

# Update on the Lake Joseph Report

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**Anna DeSellas**  
Scientist, Inland Lakes Monitoring  
Dorset Environmental Science Centre  
Ontario Ministry of the Environment  
April 30<sup>th</sup>, 2011






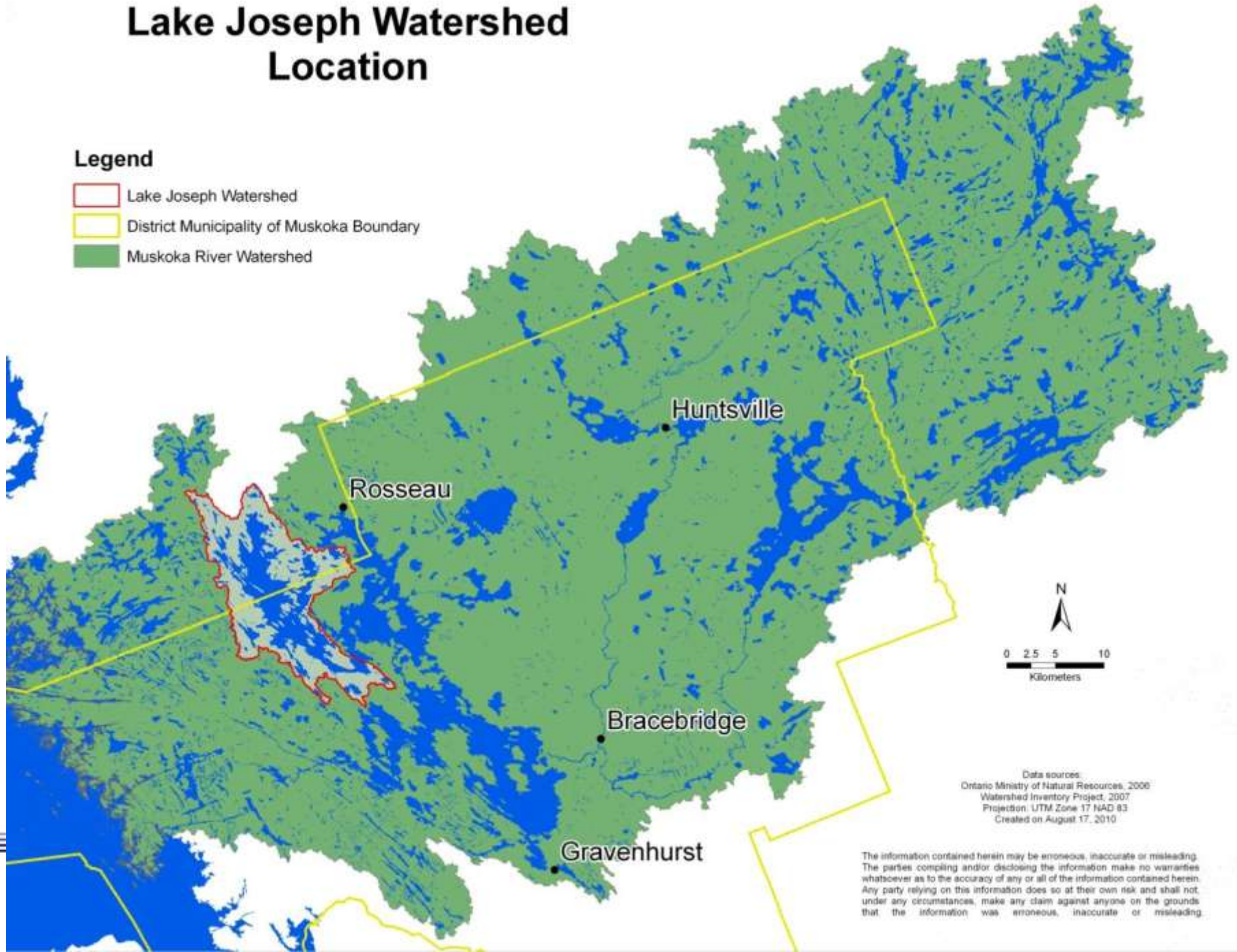
# Background

- **2007 monitoring results raised a concern**
- **Modeled below threshold**
- **Measured above threshold**
- **District of Muskoka requested a regional review to consolidate and synthesize existing background data on Lake Joseph**

# Lake Joseph Watershed Location

## Legend

-  Lake Joseph Watershed
-  District Municipality of Muskoka Boundary
-  Muskoka River Watershed



Data sources:  
Ontario Ministry of Natural Resources, 2006  
Watershed Inventory Project, 2007  
Projection: UTM Zone 17 NAD 83  
Created on August 17, 2010

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# Study Design (total phosphorus, TP)

