

Water Quality Trends of the Kissimmee Chain of Lakes, Lake Istokpoga and Lake Okeechobee

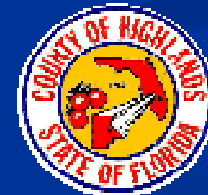


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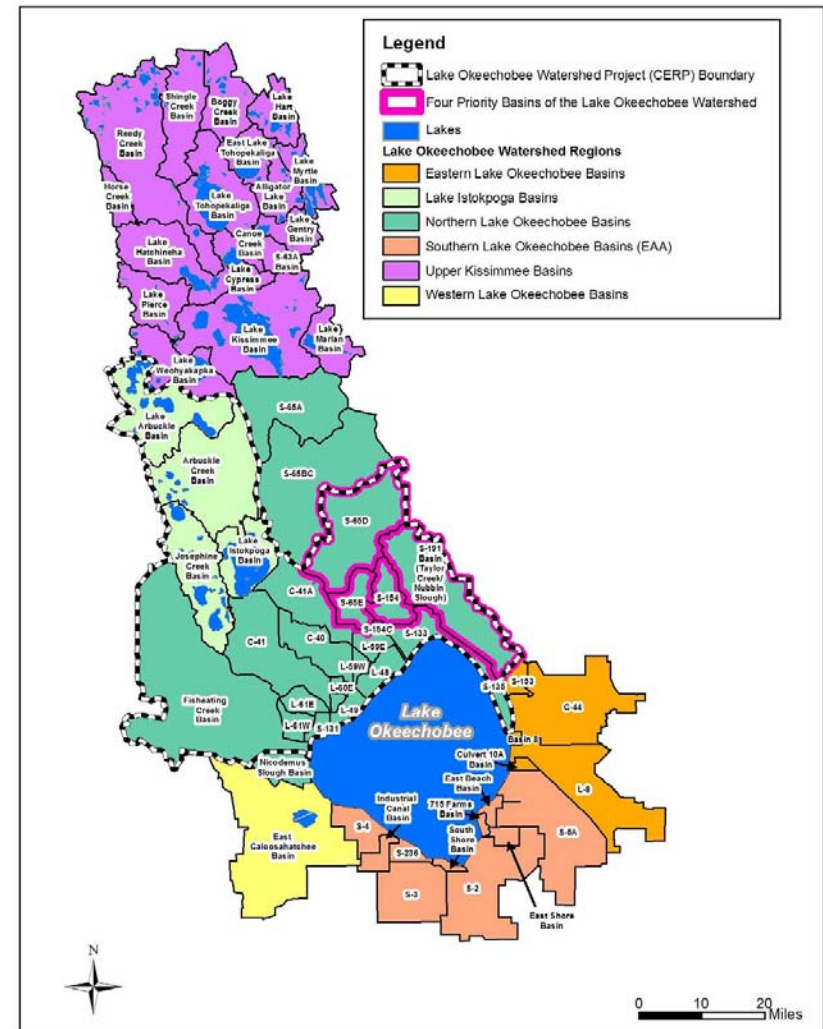


Objectives

- Evaluate long term data for the Kissimmee Chain of Lakes, Lake Istokpoga, Lake Okeechobee
- Determine if trends exist in
 - Nutrients
 - Turbidity and Transparency
 - Chlorophyll
 - Conductivity and Ions
- Determine relationships among lakes
- Look for causality

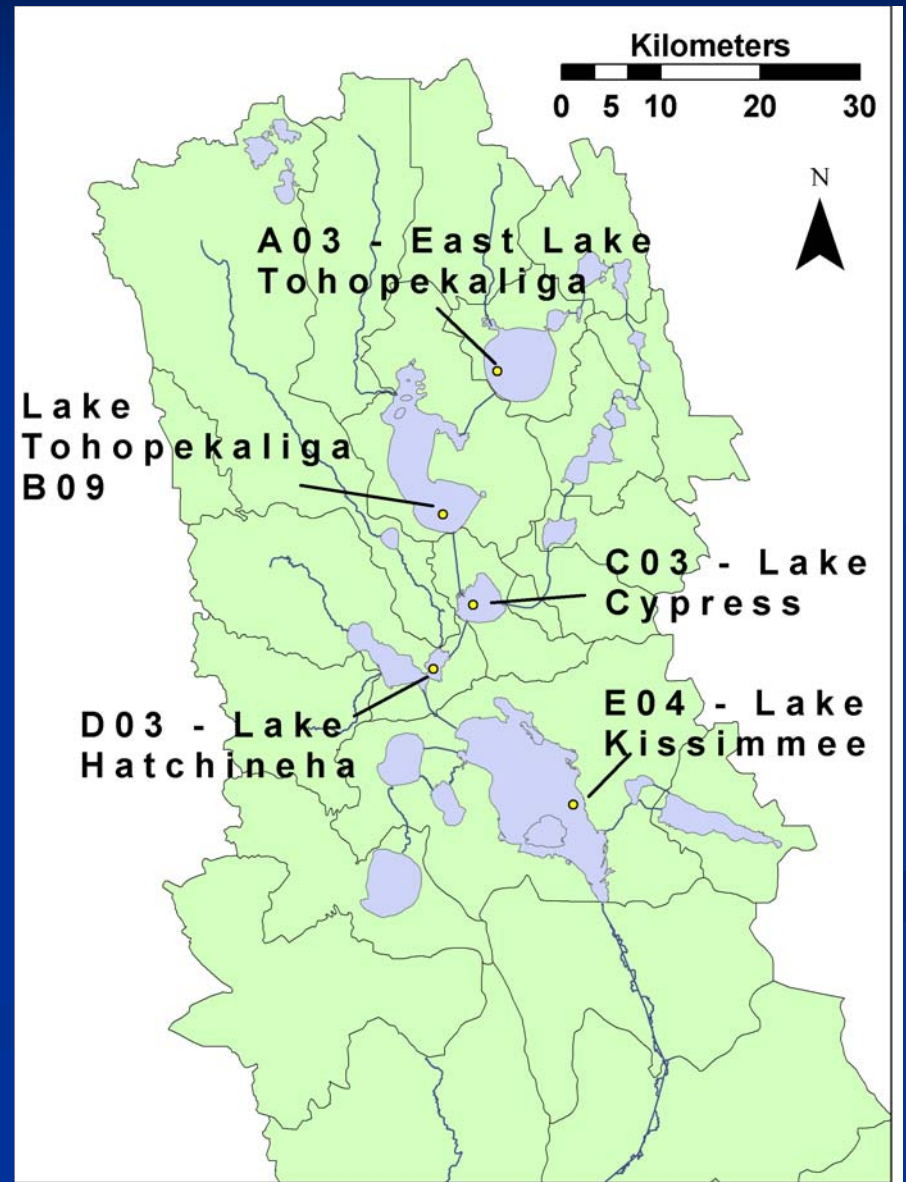
Watershed

- Drainage Area 13,859 km²
- 6 regions
- 61 basins
- Landuse
 - Natural
 - Agricultural
 - Residential
- Changed over time



