Big Chetac Lake Getting Rid of the Green Management Alternatives Presentation

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For the Big Chetac Chain Lake Association

Purpose of this Presentation

- Provide some preliminary results of the Lake User Survey
- Provide a summary of lake and watershed conditions
- Discuss possible management alternatives for improving the lakes of the Big Chetac Chain
- Seek Lake Association input related to management recommendations they would most like to move forward with

What is the public's perception of Big Chetac Lake?

Lake User Survey: Preliminary Results

- Nine page survey developed by SEH, BCCLA, and the WDNR
- 380 copies printed and distributed by the BCCLA
- To date, 183 surveys (48%) have been returned directly to SEH
- Survey tabulation and evaluation is being completed by SEH

Survey Goals

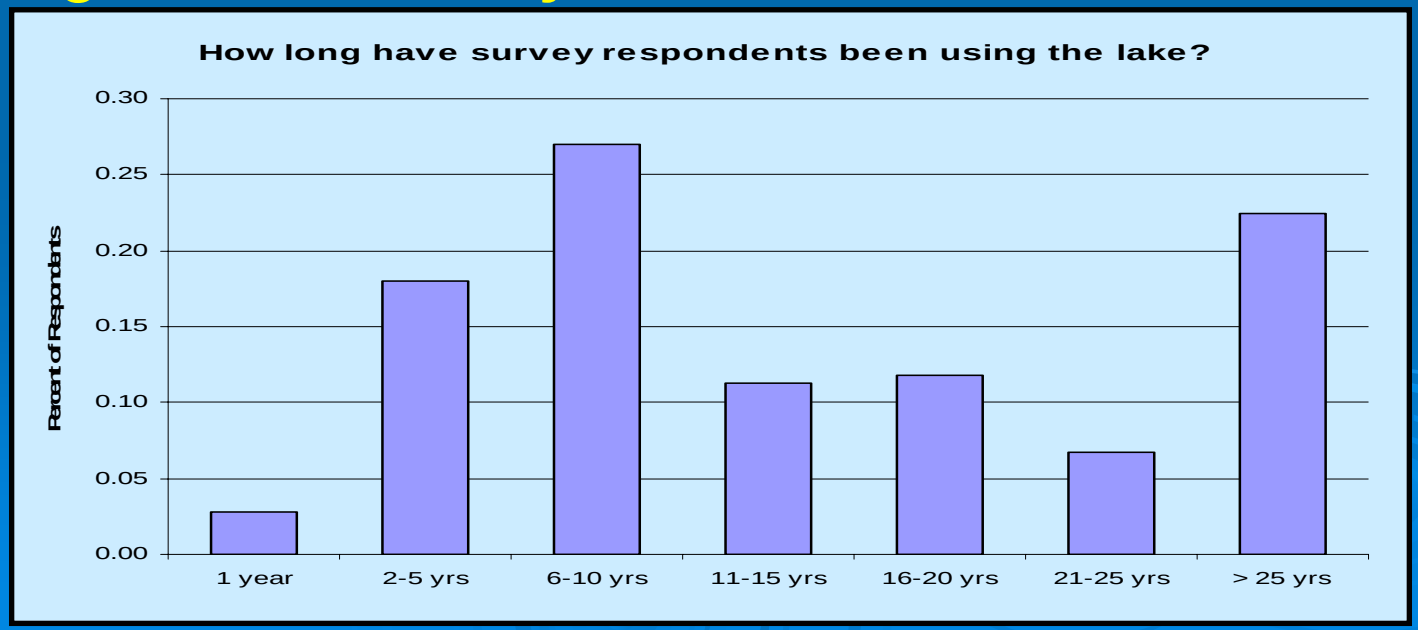
- Logistical information about survey respondents
- Determine the level of lake best management practices already occurring on the lake
- Determine overall lake use and lake issues

More Survey Goals

- Determine Lake User perception of aquatic plant growth
- Determine Lake User knowledge of aquatic invasive species
- Determine Lake User perception, knowledge, and support of plant management alternatives
- Determine the level of community support for lake management

Section 1-Lake Residency

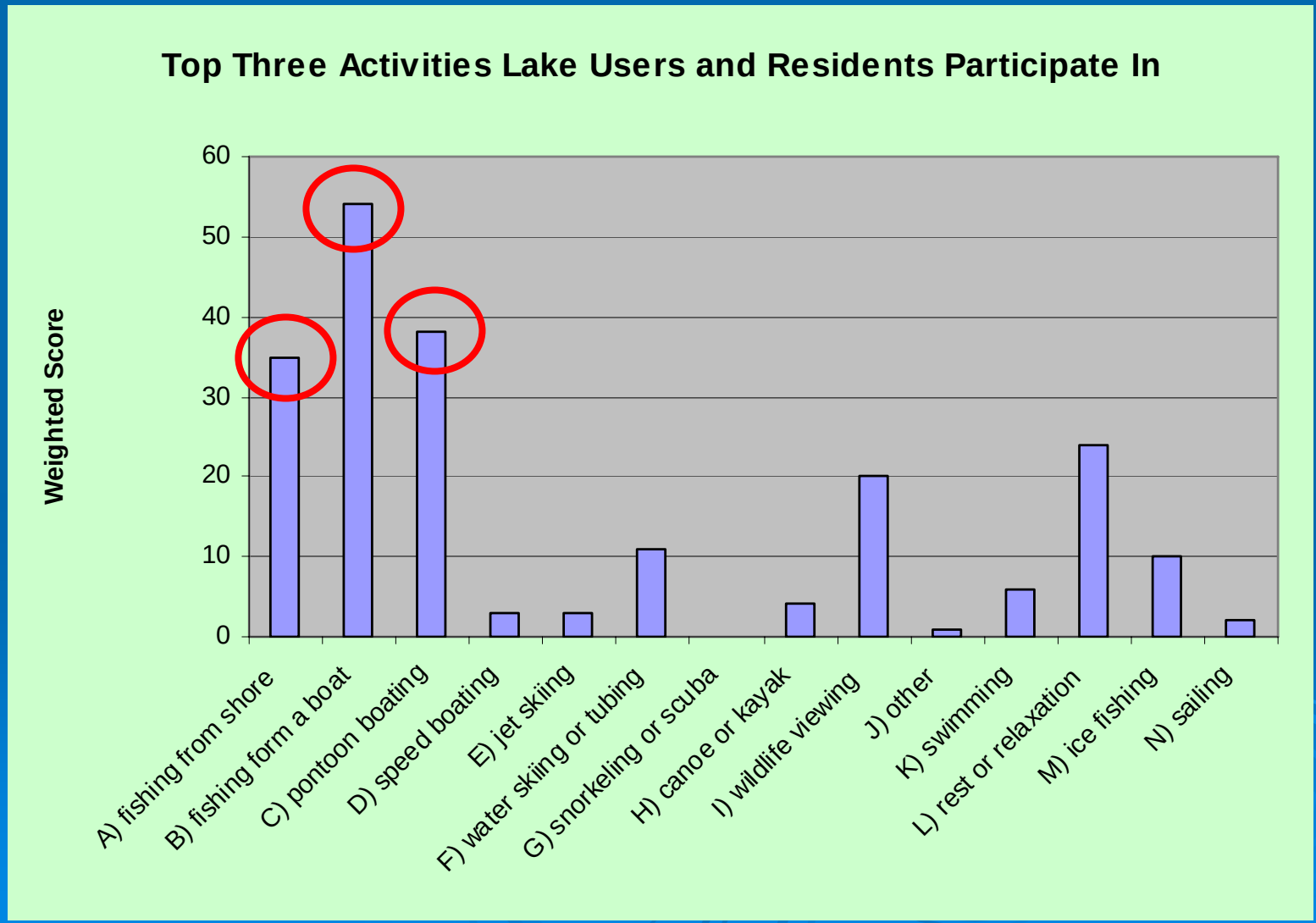
- 182 respondents owned or rented property on the lake, only 1 survey from a non-property owner
- 27% of respondents were permanent residents, 73% were seasonal
- Length of Residency



