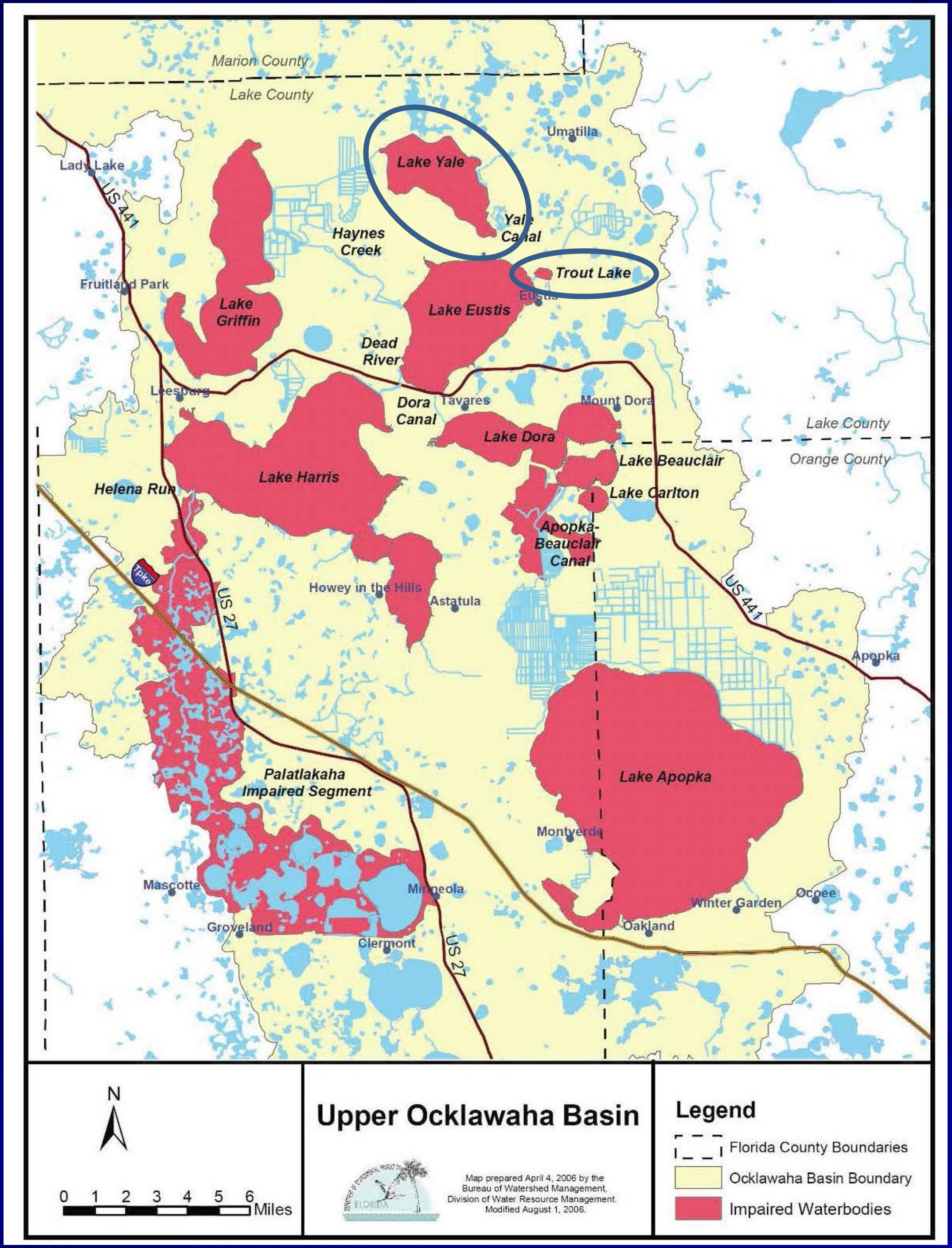
Lake County Water Authority Project Updates

Ron Hart
Lake County Water Authority
Water Resources Director

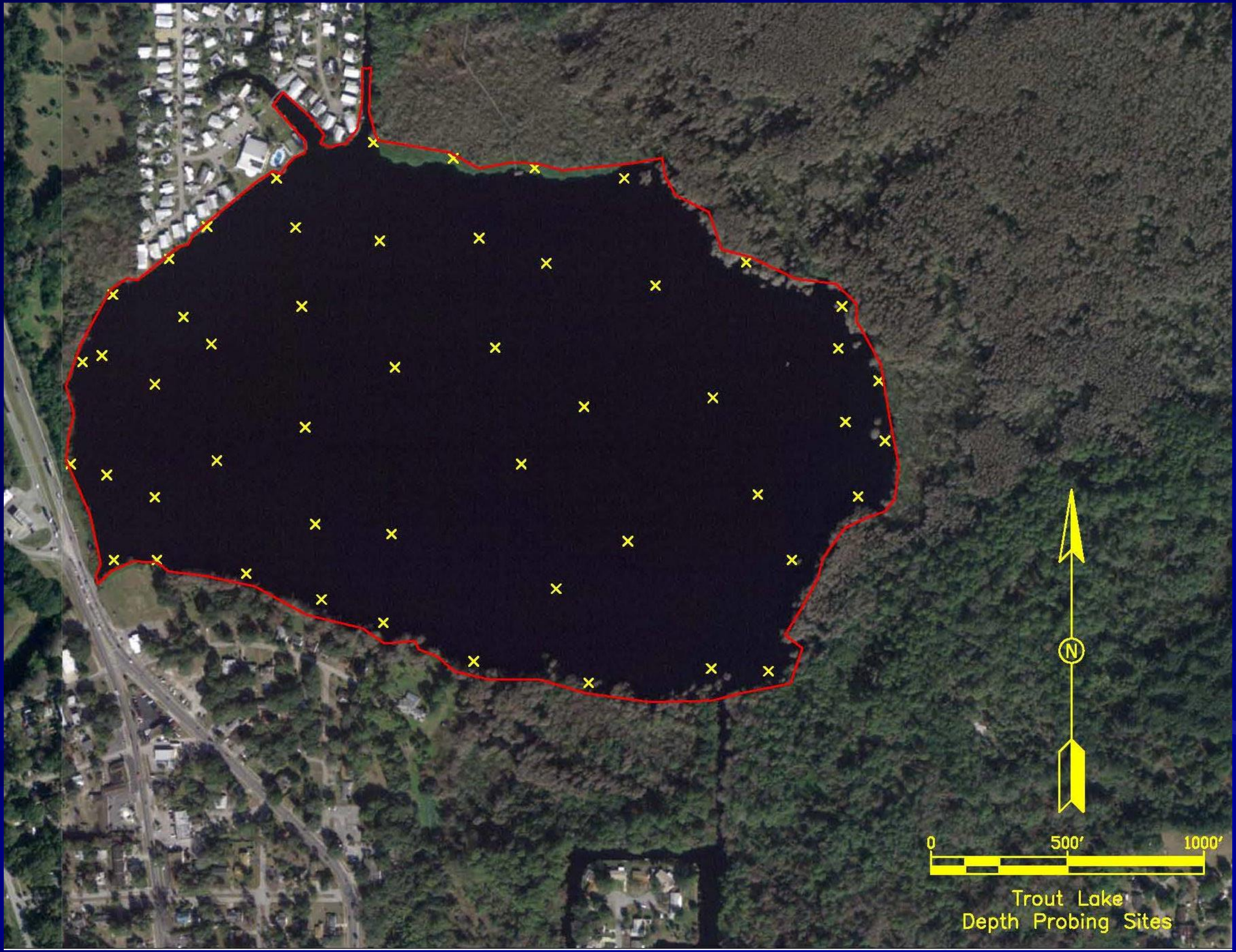


Upper Ocklawaha Chain-of-Lakes

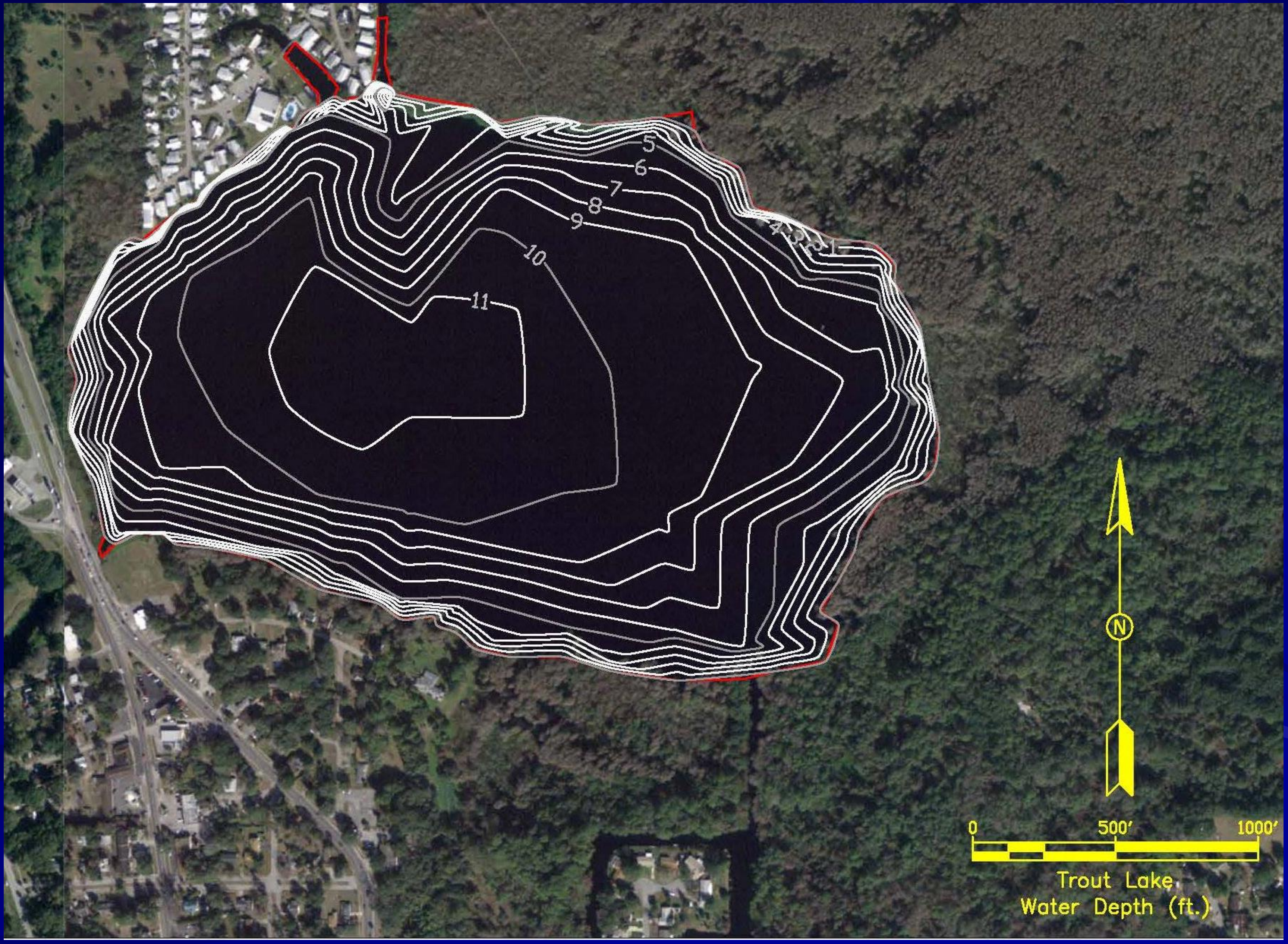
Overview of Trout Lake

Overview of Lake Yale

Probing Locations for Water and Muck Depths in Trout Lake



Water Depth Contours for Trout Lake

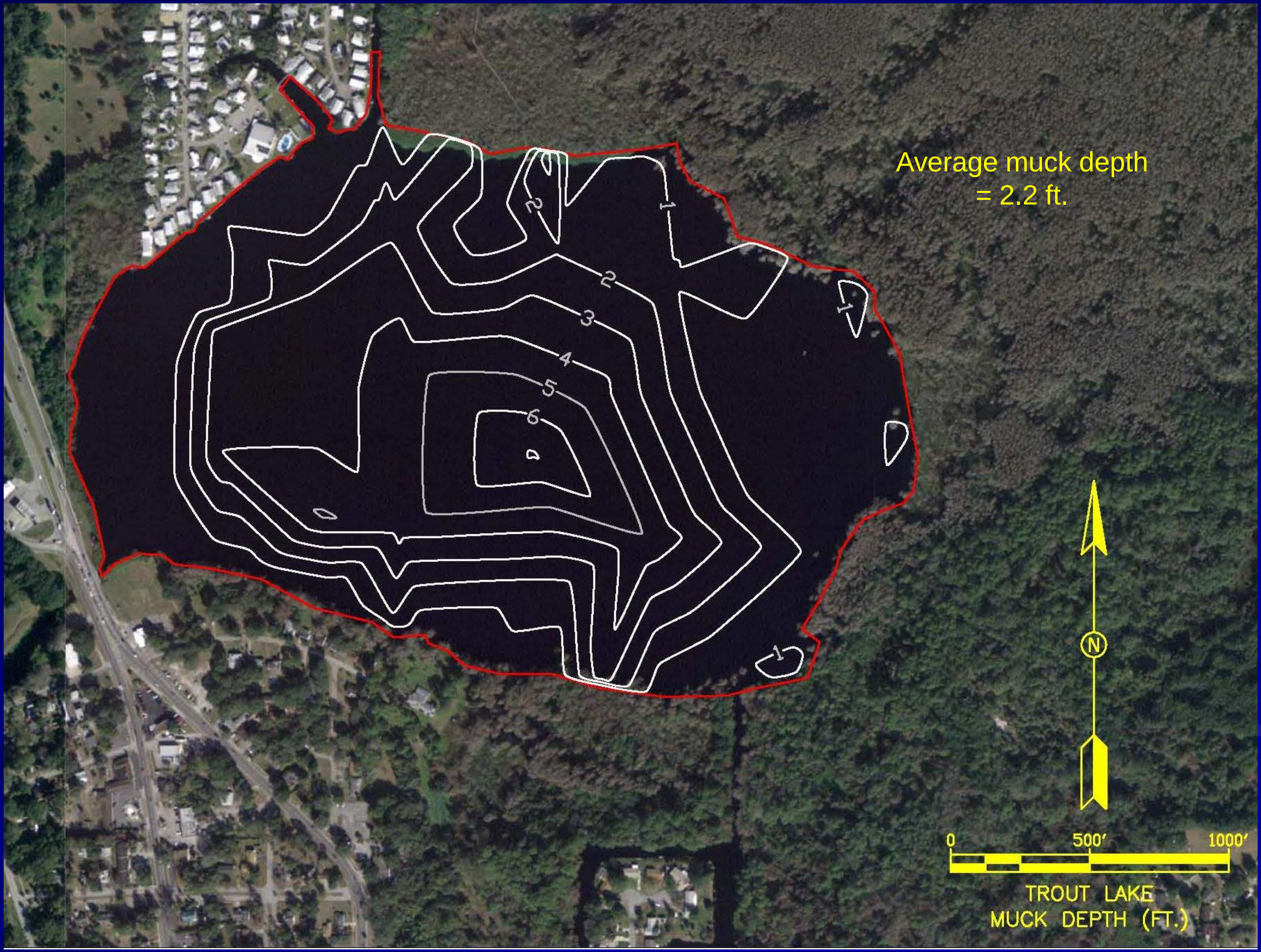


Bathymetric Characteristics of Trout Lake

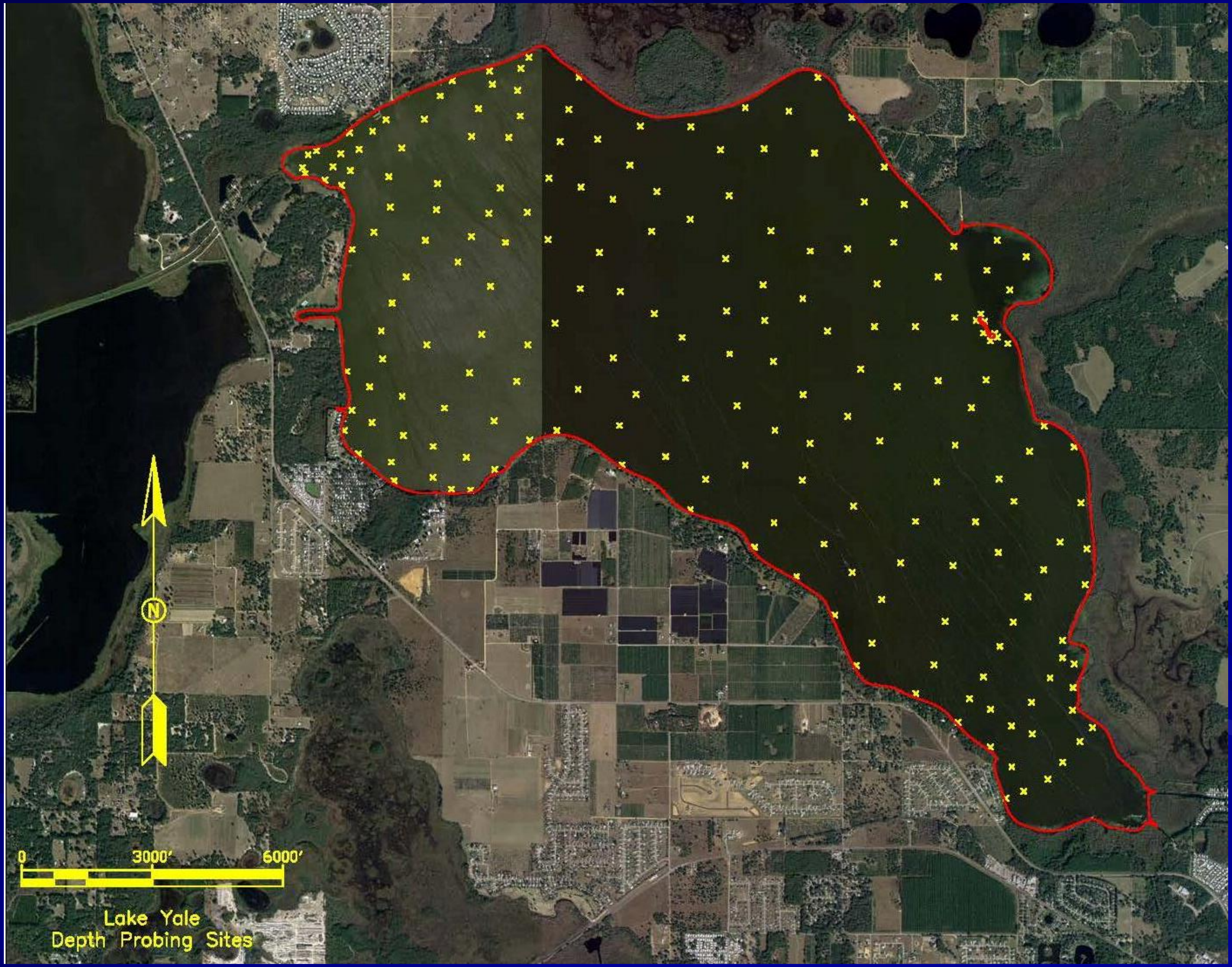
Bathymetric Parameter[1]	Units	Value
Surface Area	acres	106
Total Volume	ac-ft	806
Mean Depth	ft	7.6
Maximum Depth	ft	> 11
Shoreline Length	ft miles	9,650 1.83

