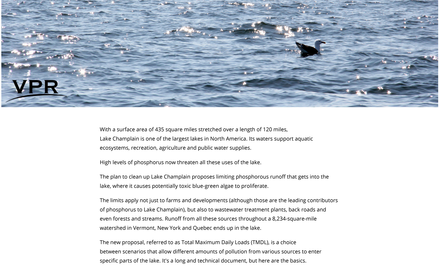
Vermont's Lake Champlain Cleanup Plan, Explained

A Data Project From Vermont Public Radio



With a surface area of 435 square miles stretched over a length of 120 miles, Lake Champlain is one of the largest lakes in North America. Its waters support aquatic ecosystems, recreation, agriculture and public water supplies.

High levels of phosphorus now threaten all these uses of the lake.

The plan to clean up Lake Champlain proposes limiting phosphorus runoff that gets into the lake, where it causes potentially toxic blue-green algae to proliferate.

The limits apply not just to farms and developments (although those are the leading contributors of phosphorus to Lake Champlain), but also to wastewater treatment plants, back roads and even forests and streams. Runoff from all these sources throughout a 8,234-square-mile watershed in Vermont, New York and Quebec ends up in the lake.

The new proposal, referred to as Total Maximum Daily Loads (TMDL), is a choice between scenarios that allow different amounts of pollution from various sources to enter specific parts of the lake. It's a long and technical document, but here are the basics.

Too Much Phosphorus

Phosphorus is a necessary nutrient in the lake's ecosystems. It's also the source of Lake Champlain's pollution problems, because it's harmful to the ecosystem when the concentration of phosphorus in the water gets too high.

Federal water quality standards put limits on the concentration of phosphorus in the water for the safety of humans and the environment. But, throughout the basin that feeds Lake Champlain, current conditions and practices put more phosphorus into Champlain than the lake's ecosystem can handle.

The cleanup plan compares current phosphorus inputs **(base loads)** to the lake's capacity to accommodate phosphorus **(loading capacity)**. It sets limits on the amount of phosphorus that can enter each segment of the lake from a host of sources. The EPA says that, together, these limits add up to an overall phosphorus load that still keeps concentrations within federally-mandated water quality standards.

'We Can't Do Nothing'

At a meeting with the public about the new lake cleanup plan in August, Natural Resources Secretary Deb Markowitz told some of the plan's critics in the audience that whatever flaws they see in the plan, something needs to be done about lake pollution.

"I would encourage you all to stay involved and to not give up before we start," she said. "Because that gives the excuse to do nothing, and we can't do nothing."

The EPA's baseline as it put the plan together was the previous 10 years of data about phosphorus loading into Lake Champlain – the *status quo*. The state and EPA weighed that data against modeling of the effects that a wide-ranging set of policies might have on pollution levels.

The state of Vermont is responsible for designing and implementing the policy package that will bring pollution down to the EPA-specified limits. Together the policy restrictions, the less pollution. But controls can be costly to implement and enforce. Any solution will have to balance the value of resources it requires against the value of resources it seeks to protect — and different stakeholders may disagree on how to strike that balance.

A New Plan

The current cleanup plan revises a TMDL proposal from 2002, which became the subject of a slow-motion lawsuit brought by the Conservation Law Foundation. Although New York and Quebec also contribute phosphorus pollution to Lake Champlain, only Vermont's 2002 TMDLs were subjects to litigation, so this 2015 revision affects only Vermont. (Vermont also contributes more phosphorus to Lake Champlain than New York and Quebec combined, as illustrated on the right.)

This revision isn't simply a new set of policy solutions to meet the same goals; the EPA used entirely new data to compose the 2015 TMDL, and the numbers are significantly different.

For one thing, the base load that the EPA used to calculate the 2002 TMDL was based on a single year of data. When the new plan used the average of 10 years of phosphorus loading, the base load was 46 percent higher.

The gap between base load and loading capacity grew as well. While the 2002 TMDL called for a phosphorus reduction of 204 metric tons per year, the new one requires annual reductions of 347 metric tons.

