

# Osprey in the Chesapeake

## Life History, Reproduction, Population, Diet and Stressors



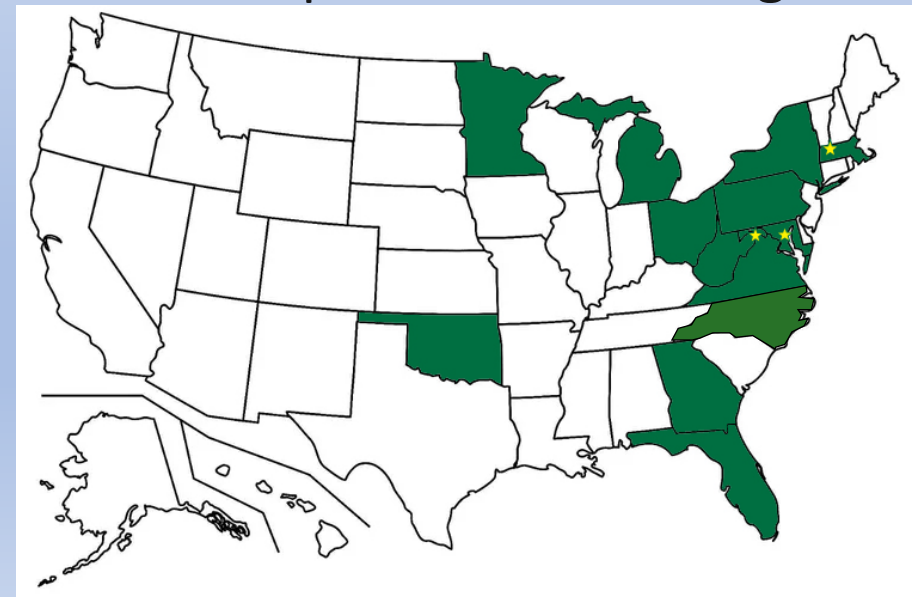
# Overview: USGS, Eastern Ecological Science Center

## U.S. Geological Survey

- Science arm of the Department of the Interior; non-regulatory
- Reputation for unbiased, scientific excellence

## Eastern Ecological Science Center

- Provides world-class science to inform natural resource decision-making
- Three campuses: MD, WV and MA
- Staff located in many states across the U.S. and with scientific capabilities including:
  - Species Population Dynamics & Surveillance
  - Quantitative Methods & Decision Science
  - Animal Health Diagnostics & Surveillance
  - Ecological Patterns & Processes
  - Fish Passage Design & Analysis
  - Remote Sensing & Geospatial Analysis
- Recognized worldwide for migratory bird science
- Collaborative osprey research for >50 years



# Osprey (*Pandion haliaetus*)

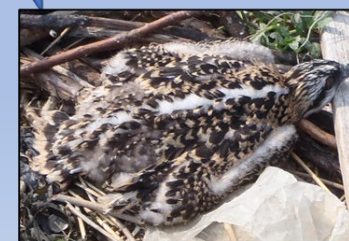
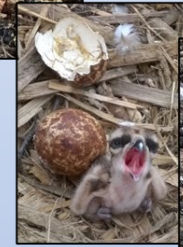
- Day-hunting bird of prey
- Distributed worldwide
- Adults large: 1400-2000 g, wingspan 59-70.8 inches
- Long-lived: generally 8 to 10 years (record 29 years)
- “Fish Hawk”, relies on live fish as food:
  - 99% of diet is fish of 150-300 g, ~6-13 inches
  - plunge dives within a meter of water surface
- Occupies many habitat types near shallow waters
- Northern populations migrate south, return north as waters warm and fish become accessible
- Sexually mature at 3-4 years
- Monogamous, long-term pair bonds



Map: Lynx Edicions/BirdLife International

# Life History in Chesapeake's "Osprey Garden"

- **Late February to early March:** Migrants arrive
- **mid-March to mid-April:** Courtship and nest building (ATONs, platforms, duck blinds, trees)
- **mid-April to May:** Egg laying (2-4 eggs)
- **day 0-40:** Incubation (38-42 days)
- **day 41-99:** Nestling period (55-60 days)
- **July:** Exercise followed by fledging
- **September:** Migration south