1. Based upon a water surface elevation of 62.23 ft

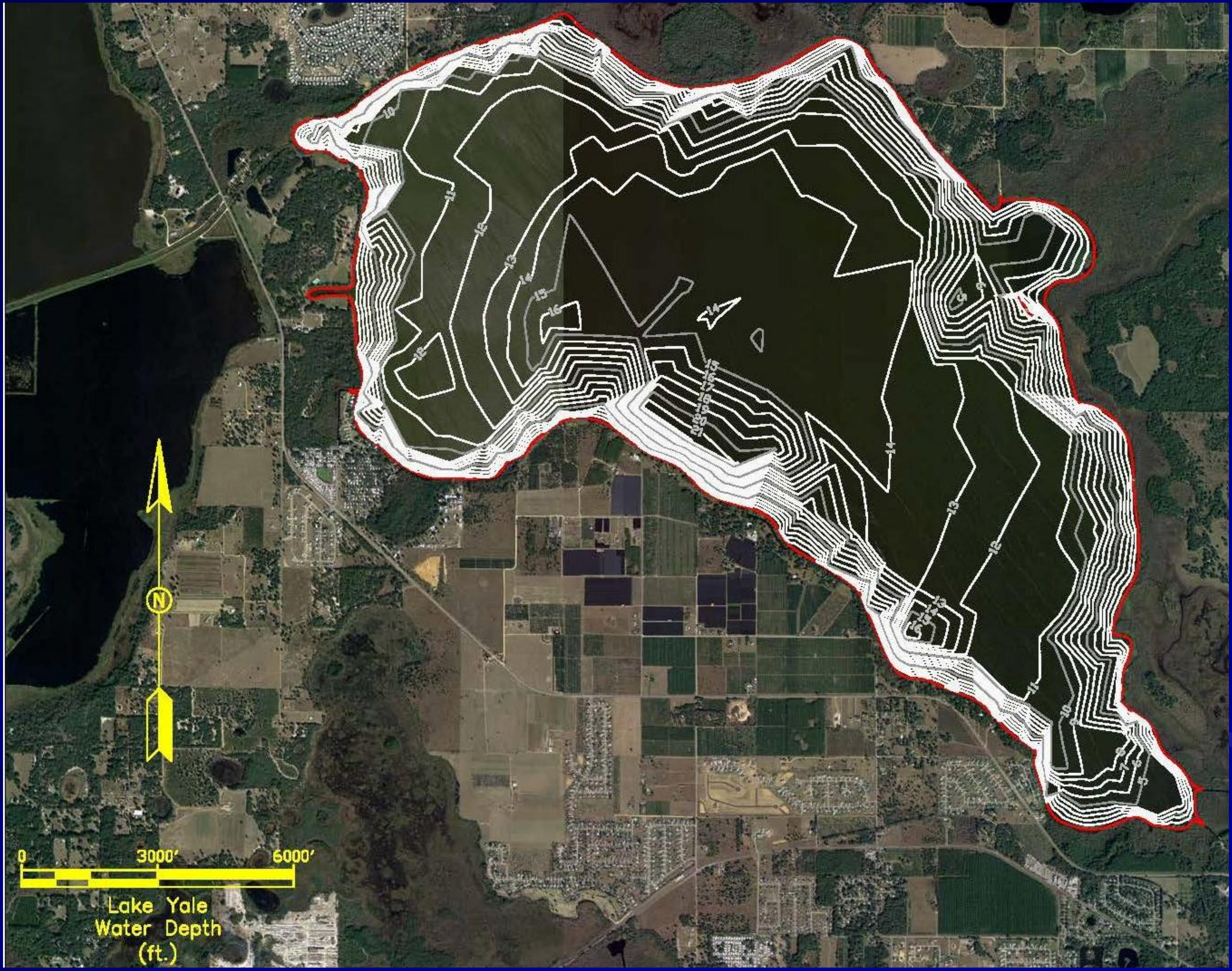
Muck Depth Contours for Trout Lake



Probing Locations for Water and Muck Depths in Lake Yale



Water Depth Contours for Lake Yale

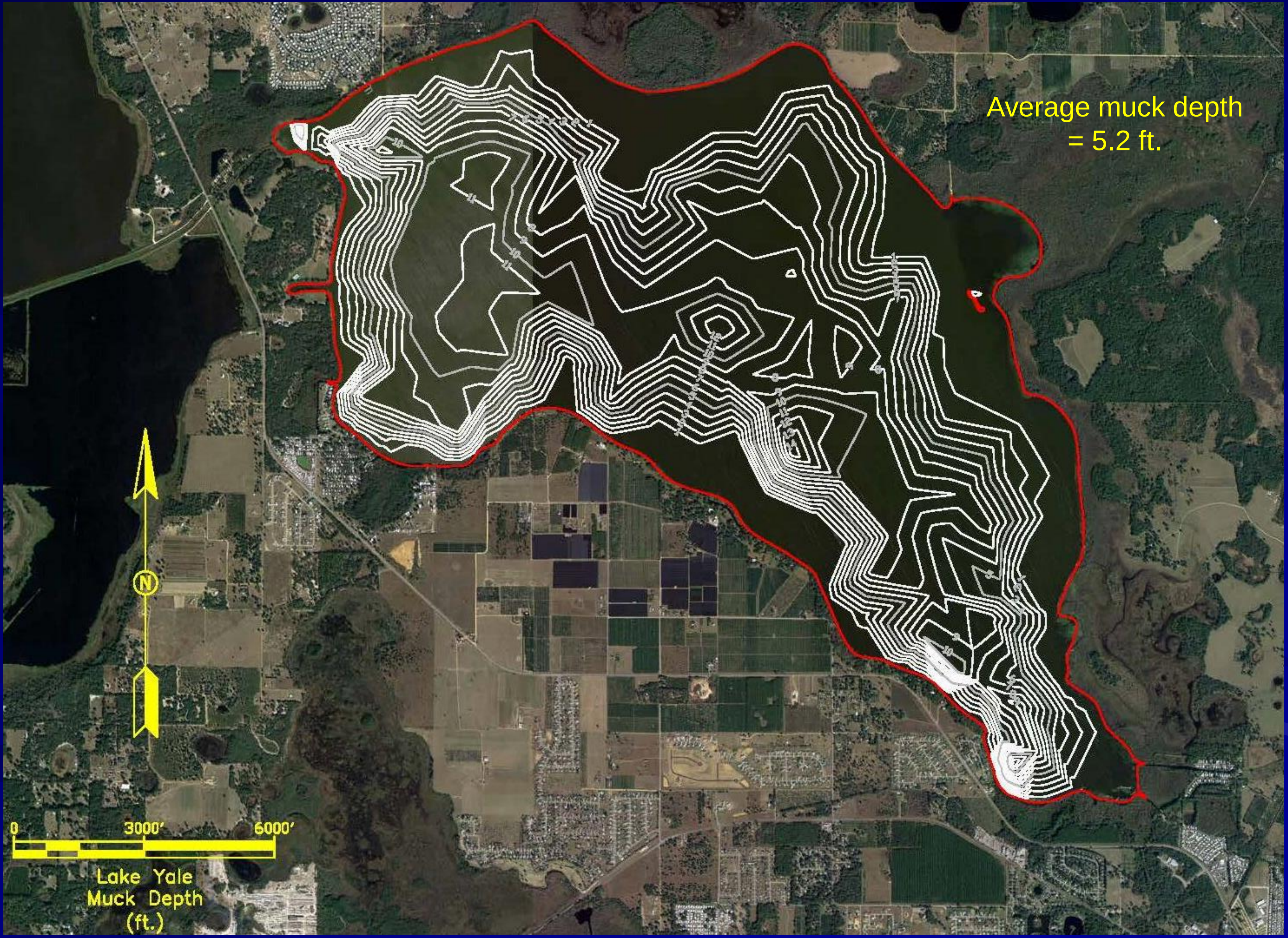


Bathymetric Characteristics of Lake Yale

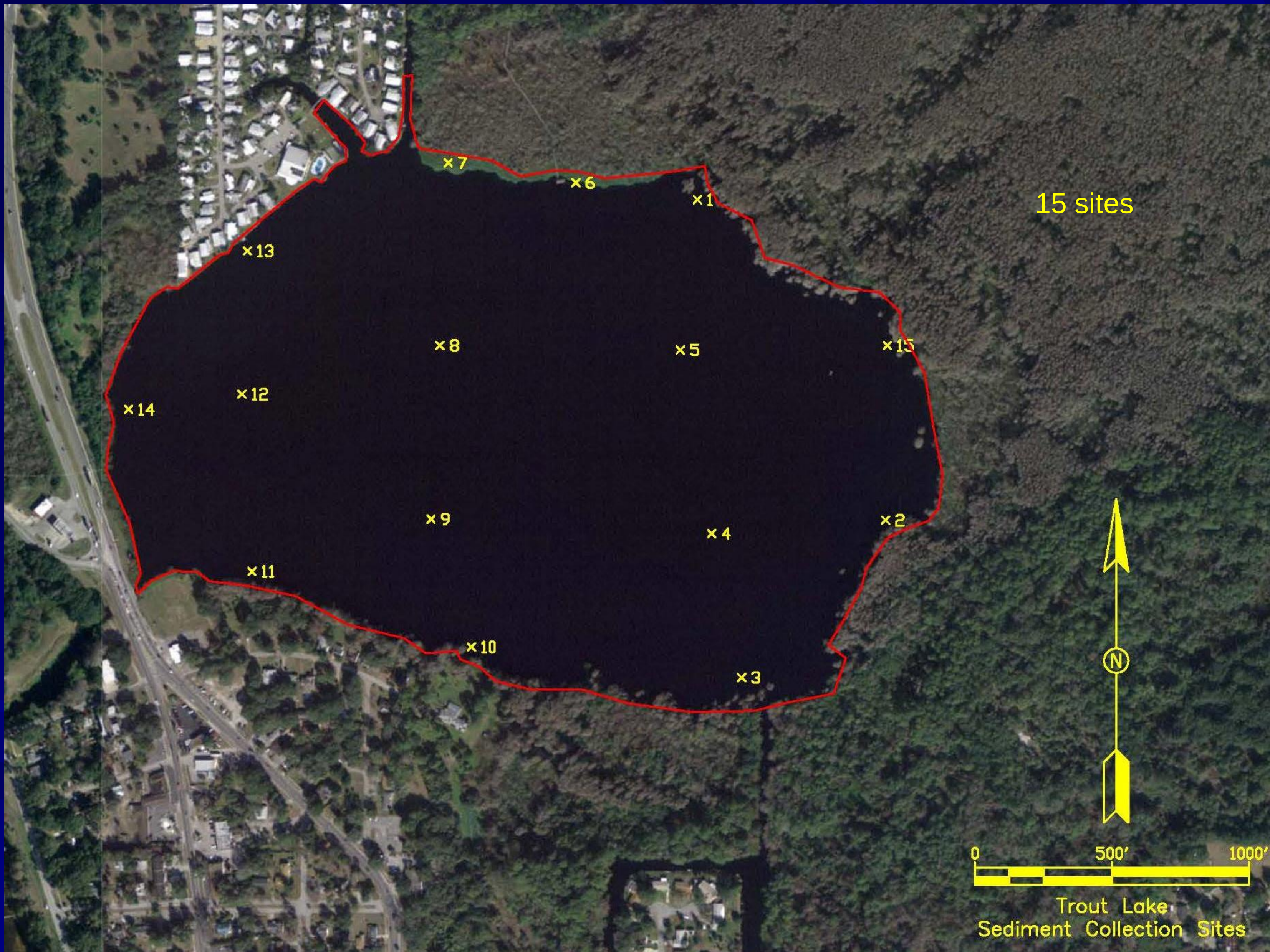
Bathymetric Parameter[1]	Units	Value
Surface Area	acres	4,012
Total Volume	ac-ft	43,094
Mean Depth	ft	10.7
Maximum Depth	ft	> 22
Shoreline Length	ft miles	70,871 13.4

1. Based upon a water surface elevation of 56.24 ft

Muck Depth Contours for Lake Yale



Sediment Core Collection Sites in Trout Lake



Typical Sediment Characteristics in Trout Lake

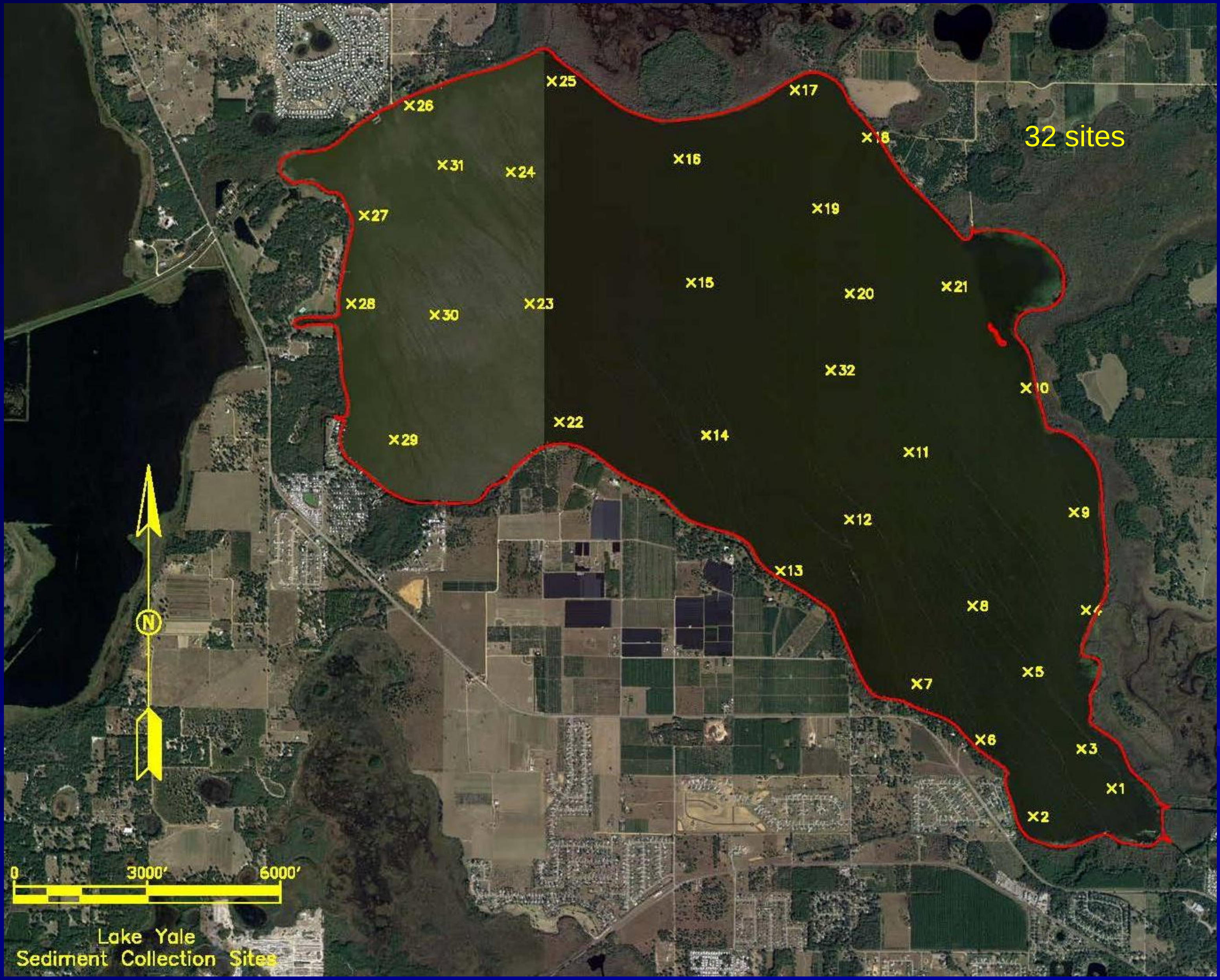
Trout Site 9

Trout Site 10

Trout Site 11

Trout Site 12

Sediment Core Collection Sites in Lake Yale



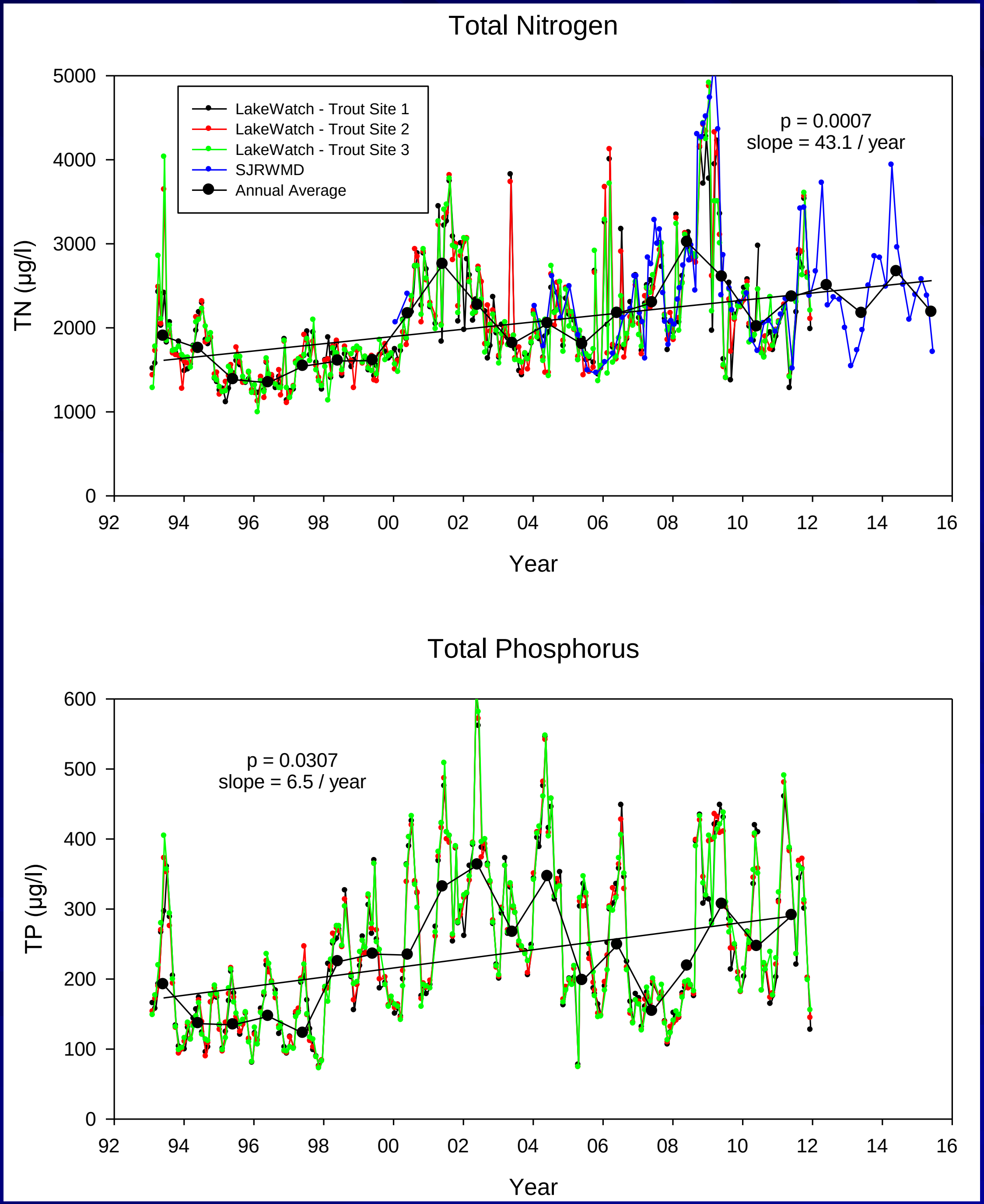
Typical Sediment Characteristics in Lake Yale

Yale Site 1

Yale Site 2

Yale Site 3

Yale Site 4



Trends in Total Nitrogen and Total Phosphorus in Trout Lake from 1993-2015

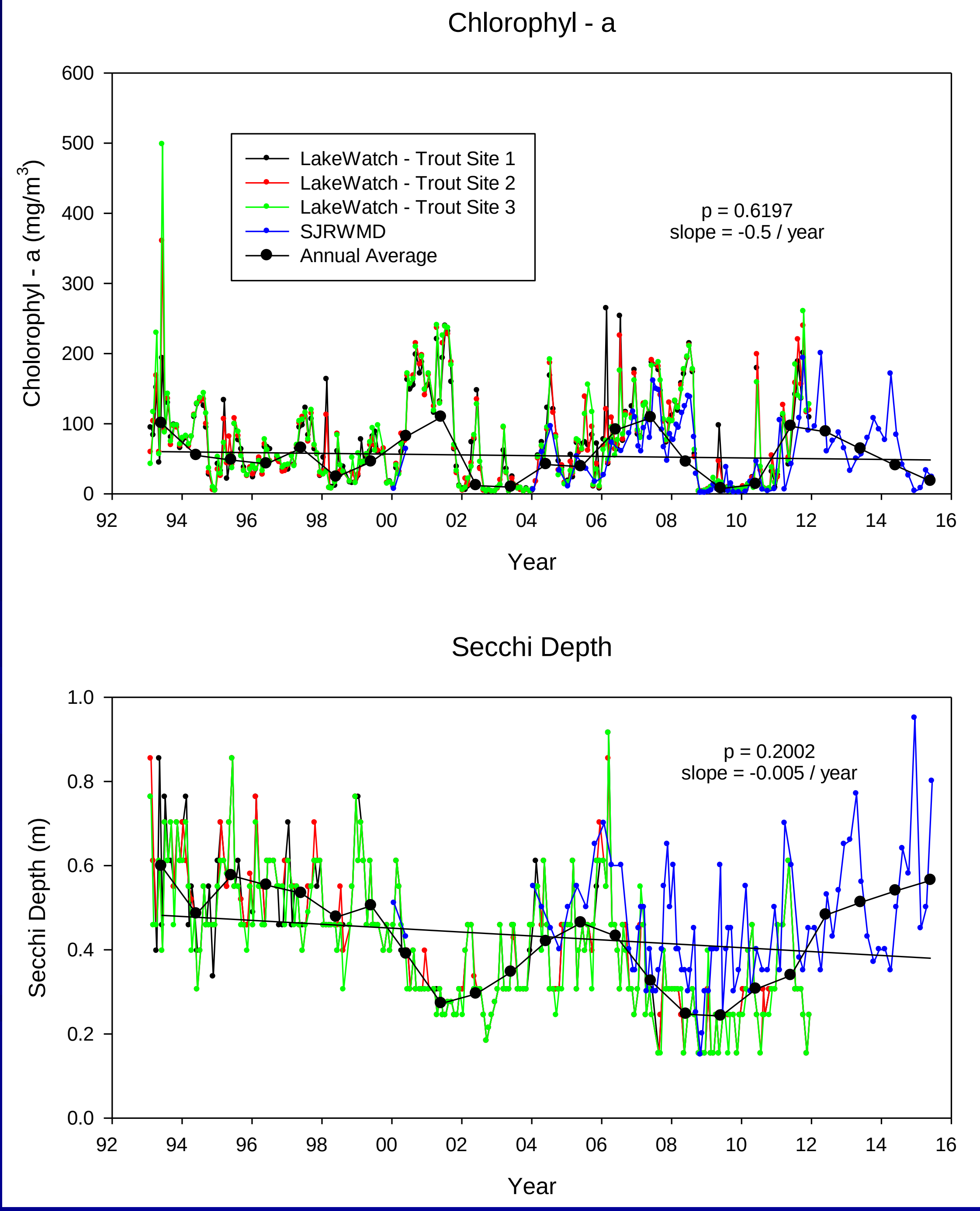
- statistically significant increases in both TN and TP over time