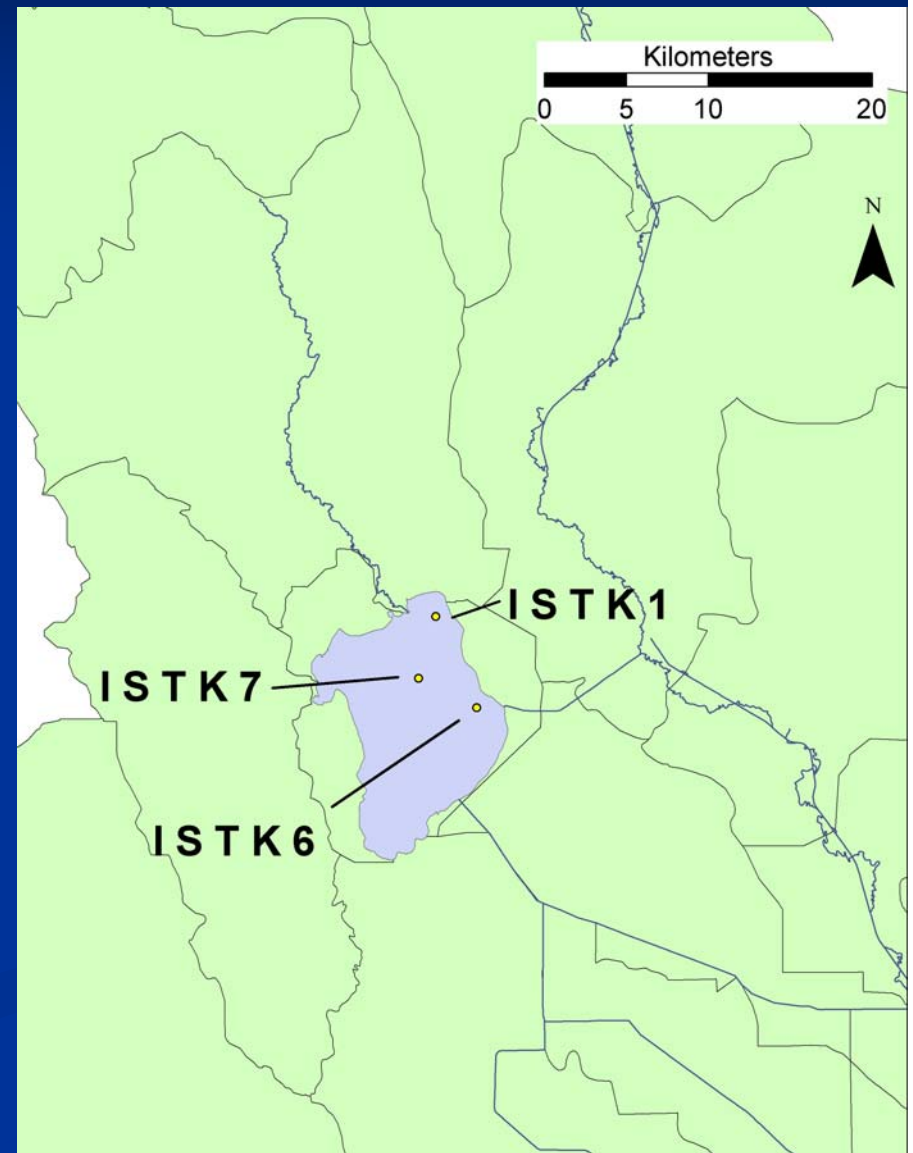
Upper Chain of Lakes

- Headwaters of Kissimmee River
- Sampling began in 1981
- Lakes interconnected by canals
- Water Levels Regulated
- Hydrilla Increased through the 1990s
 - Chemical control has been partially effective
 - Lakewide treatments in late 90s
 - Hurricanes and turbidity helped to control in the 2000s



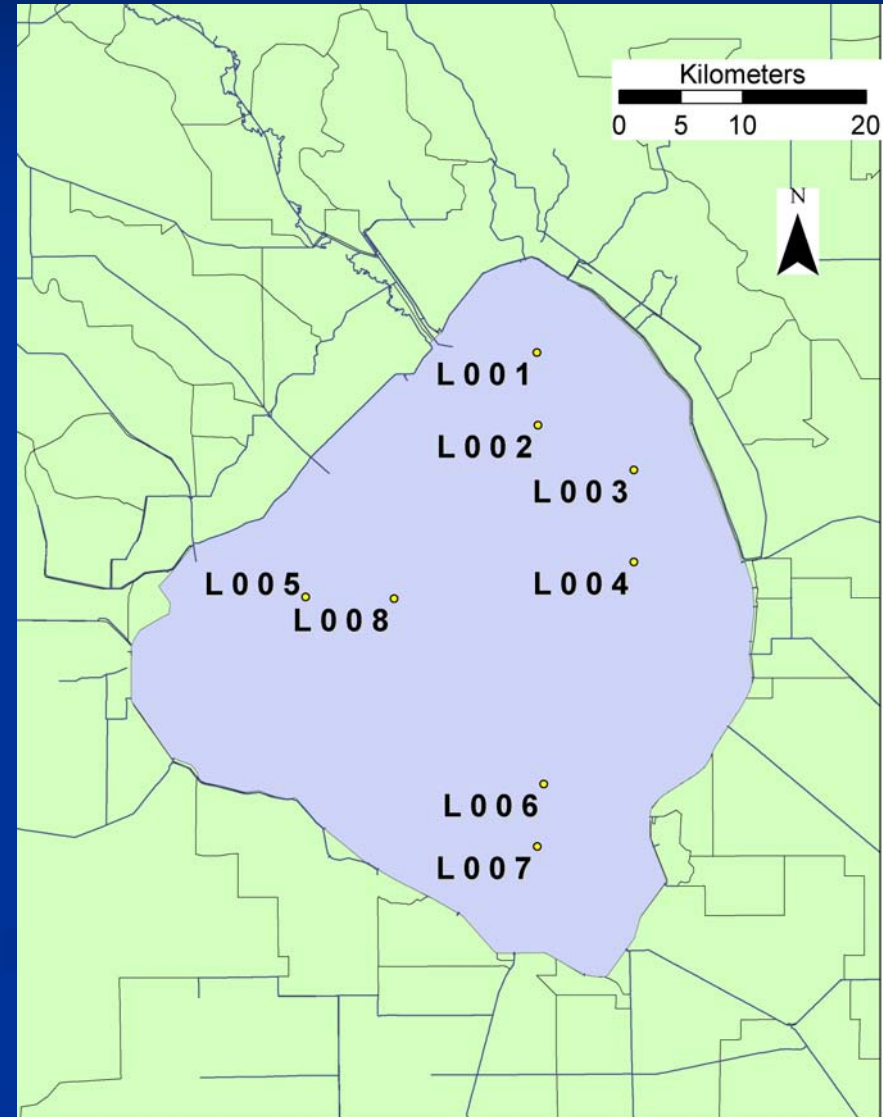
Lake Istokpoga

- Fifth largest Lake in Florida
- Sampled since 1988
- Outflow Structure built in 1961
- Waters regulated within a few feet



