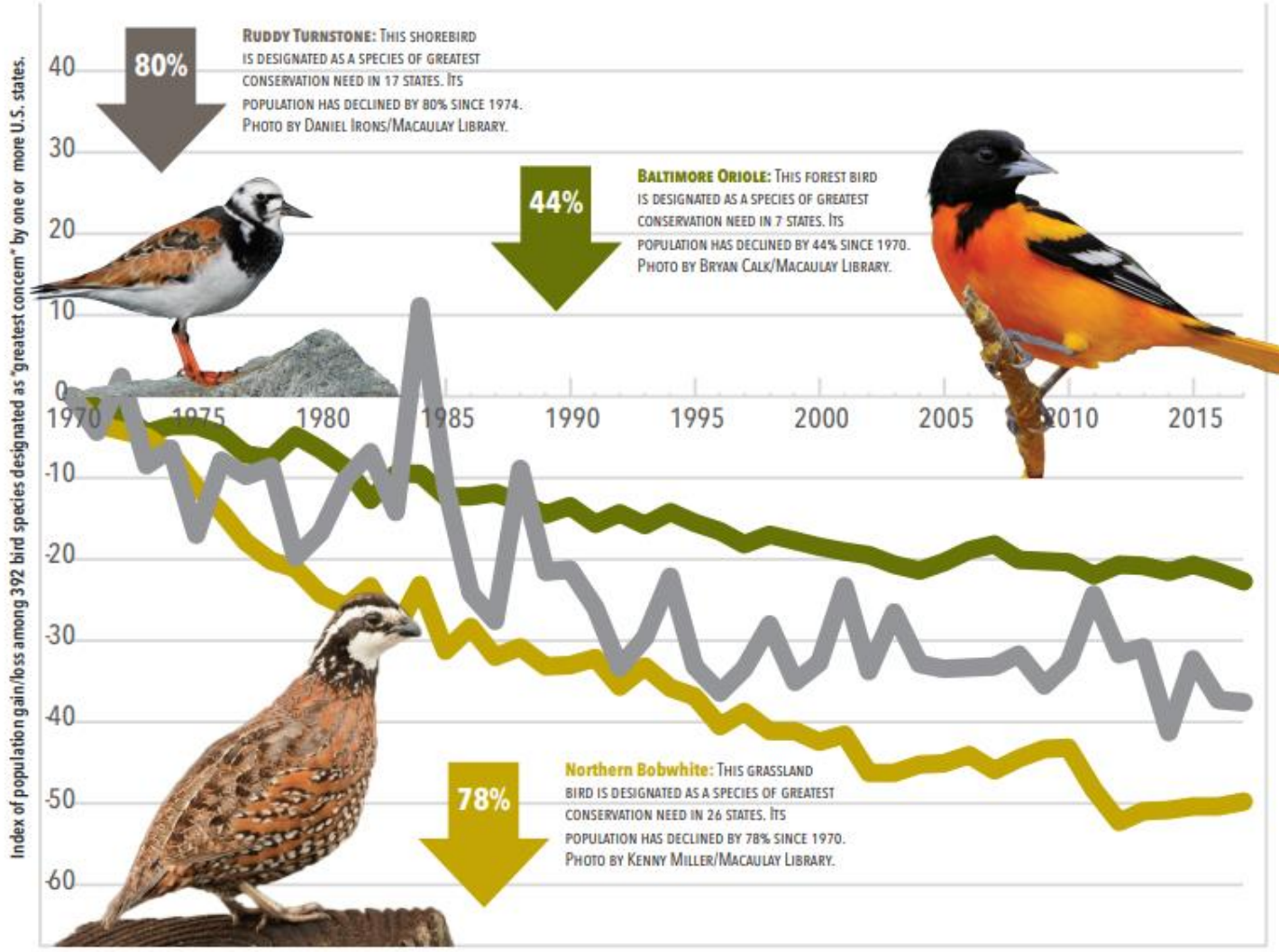
Current Bald Eagle Abundance by Season Based on eBird Data

Photo of Bald Eagle by Tom Mast/Macaulay Library

Our national bird, an icon of wildlife recovery: In 1970 only a few hundred Bald Eagle pairs remained in the lower 48 states. Federal and state protections sparked a remarkable recovery. The Bald Eagle was delisted as an Endangered Species in 2007, and today 30,000+ eagle pairs live in the U.S.A.

https://www.stateofthebirds.org/2022/wp-content/uploads/2022/10/state-of-the-birds-2022-spreads.pdf

America's Birds are in Steep Decline



Forest Birds — **22% decrease since 1970**

Forest birds have experienced consistent declines, with big losses among beloved species such as Wood Thrush and Baltimore Oriole. Altogether, forest bird populations have lost 1.2 billion birds since 1970.

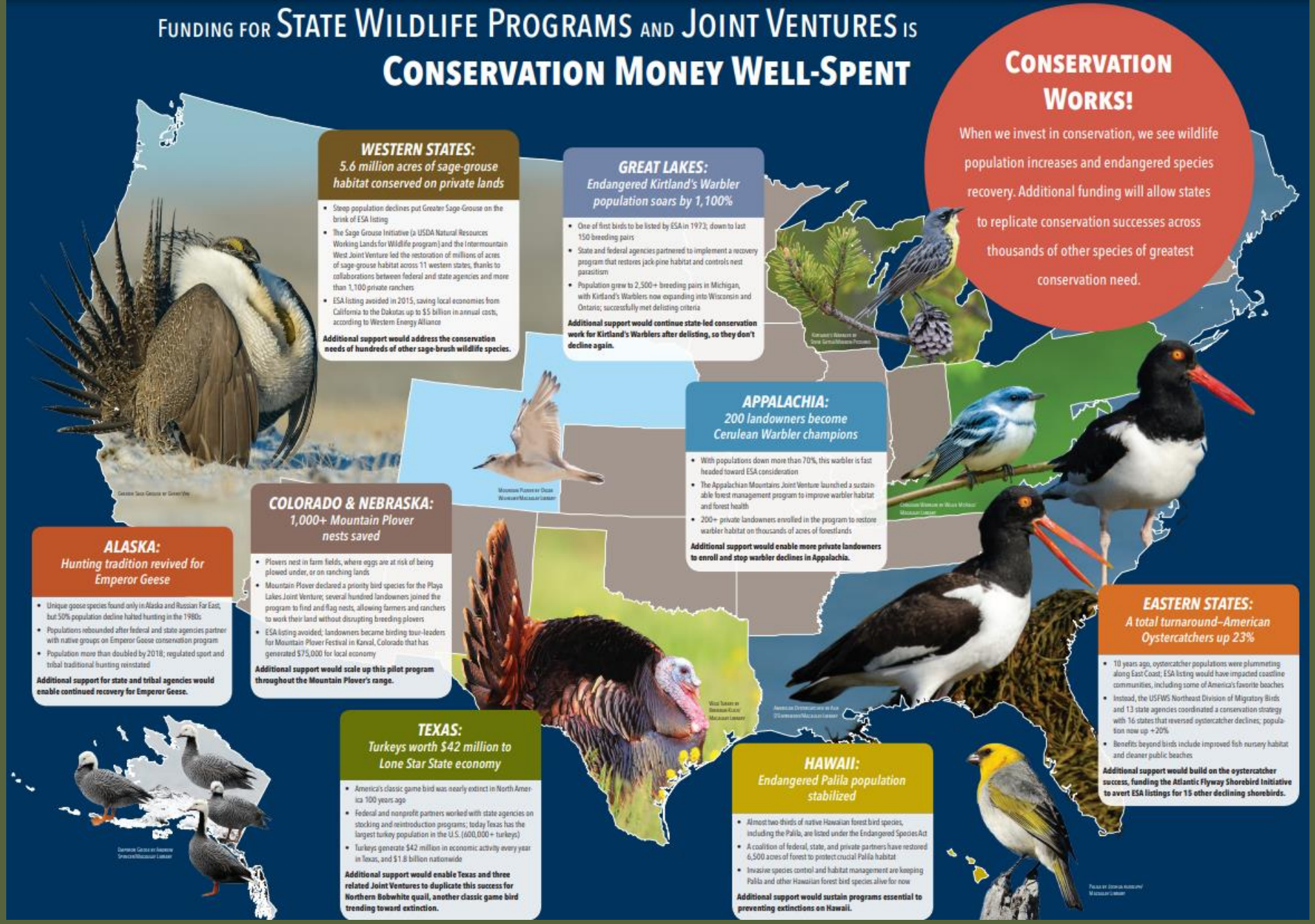
Shorebirds — **37% decrease since 1974**

Shorebirds include many migratory species such as Ruddy Turnstone and Semipalmated Sandpiper that are declining fast, with critically low populations that may soon trigger Endangered Species Act listings.