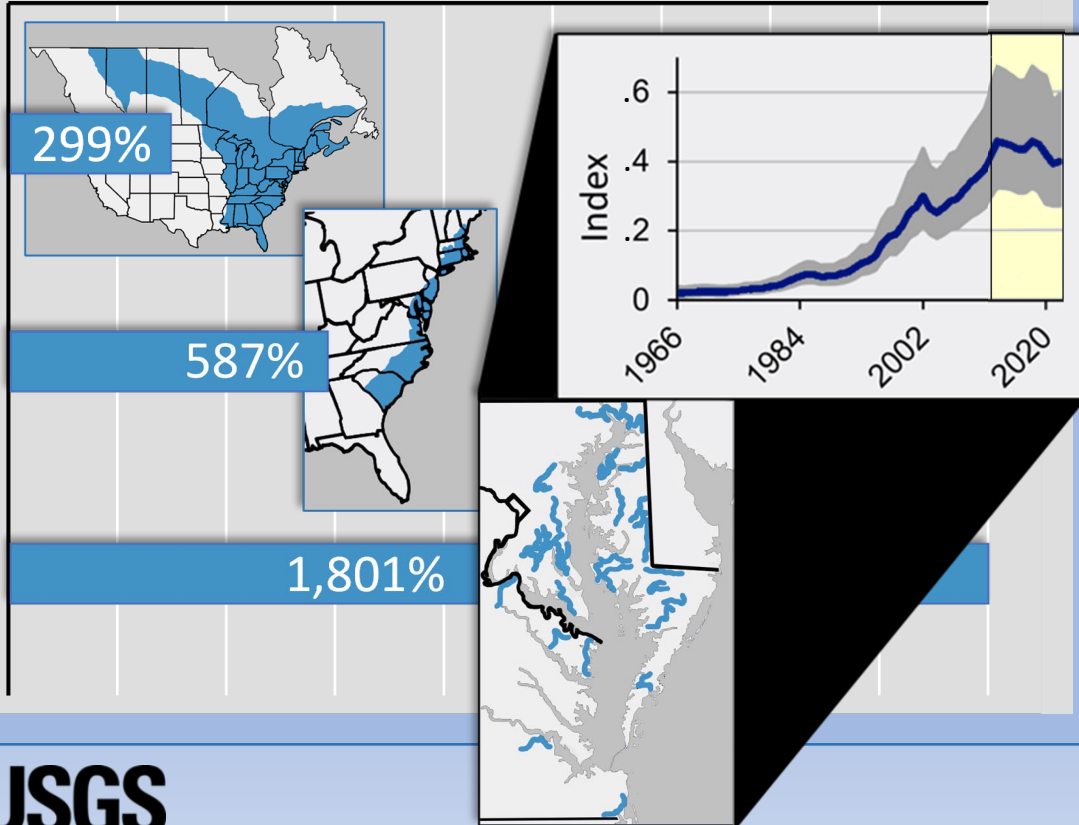


# Continental and Regional Population Trends

## Long-term Change 1966 – 2022

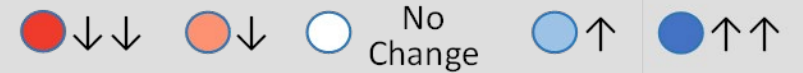
### North American Breeding Bird Survey

0% → Overall Population Growth → 1,800%

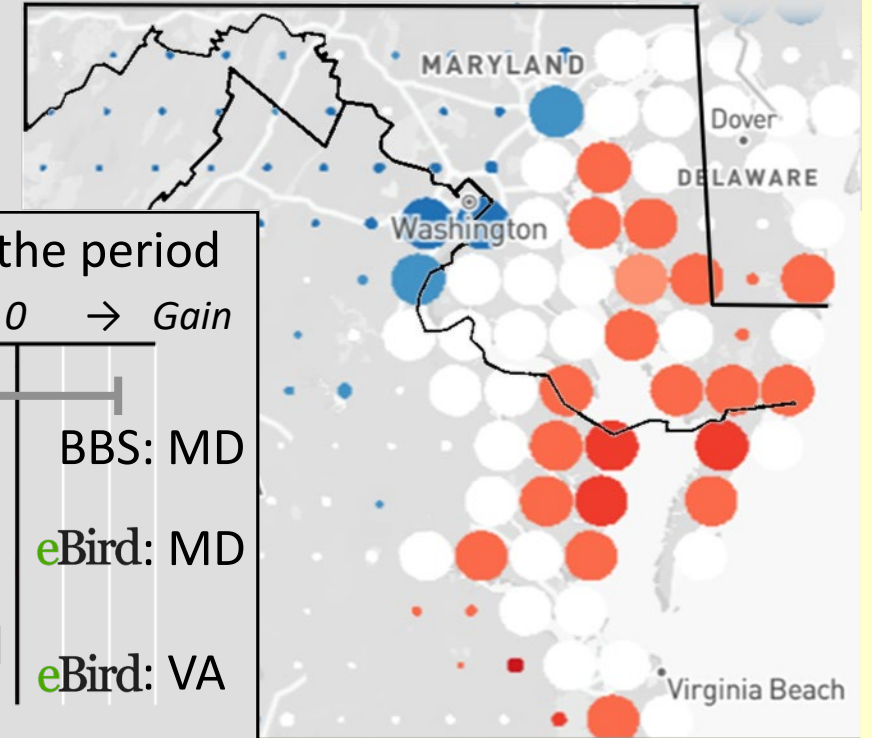
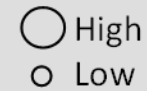