Lake Okeechobee

- Largest Lake In Southeast
 - 1730 km²
 - Shallow
- Sampled since 1973
- Surrounded by Herbert Hoover Dike
- All inflow and outflows except Fisheating Creek are regulated



Sampling

- Samples taken on a monthly basis
- Water samples analyzed for ions, nutrients and chlorophyll using standard methods
- Transparency measured with a Secchi Disk

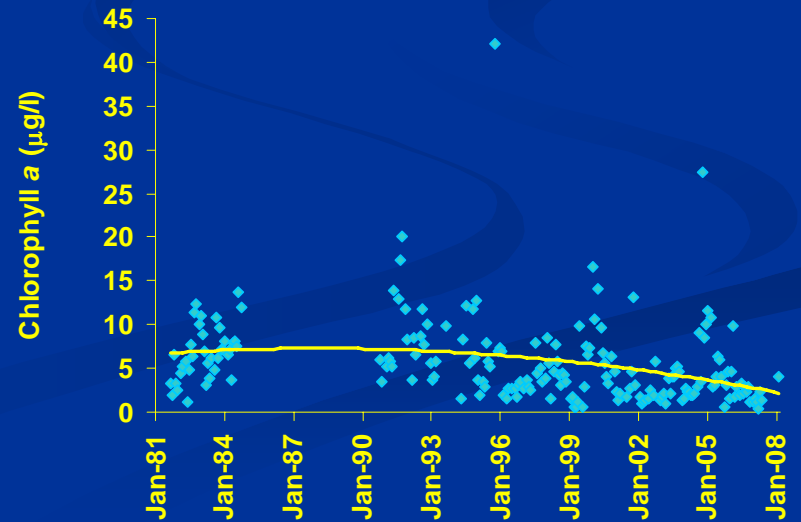
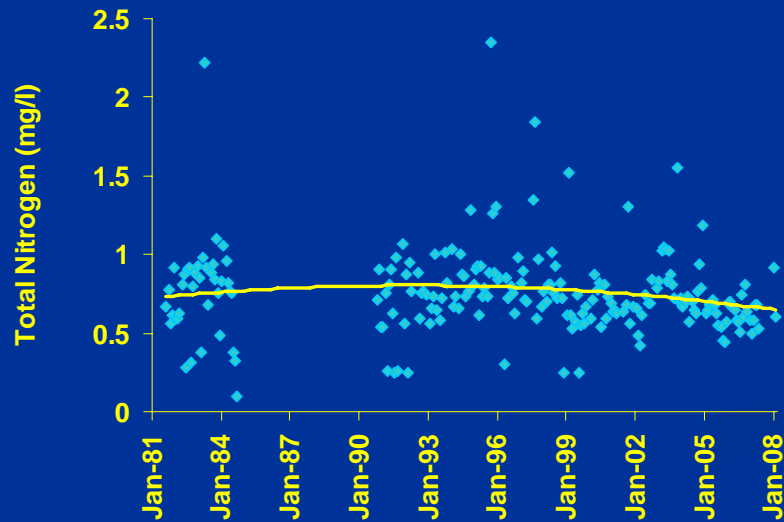
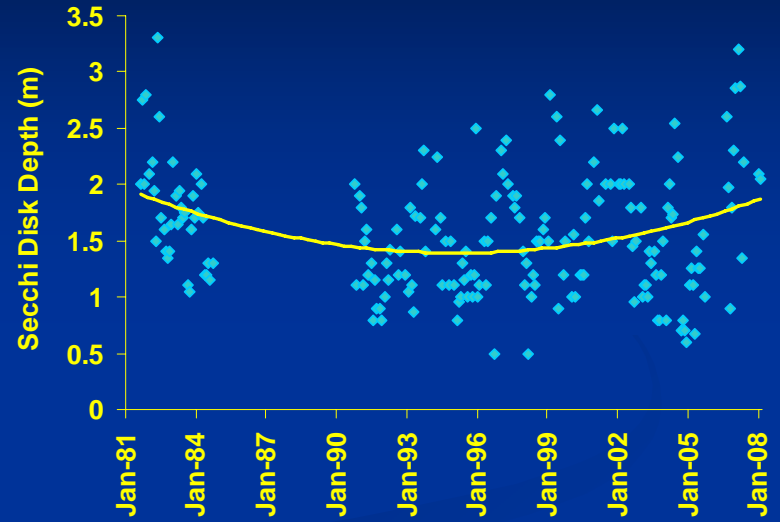
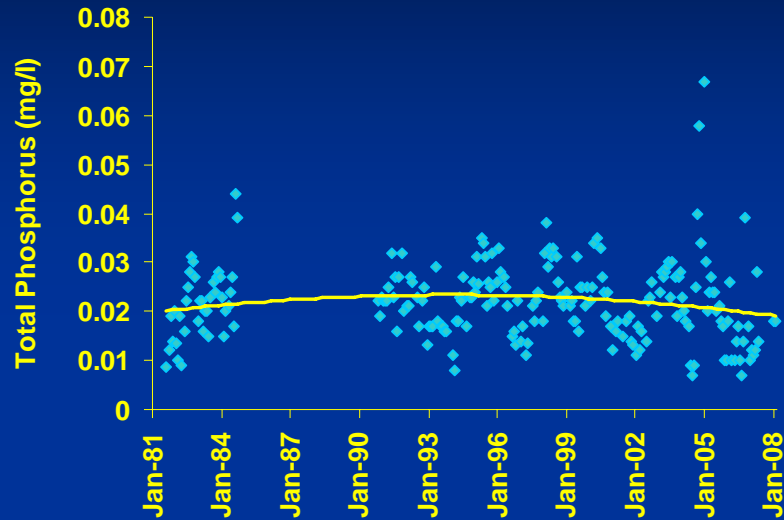
Analysis

- Kendall's Tau analysis
- Graphics
 - Timelines
 - Fit with 2nd order polynomial curve

