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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?

What we say to dogs


What they hear


## 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

## Wet Weather = productivity

## Dry Weather = color

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

|  | Dry Years | Wet Years |
| :--- | ---: | ---: |
| Higher TP | $15 \%$ | $30 \%$ |
| Lower TP | $31 \%$ | $20 \%$ |


|  | Dry Years | Wet Years |
| :--- | ---: | ---: |
| Higher Color | $2 \%$ | $39 \%$ |
| Lower Color | $67 \%$ | $16 \%$ |

## Long Term Changes? (as of 2008)

| Sampling Parameter | \% CSLAP Lakes <br> Increasing | \% CSLAP Lakes <br> Decreasing | \% CSLAP Lakes No <br> Significant Change |
| :--- | :---: | :---: | :---: |
| Water clarity | 0 | $<1$ | $>99$ |
| Total phosphorus | 3 | 0 | 98 |
| Nitrate | 2 | 5 | 93 |
| pH | 5 | 8 | 87 |
| Conductivity | 9 | 8 | 83 |
| Color | 14 | 2 | 84 |
| Water temperature | 7 | 6 | 87 |
| Perceived WQ | $\mathbf{3}$ | 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?

## 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

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


## Drinking Water Protection


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/ 100 ml )
- Ammonia ( $20 \mathrm{mg} / \mathrm{l}$ ) and NOx ( $10 \mathrm{mg} / \mathrm{l}$ )
- Other PWS indicators (MCLs)


## Public Bathing Protection

| Table 4 Public Bathing Use Assessment Criteria |  |  |
| :---: | :---: | :---: |
| Use Assessment Criteria | WI/PWL Use Impact |  |
|  | Severity | Documentation |
| Frequent/Persistent Conditions Prevent Use <br> - NYS/local Health Department has closed the waterbody to swimming for the entire season, based on water quality (bacteriological) monitoring data. | Precluded | K nown |
| Periodic/Occasional Conditions Prevent Use <br> - NYS/local Health Department has issued temporary closures of the waterbody to swimming, based on water quality (bacteriological) monitoring data, or <br> - Sufficient stream flow/water level necessary to support swimming uses are artificially restricted. | Impaired | Known |
| Frequent/Persistent Conditions Discourage Use <br> - Swimming use requires additional measures (eg., aquatic weed harvesting/control). <br> - Monitoring data show exceedence of Impaired criteria* (bacteriological, clarity) more than $10 \%$ (suspected) or $25 \%$ (known) of time. | Impaired | Known <br> or <br> Suspected |
| Occasional (Other) Conditions Discourage Use <br> - Recreafion uses are assessed as Impaired/Precluded ${ }^{1}$, or <br> - Monitoring data show exceedence of Stressed criteria* (clarity) more than $10 \%$ (suspected) or $25 \%$ (known) of time. | Stressed | $\begin{gathered}\text { Known } \\ \text { or } \\ \text { Suspecled }\end{gathered}$ ${ }^{1}$ |
| Conditions Support Use, but Threats Noted <br> - Monitoring data show exceedence of Threatened criteria" (clarity, phosphorus) more than $10 \%$ (suspected) or $25 \%$ (known) of time. | Threatened | K nown or Suspected |
| No Known Impairment or Imminent Threat <br> - NYS/local Health Department has not restricted swimming, and <br> - Swimming use does not require any additional measures, and <br> - Monitoring data does not exceed criteria* ( $\gg 10 \%$ of time), and <br> - Recreation uses are not Impaired/Precluded. | No Known Impact | Assessment <br> Level: <br> Monitored |
| * Monitoring Data Criteria Impaired Stressed <br> Co 1 iform, Total (geometric mean) 2,400 - <br> Coliform, Fecal (geometric mean) 200 - <br> Entericocci (geometric mean) See below ${ }^{2}$  <br> Clarity (Secchi Disc) 1.2 1.5 <br> Total Phosphorus ${ }^{3,}$ - - | $\begin{gathered} \text { Threaten } \\ - \\ - \\ 2.0 \\ 20 \end{gathered}$ | per 100 ml <br> per 100 ml <br> melers <br> $\mu \mathrm{g} / 1$ |
| ${ }^{1}$ Public Bathing assessments based on Recreafion use support should be listed as suspected. <br> ${ }^{2}$ For marine waters (excluding tributaries), the enterococci criteria is $35 / 100 \mathrm{ml}$. For Great Lakes waters (excluding tributaries), the enterococcl criteria is $126 / 100 \mathrm{ml}$. <br> ${ }^{3}$ Application of the Total Phosphorus criteria is limited to lakes and ponded waters. <br> ${ }^{4}$ Based on current New York State criteria indicative of elevated nuisance conditions and slight impacts to recreation; other state/national nutrient crileria currently being developed will be incorporated into the Assessment Methodology once adopled. |  |  |

