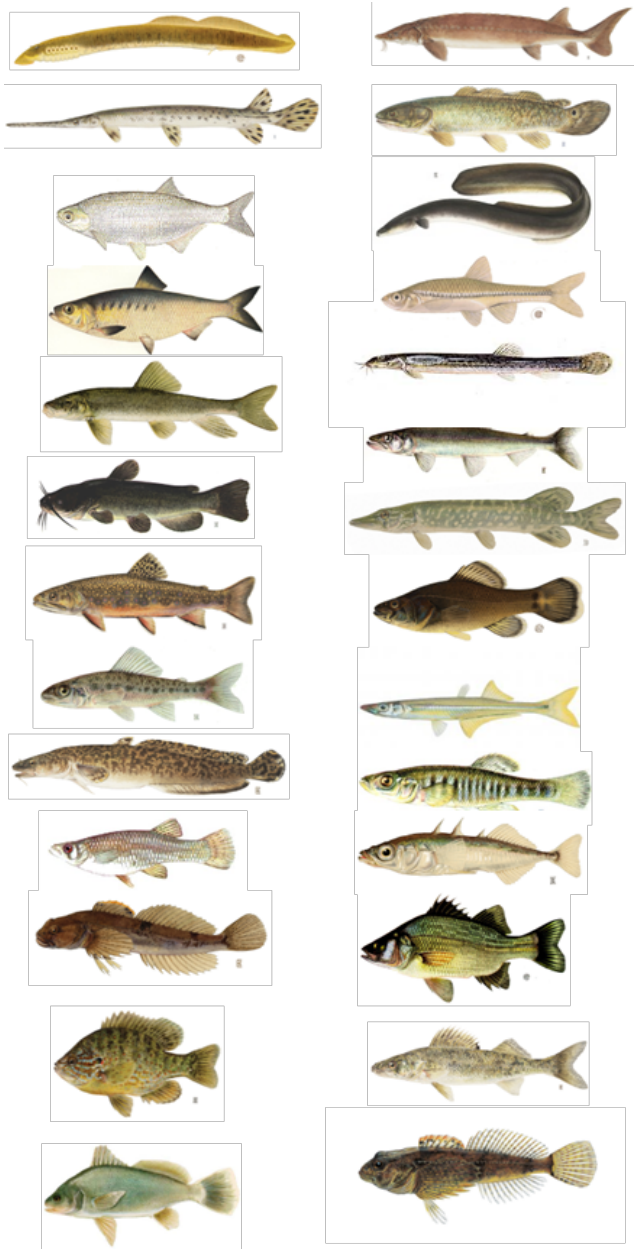
The Changing Environment for Fish and Fisheries in New York State

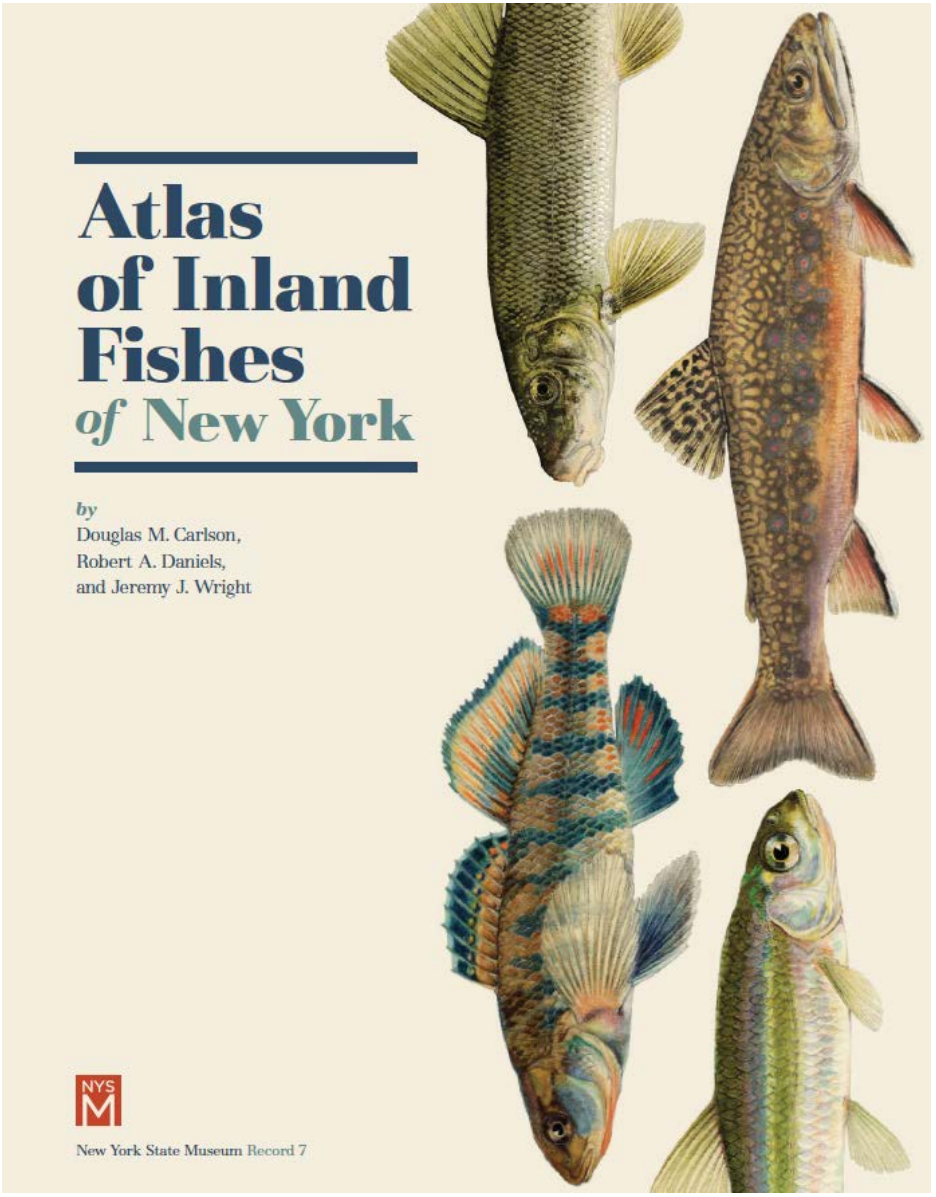
Randy Jackson
Cornell Biological Field Station

Cornell University

New York's Freshwater Resources Include Over 7,5000 Lakes and Ponds and More Than 70,000 Miles of Rivers and Streams

New York State is Home to Some 179 Species of Fish That Spend All or Some of Their Lives in Freshwater





These Resources Support World Class Fisheries That Contribute Substantially To the State's Economy

Activities in New York by Residents and Nonresidents

Fishing

Anglers	**1,882,000**
Days of fishing	29,874,000
Average days per angler	16
Total expenditures	$1,962,538,000
Trip-related	$1,057,916,000
Equipment and other	$904,622,000
Average per angler	$907
Average trip expenditure per day	$35

Hunting

Hunters	**823,000**
Days of hunting	18,433,000
Average days per hunter	22
Total expenditures	$1,564,205,000
Trip-related	$810,119,000
Equipment and other	$754,086,000
Average per hunter	$1,899
Average trip expenditure per day	$44

Anglers Enjoy Fishing Opportunities Across the Full Range of Aquatic Resources in the State

Table 6. Freshwater Anglers, Trips, Days of Fishing, and Type of Water Fished: 2011

(Population 16 years old and older. Numbers in thousands)

Anglers, trips, and days of fishing	Activity in New York					
	Total, state residents and nonresidents		State residents		Nonresidents	
	Number	Percent	Number	Percent	Number	Percent
Total anglers	**1,212**	**100**	**1,056**	**87**	**156**	**13**
Total trips	**13,121**	**100**	**12,777**	**97**	**344**	**3**
Total days of fishing	**19,200**	**100**	**18,257**	**95**	**942**	**5**
Average days of fishing	16	(X)	17	(X)	6	(X)
ANGLERS						
Total, all types of water	**1,212**	**100**	**1,056**	**87**	**156**	**13**
Ponds, lakes, or reservoirs	918	100	803	87	*116	*13
Rivers or streams	841	100	751	89	*91	*11
DAYS						
Total, all types of water	**19,200**	**100**	**18,257**	**95**	**942**	**5**
Ponds, lakes, or reservoirs	13,949	100	13,323	96	*626	*4
Rivers or streams	8,543	100	8,240	96	*303	*4

* Estimate based on a sample size of 10–29. (X) Not applicable.

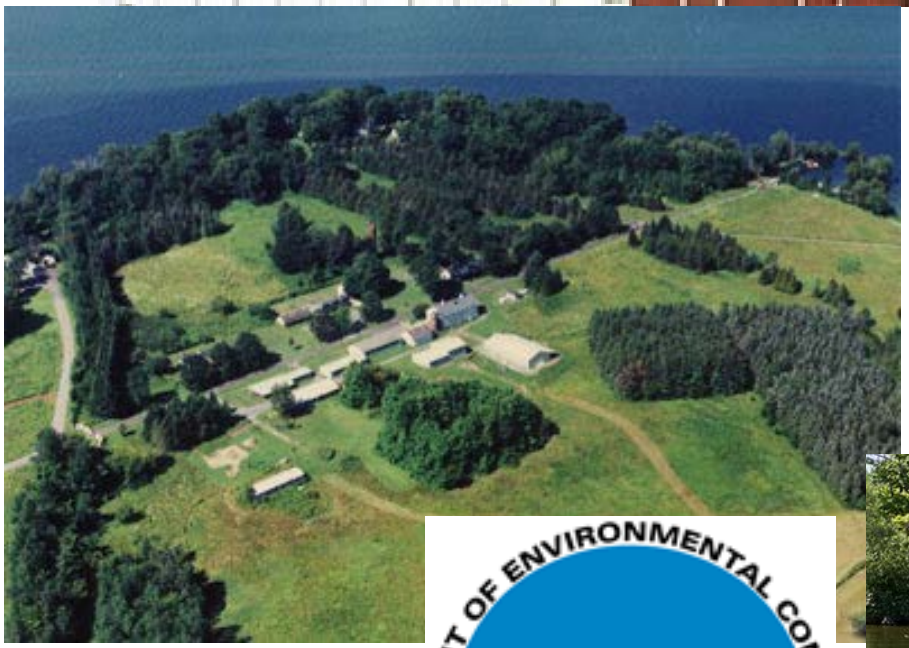
Note: Detail does not add to total because of multiple responses.

Fishing Opportunities Are Diverse and Include A Mix of Coldwater and Warmwater Species

Table 7. Freshwater Anglers and Days of Fishing in New York by Type of Fish: 2011

(Population 16 years old and older. Numbers in thousands)

Anglers and days of fishing	Activity in New York						
	Total, state residents and nonresidents			State residents		Nonresidents	
	Number	Percent of total types	Percent of anglers/days	Number	Percent of anglers/days	Number	Percent of anglers/days
ANGLERS							
Total, all types of fish	**1,212**	**100**	**100**	**1,056**	**87**	**156**	**13**
Crappie	...	...	...	...	...	...	...
Panfish	*140	*12	*100	*117	*84	...	...
White bass, striped bass, striped bass hybrids	*120	*10	*100	*100	*84	...	...
Black bass	452	37	100	373	83	*78	*17
Catfish, bullheads	...	...	...	...	...	...	...
Walleye, sauger	*90	*7	*100	*85	*95	...	...
Northern pike, pickerel, muskie, muskie hybrids	*58	*5	*100	...	...	...	...
Steelhead	...	...	...	...	...	...	...
Trout	647	53	100	589	91	*58	*9
Salmon	...	...	...	...	...	...	...
Anything[1]	*149	*12	*100	*126	*85	...	...
Other freshwater fish	...	...	...	...	...	...	...



