

Comfort Lake Forest Lake Watershed District
Six Lake TMDL Project

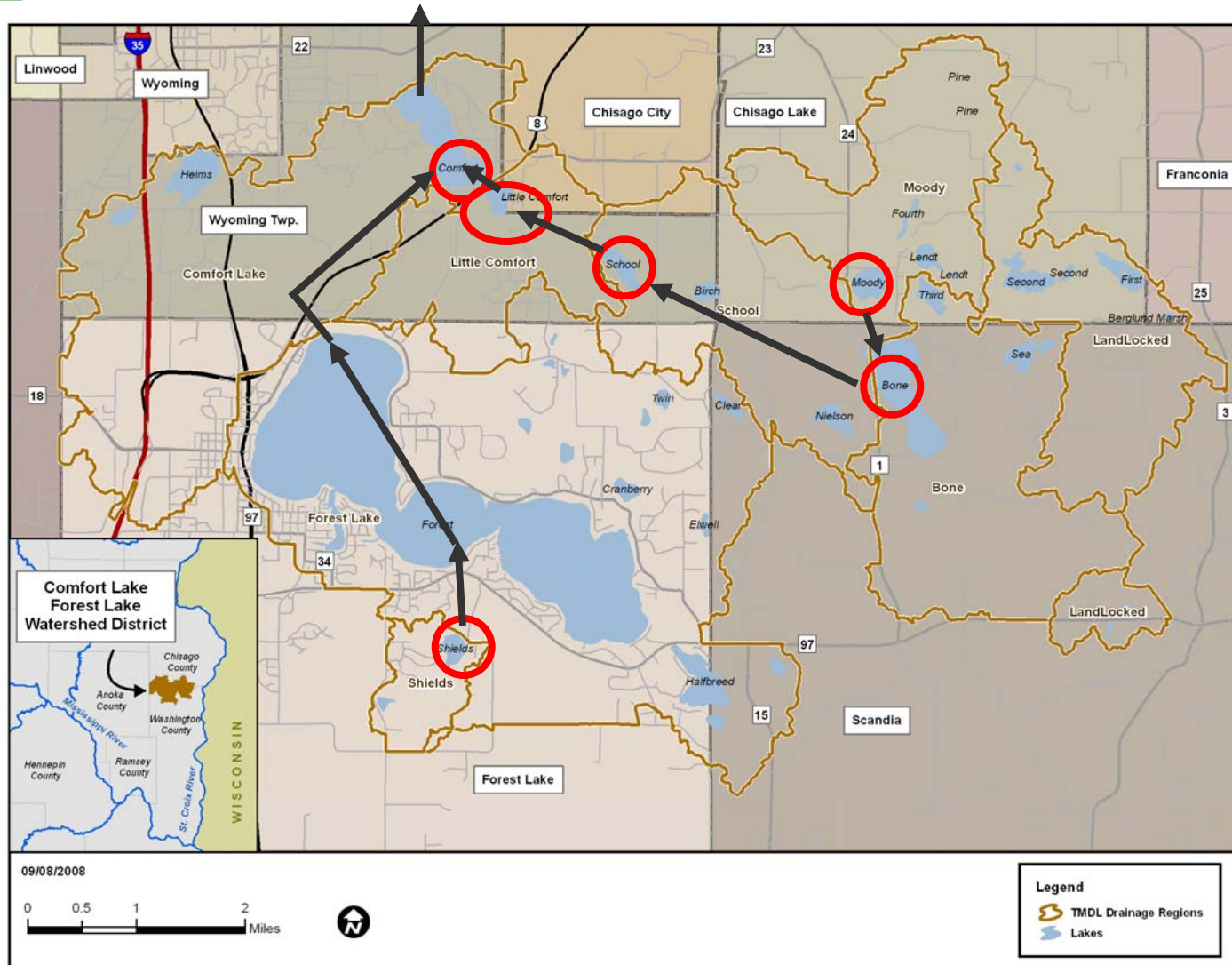
Stakeholder Meeting
April 8, 2009



Goals and Agenda

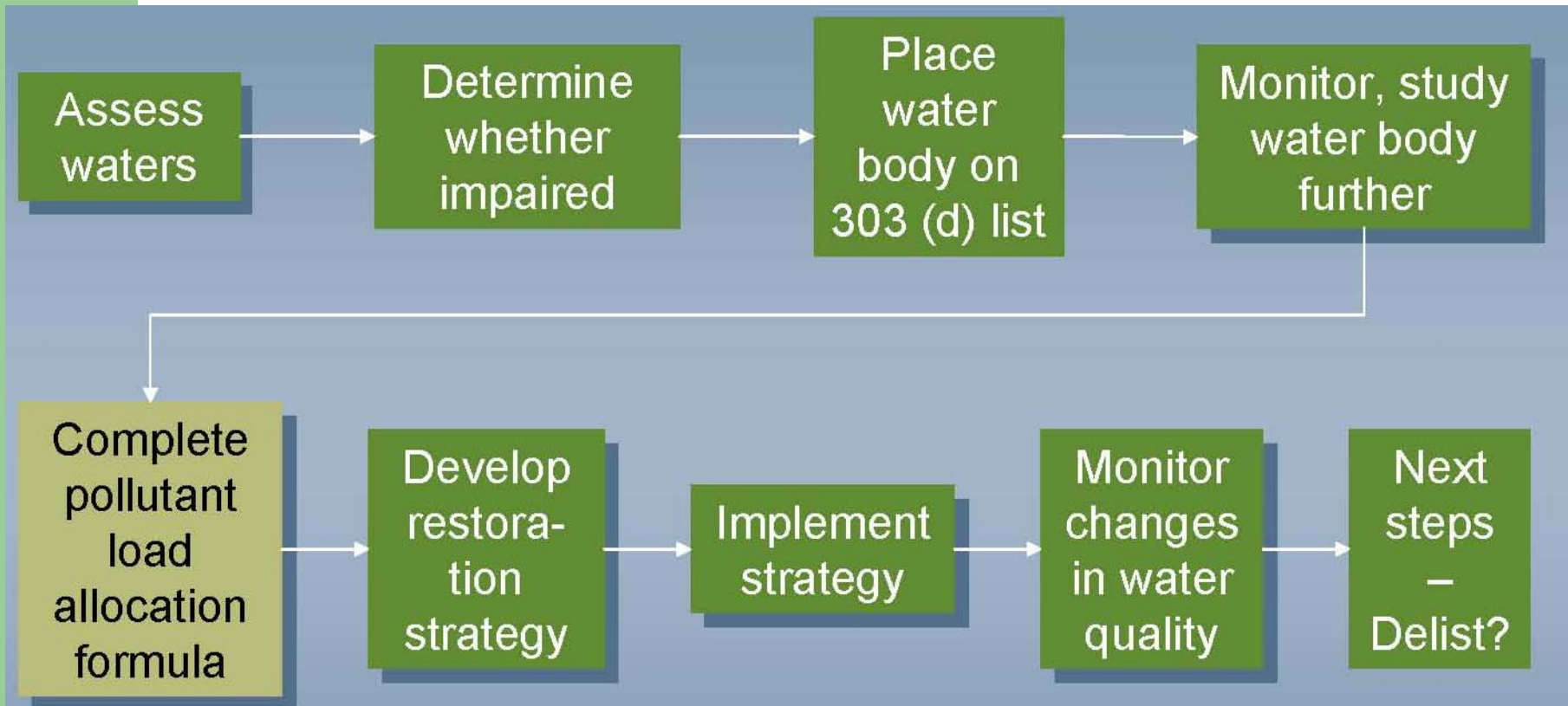
- Goals
 - Understanding of how the TMDL loads proposed to be allocated
 - Provide input on allocations and implementation
- Agenda
 - Background on TMDL Process and the impaired lakes
 - Future MS4s
 - Load allocation process and assumptions
 - Draft wasteload and load allocations for each lake
 - Implementation Strategy
 - Implementation Ideas

Which Lakes are in this TMDL Study?



