PUBLIC INFORMATIONAL MEETING
MUD LAKE REHABILITATION PROJECT

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Roxbury Town Hall
October 18, 2017

Dane County Parks
Always in Season

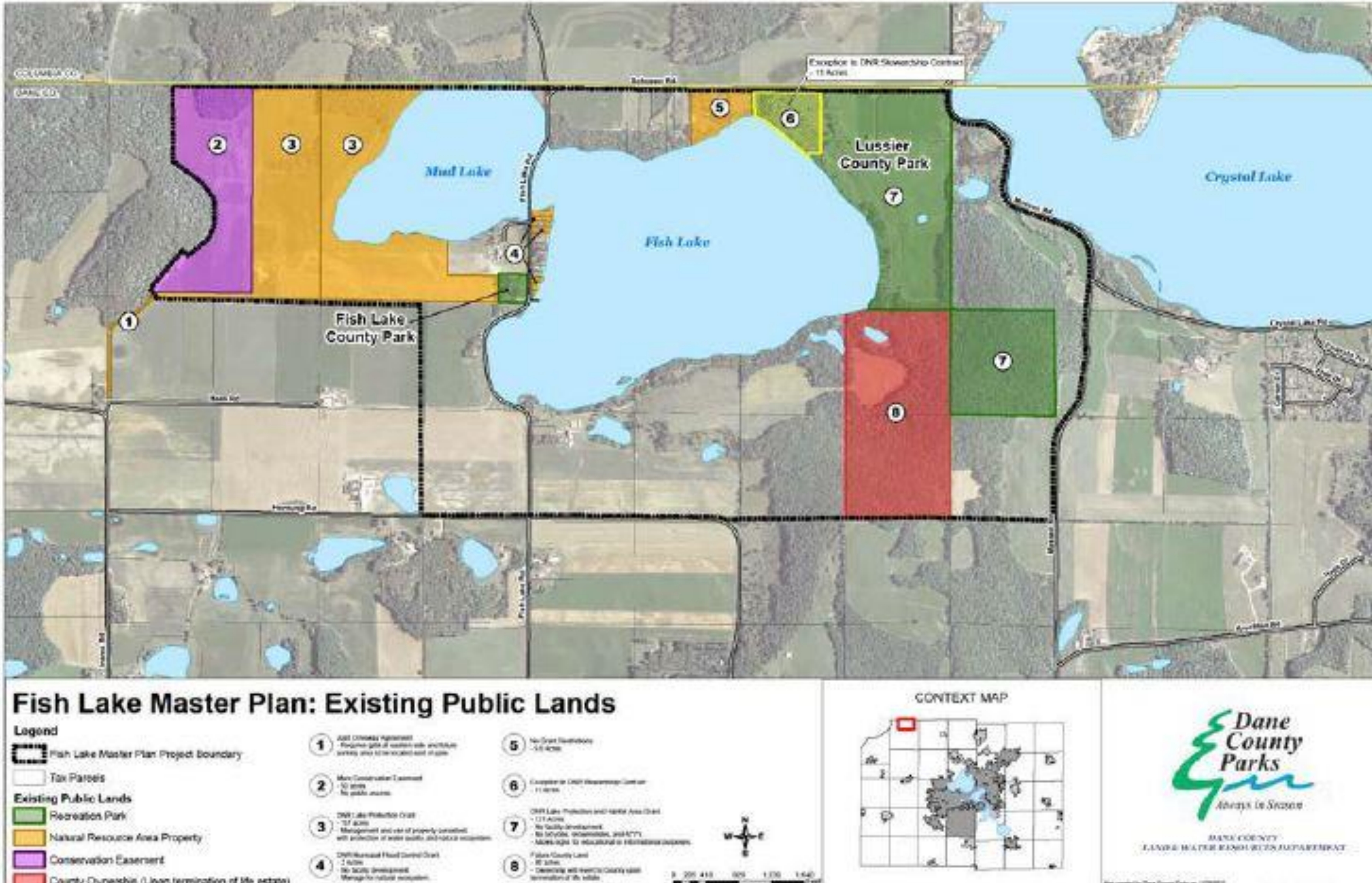
WISCONSIN
DEPT. OF NATURAL RESOURCES

Overview

- Background info/need for project
  - Mud Lake historically
  - Shallow lake ecology
  - Status of fishery, carp dominance, water quality
- Rehabilitation plan
  - Alternatives
  - Action plan
- Evaluation and future plans
  - Monitoring
  - Education

Collaborative Lake Improvement Projects in Dane County

- Dane County and WDNR partner to improve lakes via carp management
  - Lake Wingra
  - Cherokee Lake
  - Lake Belleville
  - Lake Kegonsa
  - Indian Lake
  - Mud Lake


Exception to DNR Stewardship Contract
Mud Lake
Fish Lake
Crystal Lake
Lussier County Park
Fish Lake County Park
1
2
3
3
4
5
6
7
7
8
Fish Lake Master Plan: Existing Public Lands
Legend
Fish Lake Master Plan Project Boundary
Tax Parcels
Existing Public Lands
Recreation Park
Natural Resource Area Property
Conservation Easement
County Ownership (Upon termination of life estate)
CONTEXT MAP
Dane County Parks
Always in Season

1937-Mud Lake

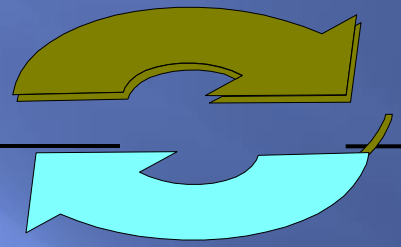
Mud Lake Today

Mud Lake Today

- No flowing inlet/outlet, fed by seepage, linked to Fish Lake
- ~85 acres
- ~9 feet max depth
- ~6 feet average depth
- Murky water, summer algal blooms
- American lotus

What Is The Problem?