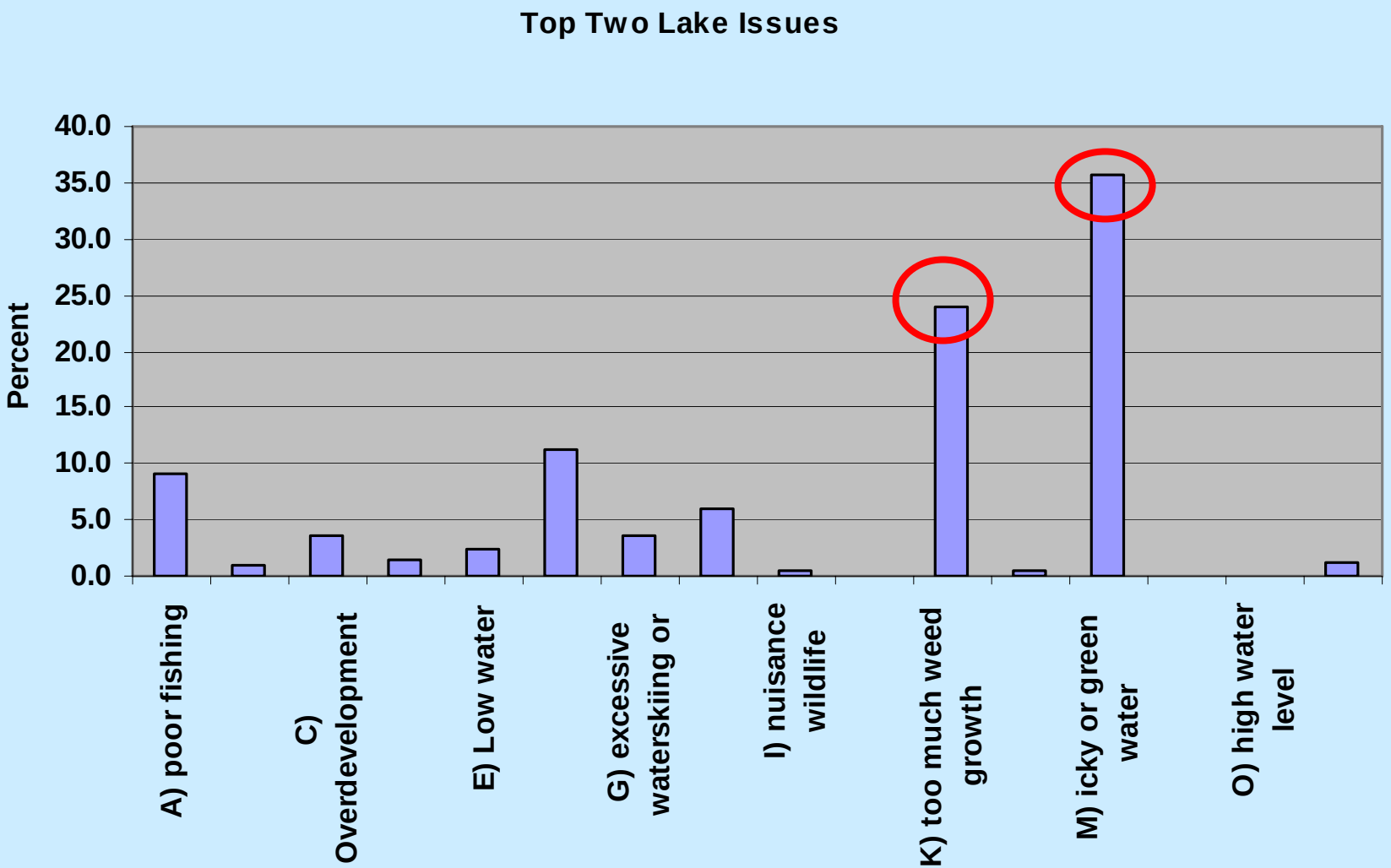
Section 2-Lake BMP's

- **74% of respondents use no fertilizer**
  - Of those who do, 80% use phosphorous free
- **43% of respondents claim to have a buffer strip in place**
  - Actually agrees with results of shoreline survey (42% of developed shoreline has a buffer in place)
- **Shoreline restoration, native tree and flower planting, and buffer strips most interesting to lake shore owners**
  - What would motivate lake shore owners to install these practices
    - 75% said "better water quality"
    - 62% said "a tax rebate"
  - Least motivating
    - Less lawn mowing at 18%
    - 17% not interested in doing anything more

Section 3-Lake Uses and Issues



Biggest Issues of Concern



Water Quality Perception

- 82% use a boat 3-4 times a week or more
- 59% swim or wade 1 or 2 times a season or less
- Water Quality Changes
  - 17% better, 37% worse, 40% the same, 6% unsure
- Water Quality Status
  - 17% very poor, 43% poor, 37% fair, 10% good, 1% excellent
- Activities impaired by water quality
  - Swimming, enjoying the view, fishing, skiing and tubing

Aquatic Plant Perception

- **What has happened to the plant growth?**
  - **61% increased, 3% decreased, 28% same, 8% unsure**
- **How big a problem is plant growth?**
  - **Large 54%, Moderate 25%, Small 8%, none 2%, Unsure 11%**
- **What activities are impaired by plant growth?**
  - **Swimming, fishing, motorized boating, enjoying the view**
- **When is plant growth the worst?**
  - **62% July-Sept, 26% April-June**

Algae Growth – The stuff that turns the water green.

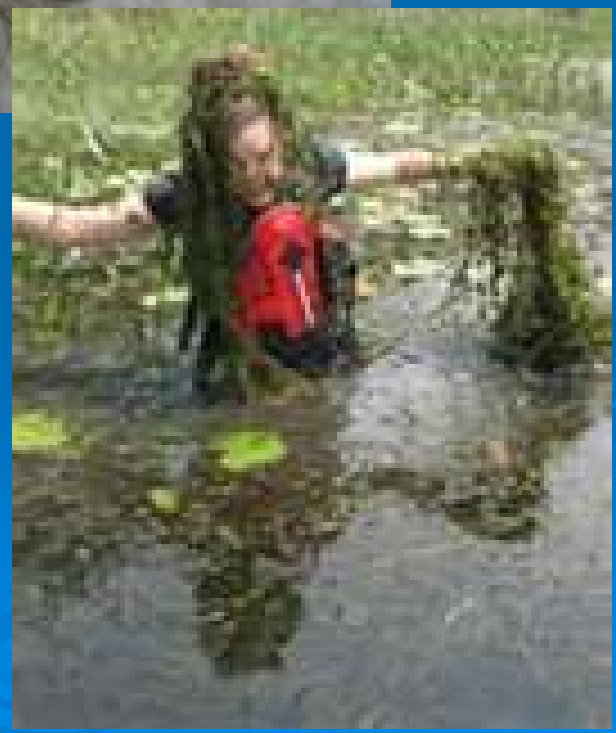
- 50% say it has increased
- 39% say it is the same
- This picture is not from Big Chetac Lake

Aquatic Invasive Species

- **Did you know curly-leaf pondweed (CLP) was present in Big Chetac Lake?**
  - **56% Yes**
  - **32% No**

Eurasian Watermilfoil (EWM)

- Not in Big Chetac that we know of
- Need to keep it out as long as possible
- Large dense mats of vegetation
- Present all year, does not disappear in late June like CLP

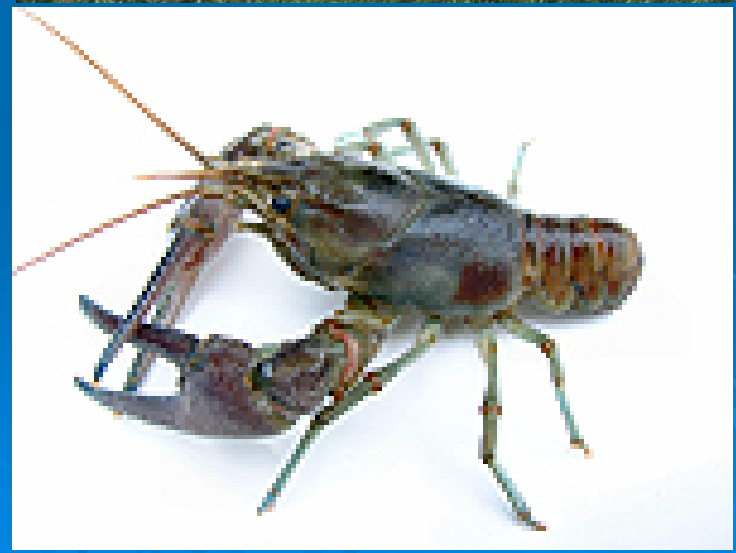


CLP and EWM

- **How much do you know about the problems CLP and EWM can cause?**
  - **CLP**
    - **A lot 7%, Some 25%, A little 47%, Survey only 21%**
  - **EWM**
    - **A lot 8%, Some 29%, A little 35%, Survey only 28%**
- **Would you recognize CLP or EWM if you saw it in the lake?**
  - **CLP**
    - **D. Yes 23%, P. Yes 26%, Unsure 23%, P. No 18%, D. No 10%**
  - **EWM**
    - **D. Yes 7%, P. Yes 16%, Unsure 37%, P. No 29%, D. No 11%**

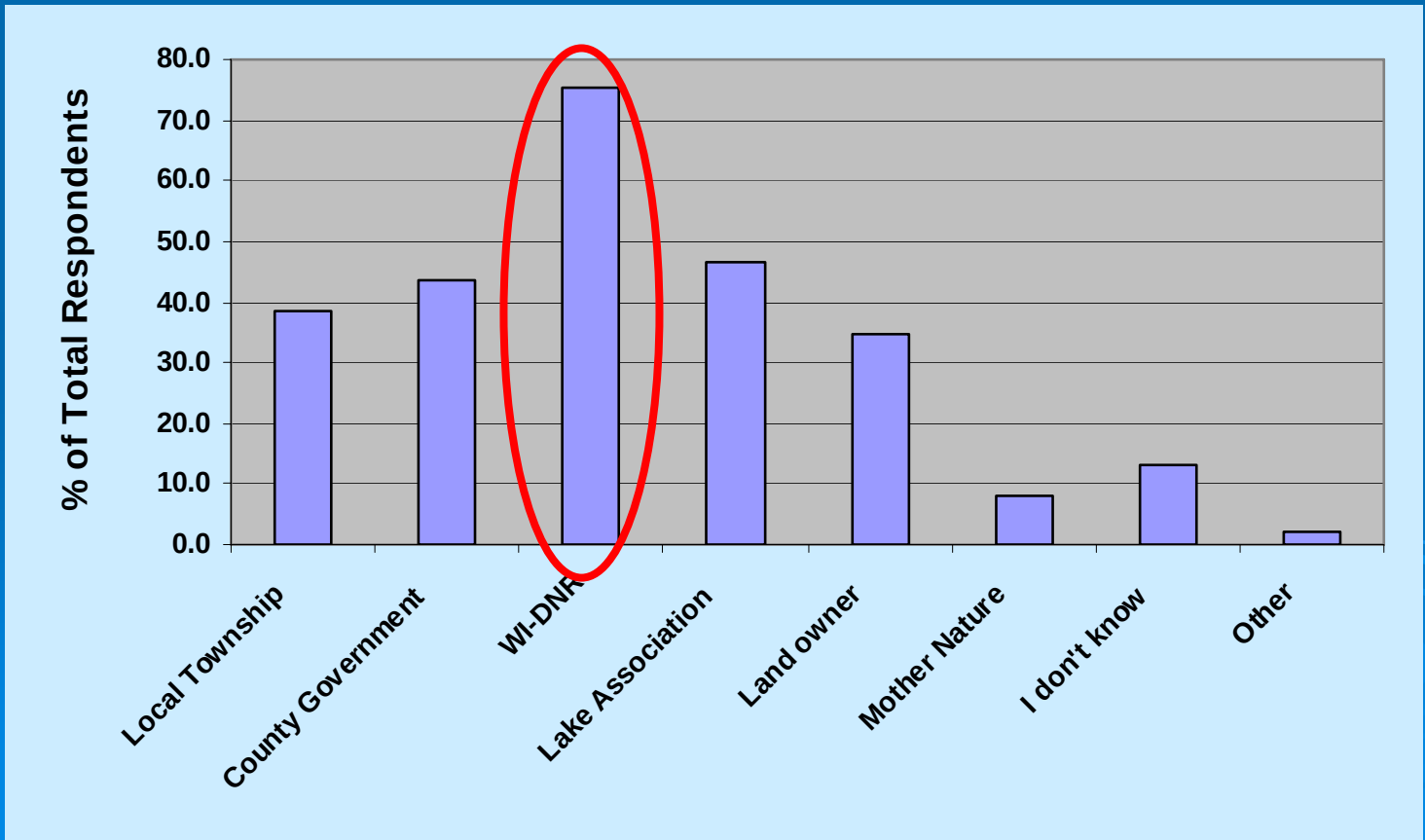
What other invasive species have you heard of?