Cornell Biological Field Station

Fisheries Research Dates Back to 1957

Oneida Lake Work Continuous Since 1957

Periodic Statewide Studies

What Our Research is Telling Us About How New York's Fish Resources Are Responding To Environmental Changes

1. Fisheries of Oneida Lake (Landscape Modification, Invasive Species, Climate Change)

2. Statewide Stream Fish Surveys (Climate Change)

1. Fisheries of Oneida Lake (Landscape Modification, Invasive Species, Climate Change)

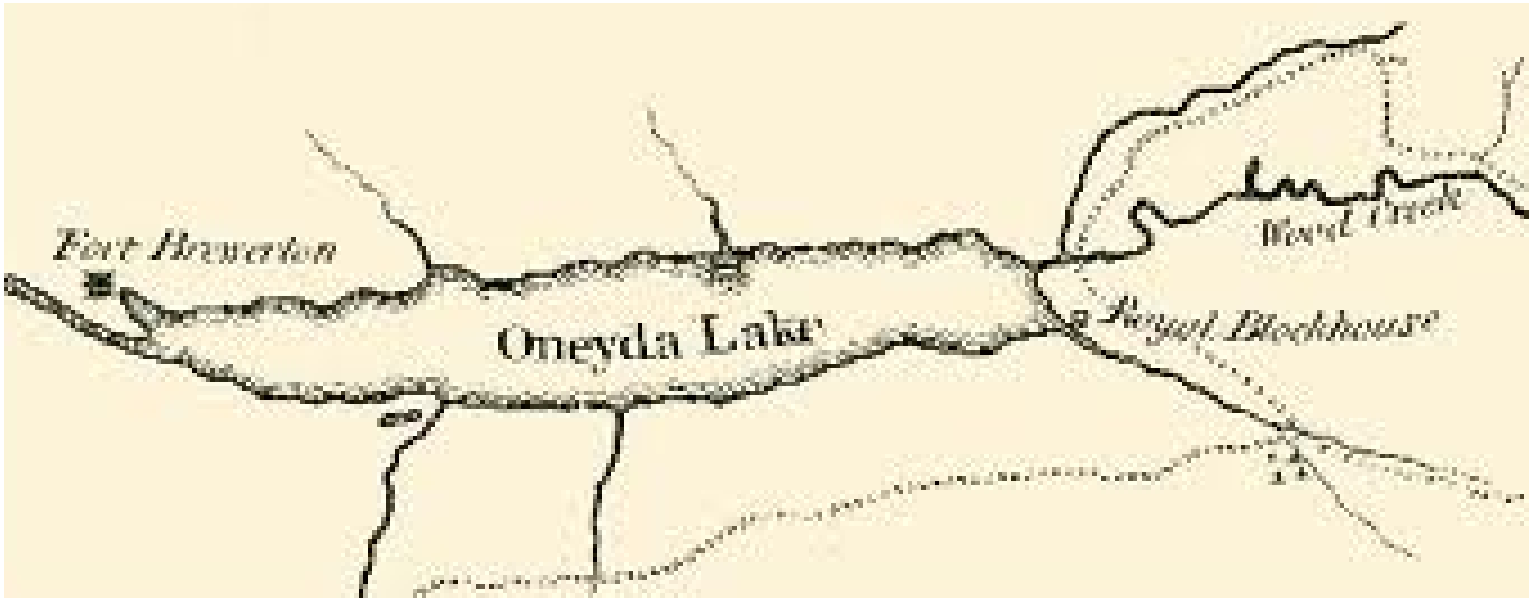
ONEIDA-LAKE
Team Walleye Trail
·2013·

Bass Pro Shops
BASSMASTER OPENS
Presented by Allstate

Attend the Bass Pro Shops Northern Open #2
AUG. 6-8, 2015 ONEIDA LAKE • SYRACUSE, N.Y.

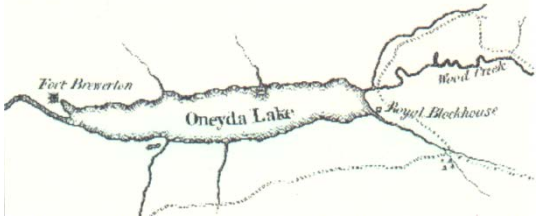
In Oneida Lake, Our Studies Have Been Largely in the Context of their Impacts on the System and Modern Fisheries in Place in the mid-1900s

But We Have Some Context for Understanding What the "Natural" State of Lake Fisheries Was



Vanderkemp (1792):

“Oneyda Lake, as handsome, as rich in fish as any lake in the western world.”



“Never did I see yet a country, where all kind of fish was so abundant and good. It may be equalled, it cannot be excelled. I salted within a short time more than a dozen different species….Salmon, pike, pickerel, cat-fish, Otzwego baas, yellow perch, sun-fish, tziob, three species of trout, river lobsters, turtle, sword-fish, and a green coloured fish of an exquisite taste, white-fish, &c,&c.” - Vanderkemp

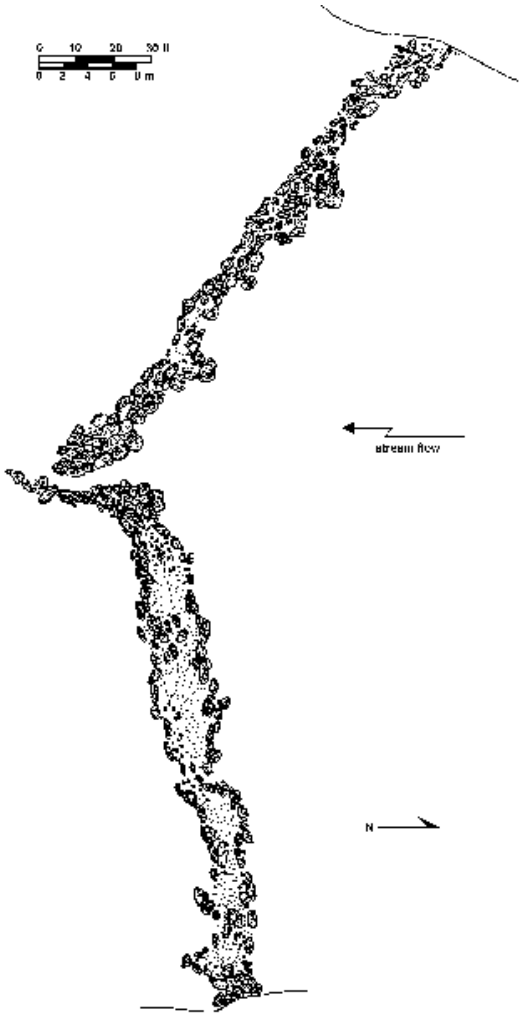
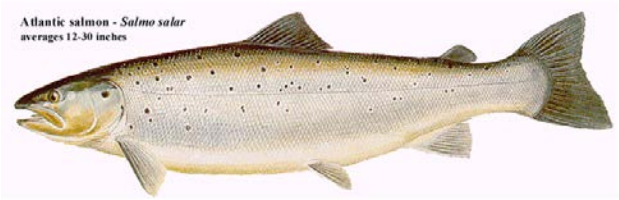


Figure 2. Survey of weir.

From the Jesuit Relations (1656):

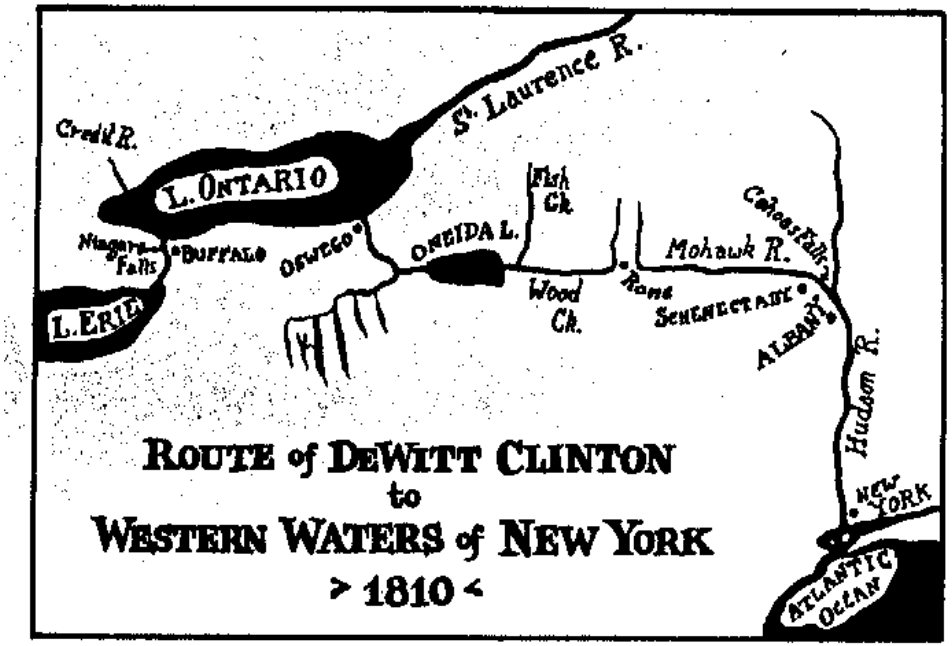
"… our savages construct their dams and sluices so well, that they catch at the same time the Eels, that descend, and the Salmon, that always ascend."

"[Oneida Lake] furnishes fish to nearly all the Iroquois."



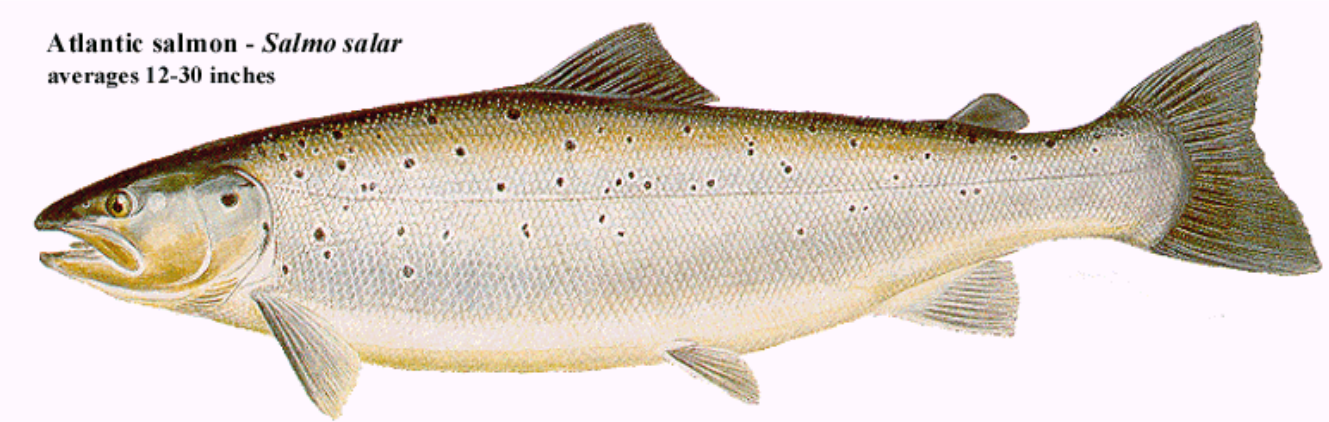
De Witt Clinton's Travels

De Witt Clinton (*Frontispiece in Campbell 1849*)



Map drawn by Dr. Webster.

