

Department of Environmental Conservation

What did we learn in 2014?



"The picture's pretty bleak, gentlemen. ... The world's climates are changing, the mammals are taking over, and we all have a brain about the size of a walnut."

Scott Kishbaugh CSLAP Director, NYSDEC



Department of Environmental Conservation

Been there, done that (2010 FOLA presentation) 19,000 Samples Later: What Have We Learned Through CSLAP?



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What I said then....

- (Nothing useful)
- Eutrophication = Recreational Impacts (use of CSLAP data in evaluating recreational impacts from algae)
- Eyes on the ground = early detection (how CSLAP = iMap, HABs findings)
- Water quality database and trends (CSLAP data to evaluate statewide conditions and trends)
- What about specific lakes?





Did I at least show anything interesting?





State Water Quality Database



CSLAP is primary state lake water quality database in central NY, perimeter of Adirondacks

CSLAP is primary long-term state water quality database

>90% of NYS lakes sampled more than 5 continuous years sampled through CSLAP





Percentage of CSLAP Lakes with Higher or Lower **Readings in Wet and Dry Years**

	Dry Years	Wet Years		Dry Years
Higher TP	15%	30%	Higher Color	2
Lower TP	31%	20%	Lower Color	67



2%

67%

39%

16%

Wet Years

Long Term Changes? (as of 2008)

Sampling Parameter	% CSLAP Lakes Increasing	% CSLAP Lakes Decreasing	% CSLAP Lakes No Significant Change	
Water clarity	0	<1	>99	
Total phosphorus	3	0	98	
Nitrate	2	5	93	
рН	5	8	87	
Conductivity	9	8	83	
Color	14	2	84	
Water temperature	7	6	87	
Perceived WQ	3	8	89	
Perceived Plant Coverage	9	6	84	
Perceived Recreation	3	9	88	



Rephrasing the question..... (2014 CSLAP report = "What Did We Learn")

What is condition in the lake?

Is there anything new that showed up in the testing this year?

How does the condition of our lake this year compare with other lakes in the area?

Are there any trends in our lake's condition?

Should we be concerned about the condition of our lake? Are we close to a tipping point?

Are any actions indicated, based on the trends and this year's results?

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What is the condition of the lake?

Can I swim (drink the water, eat the fish, sell my property,....)?

Will I (my kids, the dog, the wildlife,...) get sick?

Are there any problems?

Is there something you're not telling me?



Stay CALM (it's all about the assessments)

Consolidated Assessment and Listing Methodology sets rules for assessment waterbodies

Based on protection of designated uses

Sets level of impairment based on data relative to WQ standards or other criteria





10% Rule

<u>Impaired</u> = Average (mean) > Standard, Guidance Value, MCL.. <u>Stressed</u> = > 10% of samples > Standard, Guidance Value,.. <u>Threatened</u> = Non-numeric or "Administrative" (presence of blooms or AIS species, land use changes,....)





Drinking Water Protection

Table 2 Drinking Water Supply Use Assessment Criteria						
			W I/P WI	L Use Impact		
Use Assessment C	Severity	Documentation				
Frequent/Persistent Conditions Prevent Us • NYS/local Health Department water supply	Precluded	Known				
Occasional Conditions Prevent Use • NYS/local Health Department water supply	closures lasting	up to 30 days.	Impaired	Known		
Frequent/Persistent Conditions Discourage Impacts do not require closure or advisories of the finished water and/or treatment costs turbidity, activated charcoal filtration, etc.). Monitoring data show exceedence of Impail oryptosporidium, coliform, or Monitoring data show exceedence of Impail for other substances more than 10% (support than 10% (support)	Impaired	Known or Suspected				
Occasional Conditions Discourage Use SWAP determination of very high susceptil Monitoring data show exceedence of Streas coliform, or Monitoring data show exceedence of Streas for other substances more than 10% (suspe	Stressed	Known or Suspected ¹				
Conditions Support Use, but Threats Note • SW AP determination of <i>high susceptibility</i> • Monitoring data show exceedence of <i>Threa</i> criteria* more than 10% (<i>suspected</i>) or 25%	Threatened	Known or Suspected ¹				
No Known Impairment or Imminent Three • No drinking water restrictions, and • No additional treatment required, and • No significant contaminants/threats present	No Known Impact	Assessment Level Monitored or Evaluated				
*Parameter-Specific Criteria Cryptosporidium (average) Cryptosporidium (individual) Coliform, To tal (mediam) ² Coliform, To tal (mediam) ² Coliform, Fecal (geometric mean) Ammonia/Ammonium Nitrate, as N other substances (our ewater) ³ other substances (finished water) ⁴	Impaired 7.5 - 50/2,400 200 20 10 Standard MCL	Stressed 3.0 7.5 - 10 5 50% of Std. 50% of Std.	Threatened 3.0 - 5 2 20% of Std. 20% of MCL	oocysts/100 L oocysts/100 L per 100 m1 per 100 m1 mg/1 mg/1		