- Purple Loosestrife
- Rusty Crayfish
- Zebra Mussels



Aquatic Plant Management

- **Is aquatic plant management necessary?**
  - **81% said probably or definitely yes!**
- **Who should be responsible for it?**



Completing Aquatic Plant Management

- **What would be considered a successful outcome?**
  - Most unsure, but seasonal reduction of CLP most supported
  - no management least supported
- **What common management alternatives would you support?**
  - Most unsure, but large-scale herbicide use and large-scale harvesting about tied for support
  - No management least supported
- **What uncommon management alternatives would you support?**
  - Most unsure, but drawdown and whole-lake chemical use most supported
  - Biological manipulation least supported

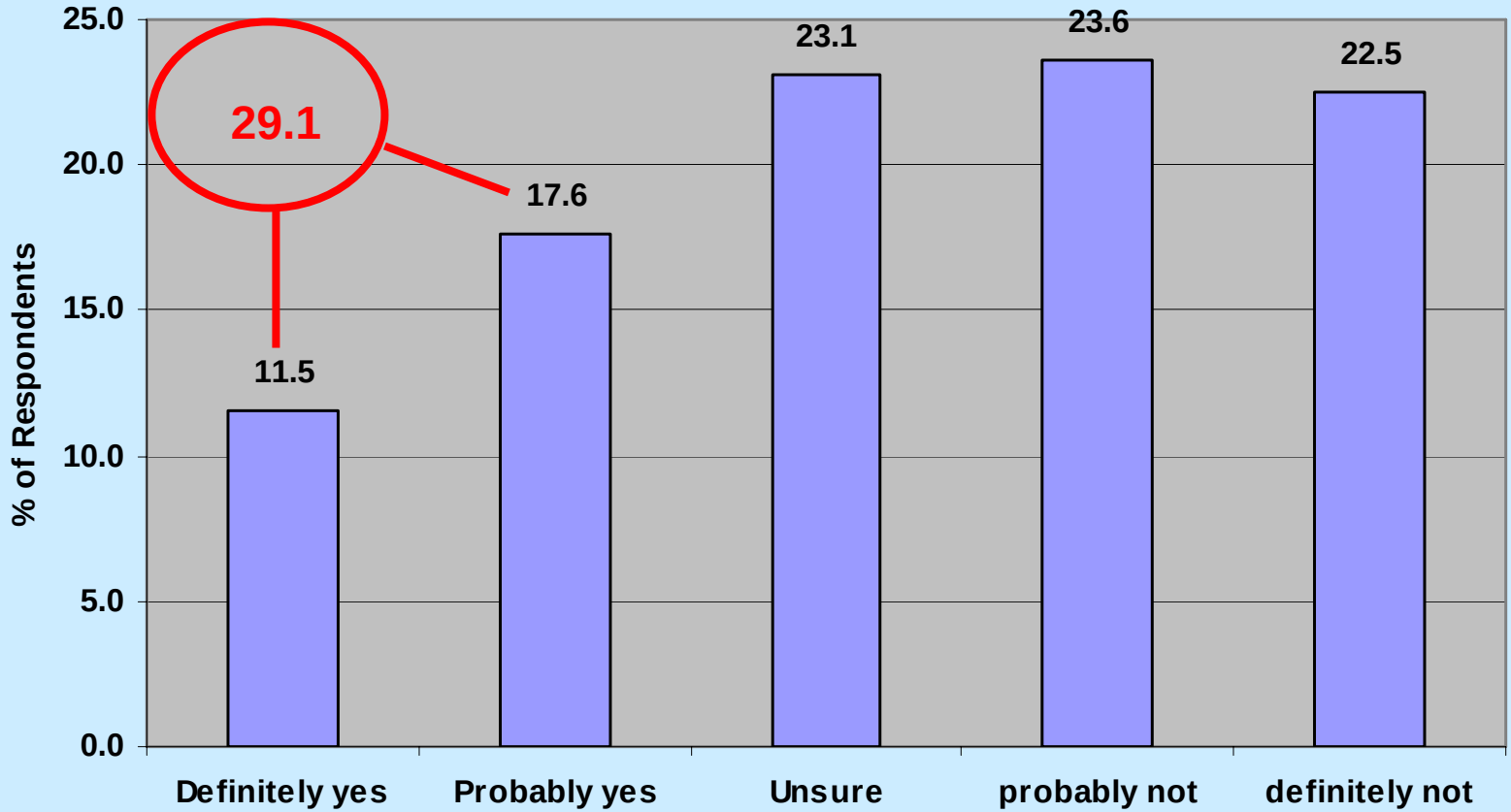
Community Support

- **Volunteer Time**
  - 28% no time, 36% a few hours, 24% a few days
- **Volunteer Services**
  - 24% yes, 14% no, 30% maybe, 30% wait and see
- **Financial Support**
  - 47% cash donations, 38% increased dues, 41% fund raisers

Support for a Lake District

What kind of support is there for forming a Lake District?

(At least 51% of the lake property owners need to be in favor of it to even consider pursuing the idea.)



Why the Survey?

- Public Involvement
- Help document the problem
- Help determine the need for management
- Determine what knowledge base exists with lake users and what needs more focus
- Determine public support for management alternatives (without presumed bias)

So what management alternatives are feasible for Big Chetac Lake and Why?

You need to know more about what the problems are first.

Perceived vs. Real Problems

- **Problems identified by the Lake User Survey**
  - Green water (91%)
  - Excess weed growth (79)
  - Foul odor (68)
  - Invasive species (57)
  - Floating vegetation (48)
  - Poor fishing (47)
  - Low water level (34)
  - Over development (32)
  - Excessive skiing or power boating (32)
  - Poor boat access (21)
  - Too much public use (21)
  - To much shoreland lighting (12)
  - Nuisance wildlife (8)

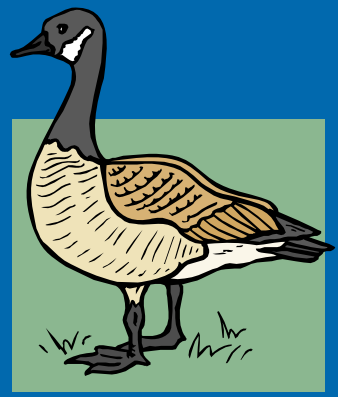
- **Problems identified by the last two years of data collection**
  - High nutrient values in the lake
    - Green water
    - Foul odor
    - excess weed growth
    - Invasive species
  - The invasive plant species curly-leaf pondweed
    - Excess weed growth
    - Floating vegetation
    - Green water
    - Poor fishing (?)
  - Shoreland development
    - Over development
    - Excessive power boating
    - Poor fishing
    - Shoreland lighting
    - Nuisance wildlife
    - Green water

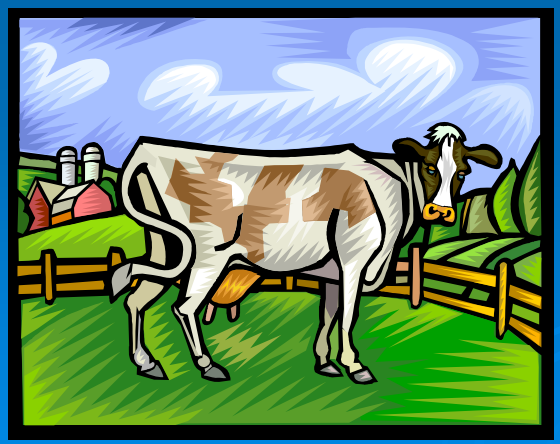
Right On!

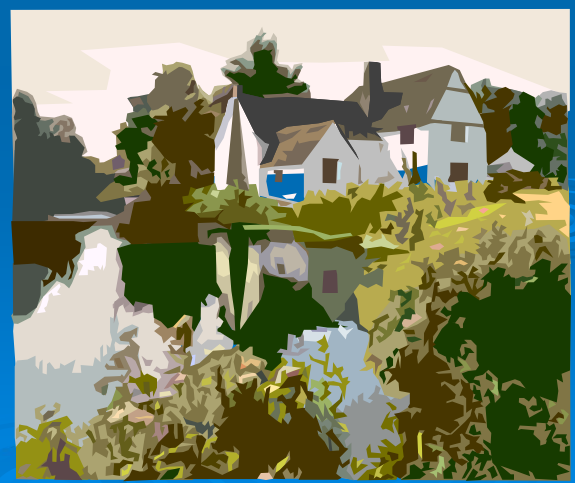
High Nutrient Values

- **12,006 lbs of phosphorous into Big Chetac Lake in 2007**
- **Now, where did it come from ?**

