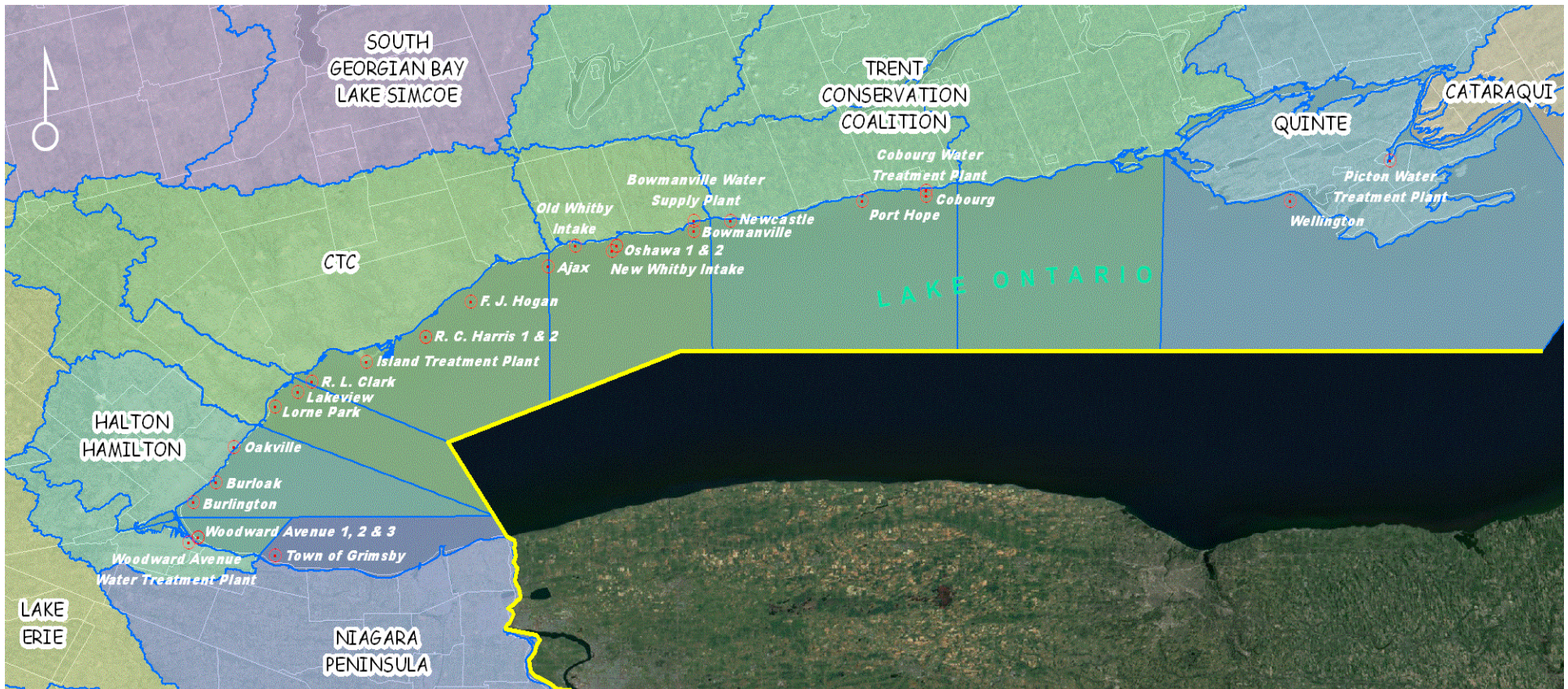


Lake Ontario Collaborative Study to Protect Lake Ontario Drinking Water *What are the Risks?*

Beverley Thorpe, Project Manager
CTC Source Protection Region

Collaborative Study to Protect Lake Ontario Drinking Water



Collaborative Partners

Municipalities/Utilities

- Prince Edward County
- Cobourg
- Port Hope
- Durham Region
- Toronto
- Peel Region (Chair)
- Halton Region
- Hamilton
- Niagara Region