Impacts/impairments based on SWAP susceptibility determinations should be listed as Suspected

² Refers to Class AA and A respectively.

³ Refers to substances for which there are NYS water quality standards for protection of *Health (Water Source)*.
⁴ Refers to substances for which there are Maximum Contaminant Levels (MCL) for finished drinking water.

Relies primarily on DOH data and "decisions" by local operators (administrative)

Lakes data of relevance

- Chlorophyll a (4-6 ug/l)
- Coliform (200, 2400 colonies/ 100ml)
- Enterococci (33 colonies/ 100ml)
- Ammonia (20 mg/l) and NOx (10 mg/l)
- Other PWS indicators (MCLs)



Public Bathing Protection

Table 4 Public Bathing Use Assessment Criteria						
No. 1 and the last	WI/PWI	WI/PWL Use Impact				
Use Assessment Criteria	Severity	Documentation				
Frequent/Persistent Conditions Prevent Use • NYS/local Health Department has closed the waterbody to swimming for the entire season, based on water quality (bacteriological) monitoring data.	Precluded	Known				
Periodic/Occasional Conditions Prevent Use • NVS/local Health Department has issued temporary closures of the waterbody to swimming, based on water quality (bacteriological) monitoring data, or • Sufficient stream flow/water level necessary to support swimming uses are artificially restricted.	Impaired	Known				
Frequent/Persistent Conditions Discourage Use • Swimming use requires additional measures (e.g., aquatic weed harvesting/control). • Monitoring data show exceedence of <i>Impaired</i> criteria* (bacteriological, clarity) more than 10% (<i>suspected</i>) or 25% (<i>known</i>) of time.	Impaired	Known or Suspected				
Occasional (Other) Conditions Discourage Use * Recreation uses are assessed as <i>impairedPrecluded</i> ¹ , or Monitoring data show exceedence of <i>Stressed</i> criteria* (clarity) more than 10% (suspected) or 25% (denown) of time.	Stressed	Known or Suspected ¹				
Conditions Support Use, but Threats Noted • Monitoring data show exceedence of Threatened criteria* (clarity, phosphorus) more than 10% (suspected) or 25% (known) of time.	Threatened	K nown or Suspected				
No Koson Impairment or Imminent Threat + NYS/local Health Department has not retricted swimming, and - Swimming use does not require any additional measures, and - Monikering data does not exceed criteria* (>10% of time), and - Recreation uses are not Impaired/Precluded.	No Known Impact	A ssessment Level: Monitored				
* Monitoring Data Criteria <u>Impaired Streased</u> Colform, Total (geometric mean) 2,400 – Colform, Tecal (geometric mean) 200 – Enteriocci (geometric mean) See below ² Clarity (Seechi Dicc) 1.2 1.5 Total Phosphorus ^{3,6} – –	<u>Threatener</u> - 2.0 20	d per 100 m1 per 100 m1 meters μg/1				

Public Bathing assessments based on Recreation use support should be listed as suspected.

For marine waters (excluding tributaries), the enterococci criteria is 35/100 ml. For Great Lakes waters (excluding tributaries), the enterococci criteria is 126/100 ml.

Application of the Total Phosphorus criteria is limited to lakes and ponded waters.

