

Friends of Merrymeeting Bay Speaker Series
Presents

Running Silver!



Featuring: John Waldman

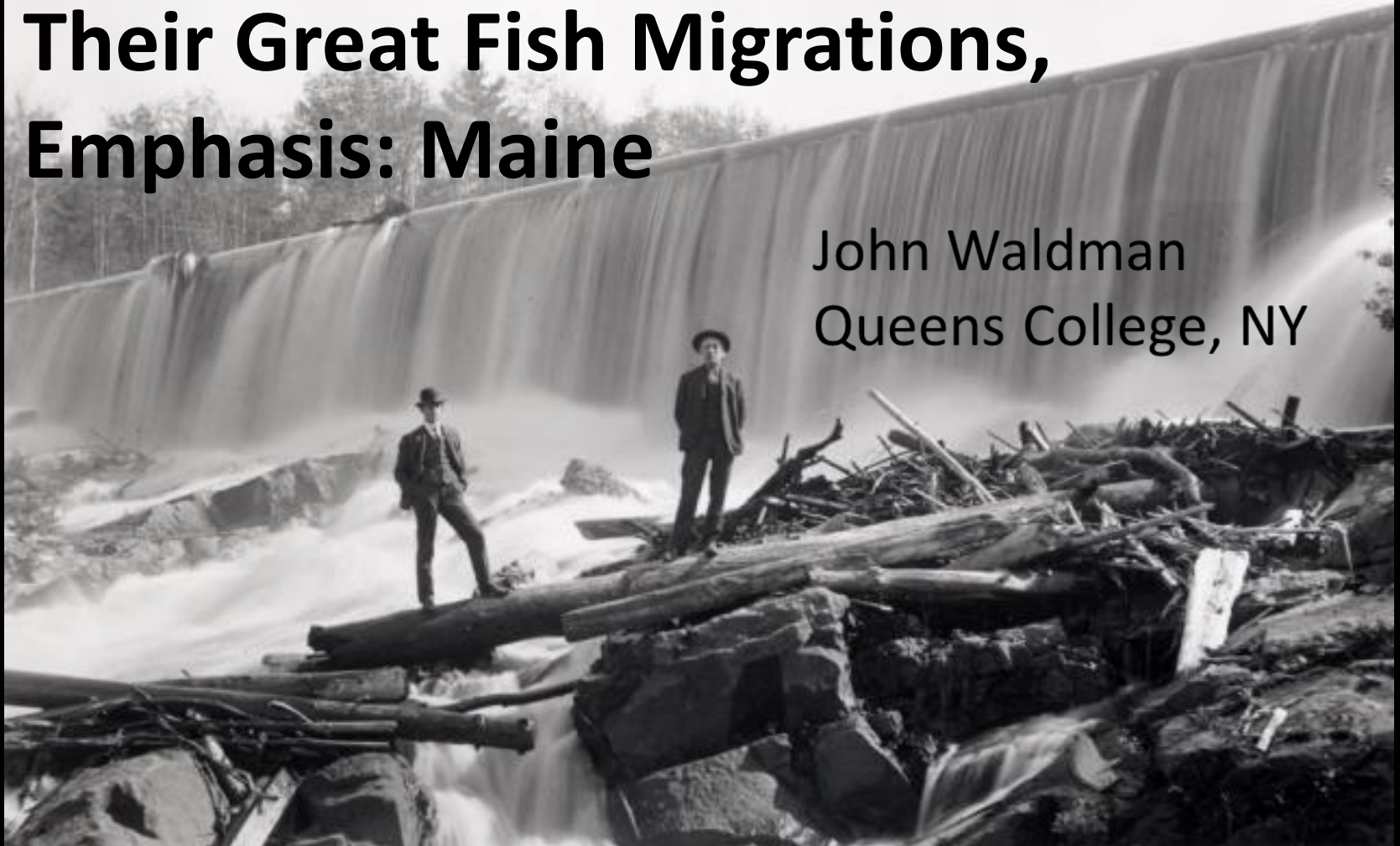
February 9th, 2023 www.fomb.org

www.mainmemory.net/item/9762

Collections of Sanford-Springvale Historical Society

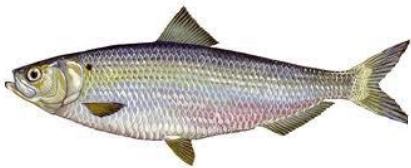
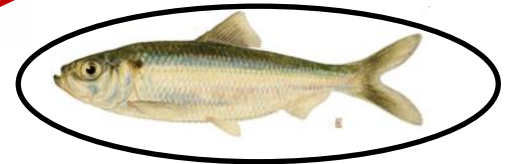
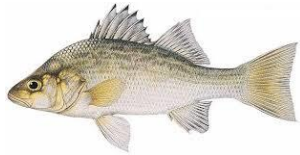
Restoring Atlantic Rivers & Their Great Fish Migrations, Emphasis: Maine

John Waldman
Queens College, NY



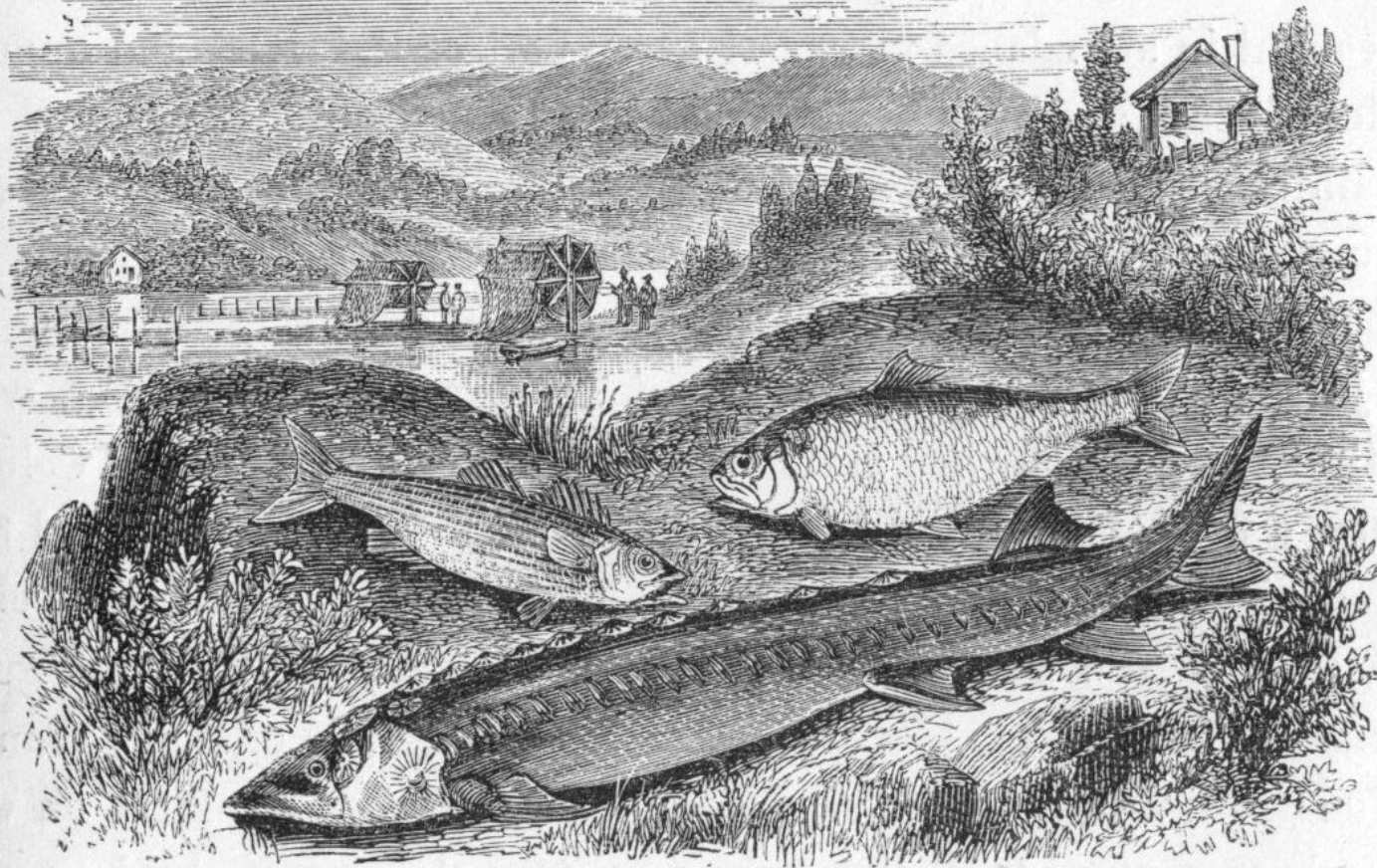
Dam at Old Falls, Mousam River, Maine ca. 1905