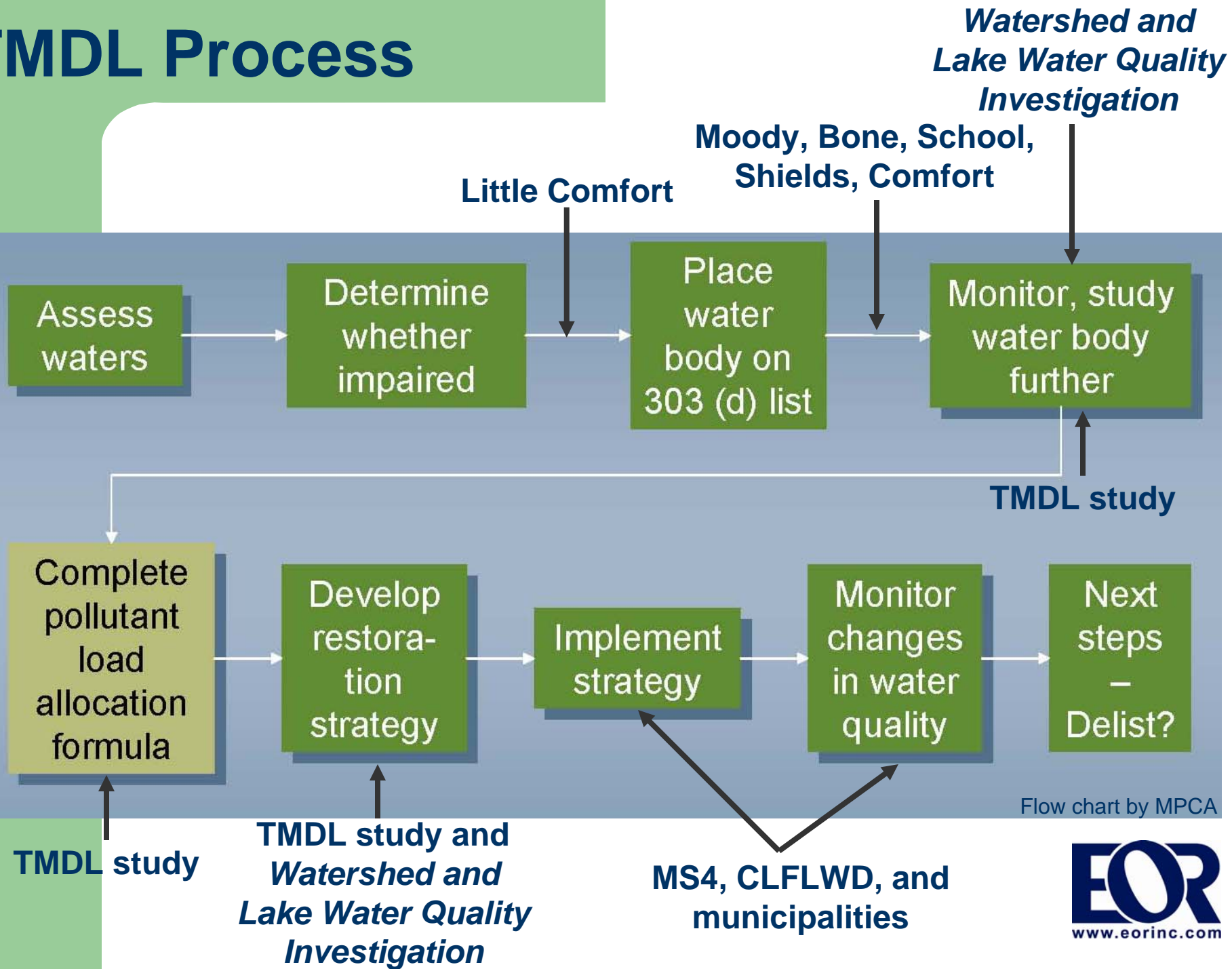
TMDL Process

Objectives: Define the “total maximum daily load” needed to reach a defined WQ goal and implement a management program