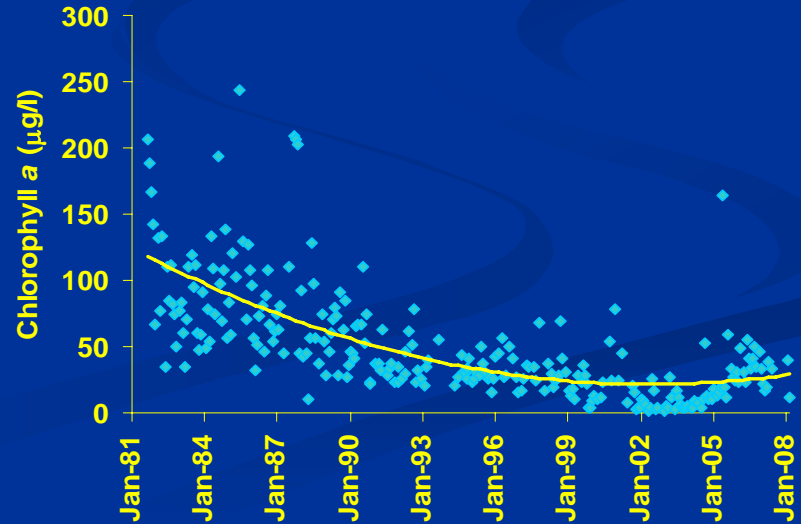
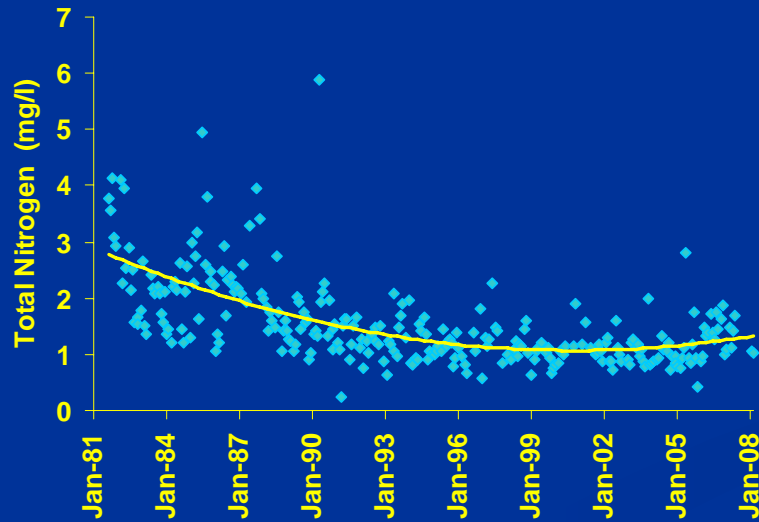
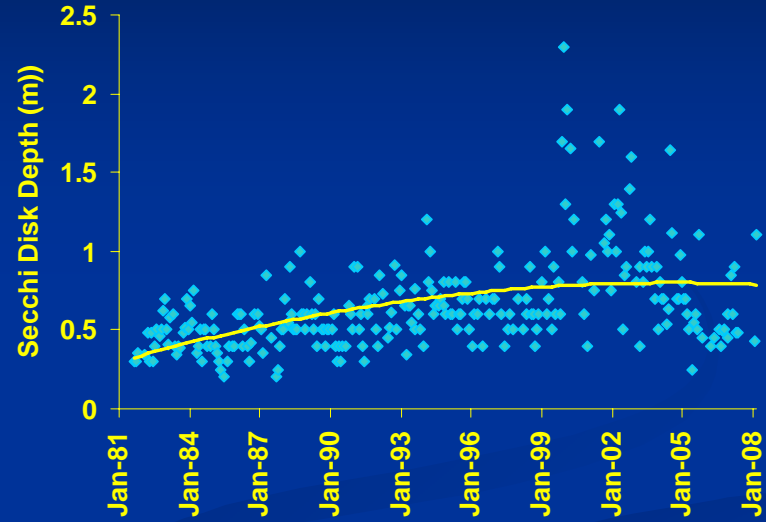
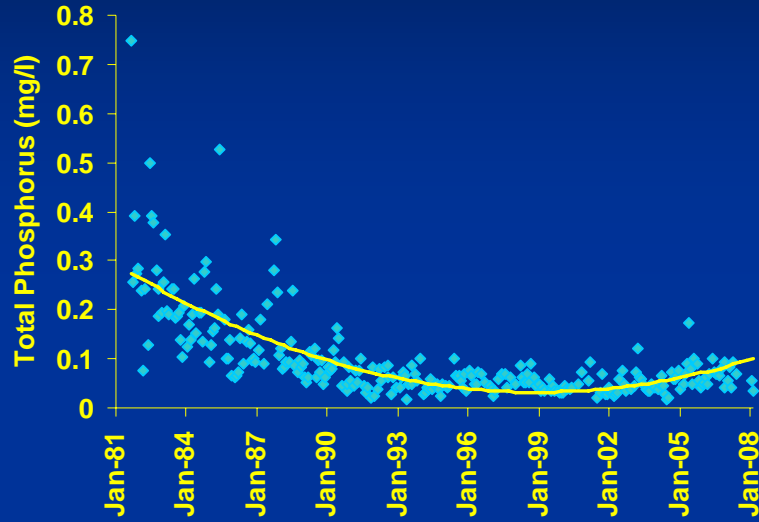
Significant Trends 1981 to 2007

Parameter	East Tohopekaliga	Tohopekaliga	Cypress	Hatchineha	Kissimmee
CA	0.2533				
CL					
SULFATE	-0.2322	-0.3937	-0.1806		-0.2154
SCOND		-1.8571			
TURB	-0.0333	-0.3700			
SECCHI		0.0150			
SI			-0.0238	-0.0617	-0.0190
TP		-0.0045	-0.0021		
SRP					0.0000
TN		-0.0437	-0.0179		-0.0094
DIN	0.0004	0.0003	0.0003		
CHLA	-0.1857	-2.9379	-0.9873		