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 $5 \quad$ Recreation Use Assessment Criteria |  |  |
| :---: | :---: | :---: |
| Use Assessment Criteria | WIPWL Use Impact |  |
|  | Sererity | Dacaneatation |
| Frequen U/Pershatent Canditions Prevent Use <br> - NY S.hacal H colh D Dquement has cloxed the watenody bo swimming. bowing or ohcer recretional we for the cutire seases, due bo witce quality cuncems. | Prechadel | Kown |
| Perladie/ Oceaslanal Conditises Preveat Exe <br> - NY SMocal Healh Deqielment has isuuol tamponary closurex of the waverbaly or portions of the waterbody bo swimsning, bosting or other recreational use due bo water quality concerro, or <br> - Sufficient star am fow/ wiber level necesary bo support rocreational user are irtificially rotrictol. | Impried | Kwwn |
| Frequen U Pershatent Canditions Dheaurage Use <br> - Recrevional uso of wider requir aldibinal measuro (cg, weel hasevesting (onatul), ar <br> - Public Rathing use are assosol as Ingrairnd/Prachaind, ar <br> - Monitoring dita show execolence of / ampairnd criberis* more than $10 \%$ (raxpectad) or $25 \%$ (krown) of time, ar <br>  than $50 \%$ of the time. | Impaied | Kwwn <br> or <br> Saspected ${ }^{4}$ |
| Oceashanal (Other) Conditions Discoarage Ese <br> - Public Rathing uses are assesol as Stremed, or <br> - Monitoring data shows excrelface of Strerxed' criveria* more than $10 \%$ (raxpected) or $25 \%$ (known) of lime, or <br> - Observitional critcria** inalicaing restrictol recreational user are notol more than $25 \%$ of the time. | Surexed | $\begin{gathered} \text { Kwwn } \\ \text { or } \\ \text { owsected } \end{gathered}$ |
| Canditioas Sappart Ese, bat Threabs Noted <br> - Monitoring data shows exccolence of Threatened criteria " more Han $10 \%$ (rappecind) or $25 \%$ (known) of time. <br> - Observational cribcria** inaliesting revarietal recreational user are notal more than $10 \%$ of the time. | Threatenal | Kaven <br> or <br> Suspected ${ }^{4}$ |
| No Keown Impairment or Immineat Threat <br> - Public Bathing uso are not Sirexnd, Impaind, Prochaied and <br> - Recrevion useo nar rotrictol, mor require additional meoures, and <br> - Mamitoring duta doe not exceal crikria*" ( $(10 \%$ of time), and <br> - Observitional critaia** for rotricted we mot notol ( $>10 \%$ of fime) | No Kaown Impast | A ssosument Level: Monithred |
| * Moal barieg Data Critteria Tobel Phospharus ${ }^{32}$ Chlomplayi a ${ }^{1}$ <br> * Observaliosal Dala Criteria ${ }^{4}$ <br> Swimminglecreation alightly (or more) rextrictal by pecifically identifiede <br> ${ }^{1}$ Application of he Toul Plosphoms criveria is limitol so hibe anal pooaled w <br> ${ }^{2}$ S Suteimational nutifent criveria bo be developed and incoqposstal into the Asse <br> 2' Obsernational Criberian reless is repposes on CSL.AP Field Obwrration Far Lake motex prosence of algue, Saitahility for Recreation note some impacs/i Recruational Use notos weols and/or elerity problems. <br> ${ }^{4}$ Impaciximpaimens broed on observibional criteria should be linted as nap | Threabened <br> 8 <br> 2.0 <br> soc (xleme, ens. <br> ment Mehol Ix. Specifica paimers, an <br> ed | 阴 <br> 阴 <br> miturx <br> , ex) <br> gy- <br> Condtion of inion of |