**1** Collect and organize background data from all agencies.



**2** Evaluate data quality (when collected, methods used, outliers).

**3** Examine water quality trends. Examine complicating factors.

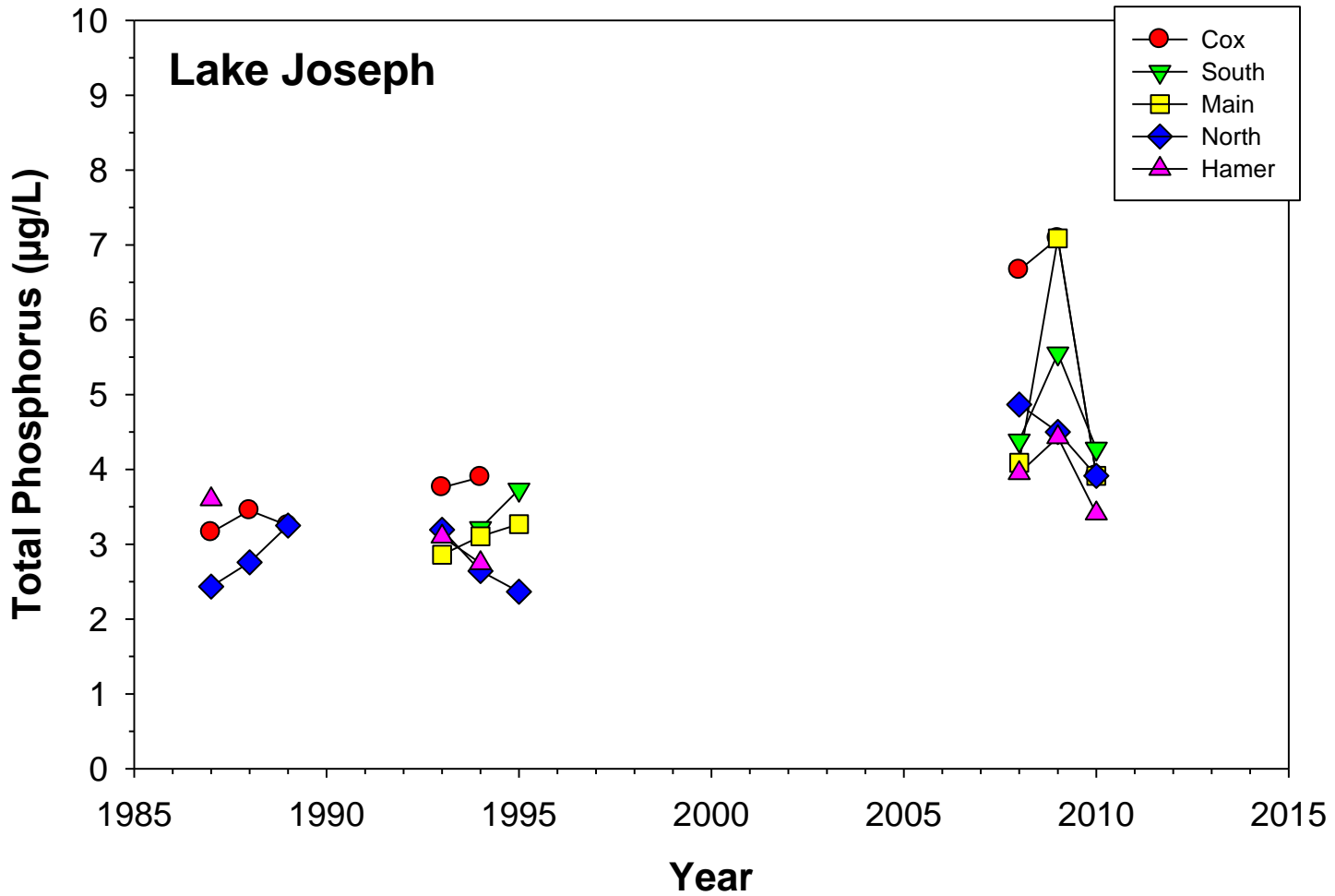
**4** Provide context. Include data from other lakes, paleolimnology, re-evaluate Lakeshore Capacity Model.

	<b>MOE</b>	<b>DMM</b>	<b>MLA</b>
<b>Sampling period</b>	<ul style="list-style-type: none"> <li>• 1969-70 (n/a)</li> <li>• 1986-89</li> <li>• 1993-95</li> </ul>	<ul style="list-style-type: none"> <li>• 1996-2001 (through MOE LPP)</li> <li>• 2002-10</li> </ul>	<ul style="list-style-type: none"> <li>• ~2002-2010</li> </ul>
<b>Sampling locations</b>	9 sites	5 sites	6 deepwater sites
<b>Duplicates</b>	Yes	Yes <i>(except 1996-2001)</i>	No
<b>Filtering</b>	Yes	Yes <i>(except 1996-2001)</i>	No
<b>Pump or Composite?</b>	Both	Composite	Neither
<b>Laboratory precision</b>	High	High <i>(except 1996-2001)</i>	High <i>(Trent U)</i>
<b>Considerations</b>	<ul style="list-style-type: none"> <li>• Sampling method and technician varied slightly over time</li> </ul>	<ul style="list-style-type: none"> <li>• In many instances, different sampling locations than MOE</li> <li>• 1996-2001 data are less precise</li> </ul>	<ul style="list-style-type: none"> <li>• Ideal sampling methods not used</li> </ul>