Trends in Chlorophyll-a and Secchi Disk Depth in Trout Lake from 1993-2015

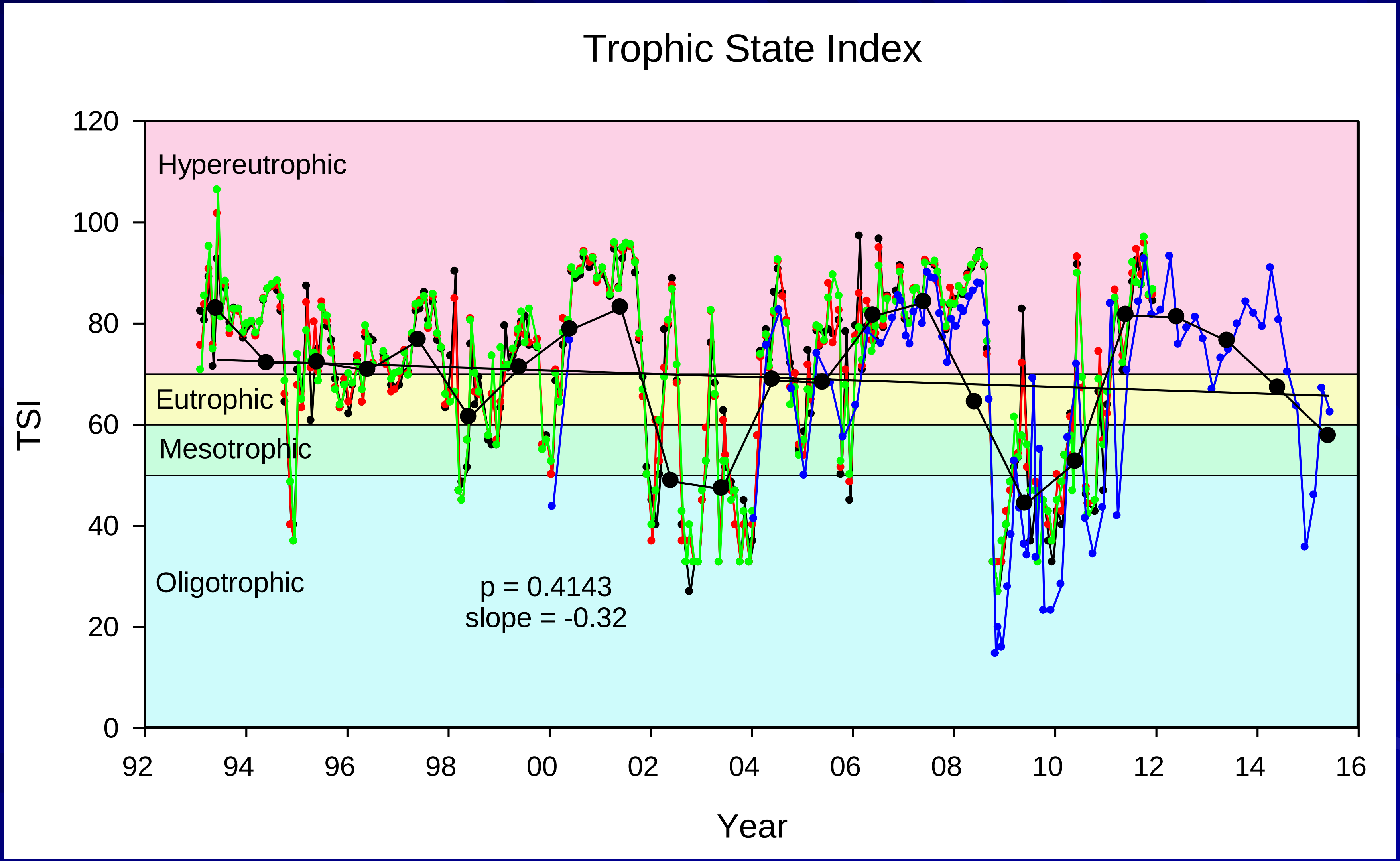
- no statistically significant trends for either chlorophyll-a or Secchi

- Trout Lake is a highly colored waterbody

- algal growth is limited by color rather than nutrients

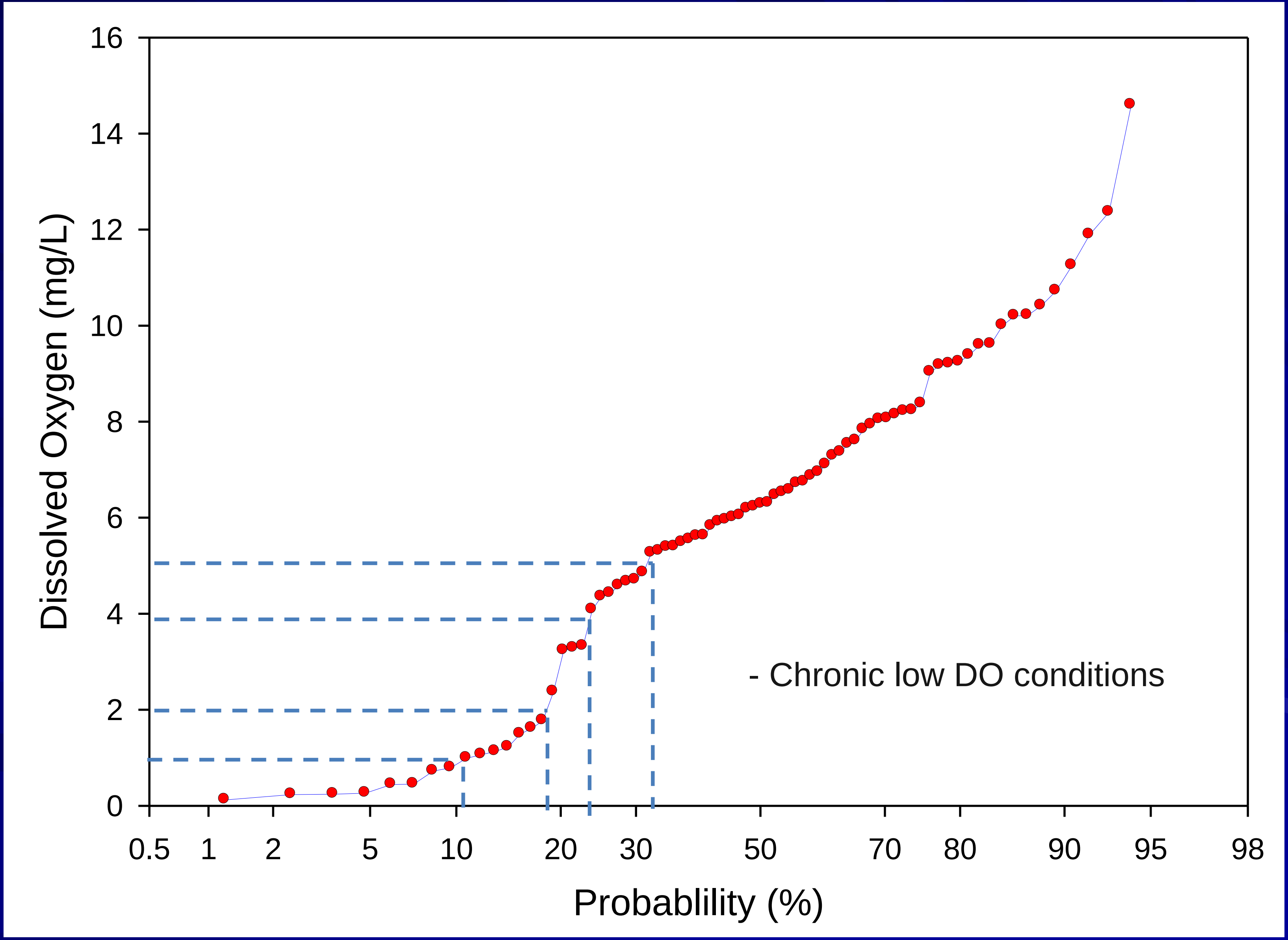


Trends in TN/TP Ratio and TSI Values in Trout Lake from 1993-2015

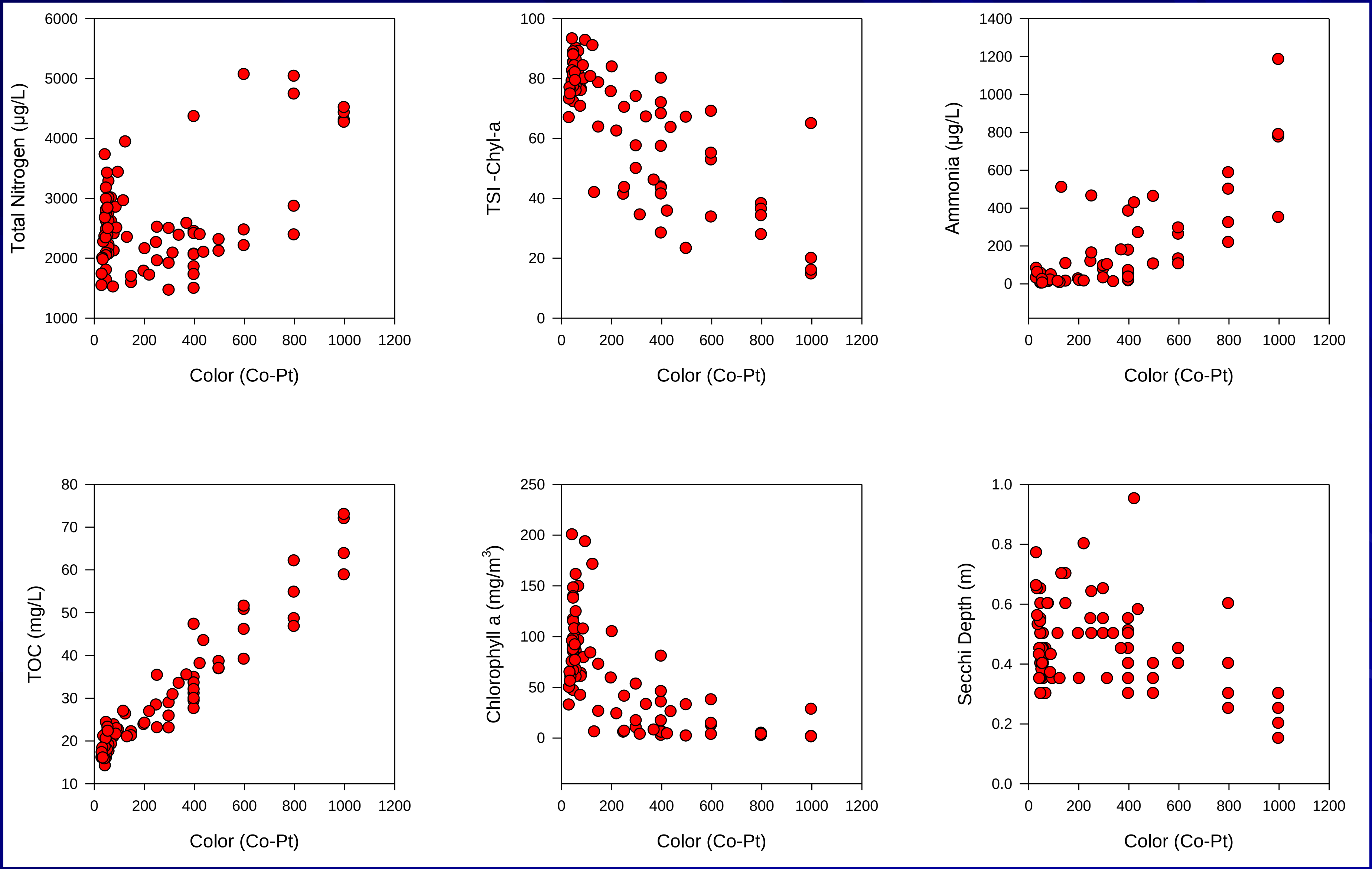


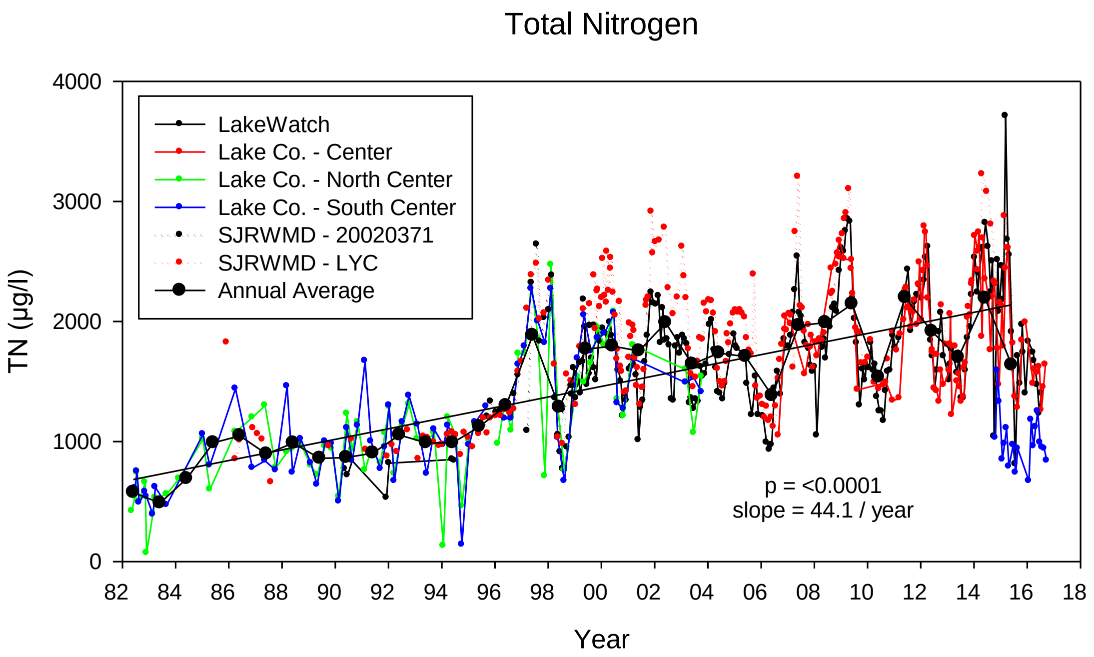
- no statistically significant trend for TSI

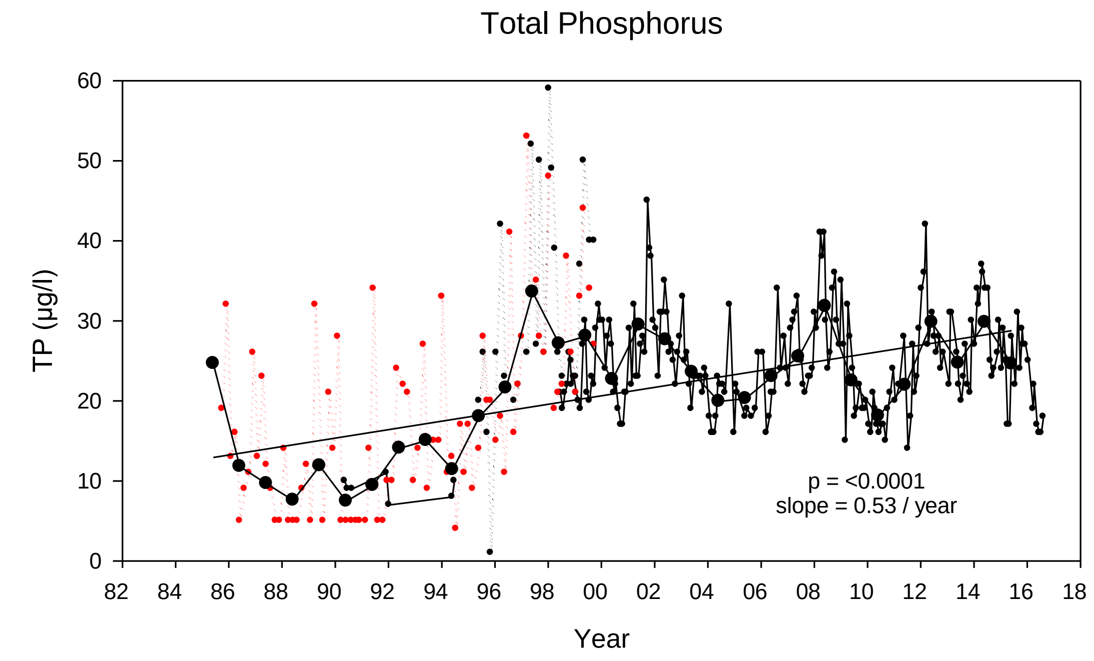
Probability Distribution of Dissolved Oxygen Concentrations Measured in Trout Lake by SJRWMD from 2000-2015



Relationships Between Color and Water quality in Trout Lake







Trends in Total Nitrogen and Total Phosphorus in Lake Yale from 1982-2016

- statistically significant increases in both
TN and TP over time

- nutrient concentrations have been impacted by vegetation control practices

- hydrilla began to spread in 1970s
- chemical treatments conducted in 1980s
- 20,000 grass carp added in 1987
- grass carp consumed all vegetation leaving muck on lake bottom
- nutrients began to spike and algal growth exploded
- problem with floating tussocks in recent years

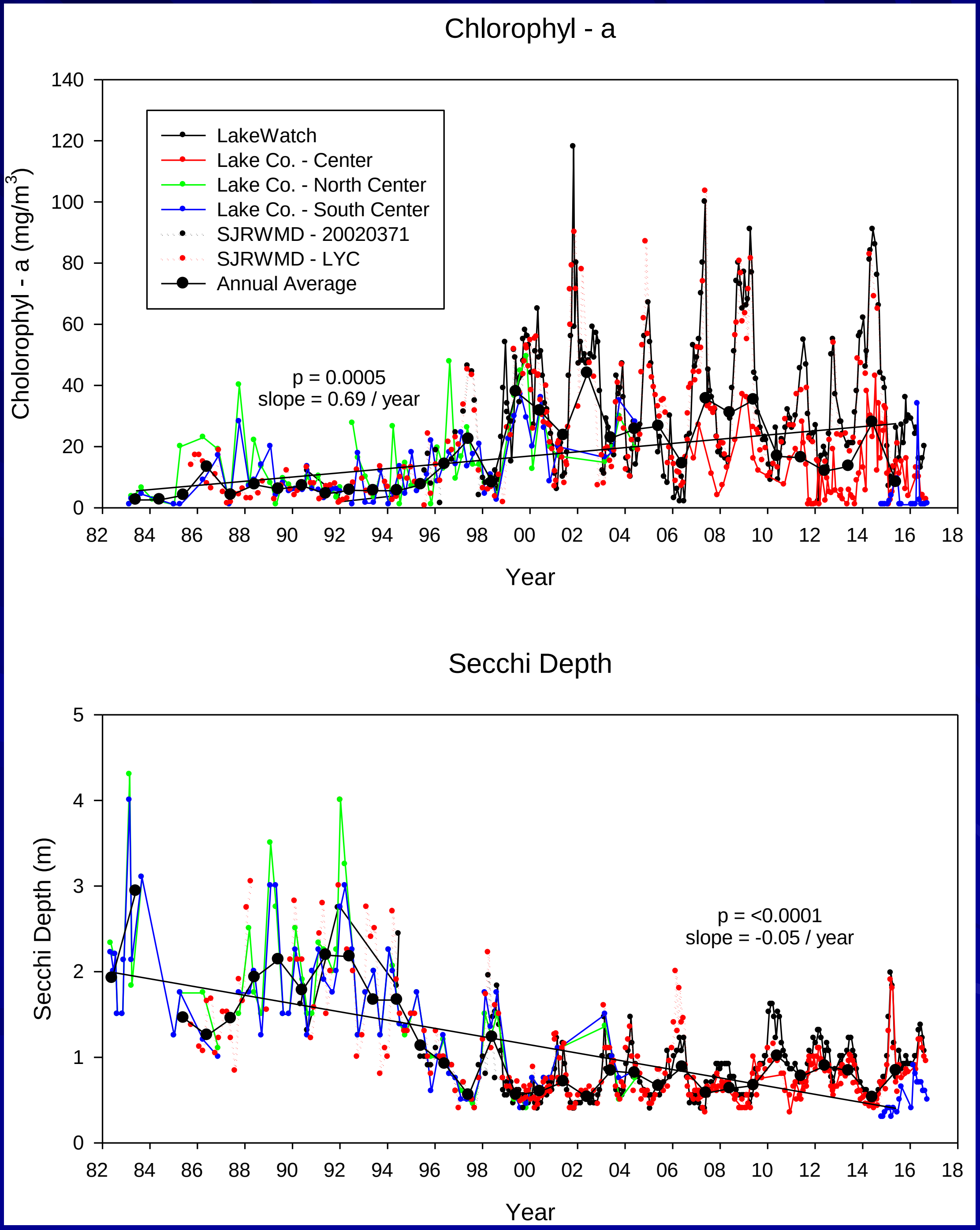
Trends in Chlorophyll-a and Secchi Disk Depth in Lake Yale from 1982-2016