## 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

| Table $5 \quad$ Recreation Use Assessment Criteria |  |  |
| :---: | :---: | :---: |
| Use Assessment Criteria | WI/PWL Use Impact |  |
|  | Severity | Dacenemtalios |
| Frequen UPershitent Canditions Prevent Use <br> - NY SVocal Healh D quartment has cloxed the watetody bo swimming. bowing or oher tecreitional we for the entire seasen, due io witer quality cuncems. | Prechadol | Kown |
| Perlodic/Occashanal Canditions Preveat Ese <br> - NY SMocal Healh Dquatment has isouol temponary closurex of the walcrboly or portions of the waterhody bo swimning, bowting ar other reareational use due bo witer quality concorne, or <br>  antificially rotrictal. | Imqained | Kwwn |
| Frequen U Pershibtent Canditions Dheaurage Use <br> - Recrevional usor of witer roquire aldibinal measuro (eg, weel hasevting (onntiol), ar <br> - Public Rathing user are assosol as /mpairad/Prochded, ar <br> - Monitoring dita show execolence of $/$ mopaind criberse " more than $10 \%$ (rappectad) or $25 \%$ (krown) of time, ar <br> - Observalional crintris* indicating rotricted rocrestional uso are moted more than $50 \%$ of the time. | Impaied | Known or <br> Suspected ${ }^{4}$ |
| Occashasal (Other) Condithass Dixaorage Use <br> - Public Bathing use are assosel as Sorezed, or <br> - Momitoring data shows excrolance of Sirarned criviaia** mure han $10 \%$ (naxpectal) or $25 \%$ (known) of lime, ar <br>  more than $25 \%$ of the time. | Stresed | Kawn or Saspected ${ }^{4}$ |
| Canditions Sappari Ese, bat Thr eabs Noted <br> - Monitoring dati shows exccolence of Threatened criveria " more llan $10 \%$ (rapectad) or $25 \%$ (known) of time. <br> - Observitional critcria** indicsing restrictol recreational use wre notol more than $10 \%$ of the time. | Thratenal | Kavwa <br> or <br> Susprected |
| No Kava Impal rement or Imminest Threat <br> - Public Rathing uses are not Sinernd, Ingpairnd, Prochaled, and <br> - Recrevion uses nor rotriatol, mor require additional mesures, and <br>  <br> - Observitional critori"* for rotristed we mot notol ( $>10 \%$ of time) | NoKnown Impast | A ssosument level: Monitored |
| - Maniltarieg Data Criteria Tobel Phosphorus ${ }^{3,}$ Chlomphalia Clueìy (Sexchi Dase) ${ }^{3}$ <br> ** Ohser valiosal Data Criberia ${ }^{x 4}$ <br> Swimminglecreation slighly (or more) rextafictal by qecifically identified e. <br> Appliention of the Toul Phosphoms criteria is limital to lhed anal poaled $w$ <br> ${ }^{2}$ Subefantional nutrient criteria to be developed and incooponstol into the Asse <br> ' Obnernational Criberia reless to repposes on CSL AP Field Obwrration Far Lake moses prosence of algue, Suitahility for Recreation noter some impact/i Recrational Use noter weols and/or elerity problems. <br> ${ }^{4}$ Impativimpaiments based on obsaverional ariteria shoull be lited as naper | Threaboned $-8$ 2.0 <br> san (alyac, ch ins. ment Medol 1x. Spocifically paimes, and <br> ad | 明 <br> 限 <br> meters $y, e x e)$ <br> gy- <br> Condition of pixion of |