Grassland Birds — **53% decrease since 1970**

Grassland birds have suffered the steepest losses, with a population decline of 700 million birds. Some of the biggest declines are among birds beloved by birdwatchers and hunters alike, such as Northern Bobwhite.

https://www.stateofthebirds.org/2022/wp-content/uploads/2022/10/state-of-the-birds-2022-spreads.pdf

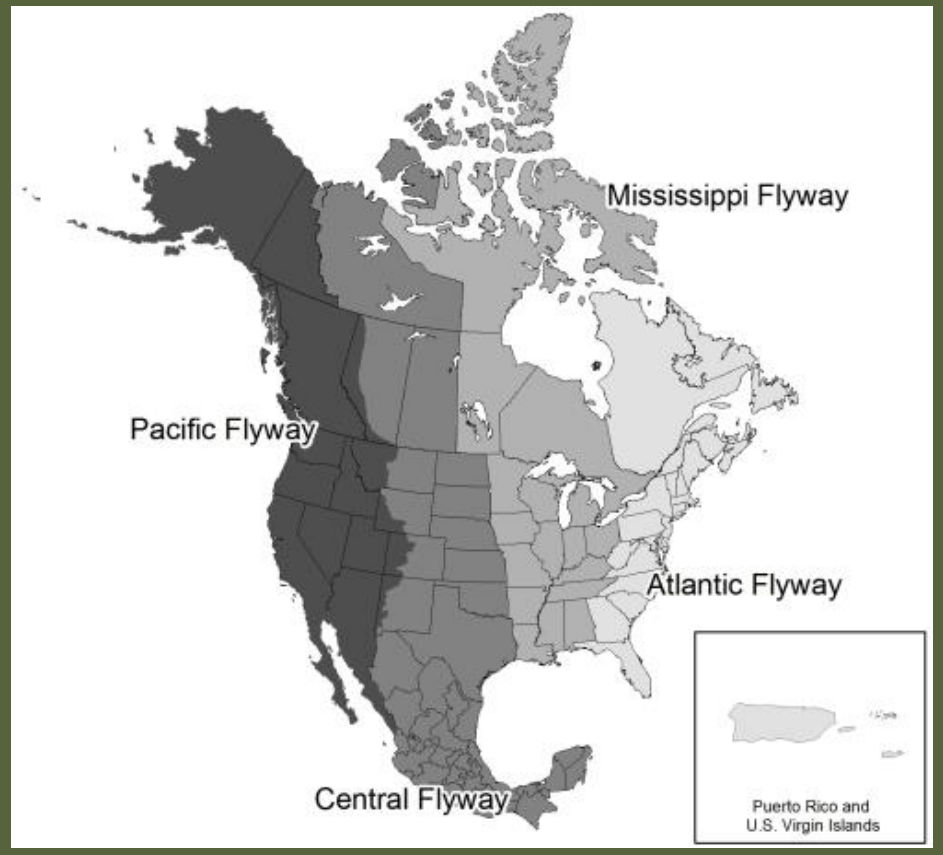


https://www.stateofthebirds.org/2022/wp-content/uploads/2022/10/state-of-the-birds-2022-spreads.pdf

The Flyways

Biological

Administrative



Flyway Structure

Two components:

- Technical Section (biologists)
    - Game and non-game sections
- Flyway Council (directors)

One official representative per state, province, or territory in each flyway

USFWS flyway representative and assistant

Associate members from the USFWS migratory bird office and joint ventures

Why have Flyway Councils and Tech Sections?

- Migratory birds are a shared resource across states and countries
  - All states and provinces are stakeholders
  - Harvest parity is important
- Dual regulatory authority
  - However - USFWS ultimately responsible for the management of Migratory birds
- Fosters collaboration between federal agencies, states, and provinces

Beyond the flyways…

Service Regulations Committee

- comprised of USFWS directors

- each flyway has two representatives to present recommendations

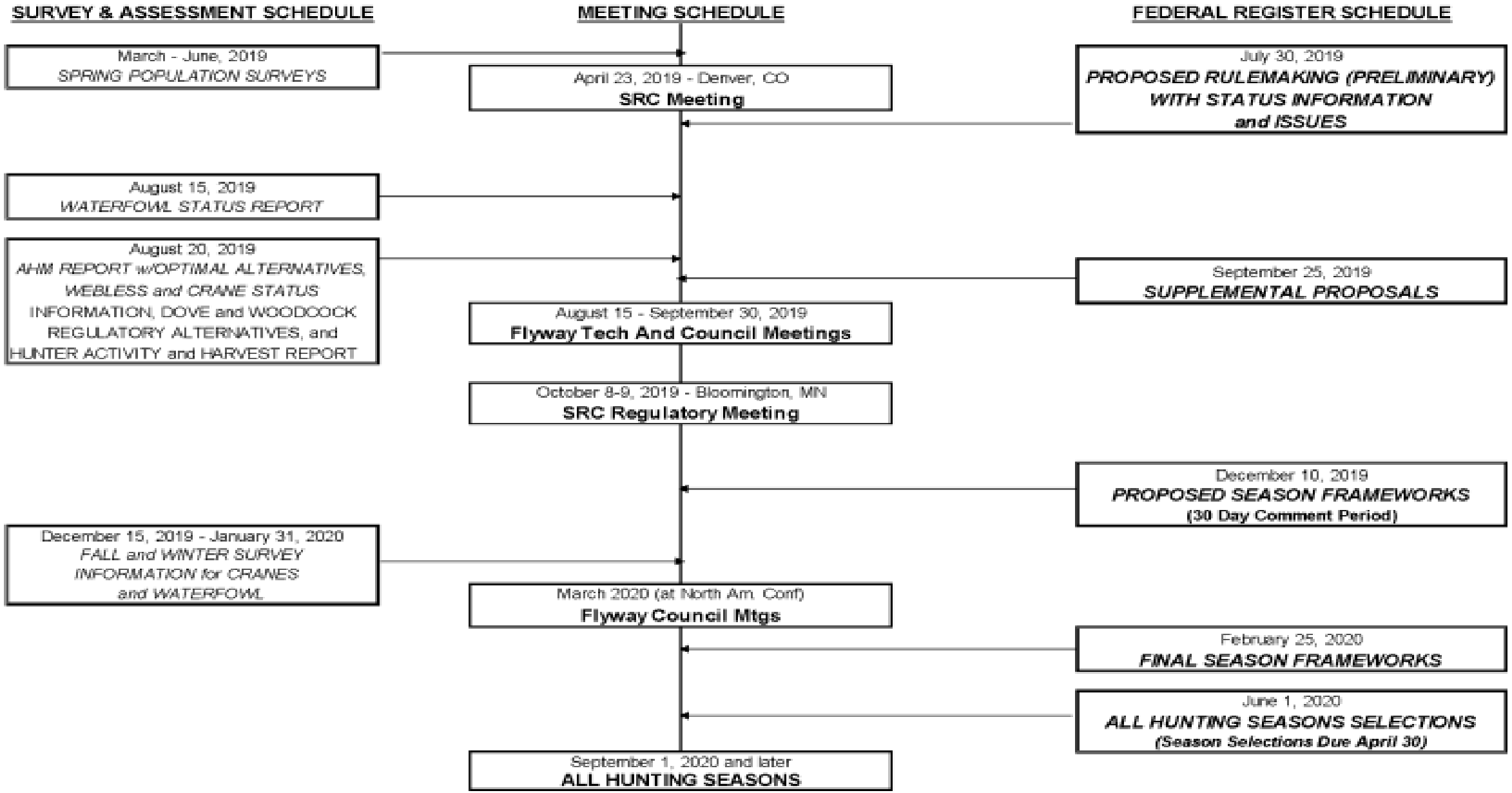
Joint Ventures

- non-regulatory

- 14 habitat oriented, 3 species oriented

- fund research and habitat improvement

SCHEDULE OF BIOLOGICAL INFORMATION AVAILABILITY, REGULATIONS MEETINGS AND FEDERAL REGISTER PUBLICATIONS FOR THE 2020-21 SEASONS



The challenge

Recover the T&E species while keeping the common species common

Application of Migratory Bird Ecology and Management

WEATHER influences the….

