

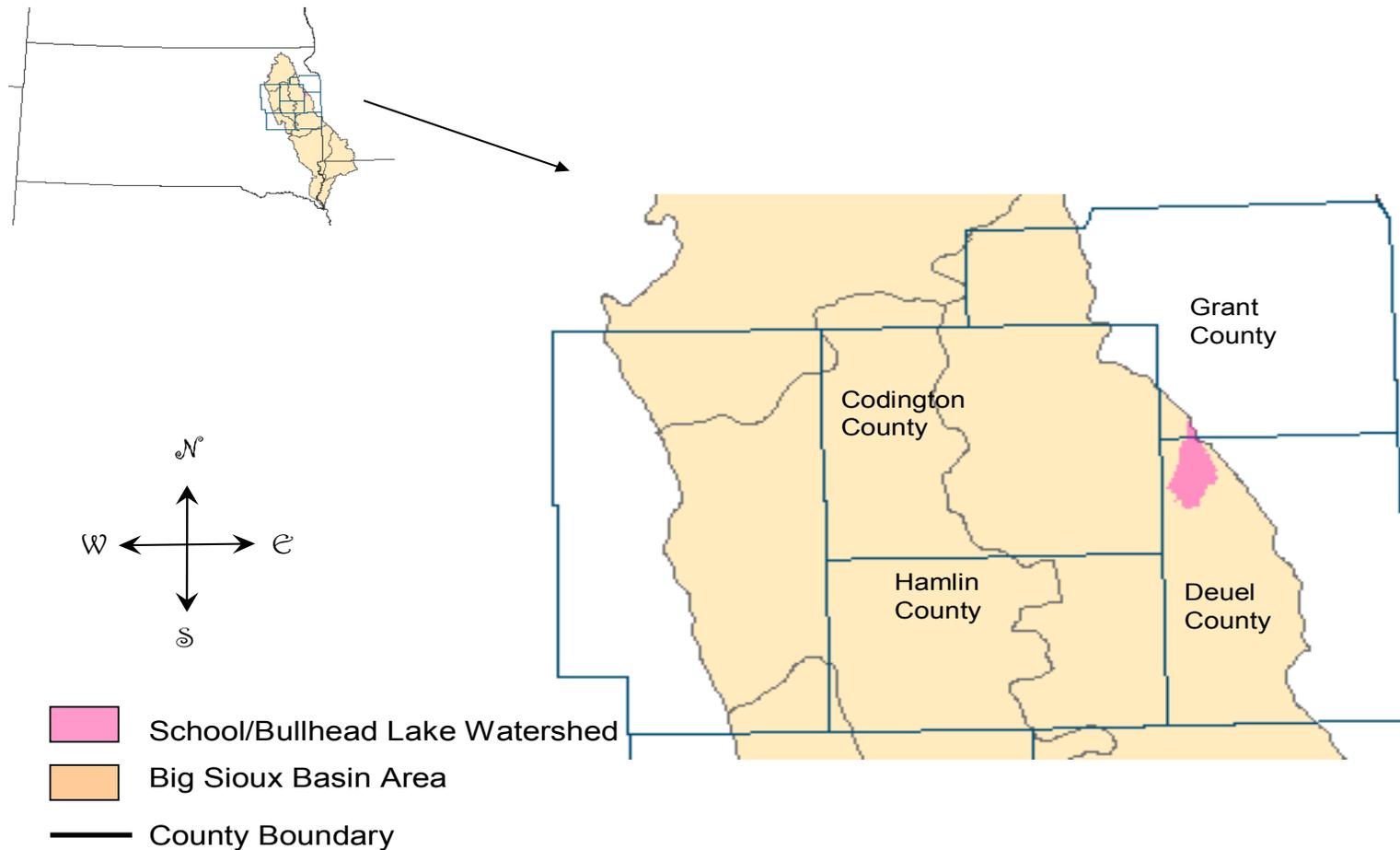
School Lake Watershed Assessment

Project Summary and Results

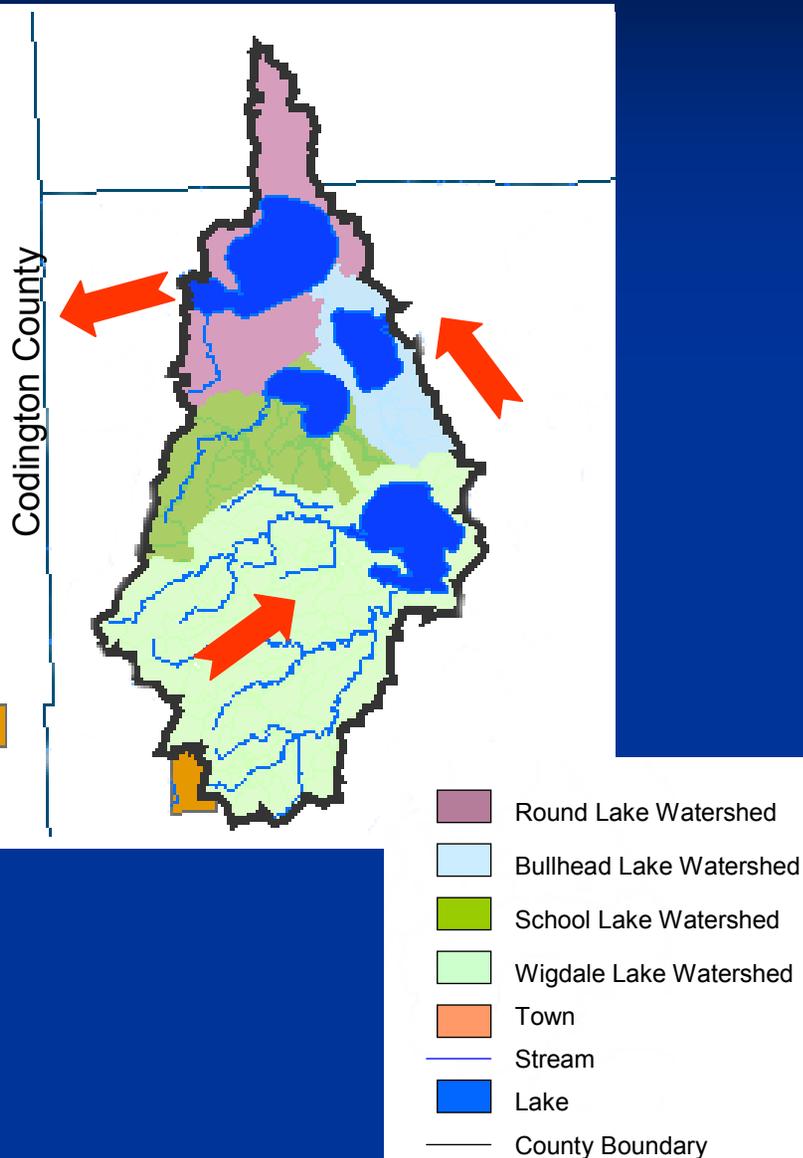
NPS Task Force Meeting

March 2007

Location of the Watershed



Study Area



- Wigdale Lake Watershed: 9,983 acres
- Round Lake Watershed: 4,903 acres
- School Lake Watershed: 3,892 acres
- Bullhead Lake Watershed: 3,374 acres

Assessment was driven by...

- 1998 SD 303(d) listing
 - School Lake and Bullhead Lake impaired
(nutrients, siltation, noxious aquatic plants)
- Subsequent DENR monitoring (ambient lake network) indicated that Bullhead Lake was fully supporting.

What Determines Impairment?

