

# NUTRIENTS IN THE ESSEX REGION WATERSHED & ITS NEARSHORE WATERS



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Water Quality Specialist

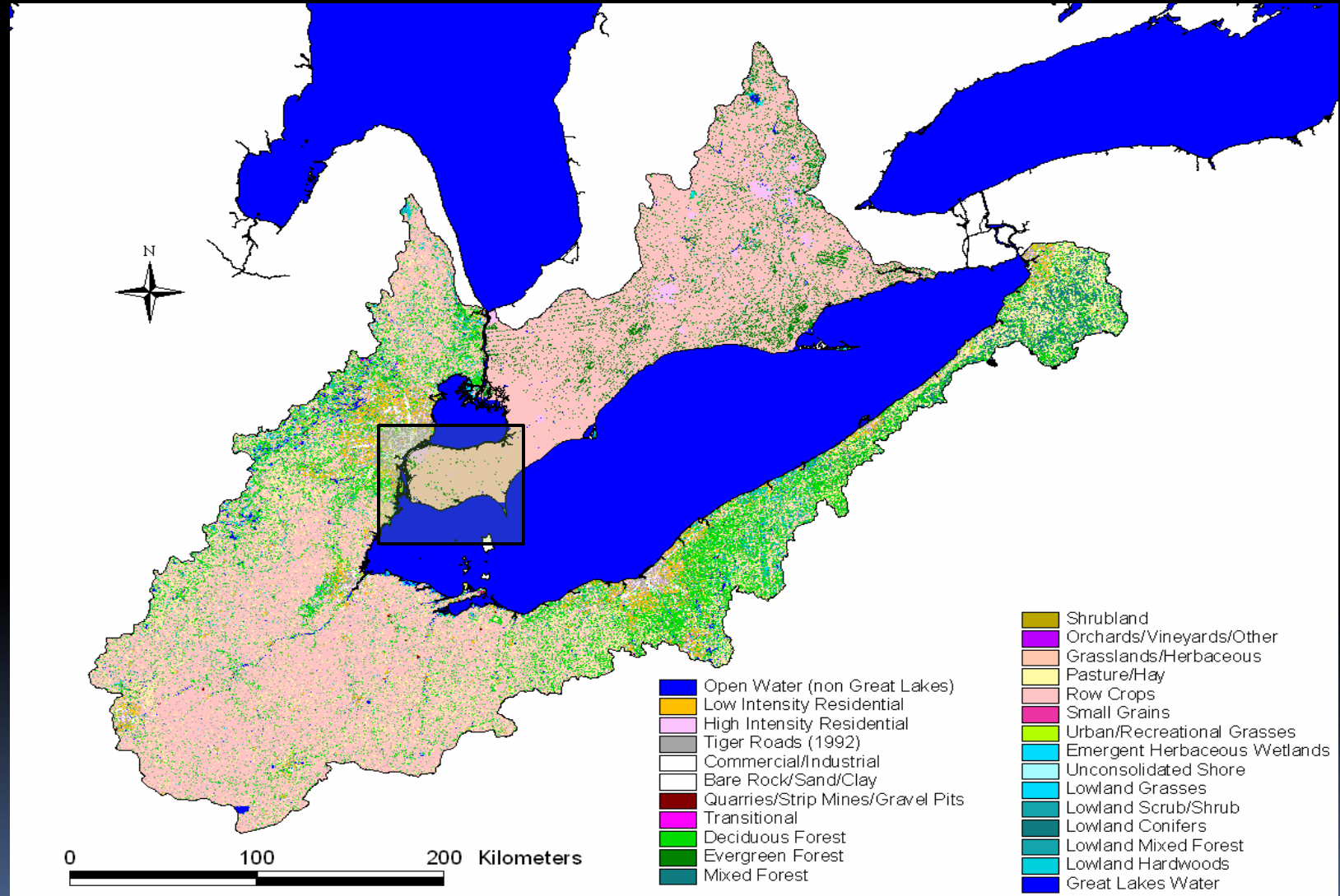
Essex Region Conservation Authority



# Outline of the Presentation

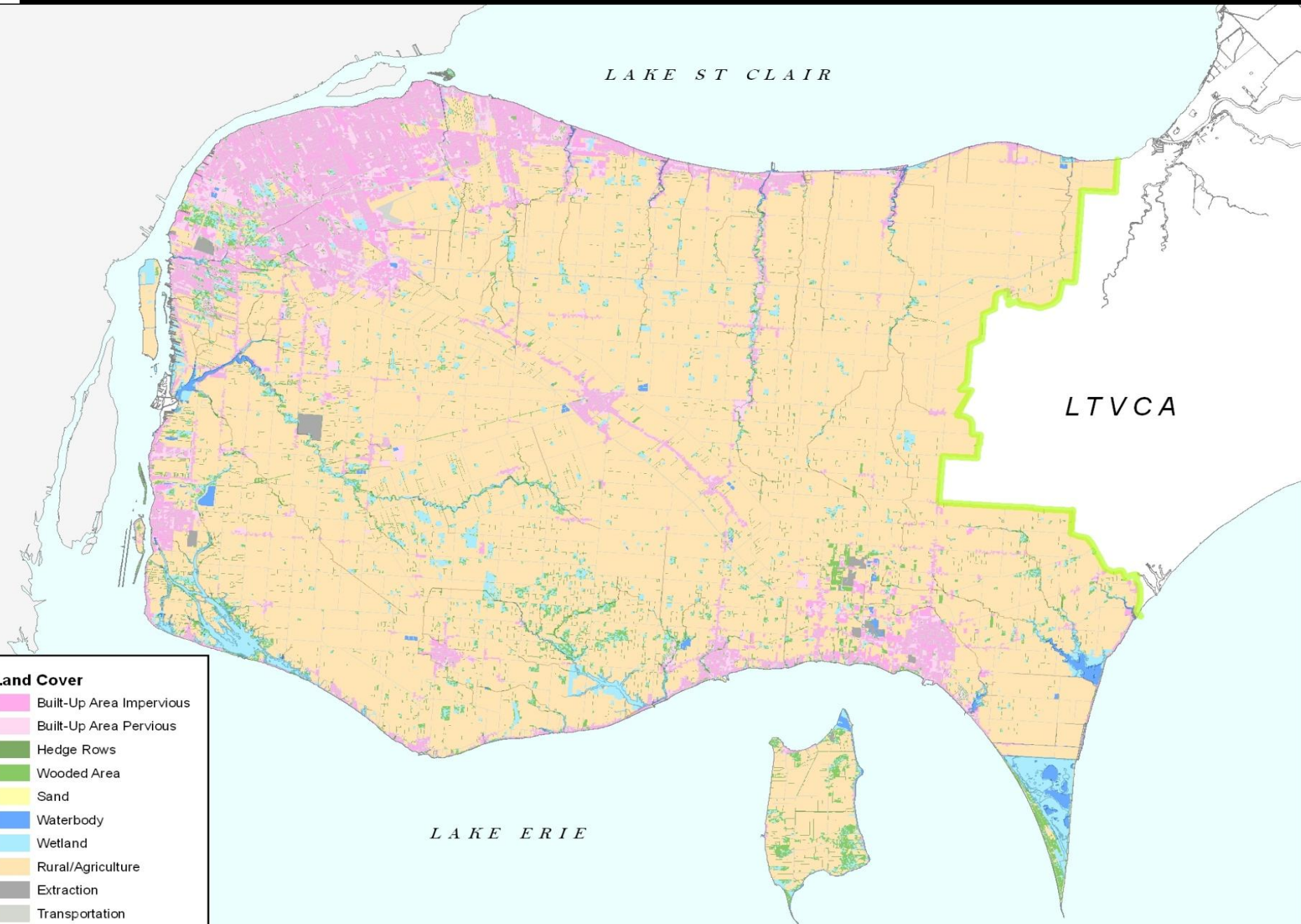
- **Study Area**
- **Data Sources & Monitoring Programs**
- **Results (mainly Total Phosphorus)**
  - *Tributaries*
  - *Nearshore waters*
  - *Sturgeon Creek Watershed*
  - *Tributary loadings and the raw water intakes*
- **Conclusion**
- **Questions**