## Recent Picture - Chesapeake 2012 – 2022

eBird

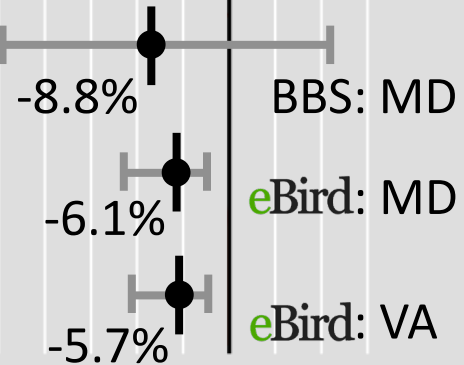


Abundance

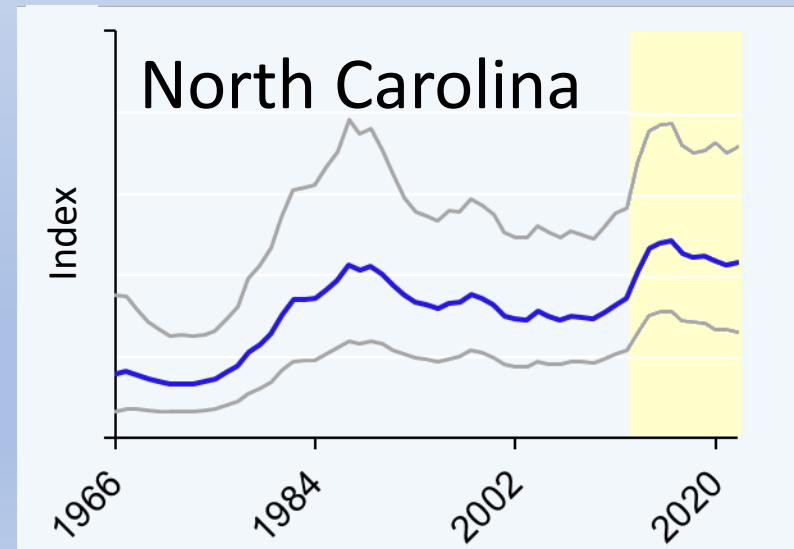
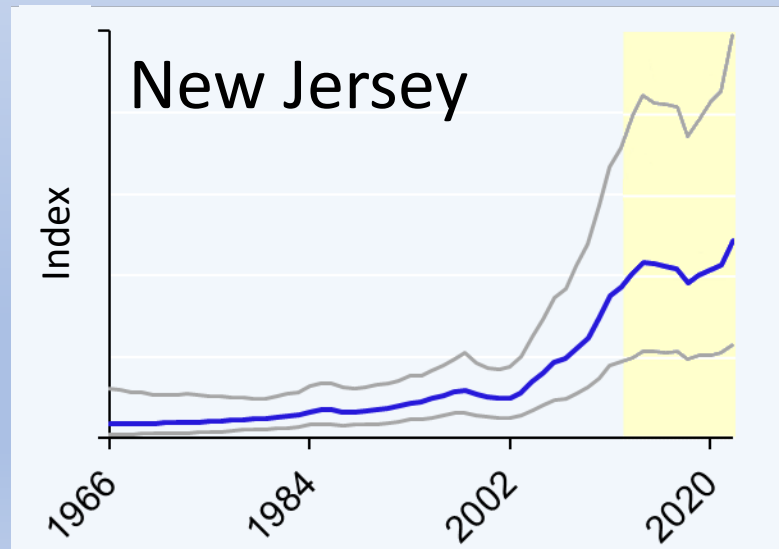