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



Egrly microscope
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


## Great....so what did we learn?

...about potable water

## ....how does it break out?

| Class AA |  | 2014 |  |
| :---: | :---: | :---: | :---: |
|  | All Years |  |  |
| Impaired |  | $17 \%$ |  |
| Stressed |  | $60 \%$ |  |
| Supported |  | $23 \%$ | $56 \%$ |
|  |  | $14 \%$ |  |


| Class A | $\underline{2014}$ |  |
| :---: | :---: | :---: |
| All Years |  |  |
| Impaired | $64 \%$ | $37 \%$ |
| Stressed | $13 \%$ | $48 \%$ |
| Supported | $23 \%$ | $14 \%$ |


| Size-AA and A |  | Large |  | Medium |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Smpaired |  | $36 \%$ |  | $27 \%$ |
|  |  | $38 \%$ |  |  |  |
| Stressed |  | $31 \%$ |  | $69 \%$ |  |
| Supported |  | $33 \%$ |  | $4 \%$ |  |
| Sun |  |  | $0 \%$ |  |  |
| N | 45 |  | 26 | 13 |  |


| Depth-AA and A | Deep | Moderate | Shallow |
| :---: | :---: | :---: | :---: |
| Impaired | 30\% | 39\% | 29\% |
| Stressed | 34\% | 61\% | 71\% |
| Supported | 36\% | 0\% | 0\% |
| N | 44 | 33 | 7 |


| Region-AA and A | Downstate | Central | Adirondack | Western |
| :---: | :---: | :---: | :---: | :---: |
| Impaired | 88\% | 44\% | 10\% | 50\% |
| Stressed | 13\% | 50\% | 55\% | 50\% |
| Supported | 0\% | 6\% | 35\% | 0\% |
| N | 8 | 18 | 40 | 10 |

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Department of Environmental Conservation

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

...about recreation

| Chlorophyll | $\underline{2014}$ |  | All Years |
| :--- | :--- | :--- | :--- |
| Impaired | $26 \%$ |  | $31 \%$ |
| Stressed | $21 \%$ | $20 \%$ |  |
| Supported | $53 \%$ | $49 \%$ |  |


| Clarity | $\underline{2014}$ |  | All Years |
| :---: | :---: | :---: | :---: |
| Impaired | $12 \%$ |  | $11 \%$ |
| Stressed | $14 \%$ |  | $16 \%$ |
| Supported | $74 \%$ | $74 \%$ |  |


| Phosphorus | $\underline{2014}$ |  |
| :--- | :--- | :--- |
| Impaired Years | $37 \%$ |  |
| Stressed | $17 \%$ | $19 \%$ |
| Supported | $46 \%$ | $47 \%$ |


| Region | Downstate | Central | Adirondack | Western |
| :---: | :---: | :---: | :---: | :---: |
| Impaired | 58\% | 28\% | 6\% | 33\% |
| Stressed | 19\% | 26\% | 19\% | 19\% |
| Supported | 23\% | 46\% | 76\% | 48\% |
| N | 62 | 74 | 86 | 21 |