# Essex Region Watershed and Lake Erie Basin





# Essex Region Watershed: Land Cover 2000



# Data Sources

## Provincial Water Quality Monitoring Network (PWQMN)

- Over 32 long-term monitoring stations (1964-1998)
- 8 Active Stations (1964-2009)

## ERCA's Regionwide Surface Water Monitoring Program

- Over 36 in-stream monitoring stations (*general chemistry, nutrients, chlorides and E.coli etc*) (since 2001)
- Around 28 nearshore monitoring stations (2008 onwards)
- Wet weather /regular weather samples.
- Flows are also monitored at selected locations.

## The 4-Pilot Watershed Monitoring Study

- Belle River, Little River, Canard River and Big Creek watershed
- Over 28 stations including in-stream and nearshore region
- Wet weather and regular weather sampling
- General chemistry, nutrients, chloride and E.coli



# Current Water Quality Monitoring Programs in the Essex Region WS



LAKE ST CLAIR

LTVCA

LAKE ERIE

**Legend**

- PWQMN (Provincial)
- ▲ PGMN (Provincial)
- ERCA Surface WQ Station



# Why do we care?

## Human Health Concerns

- Drinking Water Quality
- Bacterial Contamination at beaches
- Harmful algal blooms produce toxins that if ingested cause liver damage in humans.

## Fish and Wildlife Impacts

- Low Oxygen Levels in streams and lakes
- Impairments to fish and wildlife habitats

## Socio-economic Impacts

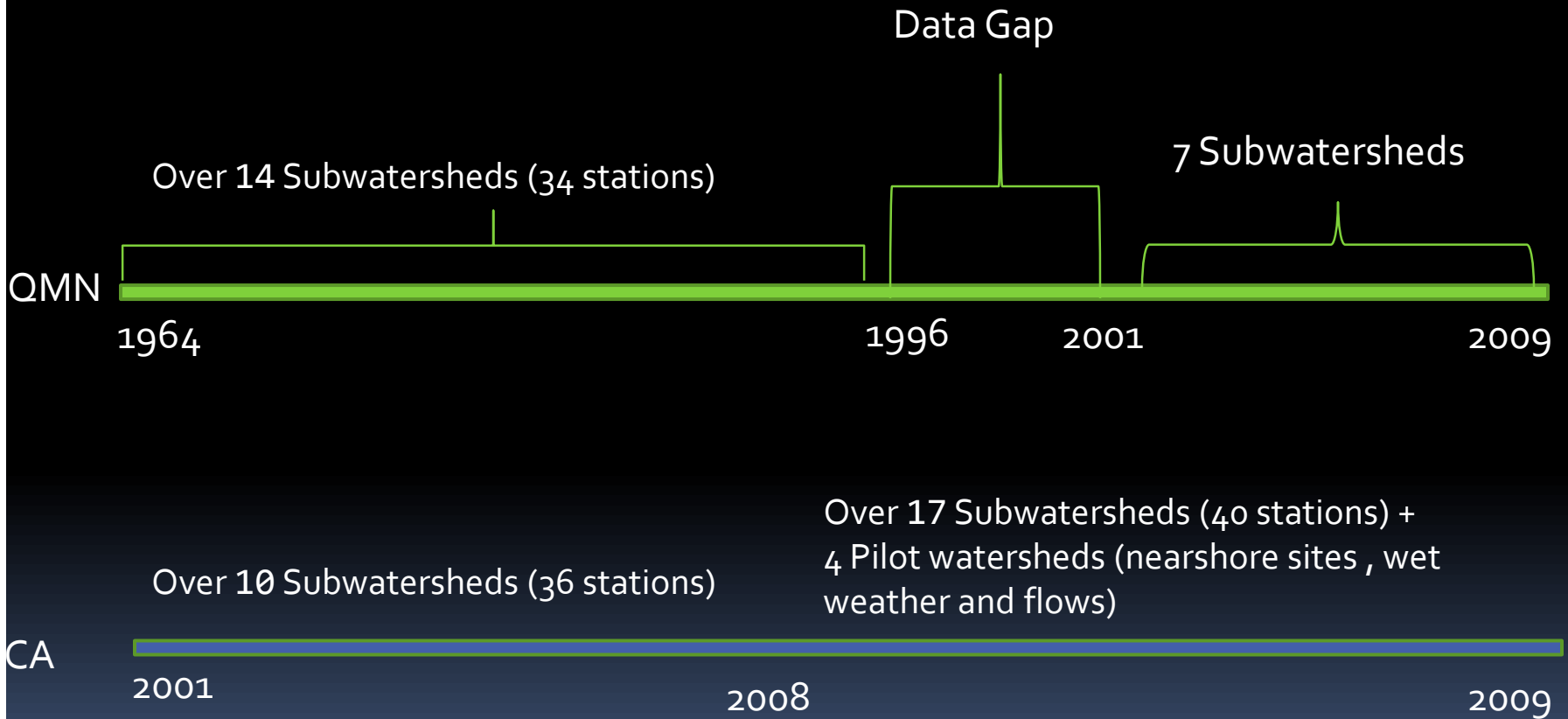
- Recreation and Tourism (i.e. Beach Closures)
- Fishing and Aesthetics
- Water Intake Clogging
- Added costs for treating drinking water