- Not meeting **water quality standards**
 - Based on Concentrations

- Not fully meeting **beneficial uses**
 - Based on criteria agreed upon by EPA and the state (**trophic state index**)

Assigned Beneficial Uses

■ School Lake, Round Lake and Bullhead Lake

(5), (6) Fish Life Propagation

(7) Immersion Recreation

(8) Limited Contact Recreation

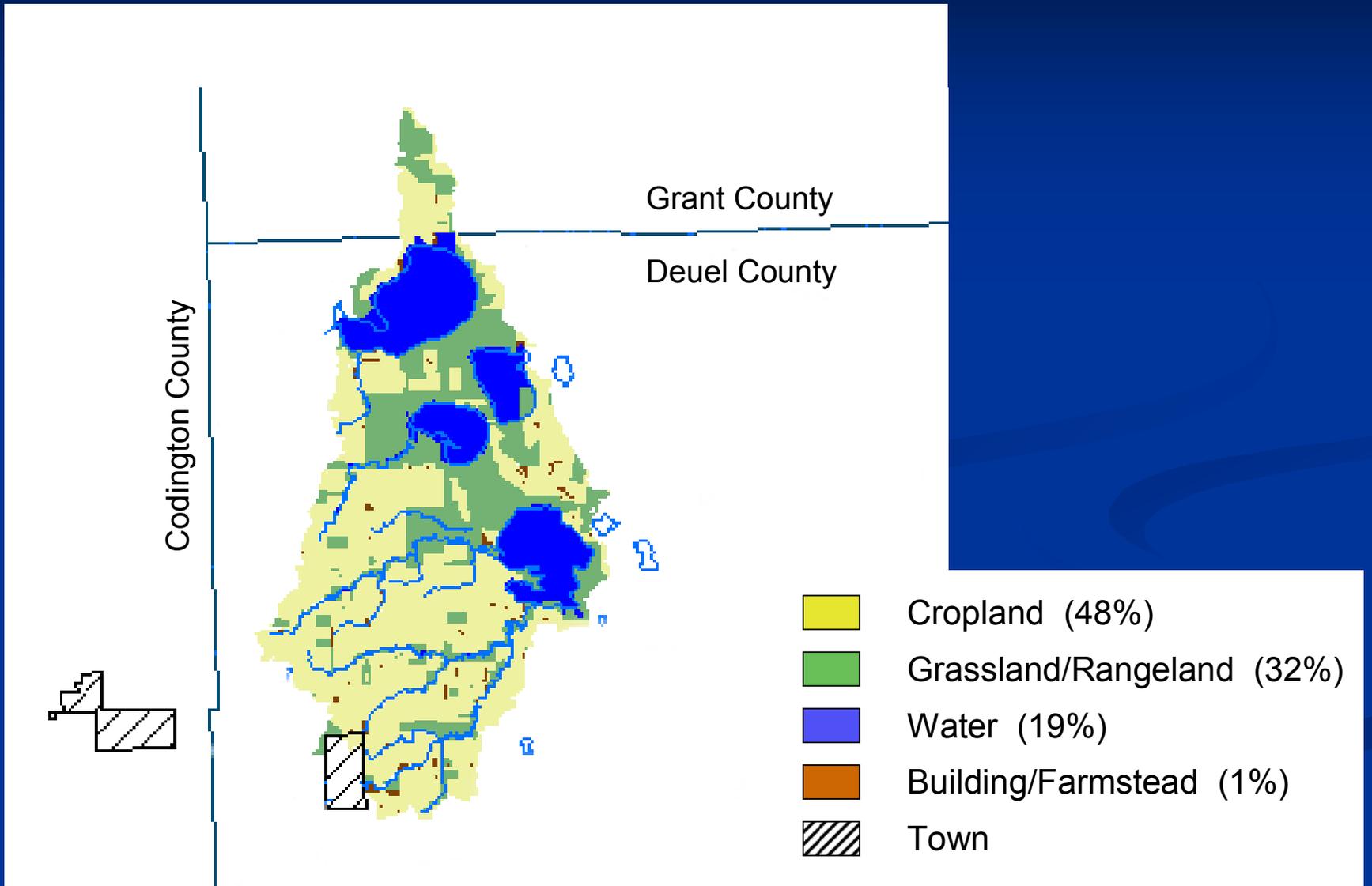
(9) Fish & Wildlife Propagation, Recreation, & Stock Watering

■ Wigdale Lake and Tributaries

(9) Fish & Wildlife Propagation, Recreation, & Stock Watering

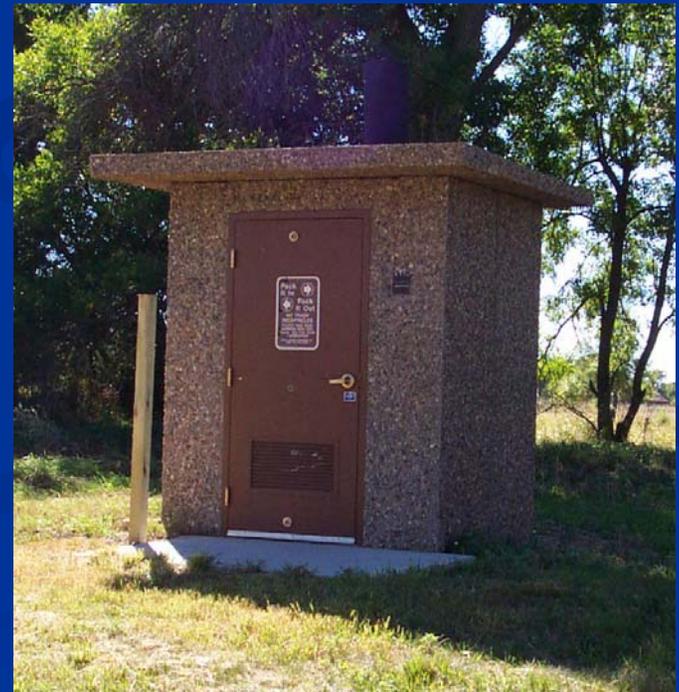
(10) Irrigation

Land Use



Recreational Uses

Lake	Boat Ramp	Public Dock	Shore Fishing	Public Toilets	Swimming
School	X	X	X		X
Bullhead	X	X	X	X	X
Round	X		X	X	X
Wigdale					