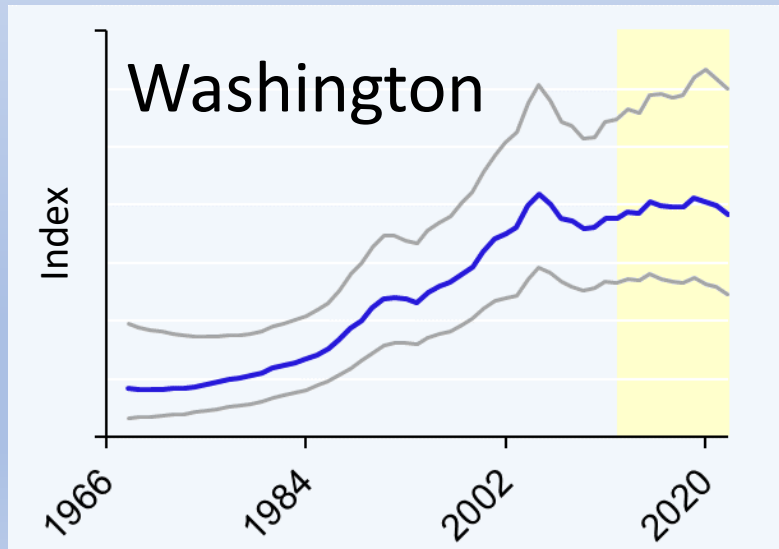
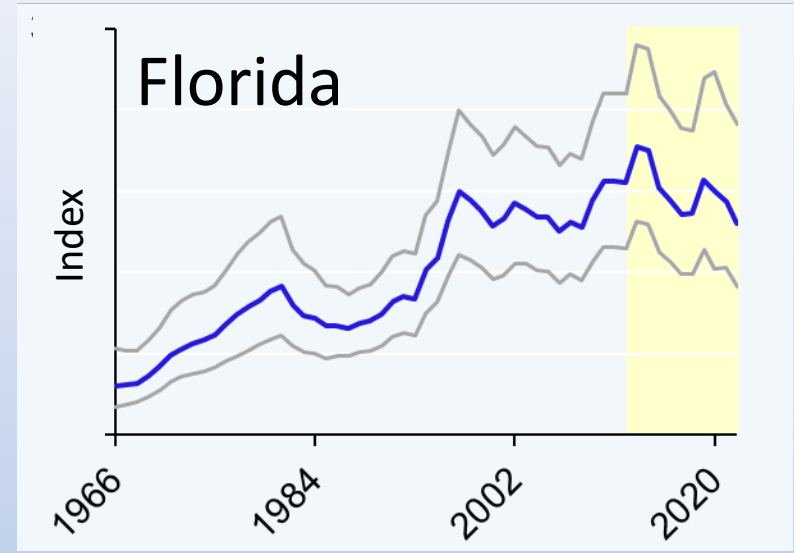
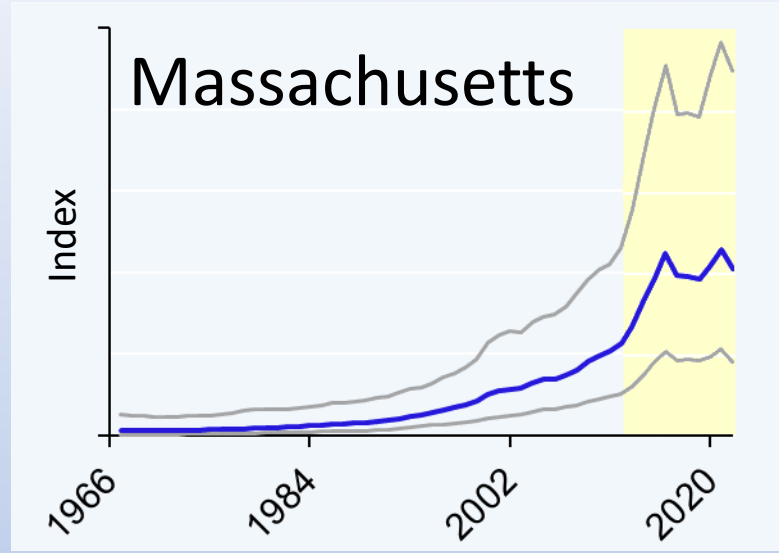
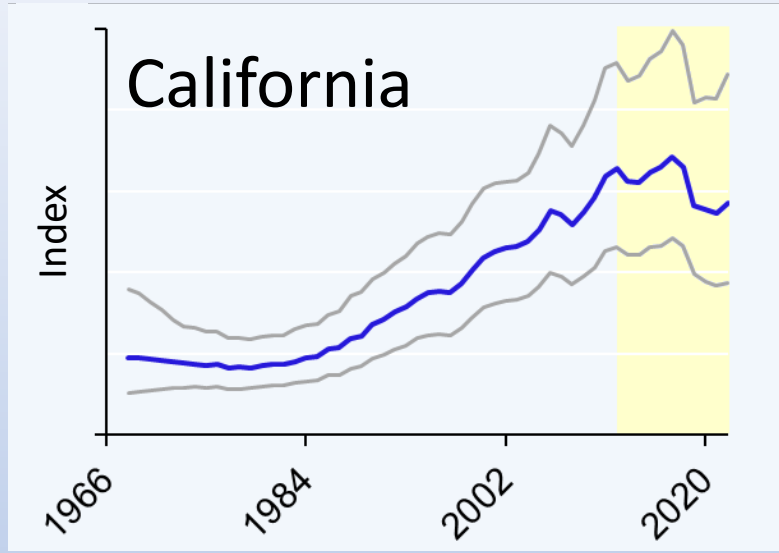