Stable States in Shallow Lakes

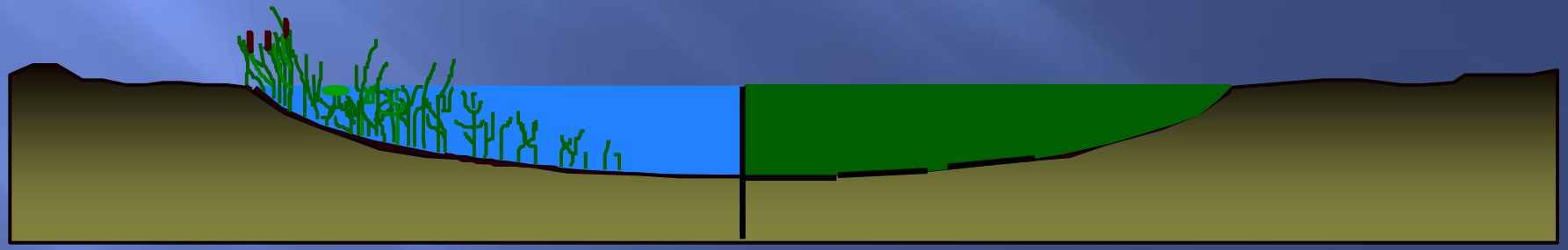


Clear State

- Clear water
- Low algal biomass
- High macrophyte biomass
- Piscivores dominate fishery

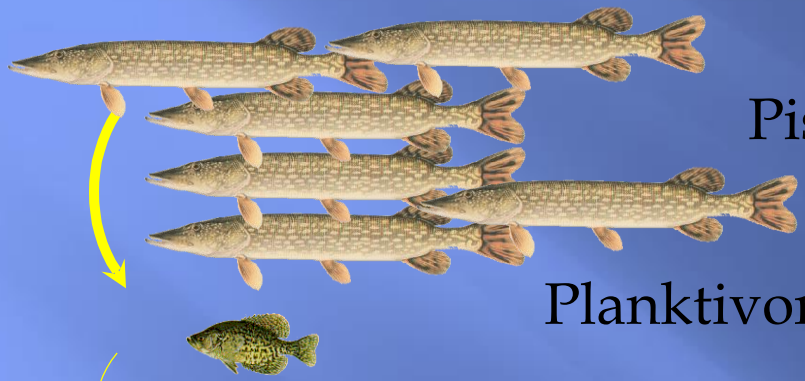
Turbid State

- Murky water
- High algal biomass
- Sparse macrophytes
- Planktivores/benthivores dominate fishery