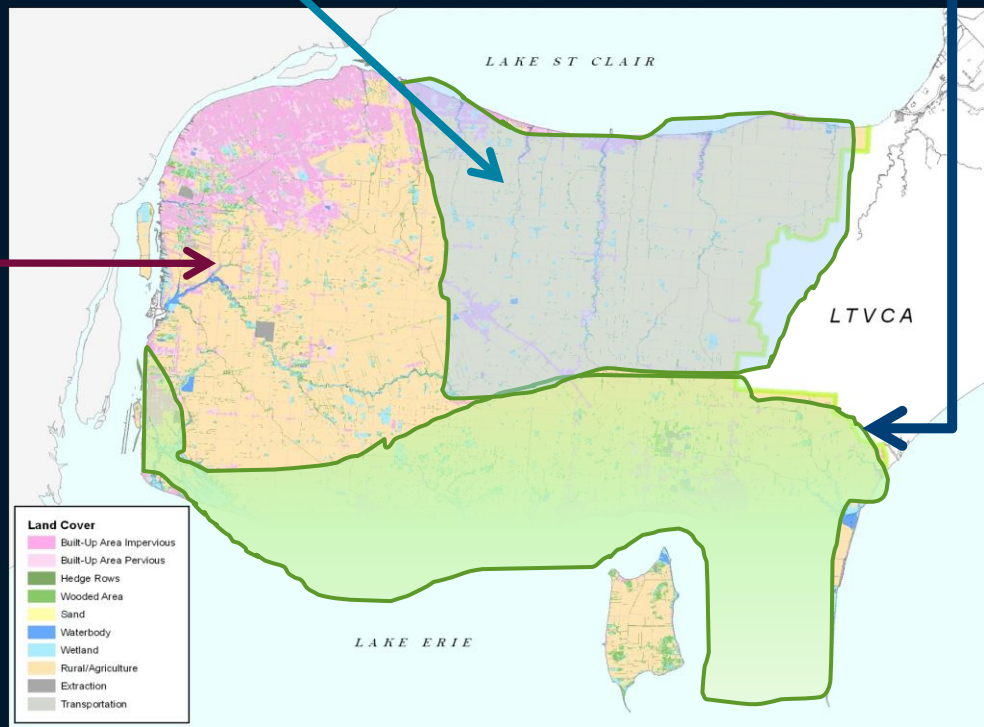
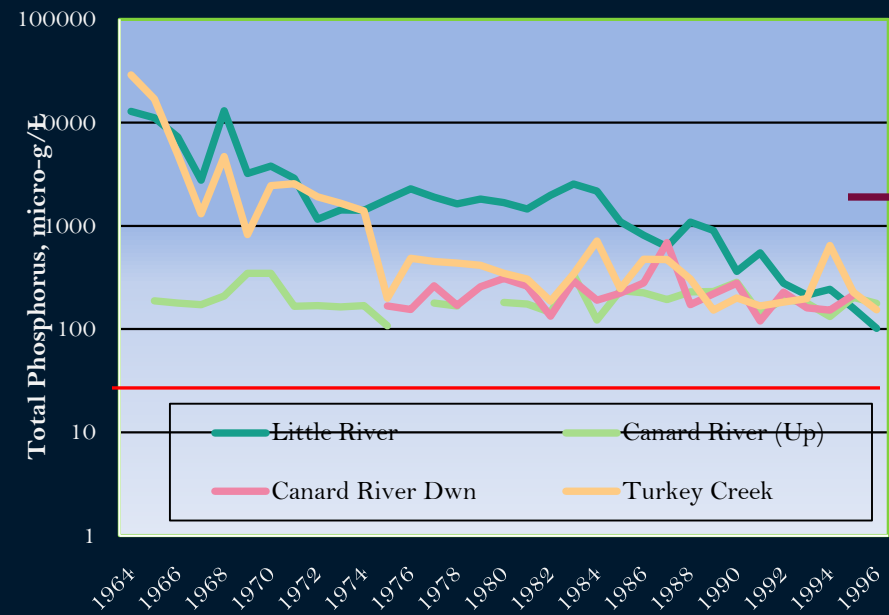
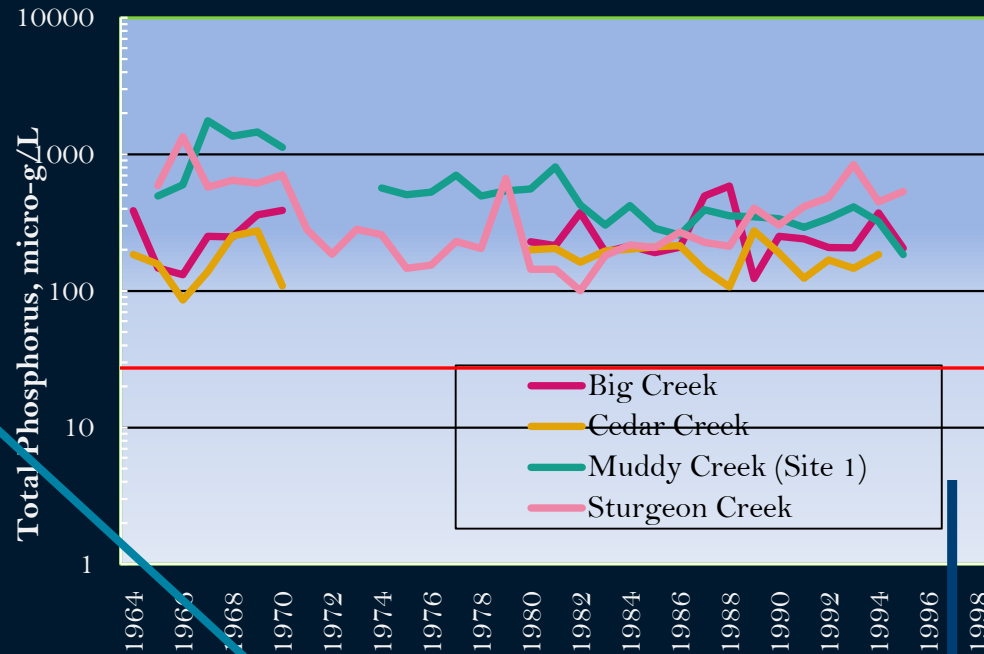
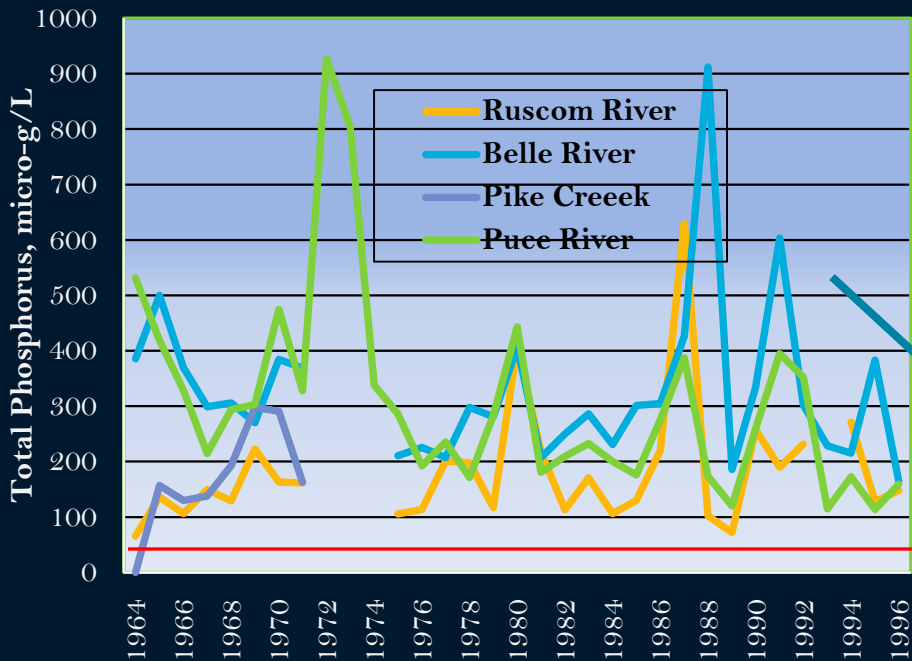
Algal blooms :  
Pelee Island  
Westshore  
(Summer 09)



