The Northern Highland Fisheries Research Area: the Past, Present, and Future of Wisconsin's Experimental Fisheries Research Lakes

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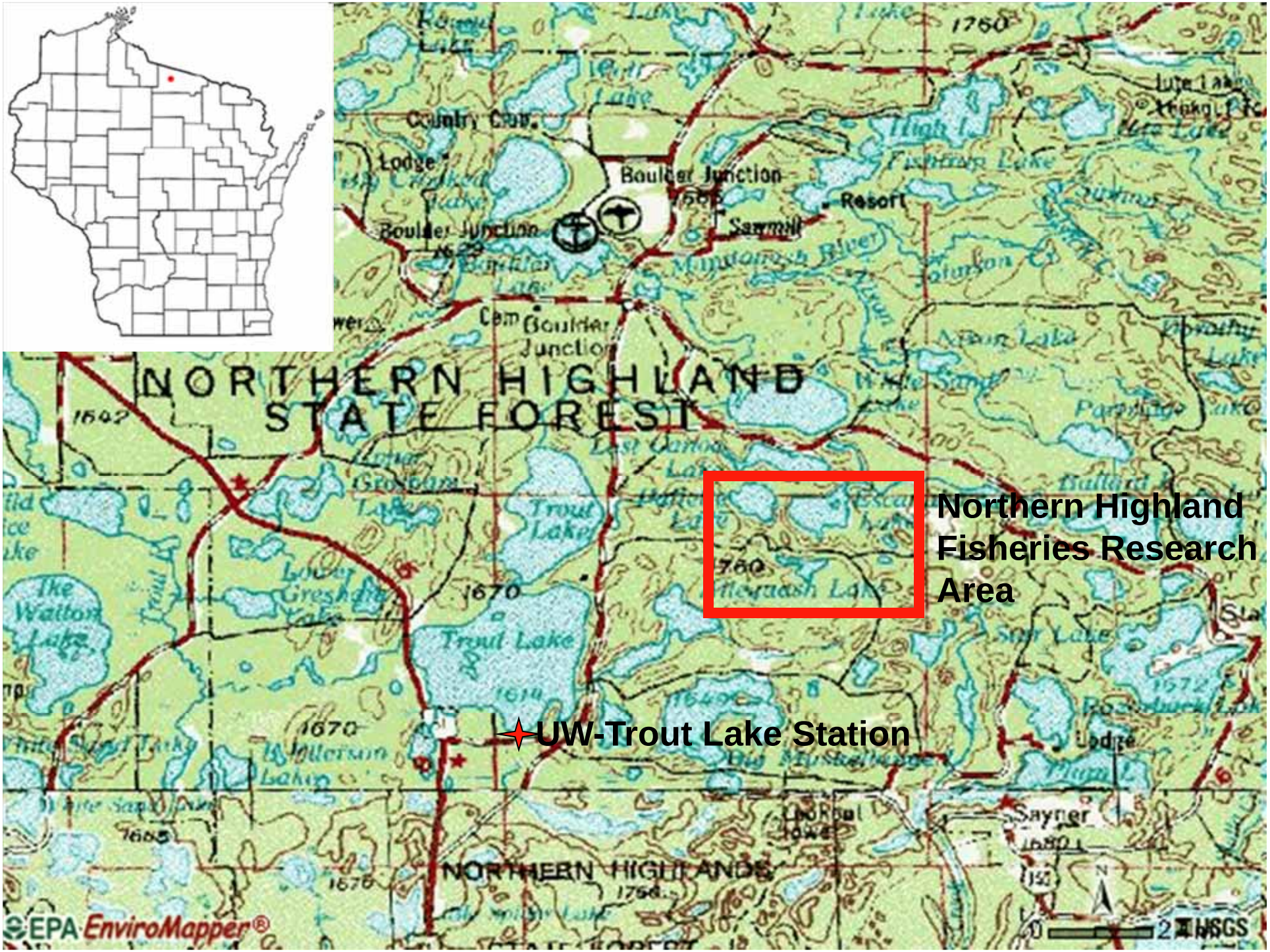
THE PAST.....