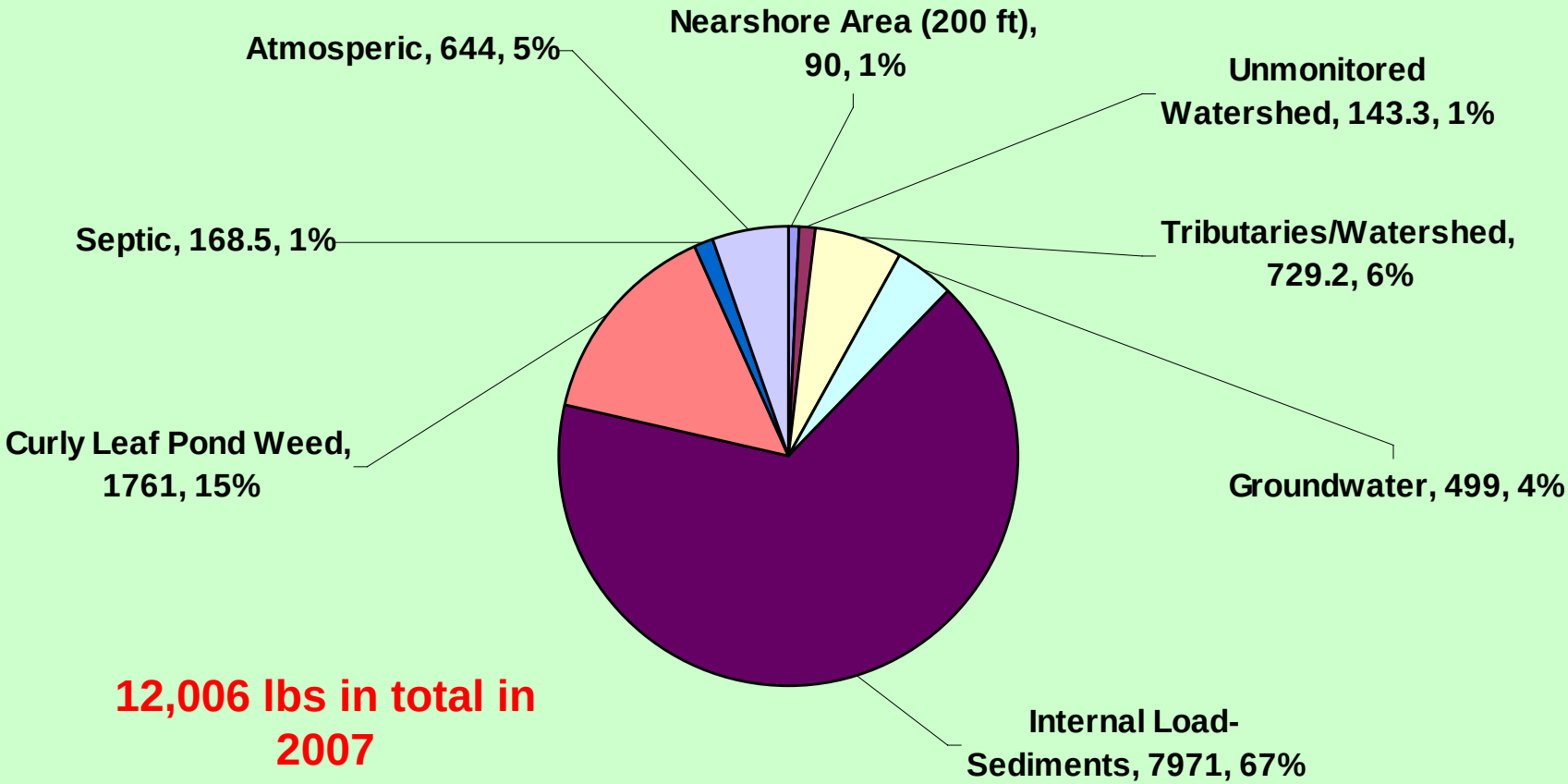
Other?







Here's where it comes from.



12,006 lbs in total in 2007

1. Atmospheric Deposition

- phosphorous found in the dust and other particulate matter that is blown over and settles into the lake
- cleansed from the air when it rains
- 506 lbs (4% of total P)
- Natural Source
- Field cover crops, dampened roads, etc

2. Groundwater Contributions

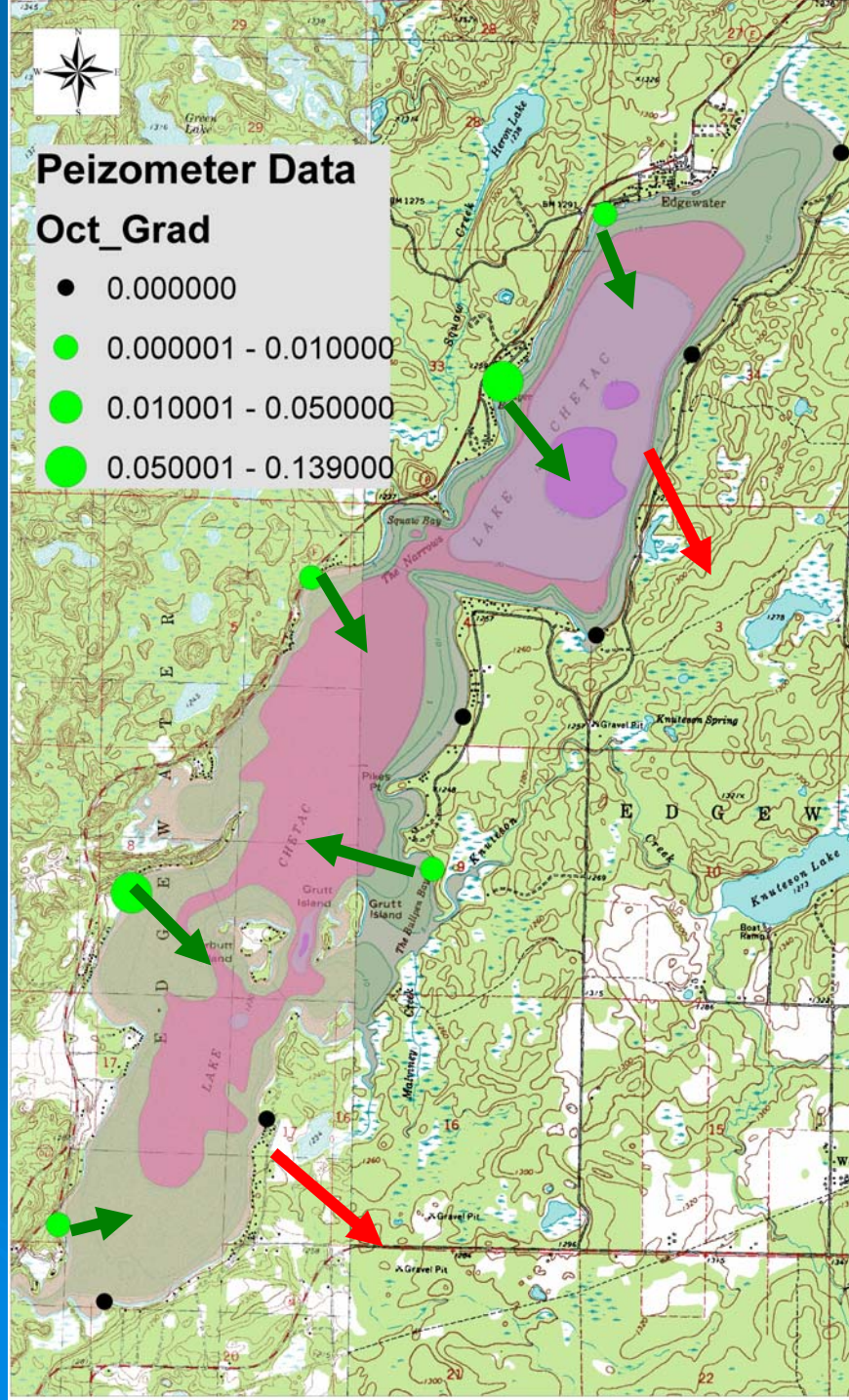
flows into the lake primarily from the northwest

flows out primarily to the southeast

approximately 4,990,670 gallons of ground water flows into the lake per day

499 lbs of phosphorous or 4% of the total seasonal load

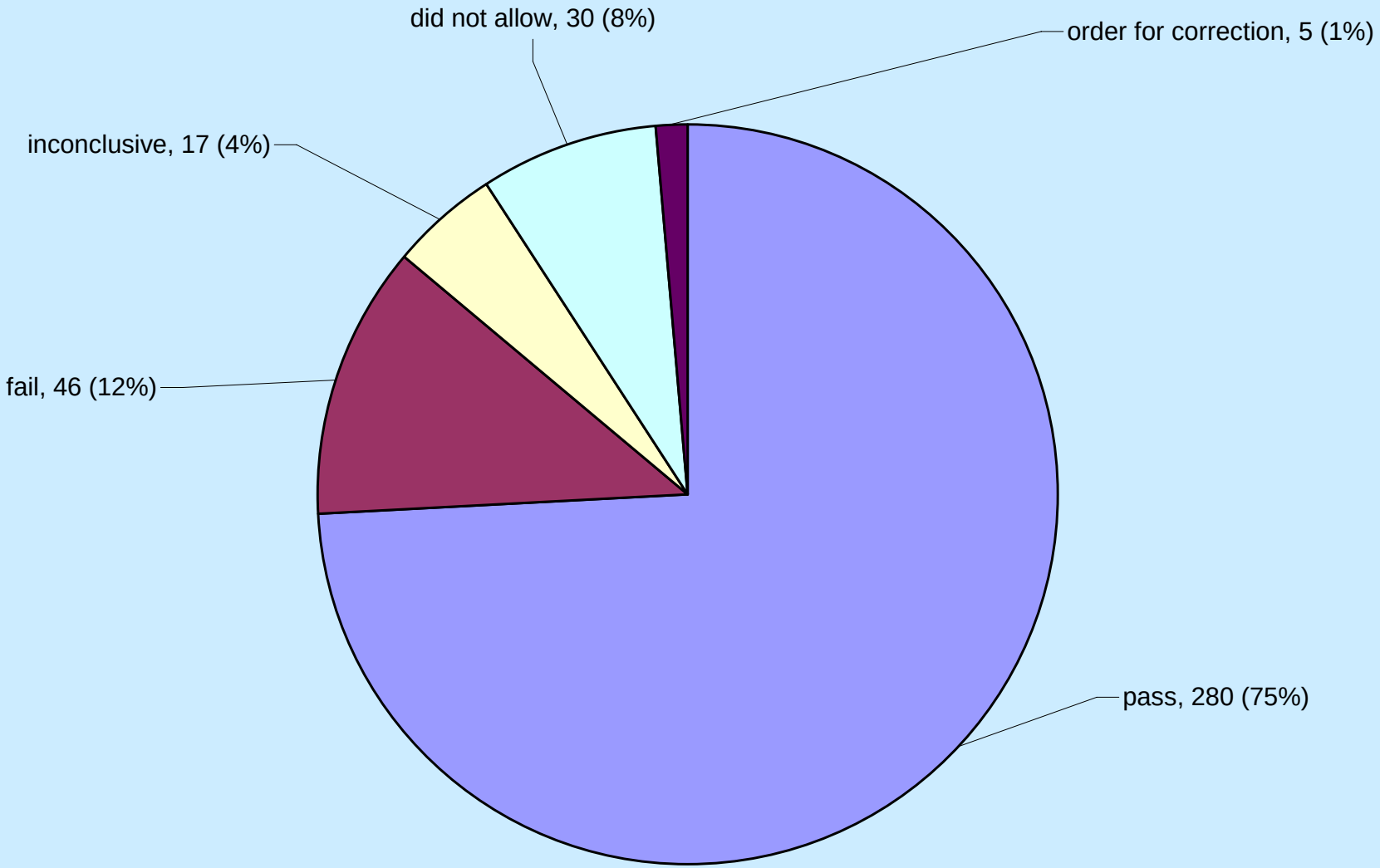
Natural Source (can be made worse by failing septic systems)



3. Septic Systems

- Survey of almost all systems completed by Sawyer County, Summer 2008
  - Based on 62% agreement of the Lake Association
- Goals of the survey
  - To identify compliant, non-compliant, and failing systems
  - To issue “orders for correction” to the worst offenders
- Attempted to survey 378 systems
- Tied in with groundwater study