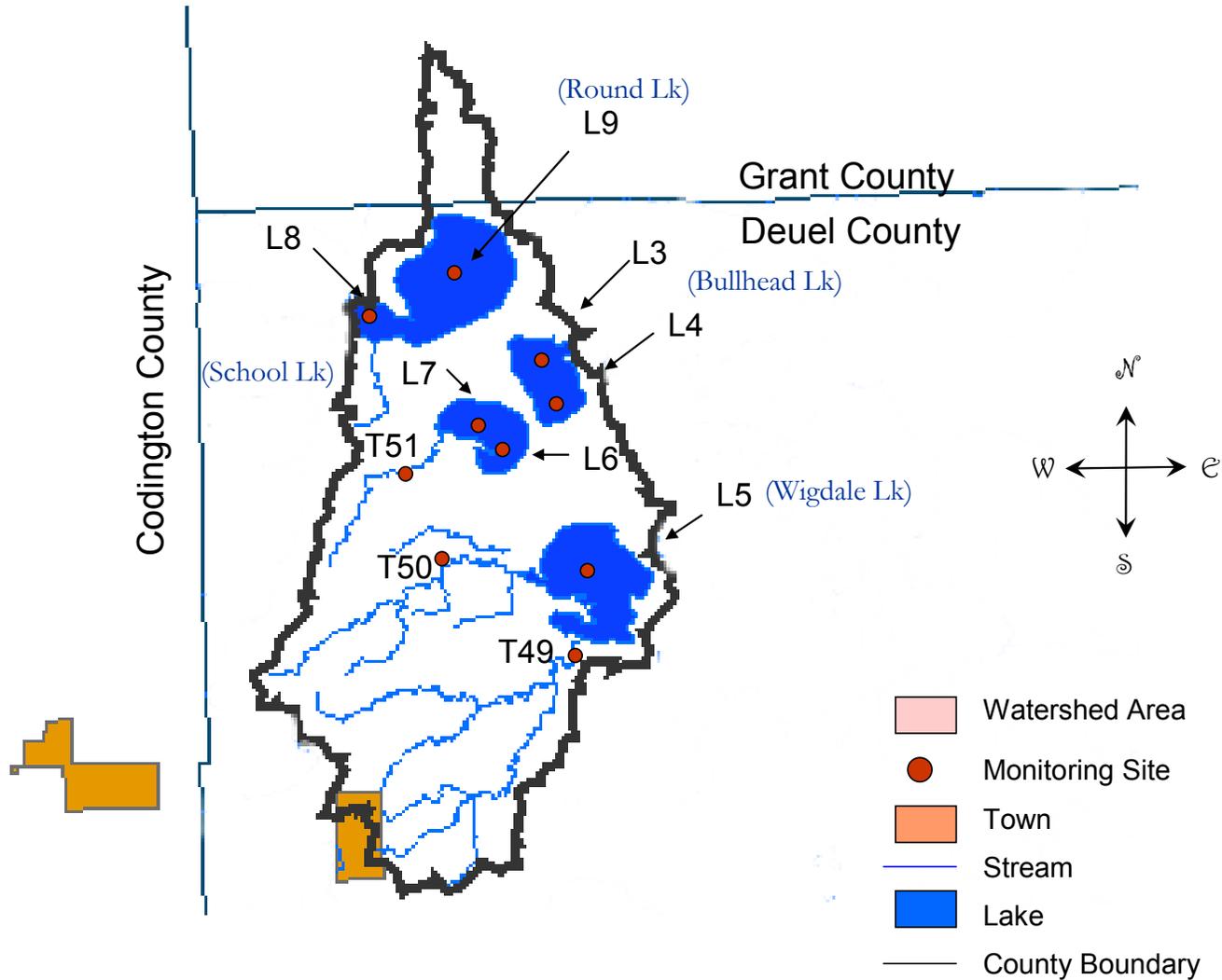
Fish Stocking Efforts

Lake	Year	Species	# stocked
School	2001	Northern Pike Fry	200,000
Round	2001	Northern Pike Fry	500,000
Bullhead	1997	Walleye Fingerlings	68,000

** Perch were stocked in Spring of 2005 in Bullhead Lake



Site Locations



Project Goal

- Goal was to determine :
 - Sources of impairment
 - Recommend management alternatives
 - Develop TMDLs

Project Tasks

- Water Quality Sampling
- Discharge/Flow Measurements
- Biological Sampling
- Land Use Inventory and Modeling
- Information and Outreach
- Assessment and Final Reports

WQ Parameters

TSS

Total Solids

Nitrates

Ammonia-Nitrogen

TKN

Total PO₄

Total Dissolved PO₄

Fecal Coliform

E. Coli

Volatile TSS

Alkalinity

Water Temperature

Air Temperature

Conductivity

Salinity

Turbidity

DO

pH

pH Exceedences

■ Round Lake

Date	Site	Parameter	Standard	Sampled Value
07/15/03	L8	pH	$\geq 6.0 - \leq 9.0$	9.54
07/29/03	L8	pH	$\geq 6.0 - \leq 9.0$	9.01
08/13/03	L8	pH	$\geq 6.0 - \leq 9.0$	9.12
07/15/03	L9	pH	$\geq 6.0 - \leq 9.0$	9.19

■ Bullhead Lake

Date	Site	Parameter	Standard	Sampled Value
04/22/03	L3	pH	$\geq 6.5 - \leq 9.0$	9.02
07/15/03	L3	pH	$\geq 6.5 - \leq 9.0$	9.61
07/29/03	L3	pH	$\geq 6.5 - \leq 9.0$	9.07
07/15/03	L4	pH	$\geq 6.5 - \leq 9.0$	9.66

pH Exceedences

■ School Lake

Date	Site	Parameter	Standard	Sampled Value
07/15/03	L6	pH	$\geq 6.0 - \leq 9.0$	9.10
07/30/03	L6	pH	$\geq 6.0 - \leq 9.0$	9.10
09/23/03	L6	pH	$\geq 6.0 - \leq 9.0$	9.04
07/15/03	L7	pH	$\geq 6.0 - \leq 9.0$	9.06
07/30/03	L7	pH	$\geq 6.0 - \leq 9.0$	9.01
08/12/03	L7	pH	$\geq 6.0 - \leq 9.0$	9.10
09/23/03	L7	pH	$\geq 6.0 - \leq 9.0$	9.06



Wigdale Lake

■ Tributary vs Lake Water Quality

Parameter	Wigdale Lake Tributaries		Wigdale Lake	
	Spring April-May 2003 mg/L	Summer June-August 2003 mg/L	Spring April-May 2003 mg/L	Summer June-August 2003 mg/L
Alk-M	305	166	205.5	151.4
TSS	17	7	61	71.2
TotSol	639	634	389	371.2
TDS	622	627	328	300
Nitrates	<0.1	0.25	<0.1	<0.1
Ammonia	0.08	0.4	<0.02	0.004
TKN	1.1	2.6	2.5	4.38
TPO4	0.15	0.63	0.227	0.257
TDPO4	0.12	0.51	0.057	0.005
	counts/100mL	counts/100mL	counts/100mL	counts/100mL
Fecal Coliform	15	3300	<10	2
E. Coli	3	2420	1.45	1.42

Trophic State Index

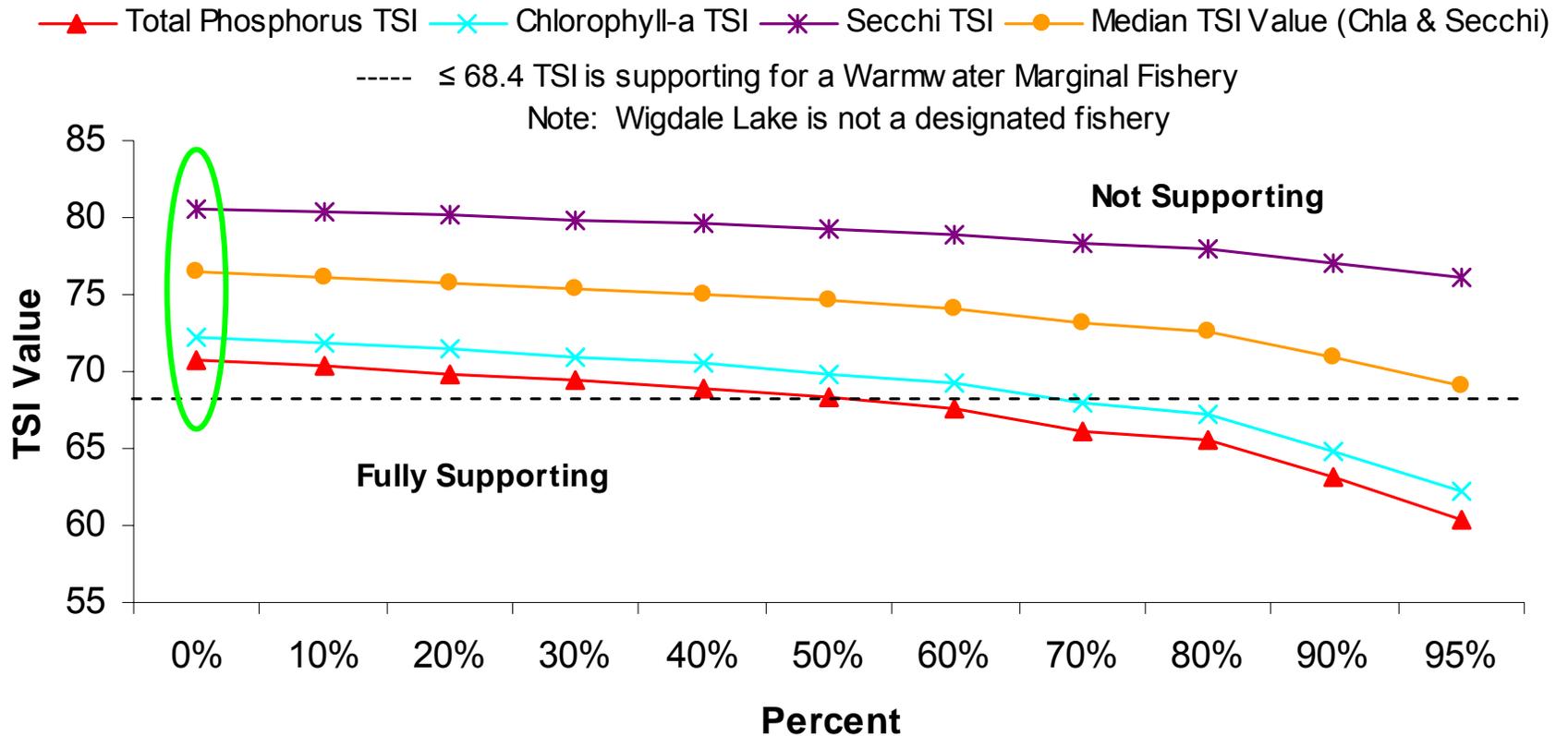
- Quantifies the trophic condition of a lake
- Values range from 0 to 100
- 2006 DENR guidelines
 - Based on fishery classification of the lake
 - Uses median of chlorophyll-a & Secchi depth