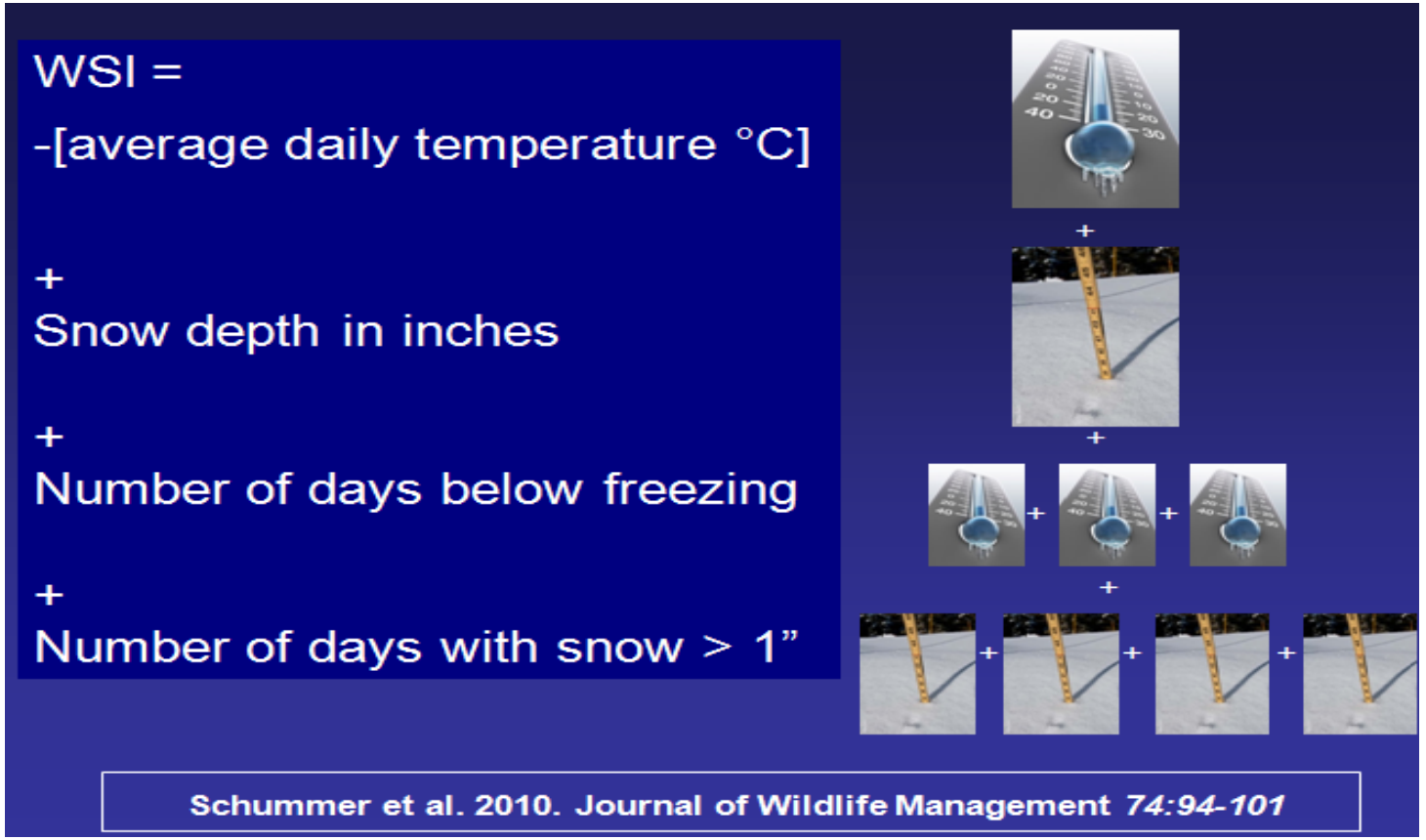
distributions of ducks, geese, and swans, which

- **Influences foraging pressure by waterfowl by latitude**
- **Influences opportunity to encounter waterfowl**
- **Influences waterfowl harvest**
- **Influences the economy and conservation dollars**

Weather Severity Indices

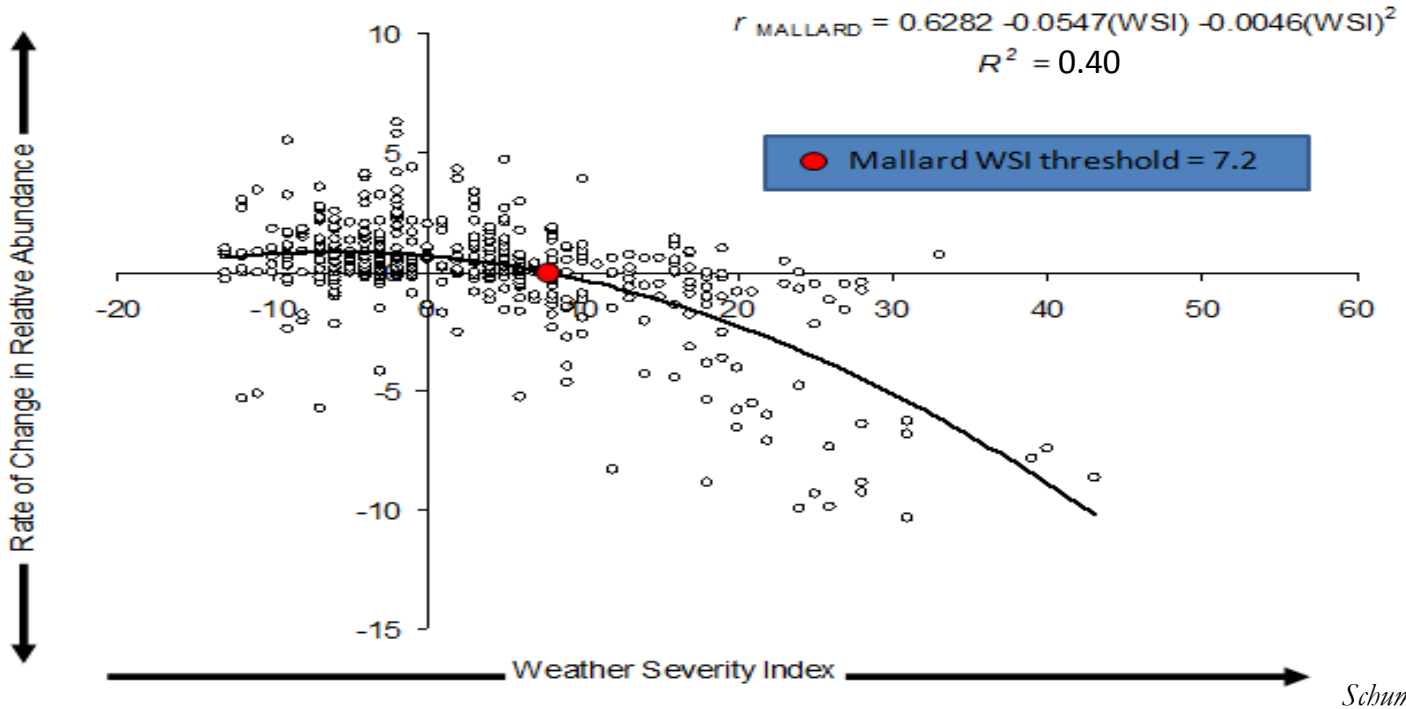
For Mallards in Missouri, published in 2010 as a Cumulative WSI