1. Where we are and what's our purpose
2. Description of lakes and fish communities
3. Past and current fishery regulations


Northern Highland Fisheries Research Area
UW-Trout Lake Station
NORTHERN HIGHLAND STATE FOREST
Boulder Junction
Country Club
Lodge
Resort
Sawmill
Trout Lake
Main Lake
Sayner
NORTHERN HIGHLANDS
EPA EnviroMapper®
USGS

Compulsory Creel Census Since 1946

- All anglers must check in at field station and check out when done fishing
- All harvested fish are measured for length and weight and scales are removed for aging
- Allows us to calculate exploitation rates, catch rates, angler effort, and information on fish population demographics
- Field station open 365 days a year

Escanaba Lake

- 293 acres
- Originally a Centrarchid dominated lake; walleye stocking in the 1950's, now one of the most studied walleye lakes in the world

walleye

yellow perch

smallmouth bass

muskellunge

northern pike

Pallette Lake

- 176 acres
- Maintains a diverse cold and cool water fish assemblage

smallmouth bass

muskellunge

lake trout

cisco

yellow perch

northern pike

rock bass

Nebish Lake

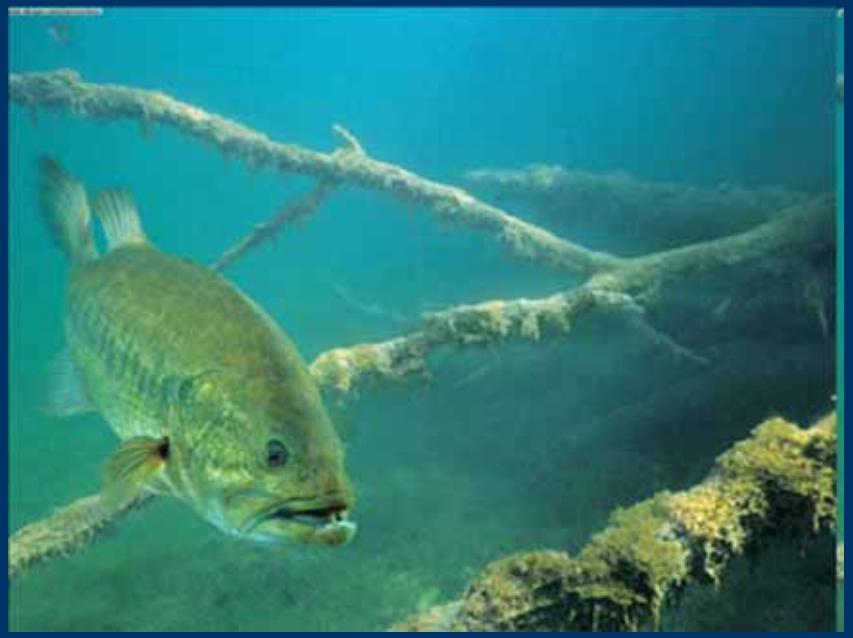
- 98 acres
- Dominated by smallmouth bass due to harvest regulations

smallmouth bass

yellow perch

Spruce Lake

- 16.5 acres
- Sphagnum bog lake with poor fish species diversity



largemouth bass

yellow perch

Mystery Lake

- 16 acres
- Winterkill lake with fish species assemblage adapted for low dissolved oxygen

Central mudminnow

redbelly and finescale dace

NHFRA Regulations

- No bag, size, or closed seasons unless specified

- ESCANABA LAKE
- From 1946-2003, no bag, size, or closed season on walleye
- Walleye population was self-sustaining with average annual adult exploitation rate of 35% (used to establish Total Allowable Catch for Ceded Territory walleye management)
- Since 2003, 28” minimum and daily bag limit of one for walleye (control for Sherman Lake 50% adult exploitation study)

NHFRA Regulations Cont.

- PALLETTE LAKE
- 22” minimum size and daily bag limit of one for smallmouth bass; lake trout fishing prohibited (conservation of Trout Lake strain)

- NEBISH LAKE
- 9-12” protected slot size limit on smallmouth bass and a daily bag limit of one (no live fish bait allowed)

- SPRUCE LAKE
- 12” minimum size and daily bag limit of two on largemouth bass (artificial baits only)

- MYSTERY LAKE
- No size or bag limits on any species

THE PRESENT.....