Results


did not allow, 30 (8%)
order for correction, 5 (1%)
inconclusive, 17 (4%)
fail, 46 (12%)
pass, 280 (75%)

Septic Contribution Calculations

- **Groundwater from northwest to southeast**
- **292 passing systems**
- **81 failing**
  - **46 failing + (17 x 0.5) inconclusive + (30 x 0.9) did not allows = 81 failing**
- **House discharge coefficient of 0.5 kg/capita/year**
  - **Based on a phosphorous ban on laundry detergent**
  - **Could range from 0.3 to 0.8**
- **Soil retention coefficient**
  - **Based on a scale from 0 (all phosphorous in the soil gets to the lake) to 1 (no phosphorous gets to the lake)**
  - **Sandy loam soil, good permeability, and good drainage around most of Big Chetac Lake**
    - **0.9 for septic system functioning properly**
    - **0.15 for septic systems not functioning properly**

Calculations continued:

- **Capita Years**
  - **determined by multiplying the number of people in a household by the total time they use the septic system**
    - **Questions 3 and 4 in Section One of the Lake User Survey (50% return rate)**
    - **27% permanent, 3.2 people/house, 365 days of use**
    - **73% seasonal, 3.9 people/house, 97.9 days of use**

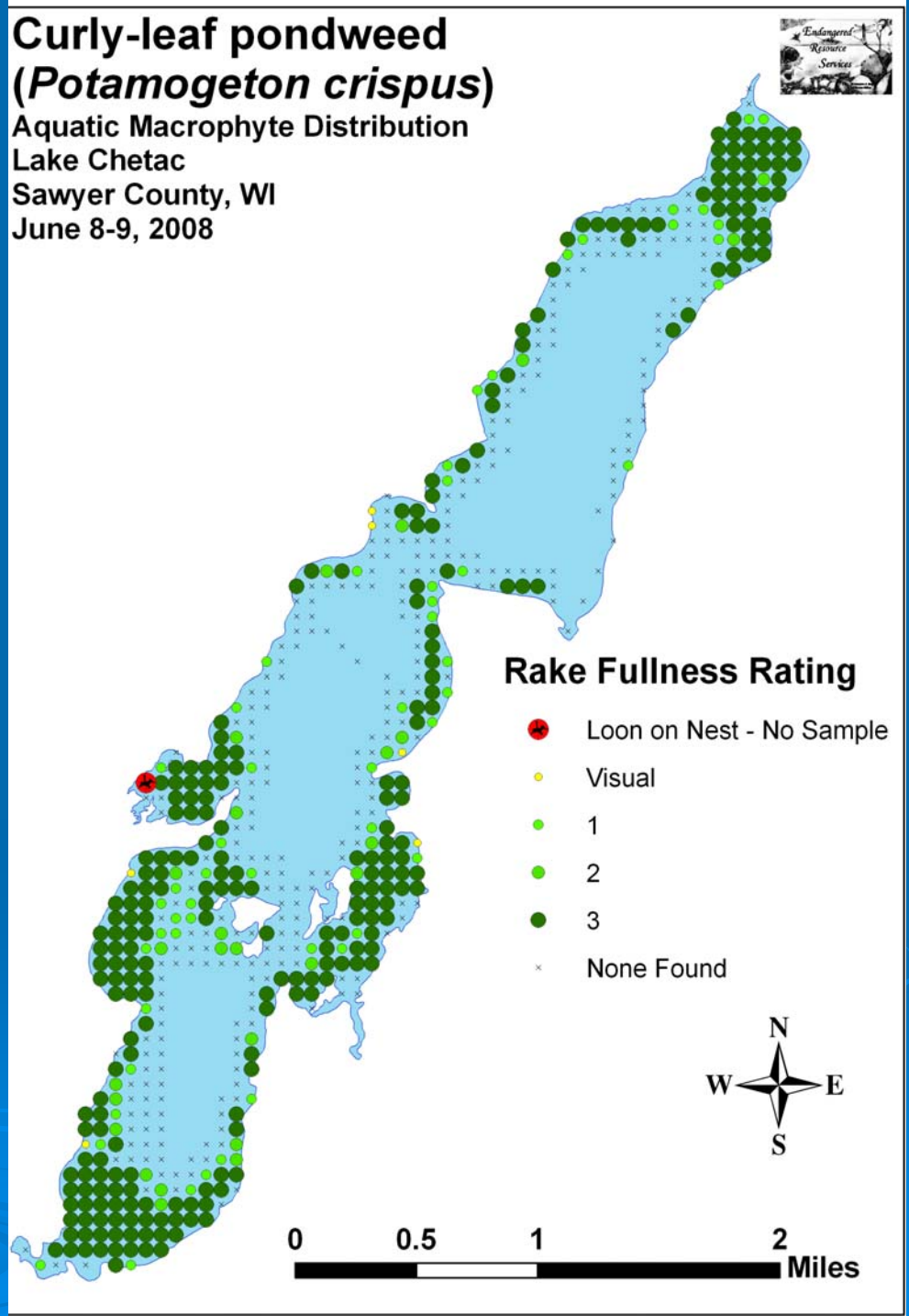
Total Septic Contributions

- **All septic systems regardless of groundwater flow**
  - **373 Septic Systems included**
  - **168.5 lbs of phosphorous**
  - **1.4 % of total load**
- **All septic systems with groundwater flow considered**
  - **108 Septic systems included**
  - **49.8 lbs of phosphorous**
  - **0.4 % of total load**

***Fixing all septic systems is a good idea, but it is not going to solve the water quality problems in the lake by itself, and is not the source contributor to blame for all the problems**

4. Curly-leaf Pondweed

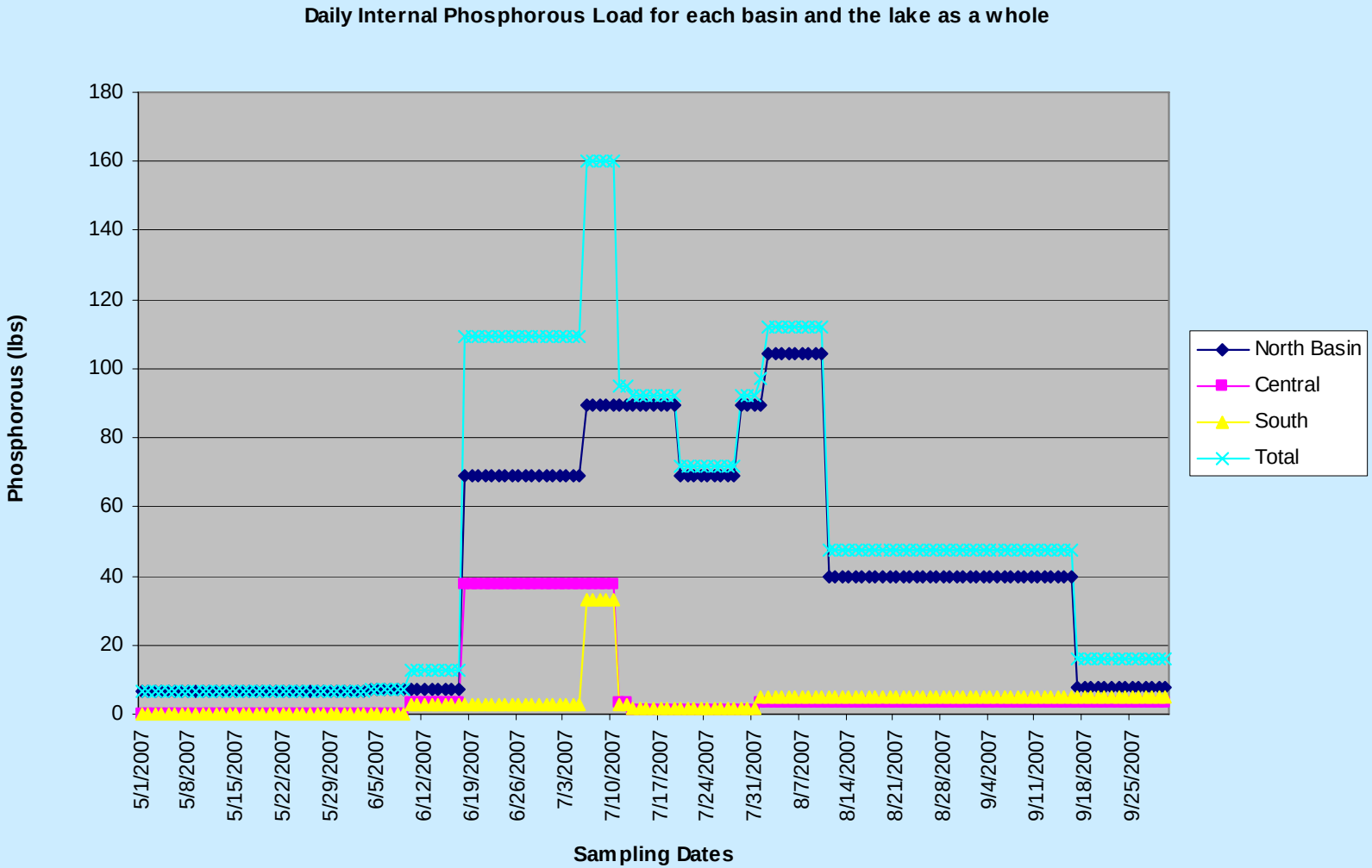
- 25-35% of the lake's surface area (depends on what surface area you use)
- 66% of littoral (plant growing) zone
- 621 acres in June of 2008
- Approx. 9,696 tons of CLP
  - Rice Lake has approximately 3000 tons, and harvests annually about 1000 tons.



How much phosphorous from CLP?