Based on current New York State criteria indicative of elevated nuisance conditions and slight impacts to recreation; other state/national nutrient criteria currently being developed will be incorporated into the Assessment Methodology once adopted. Relies primarily on primarily DOH administrative decisions

Lakes data of relevance

- Water clarity (1.2 meters)
- Coliform (200/2400)
- Enterococci (33 colonies/ 100ml)
- Phosphorus* (20 ug/l)

*not likely in future



Recreational Protection

Table 5 Recreation Use Assessment Criteria						
			WI/PWI	L Use Impact		
Us e As sessm	ent Criteria		Severity	Documentation		
Frequent/Persistent Conditions Prev • NY Slocal Health Department has clo boating or other recreational use for the concerns.	Precluded	Known				
Periodic/Occasional Conditions Prev • NYS/local Health Department has issuaterbody or portions of the waterbody recreational use due to water quality of • Sufficient stream flow/water level neo- artificially restricted.	Impaire d	Known				
Frequent d'Persistent Conditions Disco Recreational uses of water require adi have sing control), or Pablie Bathing uses are assessed as I Monitoring data show executednee of (mappecied) or 25% (known) of time, or Observational oriteria ⁶ indicating rest than 50% of the time.	Impaired	K now n or Suspected ⁴				
Occasional (Other) Conditions Disco • Public Bathing uses are assessed as S • Monitoring data shows exceedence of (nuppeeted) or 25% (known) of time, • Observational criteria* indicating re- more than 25% of the time.	Stressed	K nown or Suspected ⁴				
Conditions Support Use, but Threats • Monitoring data shows exceedence of (<i>nurpected</i>) or 25% (<i>known</i>) of time. • Observational criteria*• indicating re- more than 10% of the time.	Threatened	K now n or Suspected 4				
No Known Imp al rment or Imm inent * Public Bathing uses are not Streamed, * Recentation uses not restricted, nor reg Monitoring data does not exceed crite * Observational criteria** for restricted	No Known Impaci	Assessment Level: Monitored				
Mosi toring Data Criteria Total Phosphorus ^{1,2} Chlomphyl a ¹ Clarity (Seechi Disc) ¹ ** Observational Data Criteria ^{1,4} Swimming/recreation slightly (or mor ¹ Anoline siten of the Total Phosphone).	Impaired 15 1.2 c) restricted by spe	Streamed 20 12 1.5 coffice lly i dentified can	Threatened 8 2.0 ases (algae, clar	μg/l μg/l meters ity, etc).		
¹ Application of the Total Phosphonas criteria is first elso haces and ponded watern. ² State/maional nutrient criteria to be developed and incorporated into the Assessment Methodology. ³ Observational Criteria refere to responses an CSLAP Field Observation Forms. Specifically, Condition of Lake notes presence of algae, Suitability for Recruation notes some impacts/impairment, and Opinion of Response of the construction to have hole notification notes.						

Impacts' impairments based on observational criteria should be listed as mapacted

Primary focus of CSLAP/ LCI/ most lake monitoring programs

Lakes data of relevance

- Water clarity (1.2 meters)
- Chlorophyll a (10 ug/l draft)
- Evidence of persistent and widespread HABs



Aquatic Life Protection

Tabk 5 Recreation Use Assessment Criteria							
W1/PWI	L Use Impact						
Severity	Documentation						
Precluded	Known						
Impaired	Known						
Impaired	K now n or Suspected ⁴						
Stressed	Known or Suspected ⁴						
Threatened	K nown or Suspected 4						
No Known Impact	Assessment Level: Monitored						
Threatened 8 2.0 ses (algae, clar ens. ment Methodol us. Specifically	μg/l μg/l meters ŝty, etc). logy. r, Condition of						
	W L/P Wi Severity Precluded Impaired Impaired Stremed Threatened No Known Impact Threatened a closer, clastened stremed						

Recreational Use notes weeds and/or clarity problems.

et a impairments based on observational criteria should be listed as meneted

Primary focus of stream/ biomonitoring programs

Lakes data of relevance

- pH (< 6.0-6.5 or > 8.5-9.0)
- DO (5-7 mg/l epilimnion, "no reduction of dissolved oxygen from other than natural conditions" hypolimnion)
- Invasives (animals/plants)



Other evaluation



Other designated uses evaluated solely with non DOW data

- Fish consumption (some use of tissues, HABs, other DOW data, but not for 303d listing)
- Shellfish consumption
- "Condition" (habitat, aesthetics) evaluated with DOW data
 - Not designated uses
 - Limited applicability for 303d listings
 - Aquatic plant information plugs in here
 - Invasives = habitat
 - Natives = aesthetics

Department of

Great....so what did we learn?