1. Future regulations on NHFRA lakes
2. Growth potential of walleye and smallmouth bass
3. Coldwater fish community assessment of Pallette Lake
4. Experimental tests of sustainable walleye exploitation rates
5. Reexamination of Ceded Territory walleye management policies
6. LTER sampling on NHFRA lakes
7. Angler satisfaction and skill level survey
8. Bowfin-gar-common carp-largemouth bass interactions

Implementing Regulations Changes on NHFRA Lakes

- Due to WDNR policies, proposed regulation changes take at least two years to implement (e.g. propose spring 2012, implement spring 2014 or 2015)
- New regulation proposal to be exempt from the normal policy to allow us to use these lakes for their intended purpose (i.e. rapidly respond to pressing fisheries management questions)

What is the growth potential of walleye and smallmouth bass among lakes that vary in their forage bases?

1. Is Escanaba Lake capable of producing 28” walleye without harvest?
2. Is Pallette Lake capable of producing 22” smallmouth bass without harvest?

Escanaba Lake
-yellow perch
-white sucker
-*O. virilis*

Pallette Lake
-cisco
-yellow perch
-?

Trout Lake
-cisco
-*O. rusticus*

Sparkling Lake
-rainbow smelt
-*O. rusticus*

White Sand Lake
-cisco
-?

-Two year study to inform future management and experimentation decisions on Escanaba and Pallette lakes

Walleye and Smallmouth Bass Diet and Growth

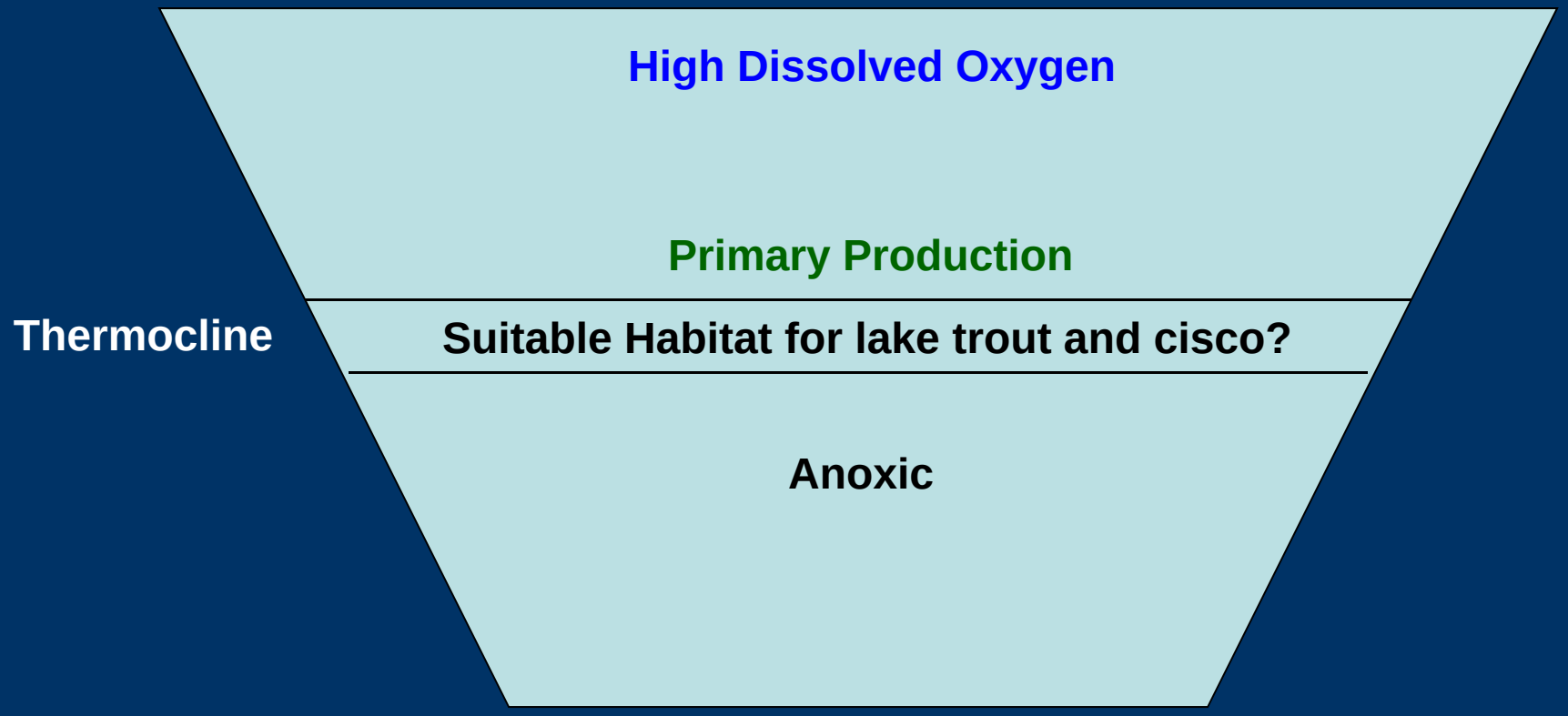
- Summer 2012 and 2013
- WE and SMB mark-recapture population estimates on each lake
- Biweekly diet content analysis
- Back-calculated growth rates