The Atlantic Assemblage



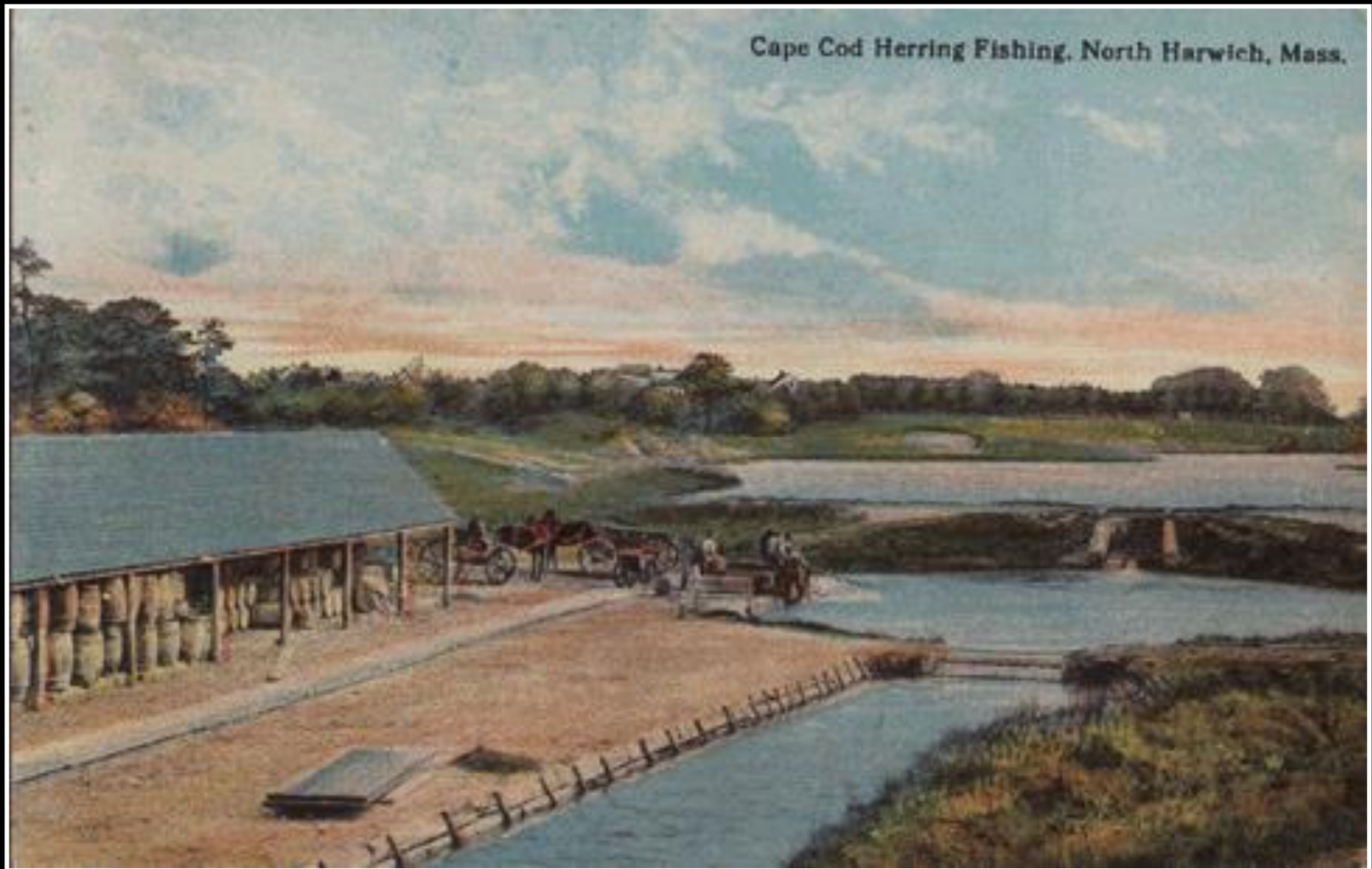
Diadromous Species are Iconic

From Lossing 1886: The Hudson from the Wilderness to the Sea



FISHING STATION.—STURGEON, SHAD, BASS.*

Managing Anadromous Fishes: *Promise & Perils*



In the Past Rivers “*Ran Silver*”

“Alewives came up to the fresh rivers to spawn in *such multitudes* it is *almost incredible*, pressing up such shallow waters as will scarce permit them to swim”

William Wood, *New England's Prospect*, 1634

“. . . in April there is a fish much like a herring that comes up into the small brooks to spawn, and when the water is not knee deep they will presse up through your hands, yea, thow you beat at them with cudgels, and in *such abundance as is incredible*.”

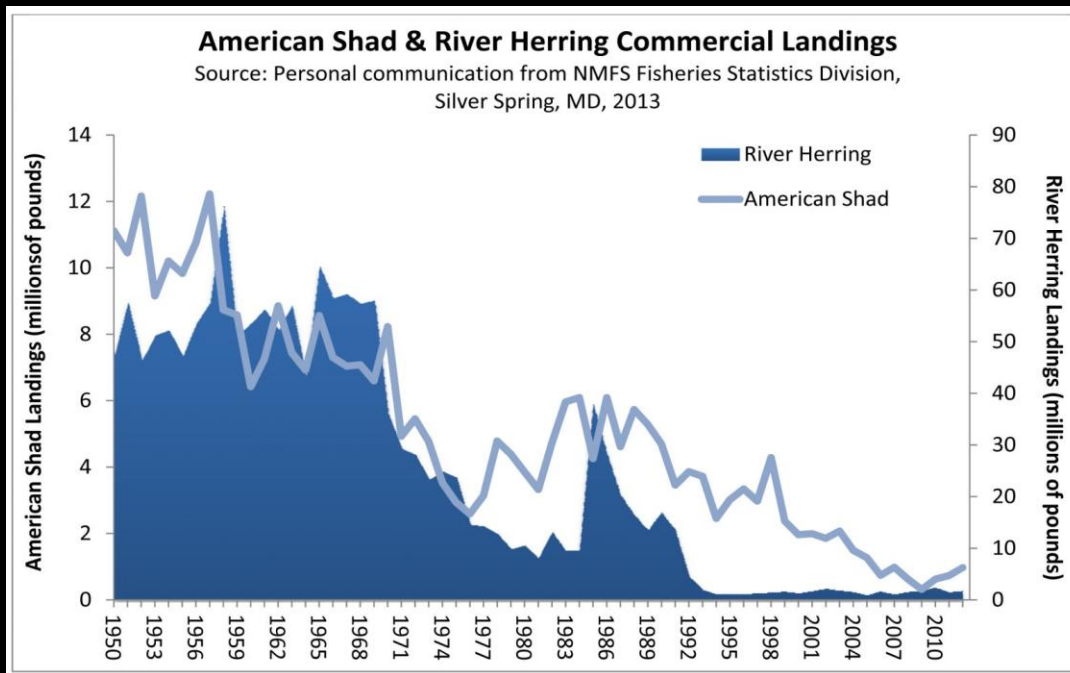
Capt. Chartles Whitborne, 1616

“In a word, it is *unbelievable*, indeed, *undescribable*, as also *incomprehensible*, what quantity is found there. One must behold oneself.”

William Byrd, *Natural History of Virginia*, 1728

River Herring Today in the Northeast

“Passenger Pigeons”



MA – total closure since 2005

RI –total closure since 2006

CT – near total closure since 2002

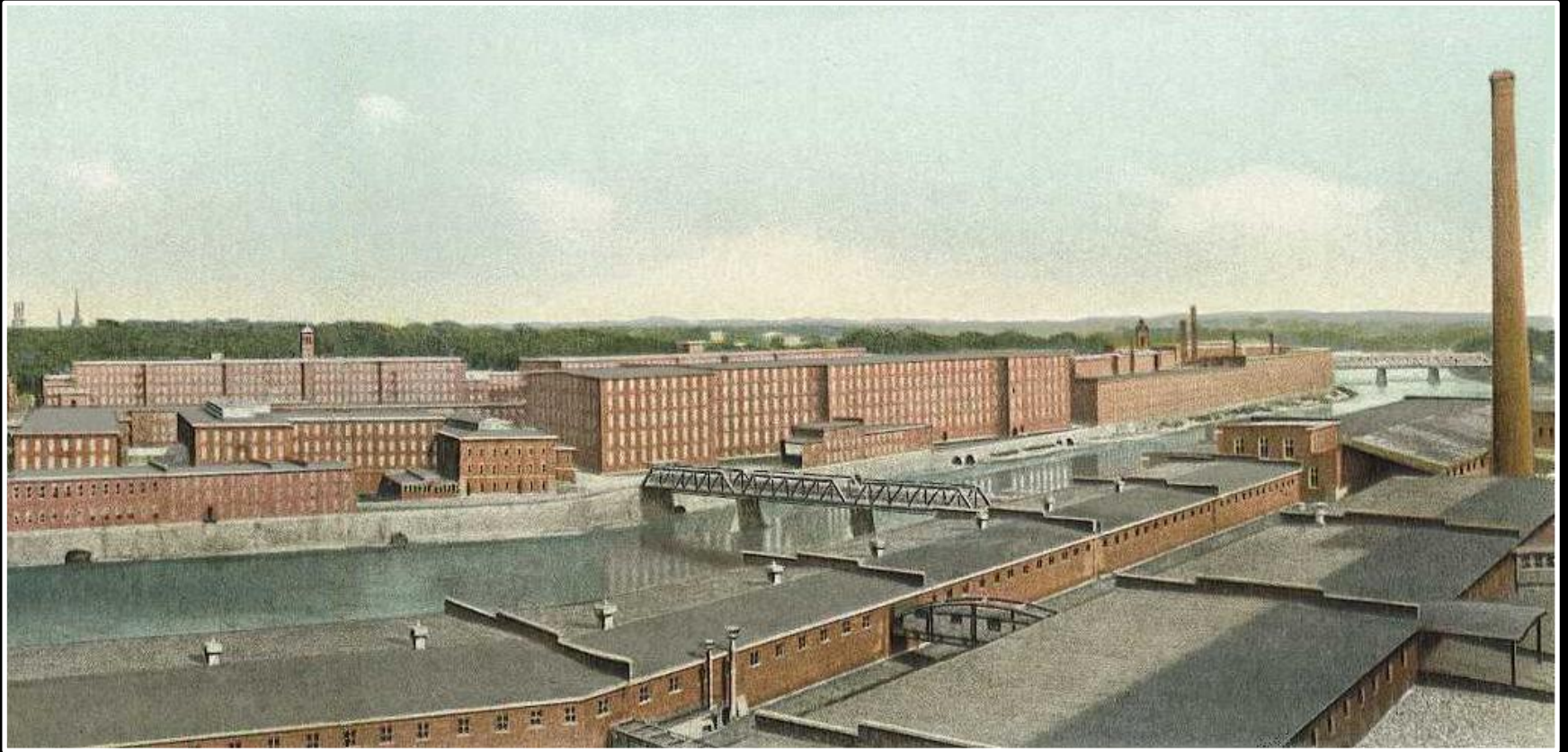
NY – reduced in HR;
closed elsewhere

A Week on the Concord and Merrimack Rivers
Henry David Thoreau (1849; trip made in 1839)



Who Hears the Fishes When They Cry?