Calculated daily and selected as maximum between two waterfowl surveys



Weather Severity Indices

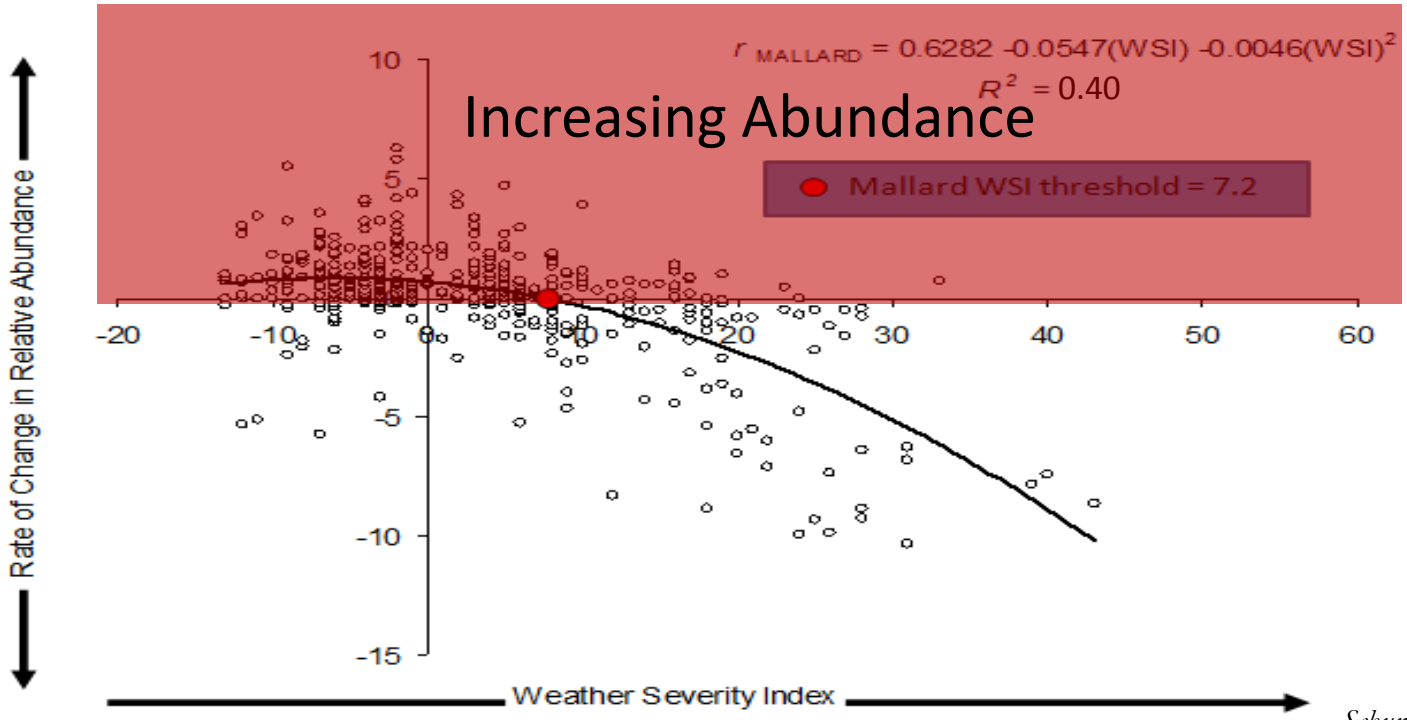
- For Mallards, Cumulative WSI



Schummer et al. 2010 JWM

Weather Severity Indices

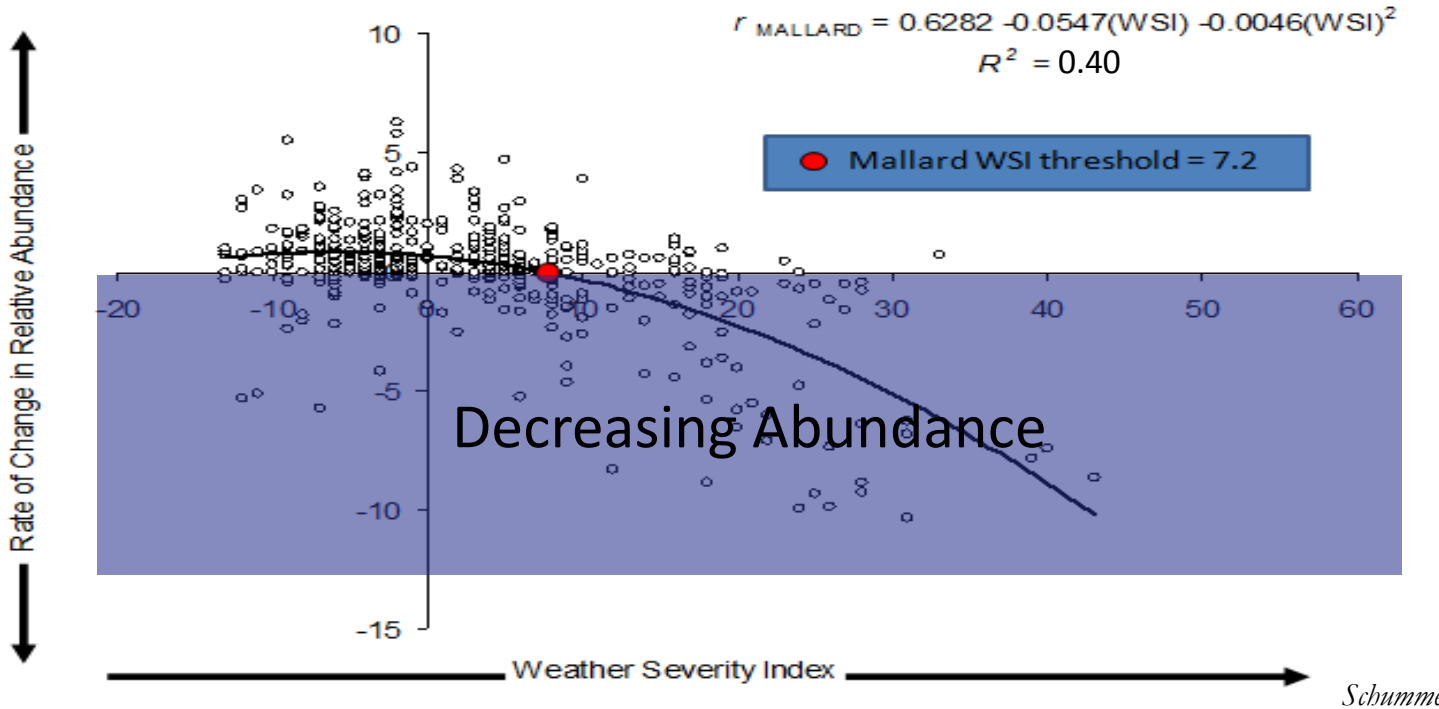
- For Mallards, Cumulative WSI



Schummer et al. 2010 JWM

Weather Severity Indices

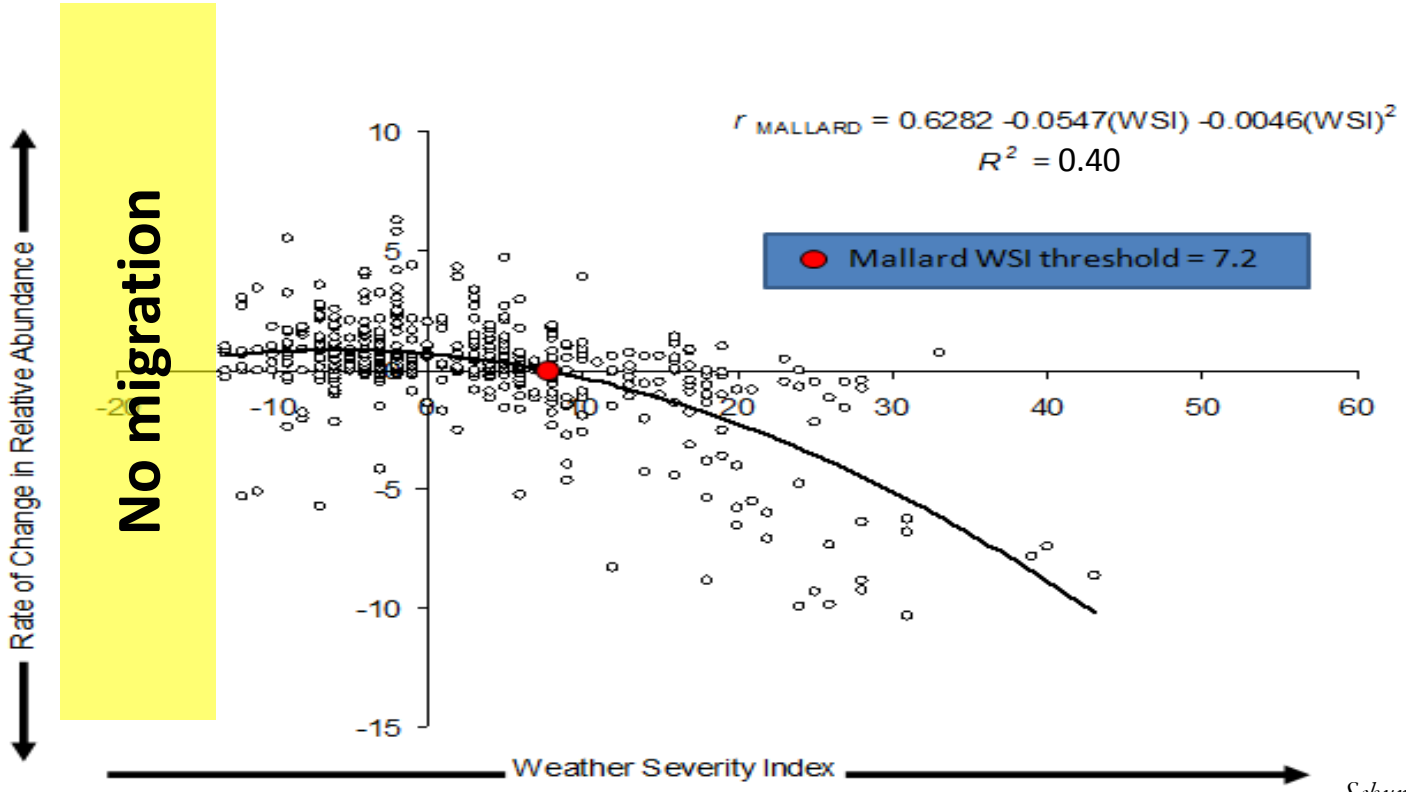
- For Mallards, Cumulative WSI



Schummer et al. 2010 JWM