Conservation Authorities

Source Water Protection Area/Regions:

- Quinte;
- Trent Conservation
Coalition;
- CTC (lead SPC)
- Halton/Hamilton;
- Niagara

Environment Canada

- Researchers in currents/modelling, pathogens, water quality and microorganisms

Ministry of Environment

- Advice, funding plus lab analysis and Great Lakes monitoring support

Ontario Clean Water Agency

- Coordination & Project Management

Consultants

Clean Water Act, 2006

- Requires local communities to look at the existing and potential threats to their municipal drinking water and set out and implement the actions necessary to reduce or eliminate significant threats
- Empowers communities to take action to prevent threats from becoming significant
- Requires public participation on every local source protection plan. This means everyone in the community gets a chance to contribute to the planning process
- Requires that all plans and actions are based on sound science
- **Directing the process are the five Source Protection Committees who are working collaboratively on this work**

What are we investigating?

- The location and nature of activities that could pose risks to drinking water intakes in Lake Ontario
- Assessing the conditions under which risks might occur & magnitude of the risks

What are we doing?

- Gathering details on all Lake Ontario municipal drinking water intakes
- Data/Information collection and Gap analysis
- Identifying and mapping threats to drinking water
- Pathogen & Algal Toxin Monitoring
- Watershed Pollutant Loading Studies
- Delineation of Intake Protection Zones (IPZ)
- Assignment of vulnerability scores to IPZs that reflect the presence of preferential pathways
- Assignment of level of uncertainty to vulnerability scores and IPZ delineations

Work Plan Under Revision to Meet New MOE Technical Rules

What are some of the likely risks to drinking water?

Discharges from tributaries during storm events

Spills into tributaries upstream



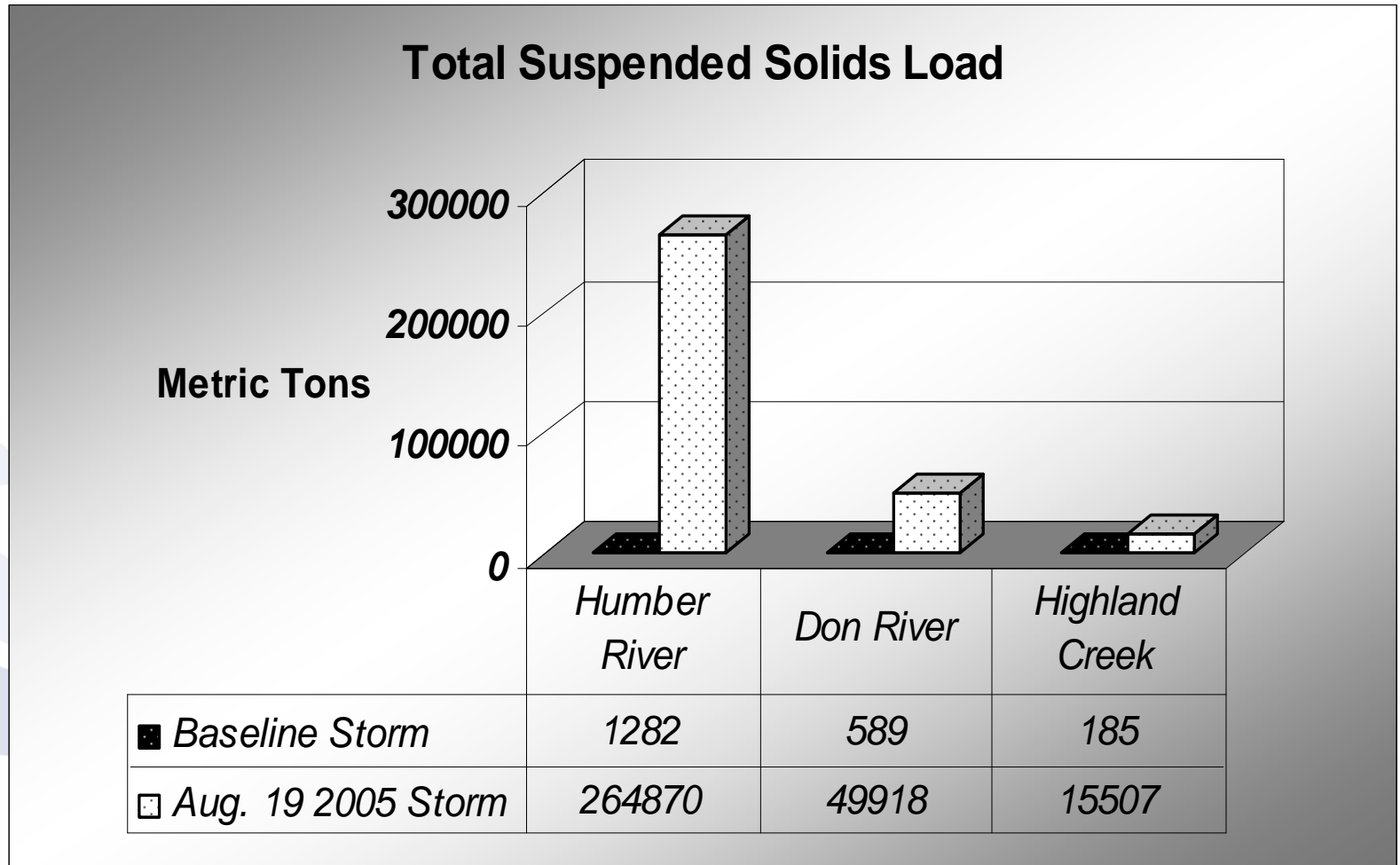
What are we investigating? Tributary Loadings