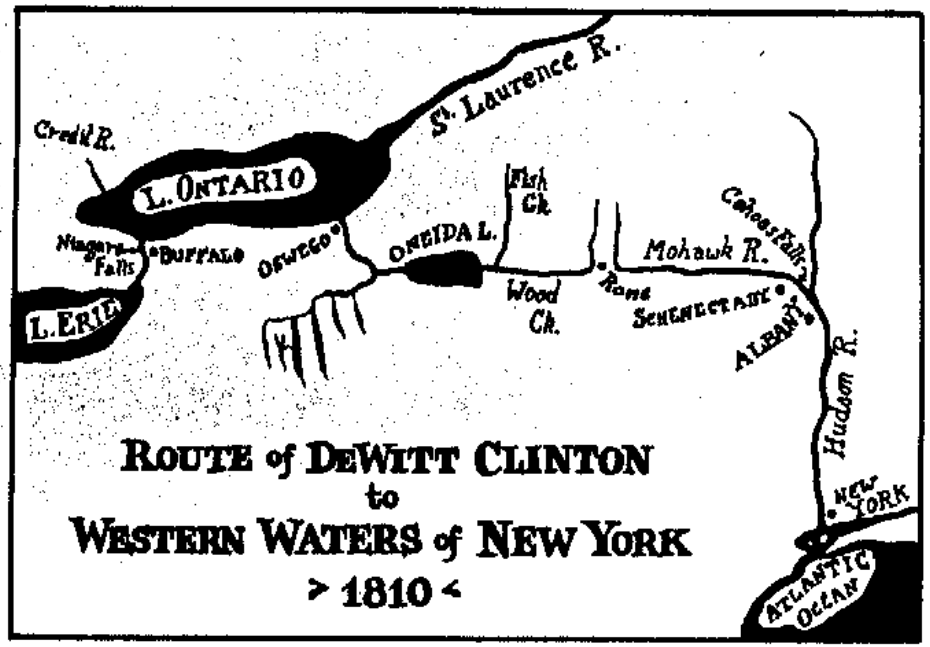
One of the best early descriptions of the natural history of central New York



For most of the history of human use of Oneida Lake fishes, salmon and eel supported the major fisheries

De Witt Clinton's Travels Directed at Development of a Canal System to Connect Eastern New York and the Great Lakes

De Witt Clinton (*Frontispiece in Campbell 1849*)

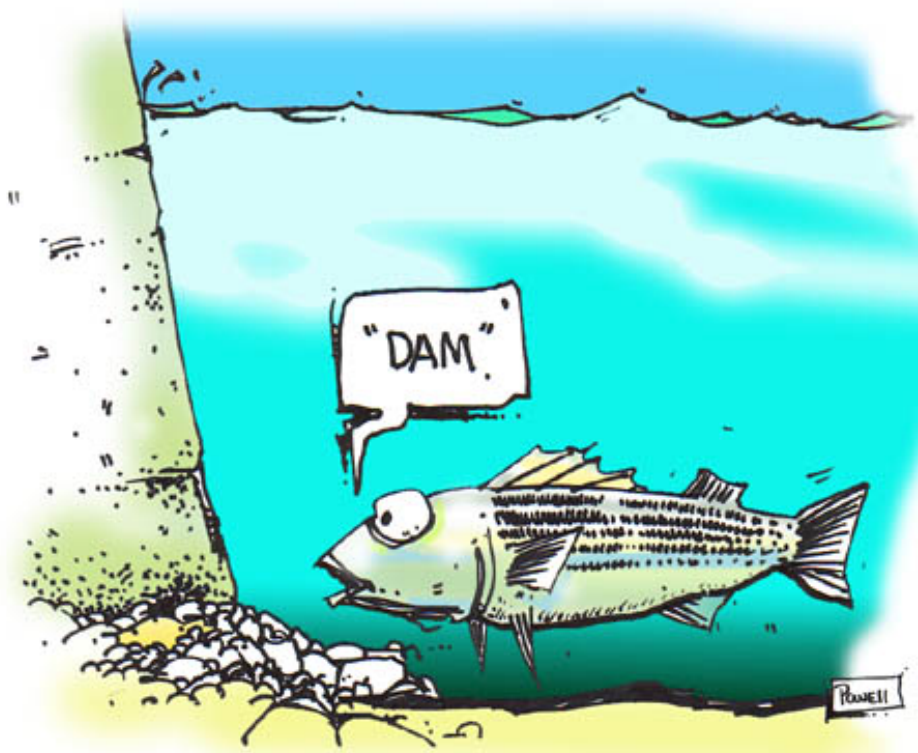


Map drawn by Dr. Webster.

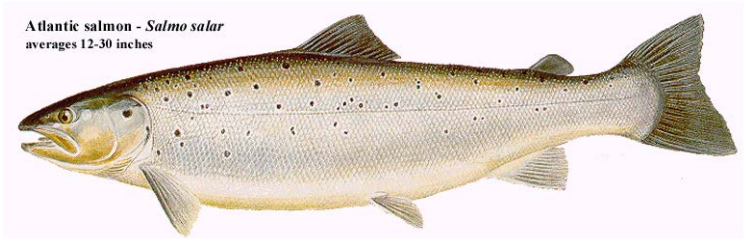
The Erie Canal – opened in 1825

The Oswego River canal was completed in 1827, major improvements as part of the New York barge canal project completed in 1917

rock fish™ cartoons 2003

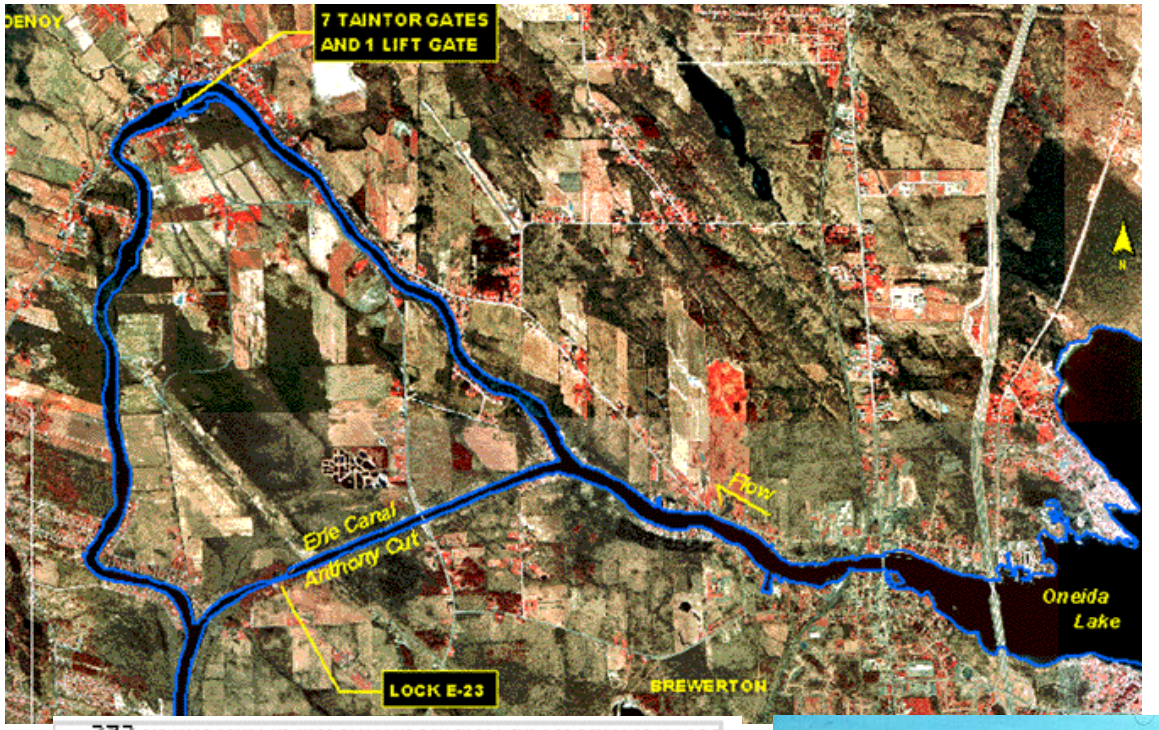


LARRY'S ACUTE SENSE OF AWARENESS SERVED HIM WELL...



Ice-Out Frequently led to Property Damage

Spring floods sometimes brought fishing opportunities too close to home



Improvements on the dam at the outlet facilitated water control starting in the 1950s

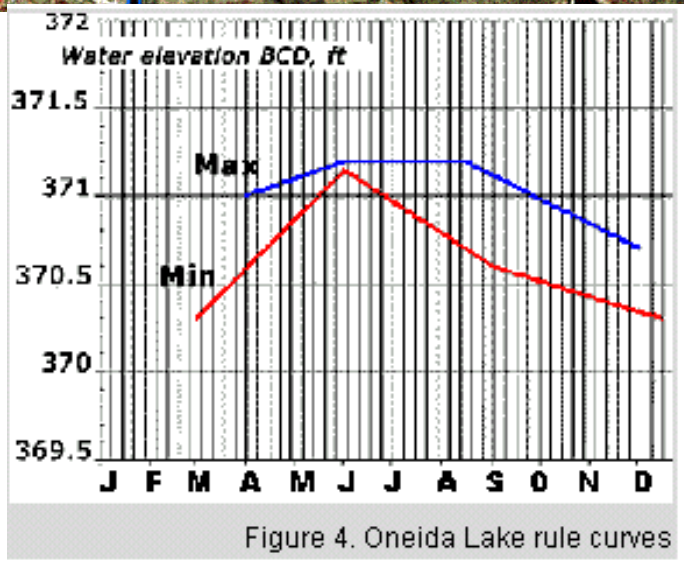
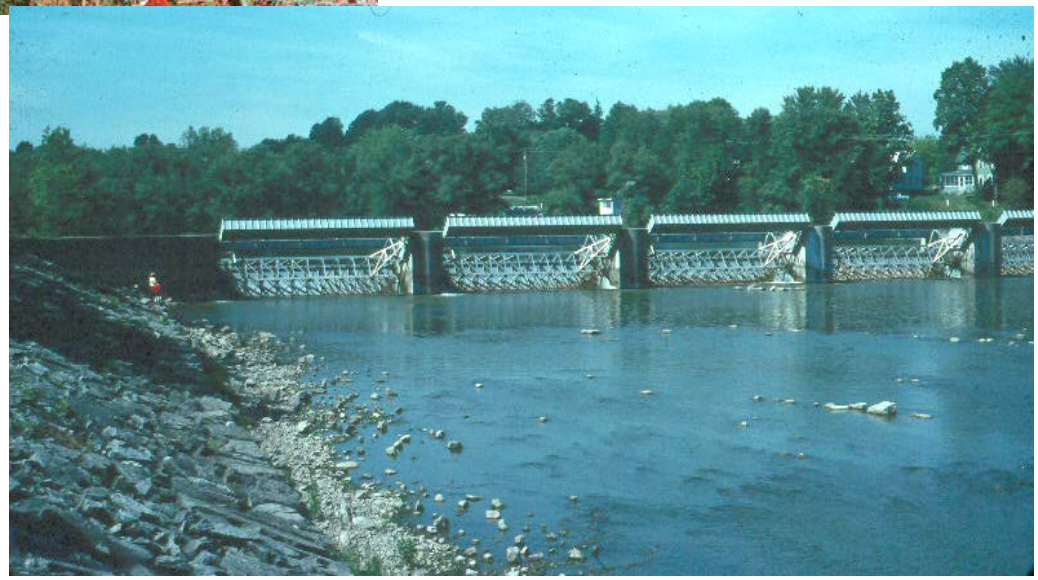


Figure 4. Oneida Lake rule curves

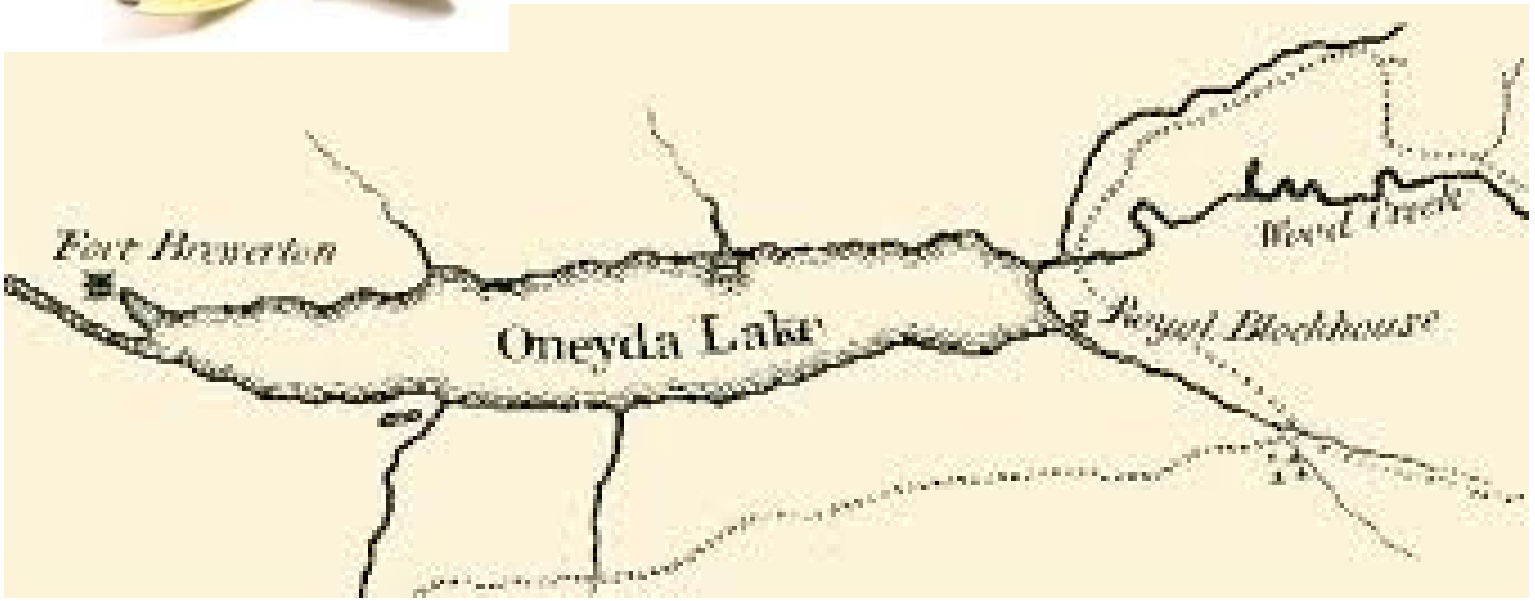


Lake Description in the 1920s:

"primarily a shallow water lake with low, extensive and swampy wooded shores."