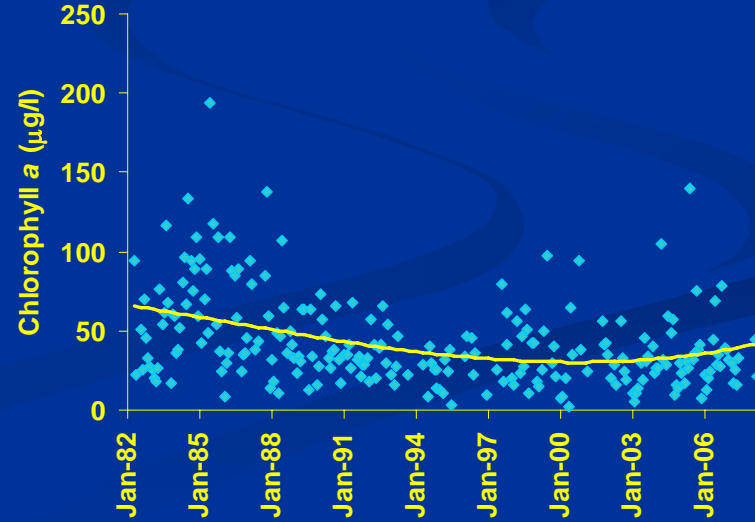
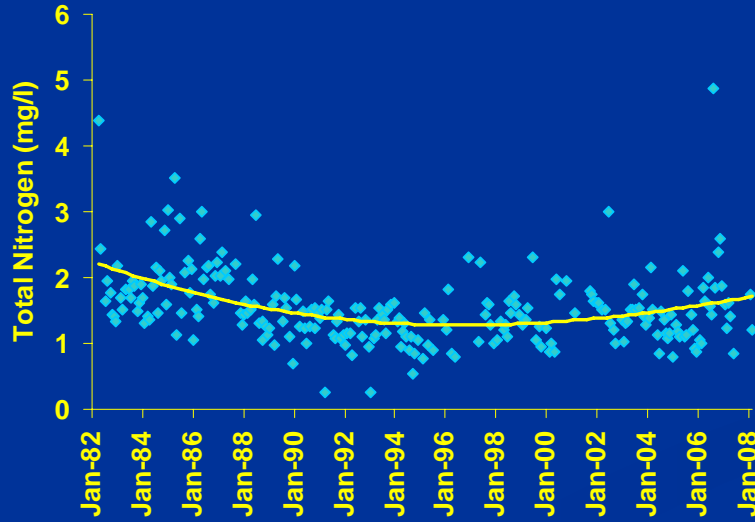
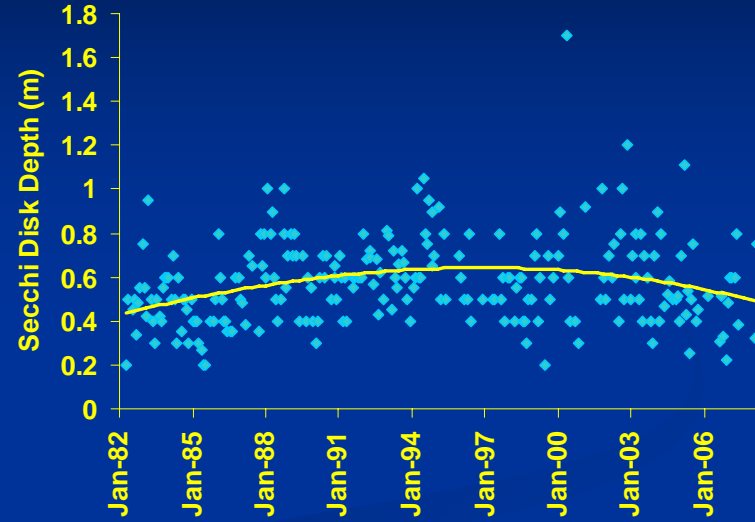
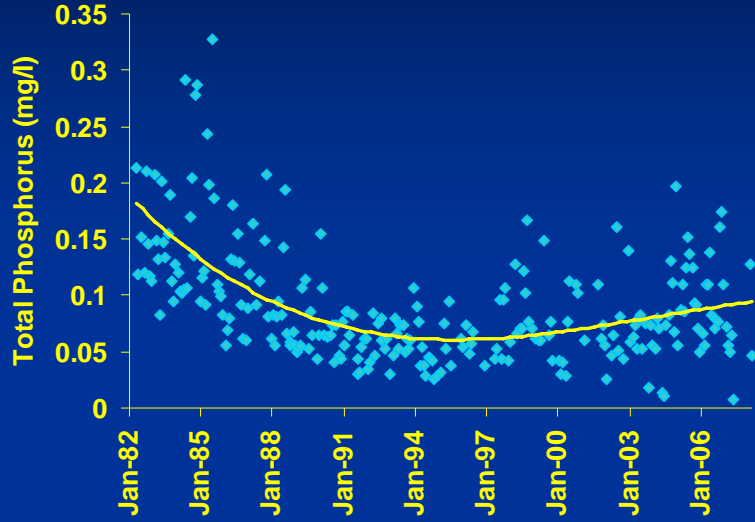
East Lake Tohopekaliga



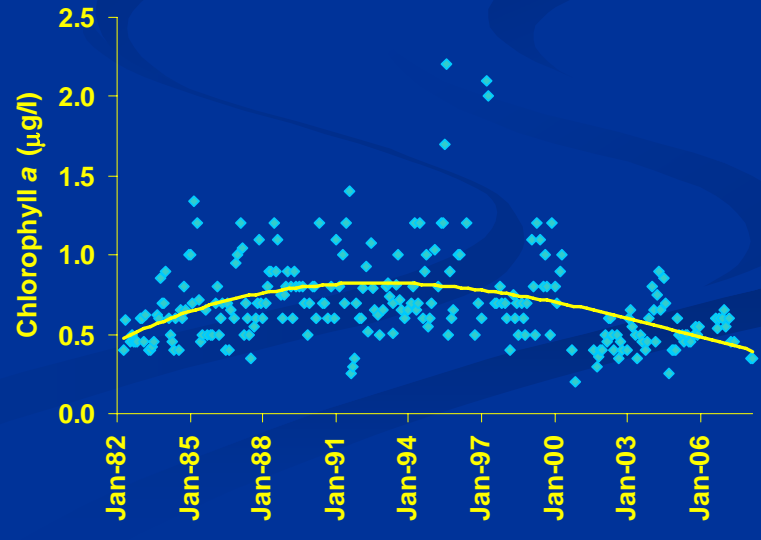
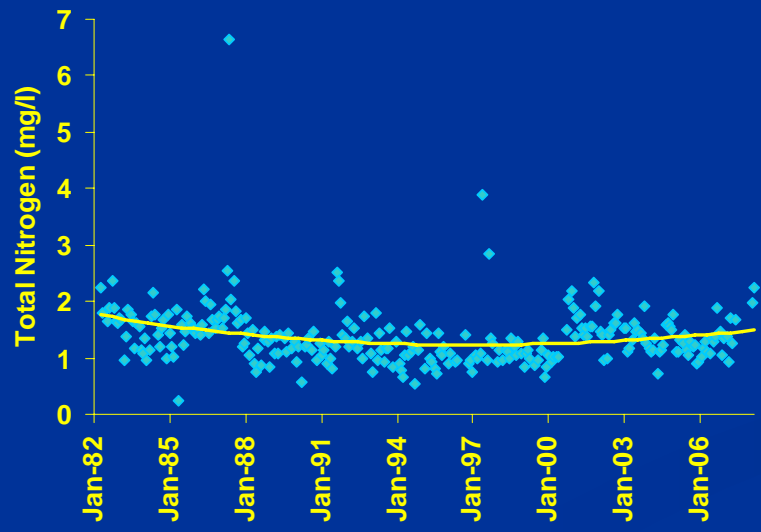
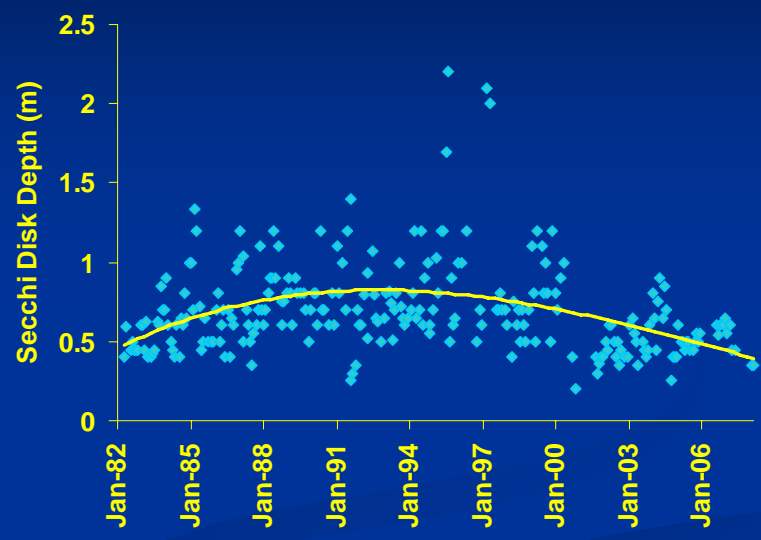
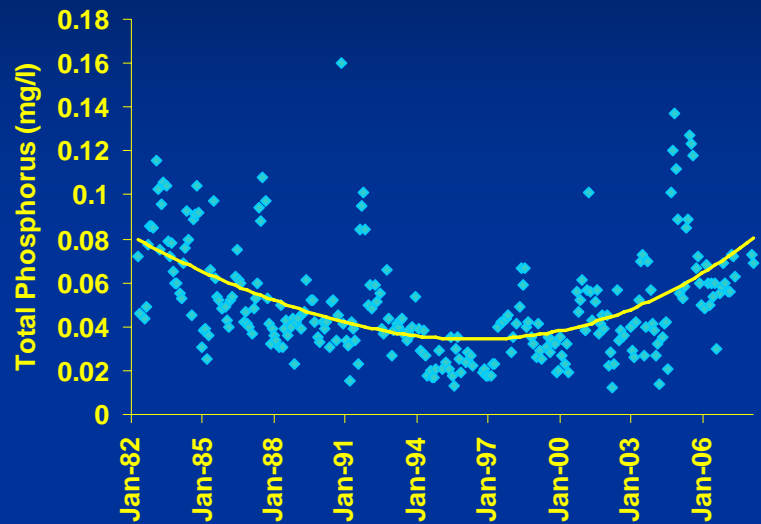
Lake Tohopekaliga