Lake & fishery class	Supporting TSI
Bullhead Lake (warmwater semi-permanent fishery)	≤ 63.4 TSI
School Lake (warmwater marginal fishery)	≤ 68.4 TSI
Round Lake (warmwater marginal fishery)	≤ 68.4 TSI
Wigdale Lake (no beneficial use for fishery)	n/a

Wigdale Lake

Predicted TSI (median of chl_a & Secchi) = 76.5

Wigdale Lake TSI Reductions based on BATHTUB Tributary Nutrient Reductions

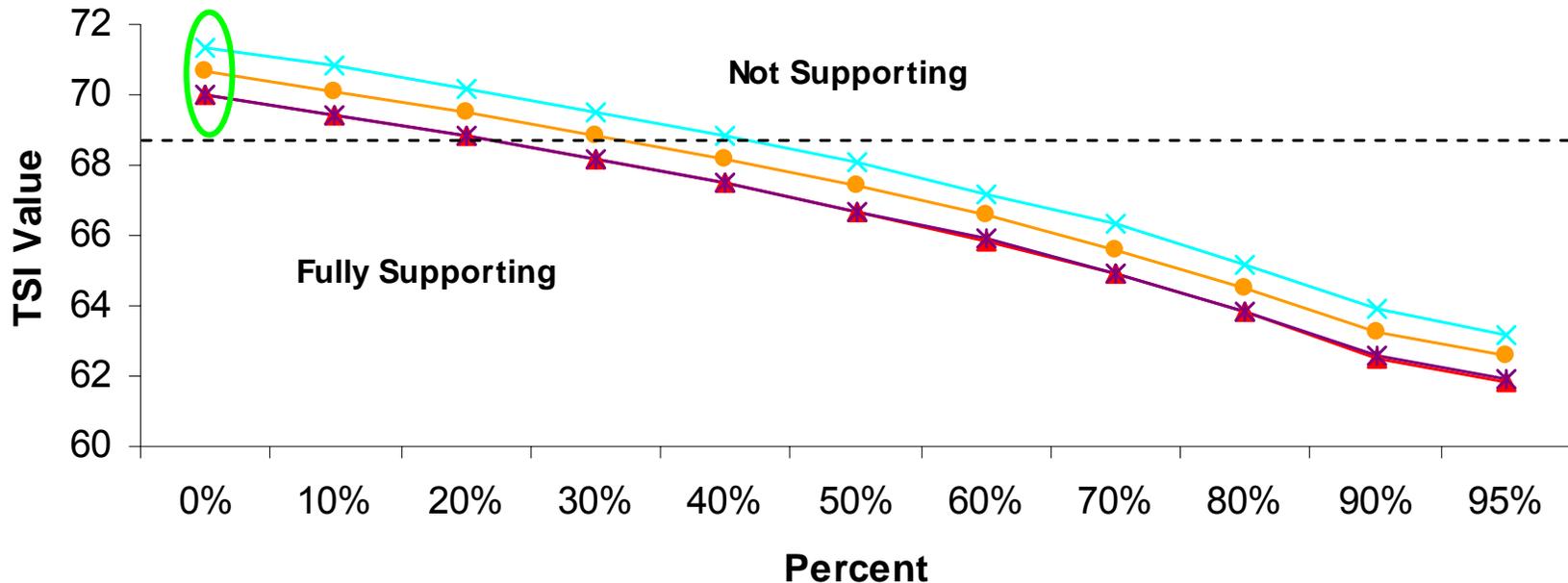


School Lake

Predicted TSI (median of chla & Secchi) = 70.7

School Lake TSI Reductions based on BATHTUB Tributary Nutrient Reductions

▲ Total Phosphorus TSI ✕ Chlorophyll-a TSI * Secchi TSI ● Median TSI Value (Chla & Secchi)
----- ≤ 68.4 TSI is supporting for a Warmwater Marginal Fishery

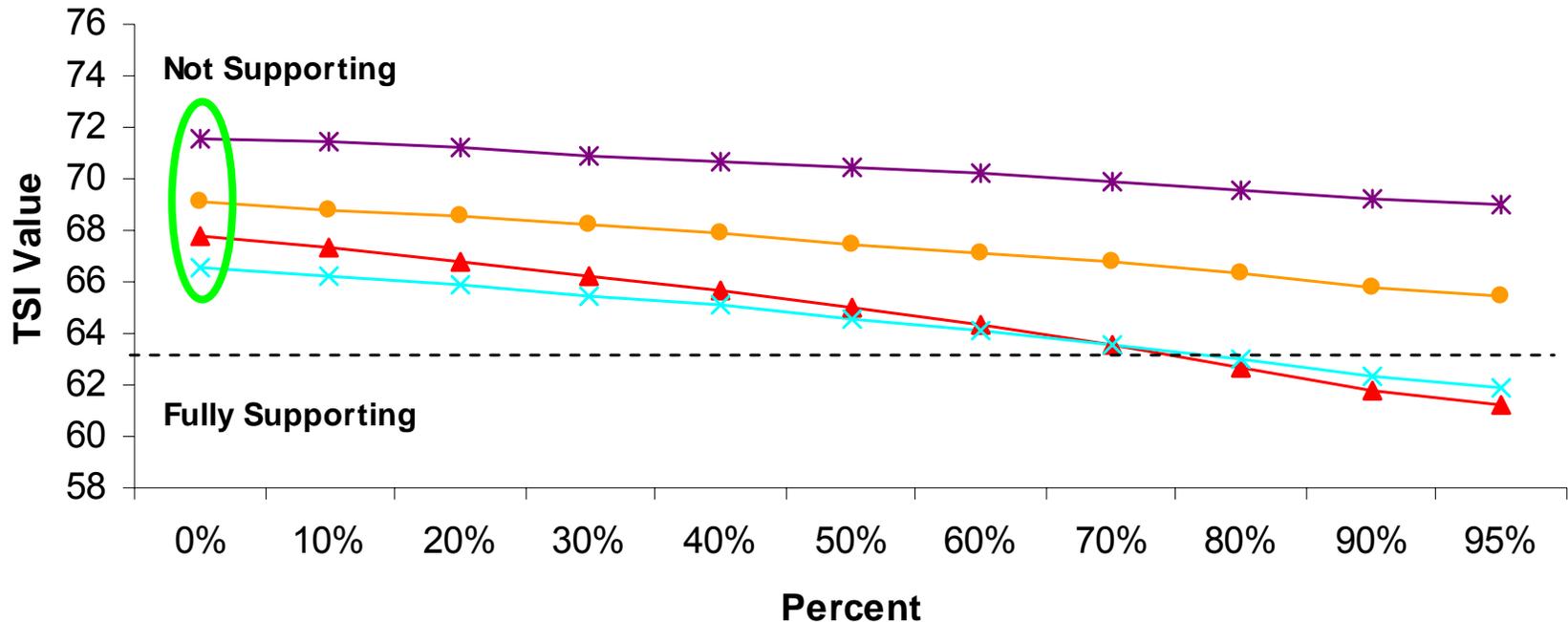


Bullhead Lake

Predicted TSI (median of chla & Secchi) = 69.1

Bullhead Lake TSI Reductions based on BATHTUB Tributary Nutrient Reductions

▲ Total Phosphorus TSI ✕ Chlorophyll-a TSI * Secchi TSI ● Median TSI Value (Chla & Secchi)
----- ≤ 63.4 TSI is supporting for a Warmwater Semi-permanent Fishery