- Approximately 3,500 lbs (1.75 tons) could be added seasonally if all phosphorous in the CLP went back into the lake
- Not all phosphorous taken up by CLP is released back into the lake
- A better, more conservative value might be 1,761 lbs or 15% of the total load

5. Sediment Phosphorous Release
(internal recycling or release of phosphorous)

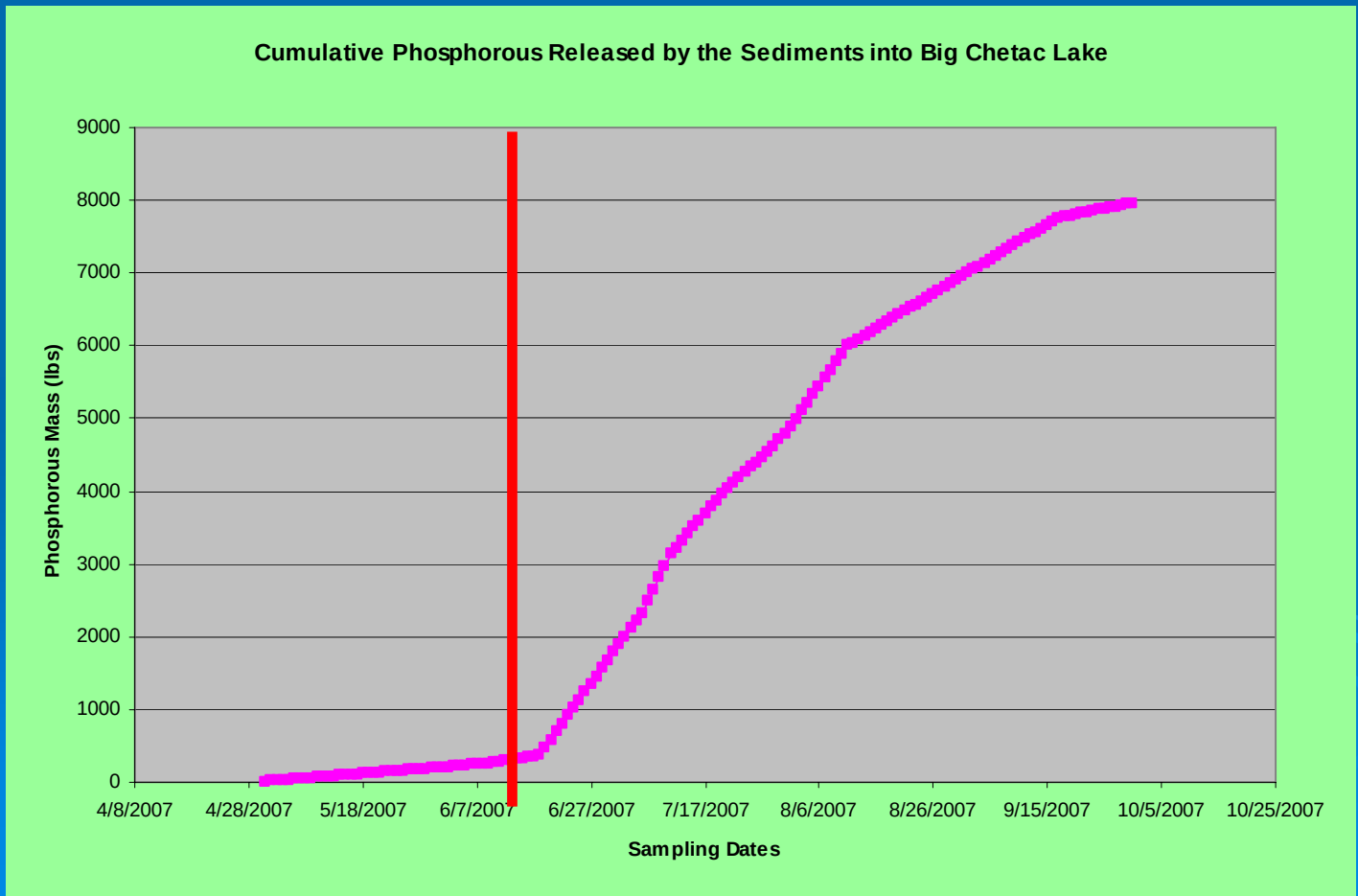


What causes internal release of phosphorous?

- A build of phosphorous in the bottom sediments over time
- Lack of oxygen in the bottom waters
- High pH values (often as a result of excess plant growth)
- Disturbing or re-suspending the bottom sediments (wind, waves, boat traffic)

How Much?

- **7,971 lbs of phosphorous being re-released into the lake from the sediments seasonally**
- **67% of the total phosphorous loading**

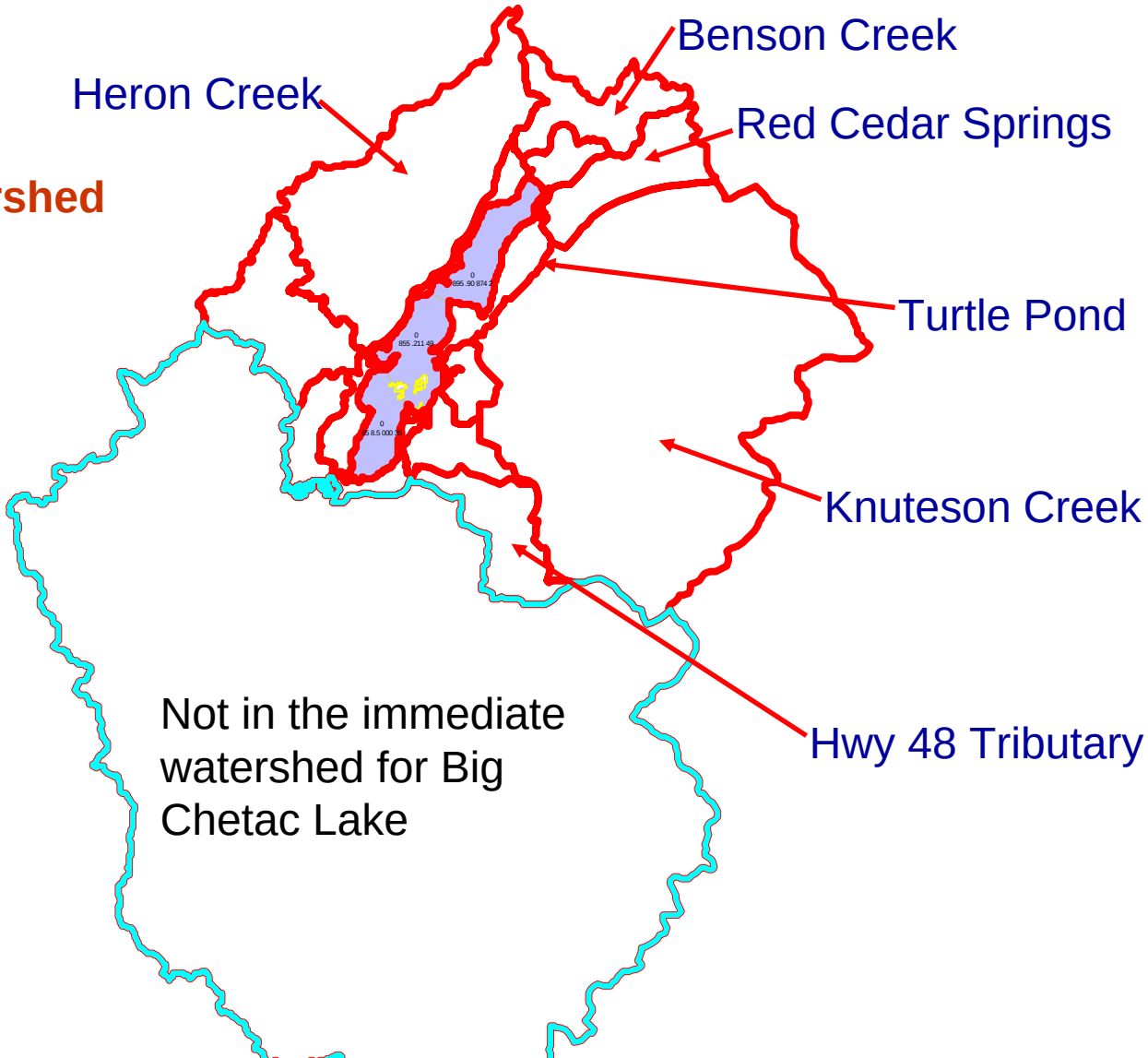


6. Tributary Loading

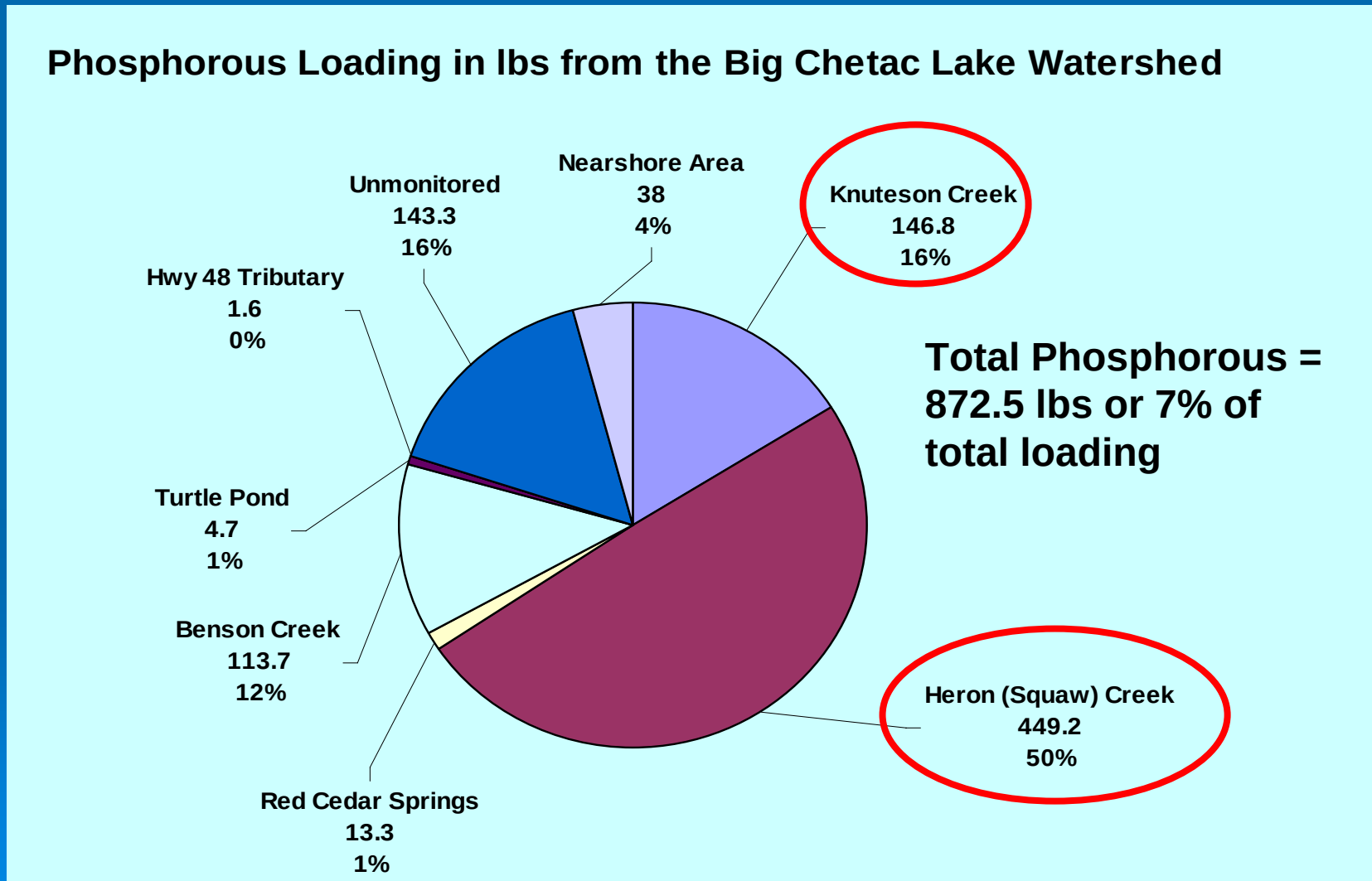
- 6 sources of tributary flow into the lake and the rest of the unmonitored watershed were evaluated
  - Nutrient sampling
  - Flow measurement
- Total Flow into Big Chetac = 15.2 cfs
- Total Phosphorous Loading = 872.5 lbs or 7% of total loading