-Testing for pattern (comparative study), not mechanism

-Density-dependence, foraging profitability?

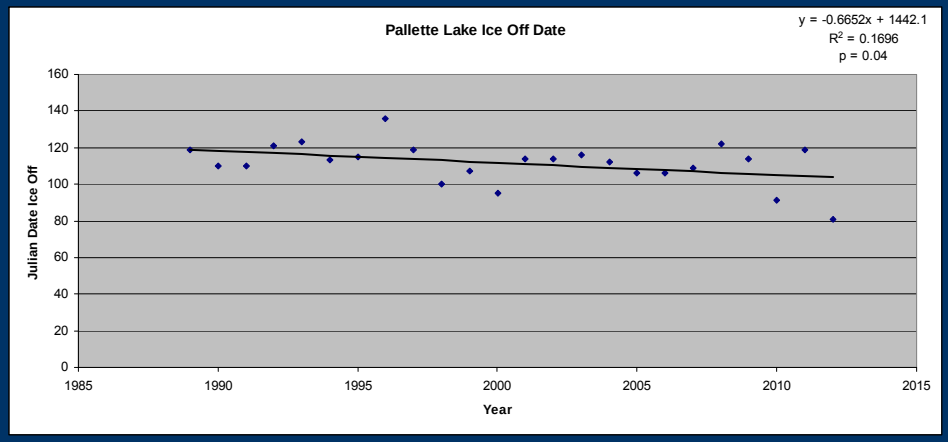
Pallette Lake Coldwater Fish Community Assessment

- Carl Watras: late 1980's, early 1990's, early 2000's



Status of the Pallette Lake Coldwater Fish Community

- Reprofiling of the water column (DO, temperature, conductivity, chl a, water clarity)
- Vertical gill nets, hydroacoustics, fall cisco seining
- Implications for conservation of Trout Lake strain LT, cisco in inland lakes of Wisconsin



Sustainable Exploitation Rates for Walleye

- Escanaba Lake, 1946-2003 – 35% average annual exploitation (min. 6%, max. 62%)
- Big Crooked Lake – experimental 35% annual exploitation rate (sustainable, improved size structure, strong compensatory recruitment)
- Schueller et al. (2008) – population modeling suggested sustainable exploitation rates of 60-90%!
- Ceded Territory walleye populations currently managed at TAC of ≤35% of adult population (around 11% on average in mixed fishery)

Sherman Lake Exploitation Study

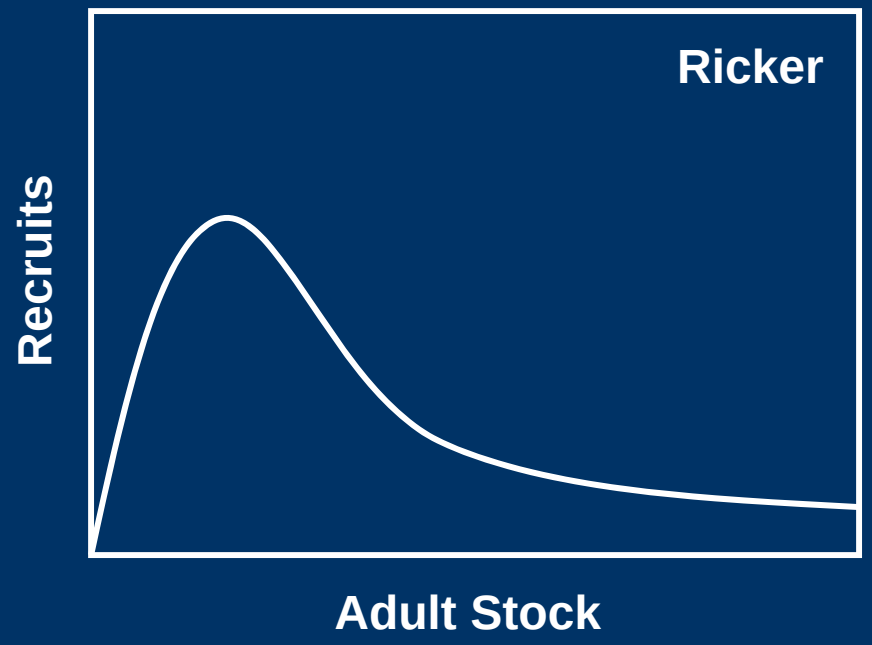
- In fourth year of 50% annual adult exploitation
- Poor size structure, low density (1 adult/acre), high growth rates, low age at maturity
- How will the walleye population respond in the next six years?