When We Think of Invasive Species Impacts Today We Think Mostly in Terms of Impacts on One of the State's Premier Walleye Fisheries

But We Should Not Lose Sight of the Fact That the Walleye Fishery Arose Due to Severe Alterations of the System

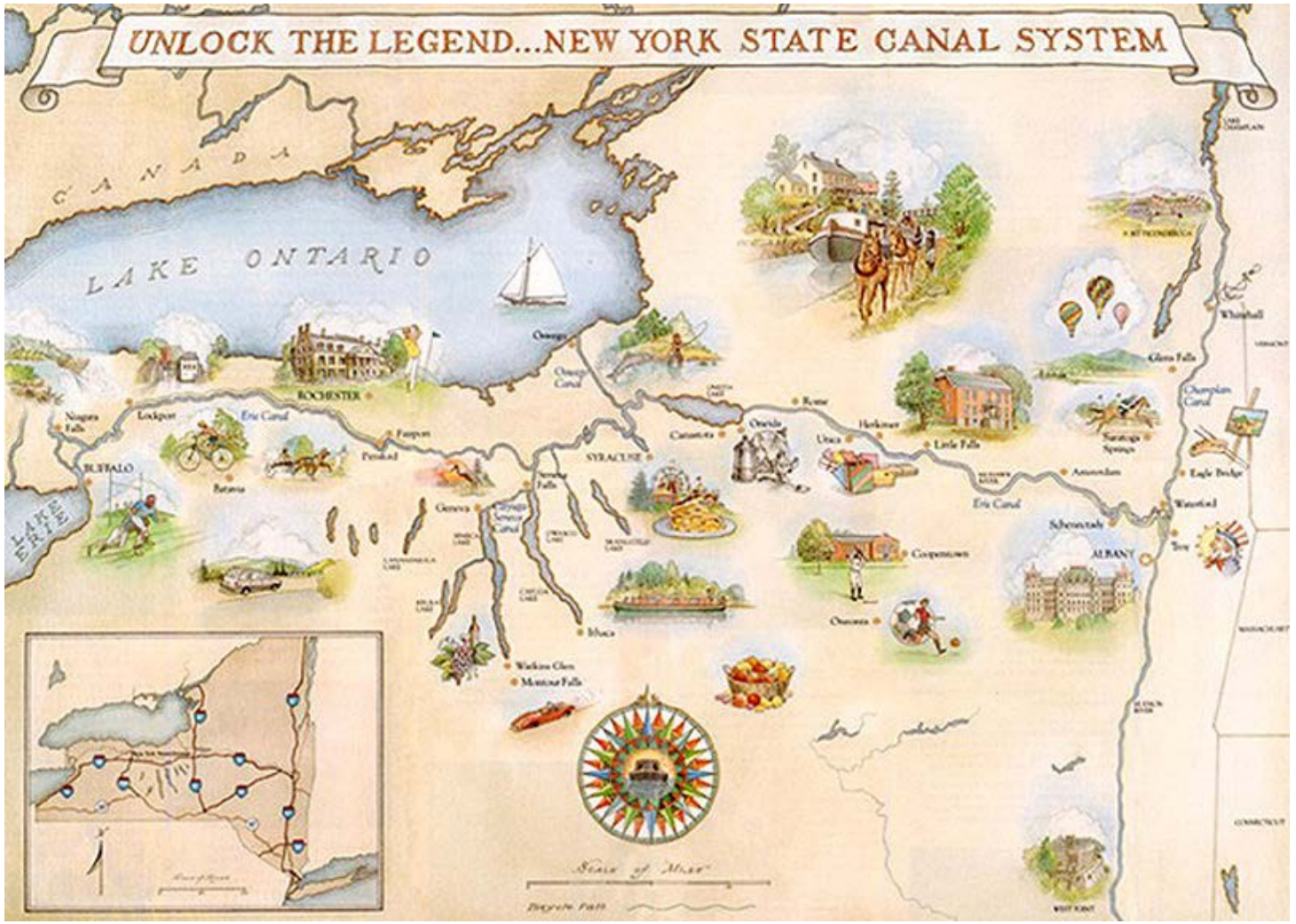


ONEIDA LAKE AS A MELTING POT: THE EFFECTS OF INVASIVE SPECIES ON MODERN FISHERIES

Attend the Bass Pro Shops Northern Open #2

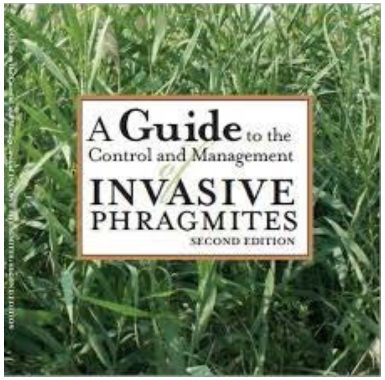
AUG. 6-8, 2015 ONEIDA LAKE • SYRACUSE, N.Y.

Most Modern Invasions Have Been Facilitated by the New York Barge Canal Project, Which Included Oneida Lake After Completion in 1917 (but also Oswego Canal in 1827)



INTRODUCED PLANTS

FRONT BACK



European Frog-Bit. Photograph. Invasive European frog-bit rapidly spreading throughout Michigan. *Michigan Lake & Stream Associations, Inc.* Web. 17, June 2014.