Flow chart by MPCA

TMDL Process



Flow chart by MPCA



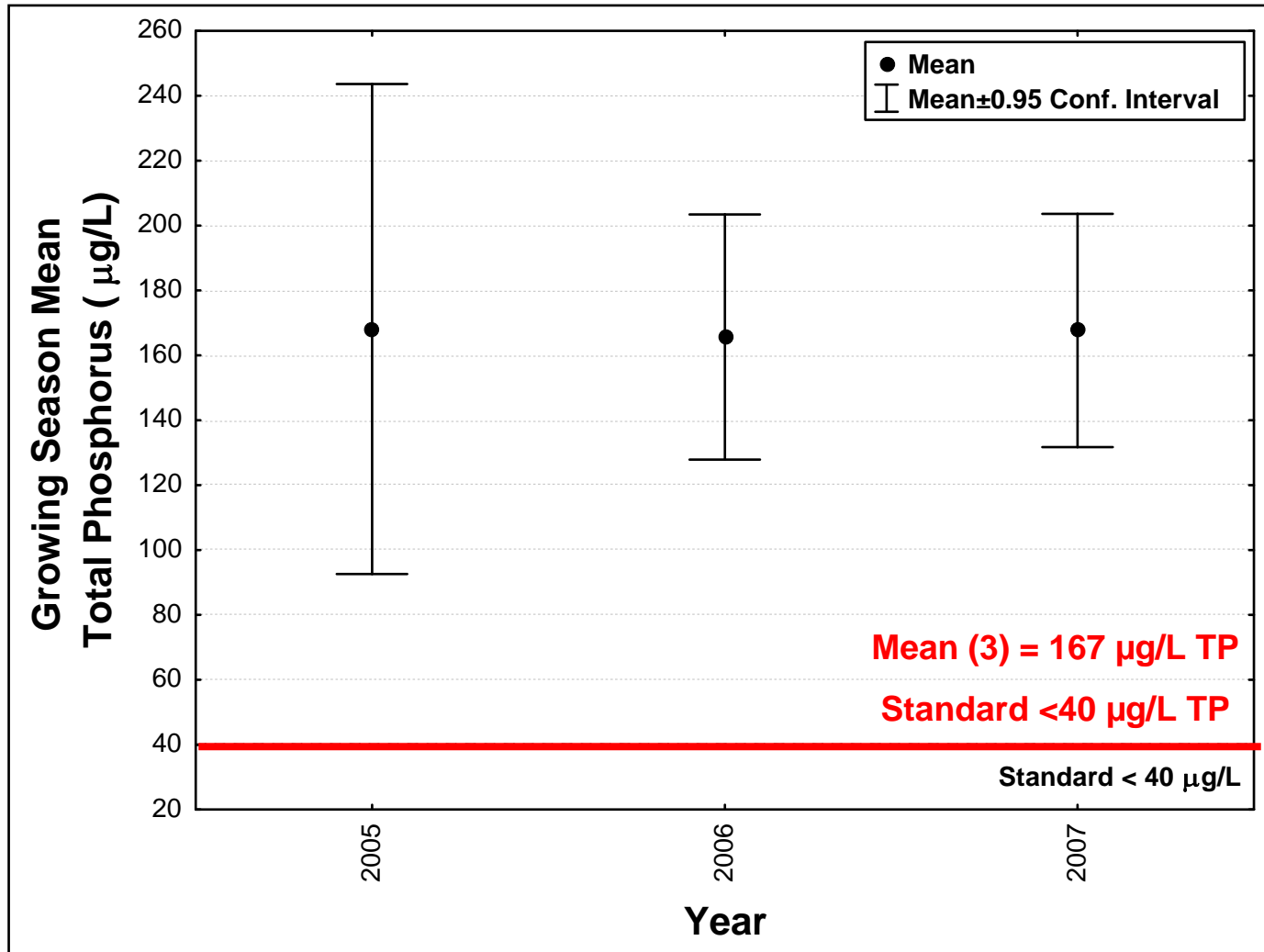
MPCA Lake Standards

Shields only

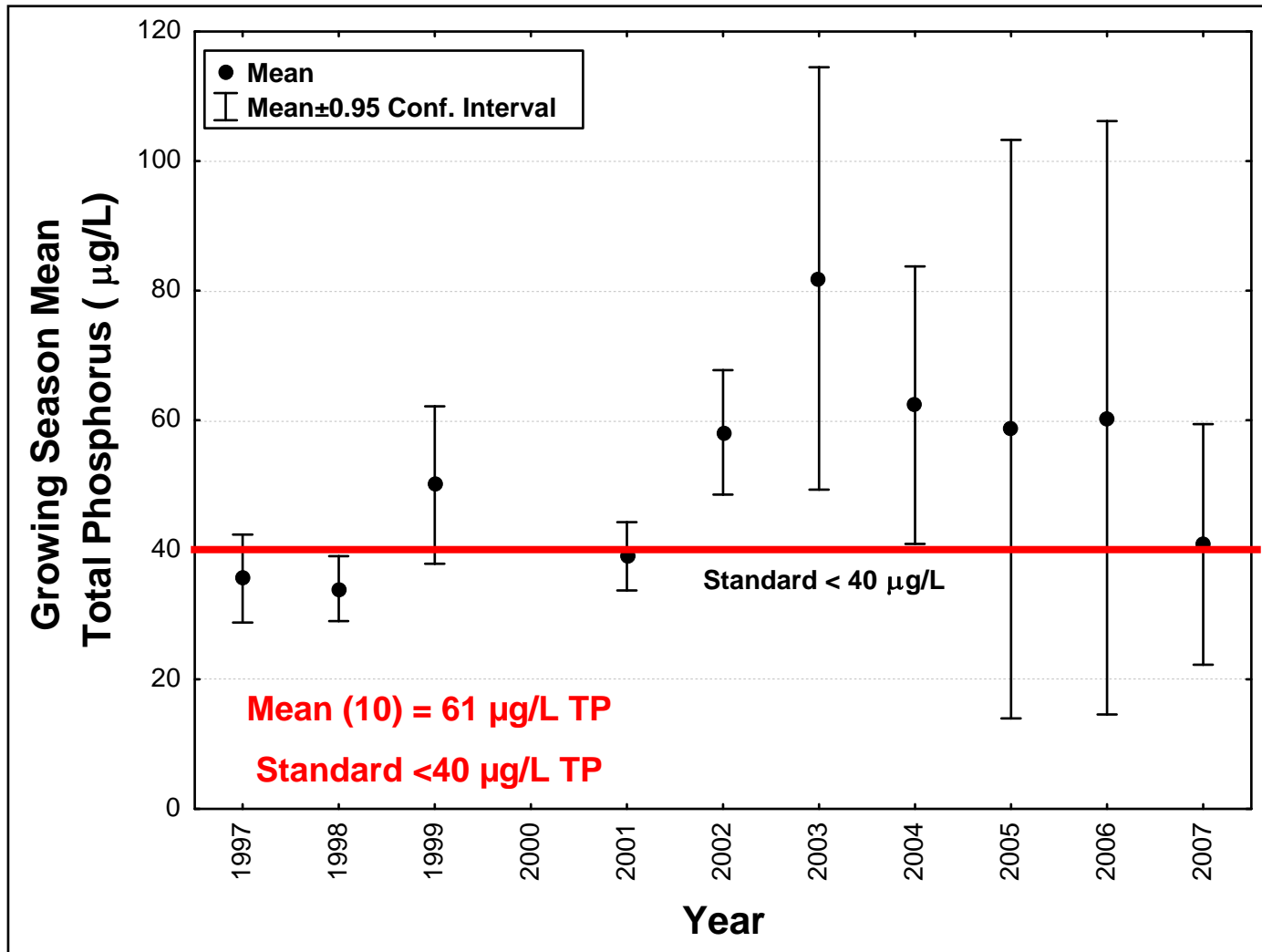
	North Central Hardwood Forest		Long-term WD goal for Bone, L. Comfort, Shields and Comfort
	Shallow ¹	Deep	
Phosphorus Concentration (µg/L)	60	40	30
Chlorophyll-a Concentration (µg/L)	20	14	
Secchi disk transparency (meters)	>1	>1.4	

¹ Shallow lakes are defined as lakes with a maximum depth of 15 feet or less, or with 80% or more of the lake area shallow enough to support emergent and submerged rooted aquatic plants (littoral zone).