- Collection and analysis of “pollutant” loading data for the major tributaries
- Estimates of loadings using well-calibrated models where data absent
- Validation & refinement of estimates using flow activated automatic samplers to quantify wet versus dry loading
- Phase 1 of this study identified watersheds which potentially might impact the drinking water intakes.
- Water quality parameters evaluated as part of the “pollutant loading” analysis include nutrients (i.e. phosphates, nitrates, etc) and suspended solids.
- Parameters were selected based upon historical data availability, statistical design and analysis considerations.
- In subsequent phases of the study these “loading” results will be incorporated into Lake Ontario wide modelling work

Impact of Severe Events

Base
Storm =
25 mm

Aug 19/05
storm
=135 mm



What are some of the likely risks to drinking water?

Direct Discharges and Spills to Lake Ontario

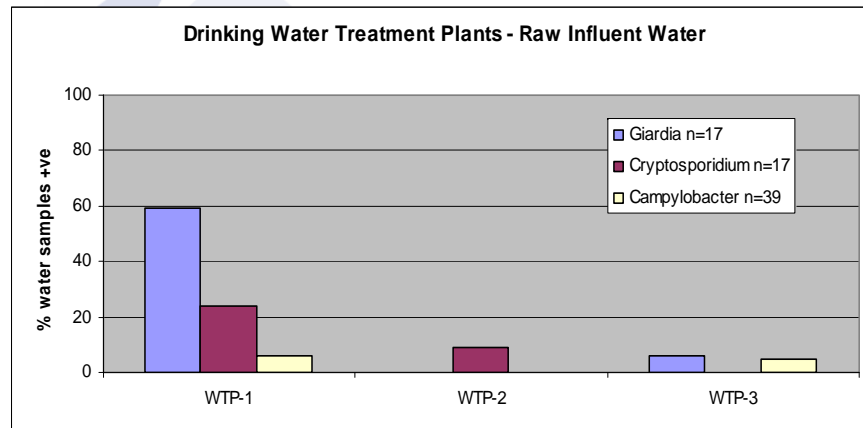
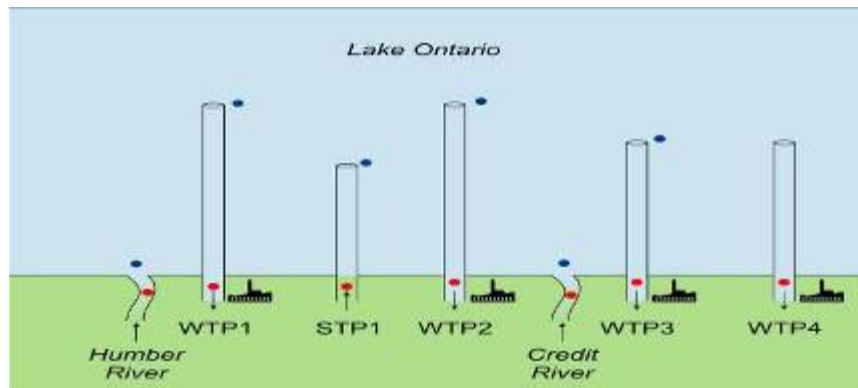
- Petrochemical facilities
- Wastewater Treatment Plants & Storm Water
- Industrial Activities, including Bulk Fuel Storage
- Nuclear Power Stations