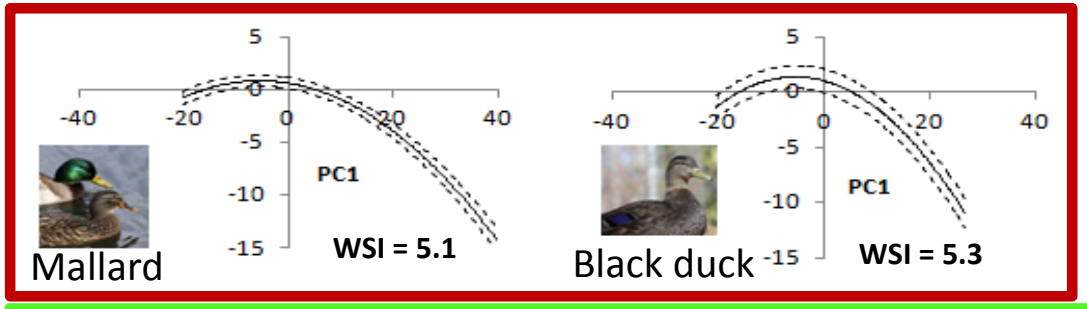
Weather Severity Indices

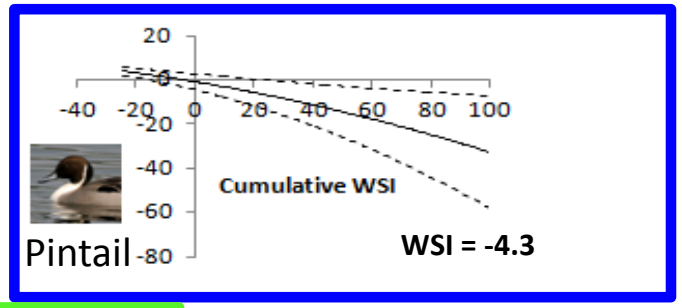
- For Mallards, Cumulative WSI

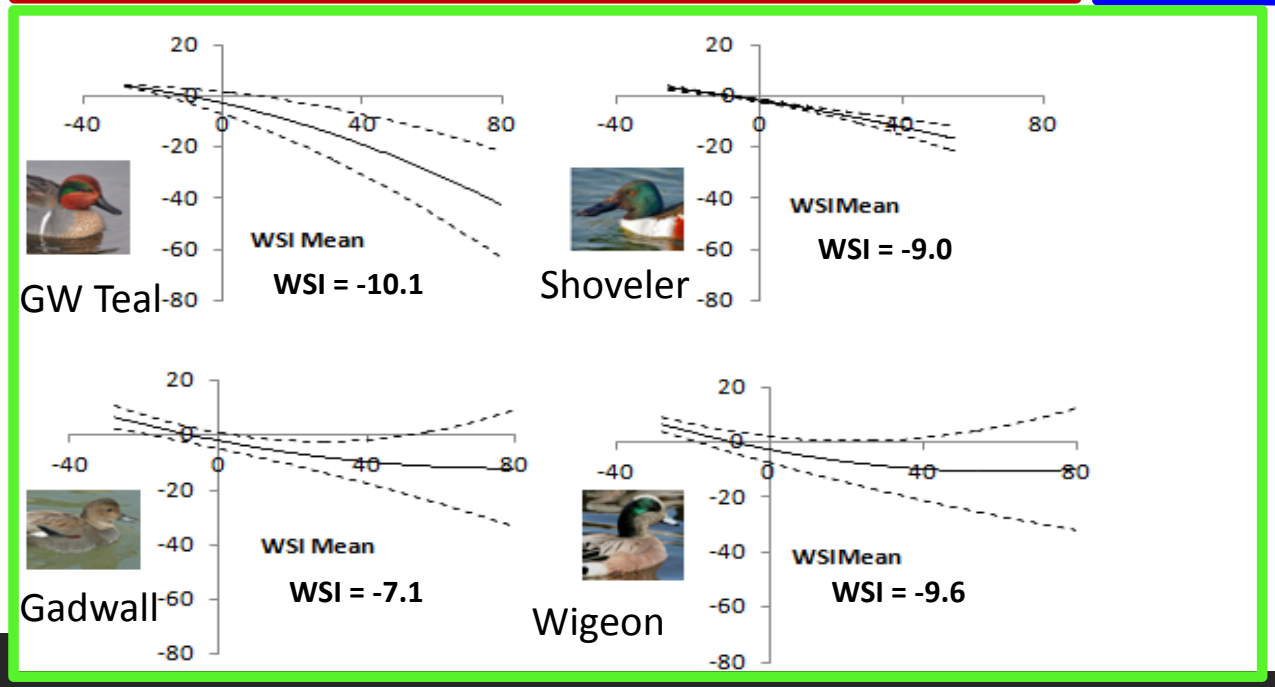


Schummer et al. 2010 JWM

Weather Severity Indices







PC1 and Cumulative WSI

-Temperature

- # days < 0° C

-Snow depth

- # days with > 1" snow

WSIMean

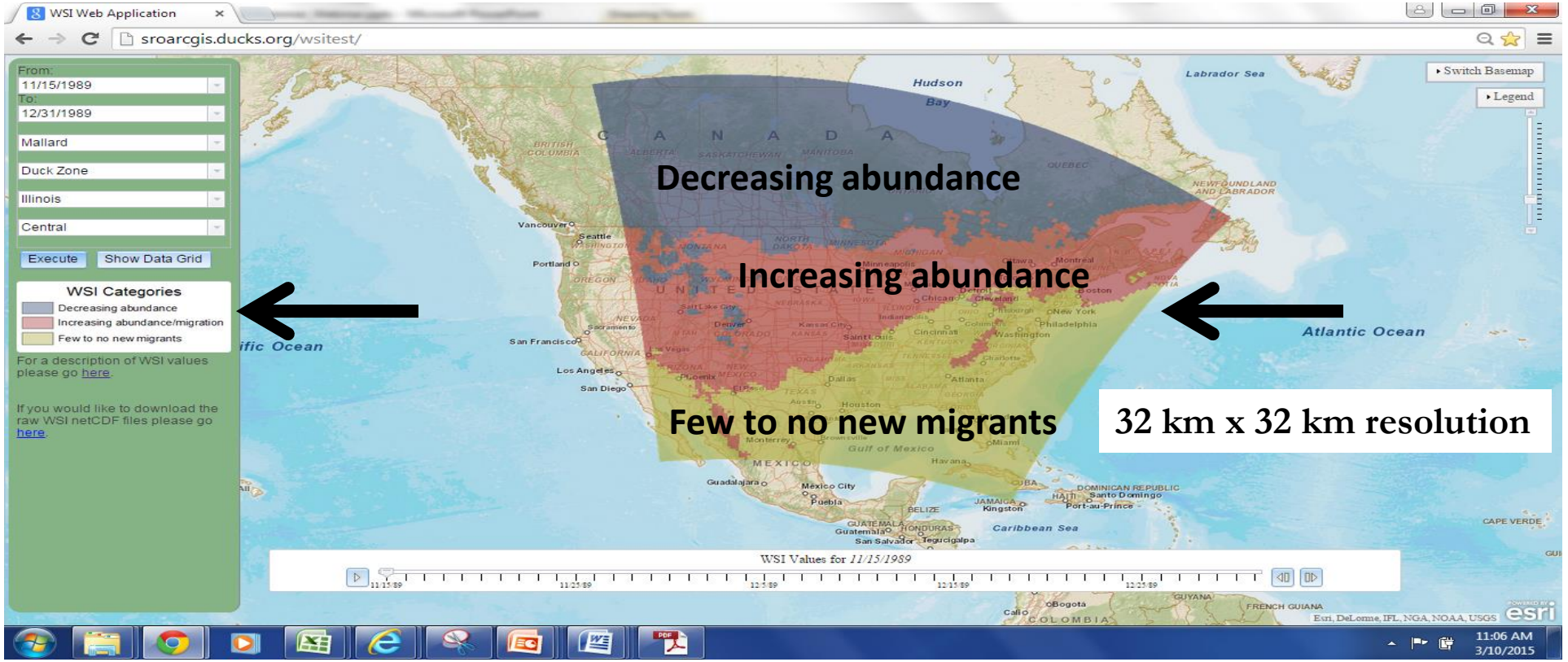
- Mean Temp. between two surveys
- # days < 0° C