- algal growth accelerated in 1990s
- water clarity declined

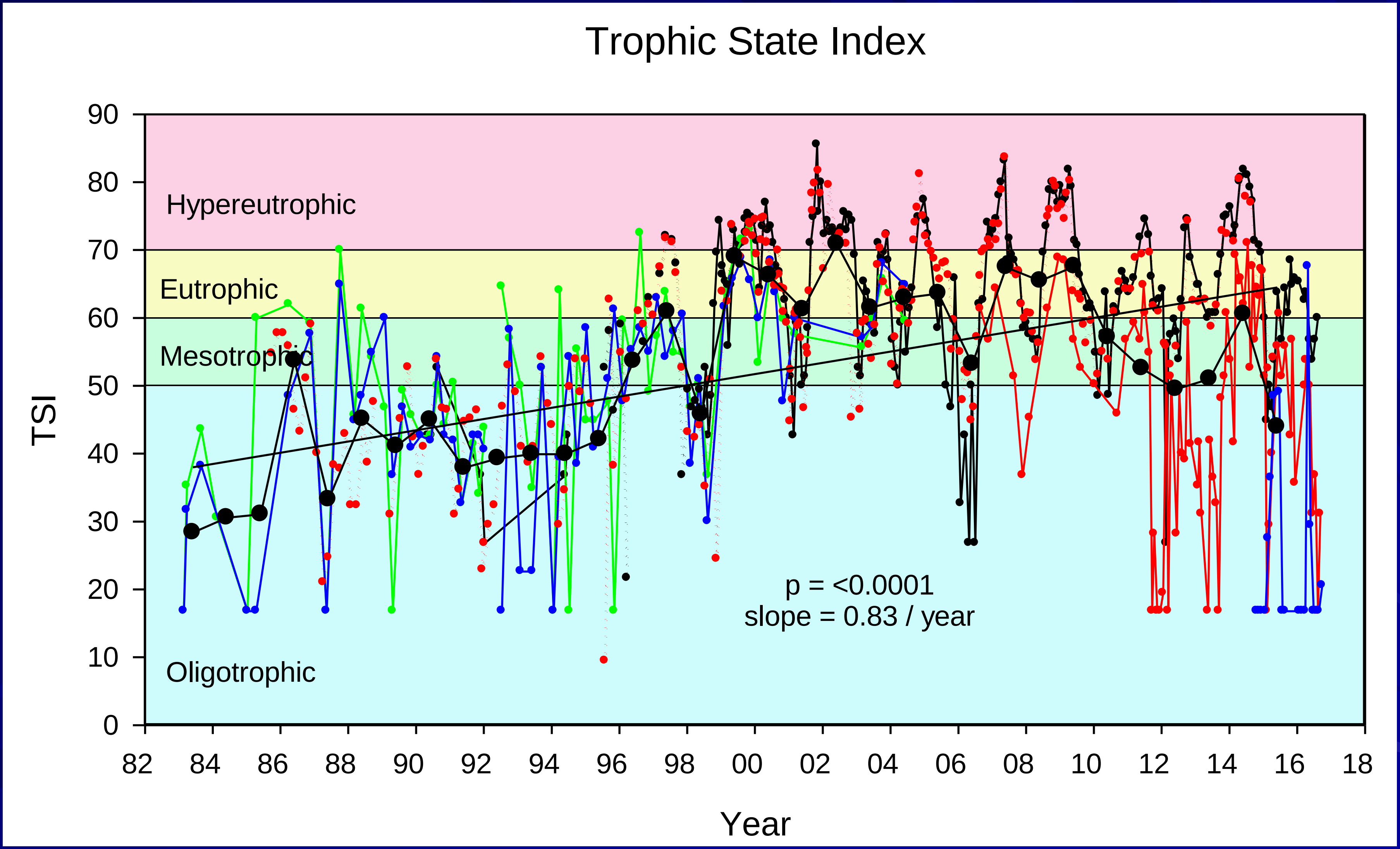
- bottom areas of lake were shaded from light, preventing plant growth

- Lake Yale was transformed from a clear, plant dominated lake to a turbid, algal dominated lake

- substantial muck deposited on lake bottom which is continuing to contribute nutrient loadings



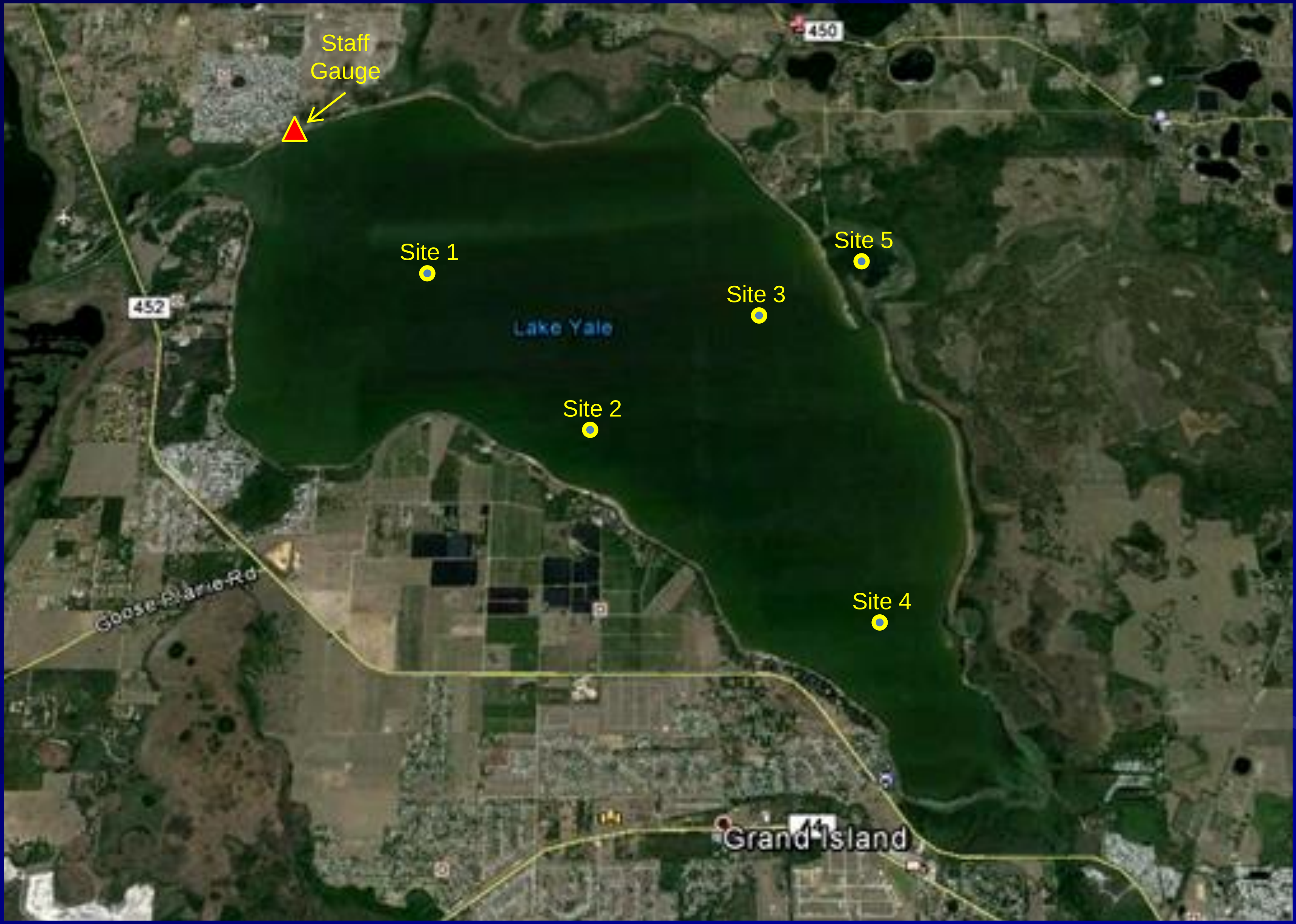
Trends in TSI Values in Lake Yale from 1982-2016



Lake Yale is currently eutrophic and is becoming more eutrophic over time

Surface Water Monitoring Sites in Trout Lake Used by ERD

Surface Water Monitoring Sites in Lake Yale Used by ERD



Control Structures in Vicinity of CR 452

Lake Yale Water Control Structures

Lake Yale outfall structure

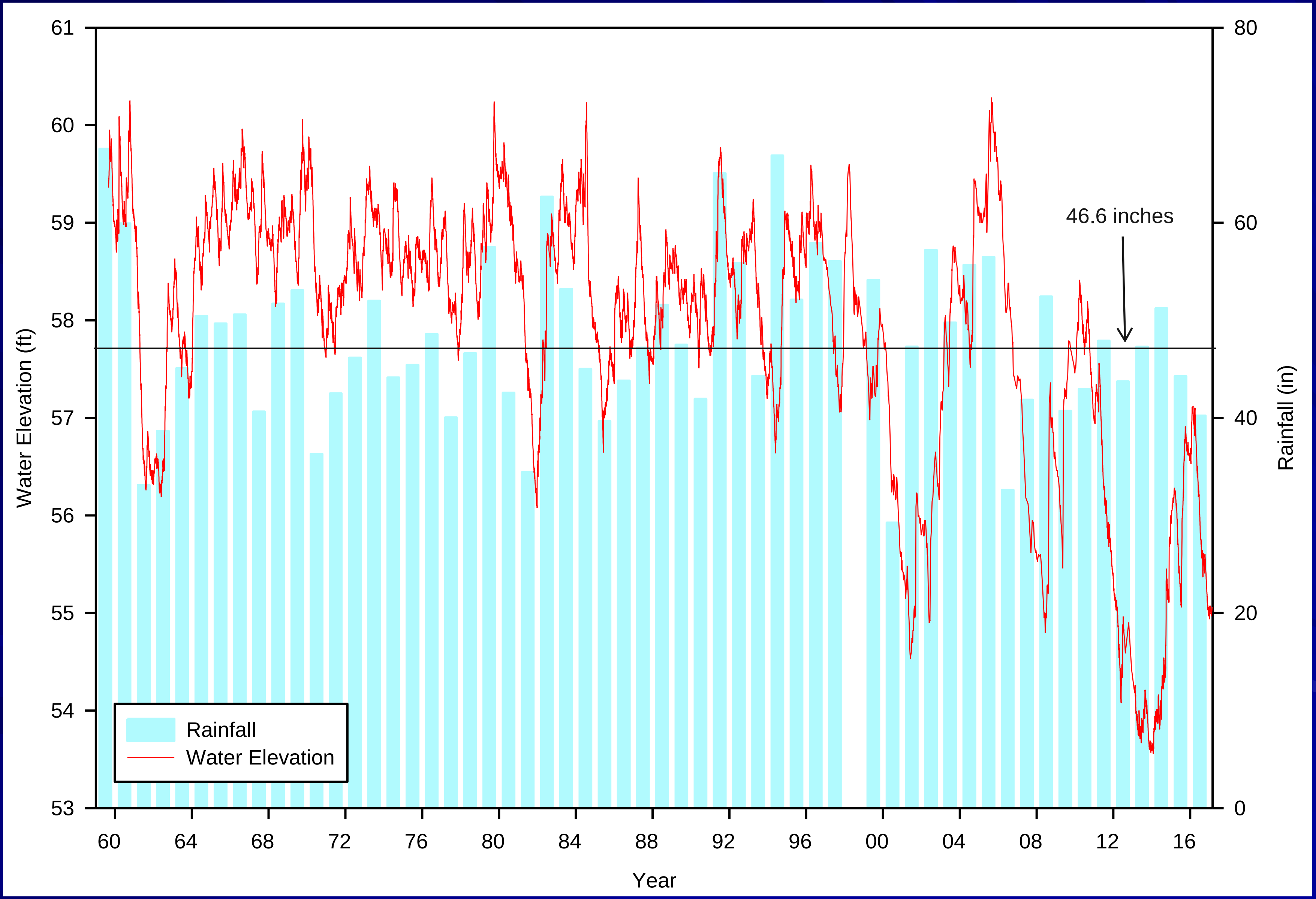
Outfall pipe through earthen berm

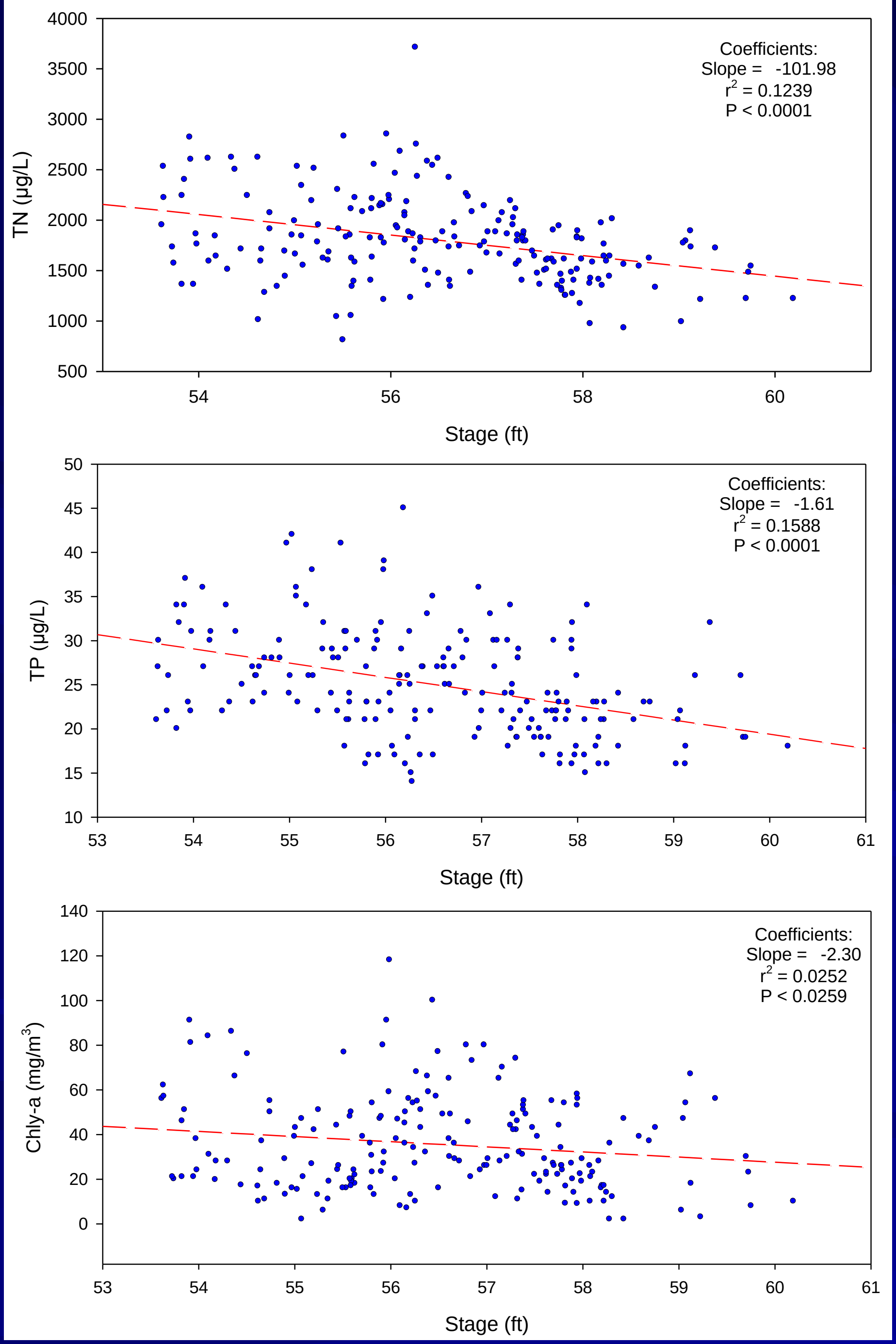
Outfall discharge through berm

Photographs
of the 24-inch HDPE
East of CR 452

Box Culvert Crossing at CR 452

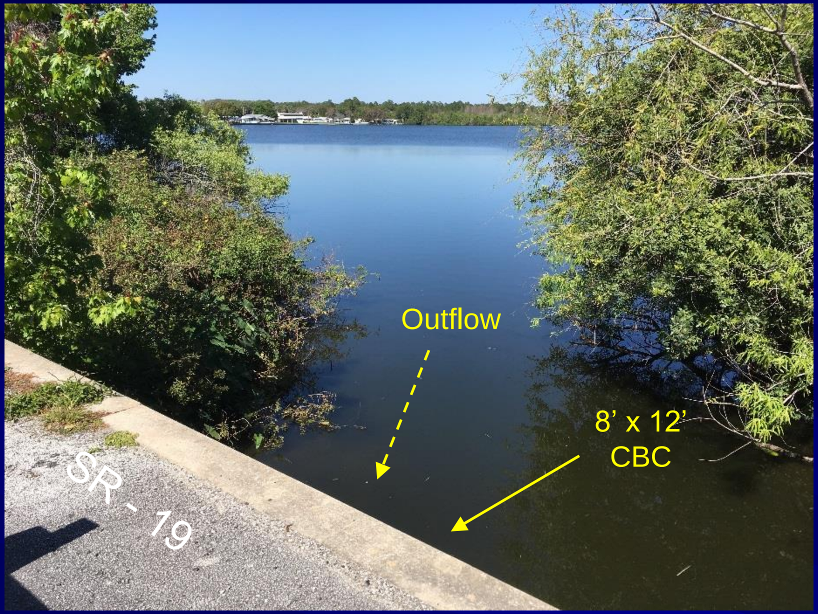
Measured Water Level Elevations and Annual Rainfall for Lake Yale from 1959-2016



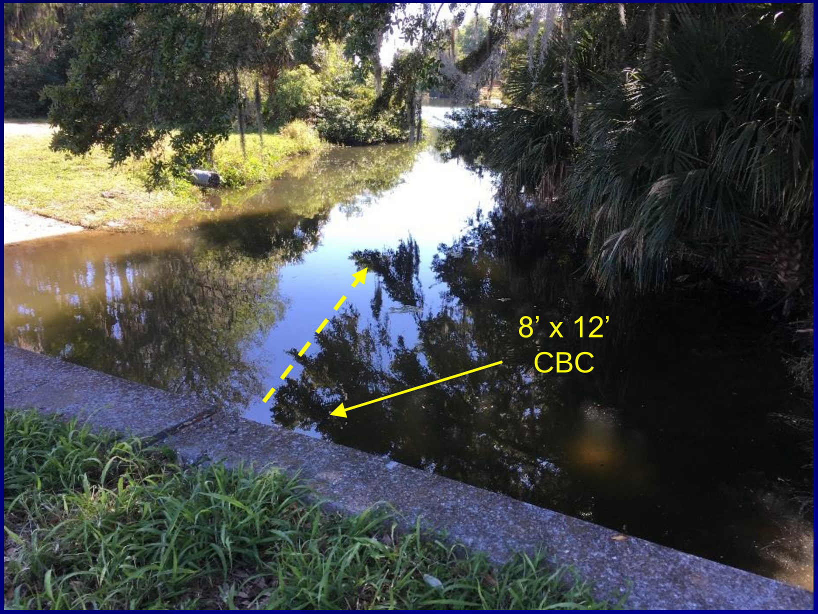


Relationships Between Lake Stage and Water Quality in Lake Yale

Trout Lake Outfall Structure

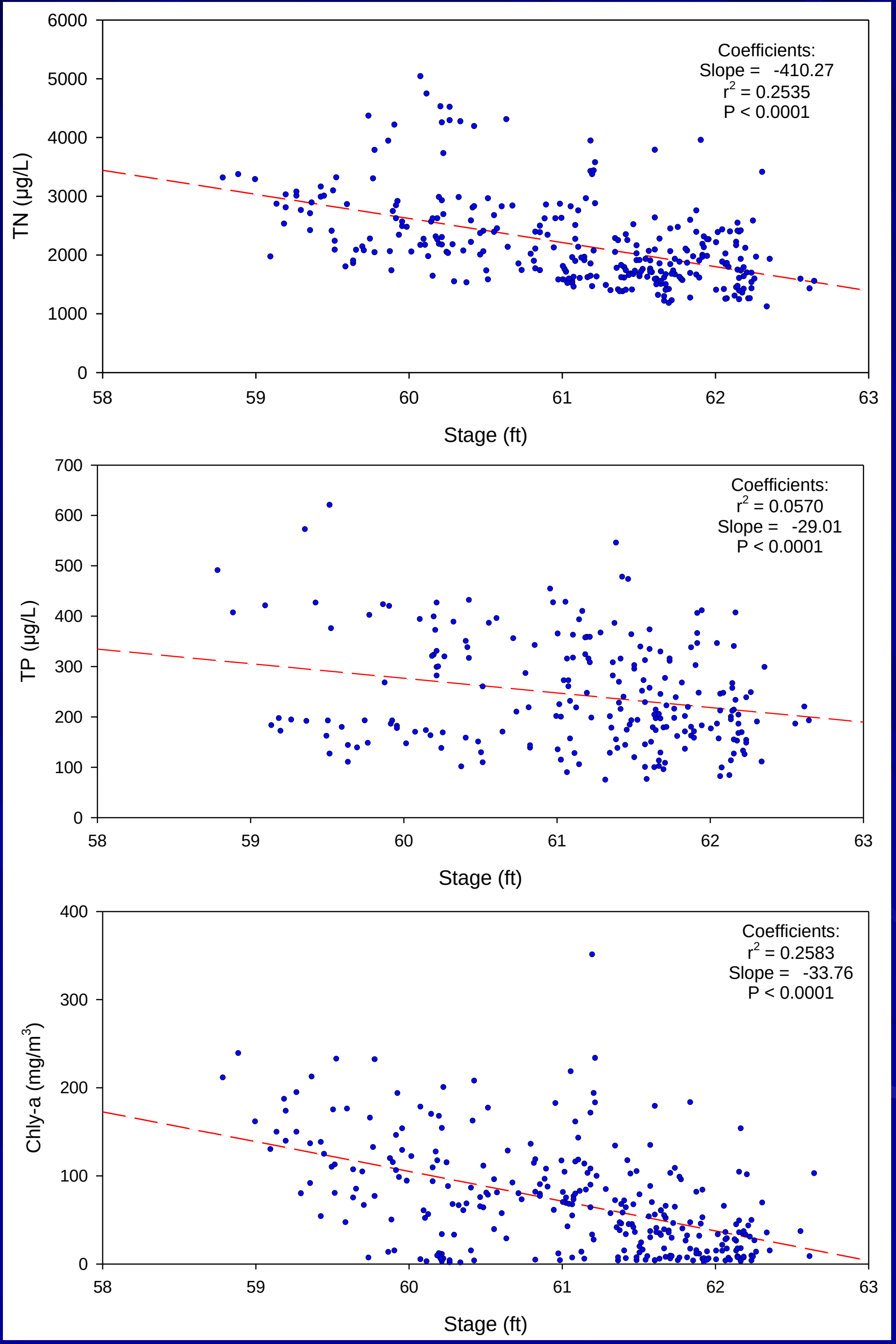


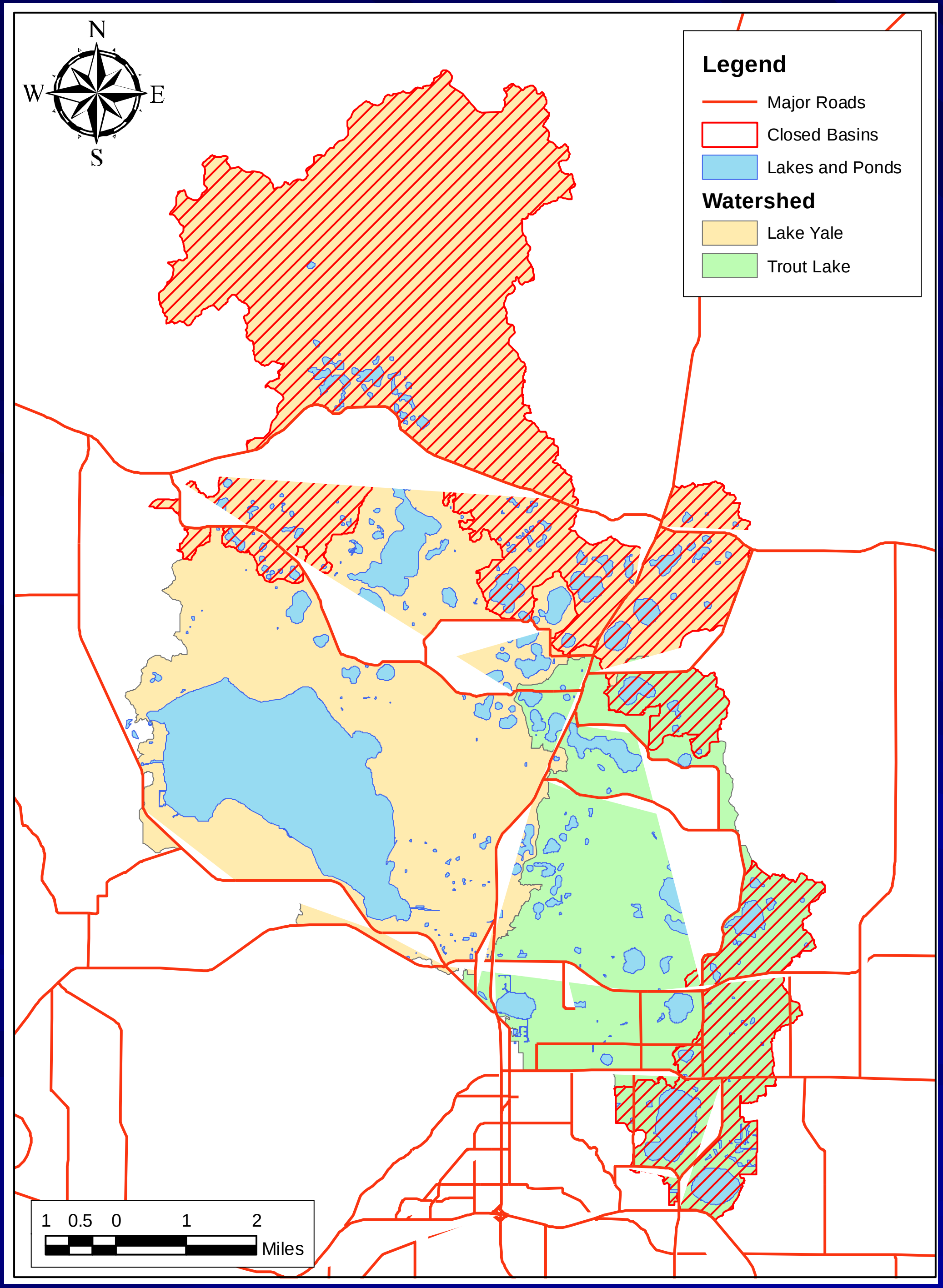
a. Trout Lake Outfall Structure – East side of SR-19