...about potable water

howd	loos	it broa	k out?
	1063		r Uut f

<u>Class AA</u>	2014	All Years
Impaired	17%	29%
Stressed	60%	56%
Supported	23%	14%

<u>Class A</u>	<u>2014</u>	<u>All Years</u>
Impaired	64%	37%
Stressed	13%	48%
Supported	23%	14%

	Size-AA and	<u>A L</u>	arg	<u>ge</u>	<u>Medium</u>	<u>S</u>	<u>mall</u>	
	Impaired	d		%	27%	3	8%	
	Stressed		31%		69%	6	2%	
	Supported		339	%	4%		0%	
	Ν		45	5	26		13	
ſ	Denth-AA an	d Δ h	Dee	en	Moderate	Sh	allow]
ł	Deptil / / / uli	<u>u //</u>		<u>cp</u>	Woucrute	<u> </u>		
	Impaired	30		%	39%		29%	,
	Stressed	34		%	61%	-	71%	
	Supported	1 30		%	0%		0%	
	N	4		4	33		7	
Ċ								
R	egion-AA and A	<u>Downstat</u>	e	Centra	<u>l Adironda</u>	<u>ick</u>	Wester	n
	Impaired	88%	88%		10%		50%	
	Stressed	13%		50%	55%		50%	
	Supported	0%		6%	35%		0%	
	N	8		18	40		10	



We don't drink the water....so what did we learn about our lake?

...about recreation

....how does it break out?

Chlorophyll	2014	All Years			<u>Size</u>	<u>Large</u>	<u>Medium</u>	<u>Small</u>	
Impaired	26%	31%		Im	paired	19%	26%	43%	
impuncu	20/0	51/0		St	ressed	11%	29%	18%	
Stressed	21%	20%		Sup	oported	70%	46%	39%	
Supported	53%	49%		•	N	64	94	106	
									5
<u>Clarity</u>	2014	All Years		<u> </u>	<u>Depth</u>	<u>Deep</u>	<u>Moderate</u>	<u>Shallow</u>	<u>'</u>
Impaired	12%	11%		Im	paired	1%	27%	59%	
a. I	1.40/	12/0		St	ressed	13%	26%	18%	
Stressed	14%	16%		Sup	oported	86%	47%	23%	
Supported	74%	74%		•	N	69	107	88	
			· · · · · · · · · · · · · · · · · · ·		-	-			
<u>Phosphorus</u>	<u>2014</u>	<u>All Years</u>	Reg	ion	<u>Downstate</u>	Centra	<u>I Adironda</u>	<u>ack Wes</u>	<u>tern</u>
Impaired	37%	34%	Impa	ired	58%	28%	6%	33	%
mpuneu		5170	Stres	ssed	19%	26%	19%	19	%
Stressed	17%	19%	Suppo	orted	23%	46%	76%	48	%
Supported	46%	47%	N	J	62	74	86	2	1

Is there anything new that showed up in the testing this year?

Open Water Algae



Shoreline HABs

AIS species

Waterbody 💌	Kingdor -	Common name 🔽	Scientific name 💌
Balsam Pond	Plant	Variable watermilfoil	Myriophyllum heterophyllum
Bowman Lake	Plant	Eurasian watermilfoil	Myriaphyllum spicatum
Chenango Lake	Plant	Eurasian watermilfoil	Myriophyllum spicatum
Chenango River near Greene	Animal	Asian clam	Corbicula fluminea
Chenango River near Oxford	Animal	Asian clam	Corbicula fluminea
Guilford Lake	Plant	Eurasian watermilfoil	Myriaphylum spicatum
Hunt Pond	Plant	Eurasian watermilfoil	Myriophyllum spicatum
Jackson Pond	Plant	Eurasian watermilfoil	Myriaphyllum spicatum
Long Pond	Plant	Eurasian watermilfoil	Myriophyllum spicatum
Mill Brook Reservoir	Plant	Eurasian watermilfoil	Myriaphylium spicatum
Mud Creek e of Cortland	Animal	Asian clam	Corbicula fluminea
Otselic River near Pitcher	Animal	Asian clam	Corbicula fluminea
Plymouth Reservoir	Plant	Eurasian watermilfoil	Myriophyllum spicatum
Warn Lake	Plant	Eurasian watermilfoil	Myriophylium spicatum
Warn Lake	Plant	Curly leafed pondweed	Potamogeton crispus