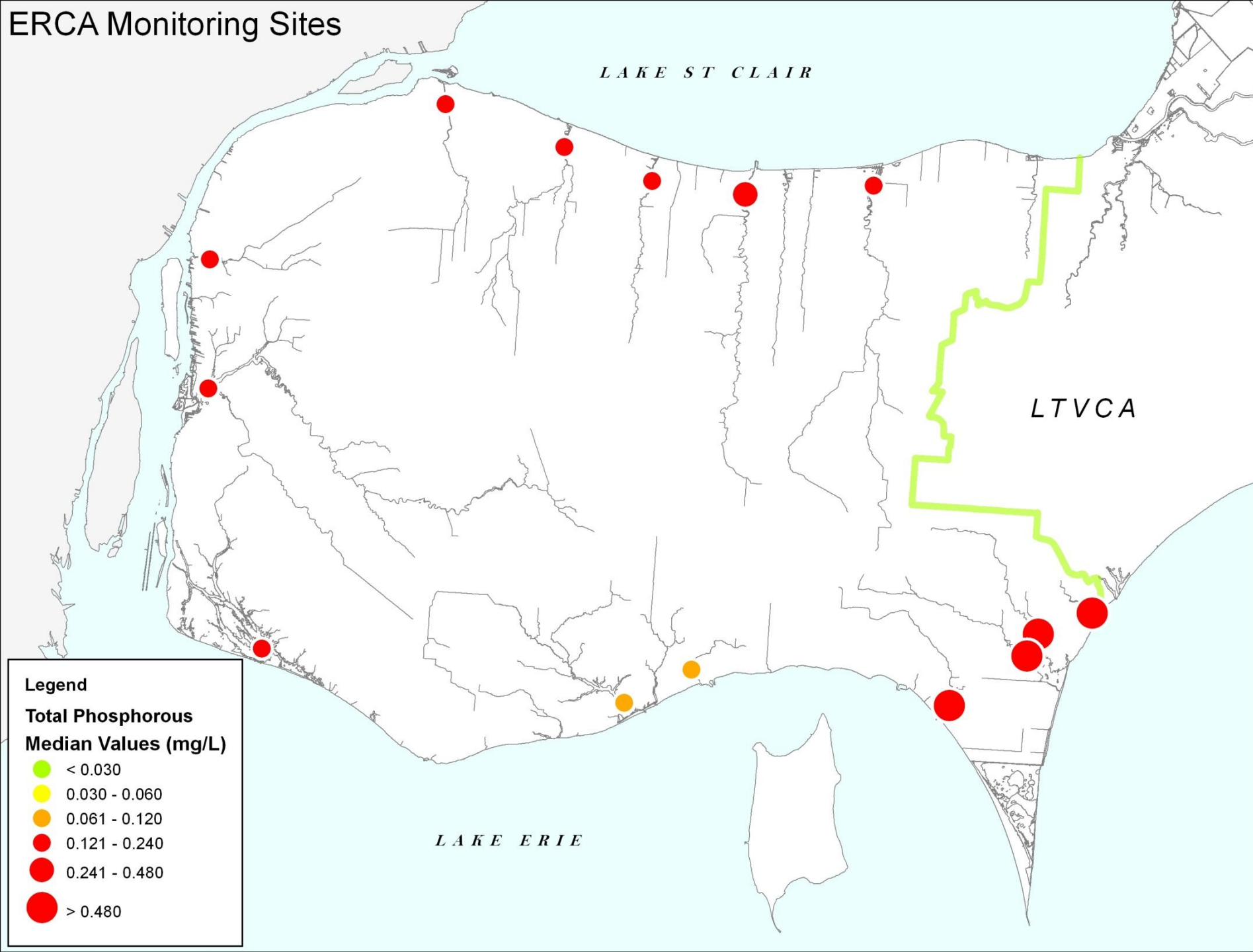
# Key Results : Snap shot of Monitoring Duration & Data