Clear-water State

Turbid-water State



Piscivores

Planktivores/Benthivores

Zooplankton grazing

Algae biomass

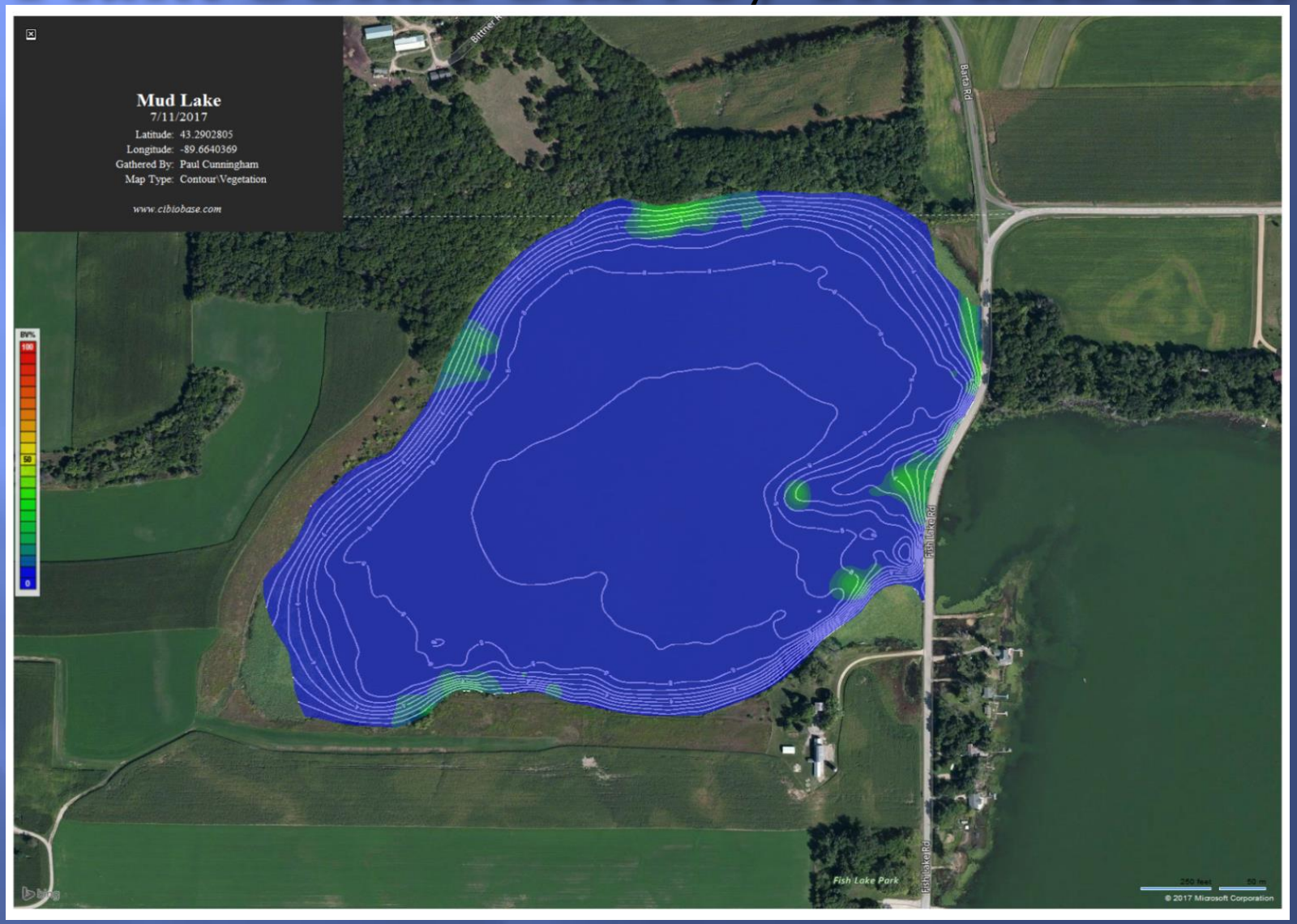
Aquatic plant biomass

Sediment Resuspension

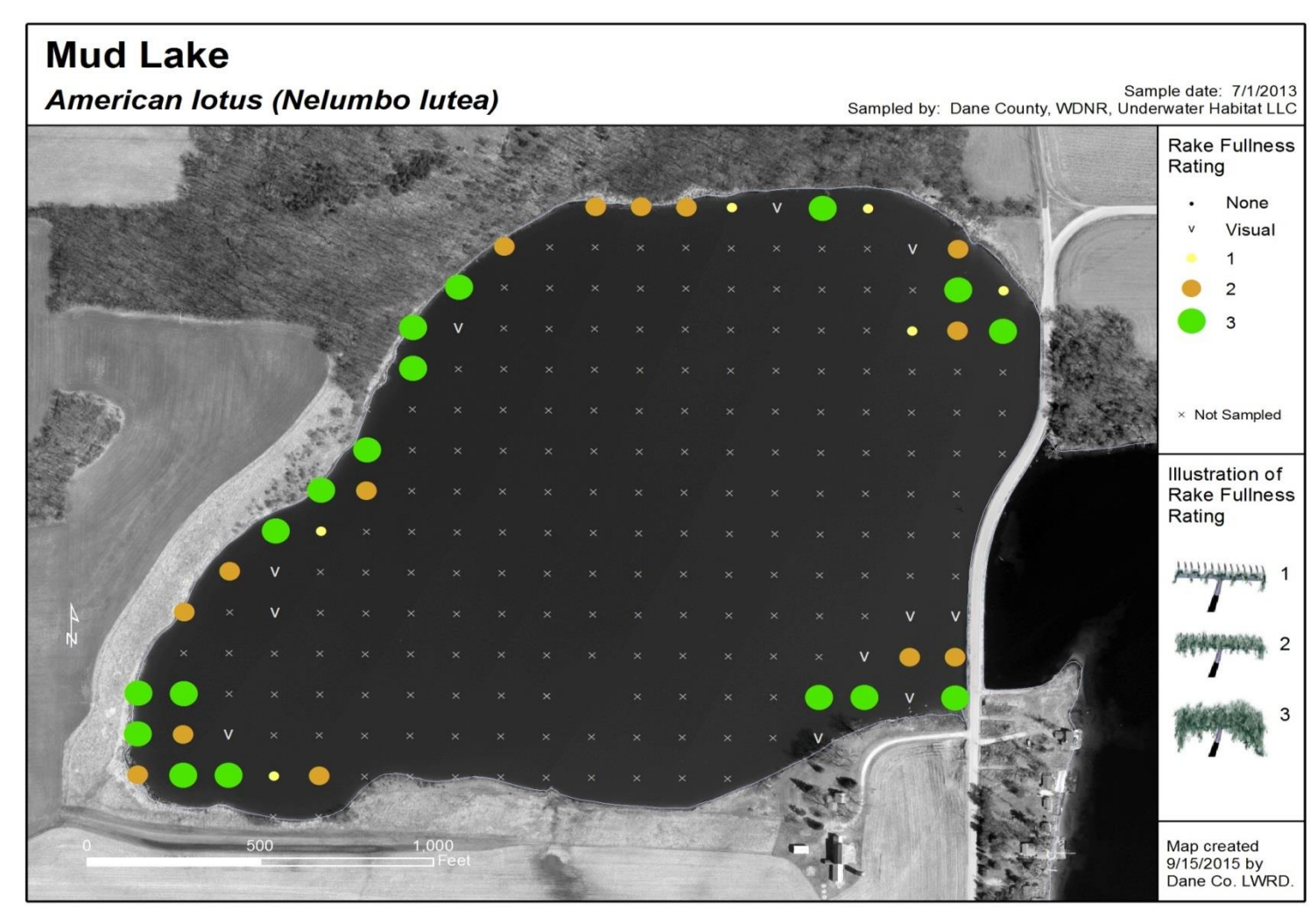
N. Hansel-Welch & M.B. Butler, 1997

American Lotus-Emergent, Dominant

Plant Sonar Survey Results 2017



Plant Rake Survey Results- 2013



Common Carp Dominance in Mud Lake

- Shallow, "winter kill" in long winters, thick ice/deep snow
- ↓ Light, ~~photosynthesis~~, ~~oxygen~~, tolerants OK, other fish ↓
- Winter DO < 3 ppm in January and February 1991, fish stress < 3ppm

Mud Lake Winter Kills

- Winter 2007-2008: >100 inches of snow, ice cover from November through March
- Dead fish at ice-out: bluegills, crappies, largemouth bass, and common carp
- Documentation of other events lacking, evidence points to multiple events over several decades