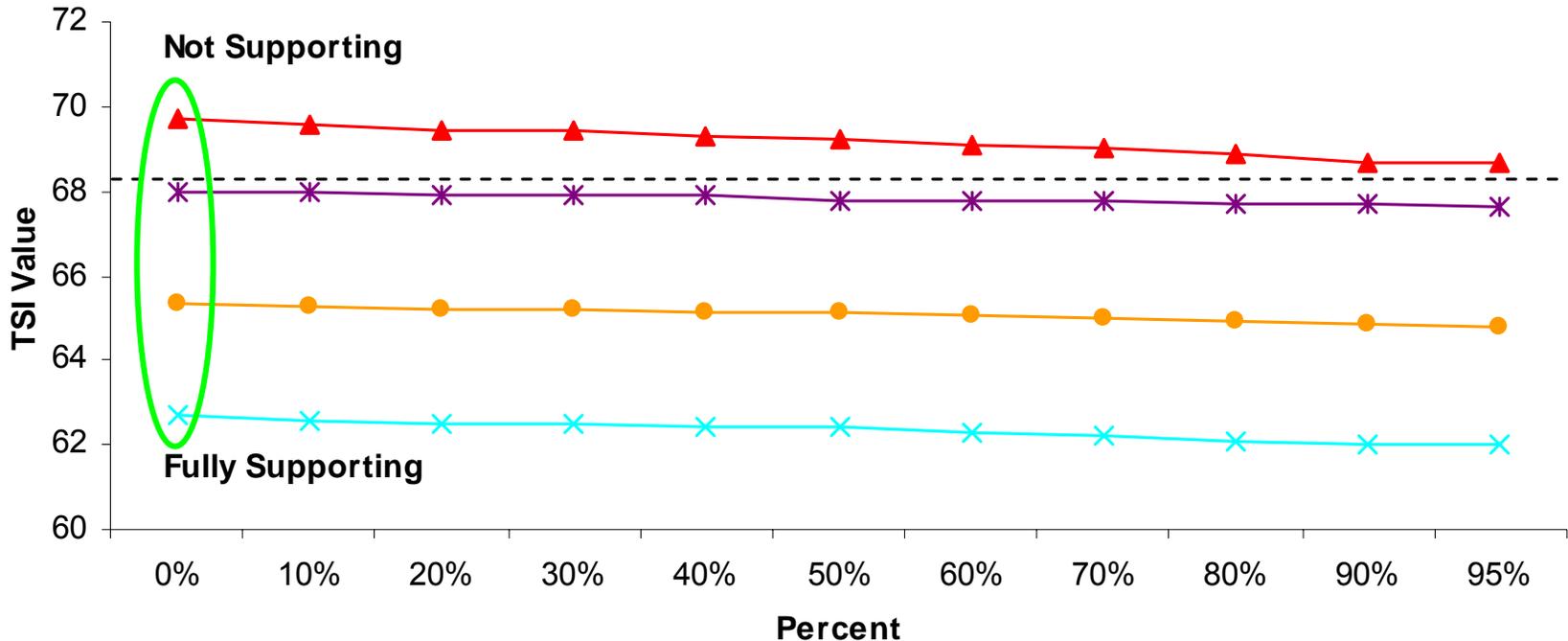


Round Lake

Predicted TSI (median of chl_a & Secchi) = 65.4

Round Lake TSI Reductions based on BATHTUB Tributary Nutrient Reductions

—▲— Total Phosphorus TSI —×— Chlorophyll-a TSI —*— Secchi TSI —●— Median TSI Value (Chl_a & Secchi)
----- ≤ 68.4 TSI is supporting for a Warmwater Marginal Fishery



Reductions

- **Bullhead Lake**

- 24% reduction in TSI (to Marginal)
- 20% reduction in pH violations

- **School Lake**

- 37% reduction in TSI
- 35% reduction in pH violations

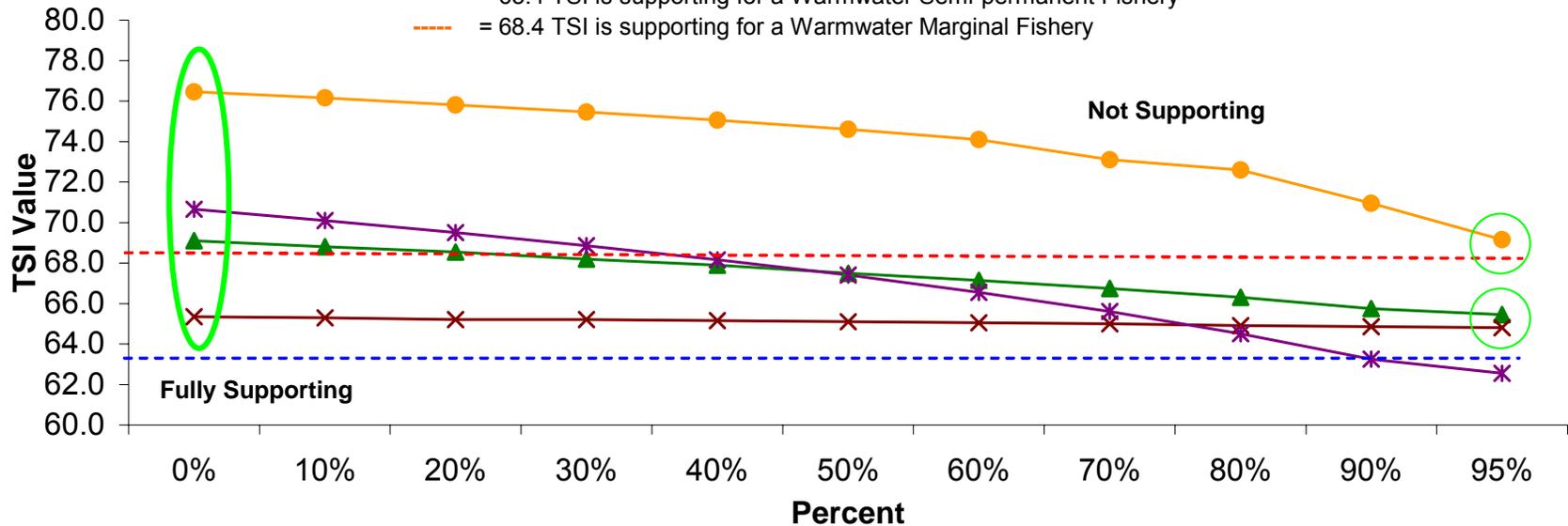
- **Round Lake**

- 20% reduction in pH violations

TSI Reductions based on BATHTUB Tributary Nutrient Reductions

▲ Bullhead Lake × Round Lake * School Lake ● Wigdale Lake

--- = 63.4 TSI is supporting for a Warmwater Semi-permanent Fishery
--- = 68.4 TSI is supporting for a Warmwater Marginal Fishery