1800 1900 2000

INTRODUCED MOLLUSCS

Pink Heelsplitter

European Valve Snail

2 Elimia's and a Hornsnail

European Faucet Snail

1800

1900

2000

INTRODUCED CRUSTACEA

Echinogammarus ischnus

Gammarus fasciatus

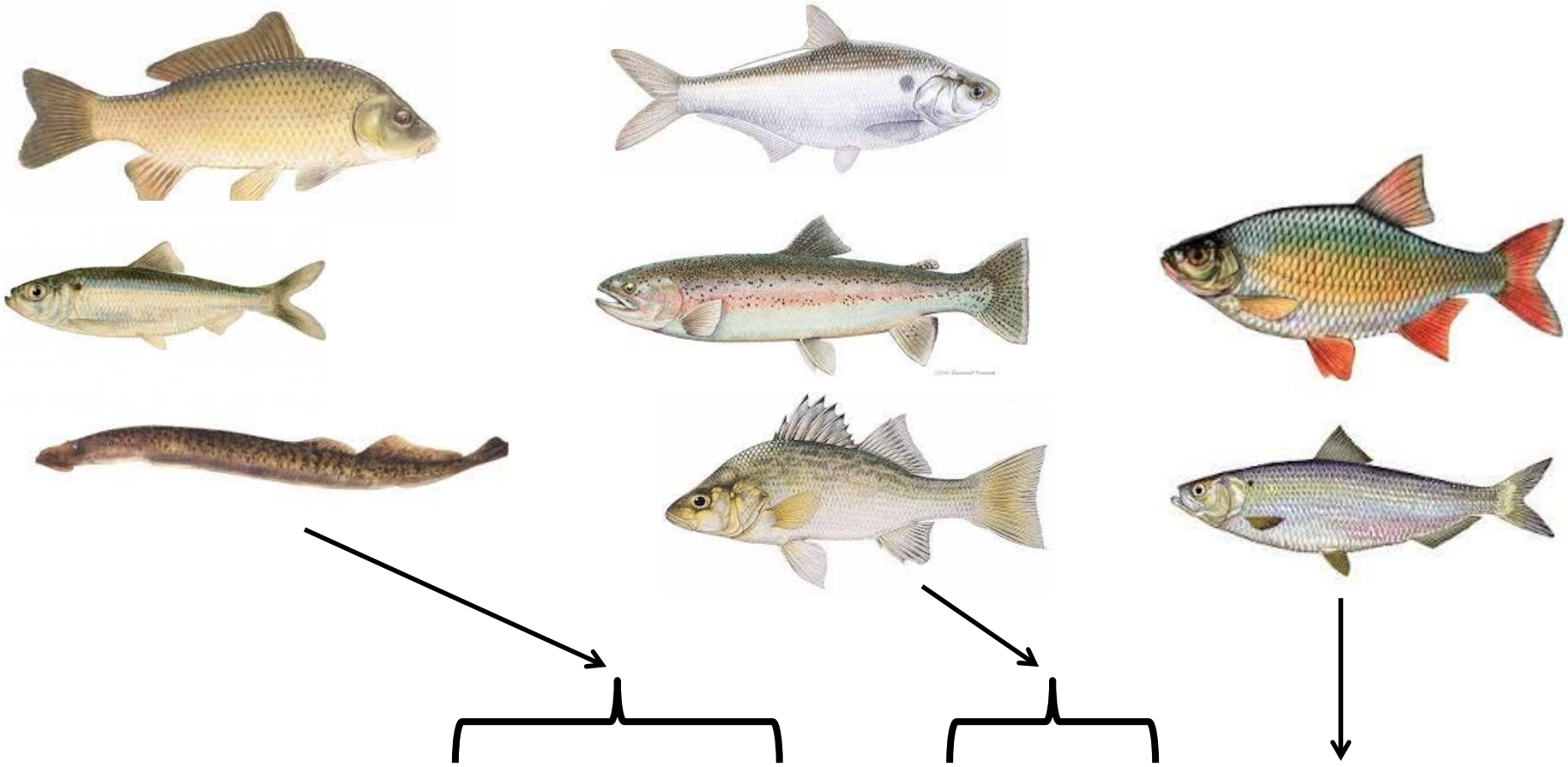
Eubosmina coregoni

Hemimysis

1950

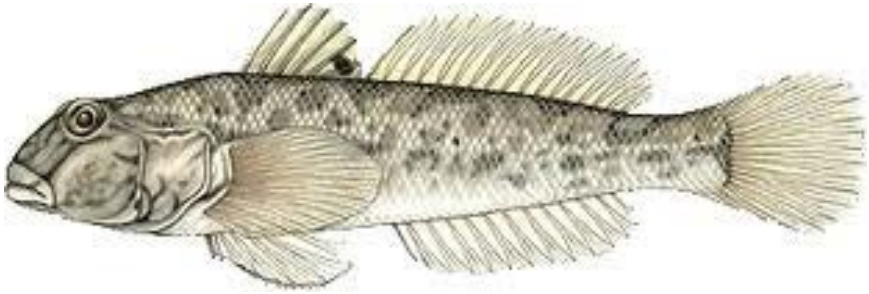
2000

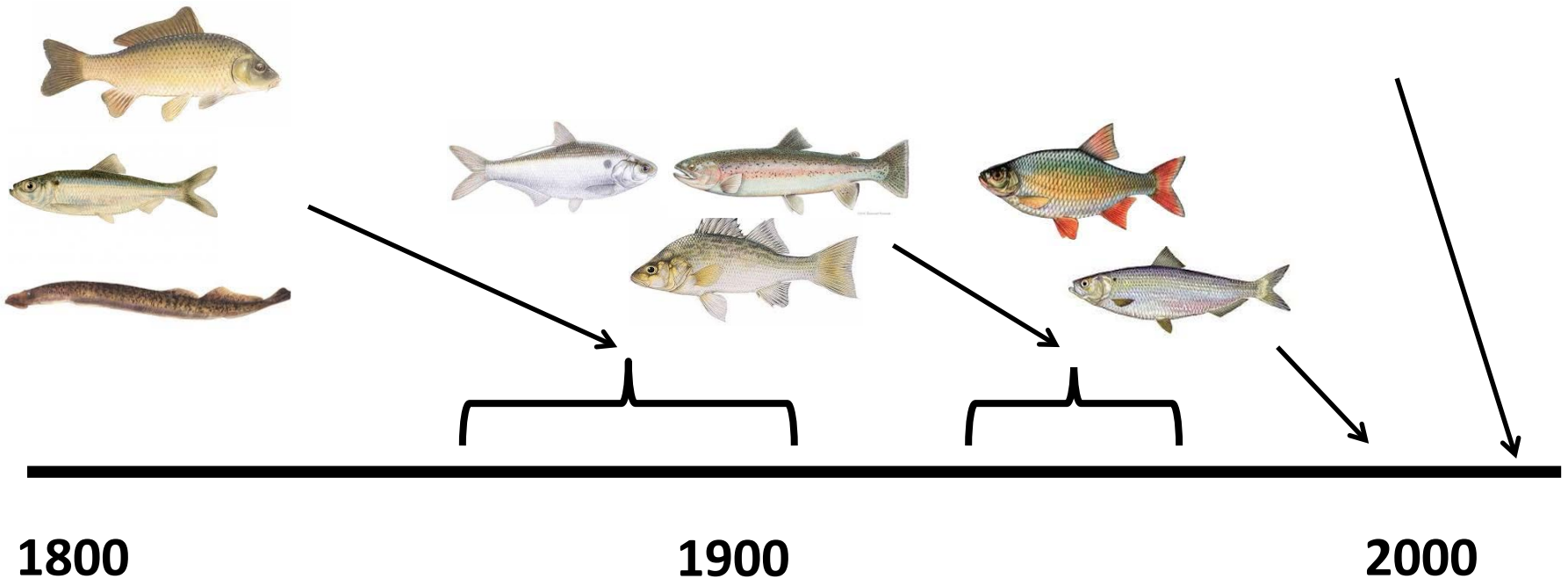
INTRODUCED FISH



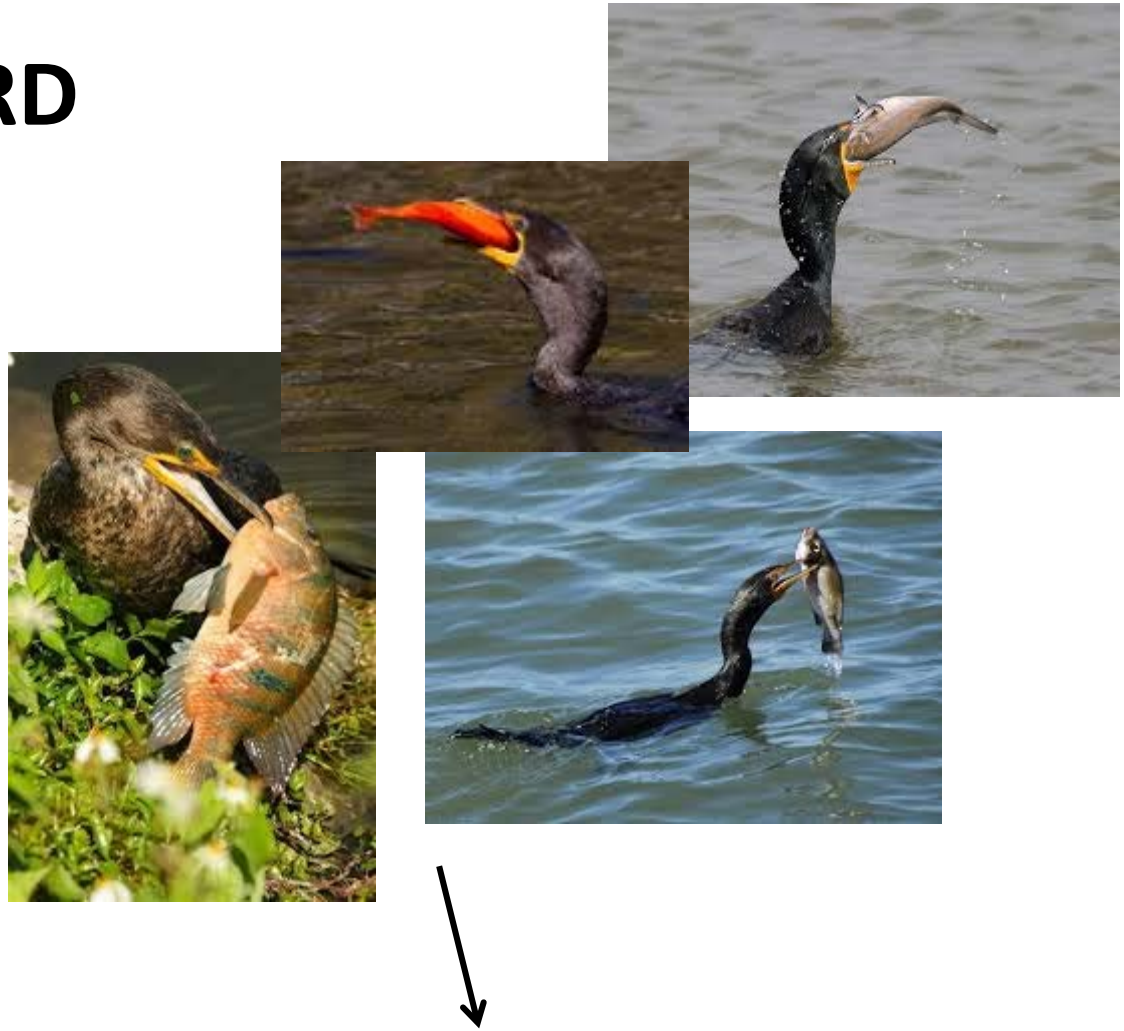
1800 1900 2000

INTRODUCED FISH



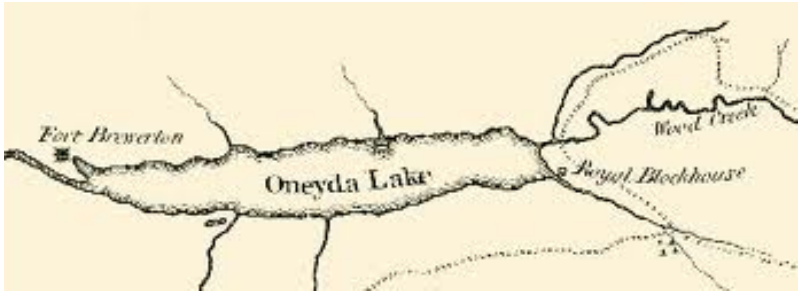


NONNATIVE BIRD



1950

2000

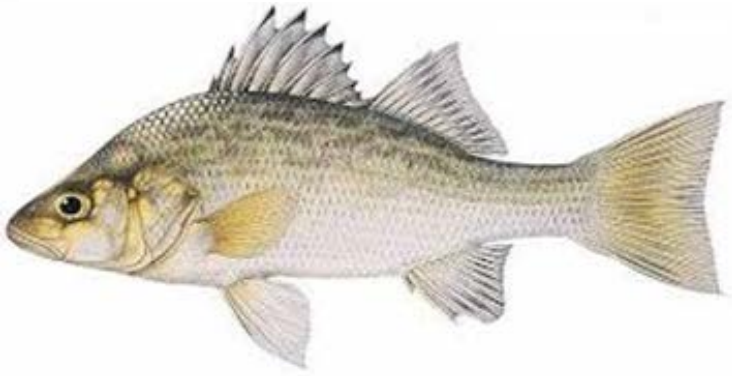


TIMELINE CONTEXT