2002 vs. 2015 TMDL plans

Phosphorus loads are shown in metric tons per year (mt/yr).

In 2002, the EPA calculated phosphorus loads from back roads, forests and streams differently when it added up sources of Lake Champlain's pollution. Additionally, the "base load" in 2002 included a single year's measurements, while the "base load" in 2015 averages measurements from 2001-2010.

Lake Segments

Lake Champlain has a total of 13 different lake segments, but phosphorus from Vermont only flows into 12 of them.

Cumberland Bay, near Plattsburgh, New York, is not part of Vermont's TMDL because Vermont's phosphorus doesn't flow into it.

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Are You A Wonk?

This page was designed to give an overview of the inner workings of the Lake Champlain cleanup plan.

If you want more detail on a given topic look for the **"For The Wonks"** links throughout this project.

The Lake Champlain Watershed

Illustration by Nell Reid

This illustration shows all waterways in the Lake Champlain watershed. Those flows all bring phosphorus into the lake. (Illustration/Matt Parrilla)

Who puts phosphorus into Lake Champlain?

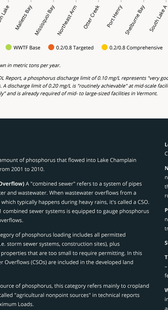
Base loads are shown in metric tons per year.

For The Wonks:
Phosphorus Concentrations By Segment

Phosphorus concentrations exceed federal Water Quality Standards in every lake segment, though they fluctuate throughout the lake. To compare current concentration levels in each segment with hypothetical levels after pollution controls are implemented, click here.

Sources Of Phosphorus

Lake-wide breakdown of Vermont phosphorus sources



Phosphorus "base loads" from the 2015 TMDL report are shown in metric tons per year. The volume is an average from the years 2001-2010.

Phosphorus gets into water virtually everywhere water flows over land, but some sources add far more phosphorus than others. The lake cleanup plan divided Vermont's phosphorus loading into seven different categories, shown at left.

For The Wonks:
Phosphorus Sources By Lake Segment

Different sources make up differing amounts of the problem in different parts of the lake, as shown in this detailed chart.

Required Reductions

The size of each circle on the map indicates the proportional phosphorus reduction required in each lake segment relative to Vermont's base load in that segment. A larger dot means a larger percentage reduction is required to meet federal standards.

Vermont is not the only source of phosphorus in each lake segment, so a given percentage reduction in Vermont's TMDL is only the reduction required from Vermont's contribution.

Hover over each marker to see the name of the lake segment, then click the marker for details.

For The Wonks:
Required Reductions By Source

To see how much phosphorus various sources contribute to each lake segment compared to EPA limits, click here.

Percent phosphorus reductions required for each lake segment

The proportional percent of phosphorus reduction required for a lake segment may be quite different from the volume reduction required. For example, in a segment with low phosphorus loads, a small volume may represent a large percentage of that segment's reduction — and vice versa.

Wastewater

Wastewater Discharges

Discharges from wastewater treatment plants throughout the lake's basin also pollute Champlain. The less treatment wastewater receives, the more phosphorus it adds to the lake. At current levels, wastewater facilities contribute less than 5 percent of the state's total phosphorus load.

Upgrading treatment facilities can be costly, and the facilities aren't a major contributor across the entire lake. For these reasons, EPA and Vermont chose to target pollution restrictions only in select lake segments, where wastewater discharges represented a higher portion of the overall phosphorus loads: Burlington Bay, Main Lake, Missisquoi Bay, Shelburne Bay and St. Albans Bay. (See the chart below for more details.)

In this chart, the **permitted load** represents the upper limit of what facilities are permitted to discharge into a particular lake segment. This figure is higher than the **base (current) load** because facilities are designed to accommodate future growth.

Scenario comparison of phosphorus discharges from Vermont wastewater treatment facilities

Phosphorus loads are shown in metric tons per year.