Stream Flow Monitoring



ISCO GLS Samplers & ISCO 4230 Bubble Flow Meters

Lake Level Monitoring

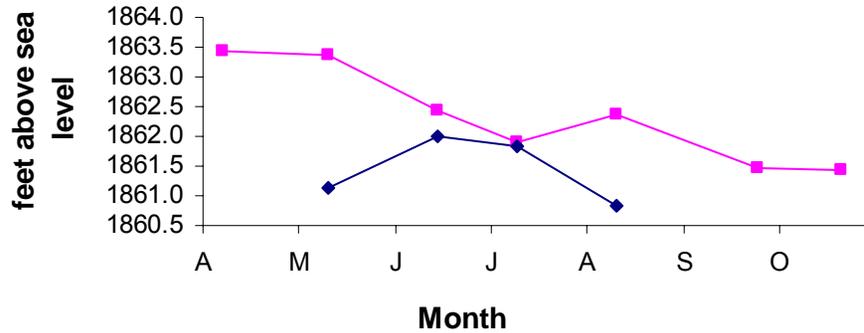
Pre-established benchmarks
used to record lake levels



Benchmark Results

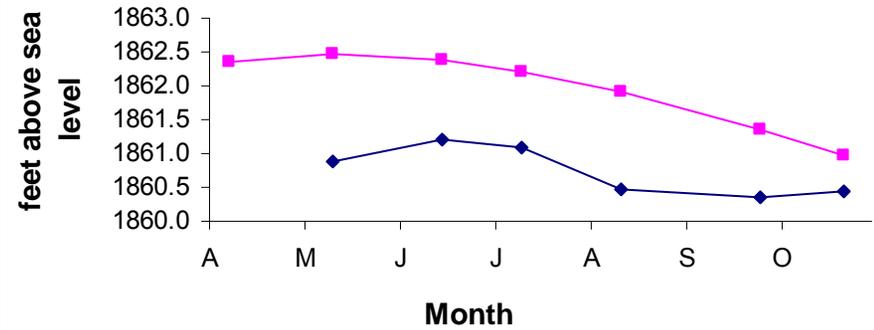
Wigdale Lake - Benchmarks

2003 2004



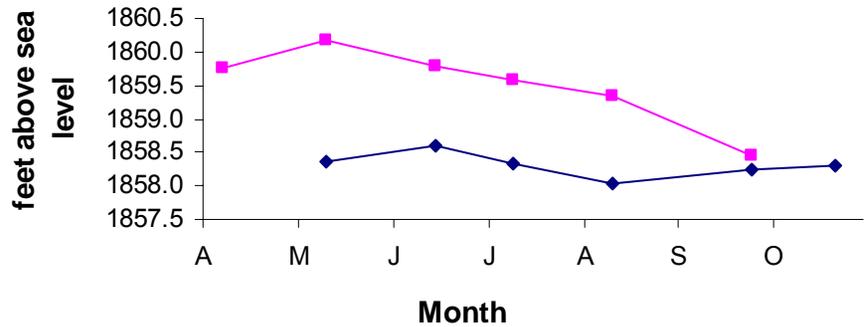
School Lake - Benchmarks

2003 2004



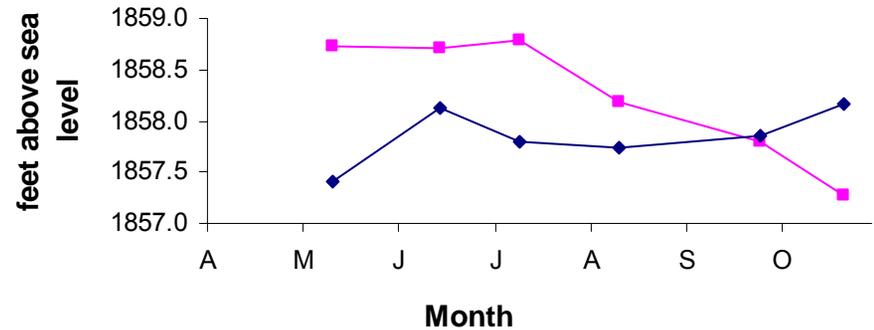
Bullhead Lake - Benchmarks

2003 2004



Round Lake - Benchmarks

2003 2004



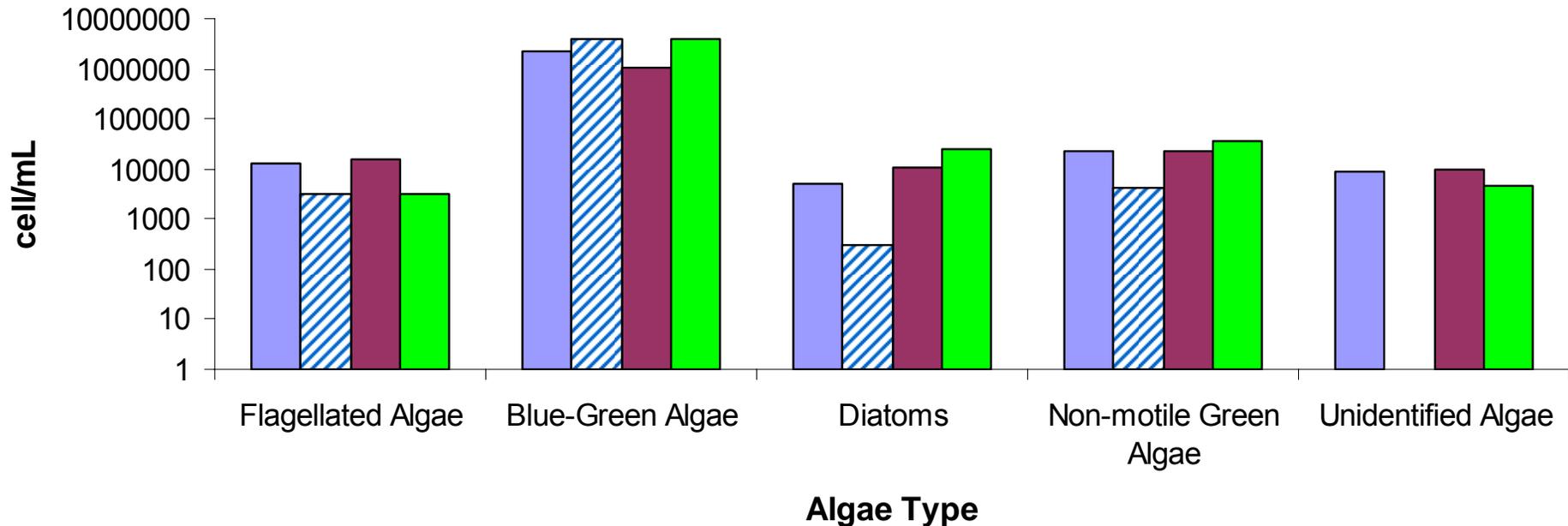
Biological Sampling

- Algae Sampling
 - June and August 2003
- Chlorophyll-a Sampling
 - April, May, and September - once a month
 - June, July, and August - twice a month
- Aquatic Plant Sampling
 - School Lake