-Snow depth

- # days with > 1" snow

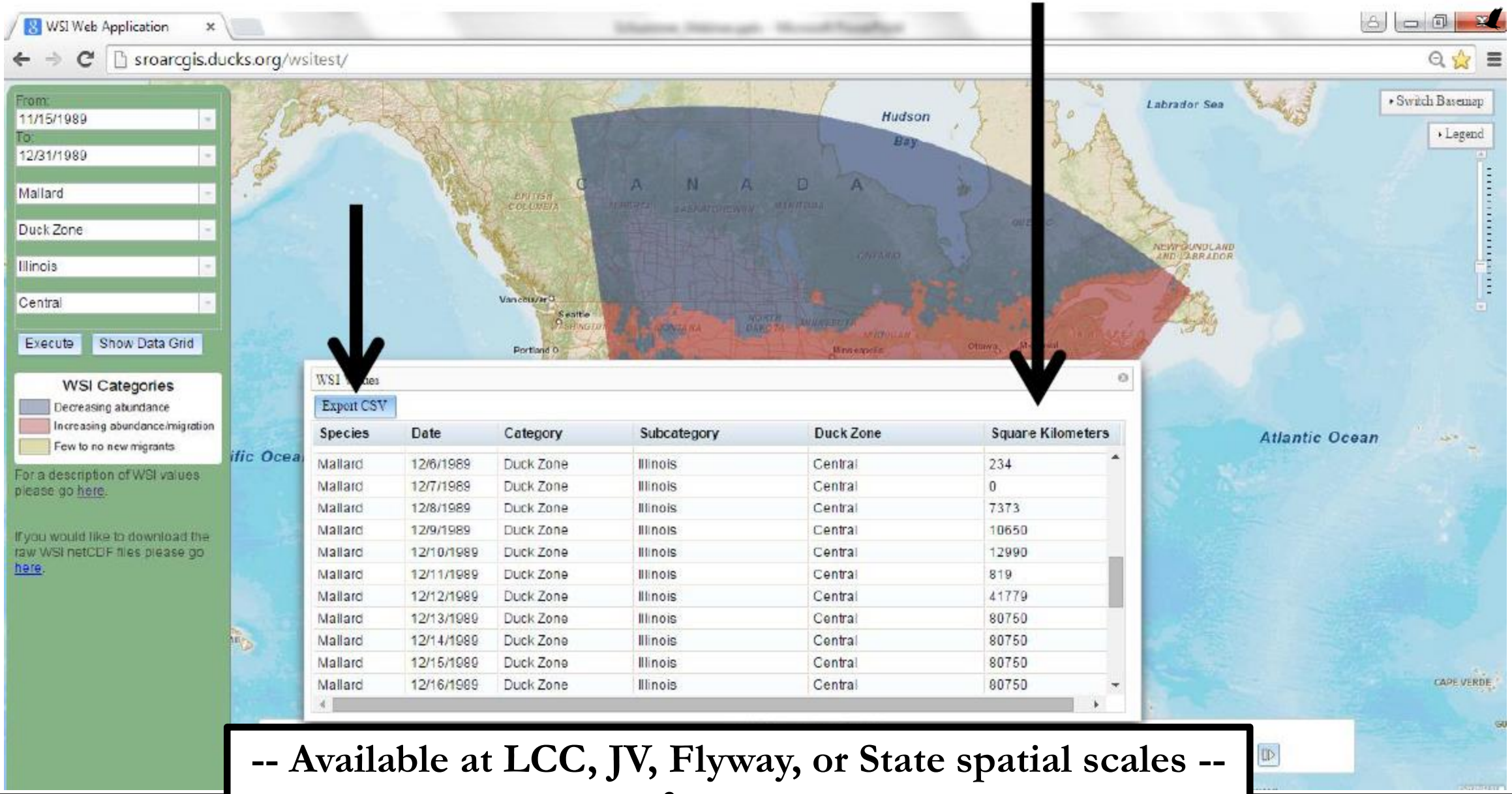
Van Den Elsen 2016

WSI Web Application Data Output



http://gisweb.ducks.org/wsi/app/

Square kilometers > WSI threshold

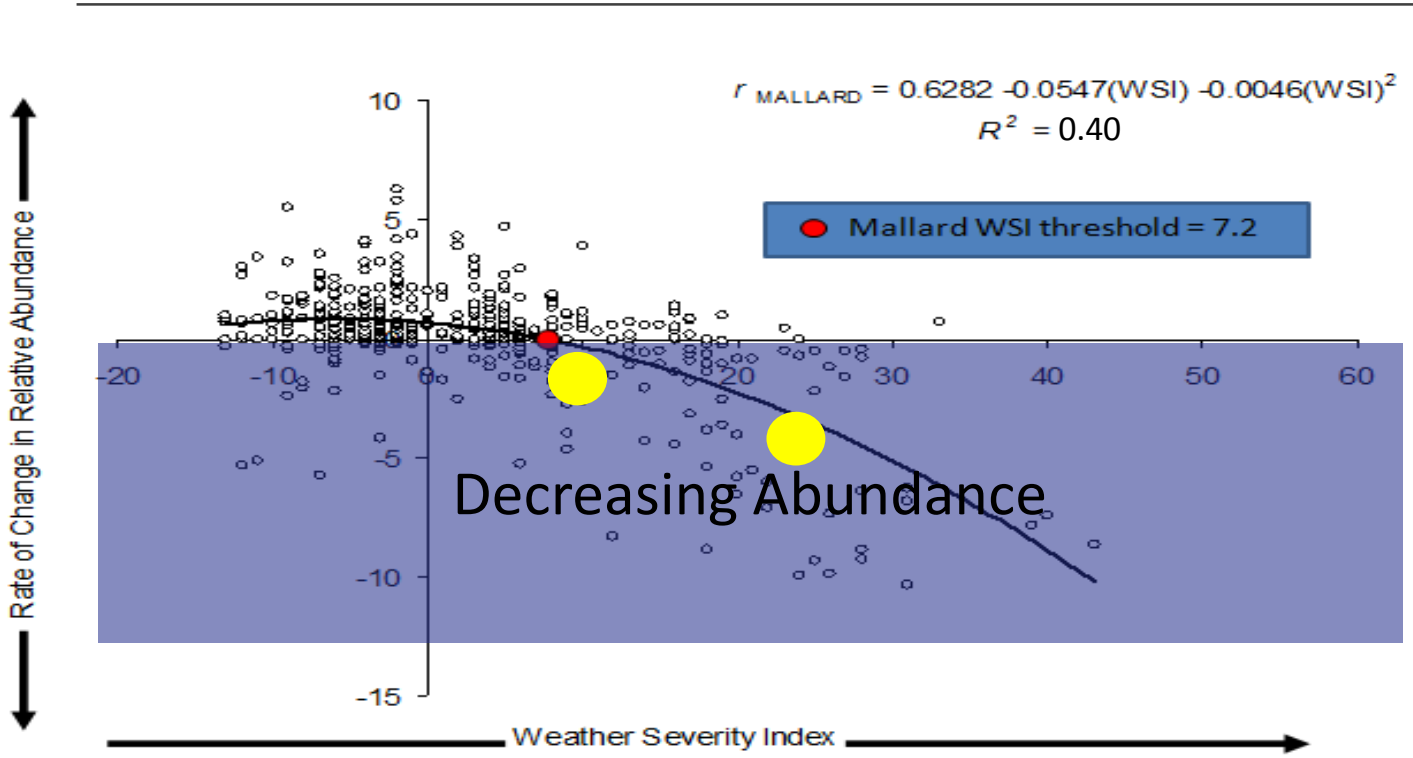


Species	Date	Category	Subcategory	Duck Zone	Square Kilometers
Mallard	12/6/1989	Duck Zone	Illinois	Central	234
Mallard	12/7/1989	Duck Zone	Illinois	Central	0
Mallard	12/8/1989	Duck Zone	Illinois	Central	7373
Mallard	12/9/1989	Duck Zone	Illinois	Central	10650