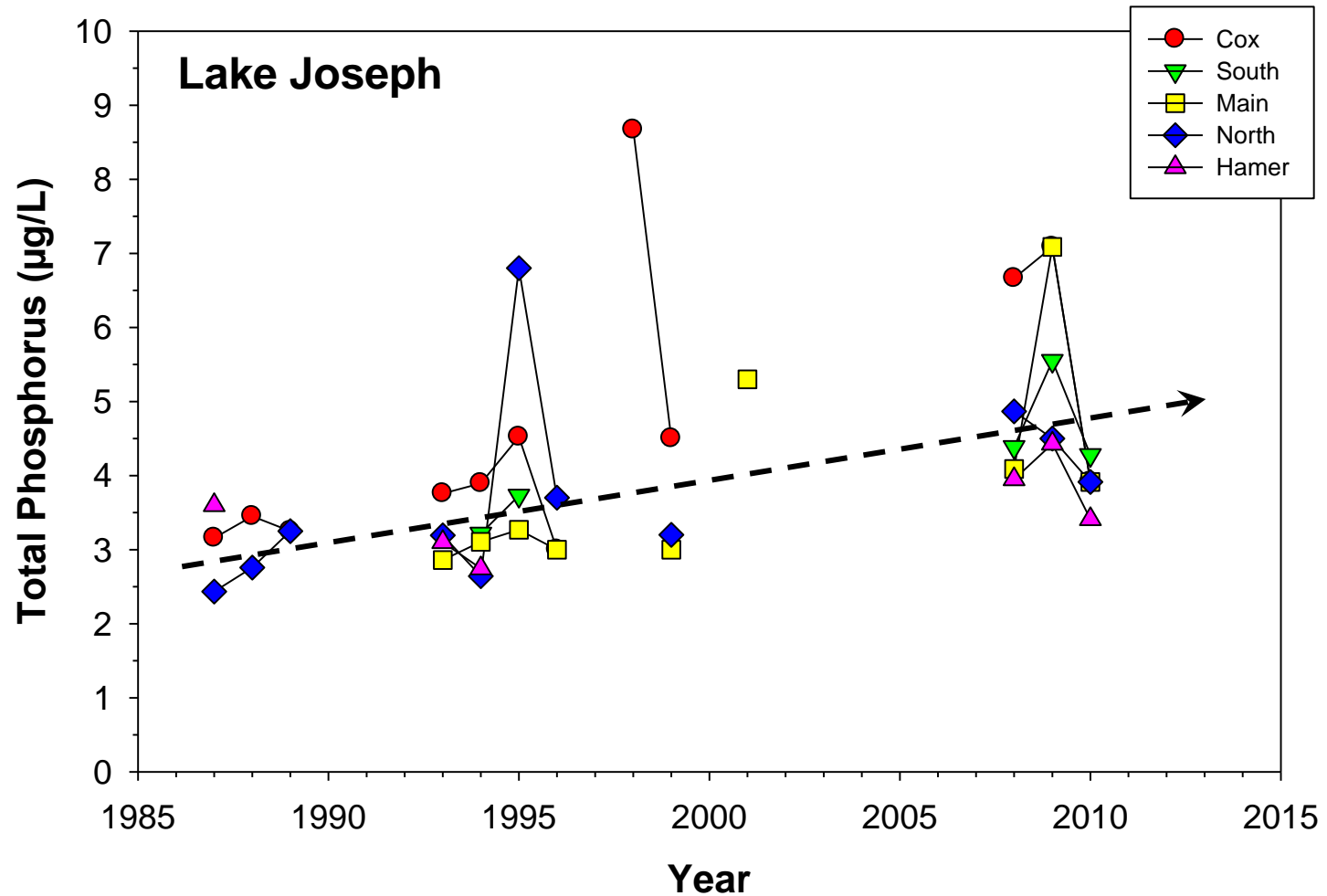
# What data to use?

- **MOE 1986-1995**
- **DMM 2001-2010**
- *DMM 1996-2001 – for comparative purposes only*
- *MLA 2002-2010 – for comparative purposes only*
  
- **Create long-term data records by combining data for sites where latitude/longitudes are similar (e.g., Main Basin and Yoho Island)**