Amoskeag Mills



“Celebrate the Magic of the Merrimack”



What's Changed?

Size



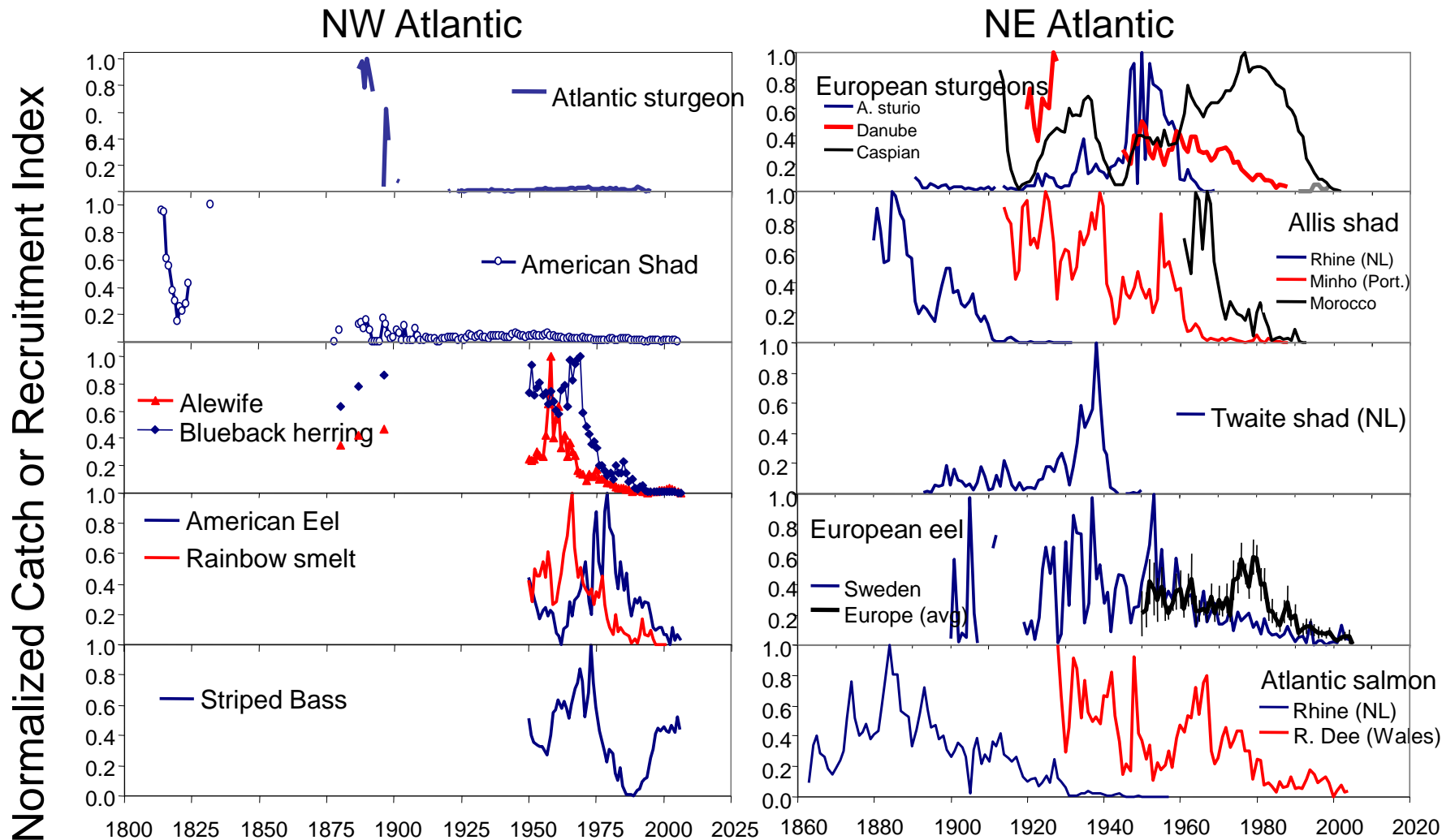
Oliver Hewitt, 1st row Right, Large Shad Catch, Fishs Eddy, NY



Species & Population Persistence

(Limburg & Waldman, Bioscience 2009)

- 22 Species found in Europe, NA, or both
 - Insufficient data on ½ (mainly lower value species)
- All others lost populations
 - American shad 70 of 138 lost (51%)
 - ~33% North American Atlantic salmon pops extirpated



For 31 time series of N. Atlantic anadromous fishes, relative abundances:

- *98% decline from historic highs in 13,*
- *90% in additional 11 (Limburg & Waldman: Bioscience 2009)*

Changes in Abundance

Atlantic Salmon

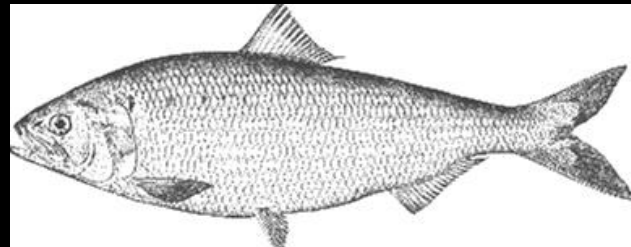
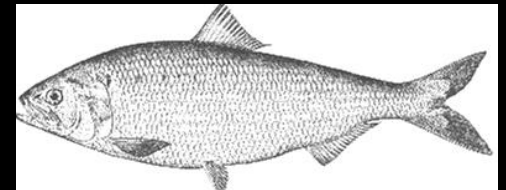
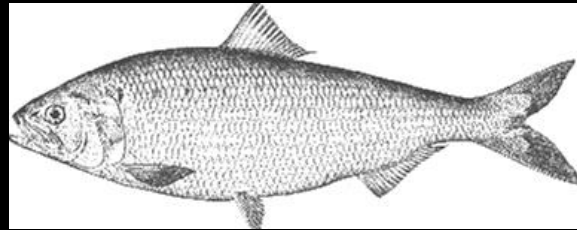
- Historical U.S. estimates 300,000 – 500,000 annually
- 2014: <400!; 2022 ~1500
- Federally endangered in Gulf of Maine rivers*****



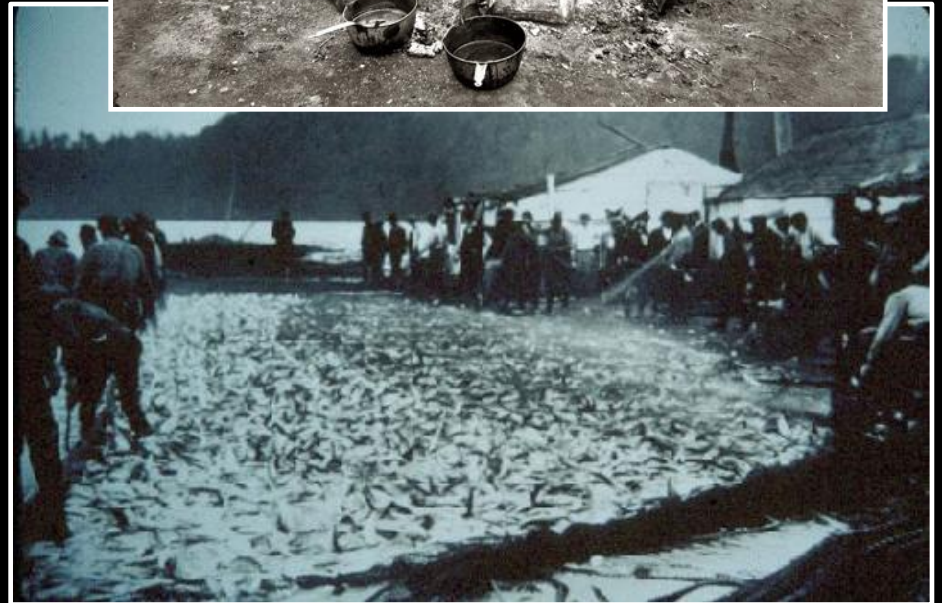
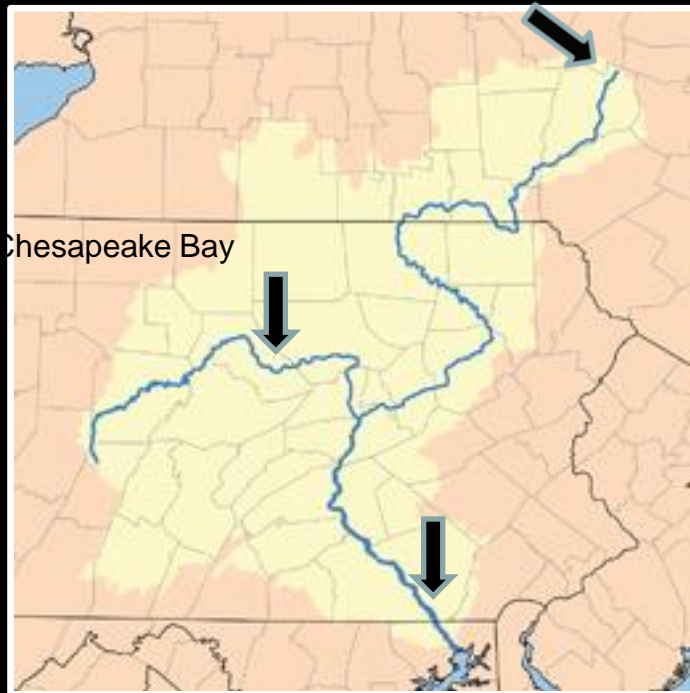