What will we investigate? Industrial & Municipal Discharges

- Identifying the location and possible materials released under normal operation and spill scenarios
- Using established lake models, predict under what conditions contaminants could reach drinking water intakes
- Predict the concentration of key parameters and assess risks using MOE technical rules when available
- Analyse historical raw water analyses at drinking water plants to assess whether there are observed elevations of parameters that may be linked to storm events or past spill or weather conditions

What are we investigating? Pathogens & Algal Threats



Waterborne Pathogen Occurrence Pilot Study - Credit River Area

- Pathogens
 - *E. coli*, *Enterococcus*, *Aeromonas*, *Campylobacter*, *Salmonella*, *Shigella*
 - *Cryptosporidium*, *Giardia*
 - *Enteric viruses*
- Cyanobacterial impairments
 - Taste-odour
 - Toxins
- Chemical tracers
 - Caffeine, faecal sterols

**Environment Canada
researchers doing
sampling and analysis**

What are other potential risks to drinking water?

In Lake Risks

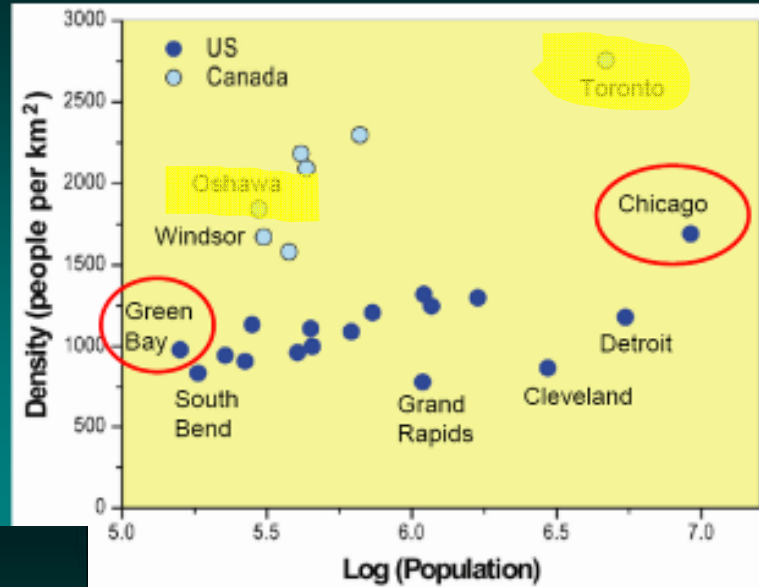
- Dredging
- Spills from Ships
- Anchors damaging inlet/outlet pipes