b. Outfow to Lake Eustis – West side of SR-19

Relationships Between Lake Stage and Water Quality in Trout Lake





Drainage Basin Area Delineations for Lake Yale and Trout Lake

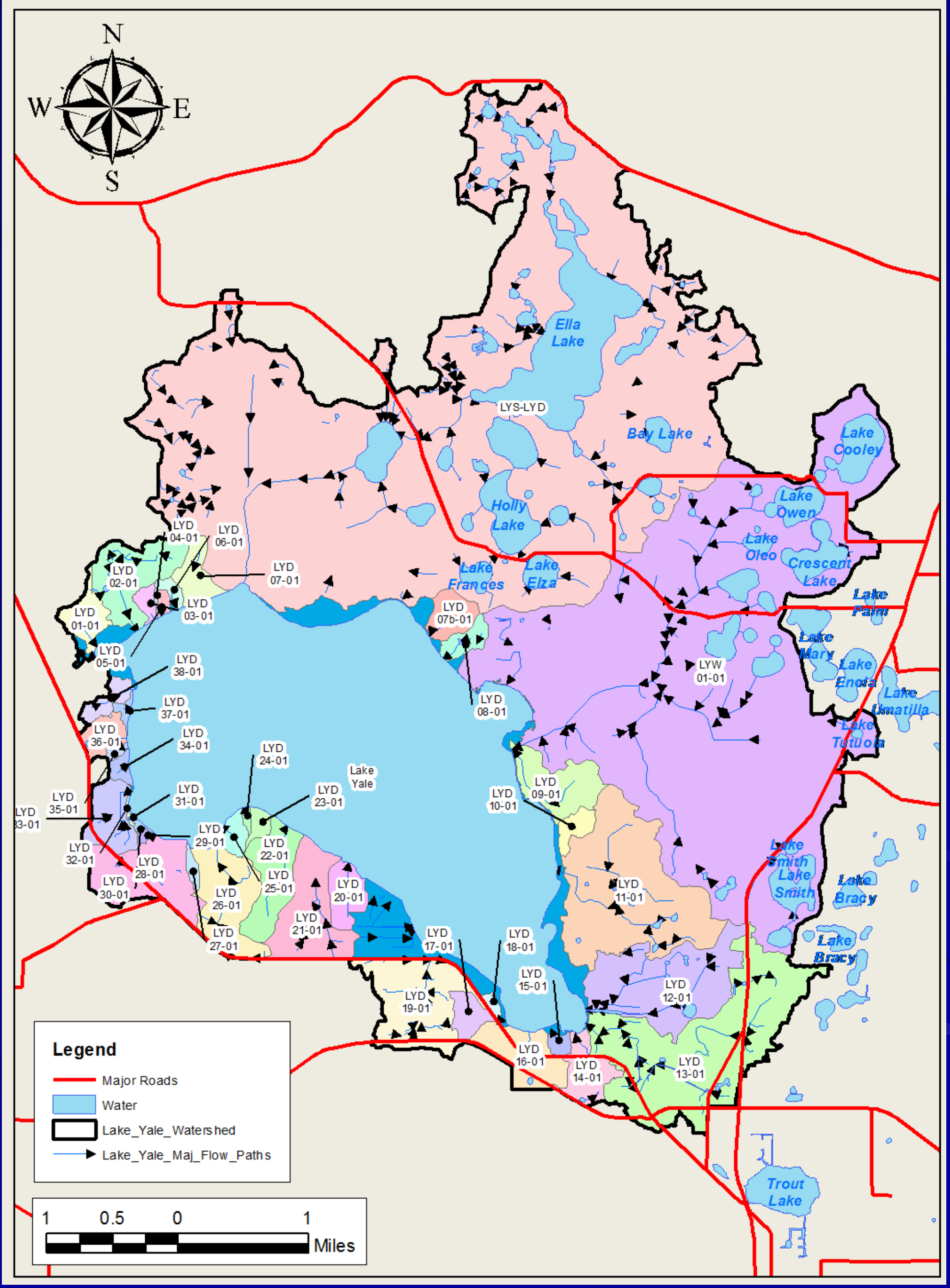
Lake	Potential Watershed Area (acres)	Contributing Watershed area (acres)
Yale	39,517	15,399
Trout	14,803	9,387

Overview of Sub-basin Areas Discharging to Lake Yale

- drainage basin contains significant internal storage

- only a small portion of the generated runoff reaches the lake

- ~ 2.3% of rainfall in watershed reaches lake as runoff

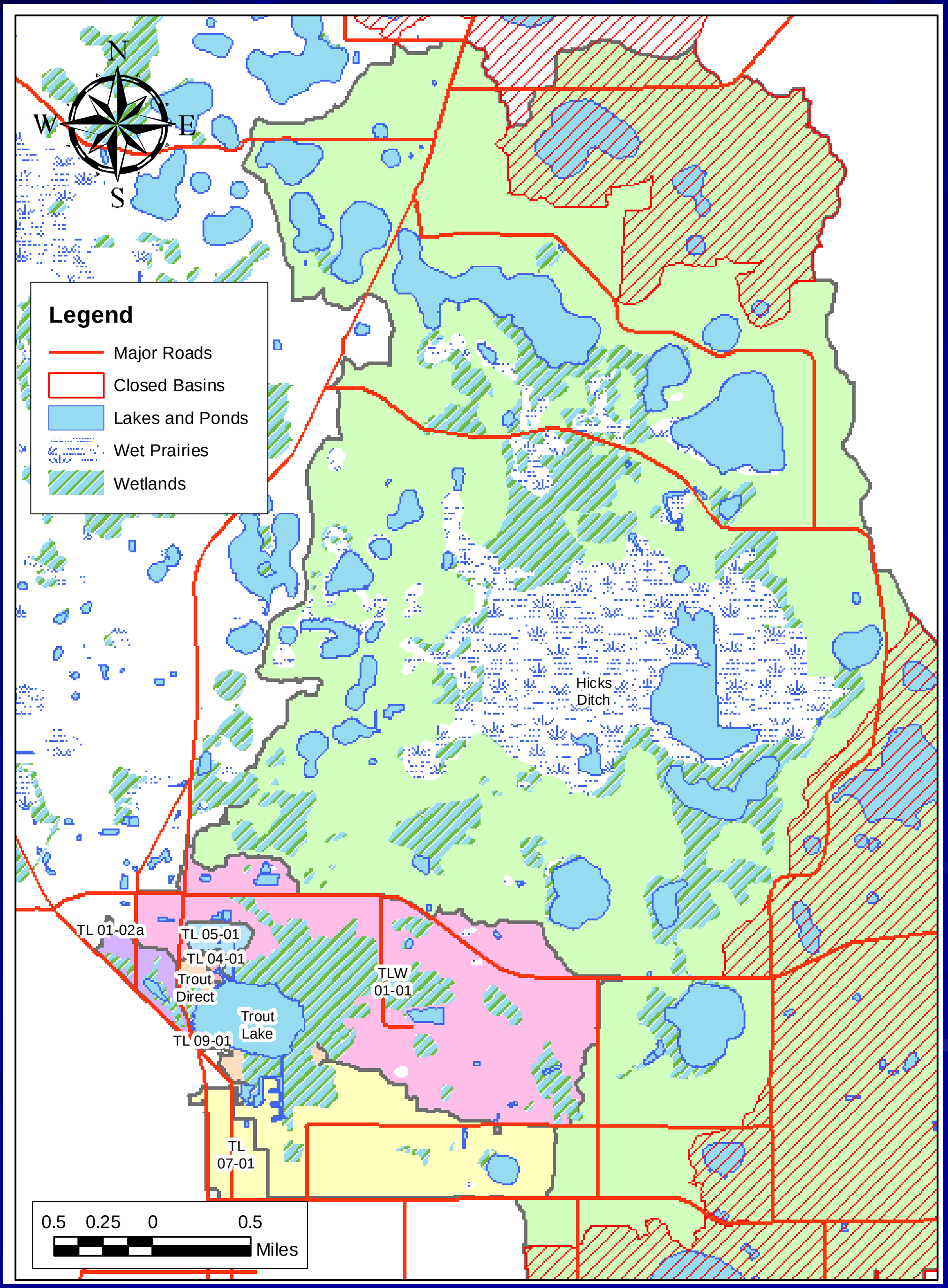


Overview of Drainage Sub-basin Areas Discharging to Trout Lake

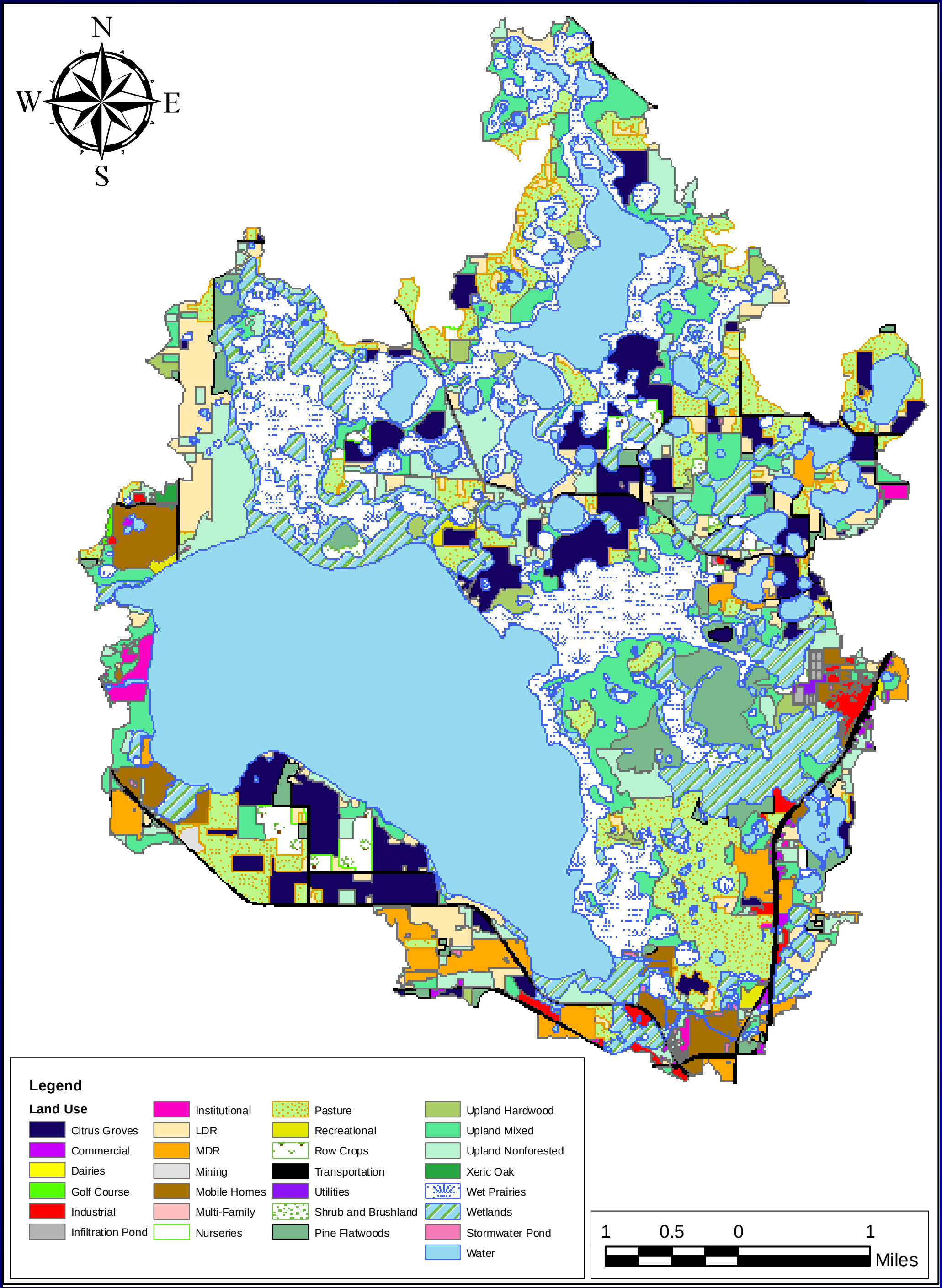
- drainage basin contains significant internal storage

- only a small portion of the generated runoff reaches the lake

- ~ 3.1% of rainfall in watershed reaches lake as runoff



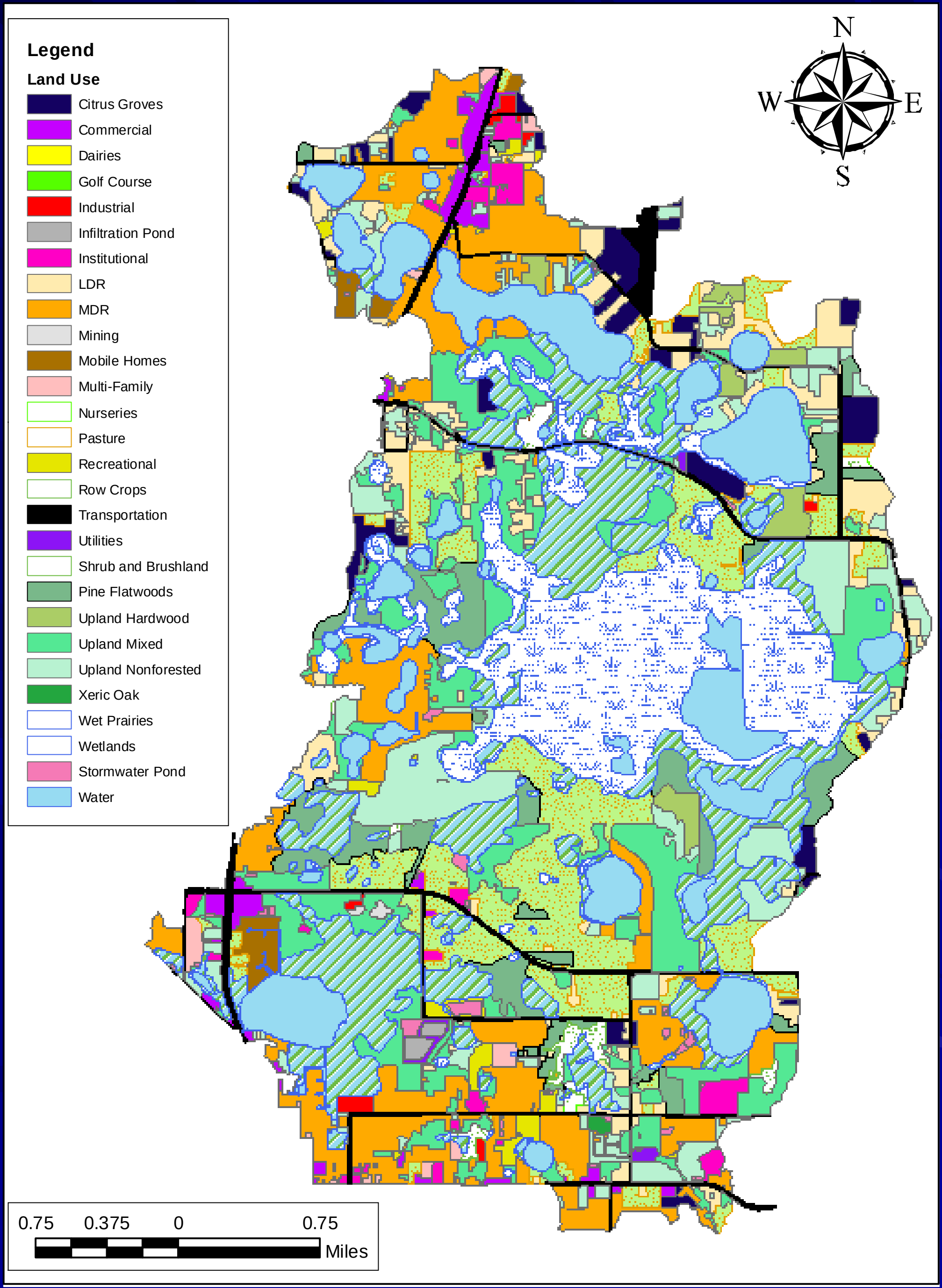
Land Use Characteristics in the Lake Yale Contributing Drainage Basin

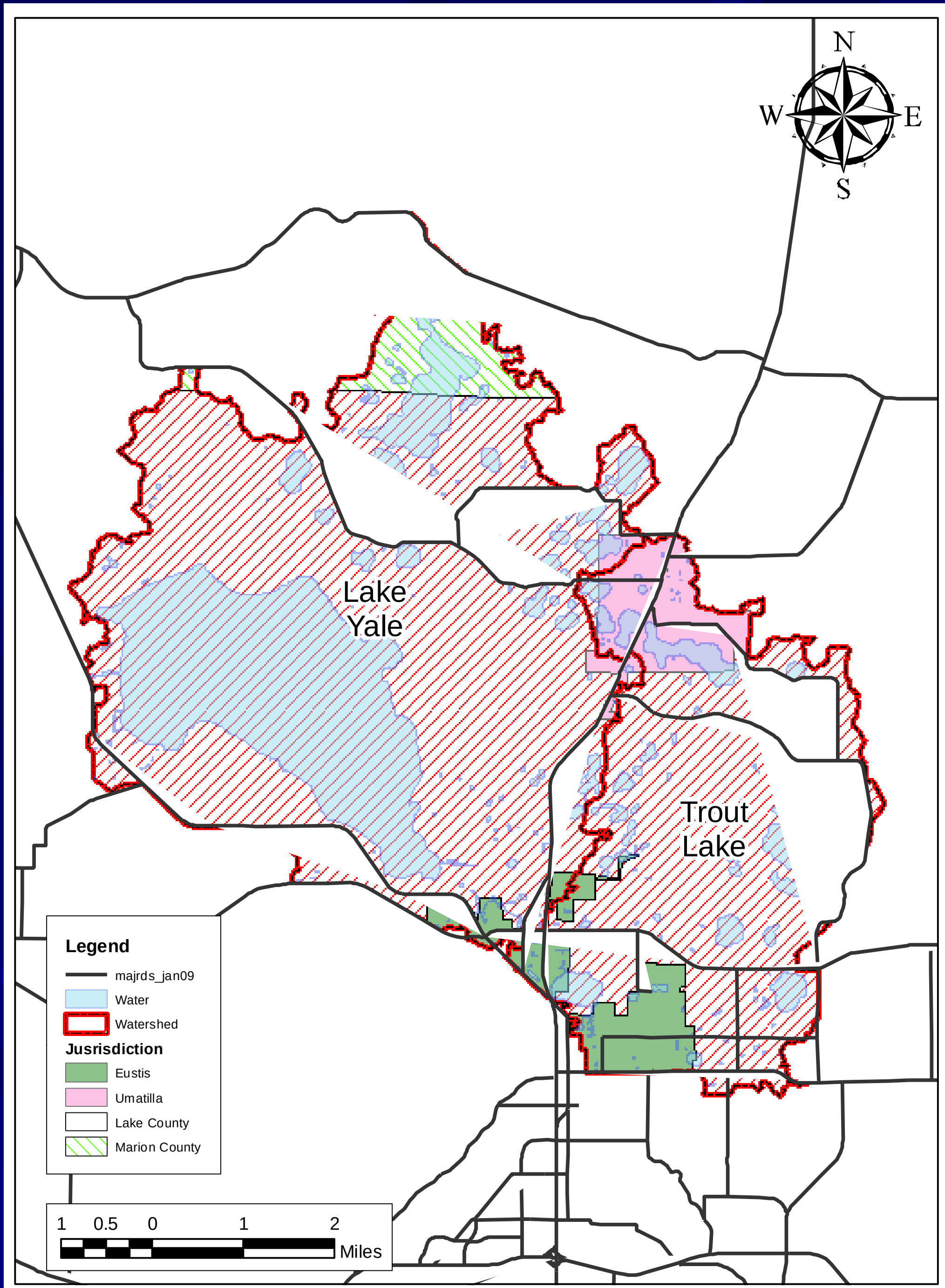


- 19.0% wet prairies
- 15.9% upland forest
- 11.8% pasture
-11.4% wetlands
- 10.1% water
- 8.7% citrus
- 5.8% low density residential