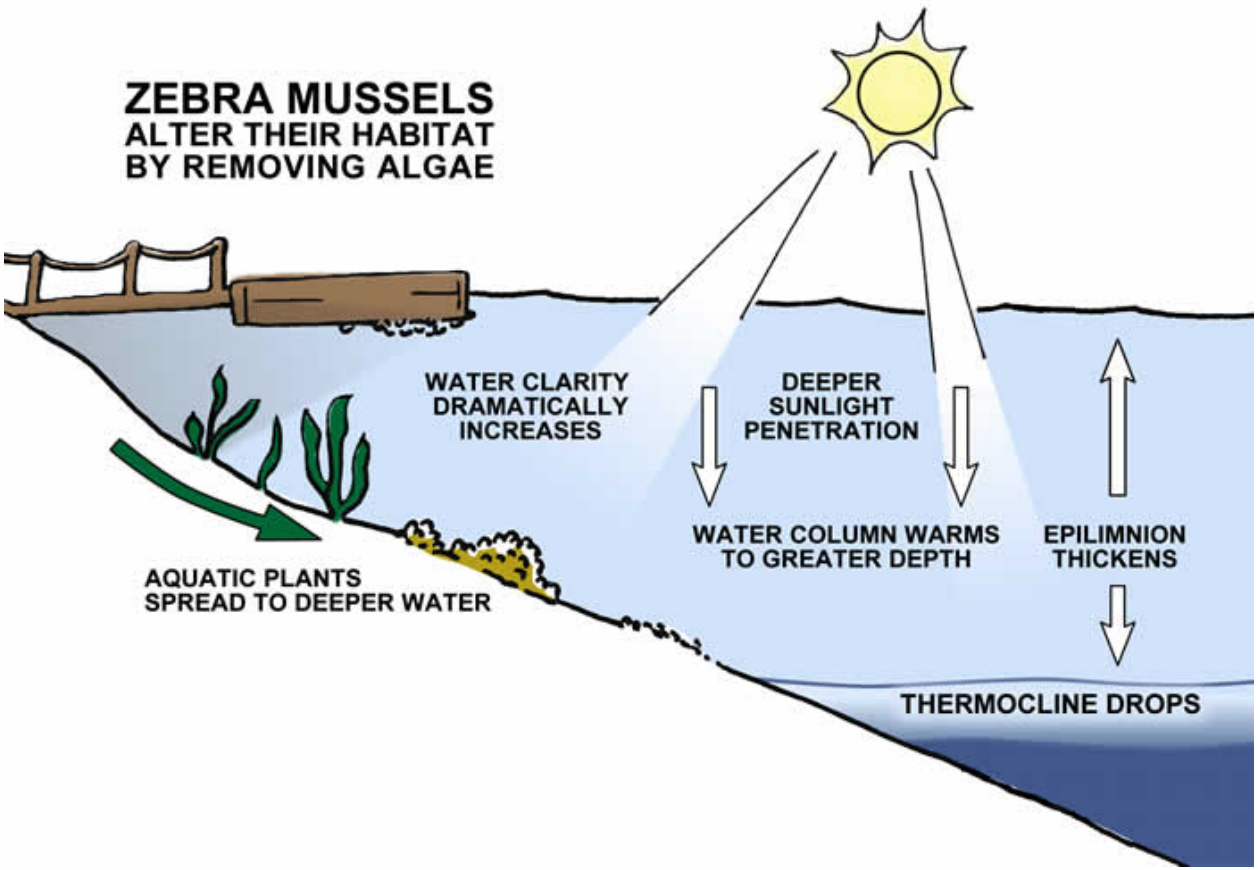
1800 — 1900 — 2000

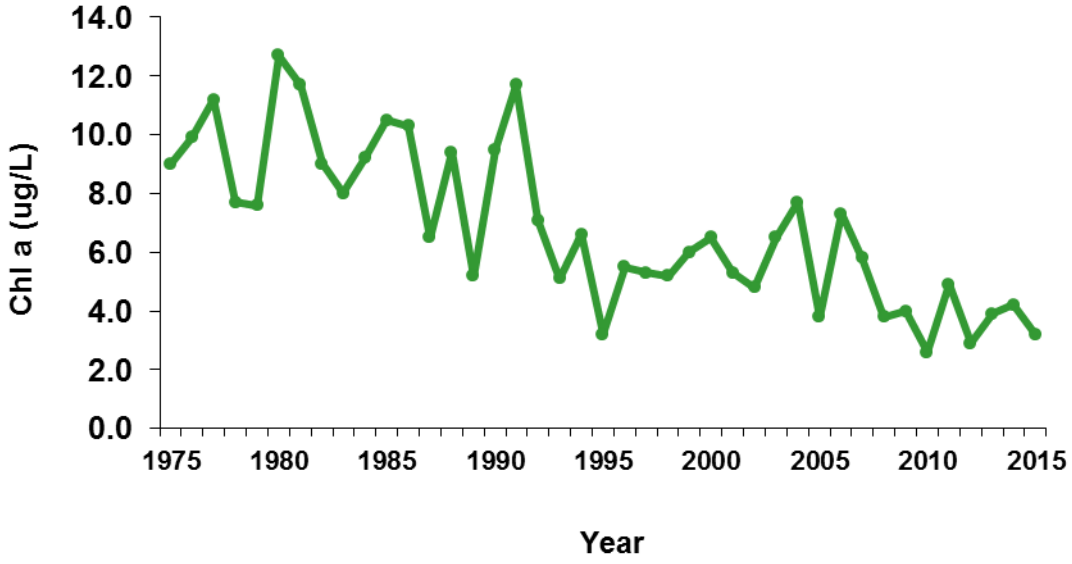
10 — 10 — 12

Only a Few Invasives Have Demonstrable Impacts on the Fisheries Of Oneida Lake

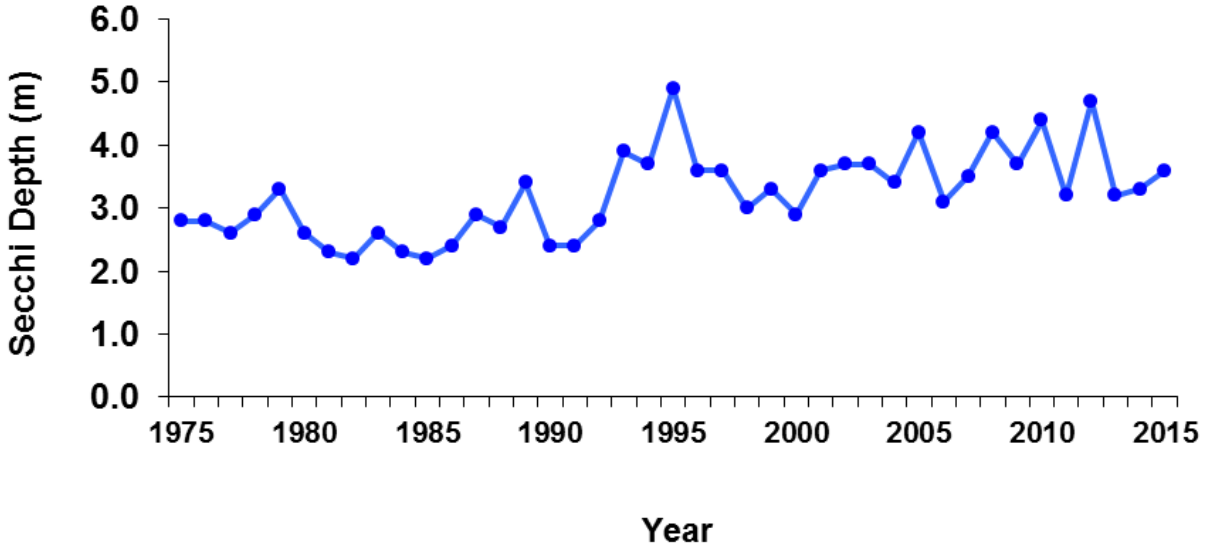


Mussel Impacts Have Been Well-Studied, and Broad Impacts on Systems Fairly Consistent



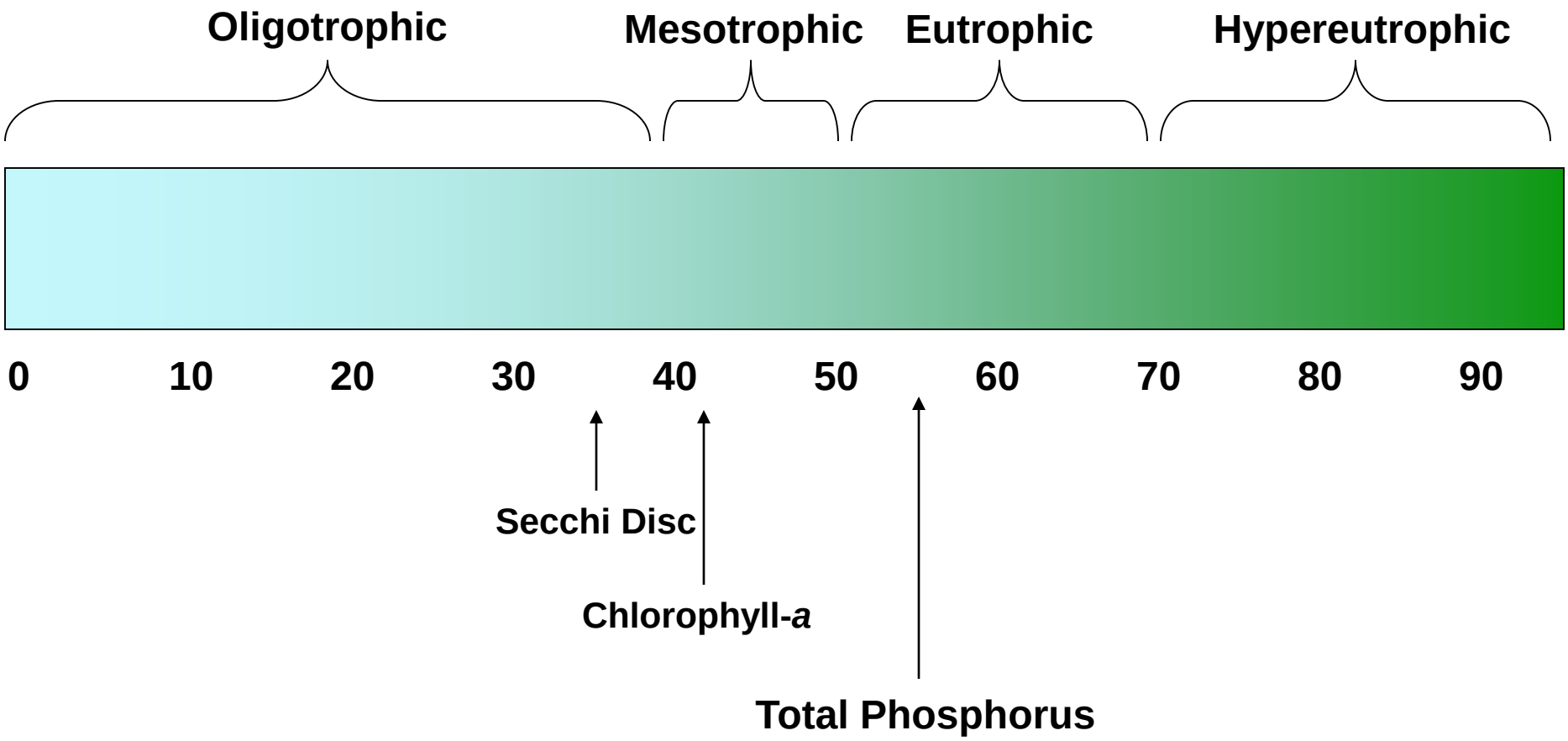


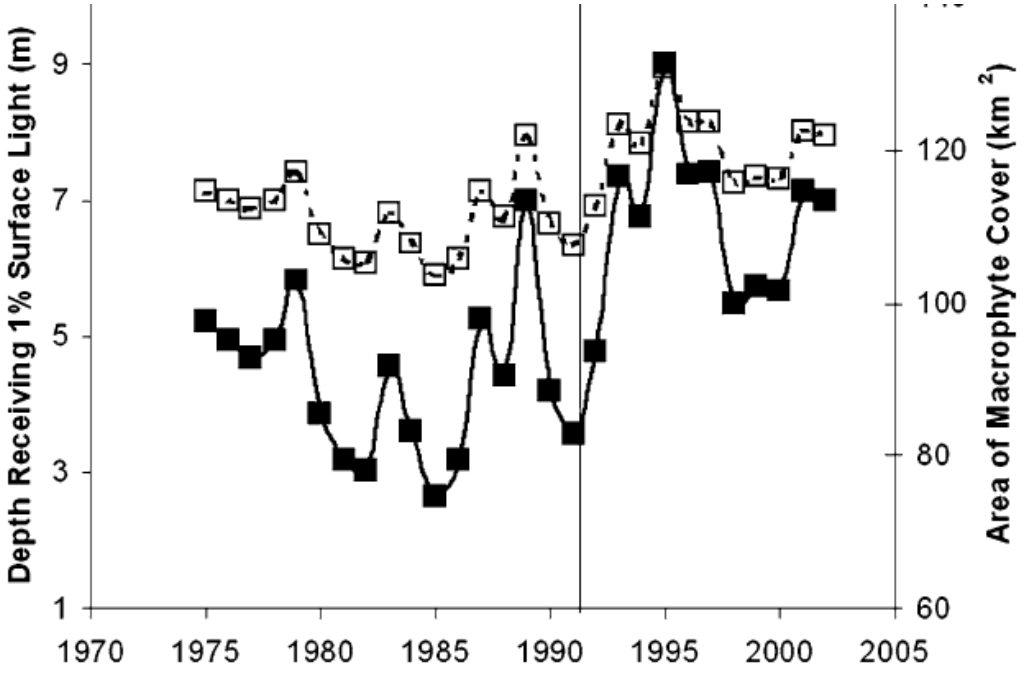
We Have Observed a Significant Decrease in Chlorophyll a and Concurrent Increase in Water Clarity in Oneida Lake Since Dreissenid Mussels Became Established



What is Oneida Lake's Current Trophic State?