Big Chetac Lake Watershed

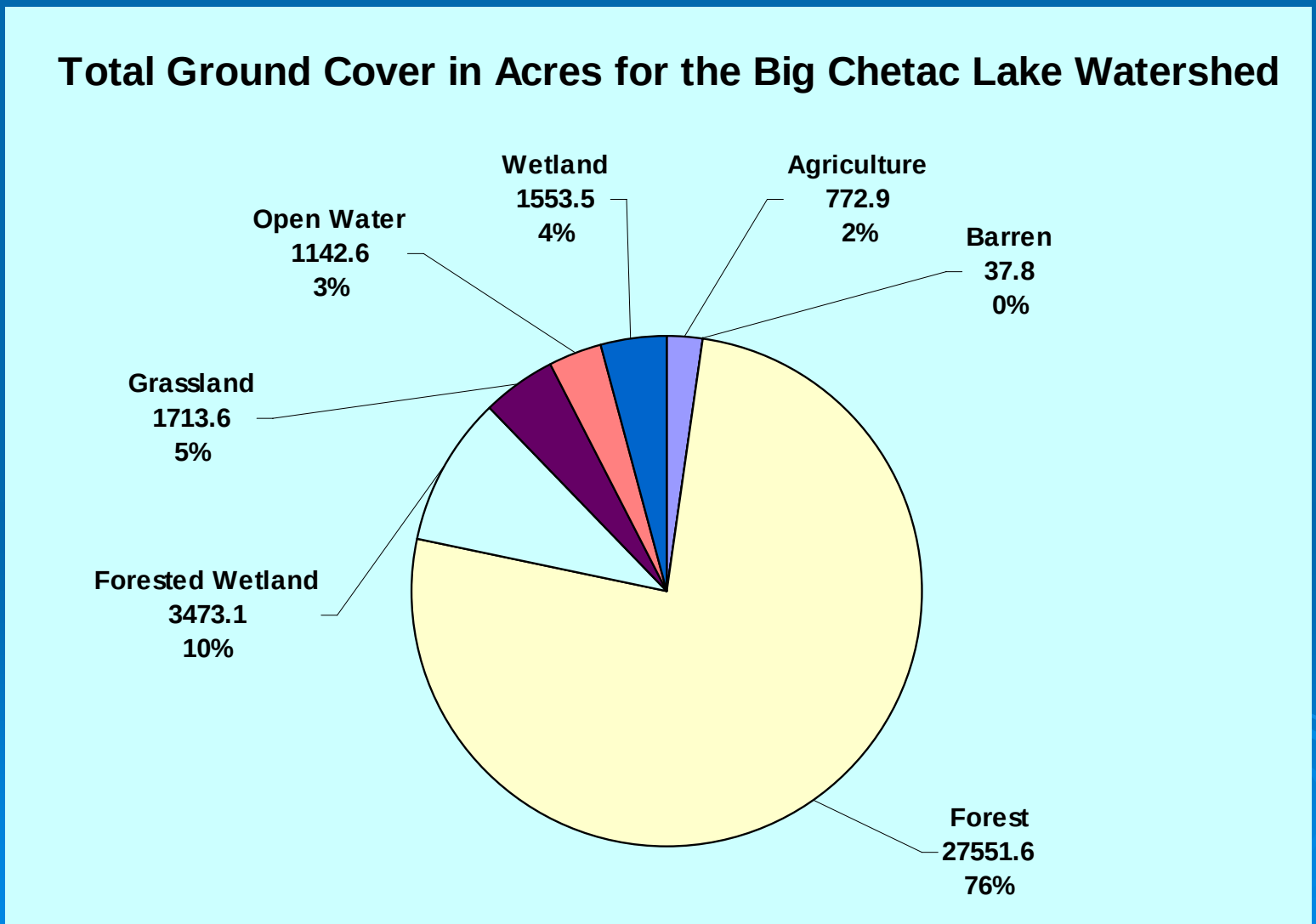
Direct Drainage Watershed
= 34,541 acres



Tributary Loading – lbs of phosphorous from each sub-watershed



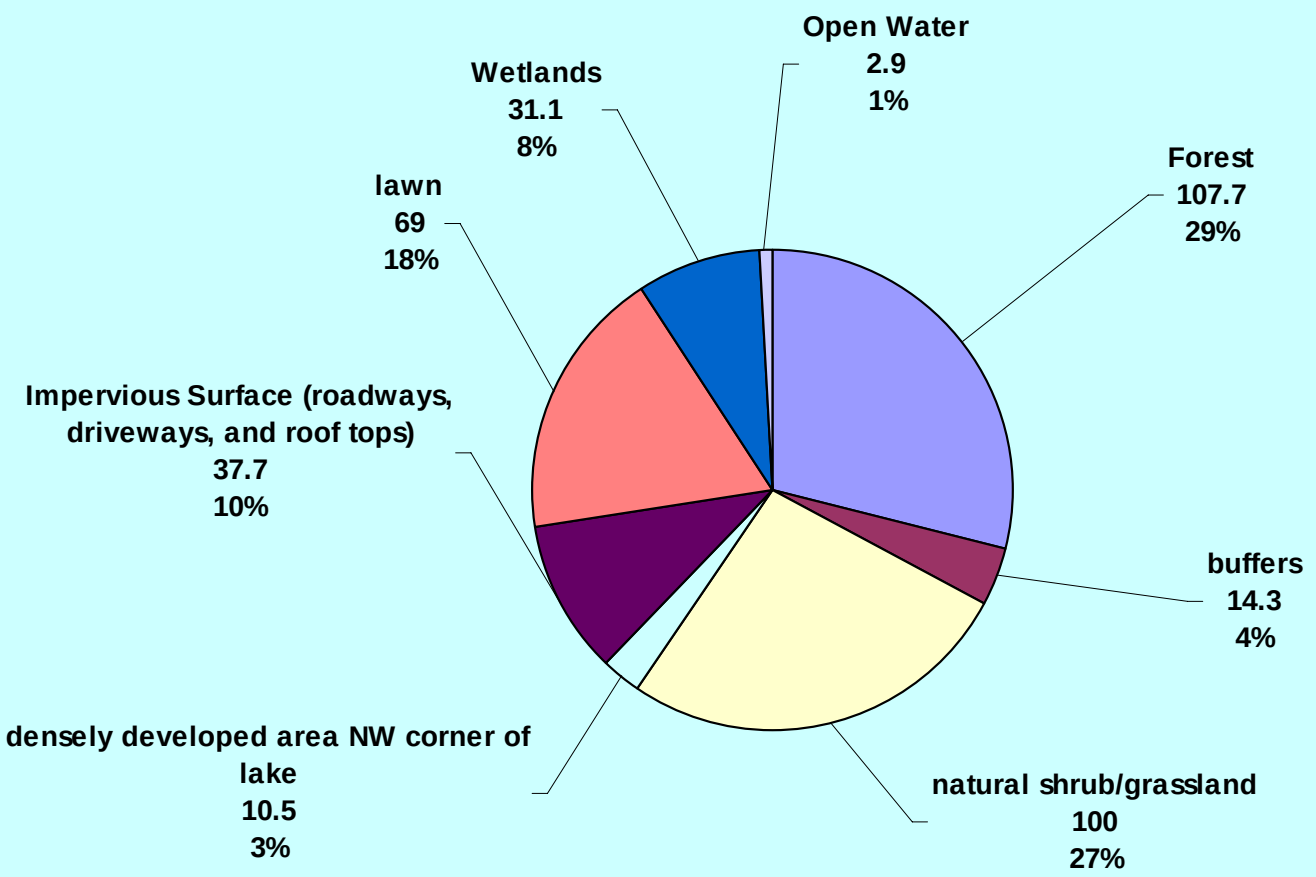
How about the larger Big Chetac Lake Watershed?



7. Near Shore Contributions

- An area within 200 ft of the shoreline
  - Contains most of the residential development
  - Roads & other impervious surfaces
- Land use determined by looking at high quality color aerial photos
- Runoff coefficients (3 levels) for each type of land cover/use used to calculate phosphorous loading from this area

Total Land Use



Nearshore Total Contribution

- 90 to 468 lbs of phosphorous annually depending on the whether the low, medium, or high coefficient is used
- Some of the nearshore contribution is already accounted for in groundwater and tributary calculations so the low value is used
- Low Range = 90 lbs = 1%
- Medium Range = 190 lbs = 2%

Loading Summary

- **Internal Loading is the biggest source of phosphorous to the lake at 67%**
  - **Nearly overwhelms all other contributions**
- **Curly-leaf pondweed is also a problem at 15% (conservative)**
- **You can't do much with atmospheric and groundwater sources at 9%**
- **Watershed, nearshore, and septic system improvements (9%) would benefit the lake and are worth doing because, for the most part these are the easy things**

What can be done about internal loading?