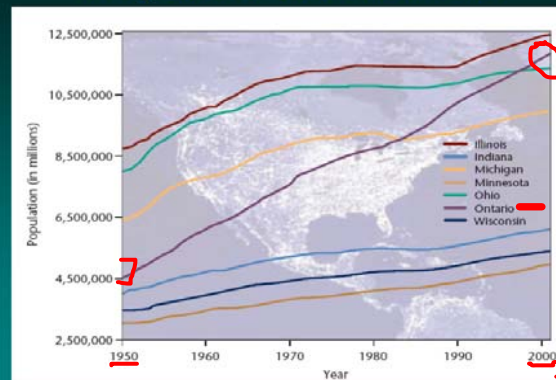
Population Impacts on Water

- Changes in runoff water quality, temperature and flow patterns
- Industrial & municipal sanitary & storm discharges
- Climate changes

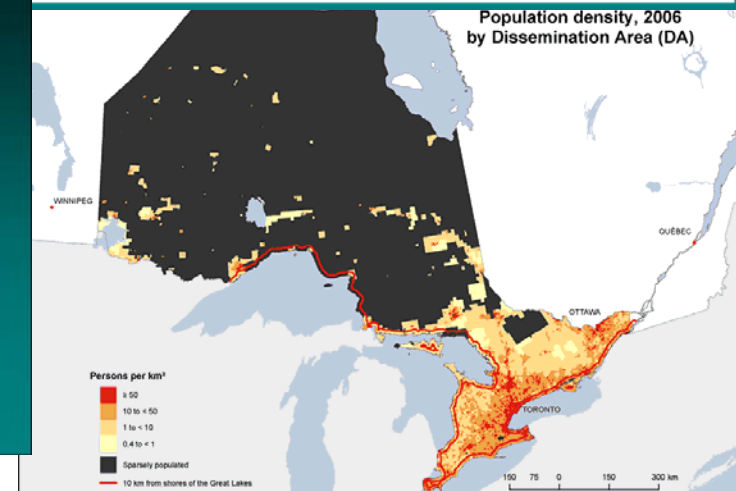
Urban Density



Population Growth



Source: *Confronting Climate Change in the Great Lakes Region, A Report By The Union of Concerned Scientists and The Ecological Society of America, 2003*



Effects of Weather – Causes Lake Conditions To Vary

- Seasonally
 - Limited winter data
- Variation in wind and temperature
- Stratification vertically and horizontally