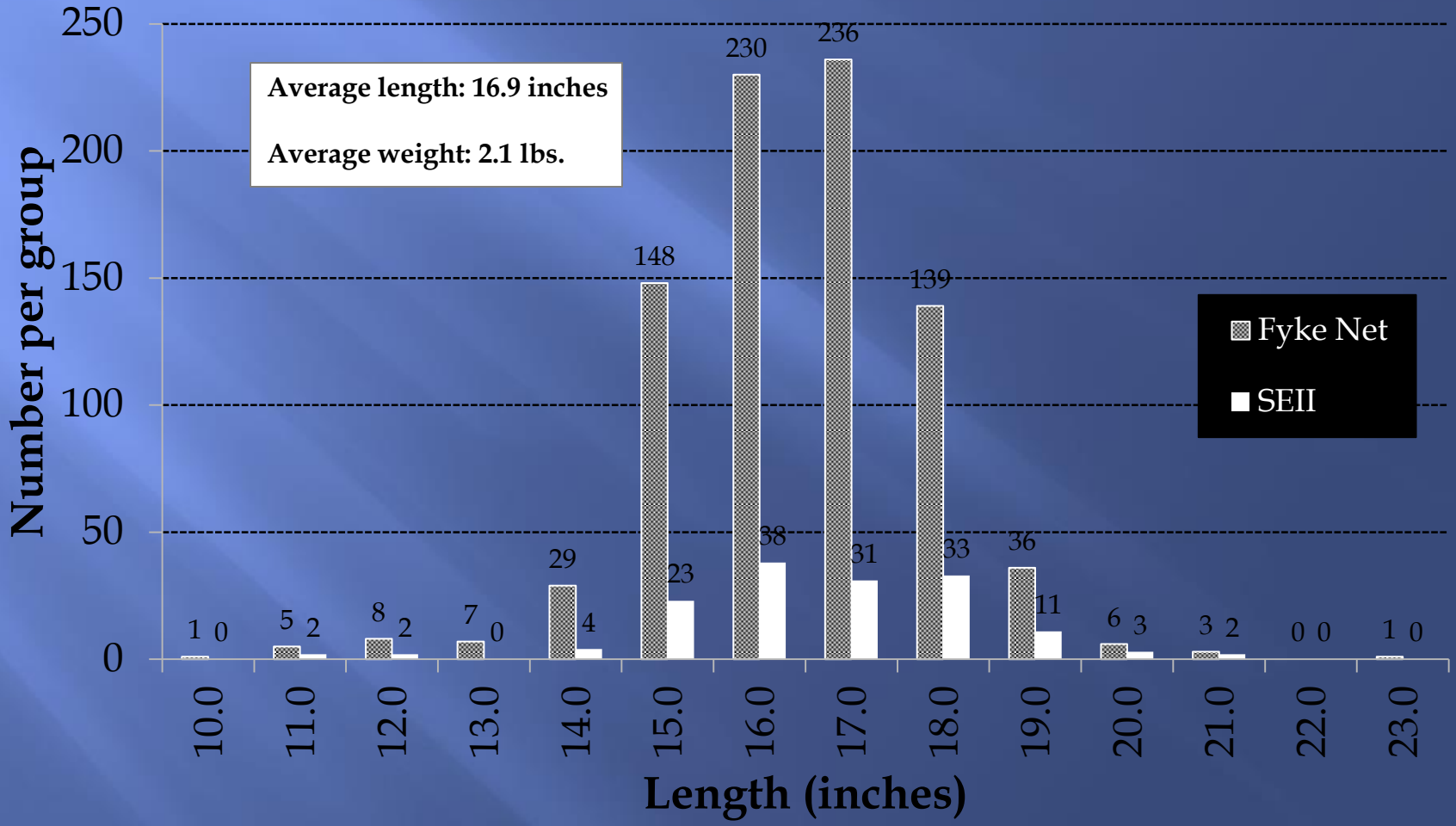
Rise of the Carp…Age of Turbidity

- Carp, crappies tolerant of low oxygen…survivors
- Bluegills control carp→ eat eggs
- Bluegills↓=carp↑
- Predators↓=planktivores↑

Mud Lake Fish Survey-2015

- Nets, electrofishing April-May
- 4,302 fish collected
- Planktivores 66%, carp 23%
- Predators 1%
- Planktivores dominate numbers
- Carp dominate biomass

Carp Size Distribution-2015



Biomass…POUNDS OF FISH

- Average weight= 2.1 lbs.

- Biomass from PE:
  - 25,500 carp*2.1 lbs. = 53,550 lbs.
  - **53,550 lbs. / 85 acres = 630 lbs./acre**

- **Carp <100 lbs./acre is manageable**

Carp Management Alternatives

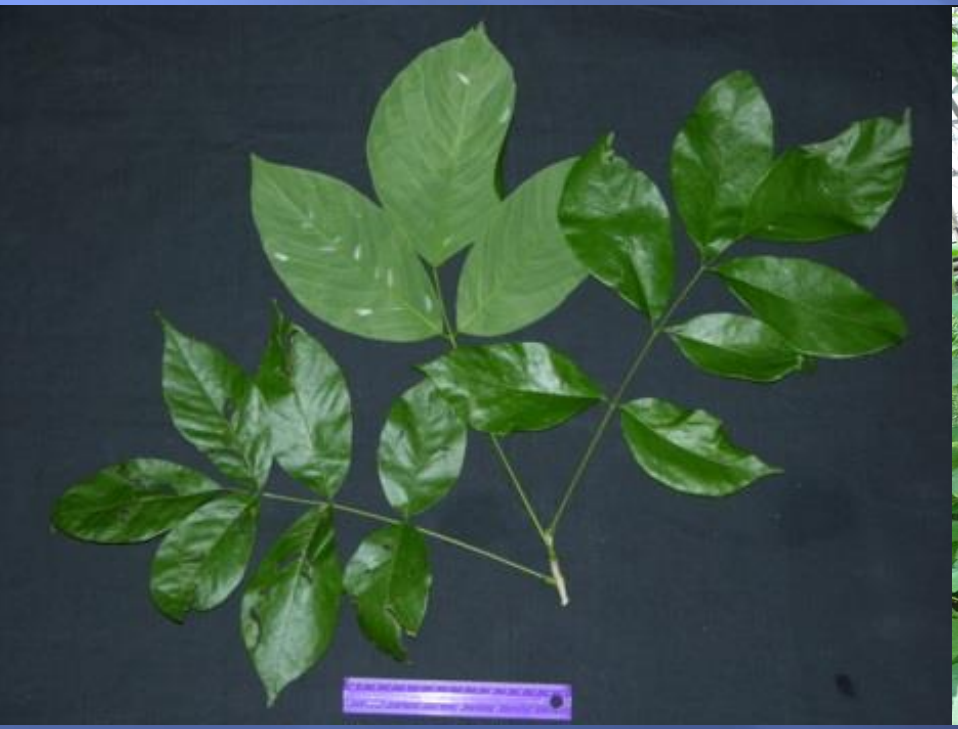
Management Alternatives	Considerations
Do Nothing	Status quo and further degradation of Mud Lake.
~~Commercial Harvest~~	~~Limited efficacy. Marketability of fish. Augment with stipend. Willing fisherman.~~
Bounty	Limited efficacy. Seasonal.
Drawdown	Cost prohibitive. Issue of time.
Application of Rotenone	**Full lake. Under ice. Historically proven method of fisheries management. Degrades quickly. Less intensive labor.**

Actions-Liberalized Regulations

- The Wisconsin Department of Natural Resources is planning a chemical treatment of Mud Lake in the Town of Roxbury, Dane County (T9N, R7E, sections 3 and 4, and T10N, R7E, section 33), during the winter of 2016-2017 to remove common carp which have reached nuisance levels. Using authority granted under NR20.33(4) of the Wisconsin Administrative Code, the Department will open the season for fishing with dip nets, minnow seines, or spears beginning **October 1, 2016** and continuing until the day the treatment commences. During the open season, all species of fish of any size may be taken with no bag or possession limit. Questions may be directed to Nathan Nye, Wisconsin DNR Fisheries Biologist in Poynette, at (608) 635-8122 or nathan.nye@wisconsin.gov

Rotenone

- Naturally occurring chemical found in the roots, seeds, and leaves of several subtropical bean plants (genus *Lonchocarpus* or *Derris*).