***Swimmable Distance,* American Shad**

- **Originally: 11,221 km**
- **In yr 2000: 6,856 km**
- **Net Loss: 4,364 km (~40%)**



Susquehanna River Shad



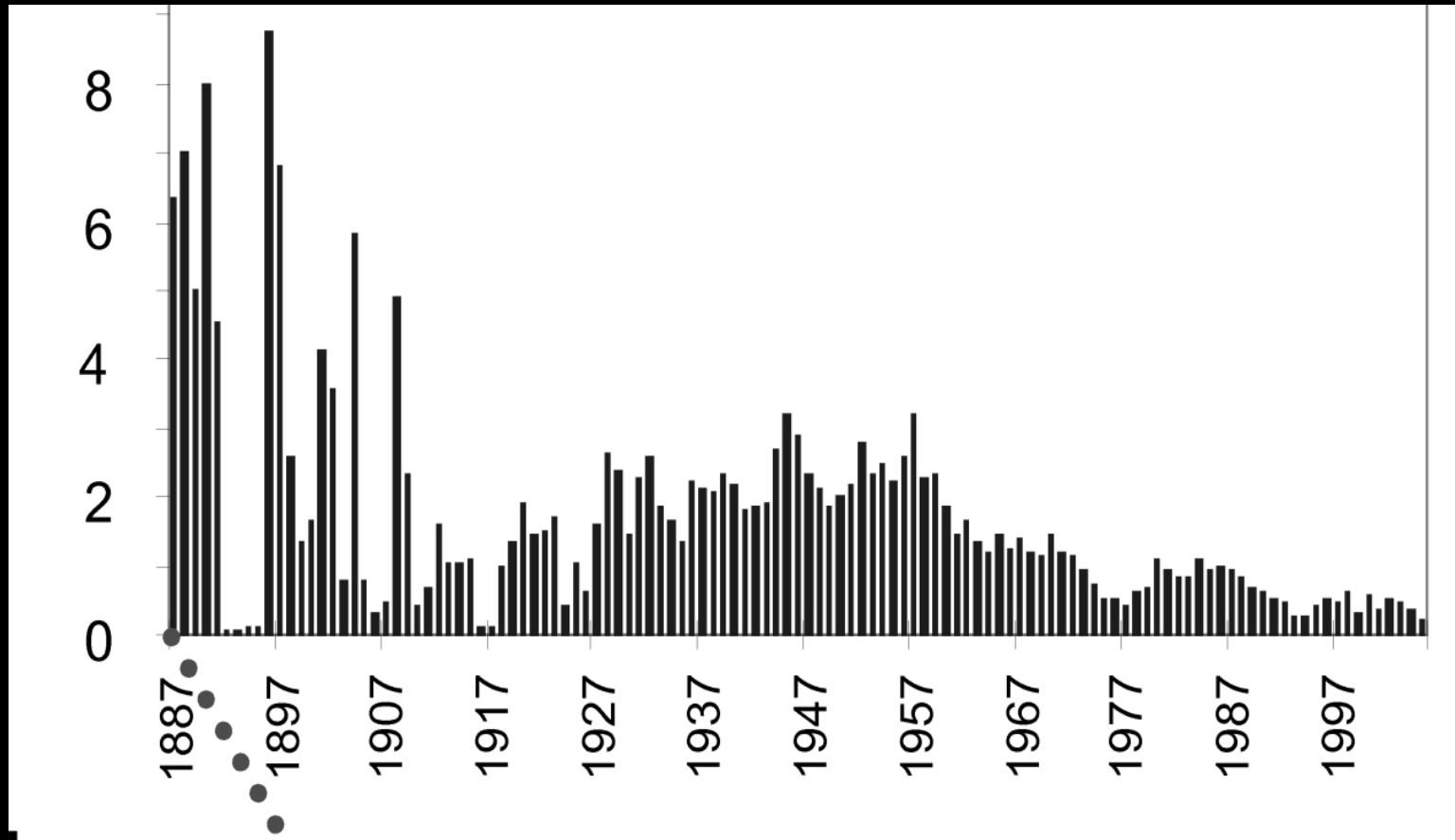
A Pervasive Problem – Faded Memories

The Shifting Baseline Syndrome

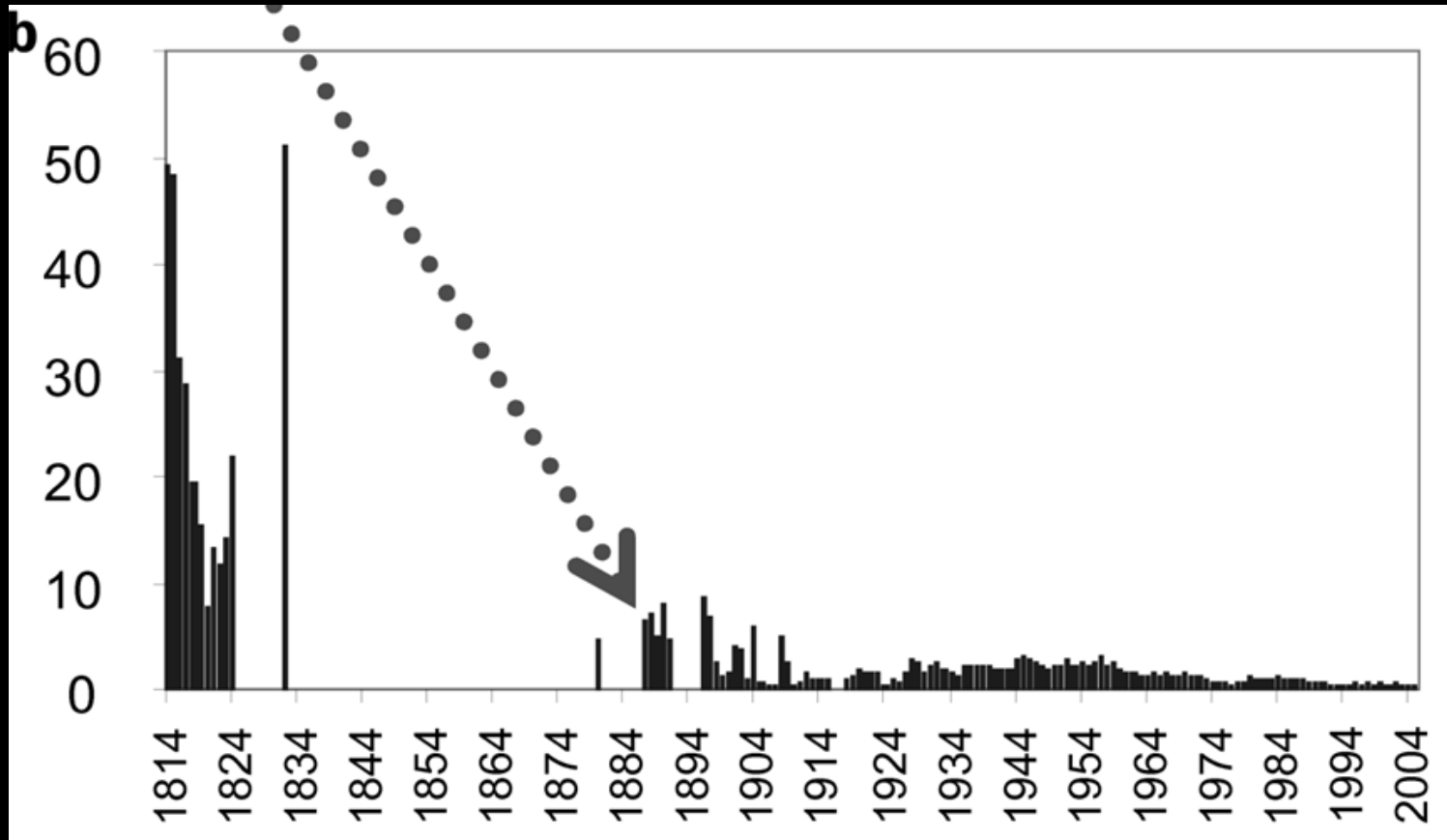
- “Each generation of fisheries scientists accepts as a baseline the stock size . . . that occurred at the beginning of their careers and uses this to evaluate changes. When the next generation starts its career, the stocks have further declined, but it is the stocks at that time that serve as a new baseline.”
- -*Daniel Pauly (1995)*



Potomac R. Shad Landings (millions/kg)



Potomac R. Shad Landings (millions/kg)



What Can Be Done?

Largely Rectified

- Pollution

Essentially Untractable

- Non-native Species
- Climate

Tractable & (Mostly)
Applied

- Overfishing
- Power Plants

Tractable but Unrectified

???