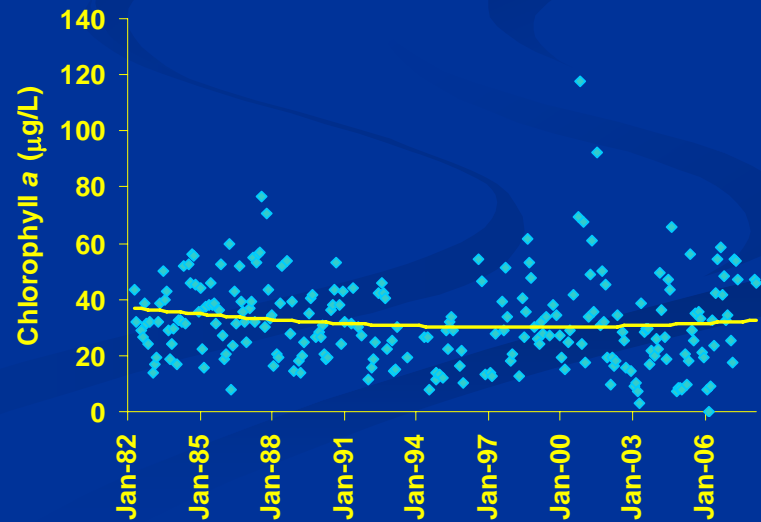
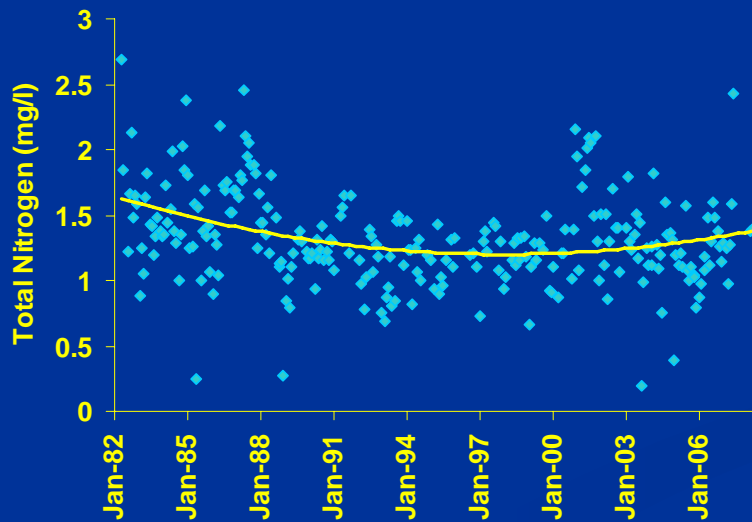
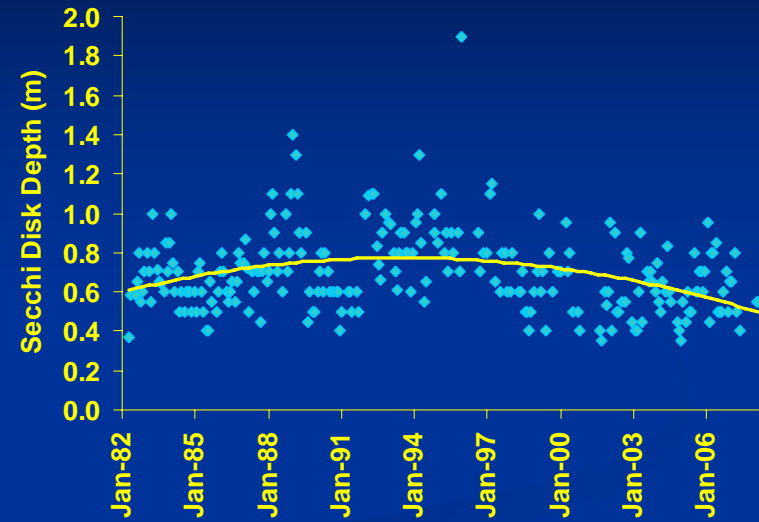
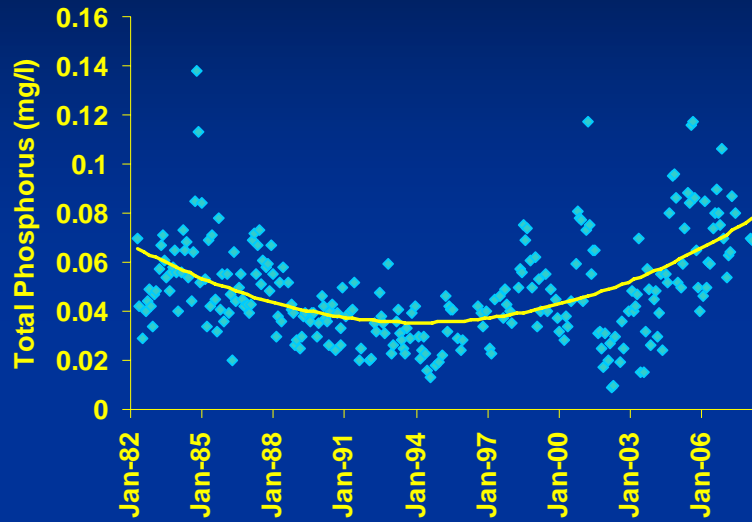
Lake Cypress