Land Use Characteristics in the Trout Lake Contributing Drainage Basin

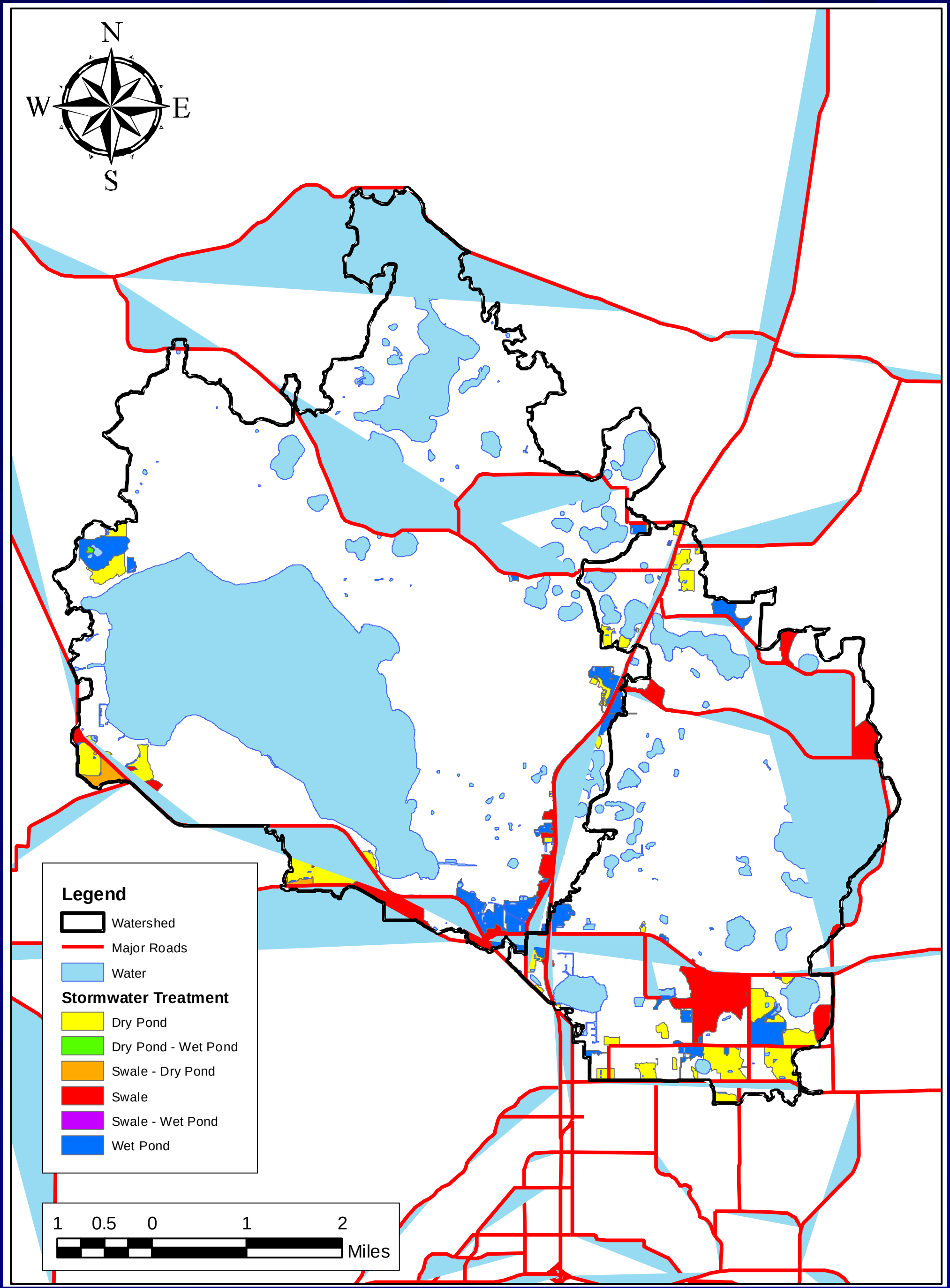
- 17.6% upland forests
- 14.4% wetlands
- 12.6% wet prairies
- 11.9 single family residential
- 10.3% pasture





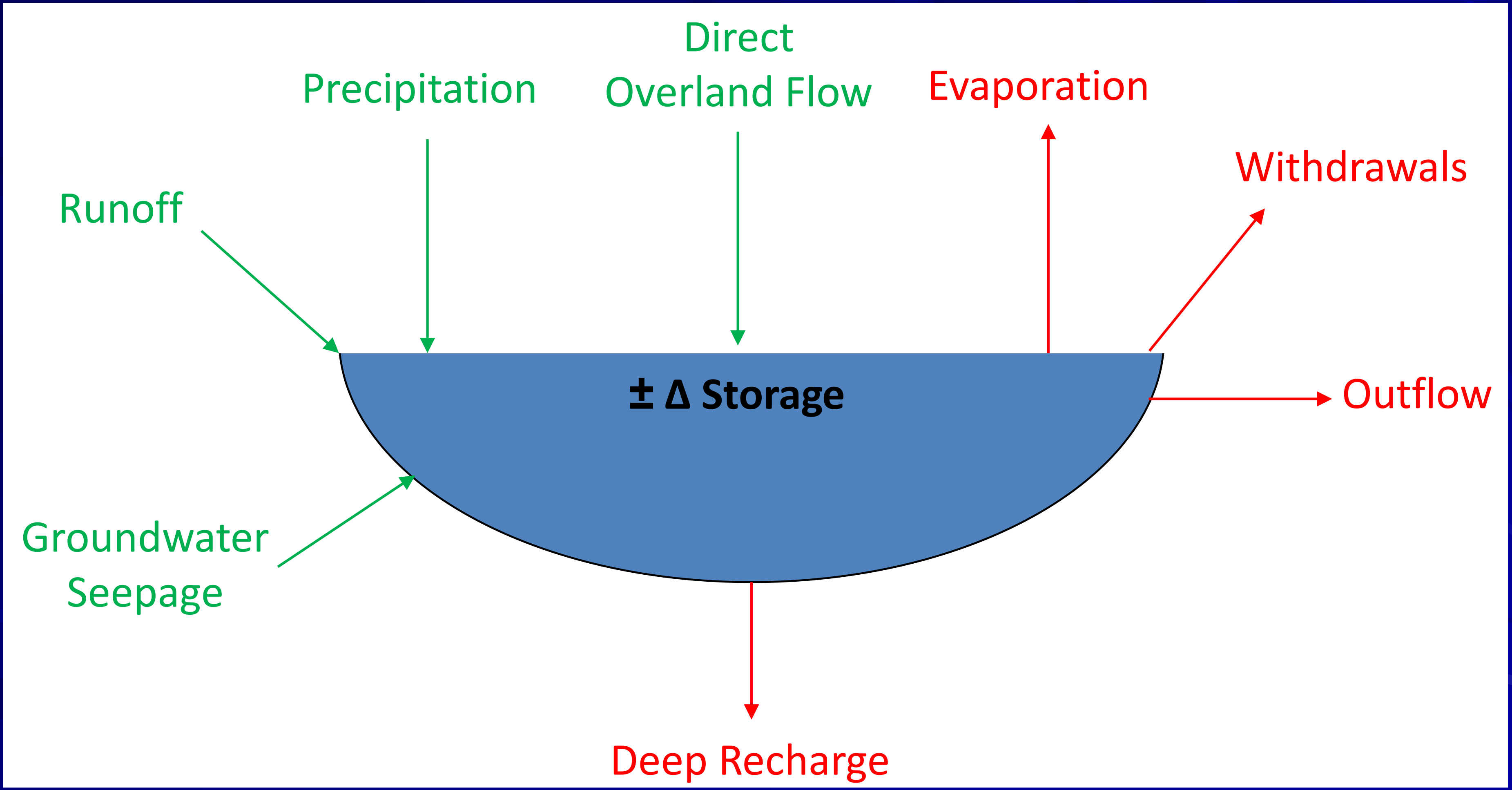
Governmental Jurisdictions in Contributing Portions of the Lake Yale and Trout Lake Drainage Basins

Watershed	Jurisdiction	Area (acres)	Percent Of Total (%)
Lake Yale	Eustis	283.9	2
	Umatilla	198.3	1
	Lake County	13,372.4	87
	Marion County	1,544.6	10
	Total:	15,399.2	100
Trout Lake	Eustis	1,025.8	11
	Umatilla	1,096.6	12
	Lake County	7,264.9	77
	Total:	9,387.3	100



Areas with Existing Stormwater Treatment in the Lake Yale and Trout Lake Drainage Basins

Conceptual Schematic of Evaluated Hydrologic Inputs and Losses to Lake Yale and Trout Lake



Modeled Annual Runoff Volumes Discharging to Trout Lake

Sub-Basin	Area (acres)	Generated Runoff Volume (ac-ft/yr)	Generated Runoff C Value	Volume Retained In SW Ponds (ac-ft/yr)	Volume Retained In Depressions (ac-ft/yr)	Runoff Volume To Lake (ac-ft/yr)	Observed Runoff C Value	Percent Of Total (%)
Hicks Ditch	7,579.2	1,256	0.040	139	345	772	0.025	64.3
Trout Lake Wetland	1,102.4	325	0.071	40.2	38.5	247	0.054	20.5
TL 01-02	72.0	31.8	0.107	7.86	10.8	13.2	0.044	1.1
TL 02-01	16.0	7.25	0.109	0.29	0	6.96	0.105	0.6
TL 03-01	6.7	6.39	0.230	0.00	0	6.39	0.230	0.5
TL 04-01	8.5	8.85	0.252	0.00	0	8.85	0.252	0.7
TL 05-01	34.6	34.2	0.239	0.00	0	34.2	0.239	2.8
TL 06-01	22.7	0.28	0.003	0.00	0	0.28	0.003	0.0
TL 07-01	511.0	148	0.070	33.1	7.55	107	0.051	8.9
TL 08-01	30.6	4.49	0.035	0.00	0	4.49	0.035	0.4
TL 09-01	1.5	2.74	0.441	2.19	0	0.55	0.089	0.0
Direct	2.1	0.13	0.015	0.00	0	0.13	0.015	0.0
TOTALS:	9,387	1,826	0.047	223	402	1,201	0.031	100.0

Figure 5-1
Lake Yale – Inflow monitoring Sites (7 sites)

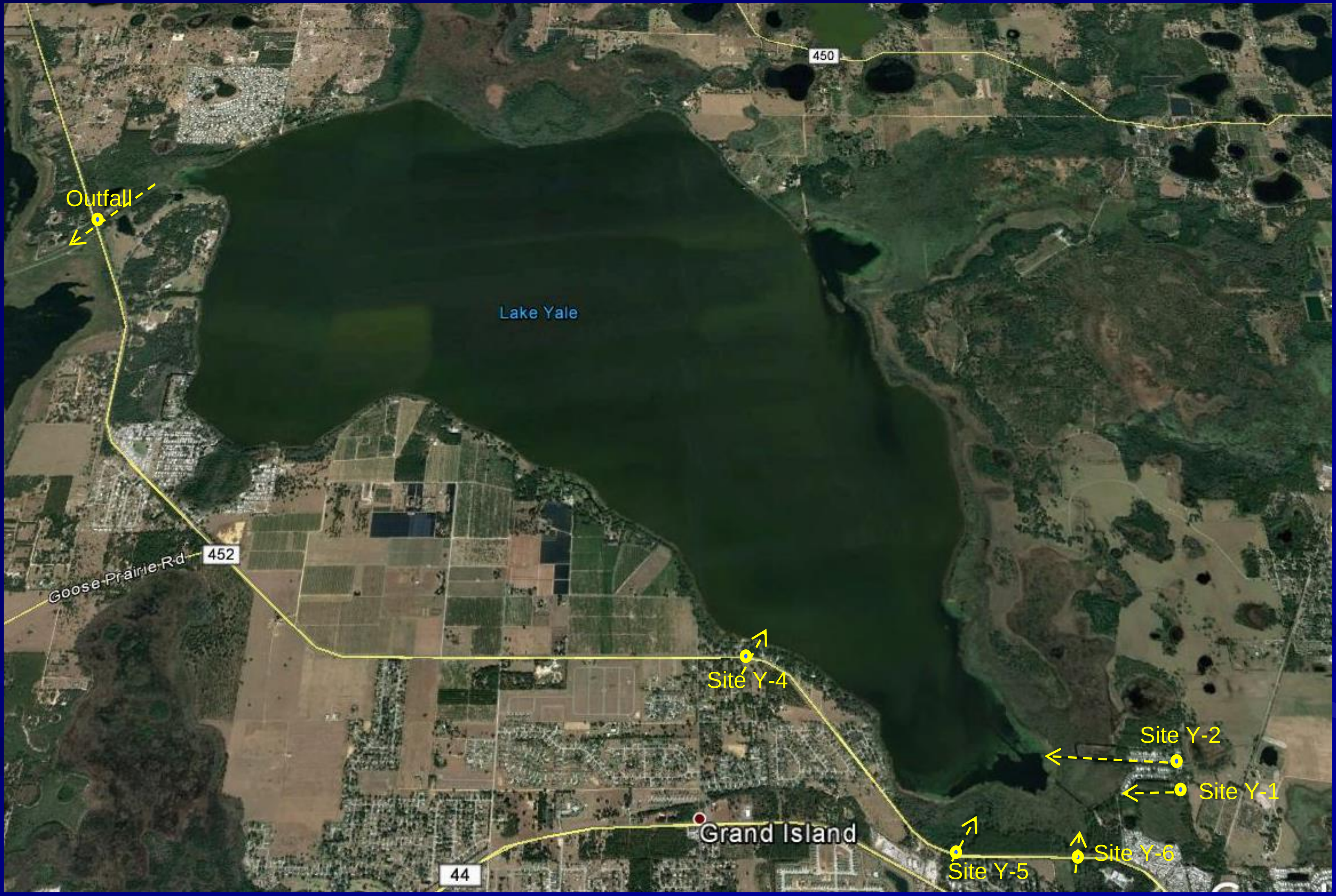
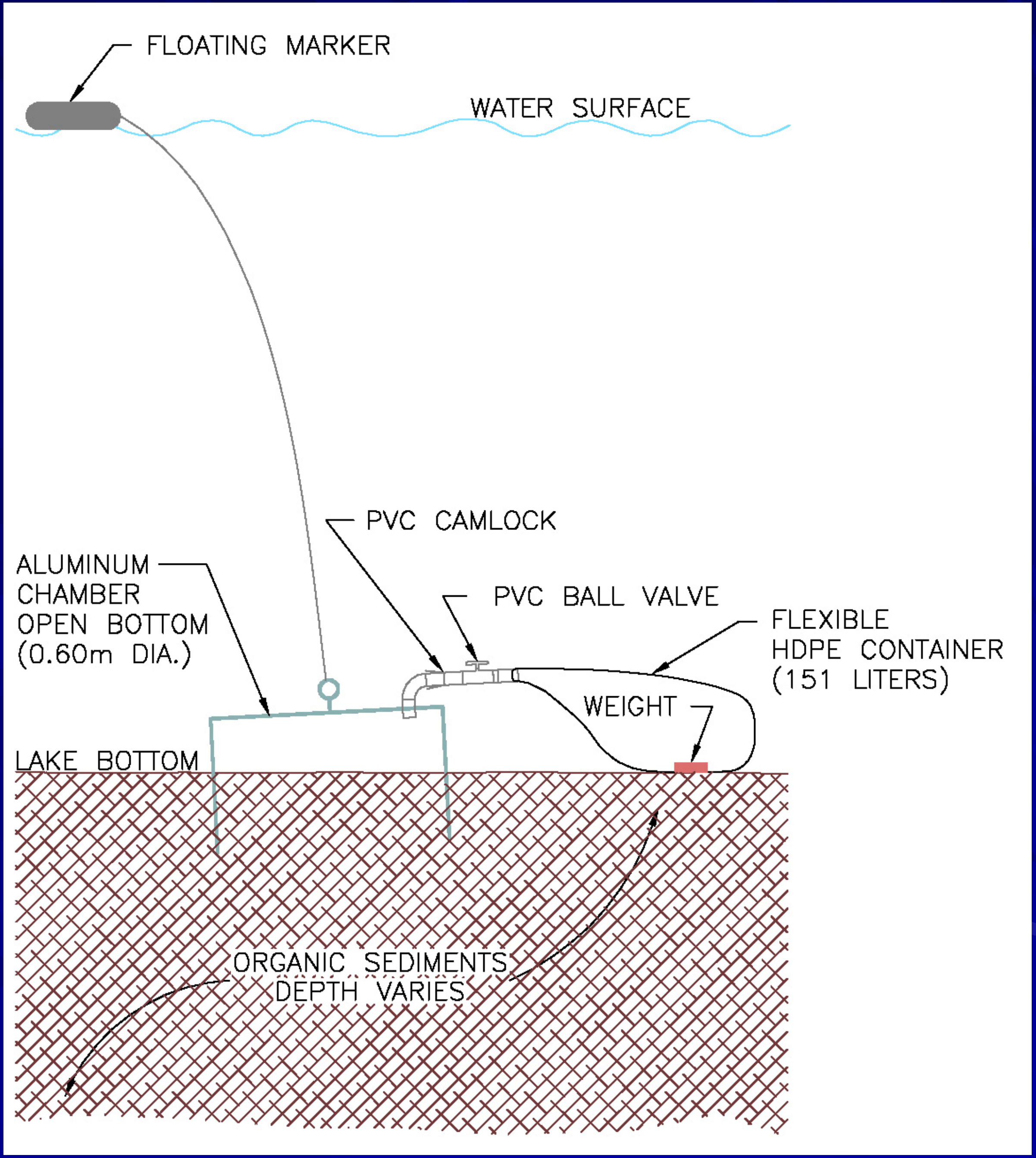


Figure 5-4
Lake Yale – Inflow monitoring Site 6

Figure 5-5
Trout Lake – Inflow monitoring Sites (7 sites)