Mallard	12/10/1989	Duck Zone	Illinois	Central	12990
Mallard	12/11/1989	Duck Zone	Illinois	Central	819
Mallard	12/12/1989	Duck Zone	Illinois	Central	41779
Mallard	12/13/1989	Duck Zone	Illinois	Central	80750
Mallard	12/14/1989	Duck Zone	Illinois	Central	80750
Mallard	12/15/1989	Duck Zone	Illinois	Central	80750
Mallard	12/16/1989	Duck Zone	Illinois	Central	80750

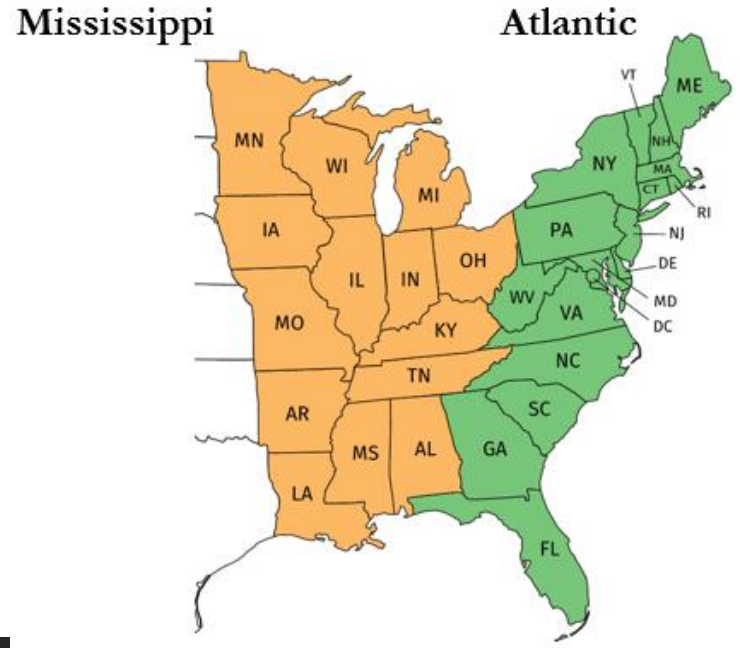
-- Available at LCC, JV, Flyway, or State spatial scales --

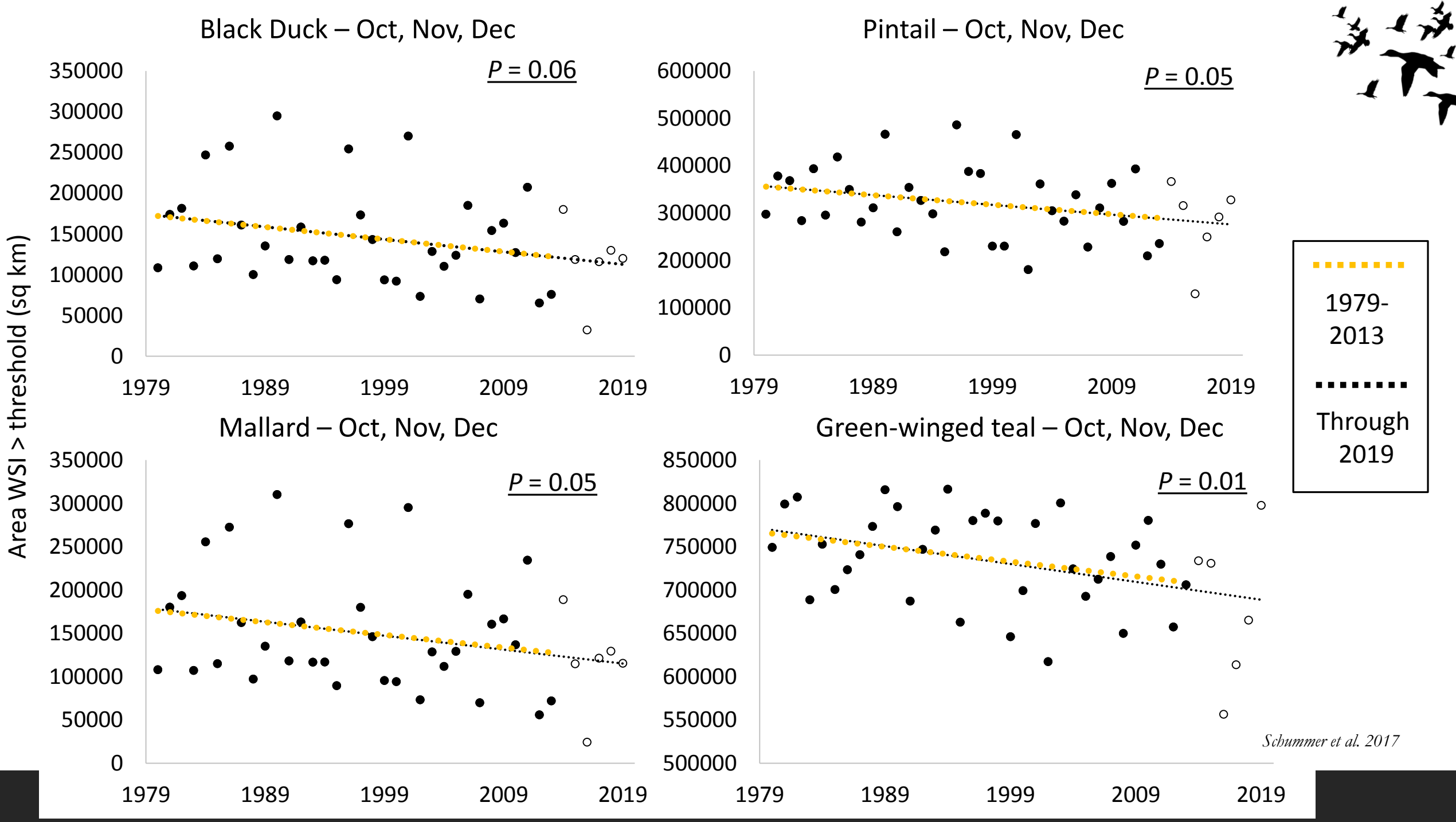
-- Outputs daily km^2 > WSI threshold for AOI --