Reexamination of Ceded Territory Walleye Management

- Brian Roth, Matt Catalano, Iyob Tsehaye (MSU, QFC)
- Tribes seeking greater Ceded Territory harvest rates on walleye; DNR wants decision to be science-based
- What is a sustainable harvest policy for regional Ceded Territory walleye populations in this multi-user fishery?

Statistical Catch at Age Model

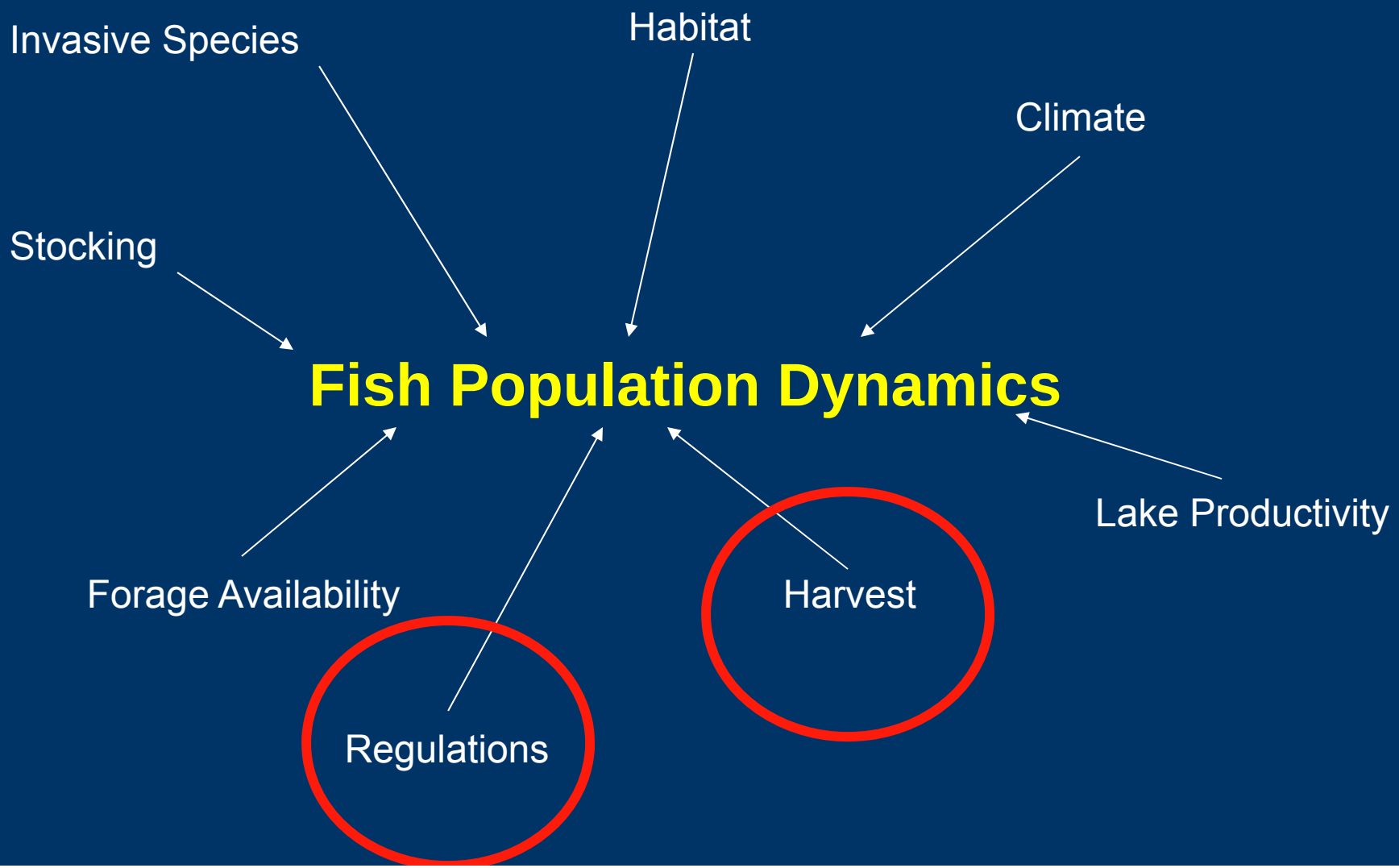
- Reevaluate stock-recruitment relationships for CT walleye (age 0, age 1)
- Use α and β parameter distributions to inform model (compensatory recruitment, initial densities)
- Previous S-R parameter estimates seem overly compensatory