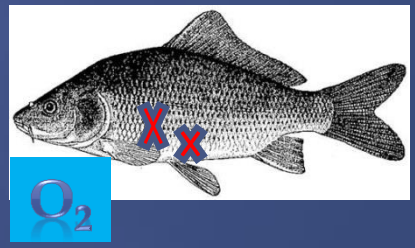


Lonchocarpus heptaphyllus, **leaves**

Derris elliptica, **plant**

Rotenone

- Inhibits a biochemical process at the cellular level preventing fish from using the oxygen absorbed in the blood and needed in the release of energy during respiration
- Acute toxicity: does not require long exposure time and fish metabolize it quickly
- Non-selective, all fish susceptible
- Low toxicity to birds and mammals
- Low bioaccumulation in fish or other organisms
  - Fish, mammals and bacteria actively metabolize rotenone
- Degrades quickly in the environment –breaks down in water and with exposure to sunlight
- Degradation process is temperature dependent



Invertebrates

- Exposure is high in lakes vs rivers
- Phytoplankton not affected
- Protozoans & rotifers tolerant
- Cladocerans & copepods sensitive
- Zooplankton egg stages resistant
- Zooplankton egg stages always present
- Recover typically within 1 year

Amphibians

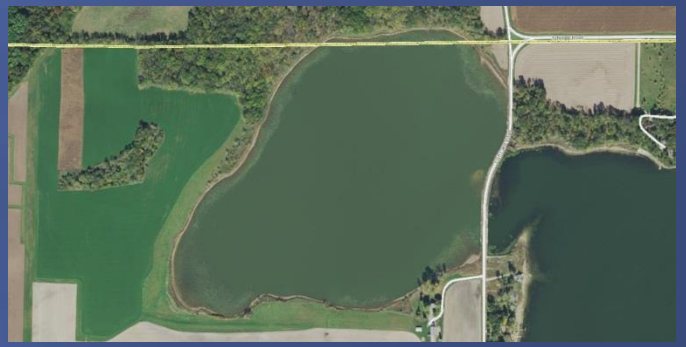
- Relatively sensitive at early life stages
- Youngest tadpoles most susceptible
- Repopulate by immigration from outside sources and reproduction of adults that survived

Environment

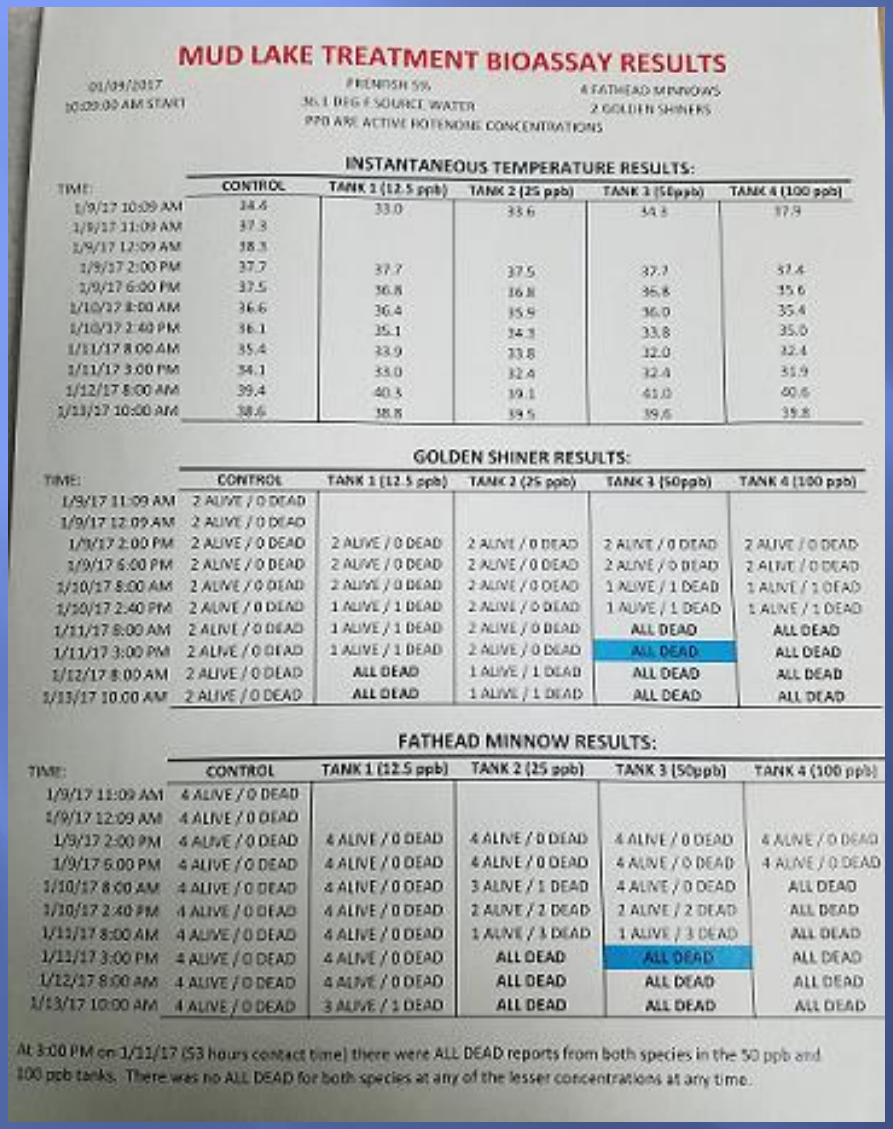
- No long-term contamination
  - Surface Water (25+ year data)
    - Persistence < 30 days for temperate environments
  - Ground Water
    - No contamination (32+ wells studied)
  - Sediment
    - Sediment persistence < 60 days for temperate environments

Why a winter treatment?