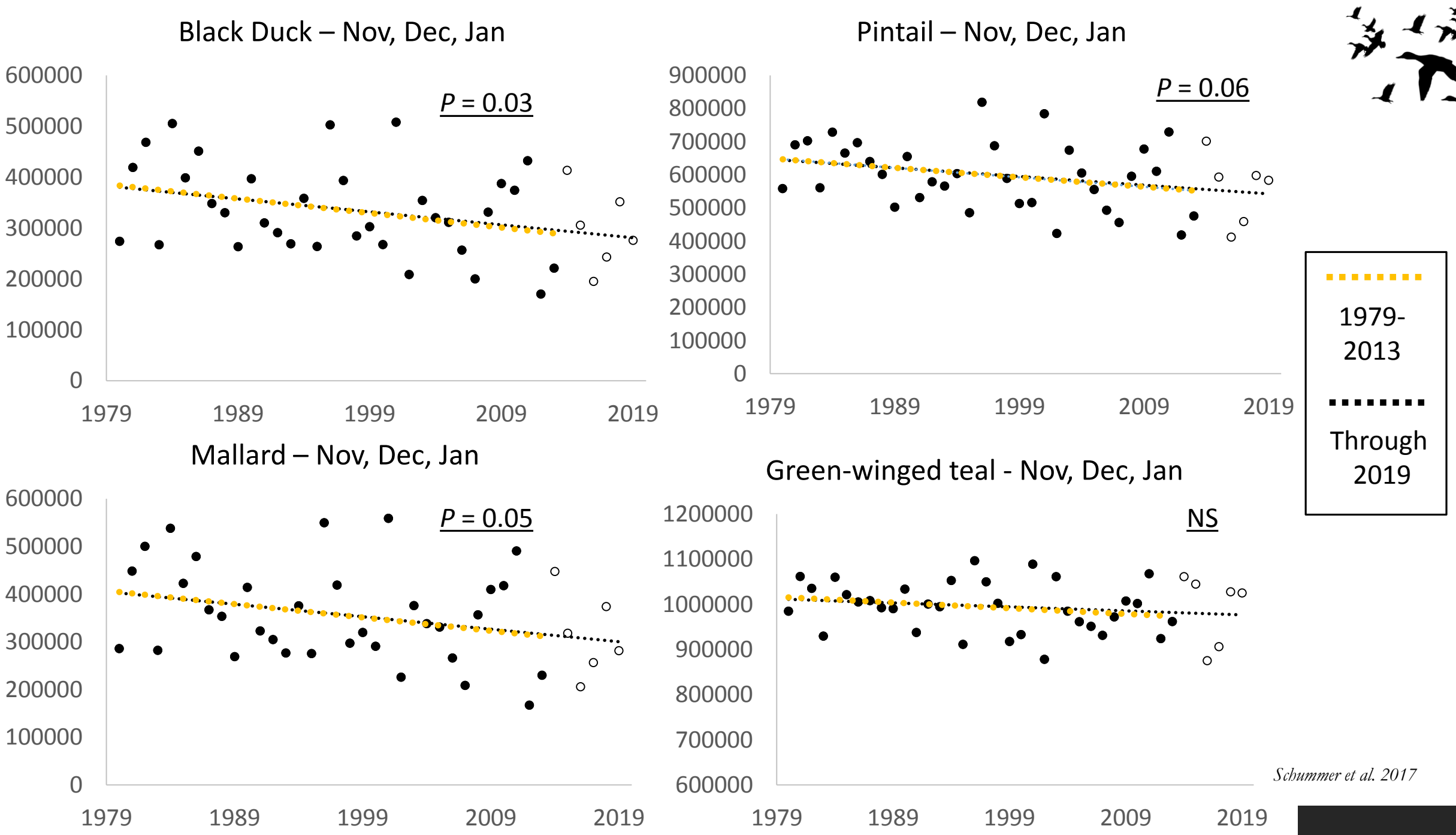
Mean daily sq km> WSI threshold for Oct-Nov-Dec (OND) and Nov-Dec-Jan (NDJ)

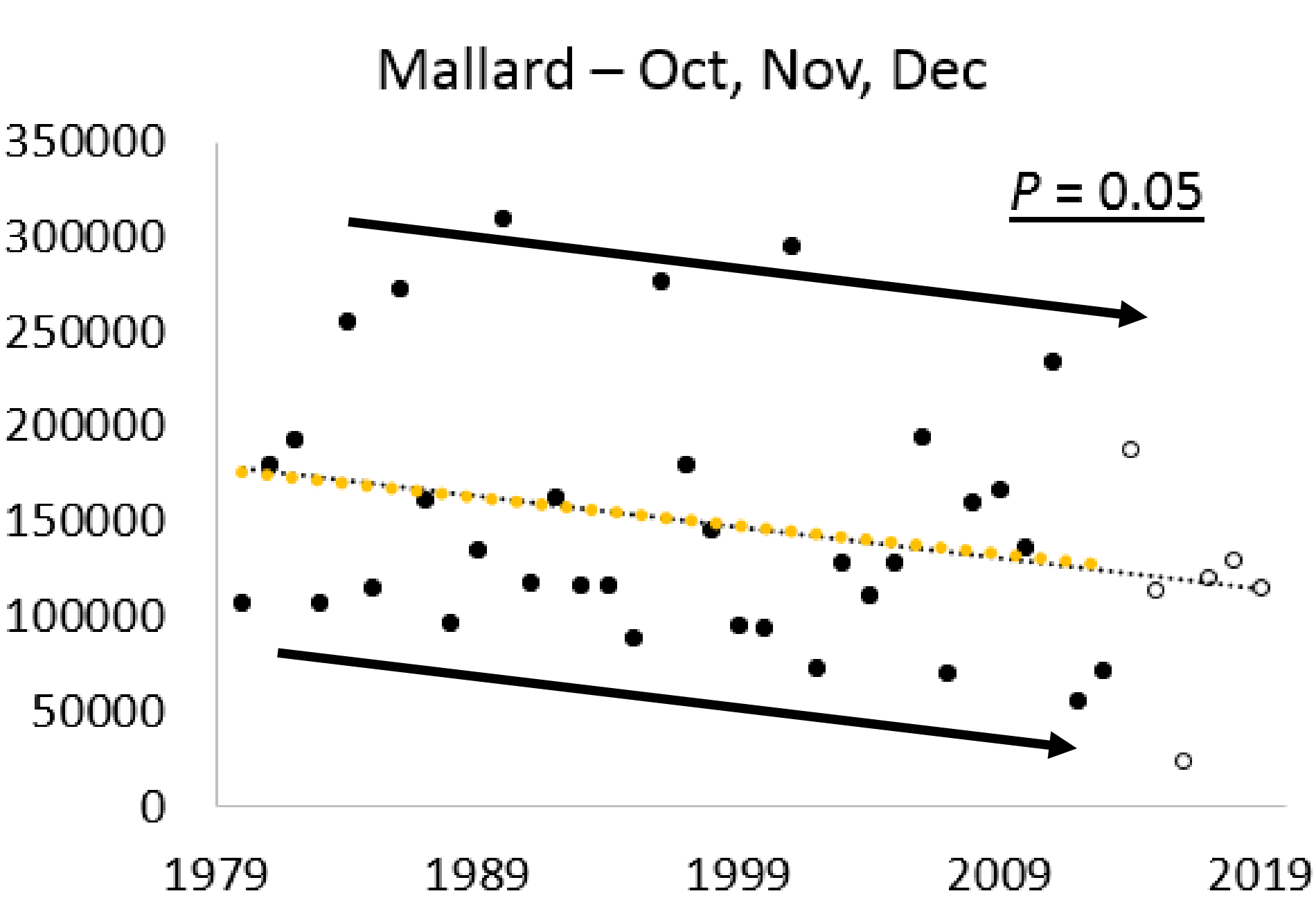


Treated Similar




Black Duck – Oct, Nov, Dec
P = 0.06
Pintail – Oct, Nov, Dec
P = 0.05
Mallard – Oct, Nov, Dec
P = 0.05
Green-winged teal – Oct, Nov, Dec
P = 0.01
Area WSI > threshold (sq km)
1979-2013
Through 2019
Schummer et al. 2017


Black Duck – Nov, Dec, Jan
P = 0.03
Pintail – Nov, Dec, Jan
P = 0.06
Mallard – Nov, Dec, Jan
P = 0.05
Green-winged teal - Nov, Dec, Jan
NS
Area WSI > threshold (sq km)
1979-2013
Through 2019
Schummer et al. 2017


Mallard – Oct, Nov, Dec
P = 0.05
350000
300000
250000
200000
150000
100000
50000
0
1979
1989
1999
2009
2019

Changes in WSI - Mississippi & Atlantic Flyways 1979 – 2013

EXAMPLE: Nov-Dec-Jan for Mallard, Black Duck, Pintail

- Available area for ducks to winter increased annually by 2,866 sq km
- Or 96,798 sq km, 1979 - 2013
- Using mean of 1,572.70 duck use days/sq km for UMRGLJV

- 152,234,215 DUDs or

An additional 1,654,720 ducks to feed each day for this 92-day period, Nov through Jan

Schummer et al. 2017 Wildlife Society Bulletin

Thank you - Questions