Statistical Catch at Age Model

- What is a sustainable walleye fishery (0.1 adult/acre, 3 adult/acre)?
- What are sustainable exploitation rates in the mixed fishery including a pulsed spear fishery (35%, 50%, 75%, 90%)?
- Under various size and bag limits (unregulated, 15”, 18”, 2, 3, 5 bag)?
- Under various tribal exploitation (50%, 75%, 90% of TAC)?
- Under various angler behavior and effort scenarios (catchability density-depedent and –independent)

LTER Sampling on NHFRA Lakes



In Summer 2012, Phase in....

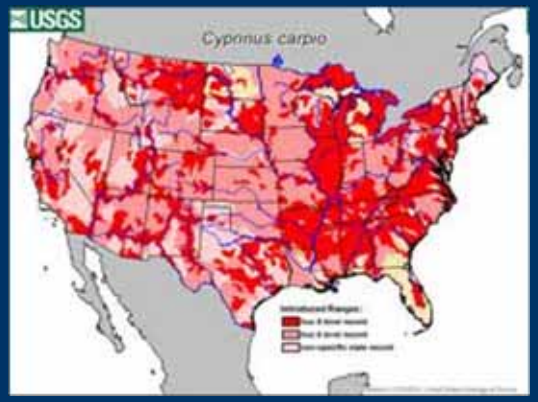
- Water level gauging
- Temperature/Dissolved Oxygen profiles
- Zooplankton sampling
- Crayfish sampling
- Secchi disk transparency

- GOAL: Collect additional, standardized ecosystem variables that may also influence fish population dynamics

2012 Optional Survey

- Ben Beardmore, Robert Arlinghaus
- Take advantage of unique opportunity to question anglers before and after fishing event
- Angler satisfaction before-after, perceived skill level vs. catch and harvest rates, lead vs. non-lead opinions

Controlling Common Carp



Common Carp – Bowfin – Gar Interactions

WI - Eagle Spring, Upper and Lower Phantom, and Lulu lakes

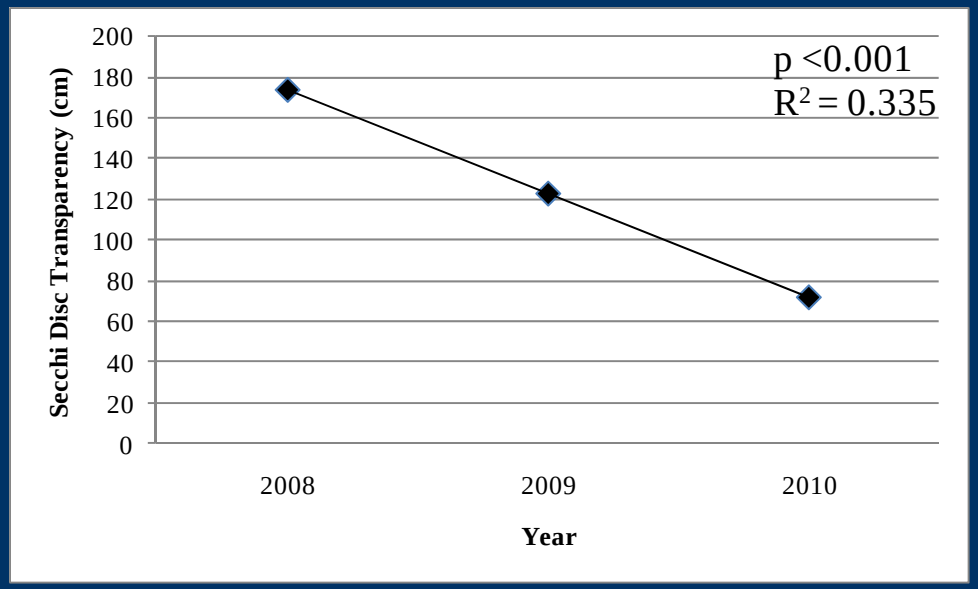
IL - The Nature Conservancy's Emiquon Preserve