- Low water temp/reduced sunlight (ice cover) = increased rotenone efficacy
- Low initial volume
- Ice cover further reduces volume
- No flowing inputs/outputs
- Limited connectivity to Fish Lake
- Reduced potential user conflicts
- No exposure to amphibians



Rotenone Concentration



MUD LAKE TREATMENT BIOASSAY RESULTS

01/09/2017
10:09:00 AM START

FRESHFISH 5%
36.1 DEG F SOURCE WATER
PPB ARE ACTIVE ROTENONE CONCENTRATIONS

4 FATHEAD MINNOWS
2 GOLDEN SHINERS

INSTANTANEOUS TEMPERATURE RESULTS:

TIME:	CONTROL	TANK 1 (12.5 ppb)	TANK 2 (25 ppb)	TANK 3 (50ppb)	TANK 4 (100 ppb)
1/9/17 10:09 AM	34.4	33.0	33.6	34.3	37.9
1/9/17 11:09 AM	37.3				
1/9/17 12:09 AM	38.3				
1/9/17 2:00 PM	37.7	37.7	37.5	37.7	37.4
1/9/17 6:00 PM	37.5	36.8	36.8	36.8	35.6
1/10/17 8:00 AM	36.6	36.4	35.9	36.0	35.4
1/10/17 2:40 PM	36.1	35.1	34.3	33.8	35.0
1/11/17 8:00 AM	35.4	33.9	33.8	32.0	32.4
1/11/17 3:00 PM	34.1	33.0	32.4	32.4	33.9
1/12/17 8:00 AM	39.4	40.3	39.1	41.0	40.6
1/13/17 10:00 AM	38.6	38.8	39.5	39.6	39.8

GOLDEN SHINER RESULTS:

TIME:	CONTROL	TANK 1 (12.5 ppb)	TANK 2 (25 ppb)	TANK 3 (50ppb)	TANK 4 (100 ppb)
1/9/17 11:09 AM	2 ALIVE / 0 DEAD				
1/9/17 12:09 AM	2 ALIVE / 0 DEAD				
1/9/17 2:00 PM	2 ALIVE / 0 DEAD	2 ALIVE / 0 DEAD	2 ALIVE / 0 DEAD	2 ALIVE / 0 DEAD	2 ALIVE / 0 DEAD
1/9/17 6:00 PM	2 ALIVE / 0 DEAD	2 ALIVE / 0 DEAD	2 ALIVE / 0 DEAD	2 ALIVE / 0 DEAD	2 ALIVE / 0 DEAD
1/10/17 8:00 AM	2 ALIVE / 0 DEAD	2 ALIVE / 0 DEAD	2 ALIVE / 0 DEAD	1 ALIVE / 1 DEAD	1 ALIVE / 1 DEAD
1/10/17 2:40 PM	2 ALIVE / 0 DEAD	1 ALIVE / 1 DEAD	2 ALIVE / 0 DEAD	1 ALIVE / 1 DEAD	1 ALIVE / 1 DEAD
1/11/17 8:00 AM	2 ALIVE / 0 DEAD	1 ALIVE / 1 DEAD	2 ALIVE / 0 DEAD	ALL DEAD	ALL DEAD
1/11/17 3:00 PM	2 ALIVE / 0 DEAD	1 ALIVE / 1 DEAD	2 ALIVE / 0 DEAD	ALL DEAD	ALL DEAD
1/12/17 8:00 AM	2 ALIVE / 0 DEAD	ALL DEAD	1 ALIVE / 1 DEAD	ALL DEAD	ALL DEAD
1/13/17 10:00 AM	2 ALIVE / 0 DEAD	ALL DEAD	1 ALIVE / 1 DEAD	ALL DEAD	ALL DEAD

FATHEAD MINNOW RESULTS:

TIME:	CONTROL	TANK 1 (12.5 ppb)	TANK 2 (25 ppb)	TANK 3 (50ppb)	TANK 4 (100 ppb)
1/9/17 11:09 AM	4 ALIVE / 0 DEAD				
1/9/17 12:09 AM	4 ALIVE / 0 DEAD				
1/9/17 2:00 PM	4 ALIVE / 0 DEAD	4 ALIVE / 0 DEAD	4 ALIVE / 0 DEAD	4 ALIVE / 0 DEAD	4 ALIVE / 0 DEAD
1/9/17 6:00 PM	4 ALIVE / 0 DEAD	4 ALIVE / 0 DEAD	4 ALIVE / 0 DEAD	4 ALIVE / 0 DEAD	4 ALIVE / 0 DEAD
1/10/17 8:00 AM	4 ALIVE / 0 DEAD	4 ALIVE / 0 DEAD	3 ALIVE / 1 DEAD	4 ALIVE / 0 DEAD	ALL DEAD
1/10/17 2:40 PM	4 ALIVE / 0 DEAD	4 ALIVE / 0 DEAD	2 ALIVE / 2 DEAD	2 ALIVE / 2 DEAD	ALL DEAD
1/11/17 8:00 AM	4 ALIVE / 0 DEAD	4 ALIVE / 0 DEAD	1 ALIVE / 3 DEAD	1 ALIVE / 3 DEAD	ALL DEAD
1/11/17 3:00 PM	4 ALIVE / 0 DEAD	4 ALIVE / 0 DEAD	ALL DEAD	ALL DEAD	ALL DEAD
1/12/17 8:00 AM	4 ALIVE / 0 DEAD	4 ALIVE / 0 DEAD	ALL DEAD	ALL DEAD	ALL DEAD
1/13/17 10:00 AM	4 ALIVE / 0 DEAD	3 ALIVE / 1 DEAD	ALL DEAD	ALL DEAD	ALL DEAD