Avg. over the period

Loss ← 0 → Gain

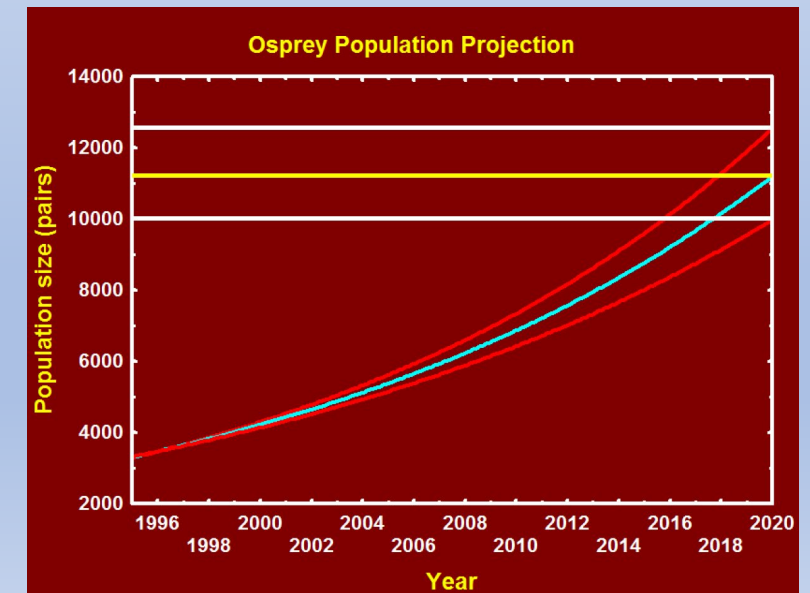
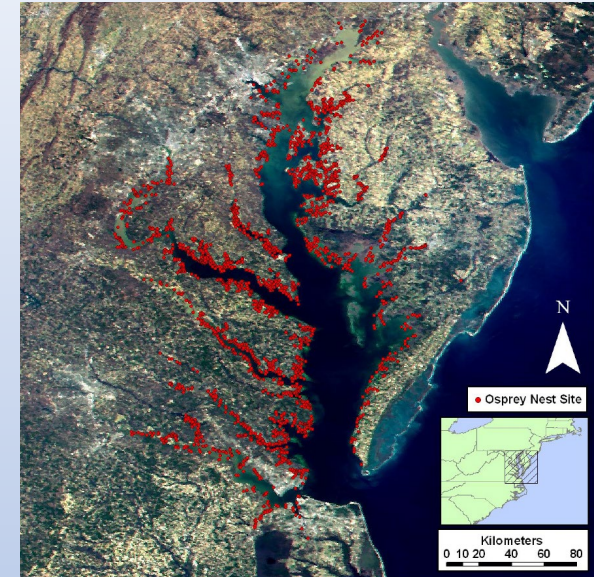


# Continental Perspective



# Osprey Nesting Population in Chesapeake Bay

- Aerial and ground survey (1973, DDT era)  
1,450 pairs (Henny et al. 1973)
- Aerial, boat and ground survey (1995/96)  
3,473 pairs (Watts et al. 2004)  
Rapid growth in tidal fresh/brackish waters  
Slowest recovery Eastern Shore
- Chesapeake osprey population project (2020)  
11,000 pairs (Watts and coworkers)



# Food Requirements

- Opportunistic feeders (if abundant, right size and accessible, it is eaten)
- Energy intake per day (Poole 1989, 2019)

	Breeding	Wintering
Number of fish	6-8	1-3
Daily catch (grams)	1250	300-350
Male's share (grams)	400	300-350
Male's (kilocalories)	360	200-250
Time (minutes/day)	195	30

- During nesting, male provides fish to mate and young (but not always)
- Provisioning rate depends on number of nestlings
- Male foraging distance from nest: 5-10 miles (rarely 15-20 miles)



# Fish Species Consumed by Ospreys in Chesapeake Depends where Feeding/Nesting

*(Glass and Watts 2009; Lazarus et al. 2016)*

## Susquehanna: salinity <0.5 ppt

- Catfish (77%)
- Gizzard shad (20%)

