

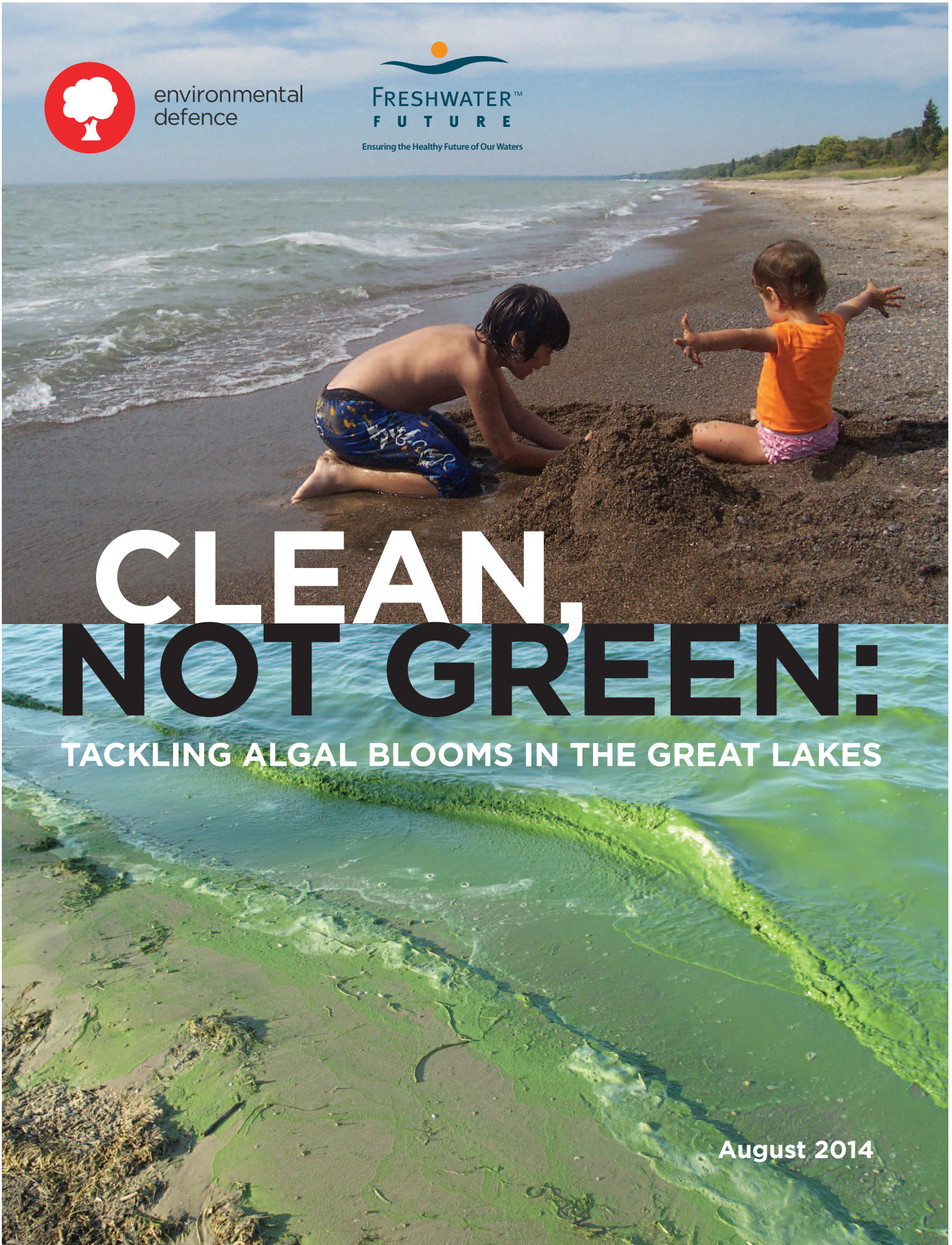


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# CLEAN, NOT GREEN:

TACKLING ALGAL BLOOMS IN THE GREAT LAKES

August 2014

# CLEAN, NOT GREEN: Tackling Algal Blooms in the Great Lakes

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# Executive Summary

## Background

In the 1970s, Lake Erie was suffocating from an onslaught of algal blooms and an overall decline in water quality and ecosystem health. In response, governments on both sides of the border, along with the Great Lakes community – including agriculture, businesses, communities, non-governmental organizations, and individuals – pulled together to bring life back to the lake. Lake Erie’s restoration was one of the environmental movement’s first and greatest victories.<sup>1</sup> But that victory appears to have been in the battle, not the war.