Biological Sampling Results: Algae

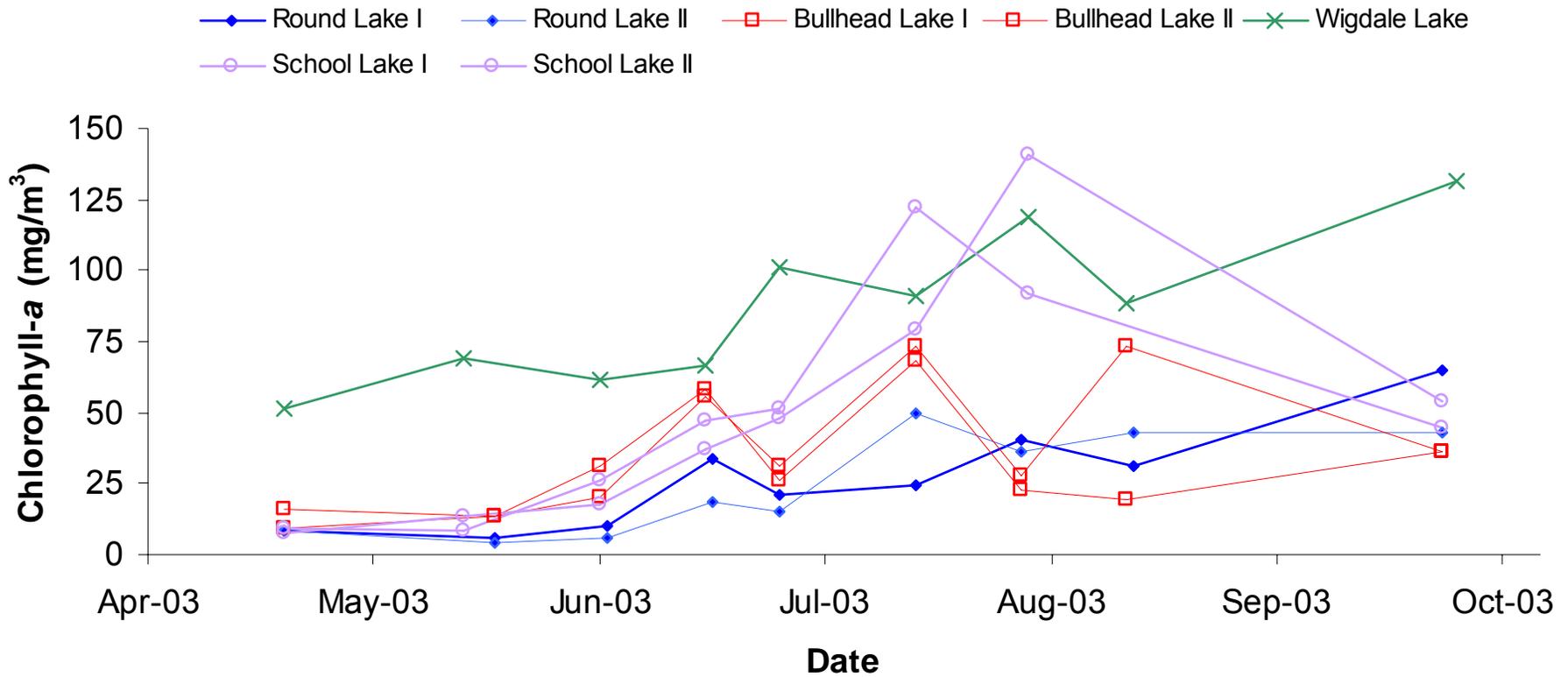
Lake Comparison - Algae (June 2003)

■ School-6/17 ■ Round-6/18 ■ Bullhead-6/17 ■ Wigdale-6/17



Biological Sampling Results: Chlorophyll-*a*

Chlorophyll-*a* Concentrations



Aquatic Vegetation Sampling

School Lake Aquatic Macrophytes			
Common Name	Genus	Species	Habitat
Sago Pondweed	<i>Potamogeton</i>	<i>pectinatus</i>	Submergent
Claspingleaf Pondweed	<i>Potamogeton</i>	<i>richardsonii</i>	Submergent
Northern Milfoil	<i>Myriophyllum</i>	<i>exalbescens</i>	Submergent
Prairie Bulrush	<i>Scirpus</i>	<i>maritimus</i>	Emergent
Bulrushes	<i>Scirpus</i>	<i>spp.</i>	Emergent
Cattails	<i>Typha</i>	<i>spp.</i>	Emergent

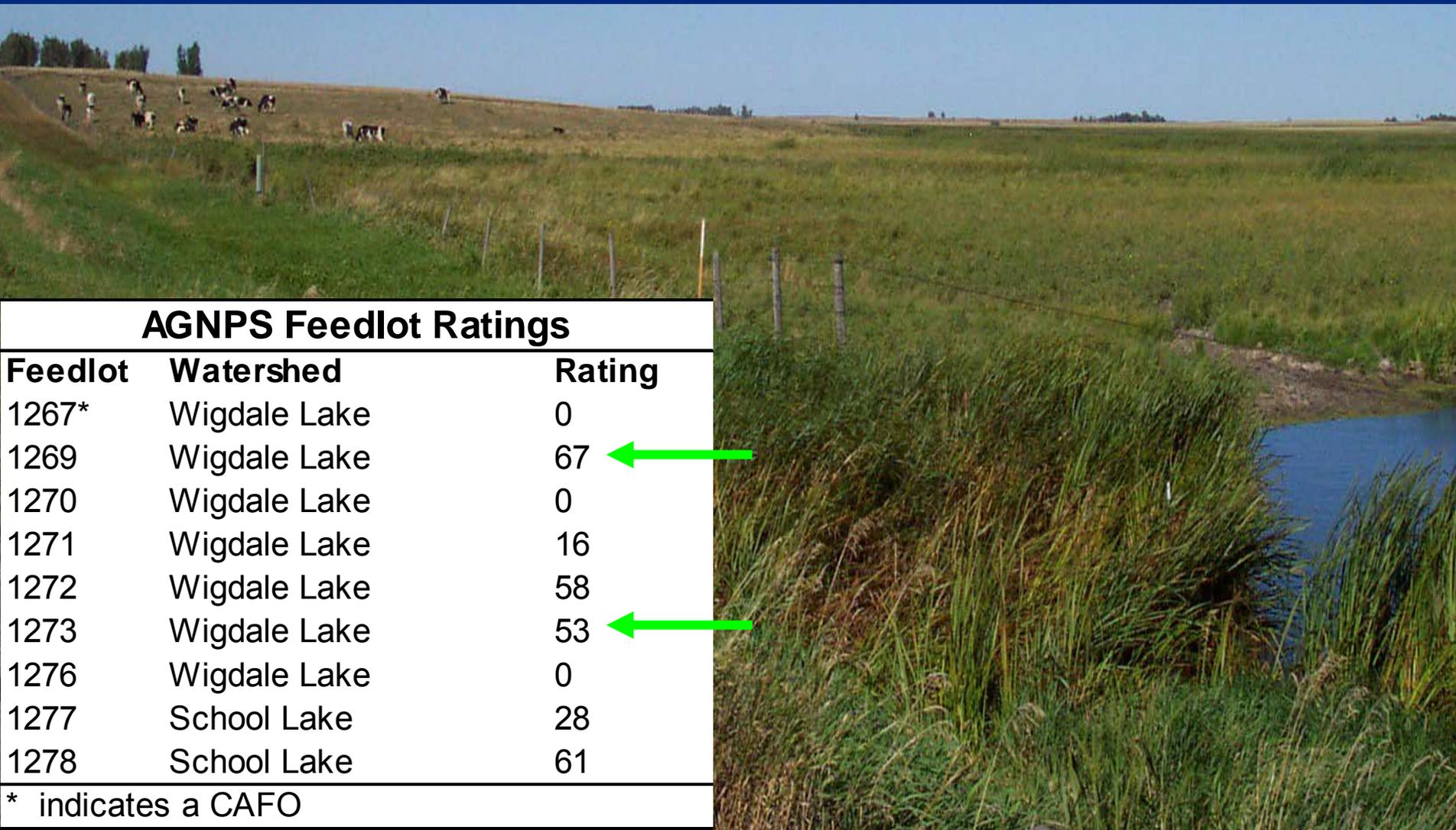


Information & Outreach

- Direct contact with landowner during feedlot assessment
- Monthly Public Board Meeting Updates
- Presentations
- Mass Mailing - Landuse Survey
- Contact with Deuel County Conservation District