Seepage Meters Being Prepared for Installation in Lake Yale and Trout Lake

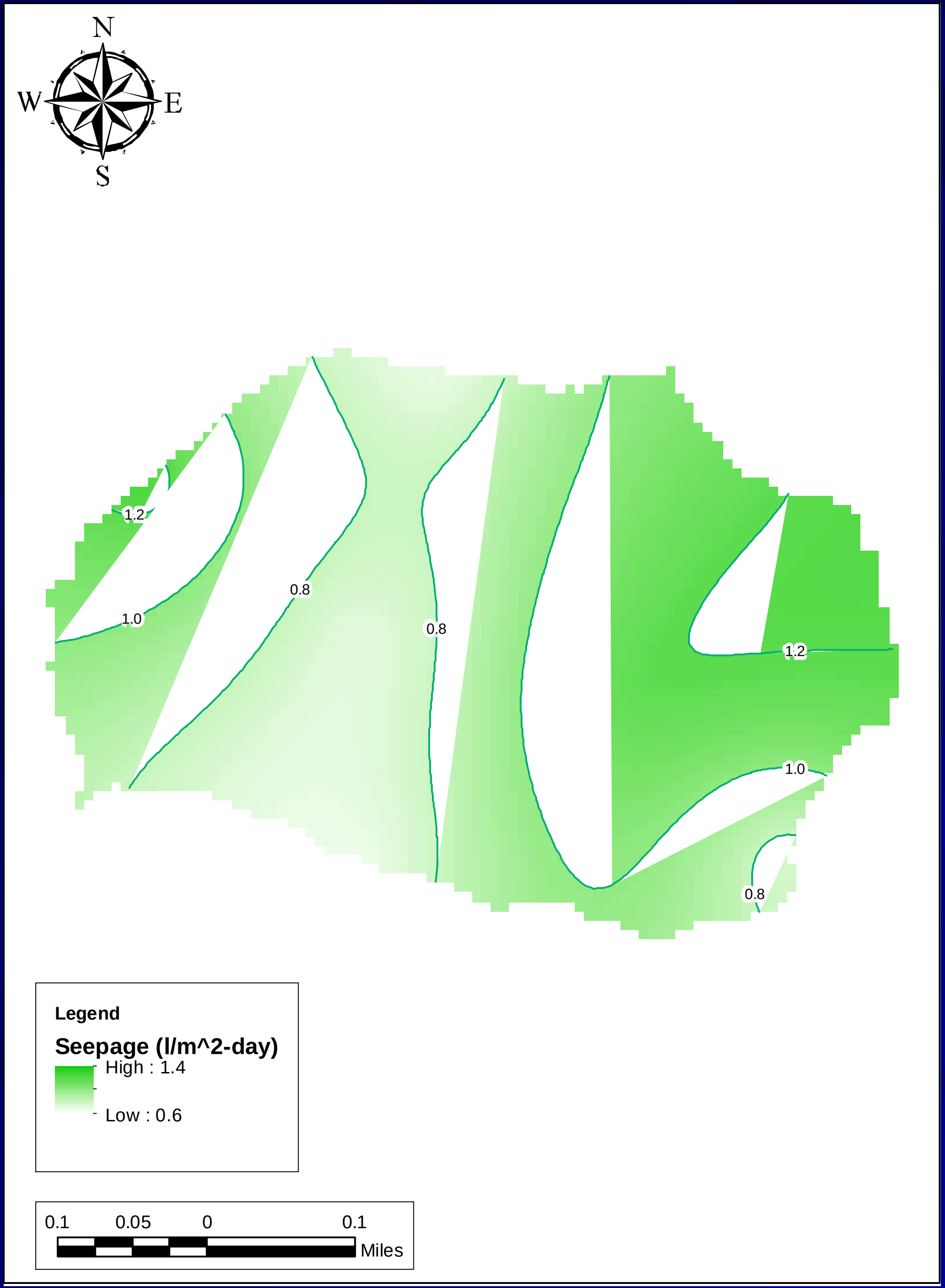
Typical seepage meter installation



Seepage Monitoring Sites in Lake Yale

Seepage Monitoring Sites in Trout Lake

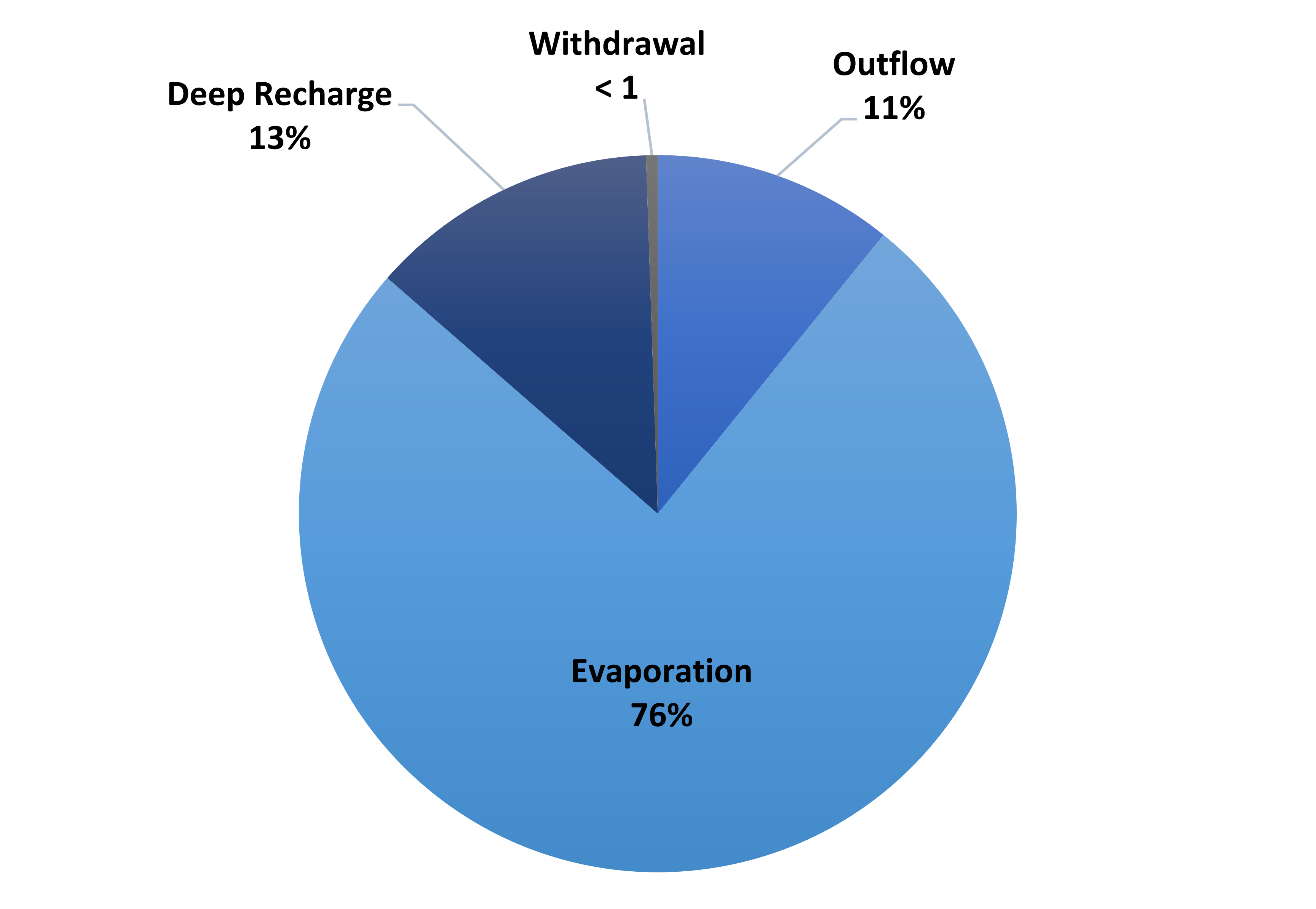
Isopleths of Mean Seepage Inflow to Trout Lake from June 2015-October 2016



Calculated Hydrologic Inputs to Lake Yale

Source	Annual Inflow (ac-ft/yr)	Percent Of Total (%)
Precipitation	16,608	75
Runoff	1,437	7
Direct Overland Flow	17	< 1
Groundwater Seepage	4,044	18
TOTAL:	22,106	100

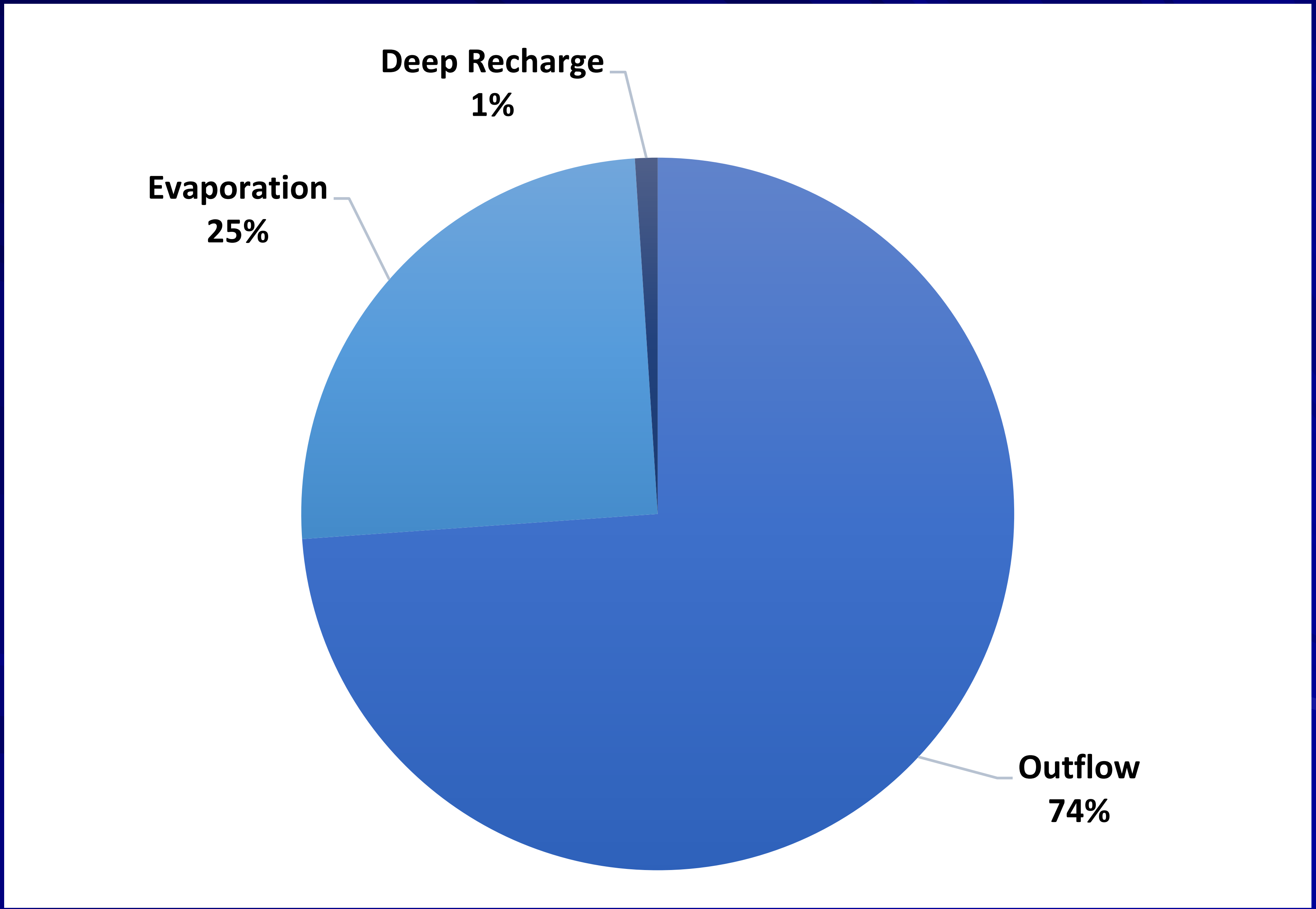
Summary of Mean Annual Hydrologic Losses from Lake Yale



Calculated Hydrologic Inputs to Trout Lake

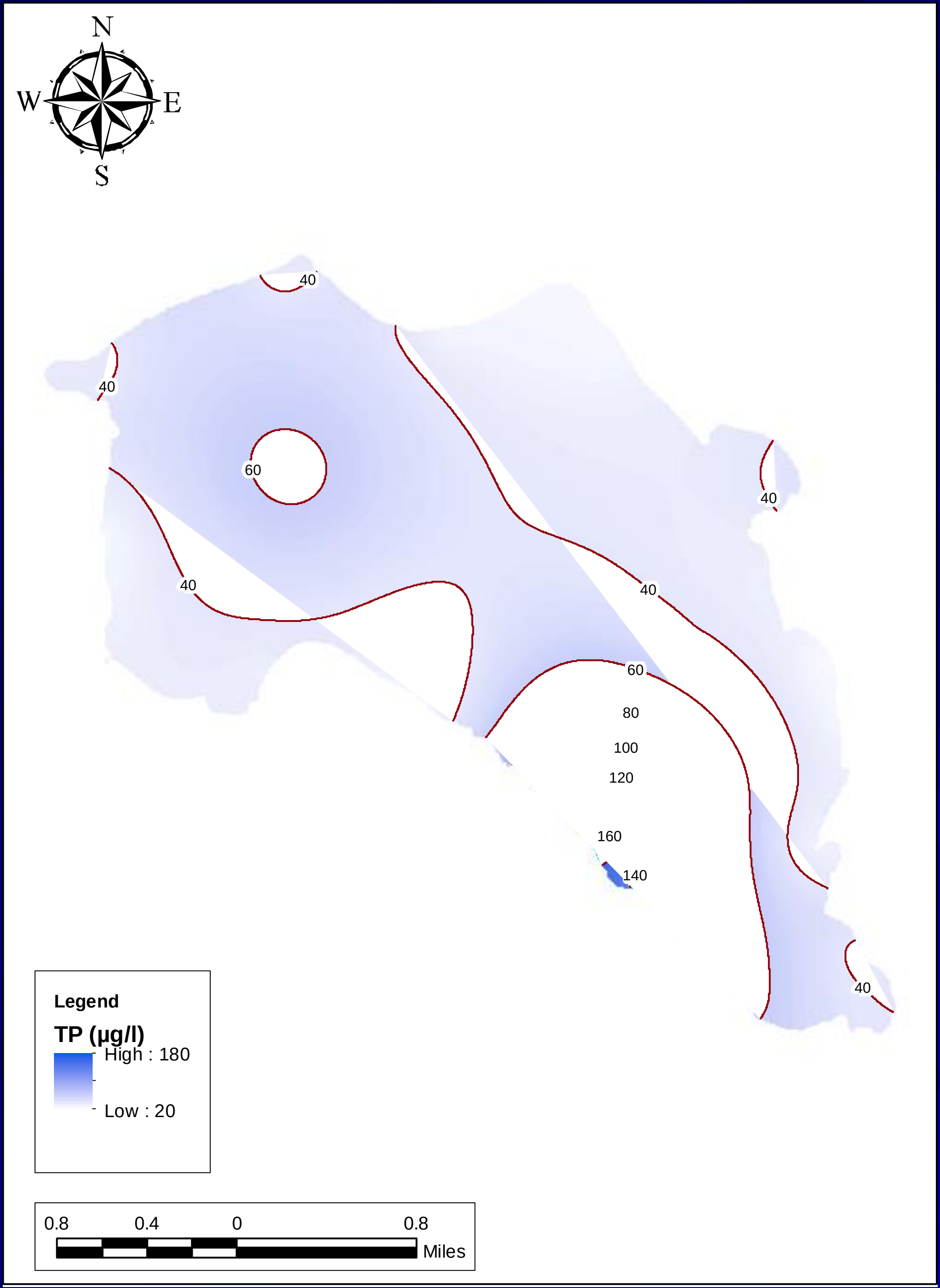
Source	Annual Inflow (ac-ft/yr)	Percent Of Total (%)
Precipitation	440	25
Runoff	1,201	68
Direct Overland Flow	0.1	< 1
Groundwater Seepage	121	7
TOTAL:	1,762	100

Summary of Mean Annual Hydrologic Losses from Trout Lake



Calculated Mean Annual Residence Times in Lake Yale and Trout Lake

Lake	Lake Volume (ac-ft)	Annual Inflow (ac-ft/yr)	Mean Residence Time (days)
Yale	43,094	22,107	710
Trout	806	1,762	167



Isopleths of Mean Total Phosphorus Concentrations in Seepage Samples Collected in Lake Yale from June 2015-October 2016

Calculated Mean Annual Loadings of Total Nitrogen, Total Phosphorus, and TSS Discharging to Lake Yale

Source	Total Nitrogen Loading		Total Phosphorus Loading		TSS Loading	
	kg/yr	% of Total	kg/yr	% of Total	kg/yr	% of Total
Bulk Precipitation	15,771	64	1,249	13	354,340	95
Runoff	2,985	12	507	5	16,984	5
Overland Flow	27	< 1	1.6	< 1	162	< 1
Groundwater Seepage	4,341	18	149	2	0	0
Internal Recycling	1,429	6	7,981	80	0	0
TOTALS:	24,553	100	9,888	100	371,486	100

Calculated Mean Annual Loadings of Total Nitrogen, Total Phosphorus, and TSS Discharging to Trout Lake

Source	Total Nitrogen Loading		Total Phosphorus Loading		TSS Loading	
	kg/yr	% of Total	kg/yr	% of Total	kg/yr	% of Total
Bulk Precipitation	418	8	33.1	6	9,382	46
Runoff	2,722	50	214	40	10,796	54
Overland Flow	< 1	< 1	0.0	< 1	1	< 1
Groundwater Seepage	644	12	108	21	0	0
Internal Recycling	1,585	30	172	33	0	0
TOTALS:	5,368	100	527	100	20,179	100

Comparison of Estimated TMDL and ERD Calculated Loadings of Total Phosphorus to Lake Yale

Source	Annual Total Phosphorus Load (kg/yr)	
	TMDL	ERD
Bulk Precipitation	1432 (combined)	1249
Runoff + Overland Flow		509
Groundwater Seepage	Not Included	149
Internal Recycling	Not Included	7,981
TOTAL:	1,432	9,888

Comparison of Estimated TMDL and ERD Calculated Loadings of Total Nitrogen and Total Phosphorus to Trout Lake

Source	Annual Total Nitrogen Load (kg/yr)		Annual Total Phosphorus Load (kg/yr)	
	TMDL	ERD	TMDL	ERD
Bulk Precipitation	50	418	25	33
Runoff + Overland Flow	10,734	2,722	1,141	214
Groundwater Seepage	176[1]	644	14.5	108
Internal Recycling	Not Included	1,585	Not Included	172
TOTAL:	10,959	5,368	1,180	527

1. Includes only "failed" septic tanks

Management Philosophy

- P loadings must be controlled to improve water quality in Lake Yale and Trout Lake
- Management of P loadings should emphasize significant inputs
- Smaller inputs should be managed as opportunities arise

Source	Trout Lake	Lake Yale
	TP Loading (kg/yr)	TP Loading (kg/yr)
Bulk Precipitation	33	1249
Runoff + Overland Flow	214	509
Groundwater Seepage	108	149
Internal Recycling	172	7,981
Totals	527	9,888

- Lake Yale – internal recycling and runoff as opportunities arise
- Trout Lake – internal recycling and runoff

Summary of Significant Sub-basin Areas Discharging to Lake Yale

Sub-Basin	Basin Area (acres)	Annual TP Load (kg/yr)	Percent Of Annual TP Load (%)	Retrofit Feasibility	Explanation
Lake Yale Wetland (LYW 01-01)	4,062	53.4	10.5 (0.5% of TP load to lake)	Low	This sub-basin consists of diffuse overland flow through a hardwood wetland with no practical method of accumulating runoff for treatment. Upstream projects would not be effective due to the water quality equilibrium which is achieved in the wetland.
LYD 11-01	639.5	45.1	8.9 (0.4% of TP load to lake)	Low	This sub-basin consists of agricultural and wetland areas connected with a series of farm canals and ditches. Discharge to Lake Yale occurs through a single shallow canal. Land is available for a BMP near the lake, but the land is in private ownership.
LYD 12-01	399.7	30.8	6.1 (0.3% of TP load to lake)	Moderate	This sub-basin consists primarily of agriculture with a small area of residential use. Drainage is collected in a series of farm ditches which become navigable channels in the residential area. Runoff from this area had elevated TP concentrations. Runoff could be diverted to an adjacent sub-basin for treatment.
LYD 13-01	757.1	97.8	19.2 (1.0% of TP load to lake)	Moderate	This sub-basin consists of a combination of agriculture, wetlands, and residential land uses. Drainage is collected in a series of farm ditches which become navigable channels in the residential areas. Opportunity to combine treatment with an existing system south of the sub-basin.
LYD 14-01	97.0	146.8	28.8 (1.5% of TP load to lake)	Unknown	This relatively small sub-basin has a high TP loading due to a runoff sample that indicated an extremely highly TP concentration. The source of this elevated TP concentration should be investigated and identified, and remedial action taken, if necessary.

Conceptual Design for a Stormwater Treatment System for Sub-basins LYD 12-01 and 13-01

Estimated Application Costs for Sediment Inactivation and Control of Groundwater Seepage in Lake Yale

(Based on 4 separate applications)

Parameter		Quantity/ Treatment	Units	Unit Cost ($)	Cost/ Treatment ($)	Total Cost ($)
Chemical Costs	Alum	1,287,584	gallons	0.45[1]	579,413	2,317,651
Labor Costs	Planning/Mobilization	1	each	15,000	15,000	60,000
	Chemical Application	287	tankers	1,350[2]	387,450	1,549,800
Monitoring/ Lab Testing	Field Monitoring	1	each	1,000	1,000	4,000
	Lab Analyses (pre/post)	16	samples	200	3,200	12,800
				TOTAL:	$ 986,063	$ 3,944,251

1. Assumed contract cost
2. Includes raw labor, water quality monitoring, insurance, expenses, application equipment, mileage, and rentals

Summary of Significant Sub-basin Areas Discharging to Trout Lake

Sub-Basin	Basin Area (acres)	Annual TP Load (kg/yr)	Percent Of Annual TP Load (%)	Retrofit Feasibility	Explanation
Hicks Ditch	7,579	156.5	73.2 (29.7% of TP load to lake)	In Progress	This sub-basin consists of diffuse overland flow from agricultural and wetland areas. A state funded project is currently underway to provide chemical treatment for this sub-basin near CR 44, with the treated water pumped to Trout Lake and bypassing the Trout Lake wetland area.
Trout Lake Wetland	1,102	20.9	9.8 (4.0% of TP load to lake)	Low	This sub-basin consists of large hardwood wetland areas that discharge to Trout Lake through diffuse overland flow with no practical method of accumulating runoff for treatment. Treatment systems in upstream portions of the sub-basin would be degraded during travel through the wetland.
TL 07-01	511	25.0	11.7 (4.7% of TP load to lake)	Low	This sub-basin consists of a combination of wetlands and residential land uses. Drainage is collected in a series of swales which discharge into the adjacent wetlands or canals. No feasible opportunities for BMP projects.