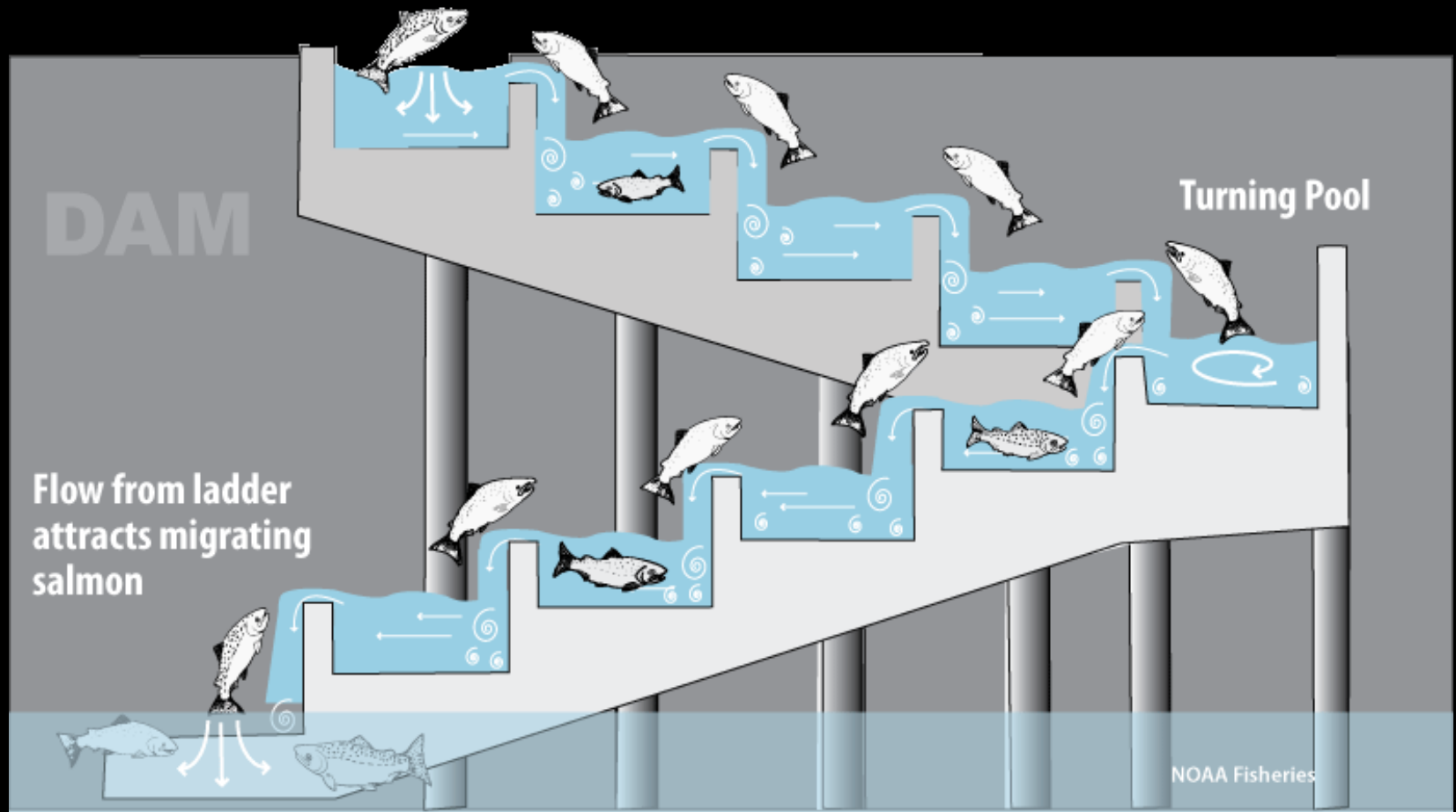
What is Tractable but *Still Unrectified*?



Conowingo Dam, Susquehanna River

How Do Fish Pass Dams?

Fish Ladders

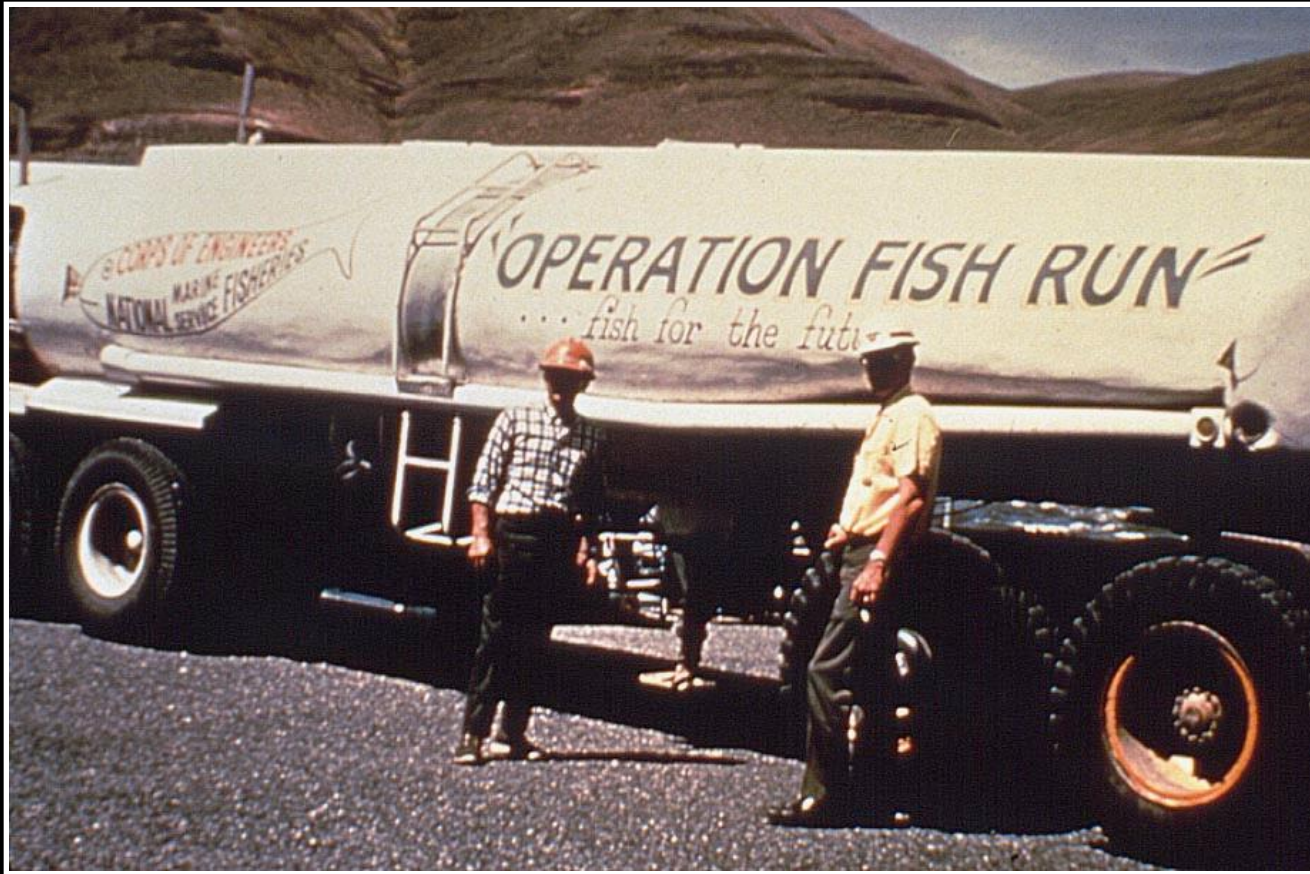


How Do Fish Pass Dams?