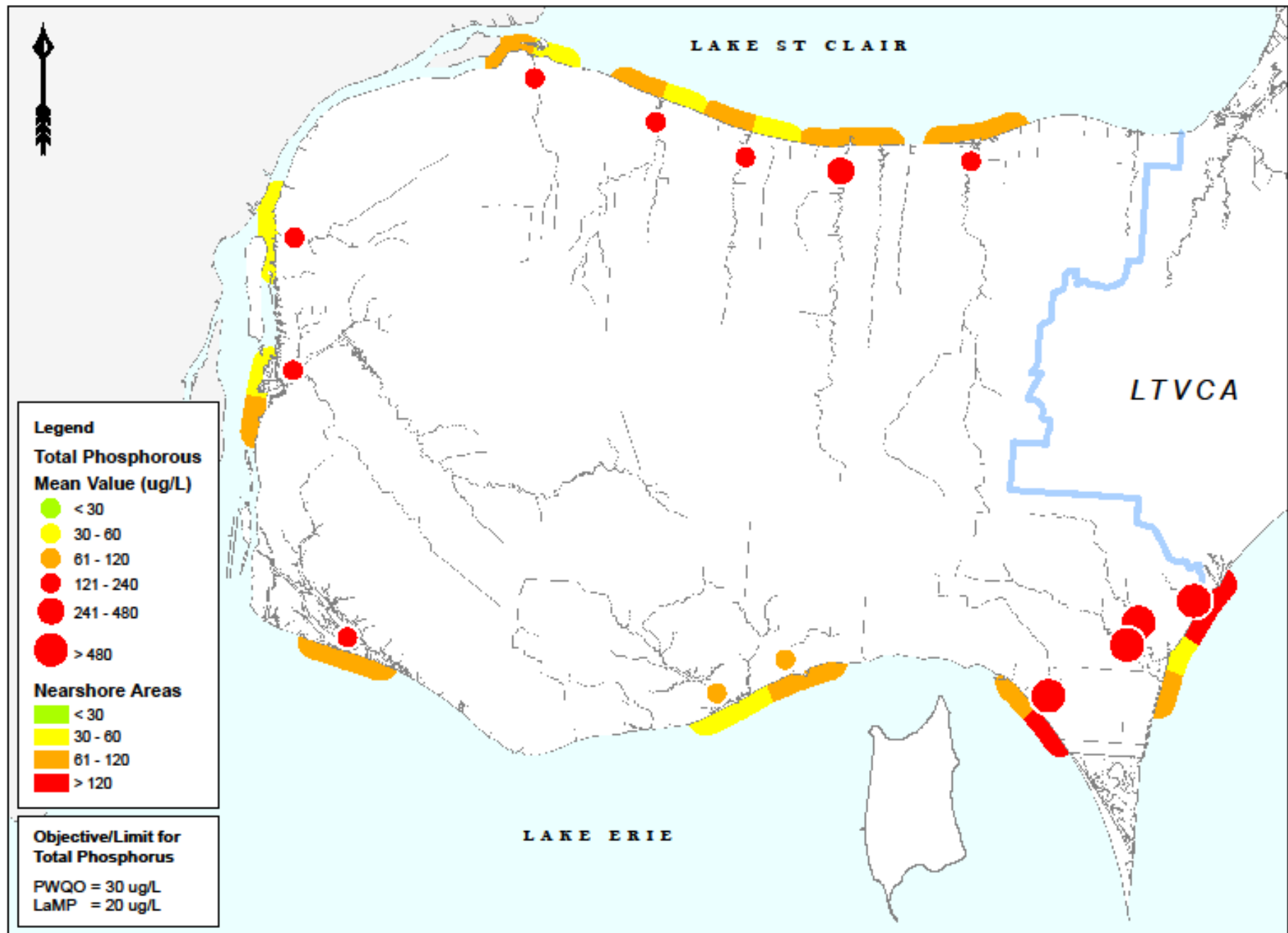




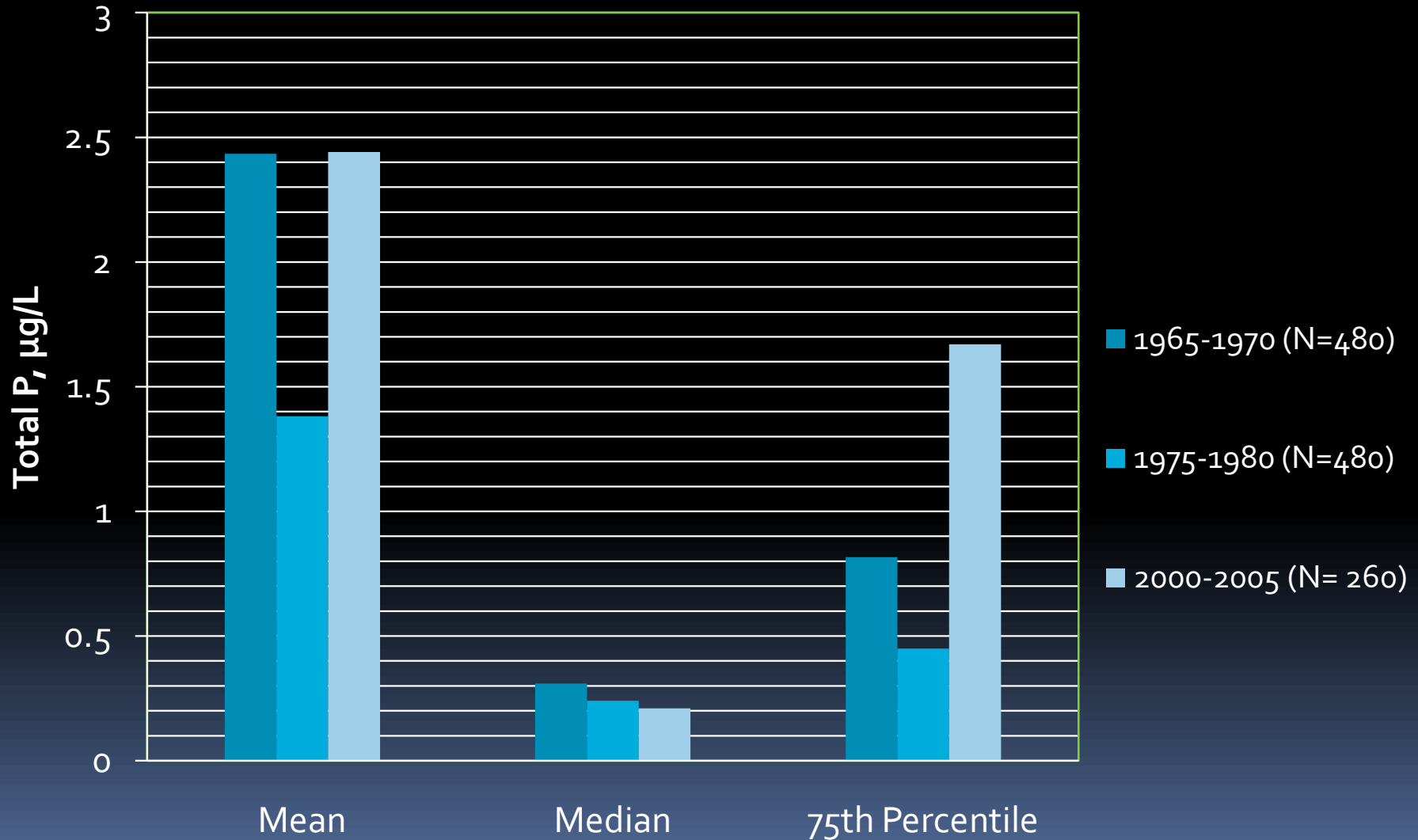
# ERCA Monitoring Sites



# Total Phosphorus in the Essex Region Watershed & Nearshore Areas (2008/2009)

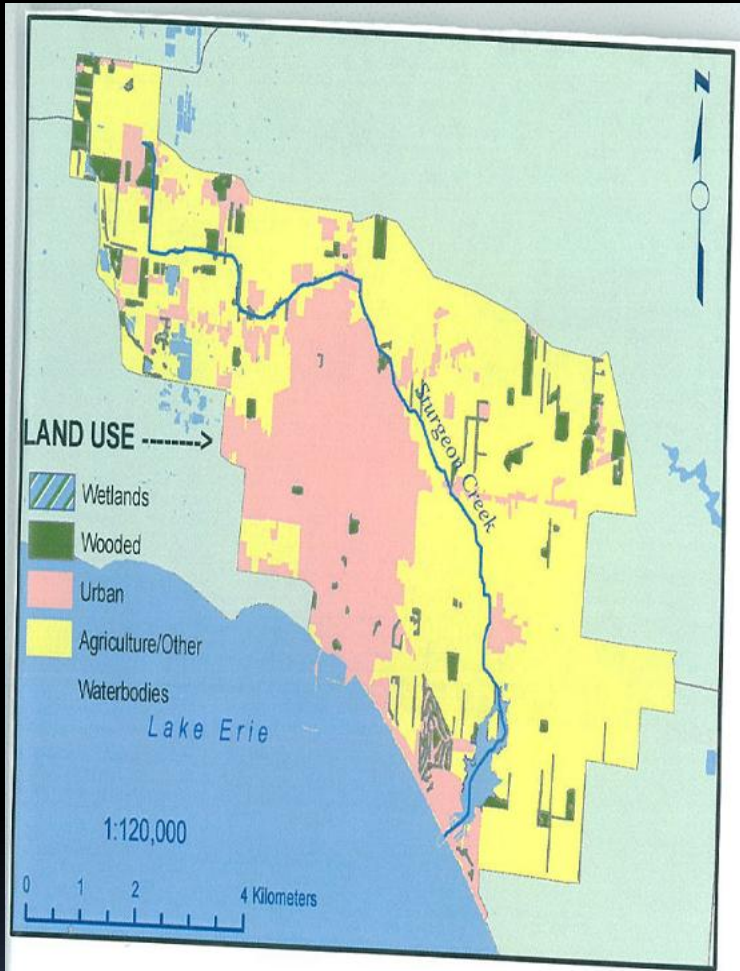