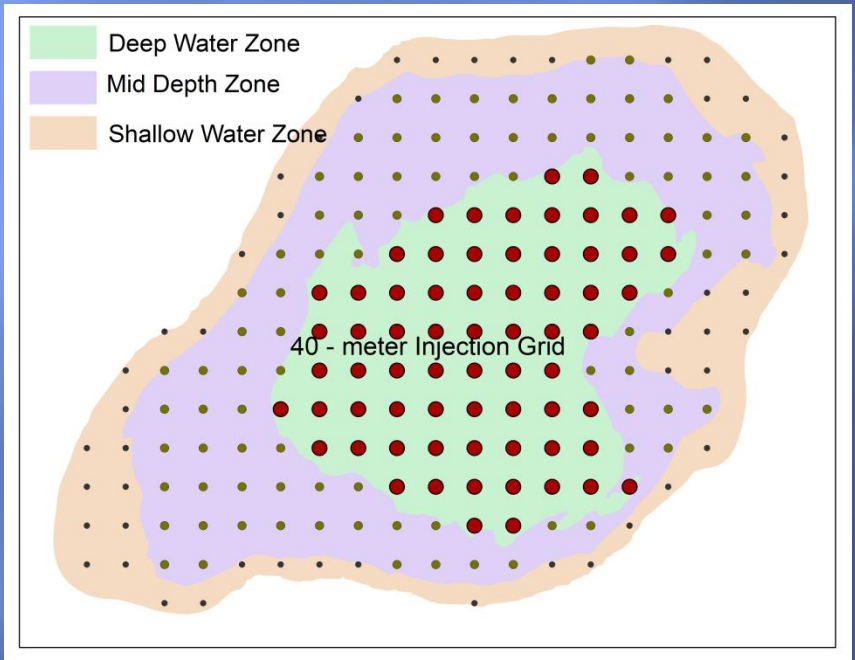
At 3:00 PM on 1/11/17 (53 hours contact time) there were ALL DEAD reports from both species in the 50 ppb and 100 ppb tanks. There was no ALL DEAD for both species at any of the lesser concentrations at any time.

- Pesticide label requires a bioassay to determine the concentration used
- Completed in Jan 2017
- Used golden shiners (tolerance similar to common carp) and fathead minnows (more tolerant than common carp).
- 2 ppm = target concentration

Rotenone Application

- Safe ice and stable weather patterns forecasted, mid-January, 2 days
- Expected long term efficacy with low temp and reduced sunlight under ice
- Grid system developed for three depth zones, rotenone injected under ice
- Estimated 292 gallons of Rotenone mixed 10:1 with water for a total of 3209 gallons of solution

Injection Zones



- Multiple holes evenly spaced covering three depth zones
- Amount of chemical applied will be adjusted based on zone
- Whole lake target concentration of 2.0 ppm

Winter Rotenone Treatment

Restrictions

WARNING

PESTICIDE TREATMENT AREA

THE WATER WITHIN _____ FEET OF THIS NOTICE AND _____ FEET OUT FROM THIS SHORELINE HAS BEEN CHEMICALLY TREATED FOR CONTROL OF AQUATIC PLANTS:

NAME OF PESTICIDE APPLIED	DATE OF TREATMENT
_____	_____
_____	_____
_____	_____
_____	_____

SPONSOR _____

CONTACT _____ PHONE _____

LABEL WATER USE RESTRICTIONS

1. DO NOT USE TREATED WATER FOR SWIMMING UNTIL _____ 20___.
2. DO NOT CONSUME FISH FROM TREATED WATER UNTIL _____ 20___.
3. DO NOT USE TREATED WATER FOR HOUSEHOLD USES, IRRIGATION, ANIMAL WATERING OR SIMILAR PURPOSE UNTIL _____ 20___.

The chemicals used for Aquatic Plant Management are labeled and registered for use by the U. S. Environmental Protection Agency. In Wisconsin pesticide labelers and manufactures are required to be licensed with the Wisconsin Department of Agriculture, Trade and Consumer Protection under s. 94.68, State Statues. Pesticides in water are further regulated by the Wisconsin Department of Natural Resources under s. 281.17(2), State Statutes. To minimize the possible effects of health, the treated water is restricted for the above purposes.

Post-treatment: Cleanup

- Winter treatment, fish decomposition begins under ice
- Dane County coordinates cleanup after ice-out as needed
- Rotenone non-toxic in dead fish

Post-treatment: Re-stocking

- Stocking begins after ice-out 2018
  - Fish salvage fall 2017, transfer from Fish Lake spring 2018
- Re-establish desirable fish community
  - Create unfavorable environment for carp
- Juvenile gamefish:
  - State, private hatcheries when available