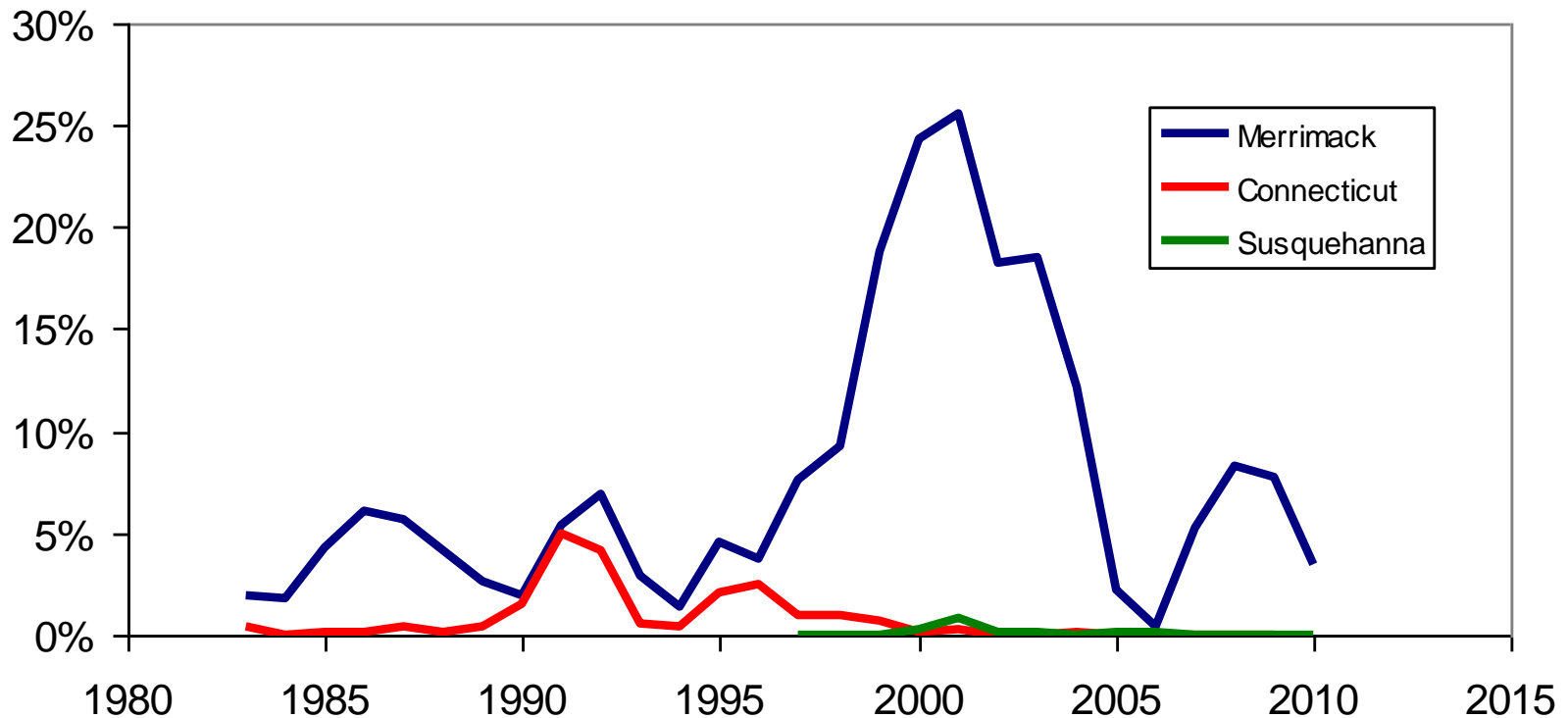
Fish Elevators



Migration Via Internal Combustion Engine

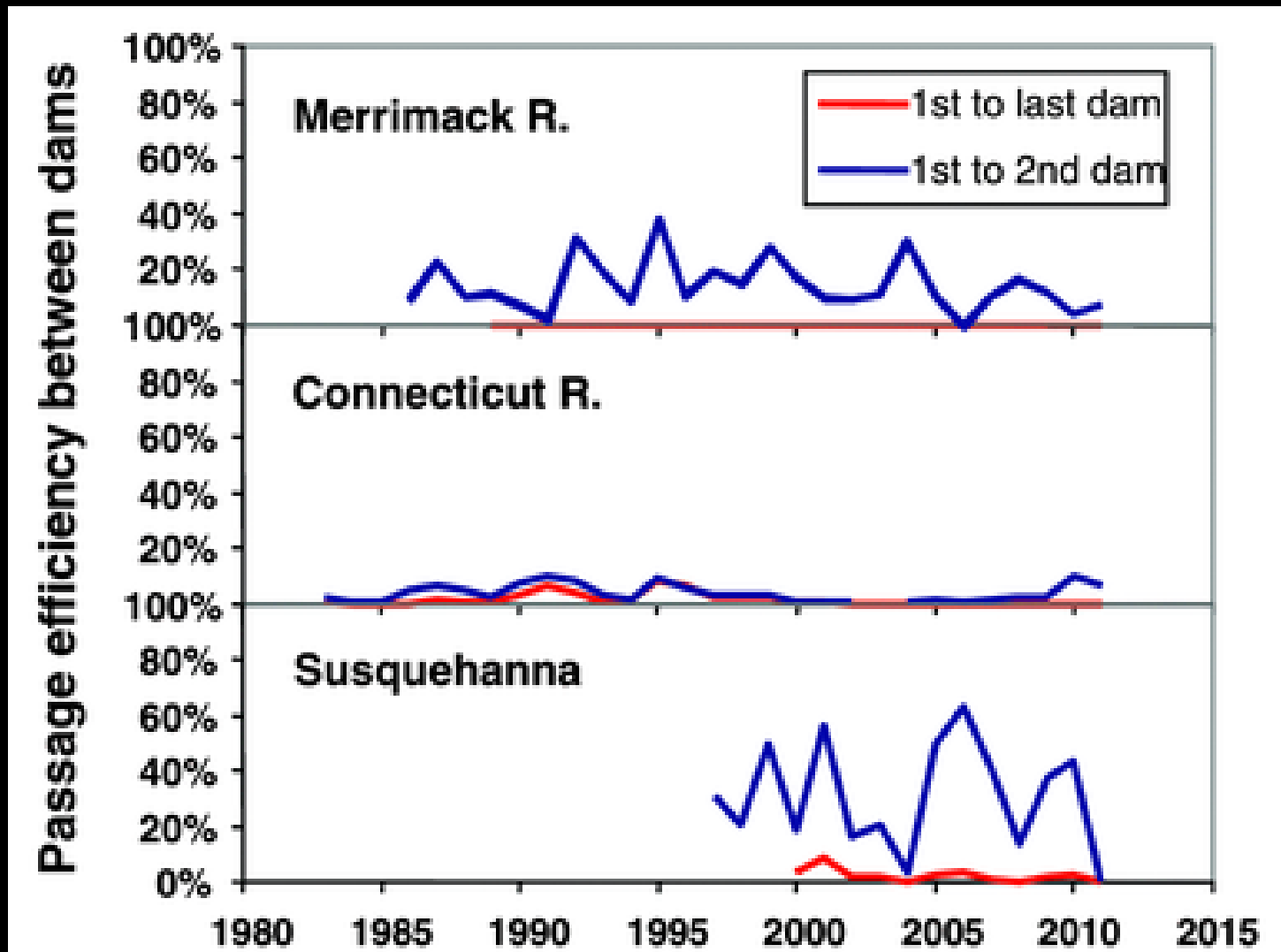


Number of Shad Passed as Percent of Target



(Brown et al. 2013)

Passage Efficiencies for Shad

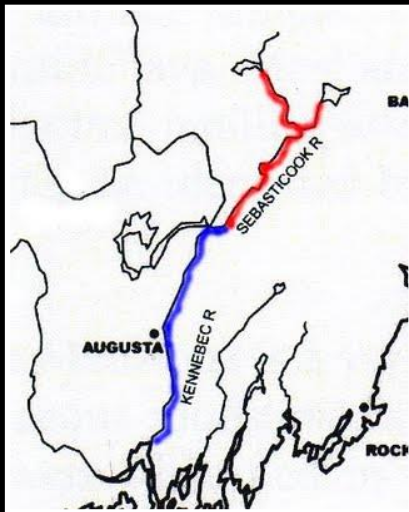


The Great Atlantic Coast Precedent

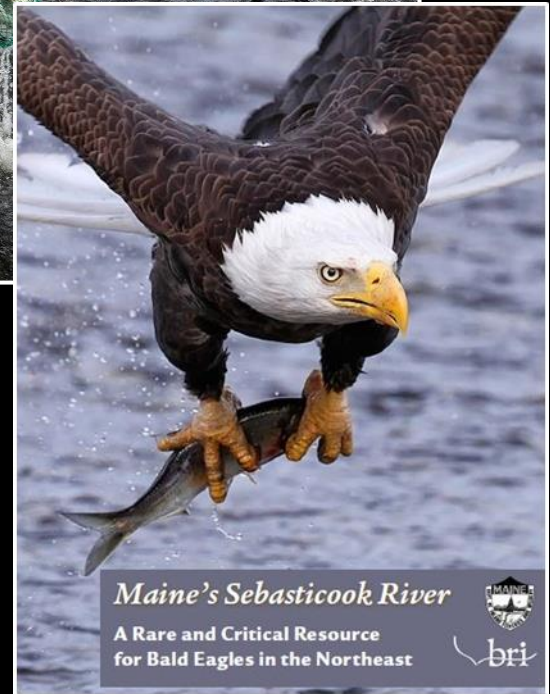


Edwards Dam, Kennebec River, built 1837
(Augusta, Maine) 3.5 MW!

July 1, 1999



Sebasticook River



Maine's Sebasticook River
A Rare and Critical Resource
for Bald Eagles in the Northeast

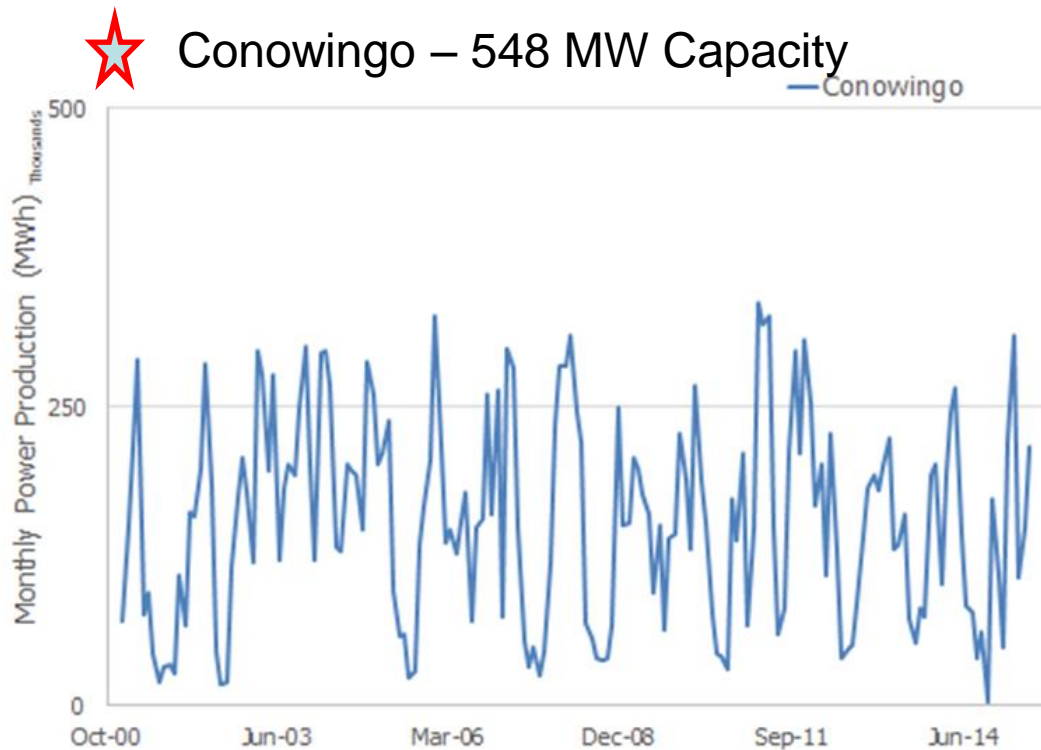


Beyond Ecology - *Aging Dams*

- Dams don't last forever - aging and sedimentation & many are coming up for FERC relicensing