Lake Hatchineha



Lake Kissimmee



Significant Trends 1981 to 1994

Parameter	East Tohopekaliga	Tohopekaliga	Cypress	Hatchineha	Kissimmee
CA	0.3111			0.6500	
CL			0.4500		
SULFATE		-0.4111			
SCOND				3.5000	
TURB		-0.4000			
SECCHI		0.0182	0.0157	0.0167	
SI					-0.0250
TP		-0.0160	-0.0085	-0.0028	-0.0028
SRP	0.0001	-0.0013			
TN		-0.1103	-0.0671	-0.0443	-0.0373
DIN			-0.0004	-0.0020	-0.0006
CHLA		-5.4083	-2.3222		

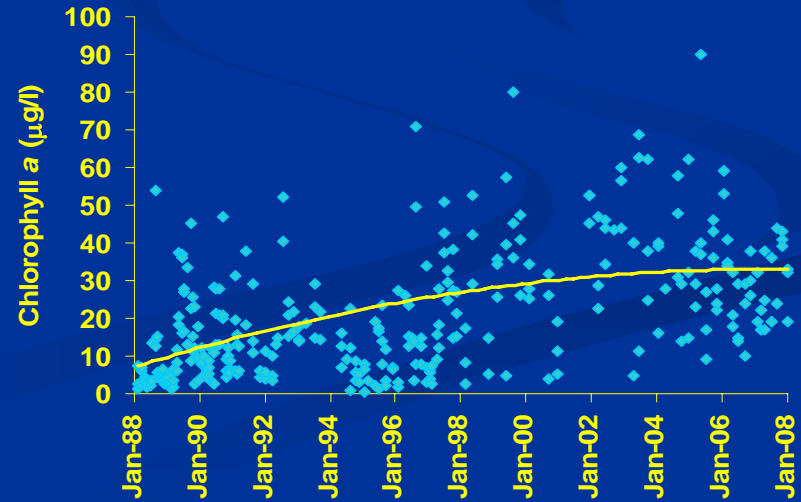
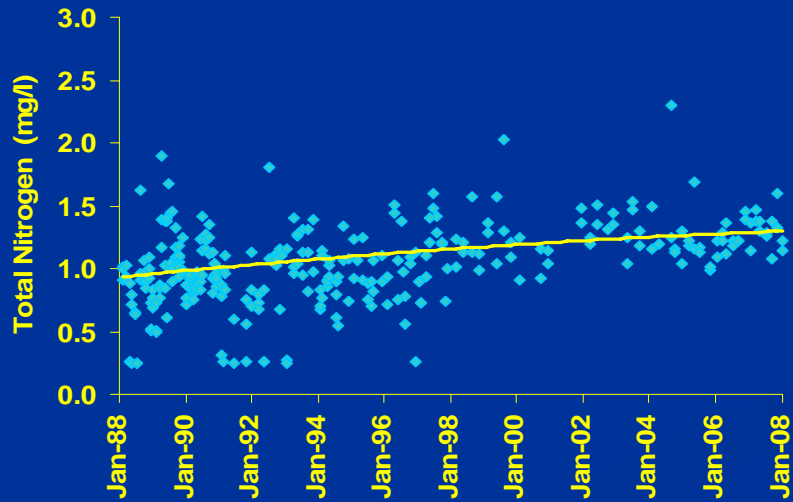
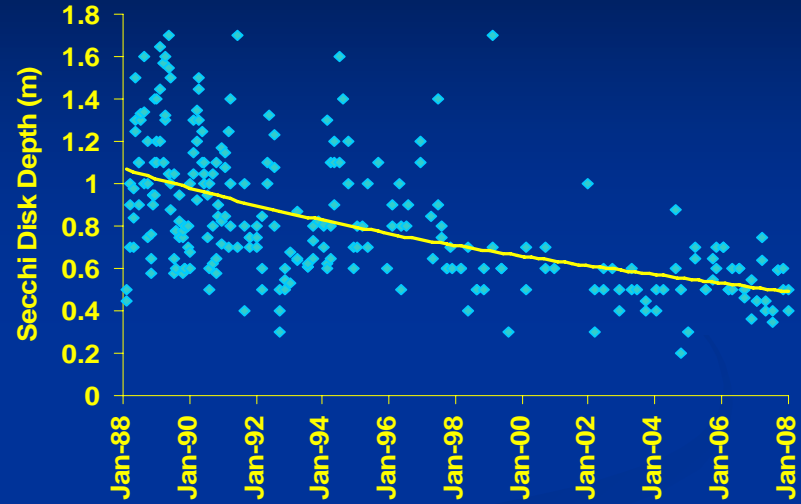
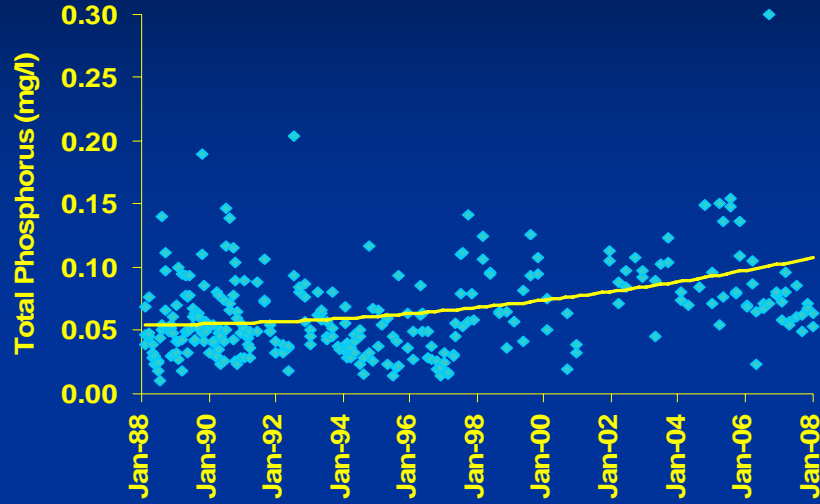
Significant Trends 1994 to 2007

Parameter	East Tohopekaliga	Tohopekaliga	Cypress	Hatchineha	Kissimmee
CA	0.3667				
CL		0.5509	0.4762		
SULFATE	-0.4250				
SCOND	1.8571				
TURB	-0.0869			0.2397	
SECCHI				-0.0286	-0.0200
SI		-0.0563	-0.0570		-0.0792
TP			0.0026	0.0033	0.0030
SRP					0.0004
TN	-0.0170			0.0258	
DIN					
CHLA					