## The Problem

Lake Erie is once again in a state of decline.<sup>2</sup> In fact, the worst algal bloom ever recorded occurred in 2011, covering an area almost the size of Prince Edward Island.<sup>3</sup> We thought this problem was solved years ago with the introduction of low-phosphate detergents and improved sewage treatment, but Lake Erie is not the same lake it was in the 1970s. Today, climate change and invasive species have changed the ecosystem, and recurring blooms suggest that current land-use practices are not sustainable in the Lake Erie watershed and more broadly across the Great Lakes basin.

Algal blooms happen when algae – microscopic, plant-like organisms that naturally live in the water – grow out of control. The resulting blooms can look like mats floating on the water, or like scum, foam or spilled paint on the water’s surface. They can be brown, neon green, or blue-green, and can be smelly, slimy and even poisonous.<sup>4</sup>


Rapid algal growth happens when nutrient levels, light, pH, and temperature are just right. But phosphorus is by far the most important ingredient in their development.<sup>5</sup> In many of Ontario’s lakes, including Lake Erie, the amount of phosphorus in the water controls how big and how bad a bloom becomes. So the key to controlling blooms is reducing the amount of excess phosphorus that reaches the lakes.

The phosphorus in Lake Erie comes from many different places, with the largest amount coming from agricultural lands.<sup>6</sup> Phosphorus helps plants grow. This is a good thing for farmer’s fields, but too much of it is quite the opposite for the health of surrounding water bodies.



PHOTO: (Brenda Culler, ODNR Coastal Management)

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## ***The Harm***

Large algal blooms can make water unsafe for people and their pets, fish and wildlife. Harmful algal blooms, made of a particular type of algae that release a variety of liver, skin, and neurological toxins, can make swimming unsafe. Large blooms also disrupt the way a whole lake ecosystem works. When algae die and sink to the lake bottom to decay, they rapidly deplete the supply of oxygen dissolved in the water, creating “dead zones,” where fish and other aquatic life cannot survive. In extreme cases, this results in large numbers of dead fish washing onto shore.<sup>7</sup>

Blooms also have direct economic implications. Who wants to own property, spend vacation time, or play on beaches covered in slimy mats of algae? Blooms discourage people from enjoying the water which means fewer boaters, anglers, and beach goers – and less of the money they bring to shoreline communities. Maumee Bay State Park in Ohio lost an estimated \$1.3 million US in 2011 because people didn’t want to spend time on its algae-fouled beaches.<sup>8</sup>

Blooms cost municipalities and industry money when algae clog their water intake pipes, or when drinking water supplies need additional treatment to remove algae-related toxins.

Continuing on the current path is an expensive and risky proposition for both the environment and economy of the Great Lakes. But a different future is possible: a future of green farm fields producing globally and locally important foods; a future of green communities designed to work in harmony with the water cycle; and a future of beautiful, blue waters that support vibrant communities, economies and ecosystems.

## ***The Opportunity***

Saving Lake Erie will require changing our approach to land-use practices to reduce the amount of phosphorus reaching the lake, with a clear focus on helping farmers and the agricultural lands they care for. This report outlines a four-point plan to start Ontario and Canada down the path towards a healthy future for the Great Lakes.

## **1. Harness market forces to help farmers reduce nutrient runoff**

- Support existing agricultural programs that have had success in reducing nutrient pollution, such as those that educate farmers about how to properly apply nutrients.
- Explore a broad suite of approaches that address the challenge of how to pay, and who pays, for practices to reduce nutrient pollution. Begin by evaluating the potential to use market mechanisms to reduce nutrient run-off. This would involve charging fees to the public or businesses for the pollution they create and using this money to support programs that prevent excess phosphorus from reaching the lakes. Such mechanisms could include tax-shifting, pollution taxes or nutrient trading (which creates a market to identify and fund the cheapest options for reducing nutrient pollution).