# Examine water quality trends

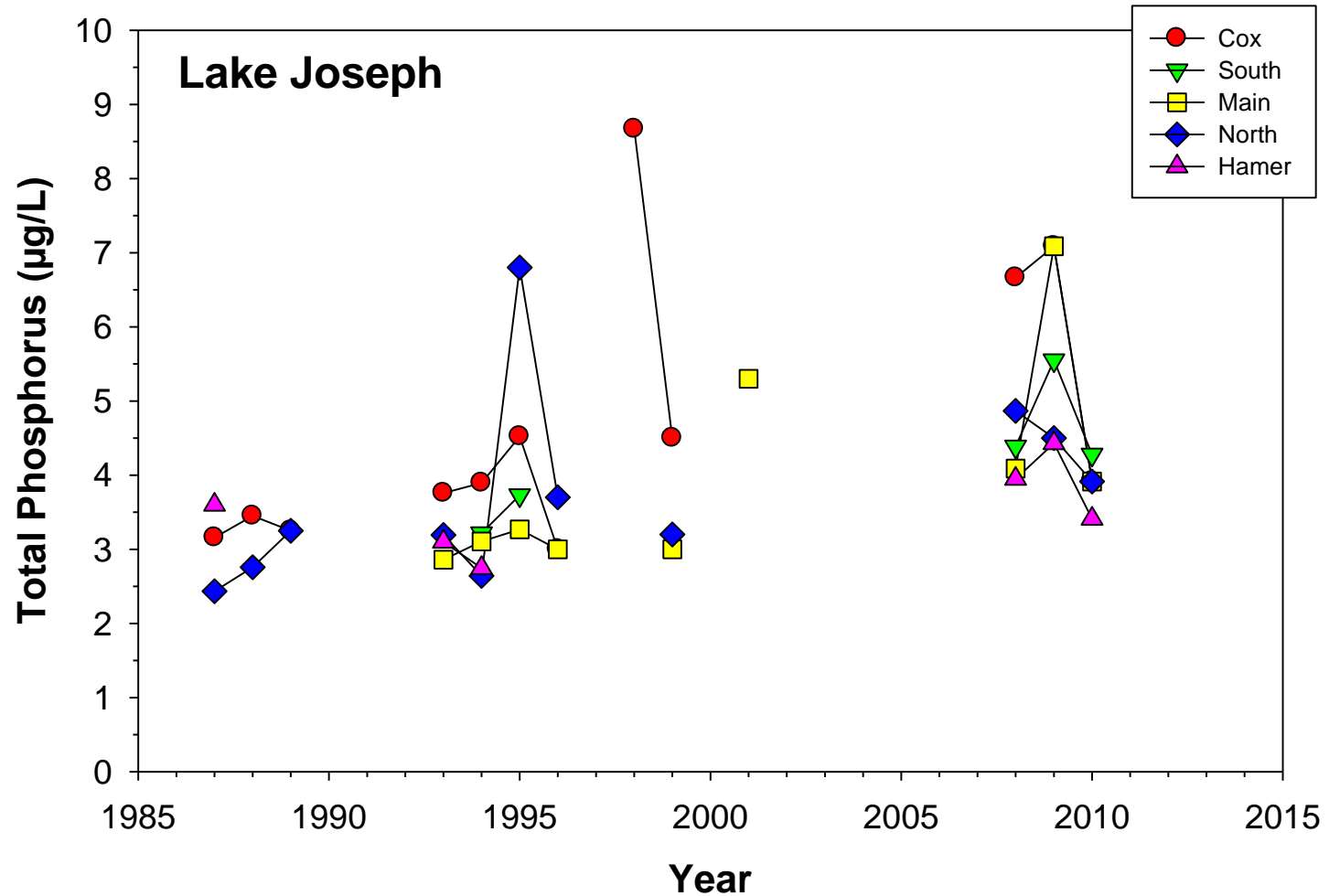


# Examine water quality trends

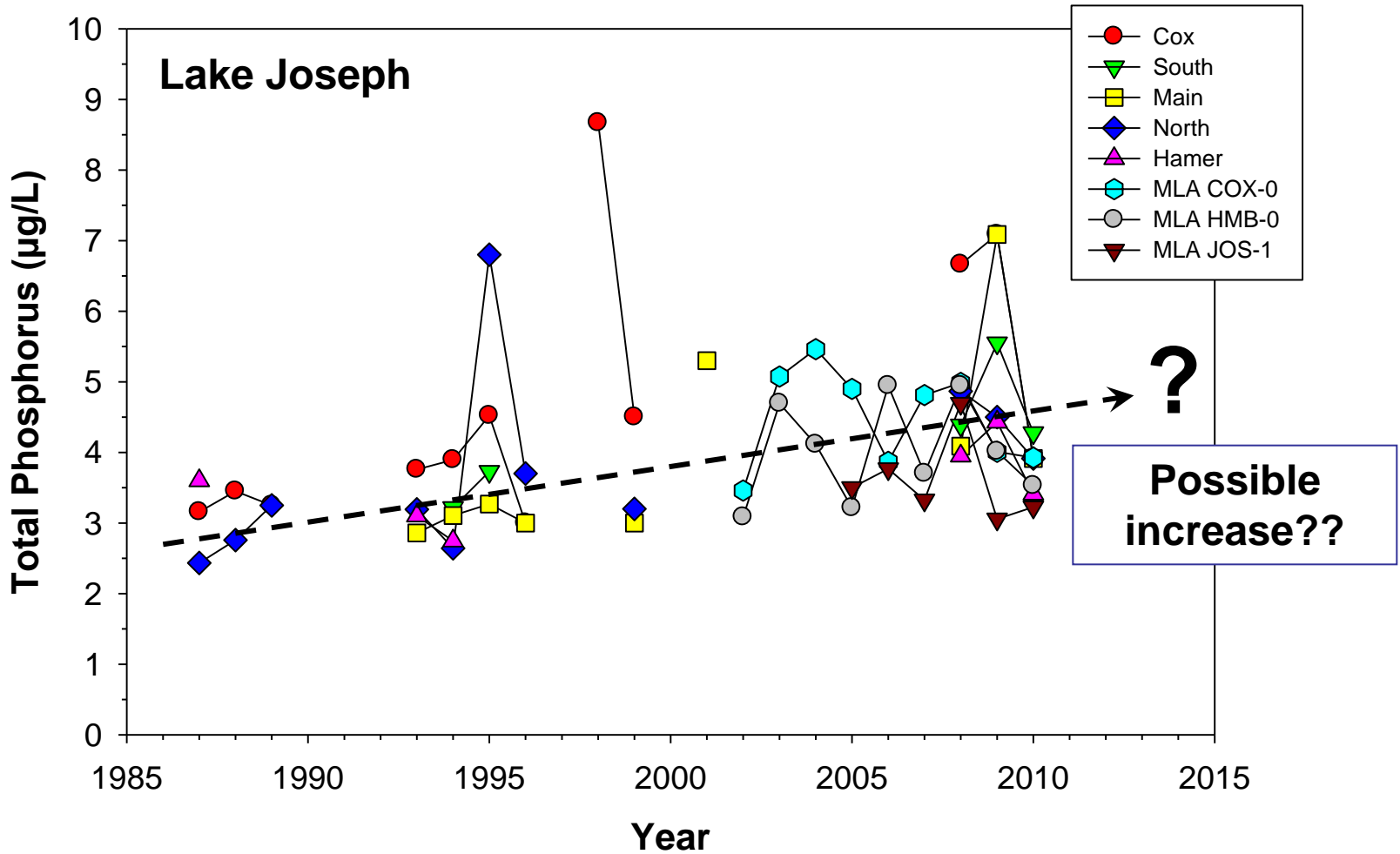