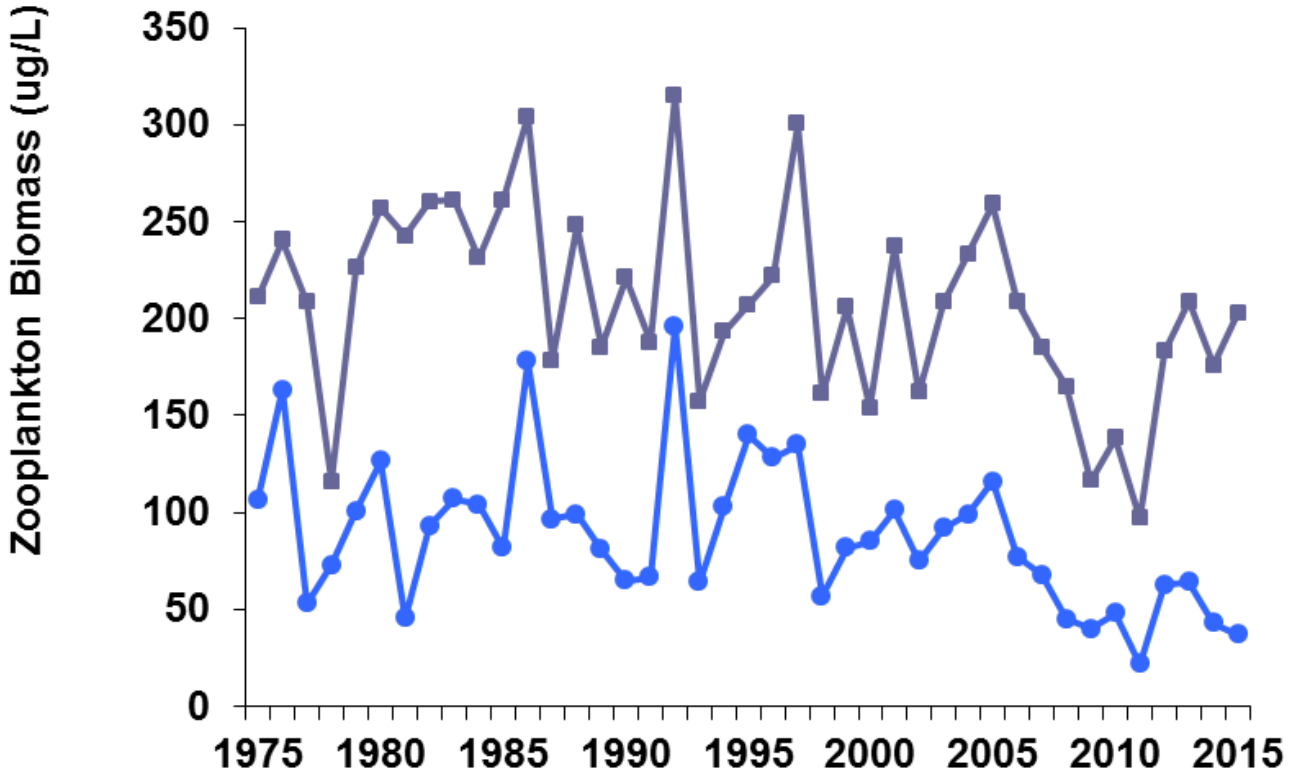
(Trophic State Index, Carlson 1977)



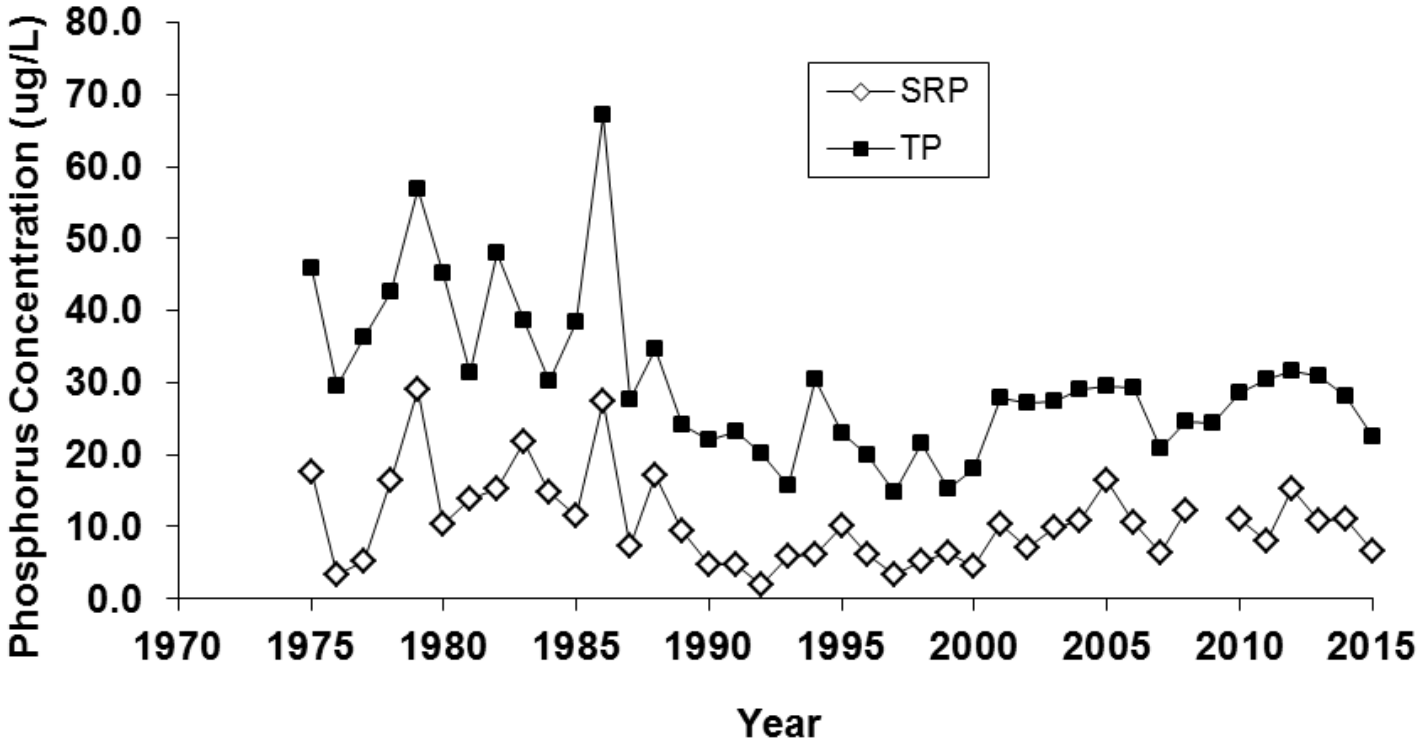


Increased Water Clarity Has Nearly Tripled the Depth at Which Aquatic Macrophytes Occur

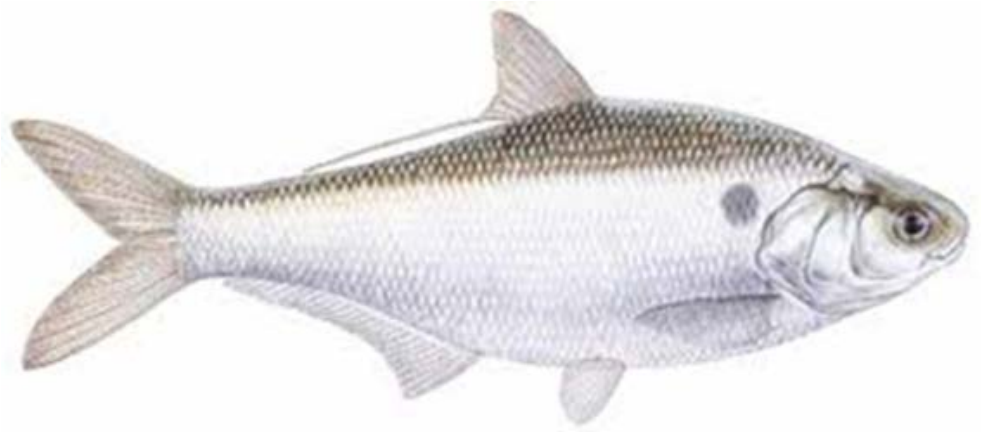
Declines in Zooplankton Density Lagged, But are Now Evident – Particularly in Daphnia



We Can Not Discount Concurrent Influence of Nutrient Reductions Resulting From The Great Lakes Water Quality Agreement (1972), But Timing More Consistent With Mussels

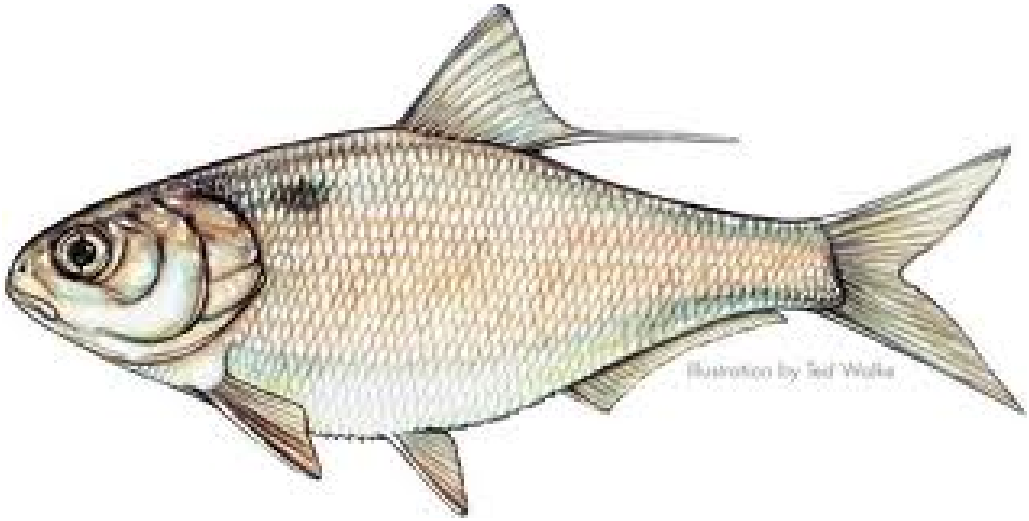


Impacts of the Most Successful Invasive Fish Species Not As Obvious as We Might Like



The First Cornell Result from Oneida Lake:

Science finds a use for gizzard shad:



Shad appeared in Oneida lake in the mid-1950s, declining walleye catch rates led to concerns that ecology of New York's premier walleye lake could be in jeopardy

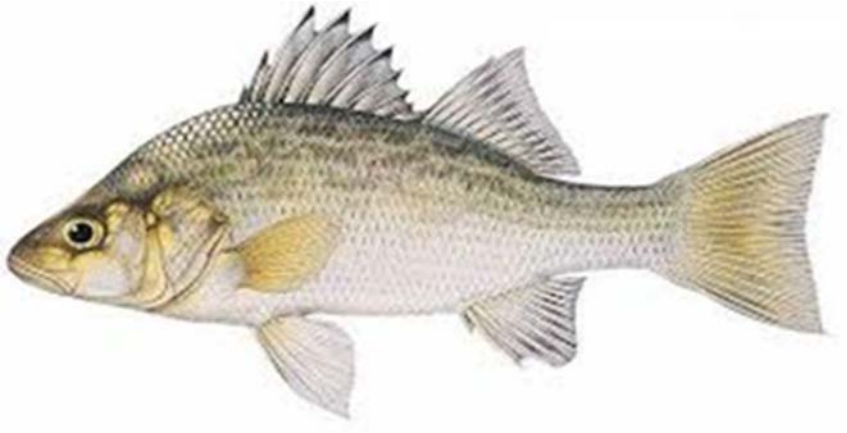
Forney proposed to the New York Department of Conservation a 3 year study to assess the walleye population in Oneida Lake – study was initiated in 1957

Dr. John Forney, with student (circa 1960's).