TN – Reelfoot Lake

The Nature Conservancy's, Emiquon Preserve

- West-Central Illinois
- Former floodplain lake of the Illinois River
- Rotenone applied to agricultural ditches to rid water of nuisance species (common and grass carp)
- Allowed to naturally fill with water and diverse native fish assemblage stocked (high LMBS stocking rates in attempt to control water clarity, any remaining nuisance species, and to create a sport fishery)

The Nature Conservancy's, Emiquon Preserve



-In 2007-2011, no common carp observed in bass diets, water clarity has declined significantly, common carp abundances have increased, but submersed aquatic vegetation is still present (Grad students – Nerissa Michaels, T.D. Van Middlesworth)

What can we learn from aquatic ecosystems where common carp have not come to dominate and have not had negative effects on water clarity, aquatic macrophytes, and the native fish community?

Reelfoot Lake, Tennessee

- Formed by earthquake in early 1800's; disconnected from MS River
- Maintains aquatic macrophytes, diverse fish species assemblage, and has had common carp for over 100 years
- TN agency reports suggested bowfin and spotted gar relative abundances similar to or greater than those for common carp
- Collaboration with Dr. Brad Ray (UT-Martin)


Cabela's


BASS
Cabela's

Reelfoot Lake, Tennessee 2011

- Bowfin and spotted gar relative abundances were equal to or exceeded those of common carp
- Diet content analysis of bowfin and gar is ongoing
- TNC funded for 2012 and 2013 to continue study on Emiquon, Reelfoot Lake, and three southeastern Wisconsin lakes

- Are high densities of primitive fishes key to dampening the negative effects of common carp?

Eagle Spring, Upper and Lower Phantom, and Lulu Lakes, Wisconsin

- **Eagle Spring**

- High LMBS, High CARP, Low BWFN

- **Upper and Lower Phantom**

- High LMBS, Low CARP, High BWFN (excellent fish species diversity)

- **Lulu**

-High LMBS, Low CARP, High BWFN

Will be sampled in 2012, 2013; BWFN and LMBS diets and relative abundances, strengthens comparative study and provides latitudinal gradient of study systems (in collaboration with John Lyons, Brad Ray)

The Future.....

1. Bass-walleye interactions
2. Cisco monitoring in inland lakes of WI
3. Establishing NHFRA lakes as LTER lakes

Bass-Walleye Interactions in Northern Wisconsin

- Anecdotal observations suggest that bass are negatively influencing walleye
- Correlation analyses, regulation changes, bass diet studies, bioenergetics modeling

Whole-lake Manipulations to Test for Bass-Walleye Interactions

ESCANABA LAKE

- Open to harvest to decrease walleye densities to CT average (3.5/acre)
- Add LMBS and BKCP to test for interactions

NEBISH LAKE

- Dominated by SMBS, but used to sustain walleye population
- Remove SMBS and add walleye to conduct reciprocal study with different bass species

Status of Cisco in Inland Lakes of Wisconsin

- Over 175 inland lakes in Wisconsin have records for cisco
- Status unknown in the majority of documented lakes
- Gill netting and hydroacoustics to evaluate state-wide status and coldwater habitat conditions, implications for climate change
- Genetic analyses to test for stock differentiation

Establishing NHFRA Lakes as Core LTER Lakes

Benefits of NHFRA Lakes as Core LTER Lakes

- No invasive species
- No lakeshore residential development
- Ability to conduct whole-lake manipulations
- Diverse lakes
- Compulsory creel census
- Establishes formal partnership with UW-Madison, WDNR, and NSF

Questions?

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