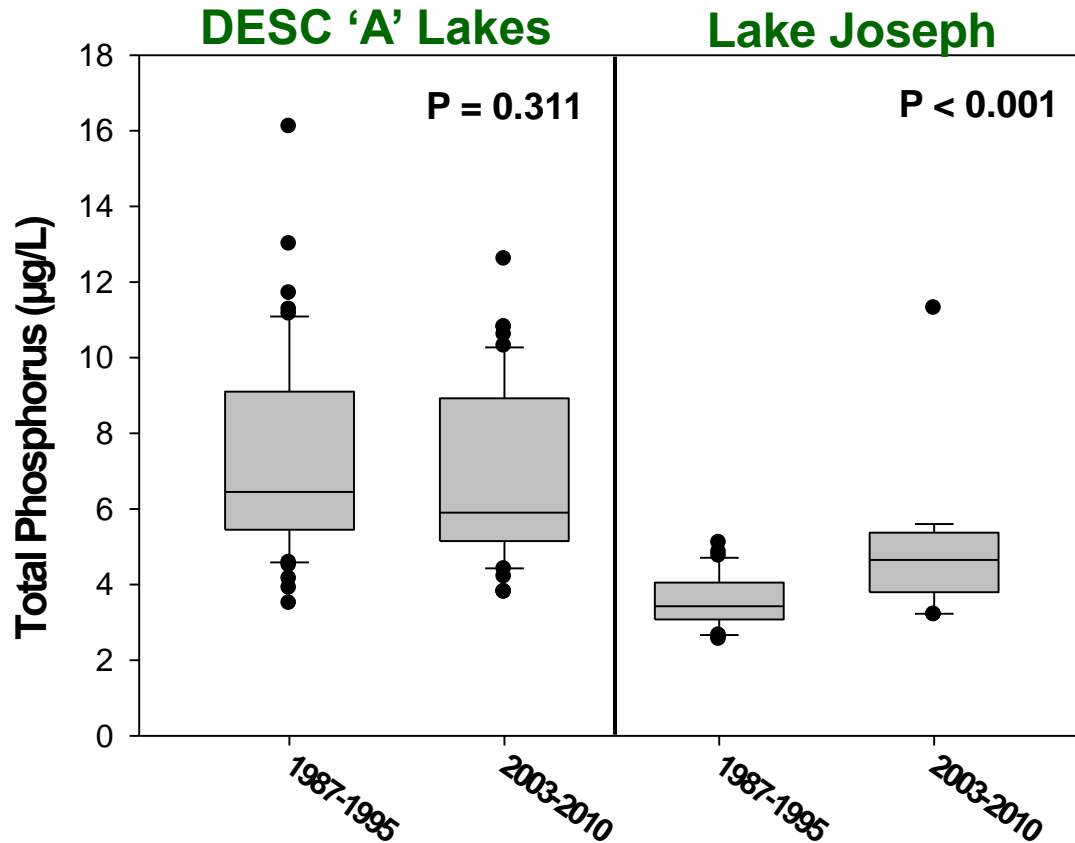
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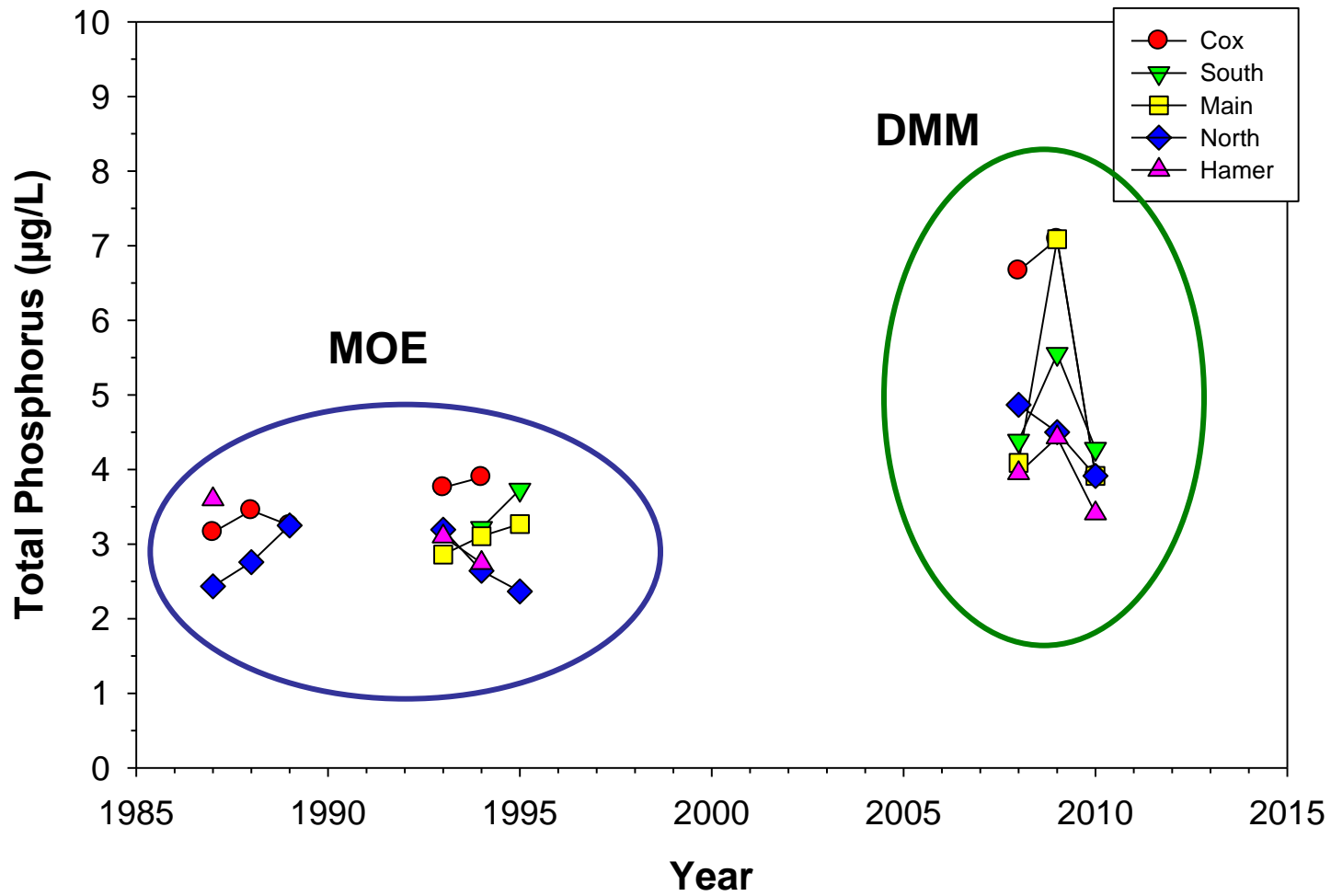
# TP - Then vs. Now