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

Open Water Algae


Shoreline HABs

AIS species

| Waterbody | Kingdon | Common name - | Saientiffic name |
| :---: | :---: | :---: | :---: |
| Balsam Pond | Plant | Variable watermilfoil | Myriophyllum heterophyllum |
| Bowman lake | Plant | Eurasian wattermilfoil | Myntowhylumspicatemin |
| Chenango Lake | Plant | Eurasian watermilfoil | Myriophyllum spicatum |
| Chenango Rluer near Greens | Animal | Asian dam | Cowhtowarantuen |
| Chenango River near Oxford | Animal | Asian clam | Corbicula fluminea |
| Gulford Lale | Plant | Eurasian watermilfoil | Myytomulum spicaturail |
| Hunt Pond | Plant | Eurasian watermilfoil | Myriophyllum spicatum |
| Iackson Prond | Plant | Euraisian wettermilfill |  |
| Long Pond | Plant | Eurasian watermilfoil | Myriophyllum spicatum |
| Mill Brook Resseruoir | Plant | Eurasian watermilfoil | Myrionhulurw spicatumat |
| Mud Creek e of Cortland | Animal | Asian clam | Corbicula fluminea |
| Otaelic River near Pitcher | Animall | Asian dam | Corkhernar fumimex |
| Plymouth Reservoir | Plant | Eurasian watermilfoil | Myriophyllum spicatum |
| Warn Lake | Plant | Eurasian wattermilfoil |  |
| Warn Lake | Plant | Curly leafed pondweed | Potamogeton crispus |



## Seasonal changes in algae type



## Near shore



## Middle of lake



2014 Shoreline Bloom Algae Types, CSLAP Lakes


## AIS distribution in NY- the plants





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

4.5 meters ( 4.3 m )
2.3 meters ( 3.1 m )
3.1 meters ( 3.2 m )
2.5 meters ( 2.1 m )

## Same question...?



Chlorophyll a
$\square$ $5.6 \mathrm{ug} / \mathrm{l}(4.5 \mathrm{ug} / \mathrm{l})$ $18.5 \mathrm{ug} / \mathrm{l}(11.6 \mathrm{ug} / \mathrm{l})$
$12.9 \mathrm{ug} / \mathrm{l}(11.6 \mathrm{ug} / \mathrm{l})$

14.2 ug/l (18.9 ug/l)

## Any more answers?


(Water quality perception)

$\square 2.2$ (2.2)
$\square \quad 2.1$ (2.5)

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

## Are you still talking?


(Total phosphorus)
$\square$ 14 ug/l (11 ug/l)
$\square 40 \mathrm{ug} / \mathrm{l}(26 \mathrm{ug} / \mathrm{l})$
$\square 25 \mathrm{ug} / \mathrm{l}(31 \mathrm{ug} / \mathrm{l})$
$\square 31 \mathrm{ug} / \mathrm{l}(47 \mathrm{ug} / \mathrm{l})$

## ...enough already....


(Blue green algae, open water)
$\square$ 2.1 ug/l (1.2 ug/l)
$\square 6.5 \mathrm{ug} / \mathrm{l}(7.1 \mathrm{ug} / \mathrm{l})$

2.3 ug/l (3.4 ug/l)
$\square$ $5.8 \mathrm{ug} / \mathrm{l}(7.3 \mathrm{ug} / \mathrm{l})$

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...



## Surely there must be some way around that?



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

1990ish to 2005apparent decrease in algae levels
1986- too few lakes

1987- likely lab problem

## And this one....



Increase 1986early 2000s?

Decrease 20032010

Why very low 2009 and high 2010? Weather?

Problem conducting statewide evaluation with different lakes in each year

## And one more....



Variable 19862000

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- TP and Chlorophyll a


Index Lakes- Water Clarity and WQ Perception


Index Lakes- Water Clarity and WQ Perception


## And what does that tell us?

Index Lakes- Nitrogen Indicators


Index Lakes- Air and Water Temperatures


Index Lakes- pH and Conductivity



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

Clarity highest in 2007-2008

No clear trend

[^0]
## So have algae levels increased in the last decade?

Algae levels lowest in 20062007

Roughly matches water clarity

No clear trend

[^1]
## And l'm sure you're wondering about conductivity...

Index Lakes Conductivity

$■$ Significantly higher $\quad$ Slightly higher $\square$ Normal $\square$ Slightly lower $■$ Significantly lower


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


[^0]:    $■$ Significantly higher $\quad$ Slightly higher $\quad$ Normal $\quad$ Slightly lower $■$ Significantly lower

[^1]:    $\square$ Significantly higher $\square$ Slightly higher $\square$ Normal $\square$ Slightly lower $\square$ Significantly lower