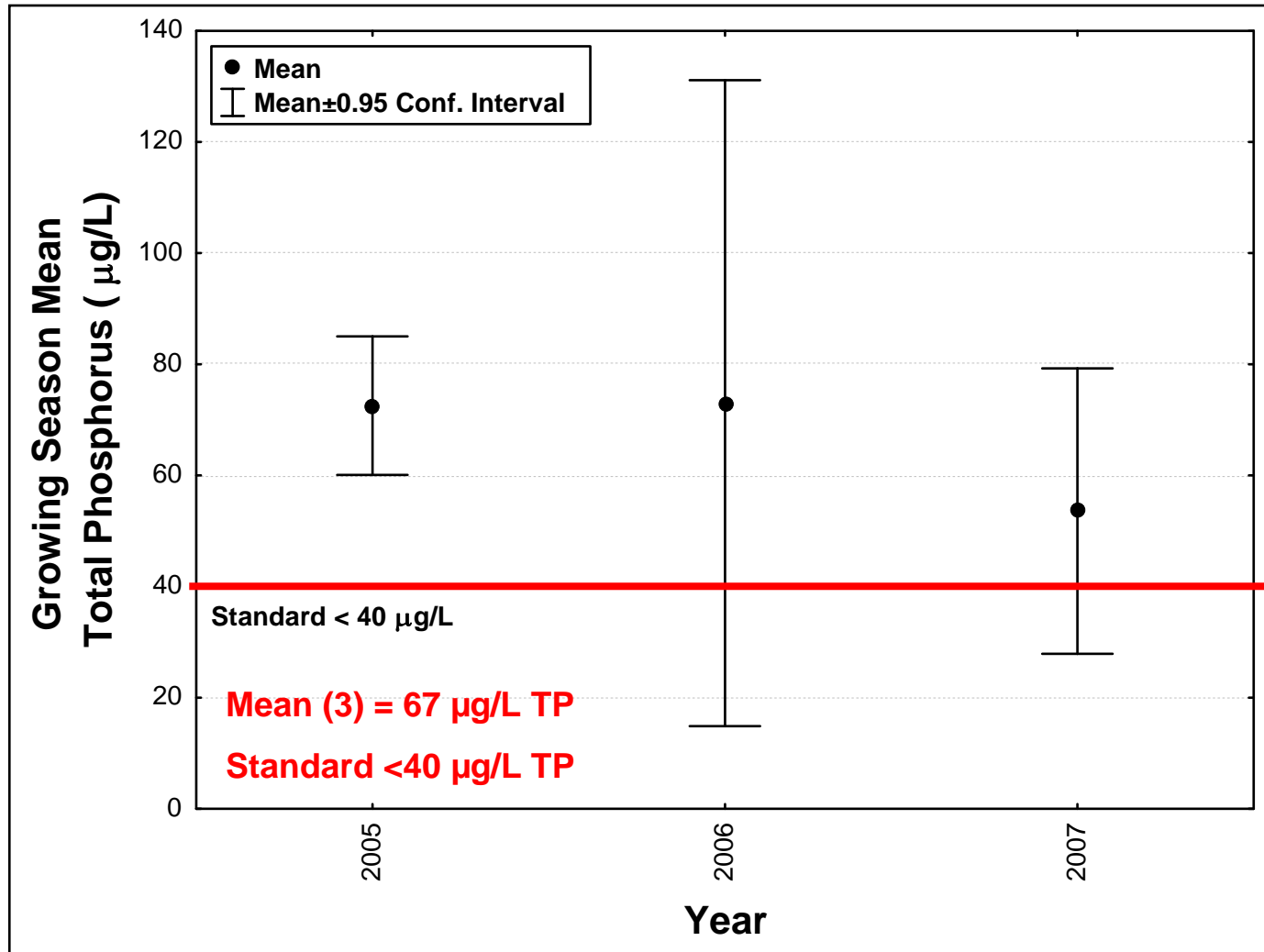
Moody Lake Total Phosphorus History



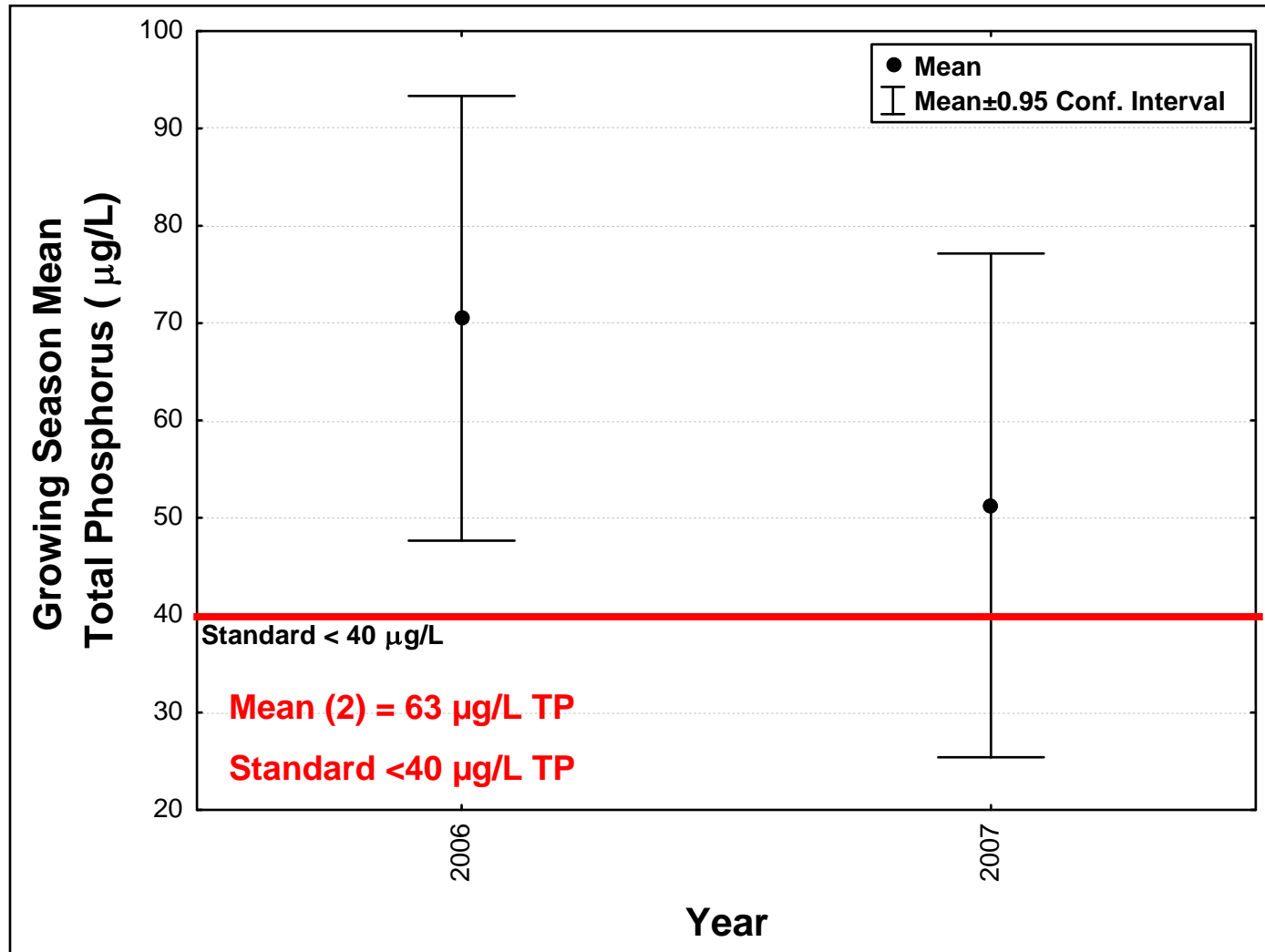
Bone Lake Total Phosphorus History



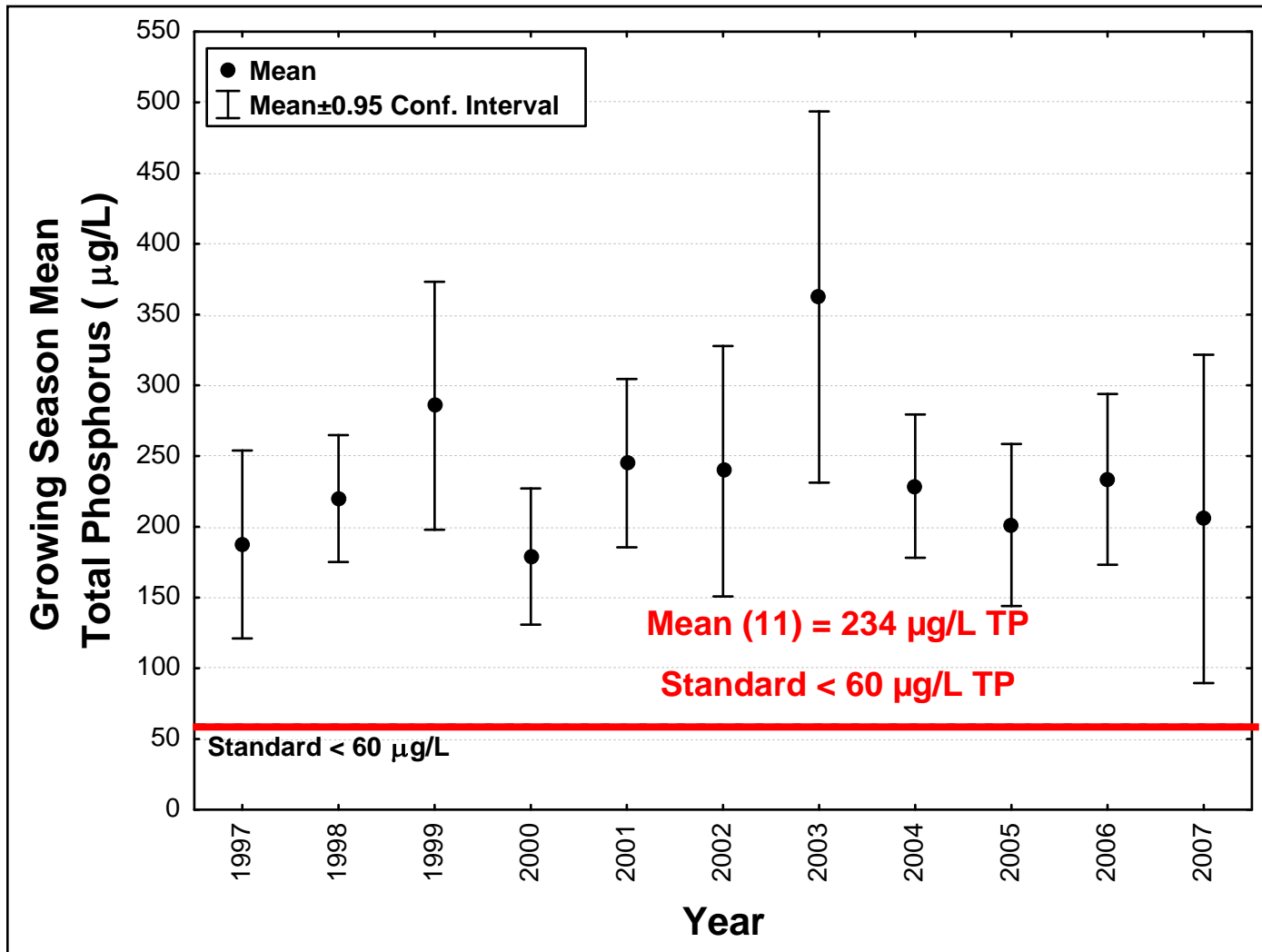
School Lake Total Phosphorus History



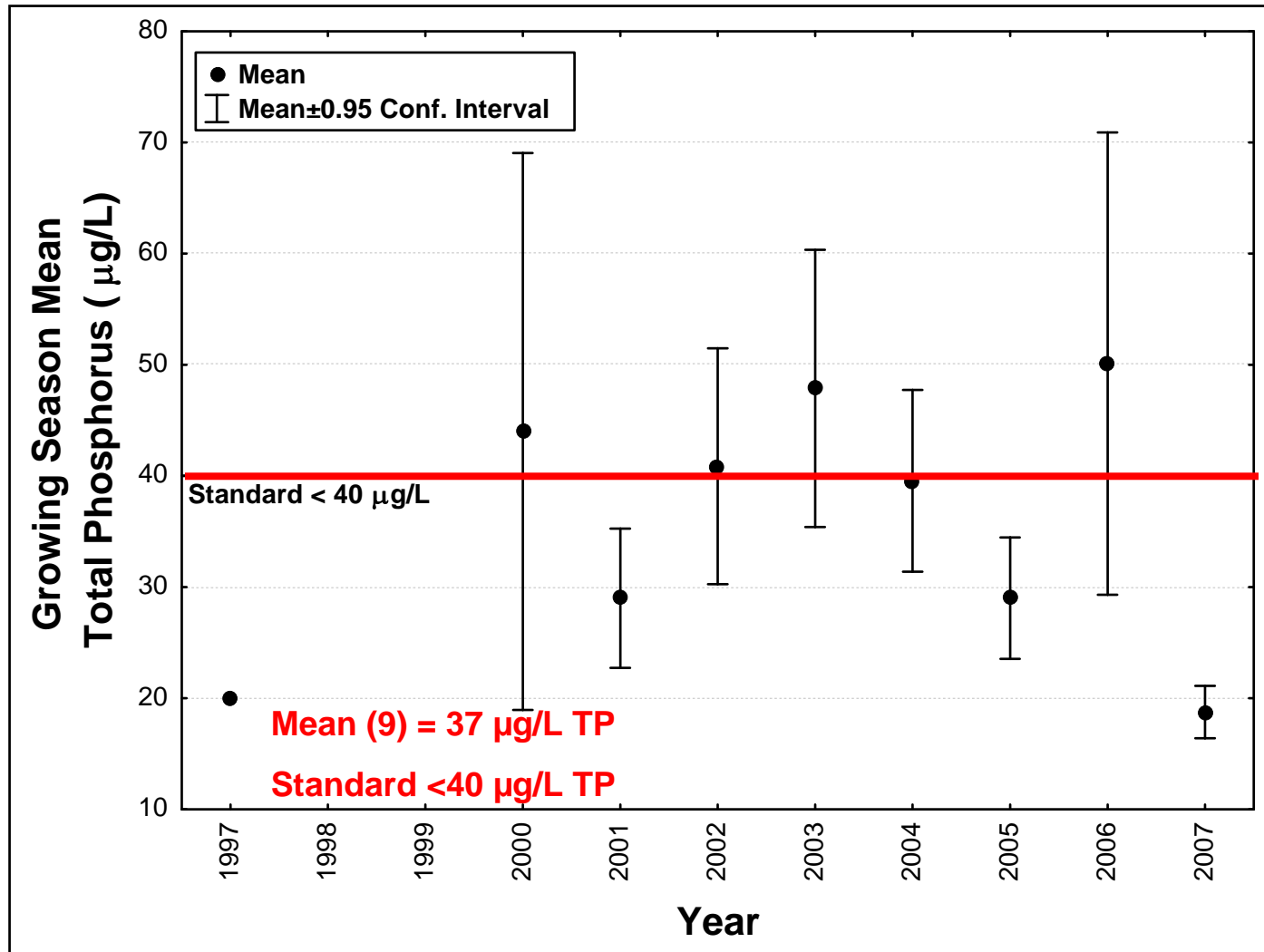
Little Comfort Total Phosphorus History



Shields Lake Total Phosphorus History



Comfort Lake Total Phosphorus History



TMDL Load Allocation

A TMDL Study must complete this pollution load allocation formula:

$$\text{LA(s)} + \text{WLA(s)} + \text{Margin of Safety} + \text{Reserve Capacity} = \text{Total Maximum Daily Load}$$

Where:

LA = Load allocations from nonpoint sources

WLA = Waste load allocations from point sources

Margin of Safety = to account for potential scientific error

Reserve capacity = set aside for future development

Formula graphic by MPCA

Including current MS4s: Forest Lake
and future MS4s: Wyoming, Scandia, Chisago City

Future MS4s

Municipality	Current Population	2020 Population	Source
Scandia	4,210	5,000	MetCo
