Water Quality Trading (WQT) has proven to be effective in multiple watersheds throughout the U.S. and Canada.

# Water Quality Trading

## Is there a road map for success in North America?

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Water Quality Trading (WQT) is not a new concept. Implemented in North America in the 1980s, WQT is now applied in many parts of the world to cost-effectively reduce nutrient loadings on waterbodies. It's essentially a transfer of costs among willing partners to reduce contaminants. This transfer varies according to contaminant source, loading, location, scale, governance structure, and management approach. WQT requires clear policies regulating discharge sources, to enable the flexibility to comply with their regulatory obligations by trading credit equivalencies, caps, or ratios.

Has the WQT system adapted sufficiently over time to adjust for new sources of contamination and other factors?

### Lessons learned

WQT programs have grown over the past 25 years in many North American jurisdictions. These programs have been specifically designed to reduce nutrient loadings and improve water quality in lakes, rivers, coastal areas, and watersheds. In fact, according to a 2017 edition of the *Journal of Environmental Management*, they have been documented with mostly positive outcomes in the following areas: Lake Okeechobee in Florida; Lake Simcoe in Ontario; Chesapeake Bay Area in Maryland and Virginia; Colorado River in Arizona; Jordan Lake Watershed in North Carolina; Miami River in Florida; Minnesota River Basin in Minnesota; and, the Chatfield Reservoir in Colorado.

### Current challenges

The impetus of WQT comes from the premise that in developed countries point sources, such as municipal and industrial sewage treatment plants (STPs), were the primary source of nutrients entering bodies of water. However, with the more stringent effluent quality nutrient requirements, it is now non-point sources, such as agriculture and stormwater, that have become the primary source.

Recent reports from the Ministry of the Environment, Conservation and Parks (MECP) provide a clear picture of the current situation. The Lake Simcoe Phosphorus Reduction Plan (2010) identified 56 percent of total phosphorus (TP) sources discharges on Lake Simcoe with these non-point sources. The Ontario government's Phosphorus Reduction in Lake Erie from Canadian Sources (2017) identified 71 percent of soluble reactive phosphorus load and 93 percent of the TP load in Lake Erie attributable to non-point sources. This study noted that "contribution from urban point sources, including municipal STPs, combined sewage overflows (CSOs) and industrial direct discharges, is estimated to be only 10 to 15 percent."

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### Key elements for success

A successful program requires a strong foundational regulatory and governance framework to make it successful. The reports regarding North American cases suggest the following key elements should be included in any WQT program:

**Baseline:** The water quality baseline needs to be well defined. The amount of pollution reduction and reduction targets will define the size of the trading market.

**Economics:** The basic economics to sustain trading needs to be understood. This is not only the capital and operating costs comparatives, but also the social and environmental costs that would enable the supply and demand market. This is the system of economic incentives that can prompt farmers, industry, regulators, and municipalities to adopt a system of trading rules to reduce costs. An effective WQT system requires an adequate supply of non-point sources as well as sufficient demand from point sources.

**Trading system:** The appropriate trading system, which can be classified in closed systems (cap-and-trade) and open systems (credit or offset) should involve water quality offsets, or credits, relying on uncertainty ratios, or loading equivalents.

**Monitoring:** The long-term sustainability of trading needs to have strong monitoring and calibration to maintain trading costs, ratios, or trading caps. This is a built-in flexibility to adapt to potentially moving targets. Trading ratios must adjust to the inherent uncertainty of non-point sources over time.

**Policies and governance structure:** The framework needs clear policies, regulations and organizations (governmental and non-governmental, hence the term governance) to sustain long-term investments and operating and monitoring costs. No industrial discharger or municipality will invest in WQT without certainty regarding the regulatory framework.

### Regulatory barriers

While the federal legislation offers a regulatory framework under which a WQT system could function, any WQT would necessarily require a provincial regulatory framework (or state government support in the U.S.). The Lake Winnipeg and Lake Simcoe cases in Canada provide significant research and pilot projects respectively where we can draw lessons learned in terms of the use of the key elements of WQT.

Research in the *Journal of Great Lakes Research* associated with Lake Winnipeg identifies the need to balance nutrient loadings entering the basin by sub-basins with cap and trade limits by source. This balance is meant to incentivise supply and demand, which would require a significant monitoring effort to determine offset ratios. In the case of Ontario, Lake Simcoe has increased adopters of TP offset projects. Ontario has a total of eight site-specific WQT projects, both industrial and municipal, some of them active since 2001. There is significant performance-based data accumulated from these WQT cases worth examining, which will likely assist in establishing guidelines to promote further WQT in Ontario and other jurisdictions.

The Chesapeake Bay Area is a good example that combines federal and multi-state permitting under a watershed-based approach. As reported by the U.S. EPA in 2018, this program has consistently achieved since 2007, more than 5,000 tonnes of nutrients removal per year, at an estimated 20 percent of the cost of conventional point-source treatment. Guidelines and case studies are developed by state and federal regulatory agencies to continually manage this watershed.

### Cost calculations

According to Dianne Saxe, in the November/December 2017 edition of *Water Canada*, the cost of removing TP using tertiary or quaternary point source treatment is about $45,000 and $100,000 per kg, respectively. This estimate considers data from the Midhurst STP and the Upper York Sewage Solutions, both in Lake Simcoe with TP regulatory requirements of 0.02 and 0.03 mg/litre.

In contrast, removing TP from non-point sources costs much less. A review of the South Nation River Conservation Authority (SNRCA) data notes that "investments" from municipal STPs fund approximately 50 to 100 percent of the costs of projects from non-point sources throughout the watershed. The SNRCA acts as the broker and clearinghouse. The reported cost of TP removal by WQT on SNRCA-managed projects is an average of $300 per kg. Other historic estimates in Florida bring WQT at non-point sources up to $7,000 per kg of TP removed, and with average cost savings of 76 percent in comparison with conventional point-source treatment.



### Road map for success

Partnerships among provincial/state/territorial governments, the agricultural industry, municipalities, industrial dischargers, independent monitors and research institutions are essential. Through these partnerships, studies, monitoring, and research could provide the evidence-based data to assist in developing guidelines and standards to establish the necessary regulatory framework (policy tools) to keep WQT as a viable option for many polluted lakes and basins.

The Canada-Ontario Lake Erie Action Plan (2018) includes specific actions to evaluate the feasibility of using WQT as one of the mechanisms in the toolbox to address phosphorus reductions. This action has the potential to open opportunities for more standardized WQT and for municipalities to address contaminant loadings from other non-point sources to achieve their own TP reduction targets.

Further, as per Robert Haller's Rules & Regs column in the March/April 2018 edition of *Water Canada*, the Halifax Harbour, the Victoria Capital Regional District, and St. John's Harbour are good examples that could benefit with WQT. Recent legislative developments illustrate federal and provincial interest to keep exploring and experimenting WQT in Canada where it makes financial and economic sense.

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