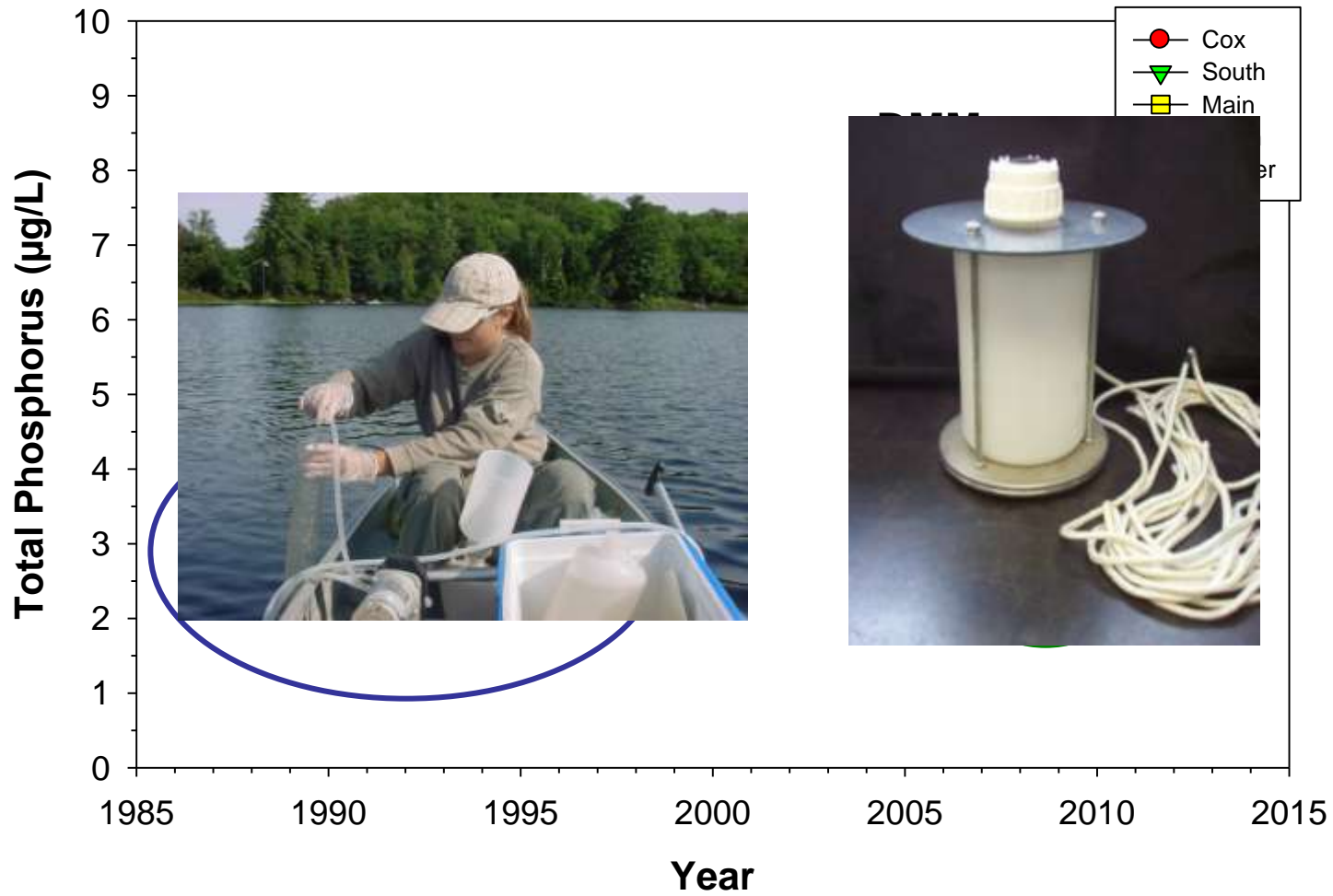


- Comparison of TP differences over two time periods for Dorset A lakes and Lake Joseph
- Mann-Whitney Rank Sum Test
- Lake Joseph – significant difference in spring TP concentrations between the two time periods