## Upper Bay Estuarine Areas: salinity 0.5-5 ppt

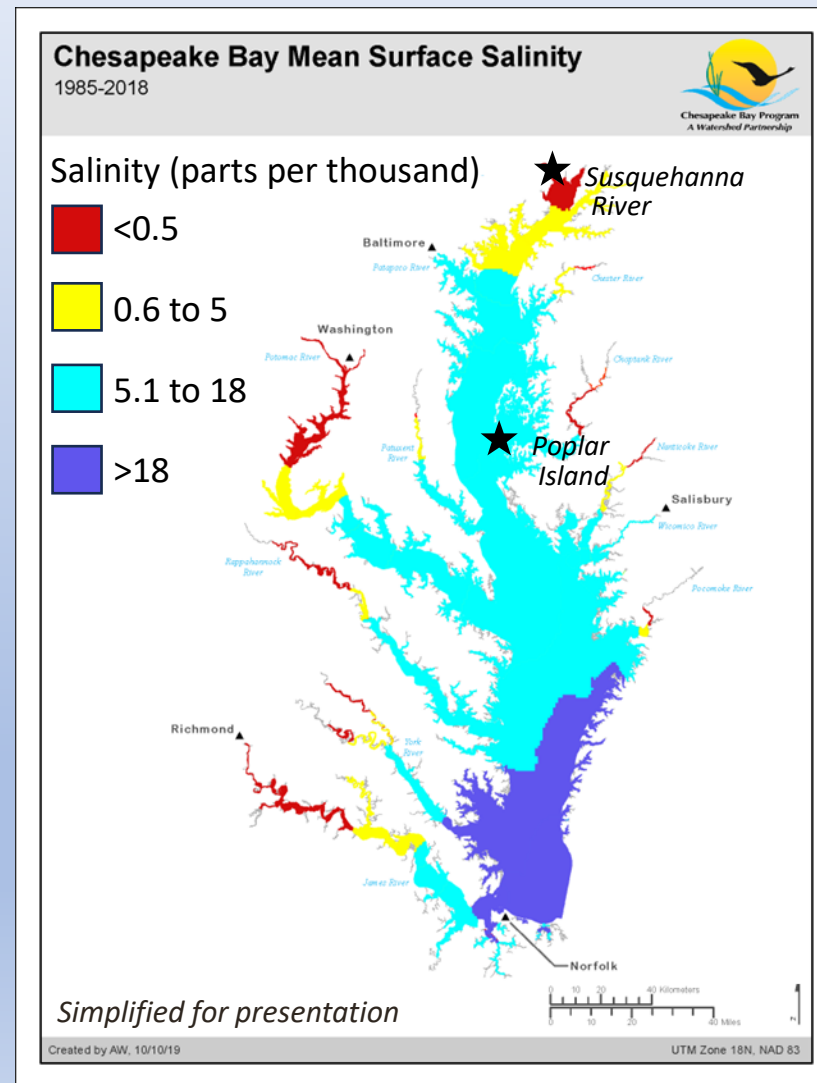
- Catfish (52%)
- Gizzard shad (28%)
- Atlantic croaker (7%)