# Essex Region TP Long Term Profile

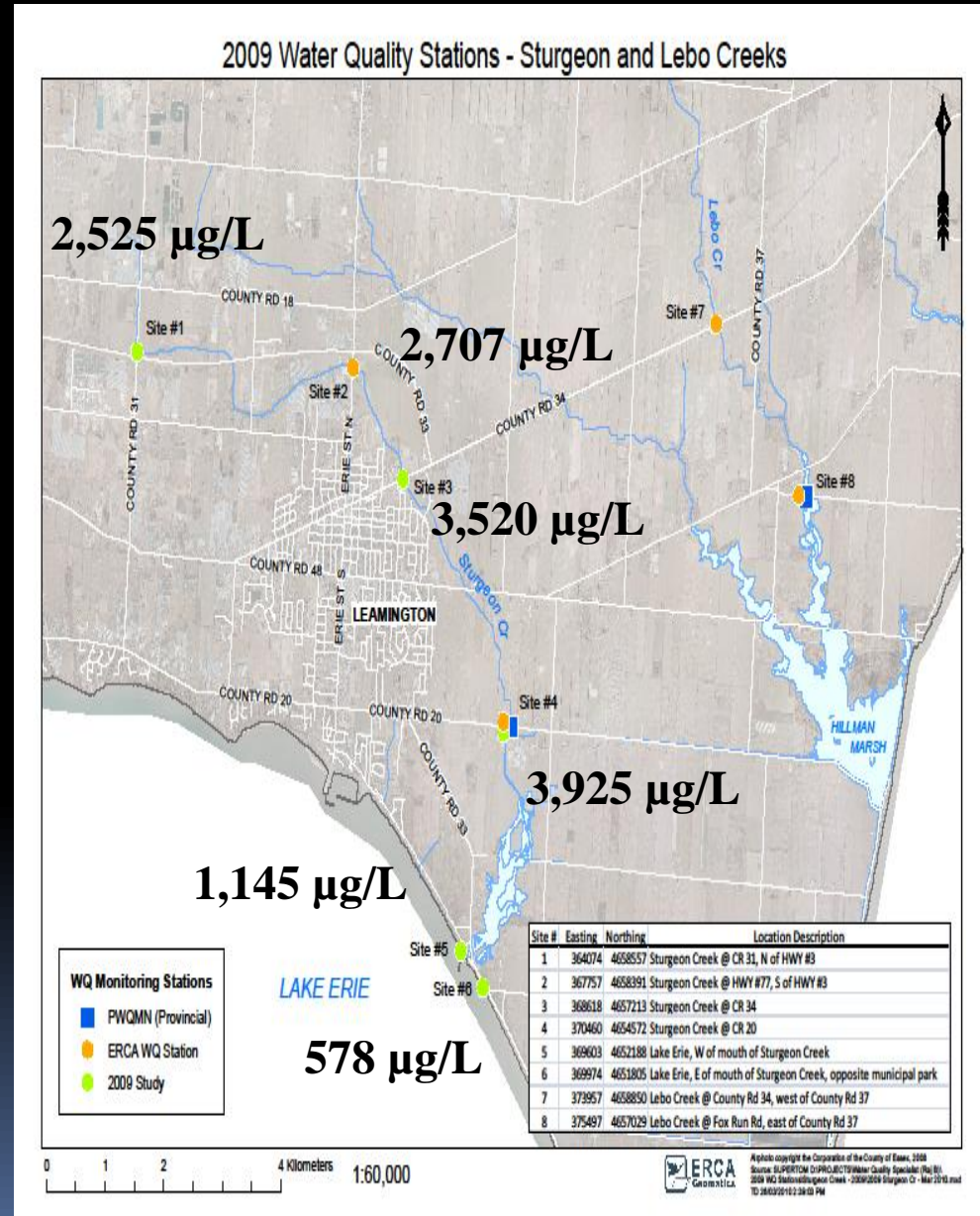




# Nutrients in the Sturgeon Creek Watershed : Current Status



Drainage Area = 46.6 km<sup>2</sup>  
 Agriculture = 63.8 %  
 Urban = 30 %  
 Wooded = 5.6 %  
 Wetlands = 0.6%