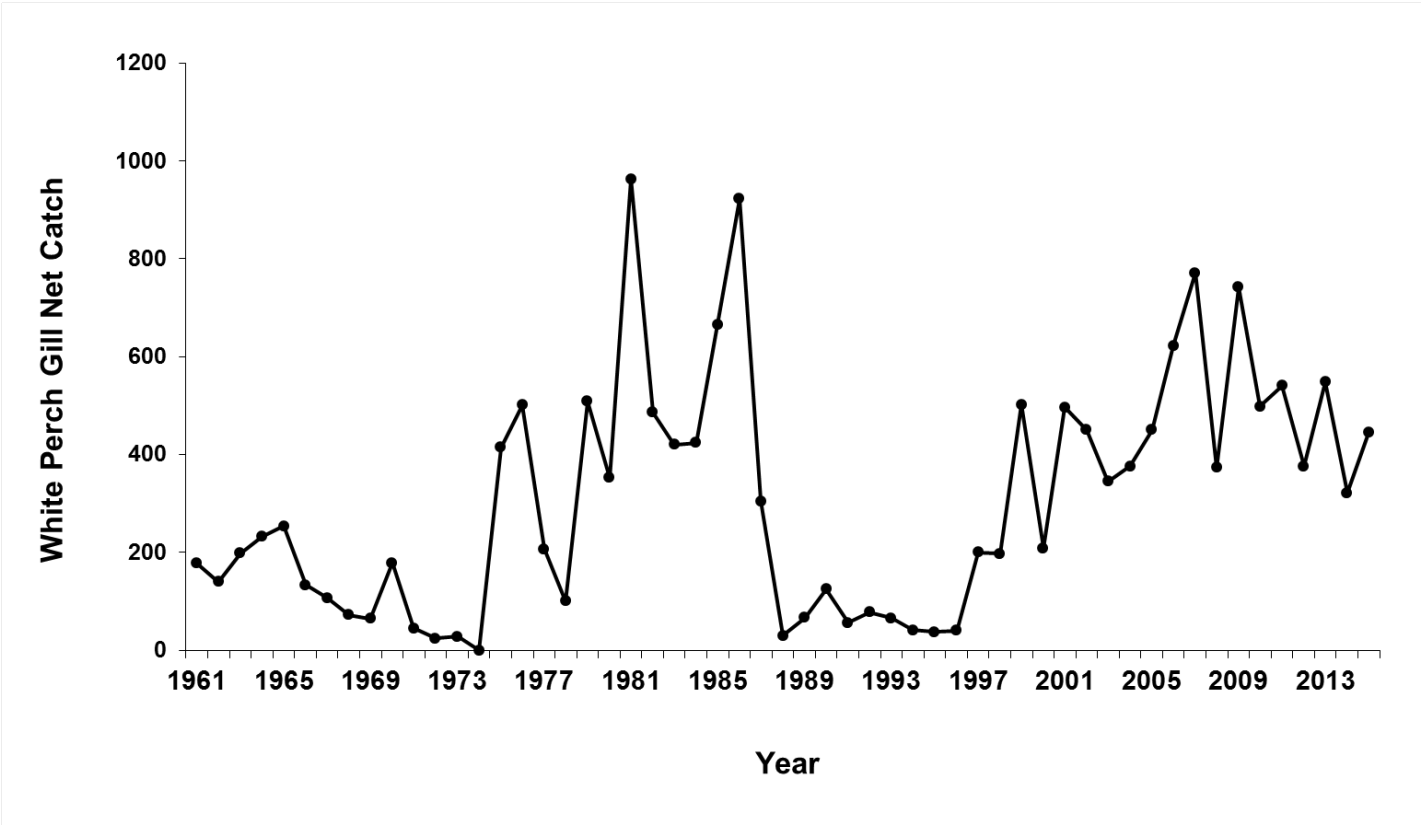
In Southern Systems Shad Can Represent 50% or more of Fish Biomass

But in Oneida:

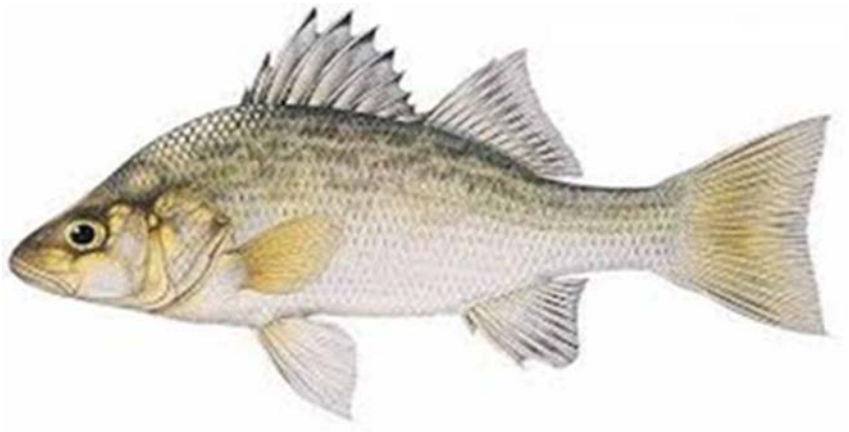
- **Represent a valuable fall/early winter food for sport fish**
- **Uneaten young typically winterkill**
- **Selected for by cormorants**
- **May well serve valuable role as buffer for yellow perch against walleye predation**



In Recent Years White Perch Commonly Outnumber Yellow Perch in Gill Net Catches – They May Now Be the Most Abundant Fish in Oneida Lake

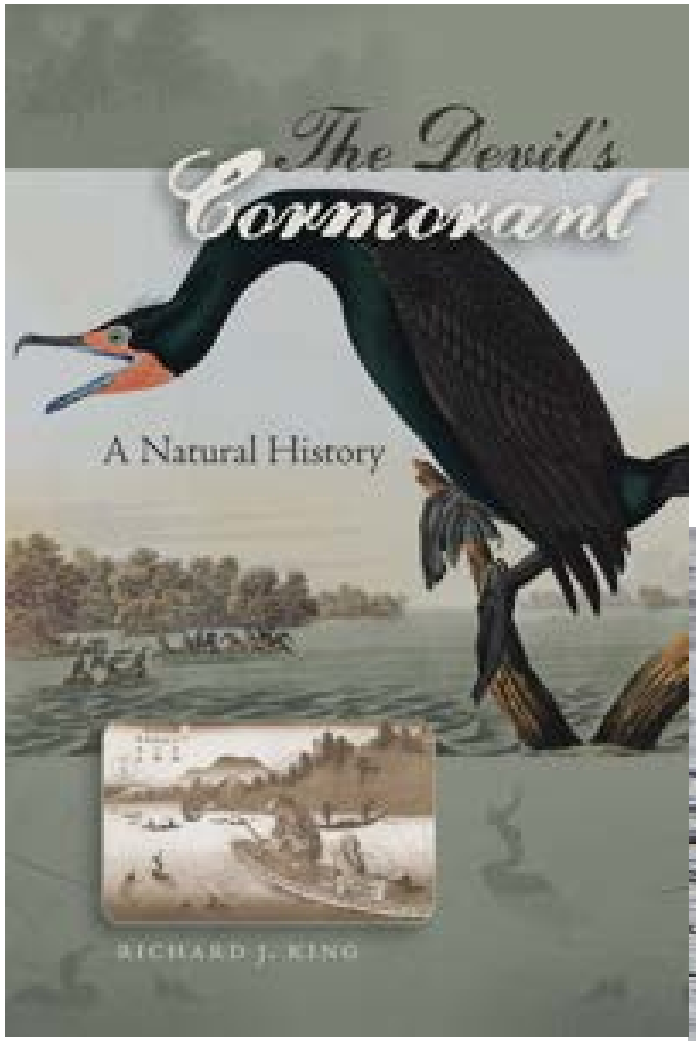


High Overlap in Diets of Yellow Perch and White Perch Creates Potential for Competitive Interactions

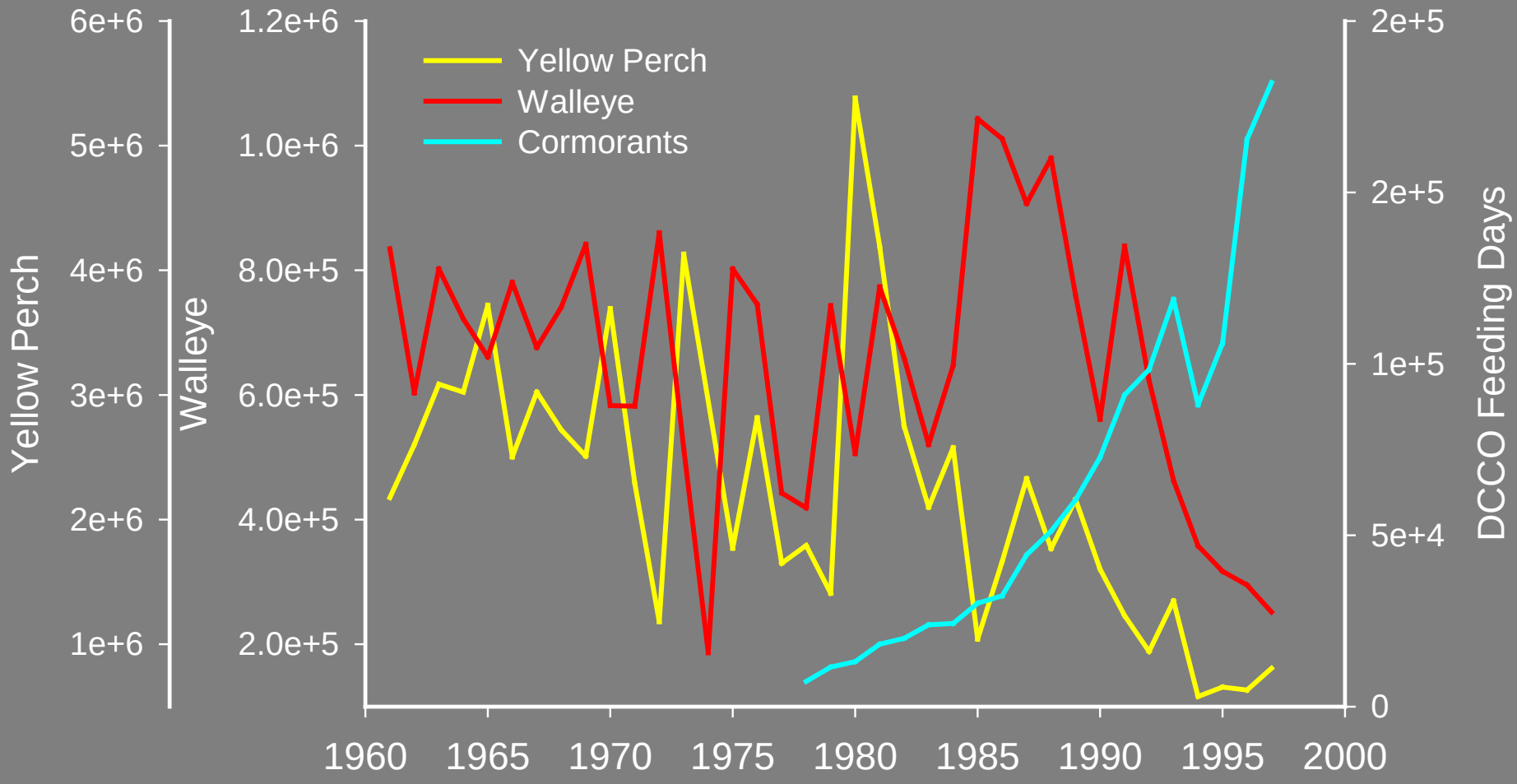


But We Don’t See Reduced Growth of Either Species as White Perch Abundance has Increased, Suggesting Resources are Sufficient to Support Both So Far

Cormorant Impacts a Bit More Conspicuous



Declines in walleye and yellow perch correlate with establishment of cormorants



Locals bring out the welcome wagon for cormorants:

The Oneida Lake Bulletin

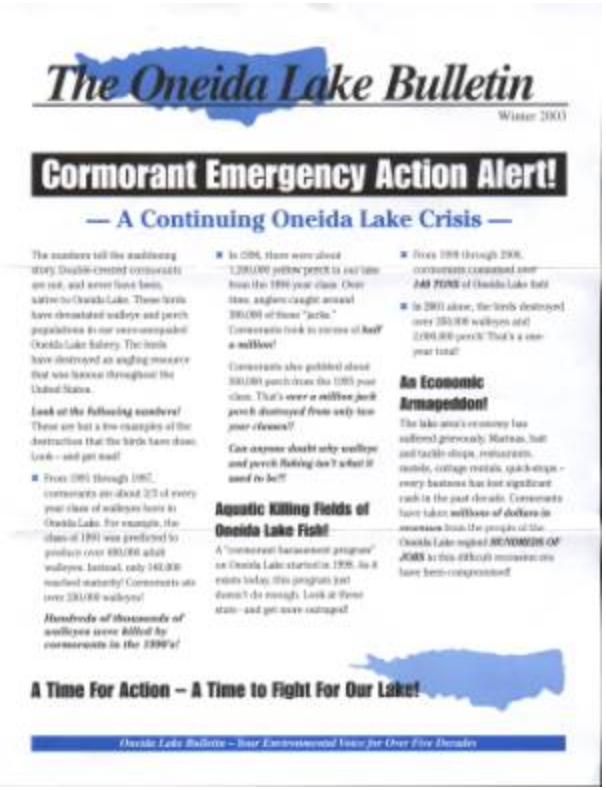
Winter 2003

Cormorant Emergency Action Alert!

— A Continuing Oneida Lake Crisis —

Aquatic Killing Fields of Oneida Lake Fish!

An Economic Armageddon!



Despite Aggressive Cormorant Management Throughout the 2000s, Percid Populations Have Not Returned to Historic Abundances