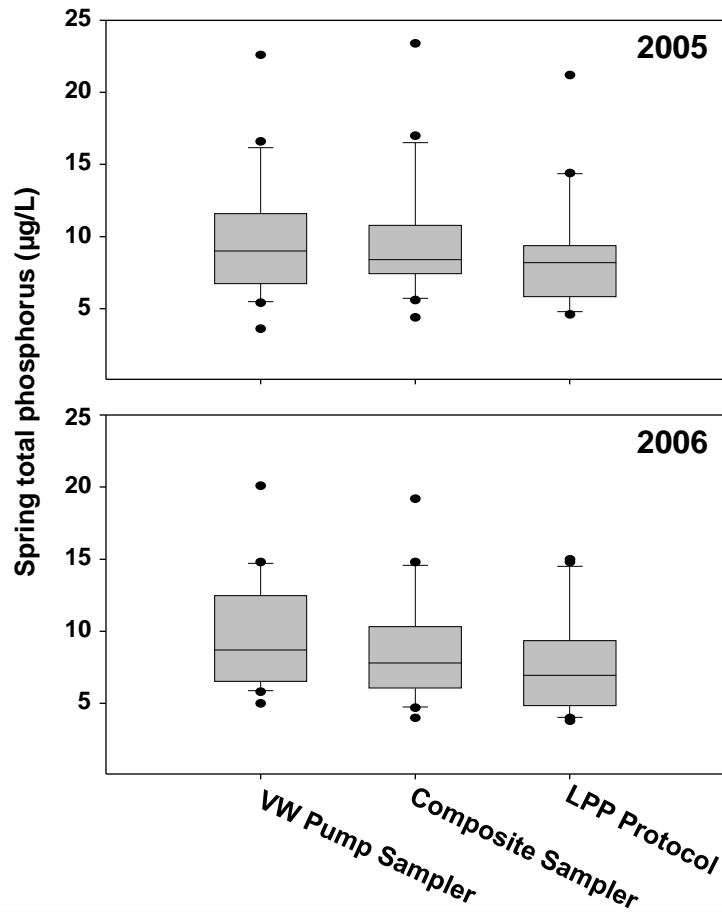
# Is this a true increase in TP?

- Trend is real
- Trend is not real
- Not enough information





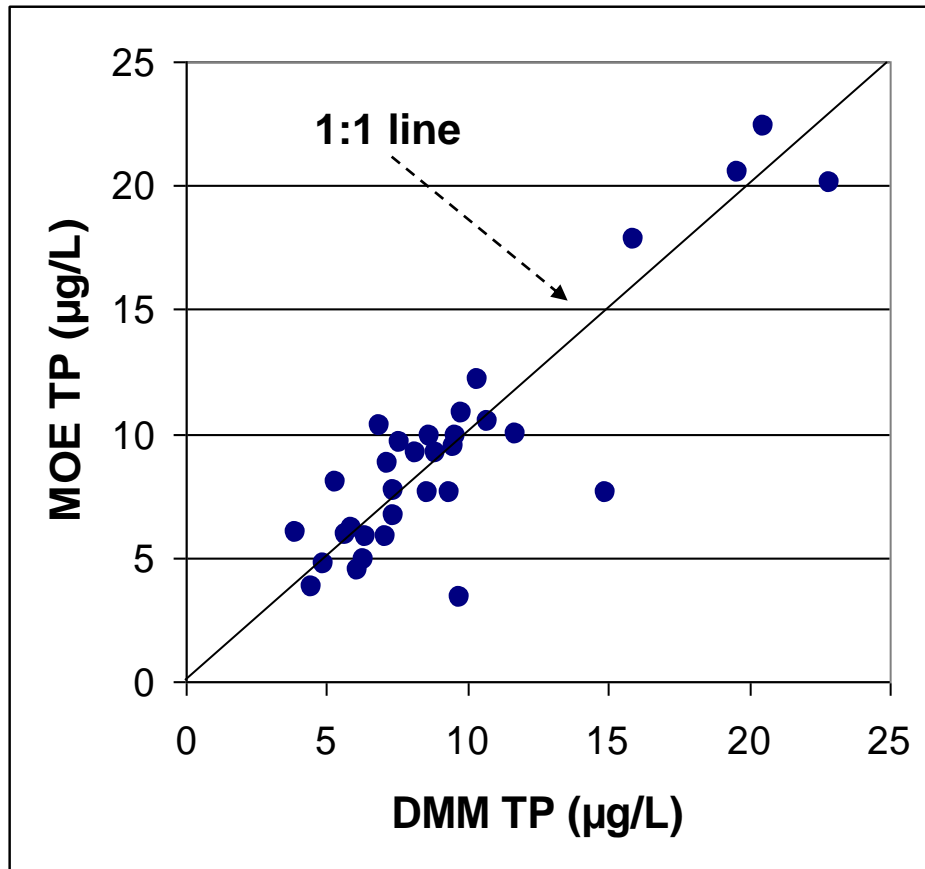
# No bias in the sampling methods



- No significant difference between Lake Partner, composite bottle and volume weighted pump and hose methods (ANOVA on ranks,  $P > 0.05$ )