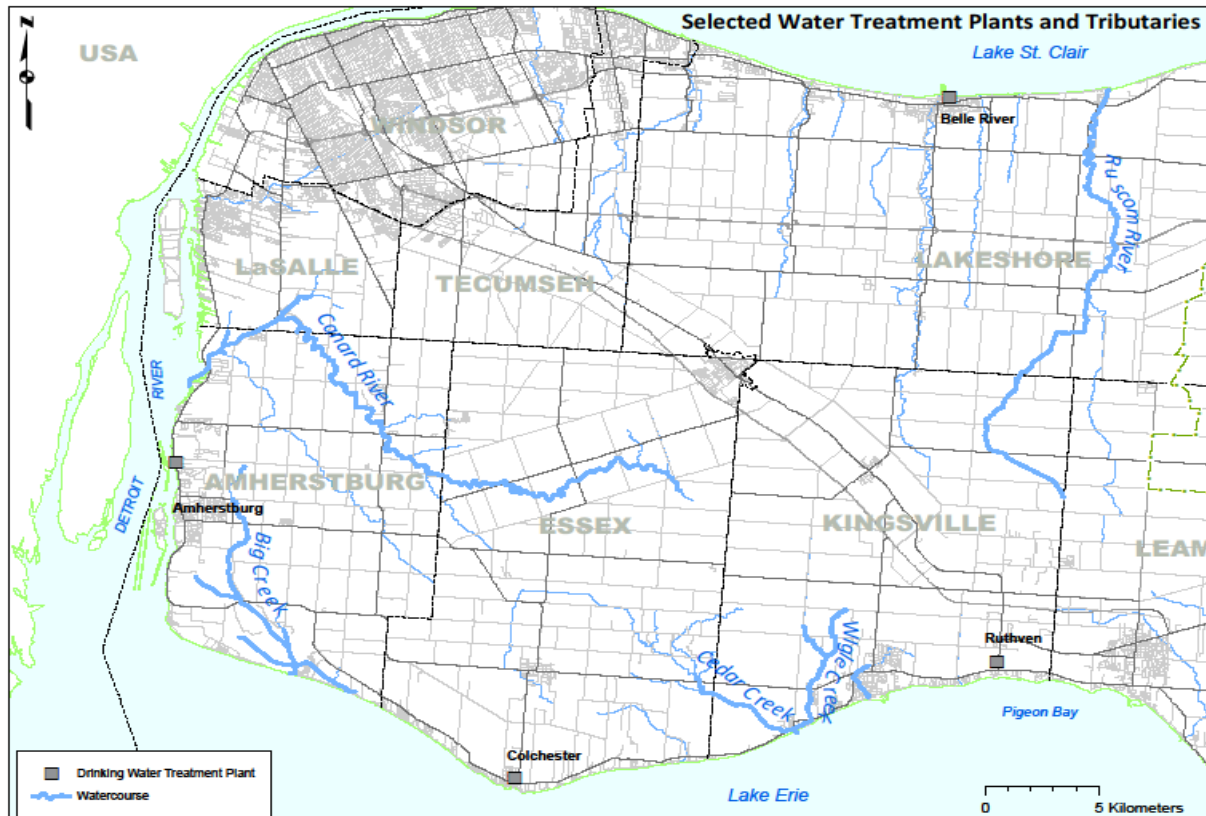


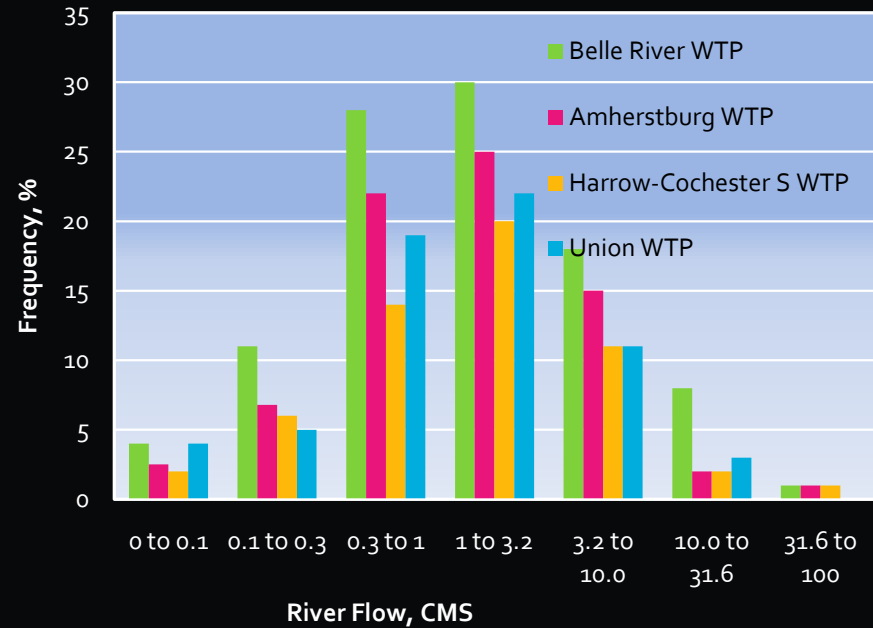
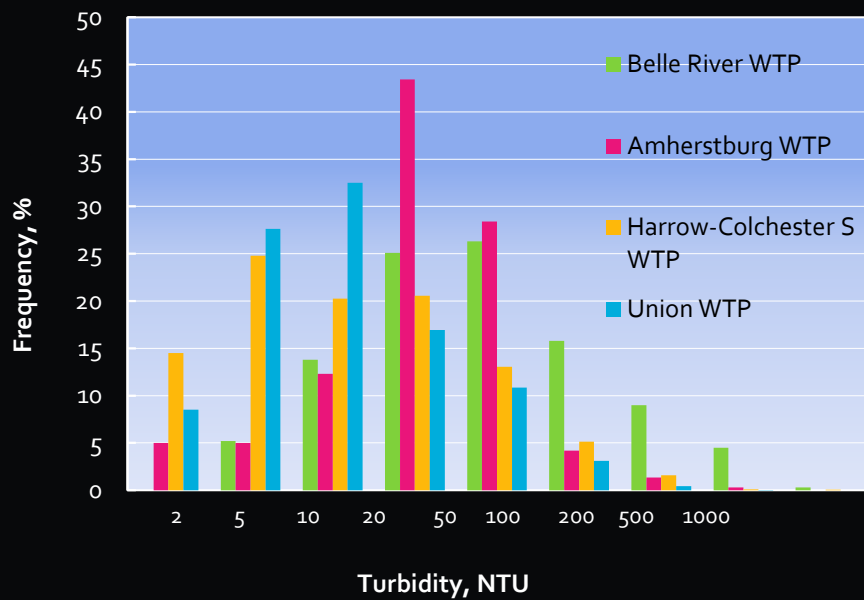
# Key Conclusions (preliminary)

- SC is heavily polluted with nutrients compared to other subwatersheds in the Region
- High levels of Total Phosphorus and Nitrates and normal TKN levels
- Total Phosphate values are closely equal to Total Phosphorous values
- Suggesting sources are likely inorganic fertilizers and not organic sources (manure r septics)
- SC watershed and surrounding area has clusters of green house and other horticulture operations
- Data base (industrial C of A) does not show any other significant sources of P and N

# Impact of Local Watersheds on Nearshore Water Quality

- **Objective of the Study:** Understanding the impacts of tributary loadings on the nearshore water quality.
- **Indicator Parameter:** Turbidity
- **Events:** Rain, Wind Direction and Wave Height
- **WTPs:** Belle River WTP, Amherstburg WTP, Harrow WTP and Union WTP
- **Tributary :** Ruscom River (gauging stations with long term data).
- **Method:** Frequency Analysis (Statistical)





## Belle River WTP Intake

- The most common turbidity level is in the range of 10 to 50 NTU (51% of occurrences).
- Almost 97% of high turbidity events occur between October and May.
- About 57% of the high turbidity events occurred when river flow rates exceeded the mean flow.
- This implies that the high turbidity events at the intake are linked to the river flows.



## Summary of Results

<b>WTP</b>	<b>% Distribution of events exceeding 100 NTU</b>		
	<b>Windstorm and tribs flow</b>	<b>Windstorm with no river flow</b>	<b>Only river flow</b>
<b>Belle River WTP*</b>	<b>90</b>	<b>7</b>	<b>3</b>
<b>Amherstburg WTP</b>	<b>78</b>	<b>4</b>	<b>18</b>
<b>Harrow-Colchester</b>	<b>87</b>	<b>8</b>	<b>5</b>
<b>Union WTP</b>	<b>85</b>	<b>12</b>	<b>3</b>

# Conclusions

## Historic

- Significant decrease in TP concentration during 1964 and 1998.
- The Essex Region tributaries are consistently high in nutrient levels.

## Current

- Increasing trend in TP concentrations (in terms of annual mean) at some sites in the Region.
- Sturgeon Creek, Lebo Drain and Muddy Creek showed very high levels of TP on consistent basis.

## Nearshore & Pilot Watershed Study

- High levels of TP and E.coli during wet weather events compared to regular weather samples.
- Over 89 % of the samples collected (112 samples) during 2008-2009 exceeded the PWQO limit of 30 µg/L.
- Statistical Analysis of daily turbidity data, streams flows and wind data suggest strong correlation between high turbidity levels at the intakes and peak flow events at inland streams.

## Conclusions....

Total Nitrate profiles were very similar to that of TP in terms of historic data, however, a significant decrease in nitrate values in the current data set

## Data Gaps

- Prior to 2008, water quality monitoring did not consider capturing wet weather events .
- Nearshore water quality data was not collected on regular basis.
- Flow data for major streams in the Region are not available.