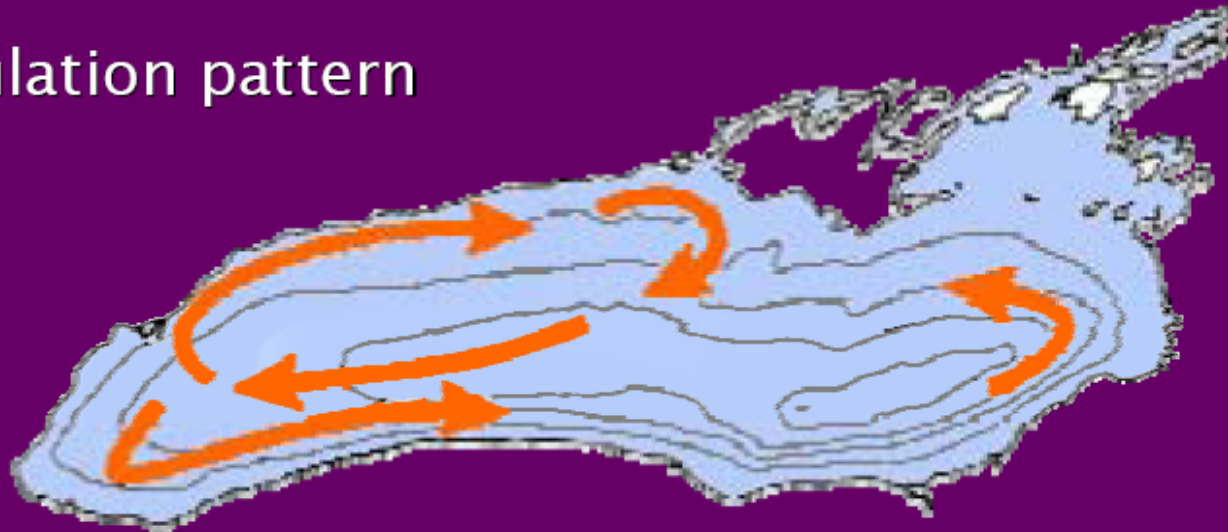


Lake processes

Vertical and horizontal stratification

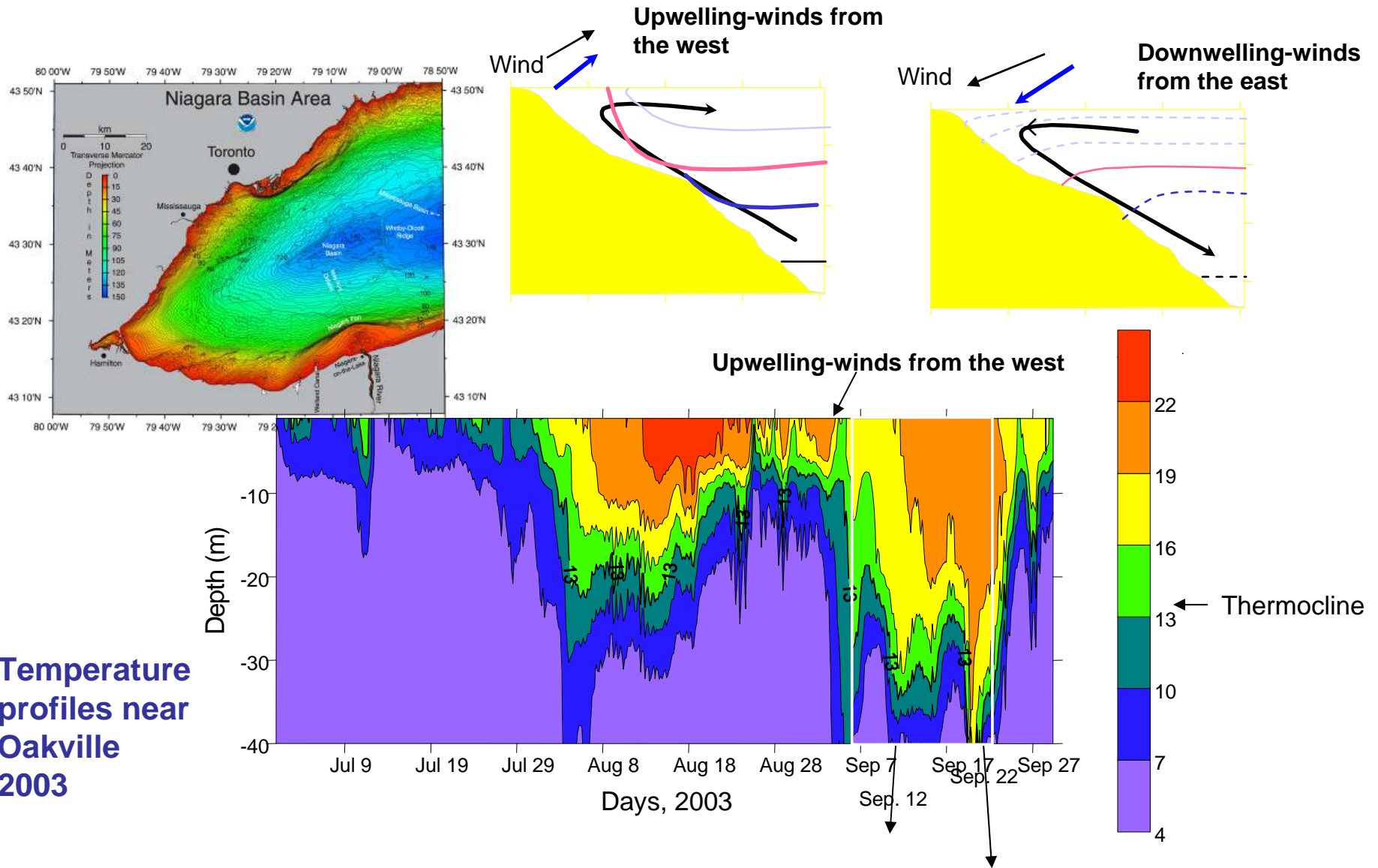


Circulation pattern



Source: Forsythe et al. 2004 as modified after Beletsky et al. 1999

Upwelling & Downwelling Processes

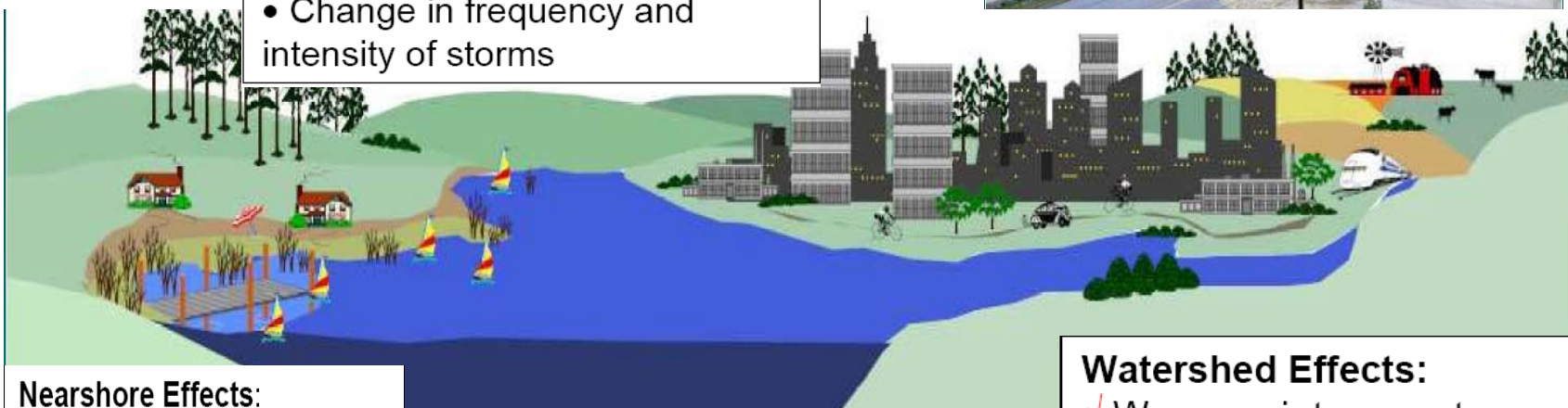


Temperature profiles near Oakville 2003

Projected Effects of Climate Change (✓ observed)

Airshed Effects:

- ✓ Increase in air temperatures
- ✓ Increase in precipitable water in warmer atmosphere
- Change in frequency and intensity of storms



Nearshore Effects:

- ✓ Increase in water temperature
- Increase in evaporation



Inlake Effects:

- ✓ Increase in water temperature
- Higher evaporative losses from lakes
- ✓ Less ice cover (shorter duration)

Watershed Effects:

- ✓ Warmer air temperatures
- ✓ More precipitation (decreases in key seasons)
- ✓ Less winter precipitation as snowfall and more rain
- ✓ Less snowpack
- ✓ More intense precipitation events
- Increase in evapotranspiration

Next Steps

- Complete workplan update & approval from 5 SPCs
- Modelling scenarios to determine potential impacts
- Detailed analysis of sampling results
- Assessing risk and likelihood of impact
- Document in each assessment report
 - Peer review
 - Public consultation
- Develop source protection plans/Great Lakes targets

Challenges

- Ability to summarize and assess data to provide realistic estimates of risks
- Knowledge gaps
- Difficulty in controlling the risks in future
- Uncertainty in future conditions
 - Population changes
 - Climate change impacts

For Further Information

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- www.owwrc.com

- **THANK YOU TO THE COLLABORATIVE PARTNERS**