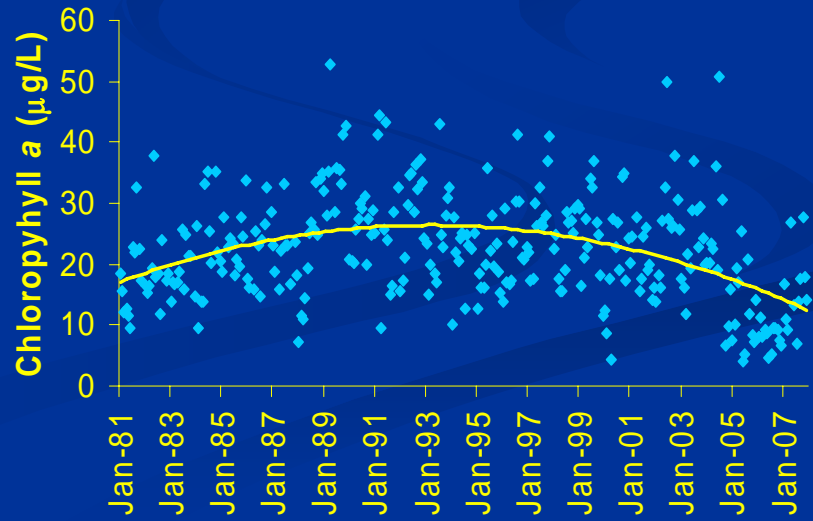
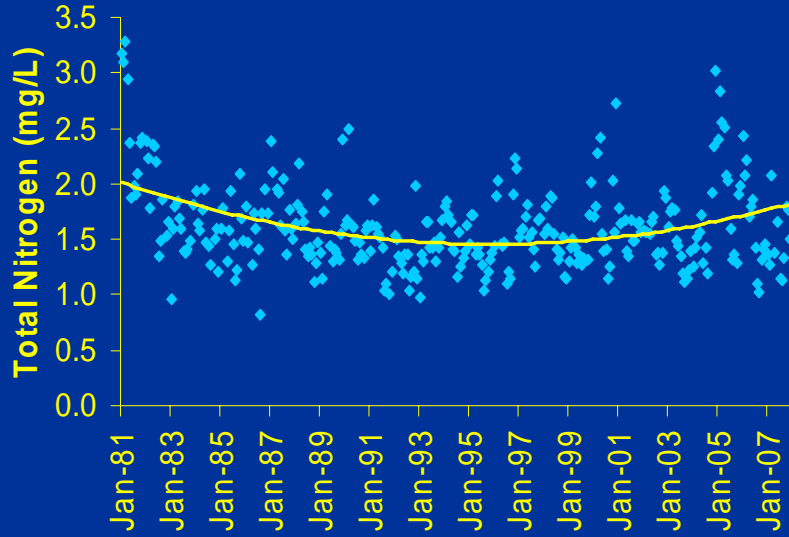
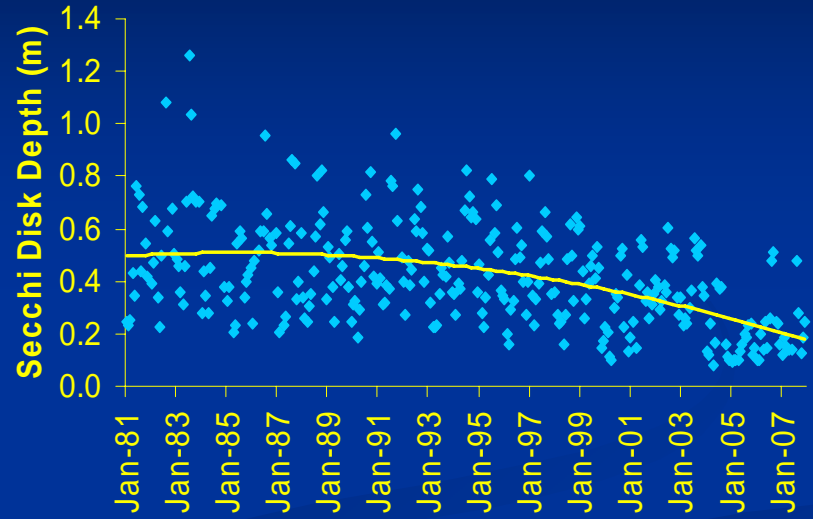
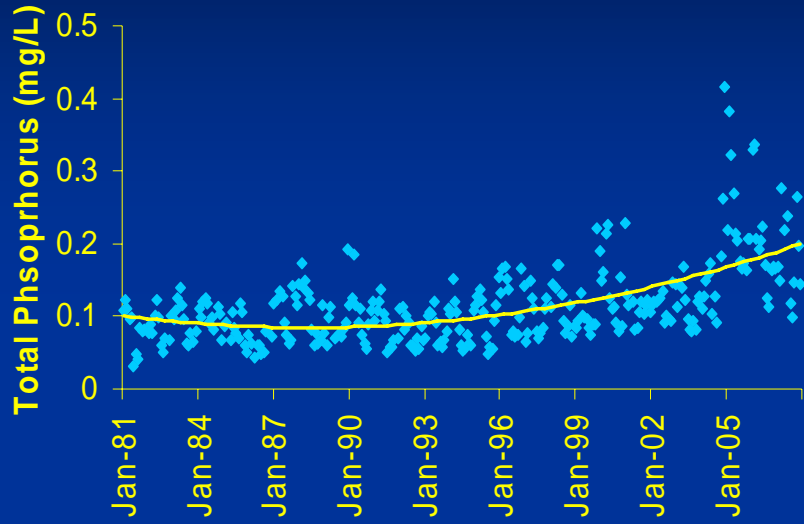
Significant Trends 1981 (1988*) - 2007

Parameter	Istokpoga*	Okeechobee
CA		
CL		-1.8074
SULFATE	0.2777	
SCOND		-10.0128
TURB	0.2502	0.8465
SECCHI	-0.0293	-0.0113
SI		-0.1255
TP	0.0018	0.0026
SRP		0.0011
TN	0.0233	
DIN		0.0023
CHLA	1.2636	

Lake Istokpoga



Lake Okeechobee



Summary

- Upper Chain of Lakes
 - Lake Tohopekaliga had greatest trends
 - Related to diversion of effluent from sewage treatment plant
 - Led to improvements downstream
 - Improvements reached a plateau in 1994
 - Hydrilla
 - Increased population

Summary

■ Lake Istokpoga

- Increased nutrients, reduced light
 - Hydrilla
 - Nutrient Loading

■ Lake Okeechobee

- Increased nutrients, turbidity, reduced light
 - Excessive nutrient loads
 - Sediment buffer
 - Phytoplankton light limited?

Questions?