Chisago City	4,646*	>5,695	MSDC
Wyoming	6,959*	11,102	MSDC
Chisago Lk. Twp.	3,703	4,685	MSDC

- Future MS4s based on population of 5,000 or greater by 2020 based on MetCo or state estimates for municipalities within ½ mile of an impaired water

*Estimate provided by the City

TMDL Load Allocation

$$\text{LA(s)} + \text{WLA(s)} + \text{Margin of Safety} + \text{Reserve Capacity} = \text{Total Maximum Daily Load}$$

Formula graphic by MPCA

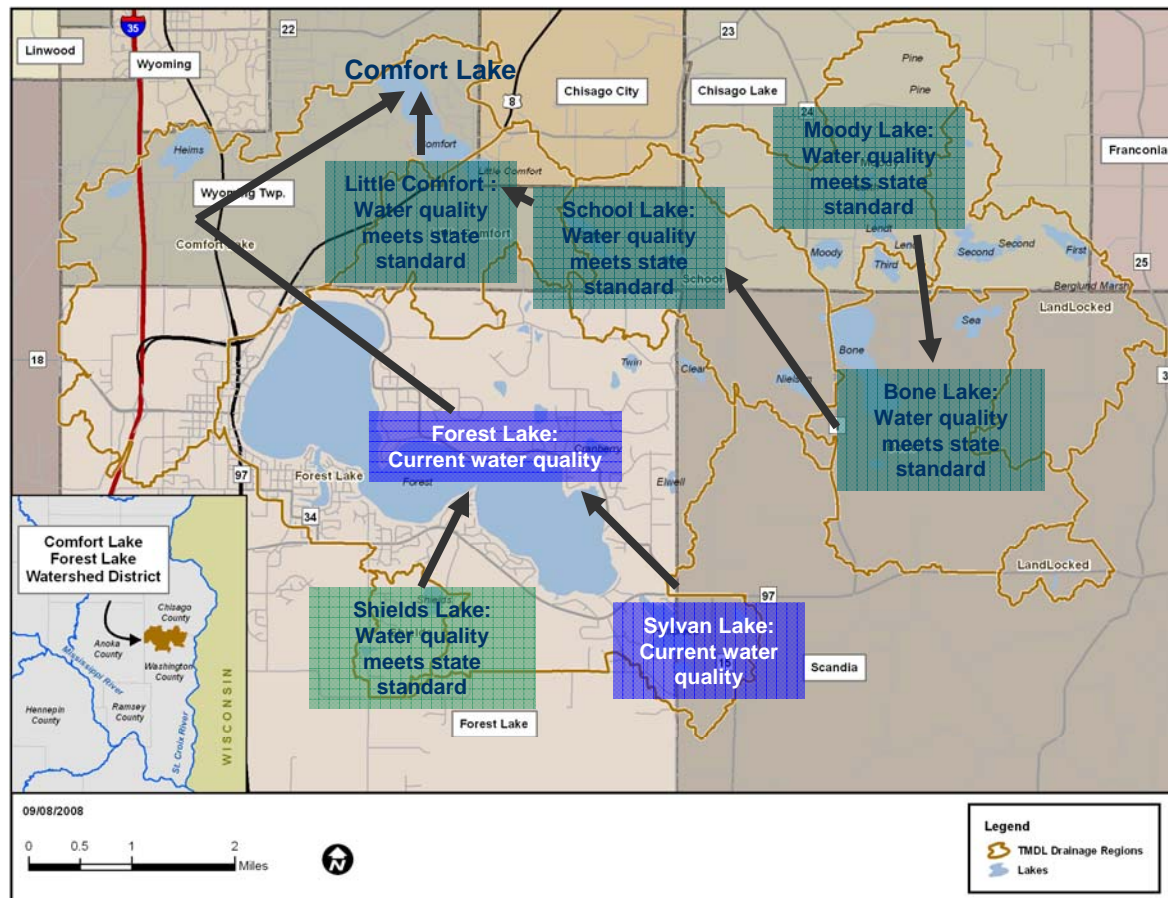
- Wasteload Allocation – enforced through state permits
 - City of Forest Lake (Comfort, Shields, L. Comfort, Bone)
 - NPDES construction and industrial stormwater permits
 - Community septic systems at “Liberty Ponds” and “The Preserve at Birch Lake”
 - Future MS4s: City of Wyoming, City of Chisago City, City of Scandia
- Load Allocation (non-MS4 and nonpoint)
 - Non-MS4 portions of Cities of Forest Lake, Scandia, Wyoming, Chisago City
 - Chisago Lake Township
 - County-registered Feedlots
 - Individual septic systems
 - Internal loading
 - Atmospheric deposition