## Poplar Island: salinity 8-13 ppt

- Striped bass (48%)
- Atlantic menhaden (44%)

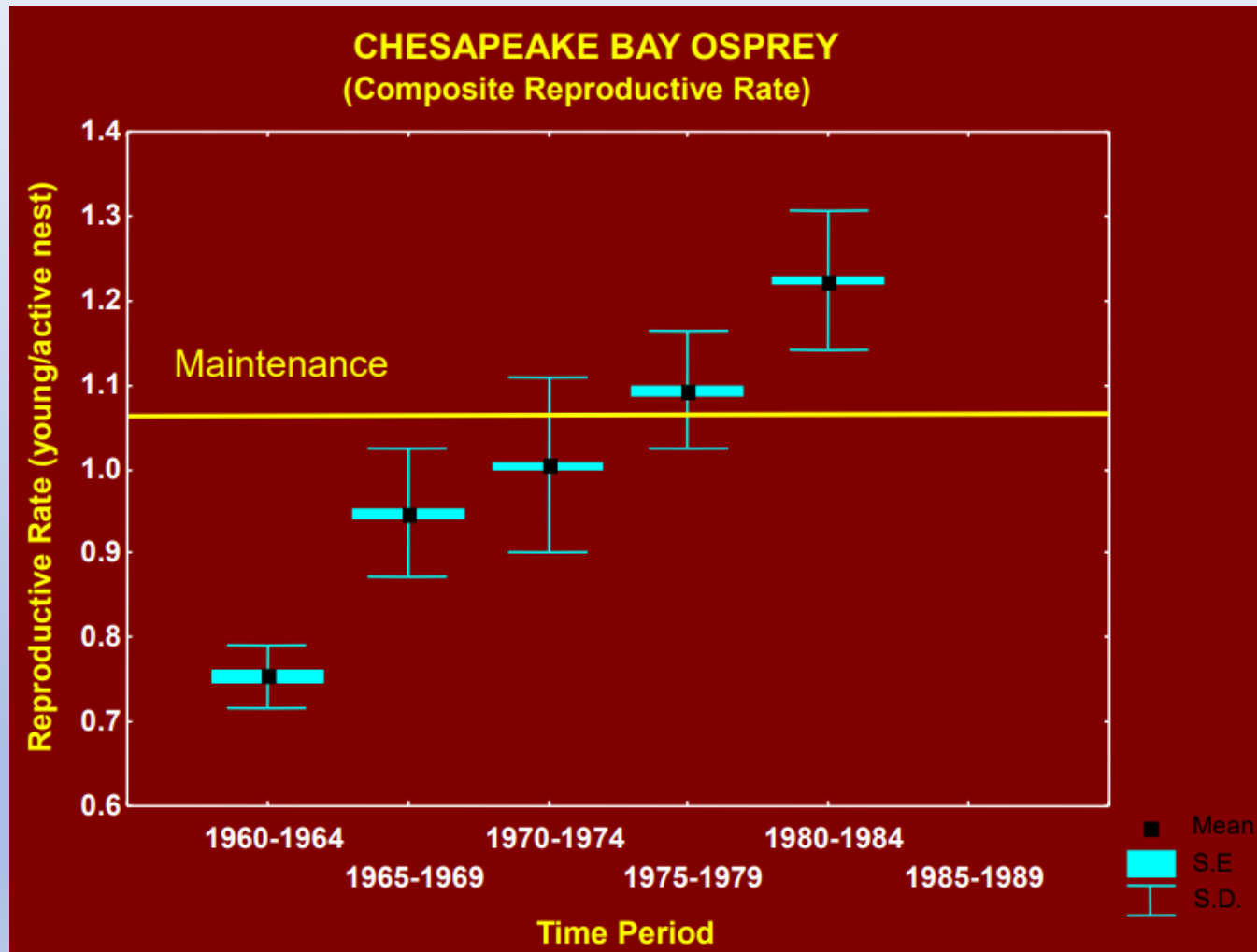
## Lower Bay Estuarine Areas: salinity > 18 ppt