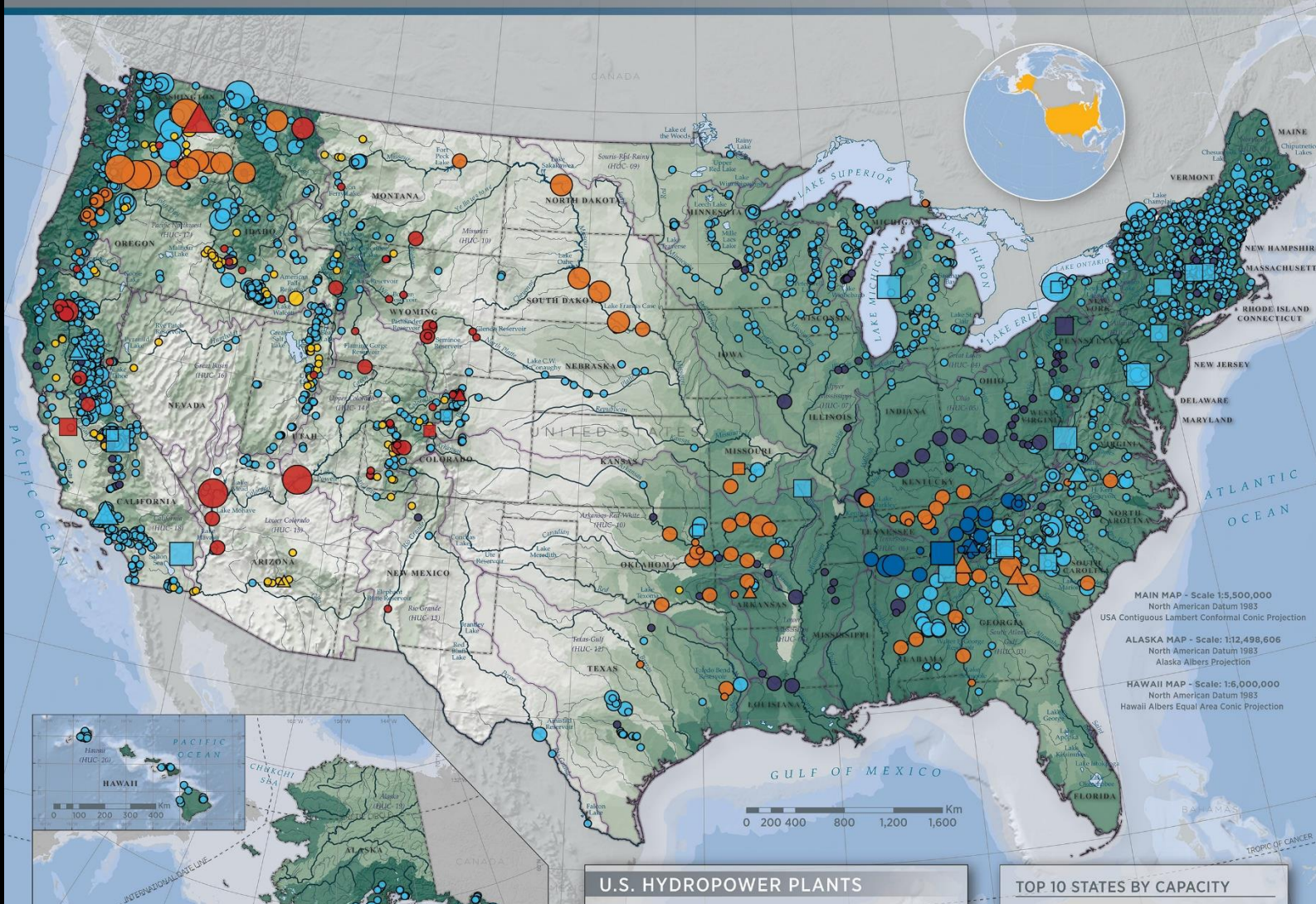
Hydropower – Neither “Clean” nor Steady, and is Less than Meets the Eye



K. Limburg

THE 2016 NATIONAL HYDROPOWER MAP

U.S. DEPARTMENT OF **ENERGY** | Energy Efficiency & Renewable Energy



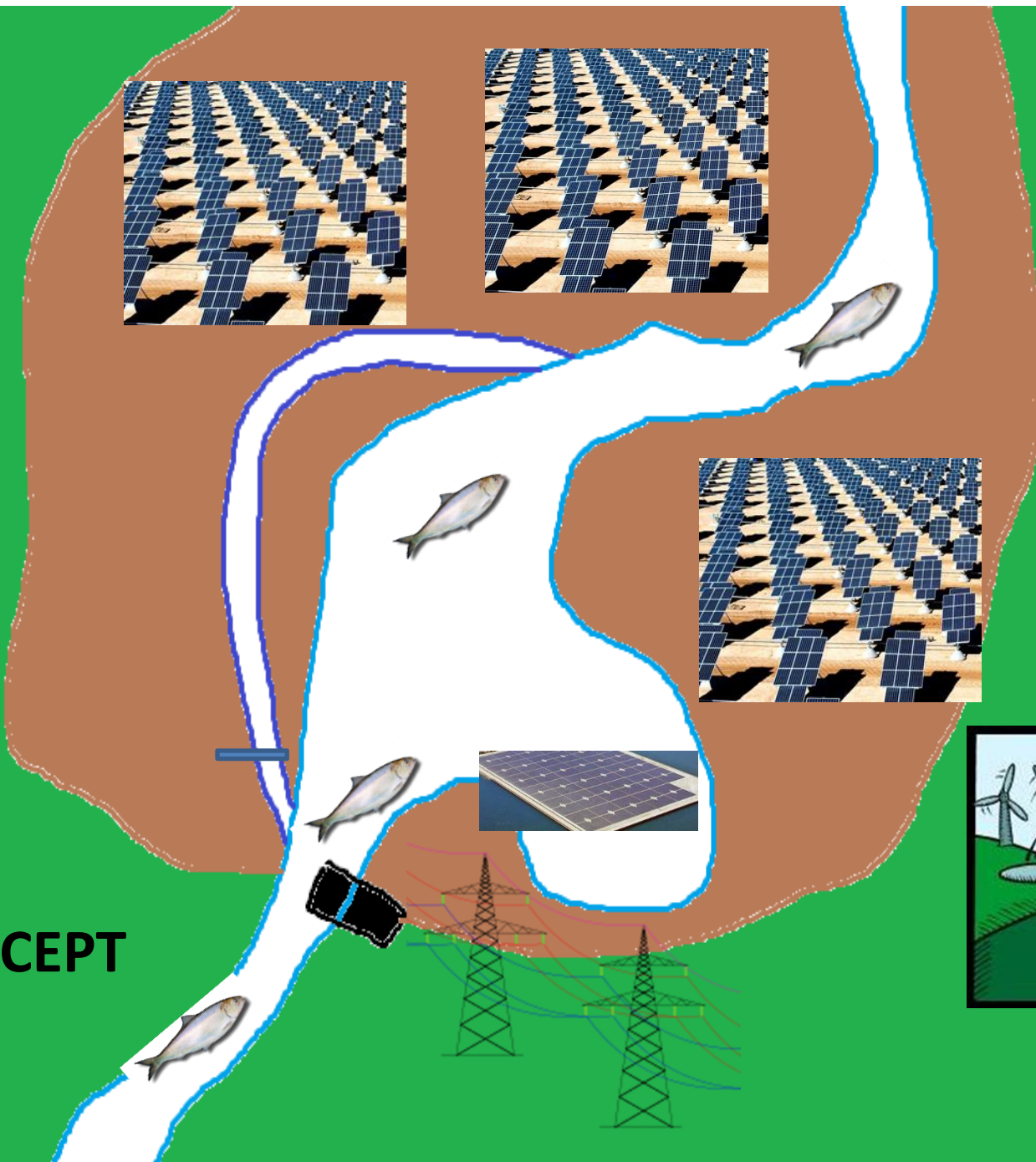
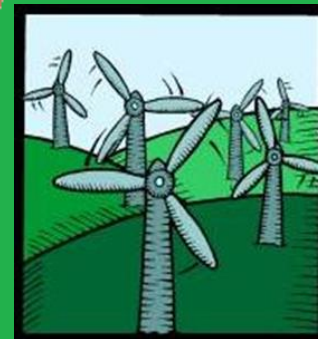
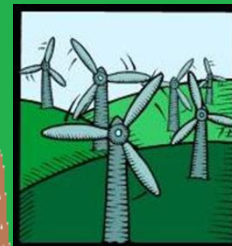
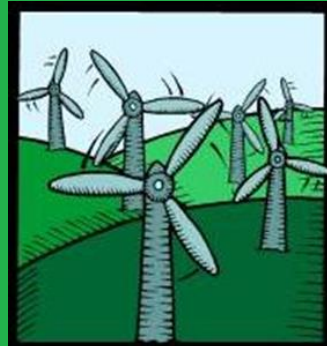
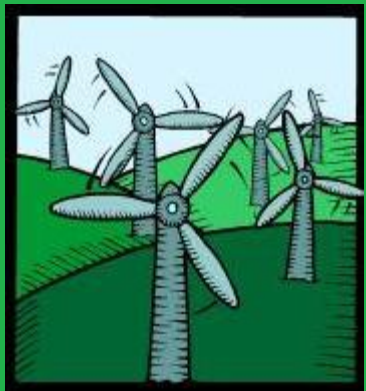
MAIN MAP - Scale 1:5,500,000
 North American Datum 1983
 USA Contiguous Lambert Conformal Conic Projection
 ALASKA MAP - Scale: 1:12,498,606
 North American Datum 1983
 Alaska Albers Projection
 HAWAII MAP - Scale: 1:6,000,000
 North American Datum 1983
 Hawaii Albers Equal Area Conic Projection

U.S. HYDROPOWER PLANTS

TOP 10 STATES BY CAPACITY

National: Hydropower < **7%** U.S. electricity generation. **1,277,233** acres needed for solar to replace ALL **2603** hydropower dams in lower 48 states. This is equal in size to Delaware and is **0.06%** of lower 48 states land area.