TMDL Load Allocation

- Allocation Process
 1. District's Water Quality Study determined each lake's assimilative capacity based on monitoring and modeling
 2. Assimilative capacity = TMDL
 3. Divide TMDL up to WLA and LA
 - a) WLA for construction and industrial stormwater permits
 - b) Other permits define WLA based on contribution
 - c) Upstream lake load part of LA
 - d) Livestock load part of LA
 - e) Atmospheric and groundwater load part of LA
 - f) Remaining watershed load divided between municipalities' WLA and LA

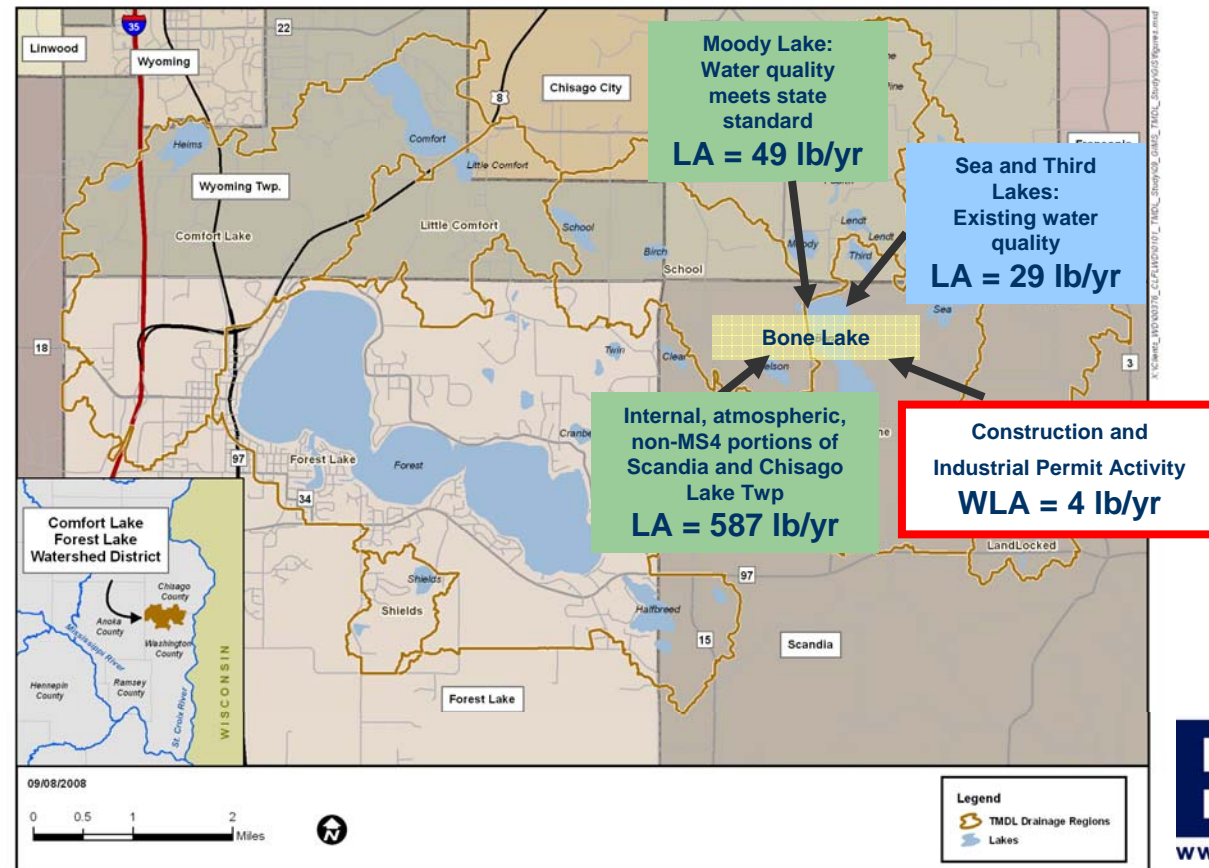
CLFLWD TMDL Allocations

- Assumptions
 1. Upstream TMDL lakes meet water quality goal
 2. Upstream un-impaired lakes maintain current quality (non-degradation)



CLFLWD TMDL Allocations

- Example: Bone Lake
 - Assumptions:
 - Moody Lake meets water quality standard
 - Sea and Third Lakes remain at existing water quality (non-degradation)
 - Allocation:
 - Load into Bone Lake from Moody Lake allocated as a load allocation because the wasteload allocation was conducted under Moody Lake's TMDL
 - Wasteload allocation for construction and industrial NPDES stormwater permits based on % land area under construction



CLFLWD TMDL Allocation-Moody Lake

P Source	Current		Goal		Reduction Needed	
	TP Load (lbs/yr)	% Total Load	TP Load (lbs/yr)	% Total Load	TP Load (lbs/yr)	% Reduction
Watershed	439	43%	54	37%	385	88%
<i>Non-MS4 areas of Scandia and Chisago Lake Twp. (LA)</i>	439	43%	53	36%	386	88%
<u>Scandia</u>	<u>11</u>	<u>1%</u>	<u>2</u>	<u>1%</u>	<u>9</u>	<u>82%</u>
<u>Chisago Lk. Twp.</u>	<u>428</u>	<u>42%</u>	<u>51</u>	<u>35%</u>	<u>377</u>	<u>88%</u>
<i>Construction & Industrial stormwater (WLA)</i>			1	1%		
Livestock	194	19%	24	17%	170	88%
Upstream Lakes	15	2%	15	11%	0	0%
Atmospheric & Groundwater	7	1%	7	5%	0	0%
Internal	368	36%	44	31%	324	88%
Total	1023	100%	144	100%	879	86%

Moody Lake (reduction needed = 879 lb., 86%)

TMDL = 144 lb/yr

- WLA 1 lb/yr (NPDES construction and industrial stormwater permits)
- LA 143 lb/yr (Internal, atmospheric, upstream lakes, non-MS4 portions of Scandia and Chisago Lake Twp)

CLFLWD TMDL Allocation-Bone Lake

P Source	Current		Goal		Reduction Needed	
	TP Load (lbs/yr)	% Total Load	TP Load (lbs/yr)	% Total Load	TP Load (lbs/yr)	% Reduction
Watershed	753	61%	422	63%	331	44%
<i>Non-MS4 areas of Scandia and Chisago Lake Twp. (LA)</i>	753	61%	418	62%	335	45%
<u>Scandia</u>	<u>752</u>	<u>61%</u>	<u>417</u>	<u>62%</u>	<u>335</u>	<u>45%</u>
<u>Chisago Lk. Twp.</u>	<u>1</u>	<u>0%</u>	<u>1</u>	<u>0%</u>	<u>0</u>	<u>0%</u>
<i>Construction & Industrial stormwater (WLA)</i>			4	1%		
Upstream Lakes	215	17%	78	12%	137	64%
Livestock	77	6%	77	12%	0	0%
Atmospheric & Groundwater	52	4%	52	8%	0	0%
Internal	132	11%	40	6%	92	70%
Total	1229	100%	669	100%	560	46%

Bone Lake (reduction needed = 560 lb., 46%)

TMDL = 669 lb/yr

- WLA 4 lb/yr (NPDES construction and industrial stormwater permits)
- LA 665 lb/yr (Internal, atmospheric, upstream lakes, non-MS4 portions of Scandia and Chisago Lake Twp)