Seasonal changes in algae type

2014 Open Water Algae Types, CSLAP Lakes



Middle of lake



Near shore



2014 Shoreline Bloom Algae Types, CSLAP Lakes









New info in CSLAP reports re AIS: Useful information

- Nearby lakes with AIS
- Area boat launches (and corresponding AIS species at waterbodies)
- Connection between roadways and AIS waterbodies
- Susceptibility to AIS animals- location, chemistry, connecting waterways
- Other useful information?



How does the condition of our lake this year compare with other lakes in the area?



Water clarity



2.3 meters (3.1 m)

3.1 meters (3.2 m)

2.5 meters (2.1m)



Same question...?



Chlorophyll a

- 5.6 ug/l (4.5 ug/l)
 - 18.5 ug/l (11.6 ug/l)
- 12.9 ug/l (11.6 ug/l)

14.2 ug/l (18.9 ug/l)



Any more answers?



1 = "crystal clear"; 2 = "not quite crystal clear";3 = "definite algae greenness"



Are you still talking?



(Total phosphorus)

- 14 ug/l (11 ug/l)
- 40 ug/l (26 ug/l)
- 25 ug/l (31 ug/l)

31 ug/l (47 ug/l)



...enough already....



(Blue green algae, open water)

2.1 ug/l (1.2 ug/l)

6.5 ug/l (7.1 ug/l)

2.3 ug/l (3.4 ug/l)

5.8 ug/l (7.3 ug/l)

1 = "crystal clear"; 2 = "not quite crystal clear";3 = "definite algae greenness"



Are there any trends in our lake's condition?

Can look at all data all years all around the state

Why that's not a good idea

- Different number of lakes sampled each year
- Different actual lakes sampled each year
- Sampling starts in May some years and June other years; ends in September some years and October...



Change in CSLAP Conductivity 1986-2014



Surely there must be some way around that?

Annual water clarity change 1986-2014



Annual phosphorus change 1986-2014



Can look at relative changes each year for each sampled lake

Compare each lake each year to long-term average for that lake

One approach is to identify % lakes with significant (> 2 SD), slight (> 1 SD) and no change (0-1 SD)

No clear trends Secchi

Lower TP 1990s

(and stop calling me Shirley)



Let's look at a few others

Annual chlorophyll change 1986-2014



2006-??? (1990, 1996, 2006 very wet)

2007- apparent steady increase in algae

1986- too few lakes

1987- likely lab problem

1990ish to 2005apparent decrease in algae levels



And this one....

Annual conductivity change 1986-2014



Increase 1986early 2000s?

Decrease 2003-2010

Why very low 2009 and high 2010? Weather?

Problem conducting statewide evaluation with different lakes in each year



And one more....

Annual water temperature change 1986-2014



Variable 1986-2000

Slight increase 2000-present

Did I mention different lakes each year? And different numbers of lakes



How do we get around that? Indexing

Evaluate common set of lakes each year

Evaluate over "index" period (summer only)

Compare changes over time





DEC RIBs program = 19 rivers

CSLAP- assigned 41 index lakes in 2006, but had to cut back to 24 lakes due to federal sequestration

And what does that tell us?



Index Lakes- TP and Chlorophyll a





Index Lakes- Water Clarity and WQ Perception



And what does that tell us?





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And now for something (not really) completely different....

Index Lakes Water Clarity

Clarity highest in 2007-2008

No clear trend



So have algae levels increased in the last decade?



Algae levels lowest in 2006-2007

Roughly matches water clarity

No clear trend



And I'm sure you're wondering about conductivity...





Substantially lower conductivity 2006-2009 (esp. 2009) Weather related? Highly variable over time



Anything else?

Come to the HABs talks tomorrow to learn more

Except for those that want to hear about invasive plants

Or new lake law

Or an intro to lake ecology and lake management

Whatever