- **On a lake this size, not much**
  - **Aluminum sulfate**
    - **Lake Wapogasset, Polk County (1200 acres)**
      - **Several hundred thousands of dollars**
      - **Was supposed to last up to 7-10 years**
      - **Extremely difficult to get accurate assessment of total chemical to use**
      - **Unforeseen events contributed to failure**
  - **Oxygenate bottom waters (hypolimnetic aeration)**
    - **Primarily in the North Basin**
    - **May be possible but generally has mixed results**
    - **Assume 120-150 days of aeration**
      - **324 hectares (800 acres)**
      - **$324,000/yr over 10 years ($1000/hectare/year)**
      - **3–4 million dollars over 10 years**

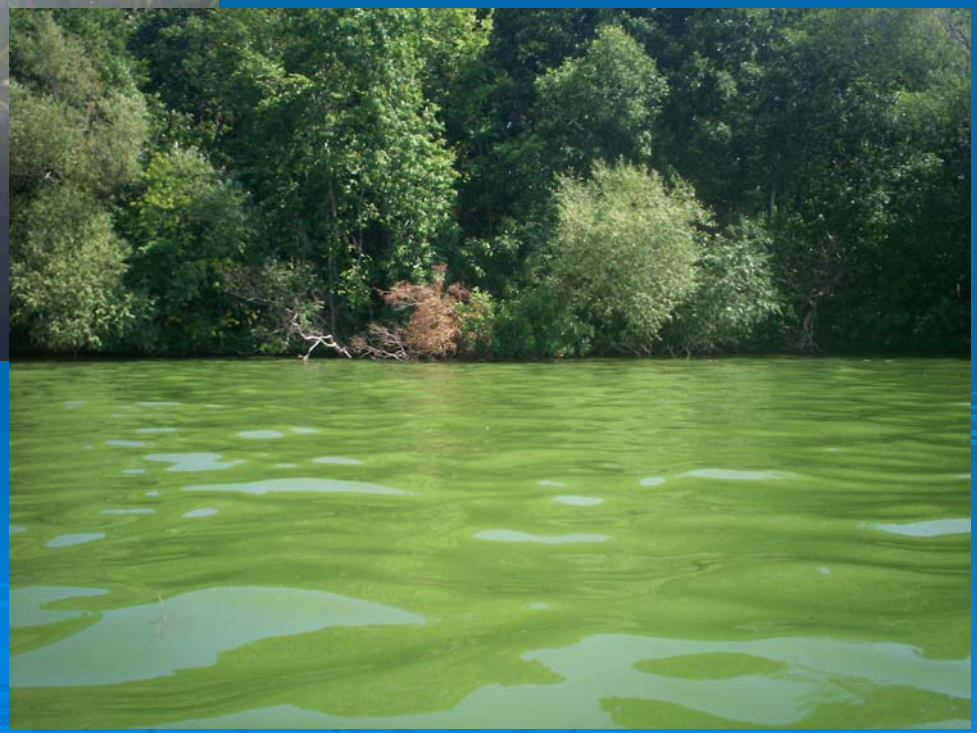
And you still have to reduce the phosphorous sources coming into the Lake

What can we do about excess plant growth?

- **Three potential options**
  - **Large-scale chemical herbicide**
  - **Large-scale mechanical harvesting**
  - **Large-scale drawdown with or without dredging**
- **Should target CLP only, not native aquatic plants**

Here's Why?

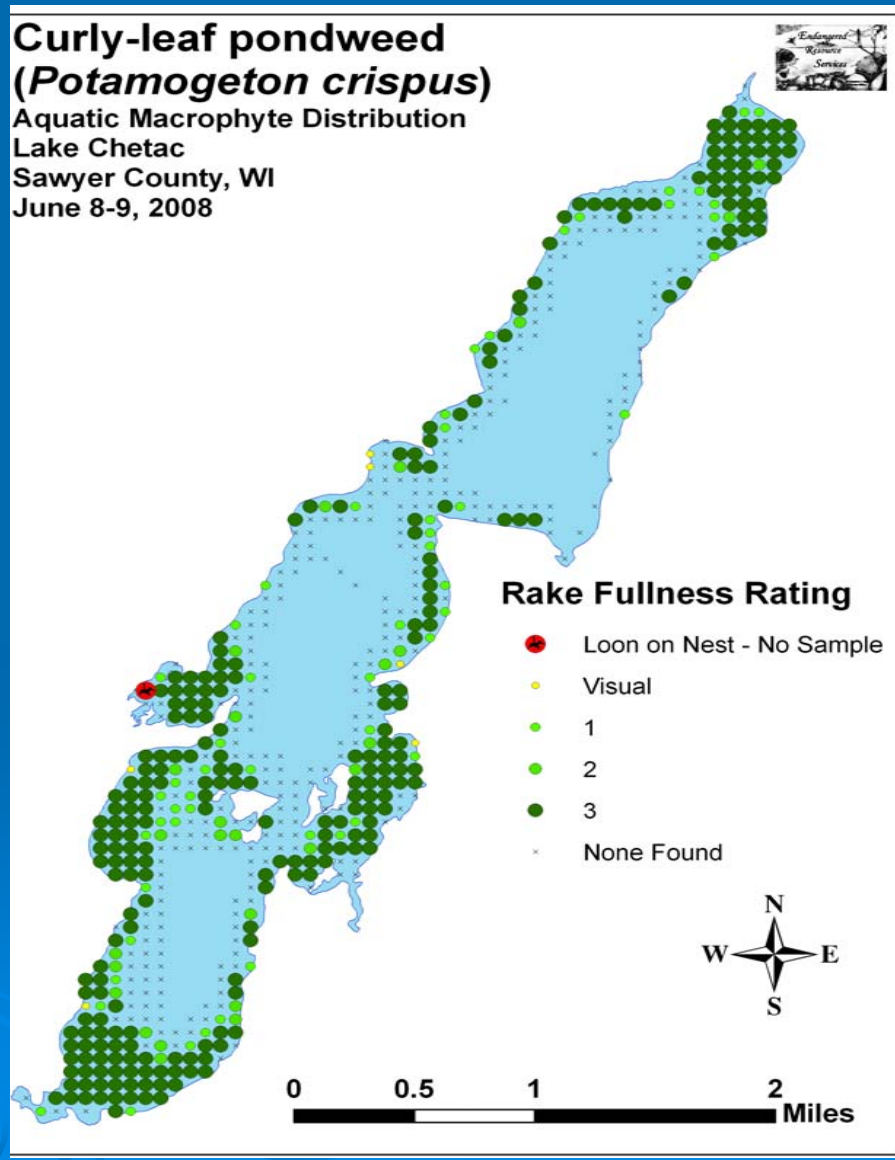
With Plants



Without Plants

CLP Management

- More than 600 acres
- Early season growth
- Early season die-off
- All season impacts on nutrients
  - 15% of the total contributions to the lake each year



Most likely management possibilities

- **Large-scale harvesting**
  - One – four mechanical harvesters
  - Off-loading sites
  - Plant hauling equipment
  - Disposal site
  - Operators
  - Insurance
- **Assuming you had all this stuff accounted for the cost of harvesting alone at an estimate of *$500/hectare/year of area harvested**
    - 200-600 acres
    - 80 to 240 hectares
    - $40,000 – $120,000/year

* 1997 UW-Extension Estimate

Contracted vs. Ownership

- **Contracted (based on 2009 evaluation completed by Freshwater Science Inc, LLC)**
  - **$250 - $530 per acre (Ave=$390)**
  - **$625 - $1,325 per hectare (Ave=$975)**
    - **80 hectares = $78,000.00/yr**
    - **240 hectares = $234,000/yr**
- **Ownership**
  - **$480 per acre**
  - **$1200 per hectare**
    - **80 hectares = $96,000/yr**
    - **240 hectares = $288,000/yr**

The cost should go down as more acreage is harvested for both contracted and ownership.

Drawbacks

- Expensive to get set up
  - DNR Grants may not be able to be used for purchasing equipment
- Requires more that one harvester to remove the amount of plant mass needed to begin making improvements
- Lots of support structure to arrange
- Makes a mess with floating fragments, disturbed sediment, etc.
- Limited “window of opportunity” to remove lots of CLP (usually about 3-5 weeks)
- May become “routine” rather than “restorative” in nature
- If, contracted, you risk introducing other aquatic invasive species

Benefits

- Once set up, costs should go down over the life of equipment
- Can remove large masses of CLP in a hurry with appropriate and adequate equipment
- No chemical used

Herbicide Application

- **Early-season Endothall**
  - Contact herbicide applied in a granular form
  - Applied before the end of May while water is still cold
  - Targets CLP almost exclusively
  - After several years, treatment may substantially reduce remaining turions or seeds for future growth possibly reducing the need for treatment
- **$400-$600 per acre (includes all pre and post treatment monitoring required by the DNR)**
  - $1000 to $1500 per hectare
    - 80 ha = $80,000/yr
    - 240 ha = $240,000/yr

Using aquatic herbicides

- **What does early-season mean?**
  - Spring treatment before most aquatic plants have started to grow
  - Mid-May, water temperatures less than 60 F
  - Pre-spawn
  - CLP actively growing, herbicide is targeted
- **What is Endothall?**
  - Aquathol Super K
  - Granular herbicide
  - CLP treated at 1.0 mg/L (a very low concentration)
  - Kills by contact time
  - No restriction for swimming
  - Not considered a carcinogen or endocrine disruptor
  - No reproductive or developmental toxicity in humans

More about Endothall

- **Not acutely toxic to bluegill, bass, fathead minnows, zooplankton, or crustaceans**
- **Certain Restrictions do apply:**
  - **Human or animal drinking of water should be avoided for 7 days**
  - **Irrigation or food washing should be avoided for 7 days**
  - **Public notification before treatment**
  - **Signs posted and buoys placed after treatment**

Drawbacks and Benefits

- **Drawbacks**
  - Public perception
  - Requires a great deal of documentation of results
  - It a chemical
- **Benefits**
  - Probably more cost effective over the long run as targeted use over time can reduce the need for treatment
  - More restorative in nature
  - Target species specific
  - Minimizes other ecosystem disturbances
  - Completed when people are not using the lake as much

Drawdown

- Massive disruption of the aquatic ecosystem
- Would have to be drawn down 5-7 ft to be effective at controlling substantial CLP
- Other management would still need to be completed
- Impacts downstream, including Birch Lake and the Balsam/Red Cedar/Hemlock System
- Environmental Assessment likely required to be done before implementation could occur

Watershed, Near shore, and Septic Systems

- **Best Management Practices (BMP's)**
  - Change in agricultural practices
  - More buffer strips
  - Shoreland restoration
  - Replace failing or non-working septic systems
  - Rain gardens, runoff diversion
  - Reduce impervious surfaces
  - Restore emergent aquatic vegetation

The End

Next Step?

Develop the Lake and Aquatic Plant Management Plan