CLFLWD TMDL Allocation-School Lake

P Source	Current		Goal		Reduction Needed	
	TP Load (lbs/yr)	% Total Load	TP Load (lbs/yr)	% Total Load	TP Load (lbs/yr)	% Reduction
Watershed	179	19%	48	11%	131	73%
<i>Non-MS4 areas of City of Forest Lake, City of Chisago City and Chisago Lake Twp. (LA)</i>	173	19%	44	10%	129	75%
<u>Forest Lake</u>	<u>38</u>	4%	<u>10</u>	2%	<u>28</u>	74%
<u>Chisago</u>	<u>119</u>	13%	<u>30</u>	7%	<u>89</u>	75%
<u>Chisago Lk. Twp.</u>	<u>16</u>	2%	<u>4</u>	1%	<u>12</u>	75%
<i>Construction & Industrial stormwater (WLA)</i>			3	1%		
<i>The Preserve at Birch Lake (WLA)</i>	0	0%	0	0%	0	0%
<i>City of Chisago City MS4 (WLA)</i>	6	1%	1	0%	5	83%
Livestock	105	11%	25	6%	80	76%
Upstream Lakes	587	63%	321	71%	266	45%
Atmospheric & Groundwater	12	1%	12	3%	0	0%
Internal	46	5%	46	10%	0	0%
Total	928	100%	452	100%	477	51%

School Lake (reduction needed = 477 lb., 51%)

TMDL = 452 lb/yr

- WLA 3 lb/yr (NPDES const. and ind. stormwater permits)
- WLA 1 lb/yr (City of Chisago City MS4)
- WLA 0 lb/yr (The Preserve at Birch Lake)
- LA 448 lb/yr (Internal, atmospheric, upstream lakes, non-MS4 portions of Scandia, Forest Lake, Chisago City and Chisago Lake Twp)

CLFLWD TMDL Allocation-Little Comfort Lake

- Little Comfort (reduction needed = 678 lb., 54%)
 - TMDL = 577 lb/yr
 - WLA 4 lb/yr (NPDES construction and industrial stormwater permits)
 - WLA 4 lb/yr (City of Forest Lake)
 - WLA 54 lb/yr (City of Chisago City)
 - WLA 56 lb/yr (City of Wyoming)
 - WLA 0 lb/yr (Liberty Ponds)
 - LA 459 lb/yr (Internal, atmospheric, upstream lakes, non-MS4 portions of Scandia, Forest Lake, Chisago City and Chisago Lake Twp)

CLFLWD TMDL Allocation-Little Comfort Lake

P Source	Current		Goal		Reduction Needed	
	TP Load (lbs/yr)	% Total Load	TP Load (lbs/yr)	% Total Load	TP Load (lbs/yr)	% Reduction
Watershed	380	30%	271	47%	109	29%
<i>Non-MS4 areas of City of Forest Lake, City of Chisago City and City of Wyoming (LA)</i>	216	17%	153	27%	63	29%
Forest Lake	<u>27</u>	2%	<u>19</u>	3%	8	30%
Chisago City	<u>94</u>	7%	<u>67</u>	12%	27	29%
Wyoming	<u>95</u>	8%	<u>67</u>	12%	28	29%
<i>Construction & Industrial stormwater (WLA)</i>			4	1%		
<i>Liberty Ponds (WLA)</i>	0	0%	0	0%	0	0%
<i>City of Forest Lake MS4 (WLA)</i>	6	0%	4	1%	2	33%
<i>City of Chisago City MS4 (WLA)</i>	71	6%	54	9%	17	24%
<i>City of Wyoming MS4 (WLA)</i>	88	7%	56	10%	32	36%
Livestock	22	2%	22	4%	0	0%
Upstream Lakes	789	63%	260	45%	529	67%
Atmospheric & Groundwater	7	1%	7	1%	0	0%
Internal	56	4%	17	3%	39	70%
Total	1255	100%	577	100%	678	54%

CLFLWD TMDL Allocation-Shields Lake

P Source	Current		Goal		Reduction Needed	
	TP Load (lbs/yr)	% Total Load	TP Load (lbs/yr)	% Total Load	TP Load (lbs/yr)	% Reduction
Watershed	186	17%	32	16%	155	83%
<i>Non-MS4 areas of City of Forest Lake (LA)</i>	<u>78</u>	7%	<u>13</u>	7%	65	83%
<i>Construction & Industrial stormwater (WLA)</i>			1	1%		
<i>City of Forest Lake MS4 (WLA)</i>	108	10%	18	9%	90	83%
Livestock	1	0%	1	1%	0	21%
Upstream Lakes	0	0%	0	0%	0	0%
Atmospheric & Groundwater	7	1%	7	3%	0	0%
Internal	913	82%	155	80%	758	83%
Total	1107	100%	195	100%	912	82%

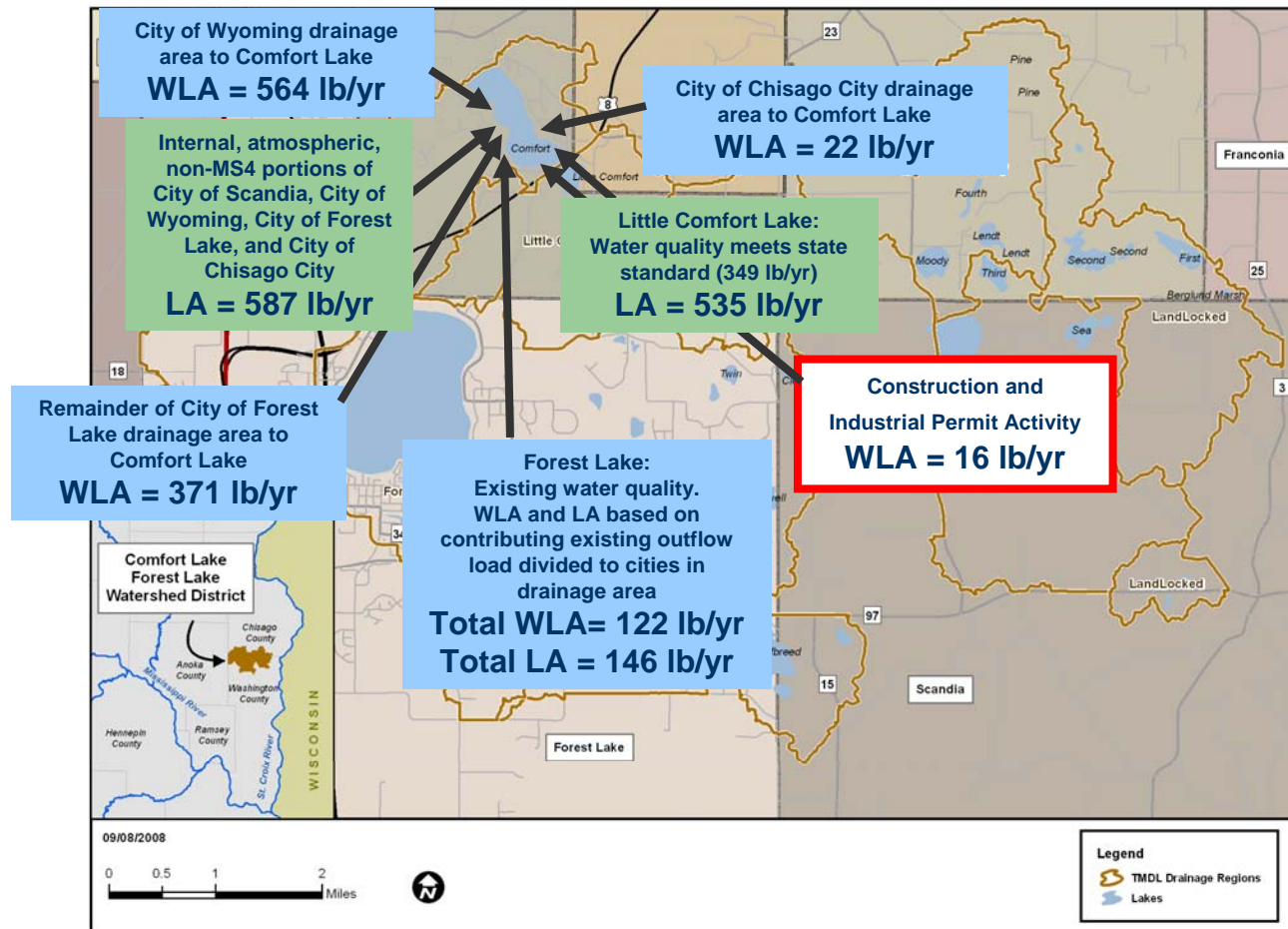
Shields (reduction needed = 912 lb., 82%)

TMDL = 195 lb/yr

- WLA 1 lb/yr (NPDES construction and industrial stormwater permits)
- WLA 18 lb/yr (City of Forest Lake)
- LA 176 lb/yr (Internal, atmospheric, upstream lakes, non-MS4 portions of Forest Lake)