**SHARED
RIVER CONCEPT**

Example: The State of Maine

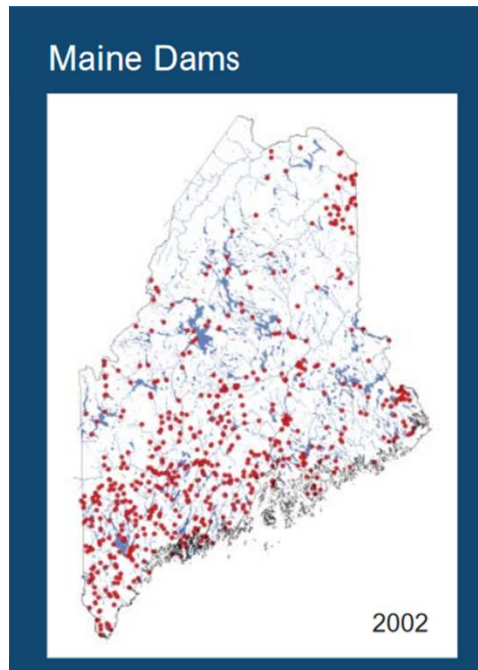


Bangor Salmon Pool, Penobscot River 1926

(Recent ten-year average Kennebec ~30 annually)

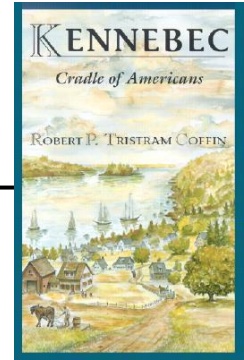
Entire State of Maine

- 241 hydro-dams with 726 MW nameplate capacity, mean is **only 3 MW/dam**;
- 75% of total from only 24 dams
- 19,150 acres or 0.08% of state area = Augusta

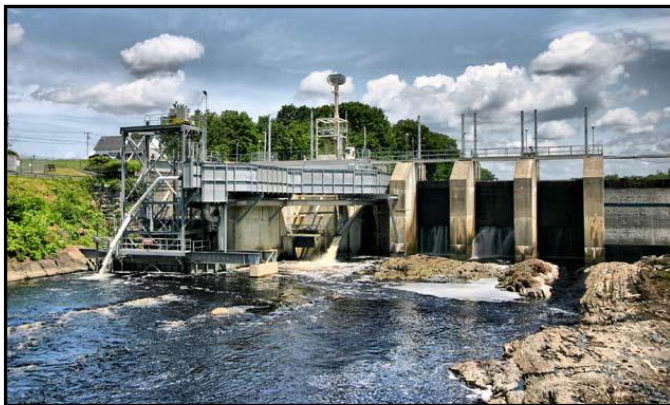


The Kennebec River Watershed

“A Shangri-La for Fishes”



- 14 Hydropower Dams yield
~246 MW nameplate capacity,
capacity factors 26 – 73%
- 3015 acres for full replacement
= 0.03% of the Kennebec River watershed



Lockwood Dam



Weston Dam

Four Lowermost Dams on Kennebec

Lockwood, Hydro Quebec, Shawmut, Weston

- Rated at total of ~43 MW
- Capacity factors 4 dams = 48 – 68%
- Solar replacement: 504 acres

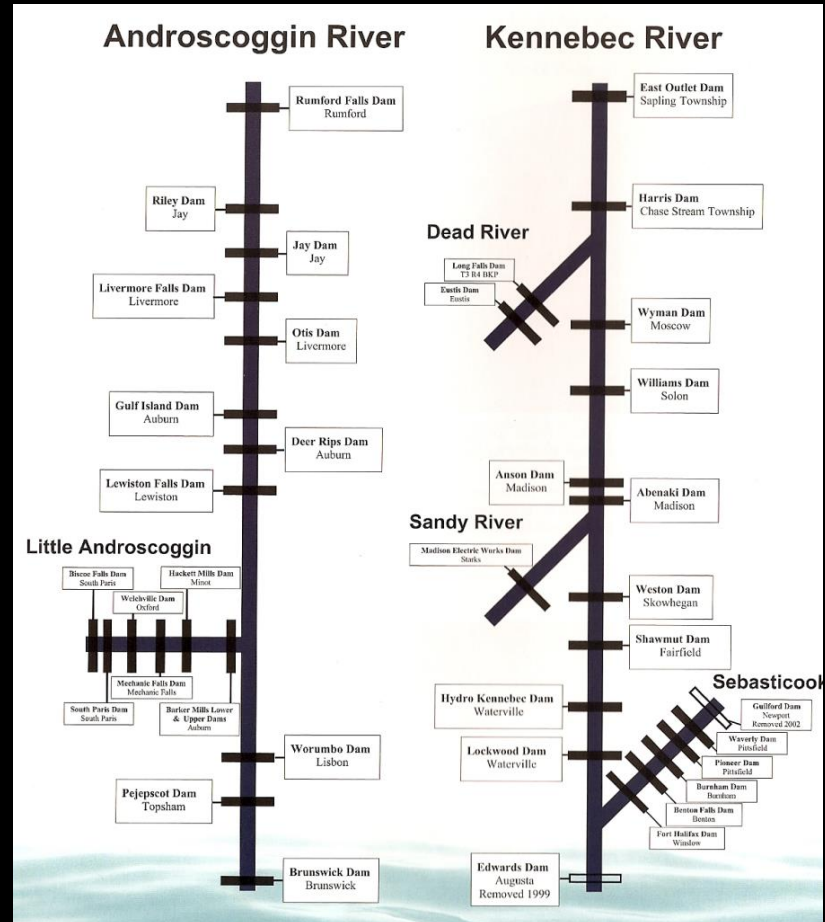
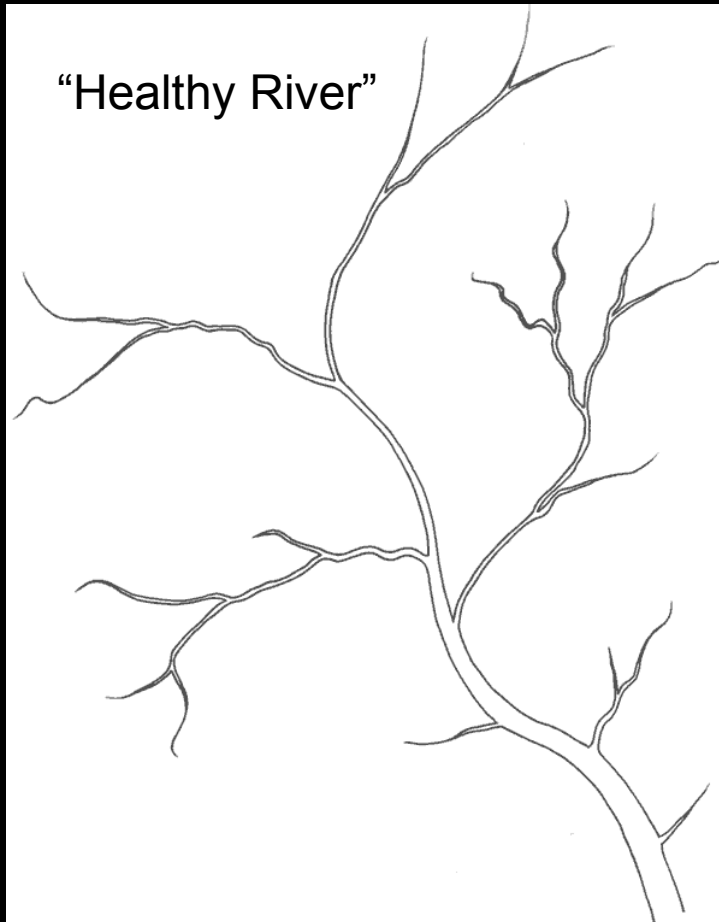
Salmon in the Kennebec

- Atkins 1867 – Before 1820, Atlantic Salmon run size 68,000 – 216,000
- In 2018, 11 salmon trapped & trucked to Sandy River
- Recent 10-yr average ~30/yr



What Can Be Done?

Ultimately - Need to Free Rivers in Space & Time!



Many Issues with Brookfield Proposals

- Maine DMR has serious concerns with proposed fishway expectations for upstream passage, e.g., considers 95% passage at each dam within 48 hrs unrealistic.
- Similarly for critical downstream passage.
- Situation largely being assessed with modeling. *“All models are wrong, some models are useful.”*

Susquehanna River Shad



Goal = 750,000 past York Haven Dam Actual Counts 2014

<u>Conowingo</u>	<u>Holtwood</u>	<u>Safe Harbor</u>	<u>York Haven</u>
10,425	2,528	1,336	8

Kennebec – Time to Ditch the Status Quo

- 50 years of East Coast fishways (with constant tweaking!) have failed to restore migratory fish populations.
- ***No reason to believe they ever will . . .***
- Fortunately, the Endangered Species Act provides real leverage for real restoration.

Why Did the Fish Cross the Road?