According to the 2015 TMDL Report, a phosphorus discharge limit of 0.10 mg/l, represents "very good treatment practices" by New England standards. A discharge limit of 0.20 mg/l, is "routinely achievable" at mid-scale facilities. A discharge limit of 0.8 mg/l, "is achieved widely" and is already required of mid- to large-sized facilities in Vermont.

Comparing Options

Compare current permit levels and actual base loads to hypothetical restrictions. Each colored bar represents a different scenario: currently permitted discharges, base levels (or actual discharges in recent years) and progressively tighter restrictions.

Hover over any bar or segment name to view detailed predictions of phosphorus loading from any of that segment's wastewater scenarios.

The EPA considered a range of wastewater scenarios for wastewater treatment facilities:

- **0.2/0.8 Targeted:** The EPA and state's preference, this tightens discharge limits to 0.2 mg/l, for large facilities, but only in some watersheds, and maintains a limit of 0.8 mg/l, for medium-sized treatment plants.
- **0.2/0.8 Comprehensive:** Large facilities in all watersheds would be restricted to 0.2 mg/L discharge limits. The 0.8 mg/L limit would remain for all medium-sized facilities.
- **0.1 All:** The tightest of all scenarios considered, this reduces the discharge limit to 0.1 mg/L for all treatment plants of any size.

For The Wonks:
Wastewater And Targeted Watersheds

The EPA's plan to address phosphorus from wastewater focused on facilities in the targeted watersheds. For facility-specific information on phosphorus contributions, click here.

Glossary

Base Load The average amount of phosphorus that flowed into Lake Champlain annually from Vermont from 2001 to 2010.

CSO (Combined Sewer Overflow) A "combined sewer" refers to a system of pipes that carry both stormwater and wastewater. When wastewater overflows from a combined sewer system, which typically happens during heavy rains, it's called a CSO. Only one of the state's 11 combined sewer systems is equipped to gauge phosphorus loading from untreated overflows.

Developed land This category of phosphorus loading includes all permitted stormwater discharges (i.e. storm sewer systems, construction sites), plus unregulated runoff from properties that are too small to require permitting. In this analysis, Combined Sewer Overflows (CSOs) are included in the developed land source category.

Farms (nonpoint) As a source of phosphorus, this category refers mainly to cropland and pastures. It is often called "agricultural nonpoint sources" in technical reports related to Total Daily Maximum Loads.

Farmsteads Essentially, farmsteads make up the parts of Vermont farms that aren't fields. These are the barnyards and buildings (as opposed to pasture and cropland) where animals are kept and milked, and where manure and silage are stored. If Vermont were to issue permits for Concentrated Animal Feeding Operations in the future, phosphorous loading from the CAFOs would be included in farmstead allocations for the Total Daily Maximum Loads.

Loading Capacity The amount of phosphorus that Vermont can send into Lake Champlain without being in violation of federal water quality standards.

Non-Point Source Pollution This type of pollution occurs when polluted water flows naturally into a waterway. Two major forms of this pollution in Vermont's segment of the Lake Champlain watershed are runoff from farms and developed areas such as roads and parking lots.

Point Source Pollution Any pollutant or nutrient that flows directly from a pipe into a natural waterway is considered point source. This term generally refers to wastewater treatment facilities in the context of the Lake Champlain cleanup plan.

Stormwater Any water from natural causes such as snowmelt or rain is stormwater.

TMDL (Total Daily Maximum Load) The calculated amount of a pollutant or nutrient – in this case, phosphorus – that a water body can receive and still meet applicable federal water quality standards.

Wastewater Water that flows from sinks, toilets, showers, appliances and most other indoor uses is wastewater. In general, wastewater is more polluted than stormwater and is required to be treated before flowing into a natural waterway.

This data project is part of Vermont Public Radio's series Downstream, an in-depth look at water quality problems in Vermont.

Data source: Environmental Protection Agency. For data and methodology notes, visit this page.

Reporting by Hilary Niles and Taylor Dobbs.
Data analysis and visualizations by Hilary Niles.
Production assistance by Emily Alfin Johnson and Angela Evancie.