CLFLWD TMDL Allocations

- **Comfort Lake (reduction needed 126 lb., 5%)**
 - TMDL = 2339 lb/yr
 - WLA 492 lb/yr (City of Forest Lake MS4)
 - WLA 22lb/yr (City of Chisago MS4)
 - WLA 564 lb/yr (City of Wyoming MS4)
 - WLA 16 lb/yr (NPDES construction and industrial stormwater permits)
 - LA 1245 lb/yr (Non-MS4 portions of Scandia, Forest Lake, Wyoming, Chisago, Little Comfort drainage, internal load, atmospheric load)



CLFLWD TMDL Allocation-Comfort Lake

P Source	Current		Goal		Reduction Needed	
	TP Load (lbs/yr)	% Total Load	TP Load (lbs/yr)	% Total Load	TP Load (lbs/yr)	% Reduction
Watershed	1605	65%	1621	66%	-16	-1%
<i>Non-MS4 areas of City of Scandia, City of Wyoming, City of Forest Lake, and City of Chisago City (LA)</i>	527	21%	527	21%	0	0%
<u>Scandia</u>	3	0%	3	0%	0	0%
<u>Wyoming</u>	316	13%	316	13%	0	0%
<u>Forest Lake</u>	202	8%	202	8%	0	0%
<u>Chisago</u>	6	0%	6	0%	0	0%
<i>Construction & Industrial stormwater (WLA)</i>			16	1%		
<i>City of Wyoming MS4 (WLA)</i>	564	23%	564	23%	0	0%
<i>City of Forest Lake MS4 (WLA)</i>	492	20%	492	20%	0	0%
<i>City of Chisago City MS4 (WLA)</i>	22	1%	22	1%	0	0%
Livestock	0	0%	0	0%	0	0%
Upstream Lakes (Little Comfort)	678	28%	535 *	22%	143	21%
Atmospheric & Groundwater	48	2%	48	2%	0	1%
Internal	134	5%	134	5%	0	0%
Total	2465	100%	2339	95%	126	5%

•Outflow load from Little Comfort Lake modeled as 349 lb/yr under goal water quality. This load was increased here to allow an additional margin of error for Comfort Lake given the large number of upstream lakes that contribute to Comfort.

Implementation Strategy

- Planning level required in this grant from MPCA
- Incorporation of *Watershed and Lake Water Quality Investigation* Recommendations
 - External (watershed) and internal mix of projects
- Add/delete projects identified by CLFLWD through the TMDL study (ex. after Shallow Pond study and based on new monitoring data)
- Add relevant projects and programs planned by municipalities and CLFLWD

Implementation Strategy – External BMPs

- Wetland restoration (or avoidance if wetland suspected as P source)
 - Moody, Bone, School (Birch), Little Comfort
- Buffers/livestock control
 - Moody, Bone, School, Little Comfort, Shields
- Infiltration/filtration
 - Bone
- Detention ponding
 - Comfort Lake
- Channel stabilization
 - Forest Lake Outlet (potential project)

Implementation Strategy – Internal BMPs

- Fish management (barriers, rough fish removal)
 - Moody, Bone, Little Comfort, Shields, Comfort
- Alum treatment
 - Moody, Bone, Little Comfort, Shields
- Curly-leaf pondweed control
 - Moody, Bone, Little Comfort, Shields, Comfort
- Biomanipulation (food-chain control)
 - Shields
- Aeration (winter-kill control)

Reasonable Assurances - Programs

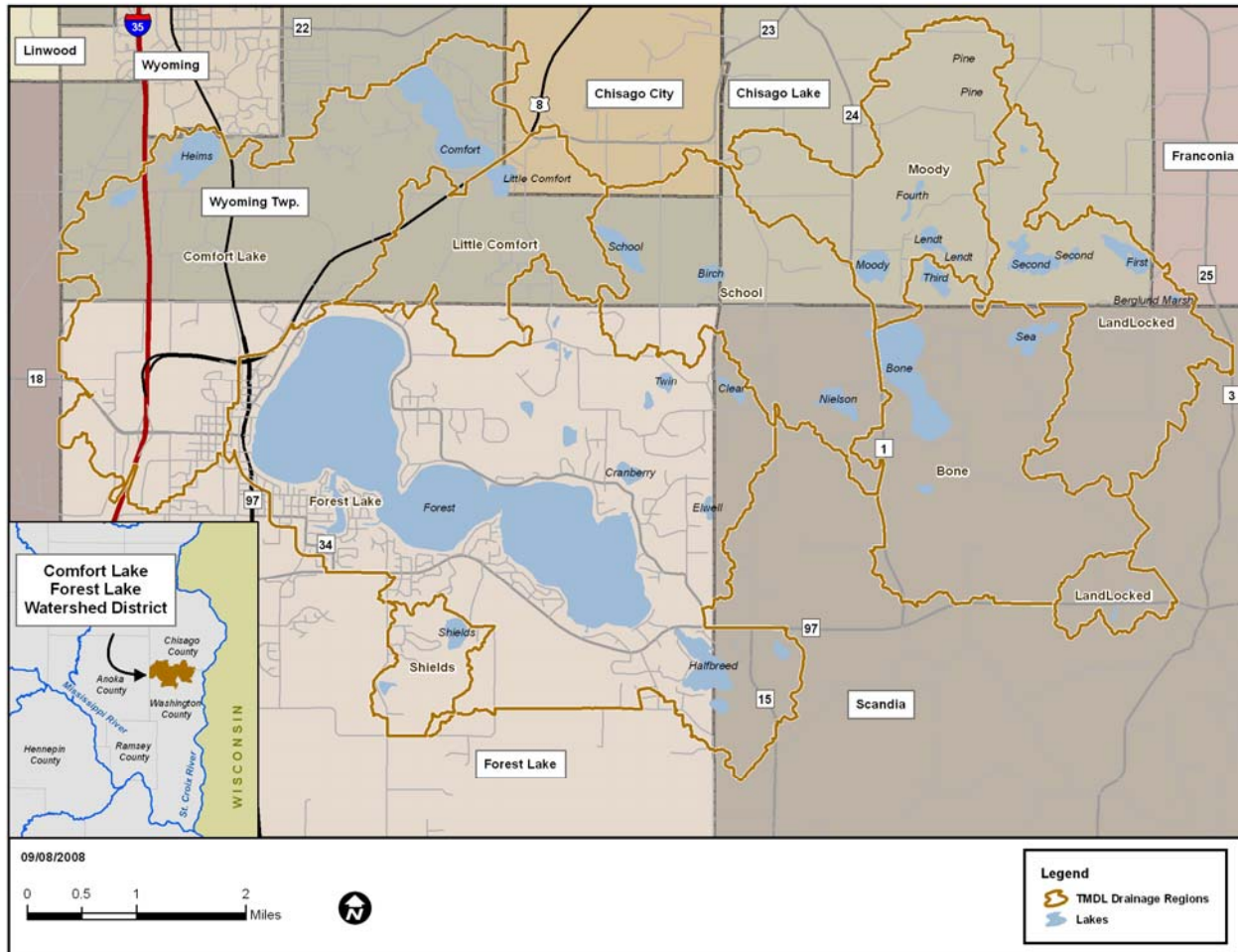
- Site plan review
 - CLFLWD permit program
 - Municipal ordinances and site review programs
- Education
 - Planting for Clean Water Program
- BMP Cost-share Program
 - CLFLWD cost-share

Implementation Strategy

	In-Lake Total Phosphorus Concentration Goal	Load Reduction Goal	Total Estimated Load Reduction From Proposed CLFLWD Projects	Additional Load Reduction Required to Meet Goal
Lake	[mg/L]	[lbs TP]	[lbs TP]	[lbs TP]
Moody	0.04	879	460	419
Bone	0.04	560	650	-
School	0.04	476	74	402
Little Comfort	0.04	678	280	398
Shields	0.06	911	660	251
Comfort Lake	0.04	127	370	-

What else should be in the Implementation Strategy?

- Projects?
- Programs?



Next Steps

- Draft TMDL study with implementation plan included - submit to MPCA
- Revise after MPCA/EPA comments, hold public hearing and submit final