Estimated Total Phosphorus Load Reductions for the Hicks Ditch Alum Treatment System

Parameter	Units	Value
Runoff Total Phosphorus Load	kg/yr	156.5
Removal by Alum System	%	75
Annual Total Phosphorus Load Reduction	kg/yr	117.4

Potential exists for system to actually increase algal growth due to color reduction

Estimated Application Costs for Sediment Inactivation and Control of Groundwater Seepage in Trout Lake

(Based on 5 separate applications)

Parameter		Quantity/ Treatment	Units	Unit Cost ($)	Cost/ Treatment ($)	Total Cost ($)
Chemical Costs	Alum	49,248	gallons	0.45[1]	22,162	110,809
Labor Costs	Planning/Mobilization	1	each	10,000	10,000	50,000
	Chemical Application	11	tankers	1,500[2]	16,500	82,500
Monitoring/ Lab Testing	Field Monitoring	1	each	750	750	3,750
	Lab Analyses (pre/post)	20	samples	200	4,000	20,000
				TOTAL:	$ 53,412	$ 267,059

1. Assumed contract cost
2. Includes raw labor, water quality monitoring, insurance, expenses, application equipment, mileage, and rentals

Summary of Anticipated Load Reductions for Evaluated Water Quality Improvement Projects in Lake Yale

Treatment Option	Current Phosphorus Load (kg/yr)	Assumed TP Load Reduction (%)	Phosphorus Load Reduction (kg/yr)	Modified Phosphorus Load (kg/yr)
Sub-basins 12 and 13 Pond	128.6	65	83.6	45.0
Sediment Inactivation	8,130[1]	80	6,054	1,596

1. Includes 7,981 kg/yr from internal recycling and 149 kg/yr from groundwater seepage

Modeled Water Quality Benefits from the Evaluated Water Quality Improvement Options for Lake Yale

Option	Mean Total Phosphorus Concentration (μg/l)	Mean Chlorophyll-a Concentration (mg/m^3)	Mean Secchi Disk Depth (m)	TSI Value
Existing Conditions	28	21.2	0.61	71
Sub-basins 12 and 13 Pond	28	21.0	0.62	70
Alum Sediment Inactivation	9	6.9	1.6	48
Alum Sediment Inactivation + Sub-basins 12 and 13 Pond	9	6.7	1.7	47

Summary of Anticipated Load Reductions for Evaluated Water Quality Improvement Projects in Trout Lake

Treatment Option	Current Phosphorus Load (kg/yr)	Assumed TP Load Reduction (%)	Phosphorus Load Reduction (kg/yr)	Modified Phosphorus Load (kg/yr)
Hicks Ditch	156.5	75	117	39.5
Sediment Inactivation[1]	281	80	225	56.0

1. Includes 172 kg/yr from internal recycling and 109 kg/yr from groundwater seepage

Modeled Water Quality Benefits from the Evaluated Water Quality Improvement Options for Trout Lake

Option	Mean Total Phosphorus Concentration (µg/l)	Mean Chlorophyll-a Concentration (mg/m^3)	Mean Secchi Disk Depth (m)	TSI Value
Existing Conditions	216	57.6	0.60	92
Hicks Ditch BMP	170	44.8	0.77	87
Sediment Inactivation	120	31.2	1.07	79
Hicks Ditch + Sediment Inactivation	75	18.8	1.70	68

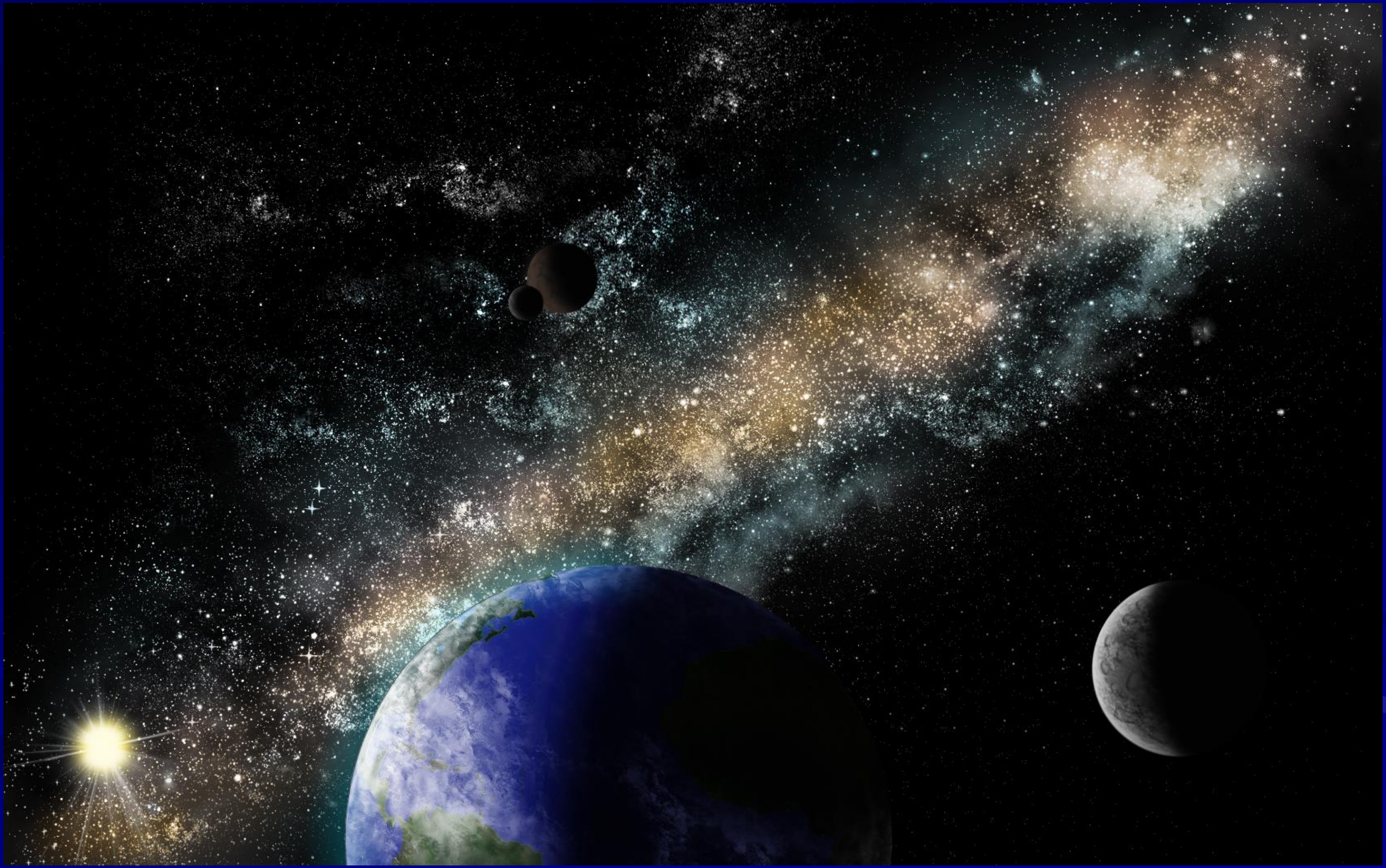
Recommended Management Options for Lake Yale

Issue		Recommendation
Treatment of Stormwater Inputs	a.	Construct treatment pond option for Sub-basins 12 and 13 (if feasible)
	b.	Evaluate sources of elevated total phosphorus concentrations originating from Sub-basin 14
Rear Yard Berms and Swales	a.	Require construction of berms and swales for all future shoreline development in Lake Yale
Vegetation Control	a.	Continue to manage tussocks as needed, preferably using mechanical means
Re-vegetation	a.	Allow submerged vegetation to recolonize as water column clears
Internal Recycling/ Groundwater Seepage Inputs	a.	Conduct a whole-lake alum treatment to control internal recycling and remove phosphorus from seepage inflows
Lawn Maintenance Activities	a.	Conduct education and enforcement for new fertilizer ordinance
Public Education	a.	Initiate public education program to inform residents of link between watershed activities and water quality
Boating	a.	Restrict normal boating activities to areas >10 ft in depth; 15 ft for enhanced wake boats; 6 ft for jet skis; idle speed in all other areas

Recommended Management Options for Trout Lake

Issue	Recommendation
Treatment of Stormwater Inputs	a. Complete current alum treatment system for Hicks Ditch
Rear Yard Berms and Swales	a. Construct berms and swales for future development along shoreline areas of Trout Lake
Vegetation Control	a. Control nuisance vegetation along shoreline
Internal Recycling/ Groundwater Seepage Inputs	a. Conduct a whole-lake alum treatment to control internal recycling and remove phosphorus from seepage inflows
Lawn Maintenance Activities	a. Conduct education and enforcement for new fertilizer ordinance
Public Education	a. Initiate public education program to inform residents of link between watershed activities and water quality
Boating	a. Restrict normal boating activities to areas >10 ft in depth; 6 ft for jet skis; idle speed in all other areas

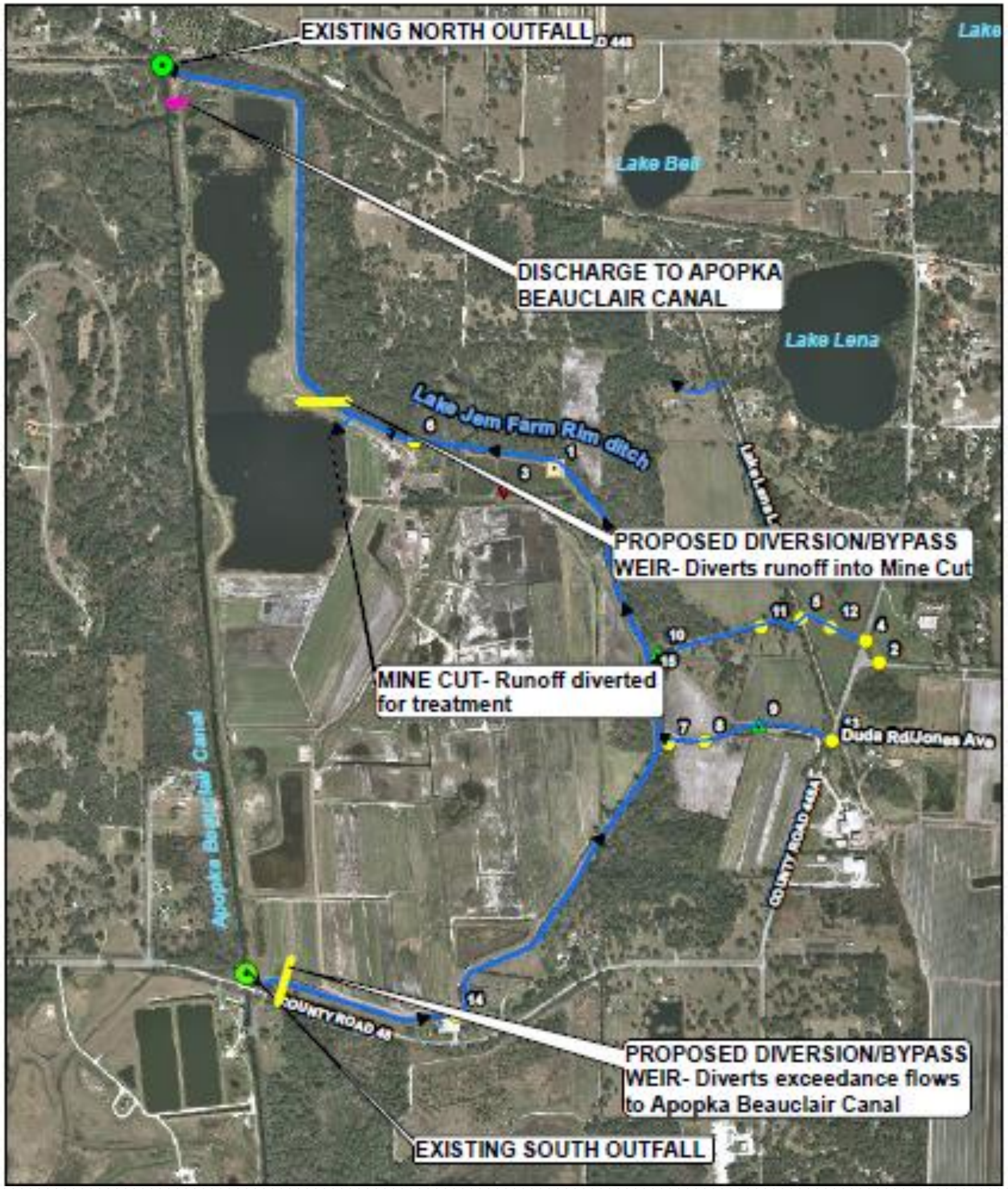
Questions?



Project Summary

Project #	Project Name	Cost	Lbs TP Removed	Cost/lb over 20-yr life	Annual Maintenance	Comment
1	ABC Ag diversion to Mine Pit	$757,000	1,809/yr	$21	$10,000	Cost includes 250k for mine purchase
2	Lake Yale Whole Lake Alum	$3,944,000	14,326/yr	$28	$0	4 applications, enough to cover 10 yrs of groundwater
3	Lake Denham Muck Farm Buyout	$1,200,000	1,100/yr	$54	$20,000	Pollutant removal would occur for perpetuity
4	Trout Lake Whole Lake Alum	$267,000	493/yr	$54	0	4 applications, enough to cover 10 yrs of groundwater
5	ABC Ag North Treatment Pond	$2,412,000	1519/yr	$86	$6,000	includes land purchase
6	ABC Ag Diversion to NuRF	$1,252,000	1836/yr	$97	$115,300	includes purchase of alum
7	Lake Yale Stormwater Basins 12& 13	$699,000	184/yr	$190	$20,000	Includes 40k for land purchase
8	Lake Yale Muck Dredging	$523,000,000	14,063/yr	$1,859	$0	335M cy muck, assumed 20yr reduction in sediment release
9	Trout Lake Muck Dredging	$6,800,000	303/yr	$5,443	0	367,000 cy muck, assumed 20yr reduction in sediment release

#1 Project - **ABC Ag Diversion to Mine Pit**



- Cost $757,000
- 1,809 lbs. TP removed per yr.
- 20-yr life cost per lb ($21)
- Annual Maintenance $10,000
- Cost includes $250,000 for Mine purchase

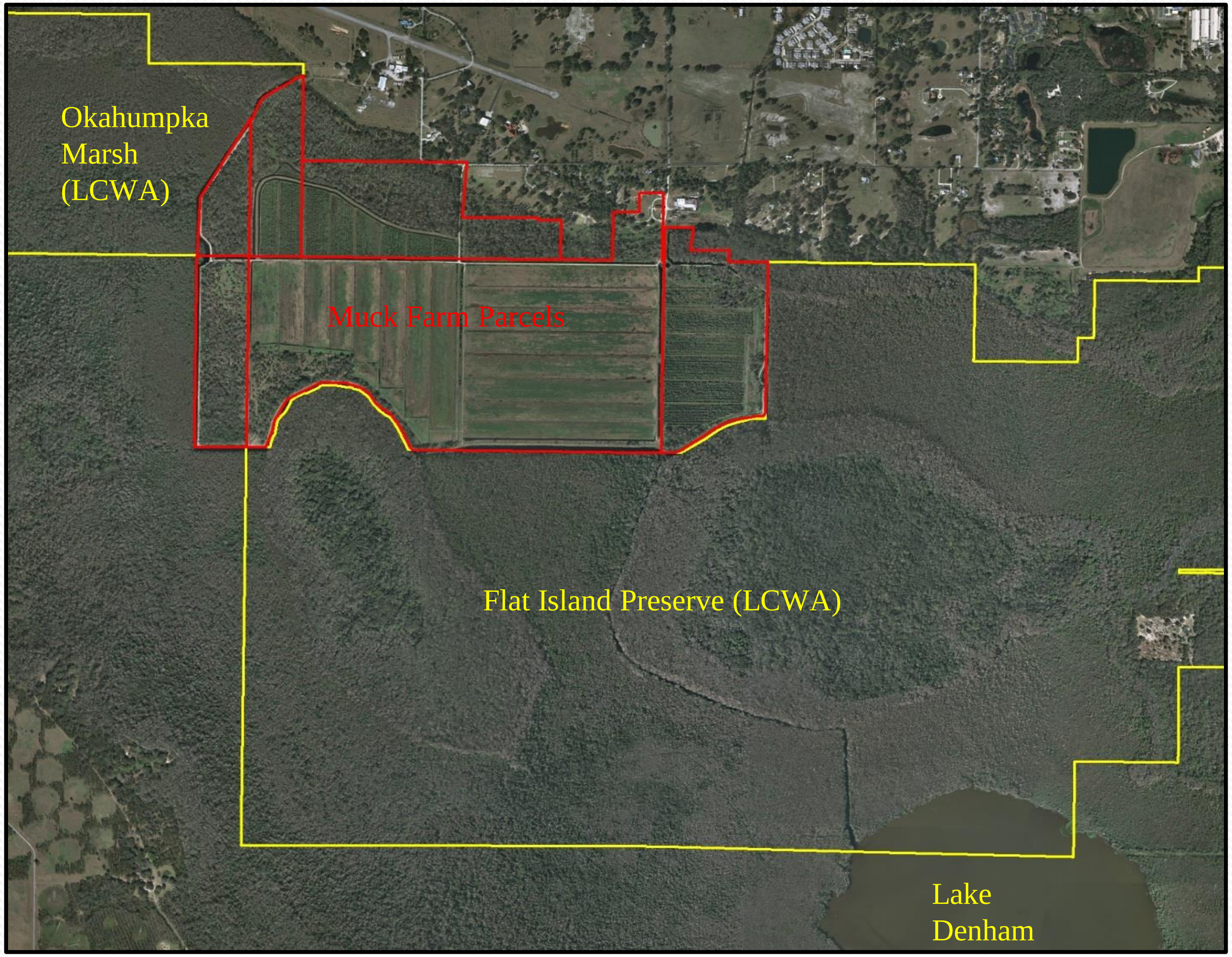
#2 Project – **Lake Yale Whole Lake Alum Treatment**

PARAMETER		UNITS	VALUE
Existing Total Phosphorus Loadings	Internal Recycling – 10 years	kg/yr	79,809
	Seepage Inflow – 10 years	kg/yr	1,490
	Total:	**kg/yr**	**81,299**
Removal by Alum Treatment	Internal Recycling	% kg	80 63,848
	Seepage Inflow	% kg	80 1,192
	Total:	**kg**	**65,040**
Alum Treatment Cost	Internal Recycling + Seepage	$	3,944,251
Total Phosphorus Removal Cost	--	**$/kg $/lb**	**61 28**

1. Assumes a 10-year period of effective control
2. Assumes that 80% of the internal recycling and seepage load is removed

- Cost $3,944,251
- 14,326 lbs. TP removed per yr.
- 10-yr life cost per lb ($28)
- Annual Maintenance $0
- 4 Applications, enough to cover 10 years of groundwater

#3 Project – **Lake Denham Muck Farm Buyout**



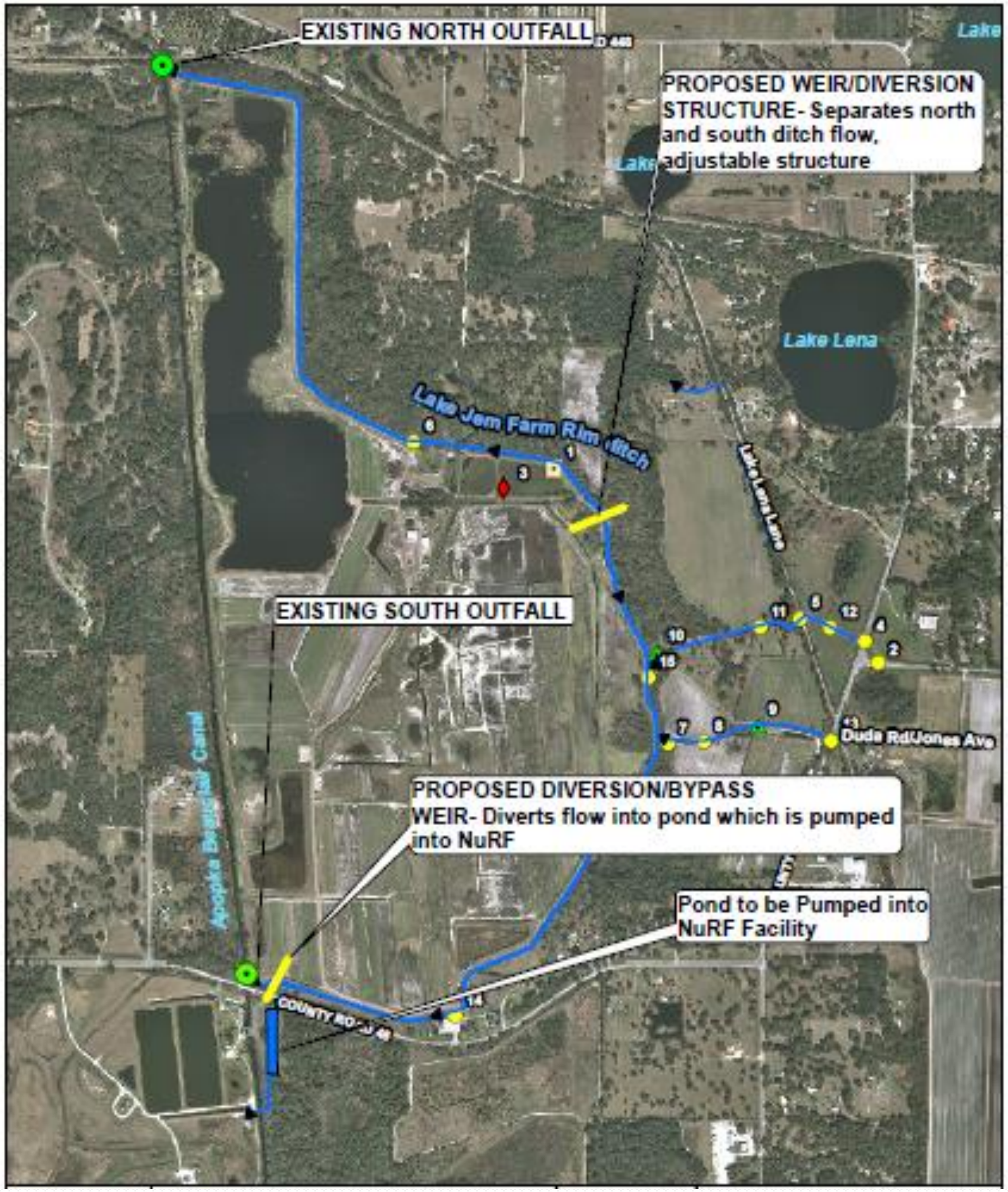
- Cost $1,200,000
- 1,100 lbs. TP removed per yr.
- 20-yr life cost per lb ($54)
- Annual Maintenance $20,000
- Pollutant removal would occur for perpetuity


Questions?

#5 Project - **ABC Ag North Treatment Pond**

- Cost $2,412,000
- 1,519 lbs. TP removed per yr.
- 20-yr life cost per lb ($86)
- Annual Maintenance $6,000
- Cost Includes Land Purchase

#6 Project - **ABC Ag Diversion to NuRF**



- Cost $1,252,000
- 1,836 lbs. TP removed per yr.
- 20-yr life cost per lb ($97)
- Annual Maintenance $115,300
- Includes Purchase of Alum

#7 Project – **Lake Yale Stormwater Basins 12 & 13**

- Cost $699,000
- 184 lbs. TP removed per yr.
- 20-yr life cost per lb ($190)
- Annual Maintenance $20,000
- Includes $40,000 for land purchase