- Spotted seatrout (29%)
- Atlantic menhaden (24%)
- Atlantic croaker (12%)



# Reproductive Rates for Population Stability

*(Watts and Paxton 2007)*



# Prey Abundance Drives Reproductive Rate

Symmetrical Brood

vs.

Asymmetrical Brood (food stress)



- Establishment of dominance, sibling aggression, brood reduction

# Reproductive Rates in Lower Chesapeake Demographic Sink

*(Watts et al. 2024)*

## Reproductive rate and Brood provisioning

Parameter	1974-75	1985	2006-07	2021	F-statistic	p value
Nests (N)	75	68	132	68		
Clutch size	$2.7 \pm 0.08$	$3.0 \pm 0.09$	$3.0 \pm 0.27$	$2.7 \pm 0.09$	2.2	0.084
Reproductive Rate	$1.7 \pm 0.10$	$1.4 \pm 0.11$	$0.8 \pm 0.08$	$0.3 \pm 0.11$	34.9	<0.001
Brood Size	$2.0 \pm 0.10$	$1.8 \pm 0.10$	$1.5 \pm 0.09$	$1.2 \pm 0.17$	10.0	<0.001

Estimated reproductive rate required for a stable population within the Chesapeake Bay is 1.15.



# Stressors Affecting Osprey Reproduction

- Limited food availability/quality
- Depredation
- Intraspecific competition for nest sites, prey, etc.
- Interspecific competition (e.g., bald eagle) for nest sites, prey, etc.
- Disease, HABs and other stressors
- Inexperienced breeders
- Weather events
- Environmental contaminants
- Water depth and clarity



# Information Needs and Data Gaps

- Relationship between trends in osprey abundance with:
  - prey species trends
  - fish community composition shifts
  - population trend of other high trophic level feeders (e.g., other piscivorous birds, striped bass, bluefish)
- Better information about relation among salinity, osprey diet, brood provisioning & demography
- More fishery independent data of prey fish abundance and age/size class

# Ongoing Research

- Osprey population and the availability of menhaden and other prey as their food source in Chesapeake Bay: historical and present-day comparison

Study area: Lower Bay, Patuxent River, Poplar Island, Choptank River

April 2024-December 2025

Multiple collaborators: USGS, USFWS, William & Mary, and others