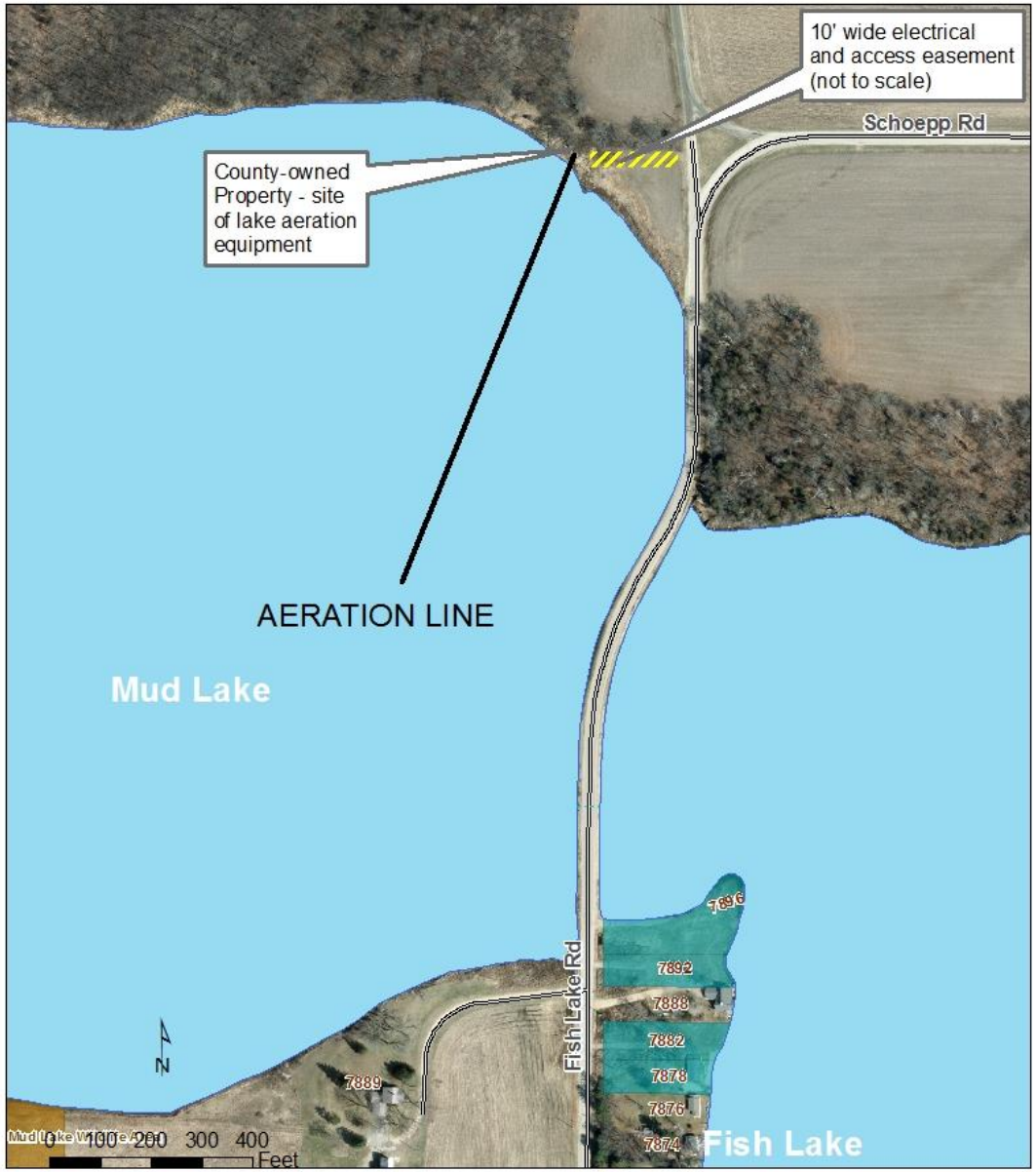
Post-treatment: Re-stocking

- Wild fish transfer from Fish Lake→ connected water
  - Bass, panfish, native minnows
  - WDNR: Trap nets, electrofishing
  - Transfer to Mud ASAP→spawning

- Re-establish healthy fishery
  - Bluegills eat carp eggs (control)
  - Predators eat young carp and control panfish numbers

Post-treatment:Winterkill Prevention

- Aeration system: Dane County
  - Open water, photosynthesis, oxygen
  - Reduce opportunities for carp
- Fishery monitoring: WDNR
  - Recovery of panfish, gamefish
  - Watch for possible carp re-introduction



Aeration Line to be run from December 1-ice out. Will provide for opening in surface to allow for atmospheric mixing of O2.

Dane County will fence/mark per WDNR safety requirements.

Post-treatment

- Aquatic plant and water quality monitoring
  - Submersed aquatic veg recovery→seed bank
  - Clear water, fewer algal blooms
- Education
  - AIS
  - Prevent re-introduction from Fish Lake

TOURNAMENT ANGLERS! Do your part to prevent the spread of aquatic hitchhikers

By following a general set of procedures every time you come in contact with any body of water, you can protect your waters from aquatic hitchhikers. There are hundreds of harmful species of plants, fish, amphibians, crustaceans, mollusks, diseases and pathogens—some so small you may not even realize they are hitching a ride with you. The following steps will help to ensure that you are not part of the problem but the solution.

STOP AQUATIC HITCHHIKERS!™

To prevent the spread of aquatic invasive species and diseases WISCONSIN LAW REQUIRES THAT YOU:

INSPECT boats, trailers and equipment.

REMOVE any attached aquatic plants or animals (before launching, after loading & before transporting on a public highway)

DRAIN all water from boats, motors and all equipment.

DON'T MOVE live fish away from a waterbody.

BUY minnows from a Wisconsin bait dealer and Use leftover minnows only under certain conditions.*

*You may take leftover minnows away from any state water and use them again on that same water. You may use leftover minnows on other waters only if no lake or river water, or other fish were added to their container. See **www.dnr.wi.gov** for more information.

If you leave a waterbody that contains aquatic invasives species **it is recommended** that you also disinfect your boat, equipment and gear by either:

WASHING with ~212º F water (steam clean), OR

DRYING thoroughly for 5 days after cleaning with soap and water and/or high pressure water, OR

DISINFECTING with either 200 ppm (0.5 oz per gallon or 1 Tablespoon per gallon) Chlorine for 10-minute contact time or 1:100 solution (38 grams per gallon) of Virkon Aquatic for 20- to 30-minute contact time. *Note: Virkon is not registered to kill zebra mussel veligers nor invertebrates like spiny water flea. Therefore this disinfectant should be used in conjunction with a hot water (>104º F) application.*

Safety Precautions for Disinfectant Use:

It is recommended that eye protection, rain gear, and gloves are worn while applying any disinfectant. While disinfecting, stay well away from any waterbody and upwind of any spray. After disinfecting, rinse all surfaces with tap water.

Sources of disinfectants:

Chlorine - Household bleach (5.25% chlorine) can be purchased from a grocery or convenience store. HTH is granular chlorine (70% calcium hypochlorite) and can be purchased from a pool supply company.

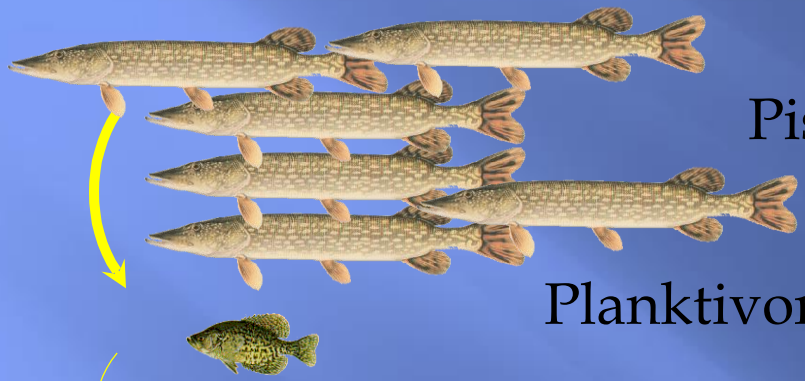
Sodium Thiosulfate - Commonly used to neutralize chlorine and iodine. It should be available at a pool supply company or from a chemical supply company.

Virkon Aquatic - Is available from Western Chemical. It is the same formulation, but without the perfume and dye, and the label addresses specific fish pathogens. Their phone is 1-800-283-5292.

UW Extension DNR PUB WT-921 2009

Clear-water State

Turbid-water State



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ANY QUESTIONS?

Thanks for your time, input, and patience.