## **2. Build water smart cities, cultivate water smart citizens**

- Design cities to better regulate stormwater and the nutrients it carries.
- Invest in green infrastructure, such as green roofs, wetlands, trees and vegetation, which can capture rainfall and improve the quality of stormwater runoff.
- Expand septic system maintenance and outreach programs that enable urban and rural residents to take action to prevent polluted water from running off their property.
- Develop an infrastructure funding plan, with support from all levels of government, to upgrade antiquated sewer systems that are subject to bypasses or overflows during heavy rainfall or snowmelt.

## **3. Improve scientific understanding of why blooms happen and their implications**

- Conduct year-round monitoring in all watersheds to get a handle on the relative contribution of nutrients to the Great Lakes from Canadian rivers, and improve understanding of when most of the nutrient loading is occurring.
- Support scientific studies to better understand how lake dynamics affect algal blooms, which solutions work best in which locations, and how blooms are impacting human health and local economies.
- Support programs that bridge science, policy, and practice. This requires investing in data management, ensuring public accessibility to data, and the tracking of progress.



PHOTO: A NASA satellite image captures algal blooms in the Great Lakes. Acquired August 3, 2014

#### **4. Create a policy framework that drives action**

- Under the binational Great Lakes Water Quality Agreement, Canada has committed to setting phosphorus loading targets for Lake Erie and developing action plans to meet those targets. The first step towards meeting this commitment is for the governments of Canada and Ontario to finalize the Canada-Ontario Agreement and for Ontario to pass the proposed Great Lakes Protection Act.
- The government of Ontario should develop a comprehensive policy to protect wetlands which help to filter nutrients out of water.

## References

- 1 Environment Canada. (2013). *Phosphorus and Excess Algal Growth*. Retrieved from <http://www.ec.gc.ca/grandslacs-great-lakes/default.asp?lang=En&n=6201FD24-1>
- 2 Government of Ontario. (2012). *Ontario's Great Lakes Strategy*. Retrieved from <https://dr6j45jk9xcmk.cloudfront.net/documents/896/5-1-5-great-lakes-strategy-en.pdf>
- 3 Michalak, A.M., Anderson, E.J., Beletsky, D., Boland, S., Bosch, N.S., Bridgeman, T.B.,... Zagorski, M.A. (2013). Record-setting algal bloom in Lake Erie caused by agricultural and meteorological trends consistent with expected future conditions. *Proceedings of the National Academy of Sciences*. doi:10.1073/pnas.1216006110.
- 4 Carmichael, W.W. (2013). *Human Health Effects from Harmful Algal Blooms: A Synthesis*. Retrieved from <http://www.ijc.org/files/publications/Attachment%202%20Human%20Health%20Effects%20from%20Harmful%20Algal%20Blooms.pdf>
- 5 Carmichael, W.W. (2013). *Human Health Effects from Harmful Algal Blooms: A Synthesis*. Retrieved from <http://www.ijc.org/files/publications/Attachment%202%20Human%20Health%20Effects%20from%20Harmful%20Algal%20Blooms.pdf>
- 6 Great Lakes Commission. (2012). *Nutrient Management: A Summary of State and Provincial Programs in the Great Lakes-St. Lawrence River Region*. Retrieved from <http://glc.org/category/docs/water-quality/>
- 7 Hallegraef, G.M. (2014). *Harmful Algae and their Toxins: Progress, Paradoxes, and Paradigm Shifts*. In G.P. Rossini (Ed.), *Toxins and Biologically Active Compounds from Microalgae*. (pp. 3-20). Florida: Taylor and Francis Group.
- 8 International Joint Commission. (2014). *A Balanced Diet for Lake Erie - Reducing Phosphorus Loadings and Harmful Algal Blooms*. Retrieved from <http://www.ijc.org/files/publications/2014%20IJC%20LEEP%20REPORT.pdf>



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