*E. Fanning, 2006. Student Work Report, DESC*

# No difference in TP data for lakes sampled by both DMM and MOE



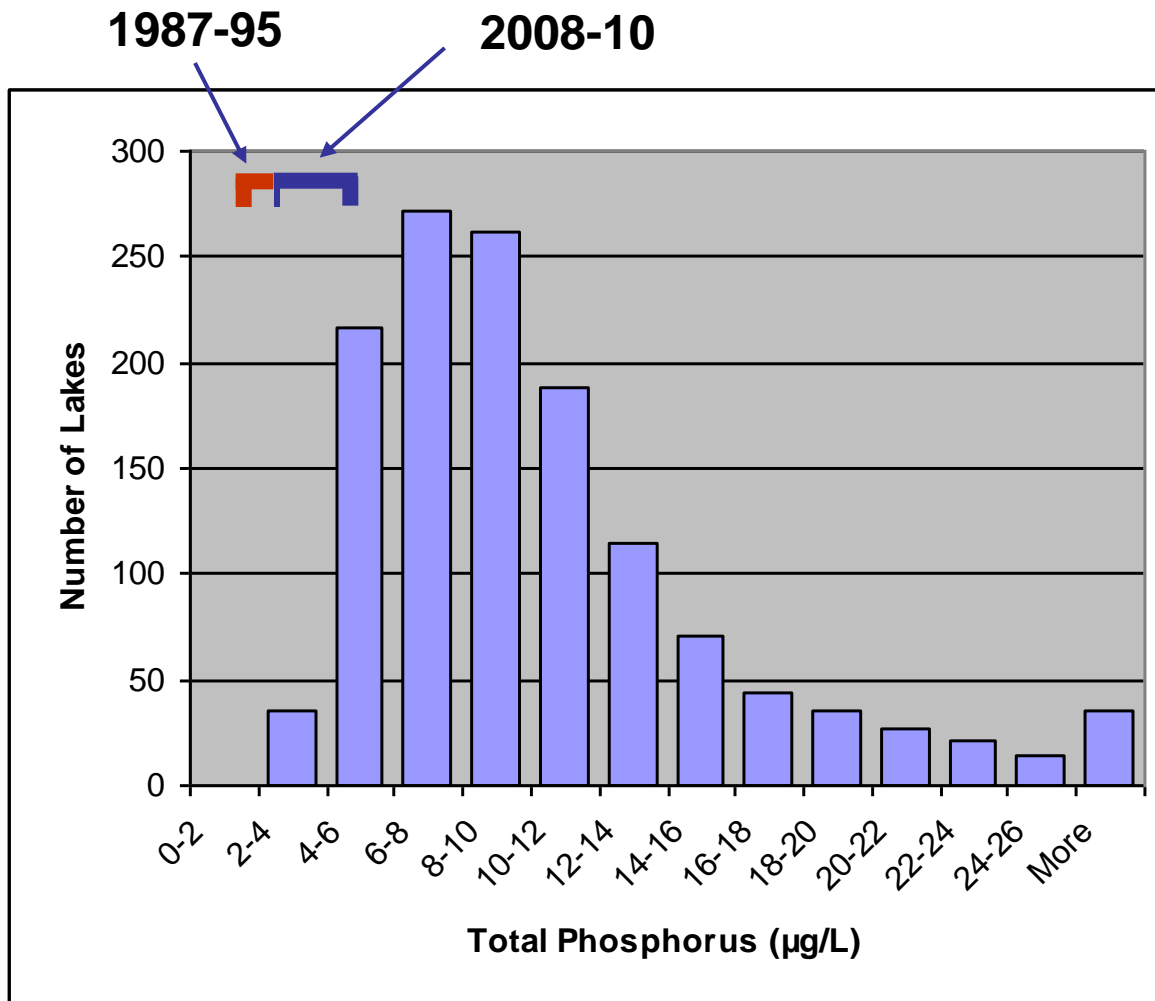
- Comparison of TP for lakes sampled by both DMM and MOE, 2006-2010
- No significant difference between TP data sampled by the two agencies (Wilcoxon Signed-Rank Test,  $P > 0.05$ )



# Is this a true increase in TP?

- ?  Trend is real
- Trend is not real
- Not enough information

# Lake Joseph's water quality is still considered to be EXCELLENT!



**Distribution of TP concentrations in 1227 lakes monitored by the Lake Partner Program, 2002-2009**

# What we know vs. What we don't know

## Know . . .

- Data we've decided to use are of high quality
- TP from 1987-95 was higher than TP from 2008-10
- Long-term monitoring records from Dorset lakes show stable TP concentrations, when these two time periods are compared.

## Don't Know . . .

- The reason(s) for this increase (not necessarily due to development, etc.)
- If this is a sustained increase over time
- If this increase is within the range of natural variability?
- Change needs to be put into a broader context (spatially – relative to other lakes; and temporally)

# Work in Progress (Final Report)

- What if we model threshold properly using the Lakeshore Capacity Model?
- What do the paleolimnological data tell us about the timing of changes in TP?
- What are the TP trends in Lakes Muskoka and Rosseau?
- What does the oxygen-temperature data show?



# Recommendations

- **Promote continuation of enhanced monitoring program in Lake Joseph (is this a sustained increase?).**
- **Begin to compile long-term data on stresses within the watershed.**