Recommendations

External Management-Agricultural

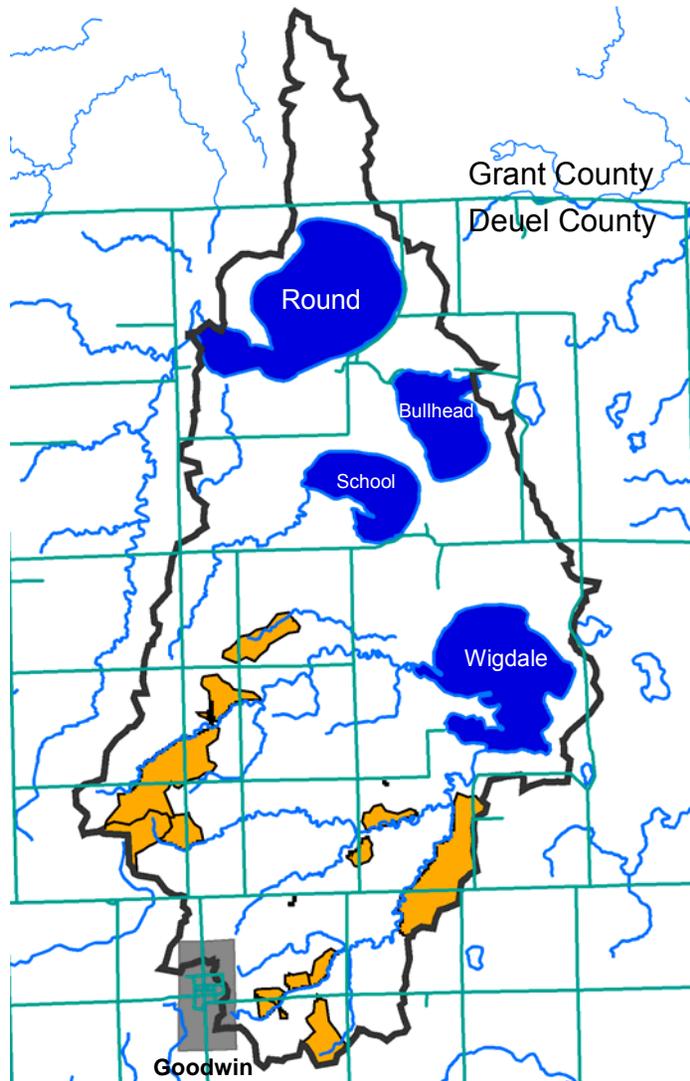


AGNPS Feedlot Ratings

Feedlot	Watershed	Rating
1267*	Wigdale Lake	0
1269	Wigdale Lake	67
1270	Wigdale Lake	0
1271	Wigdale Lake	16
1272	Wigdale Lake	58
1273	Wigdale Lake	53
1276	Wigdale Lake	0
1277	School Lake	28
1278	School Lake	61

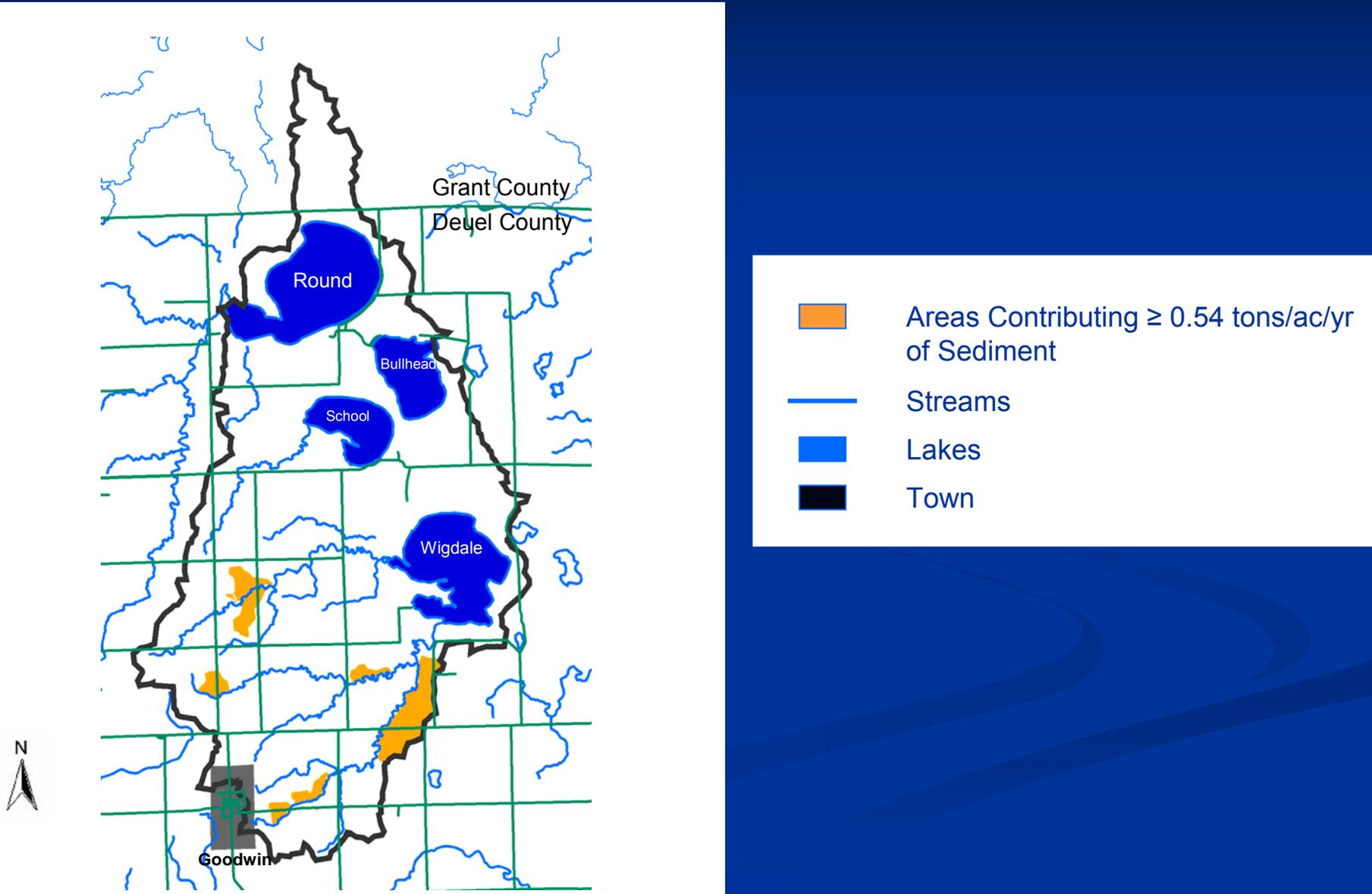
* indicates a CAFO

External Management Phosphorus Loadings - AnnAGNPS



- Areas Contributing ≥ 1.52 lbs/ac/yr of Phosphorus
- Streams
- Lakes
- Town

External Management Sediment Loadings - AnnAGNPS



Management Recommendations

- Aquatic Plant Survey – Bullhead Lake
- Removal of carp biomass
- Agricultural animals excluded from accessing the lakes

**(7.1 miles of
exclusionary
fencing)**



Management Recommendations

- Vegetated buffers (200+ acres to grass)
- Septic System Survey (2006 informal)
- Barley Straw
- Aerator in Bullhead Lake



Assessment and TMDL Reports

- 1st draft of report sent to DENR Aug 2005
- 2nd draft & TMDLs sent to DENR Sept 2005
 - School Lake, Round Lake, Bullhead Lake
- Final drafts sent to DENR Nov 2005
- Report & TMDLs to EPA for review Jan 2006
- TMDLs & Report Public Noticed Oct 2006
- Responses to PN comments and report revisions sent to DENR Jan 2007

Project Costs

TOTAL BUDGET:	\$106,010 (projected)
TOTAL EPA GRANT:	\$81,980
TOTAL EXPENDITURES OF EPA FUNDS:	\$50,113.35 (through 6/30/05)
TOTAL SECTION 319 MATCH ACCRUED:	\$18,758.73 (through 6/30/05)
BUDGET REVISIONS:	None
TOTAL EXPENDITURES:	\$68,872.08 (through 6/30/05)

Questions ?