## Future Work

- Focus on nearshore water quality and loadings from the inland streams, creeks and rivers etc.
- Land use and water quality relationship
- Soluble Reactive P (SRP) will be included in the ambient monitoring program.

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### Lime slime suggests lake in peril

#### Blue-green algae returns

BY CRAIG PEARSON, THE WINDSOR STAR    SEPTEMBER 7, 2009

STORY    PHOTOS ( 1 )



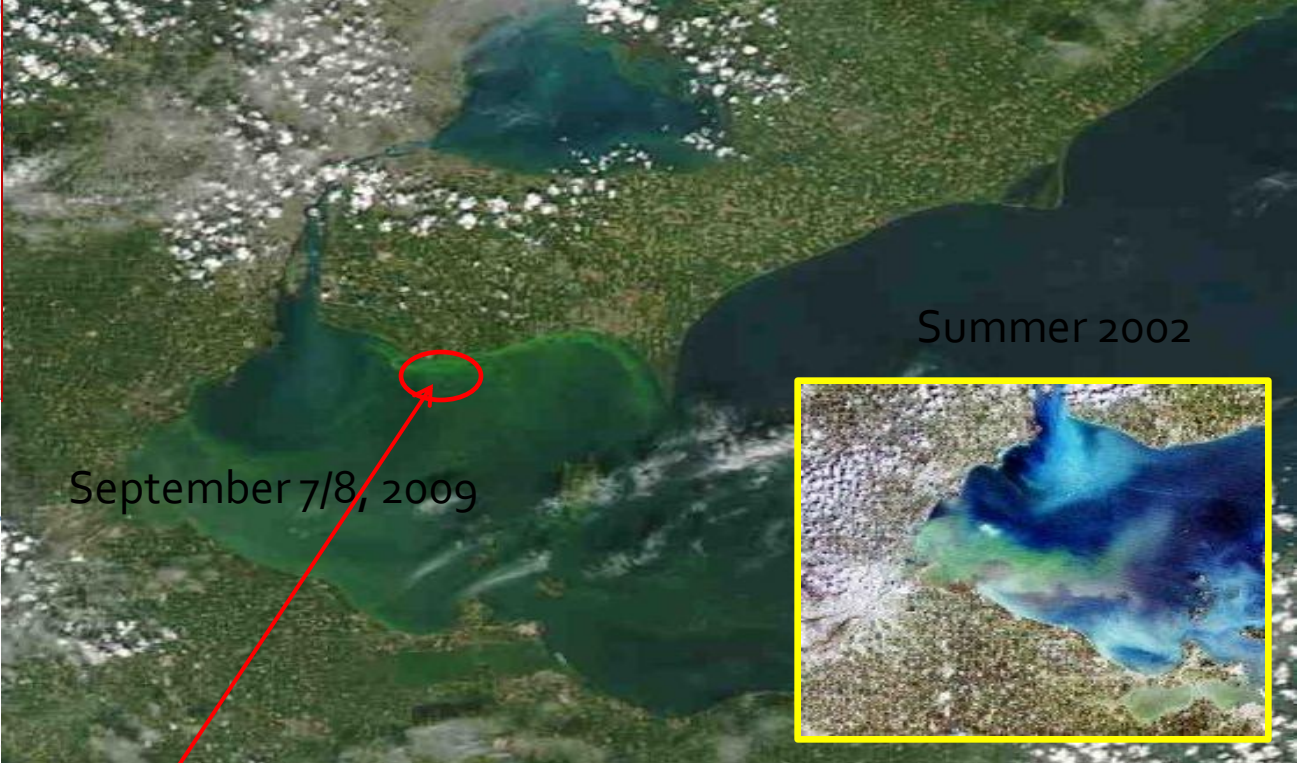
A mysterious green gunk seen floating in Lake Erie recently may indicate that an explosion of toxic algae is again threatening to suffocate the lake.

**STORY TOOLS**

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Summer 2002



September 7/8, 2009

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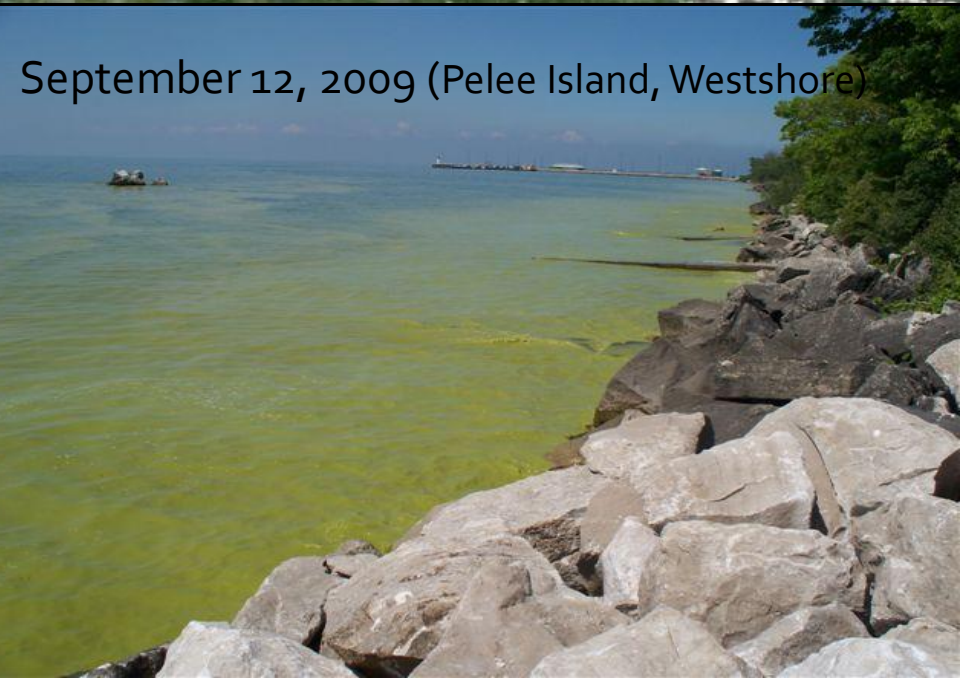
### Green gunk bad sign for Lake Erie

BY CRAIG PEARSON, THE WINDSOR STAR    SEPTEMBER 6, 2009    COMMENTS (05)

STORY    PHOTOS ( 1 )



September 12, 2009 (Pelee Island, Westshore)





# THANK YOU



Special thanks to Tom Dufour (GIS Tech, ERCA)

the buoy station in Lake St. Clair operated by NOAA (LSCM<sub>4</sub>) for the period 2001 to 2006, and the meteorological station operated by the Atmospheric Environment Service (AES) at the Windsor Airport for the period 1953 to 2007. All wind speed data measured at the stations were converted to the wind speed at 10 m above the water surface.

High turbidity events occur most frequently when winds are onshore (73%). The offshore winds only accounted for 27% of high turbidity events. During onshore winds there is increased wave activity due to the higher fetch lengths.