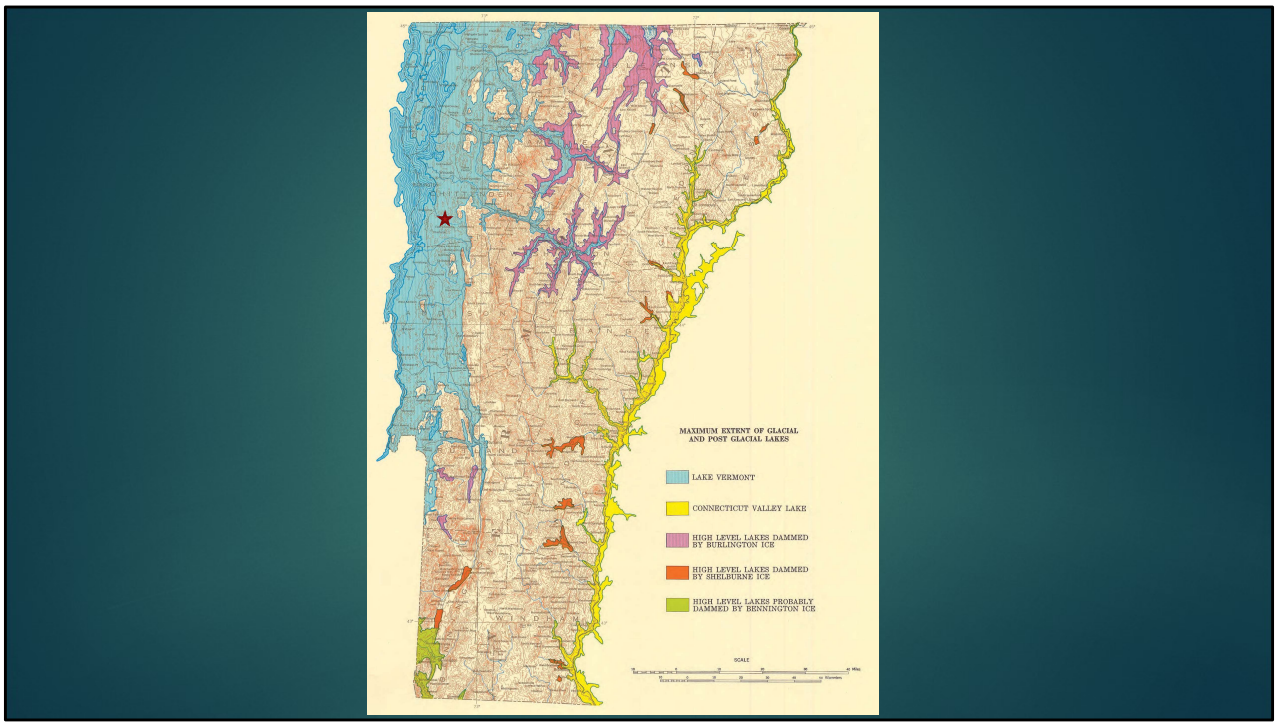
Lewis Creek Association's South Chittenden River Watch Program

LOCAL LAND USE HISTORY, WATER QUALITY, AND WHAT YOU CAN DO TO HELP

Waldorf School students' depiction of the lower LaPlatte watershed, with masks of different animals and qualities (which make up the border), as well as cards saying something about the animals depicted, who all live in the watershed. Note that there are several unique species that use this watershed, including several rare or unusual amphibians and reptiles (the uncommon Blue-spotted Salamander, the rare Four-toed Salamander, and the uncommon Northern Map Turtle)

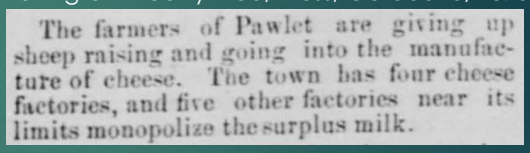


As you may know, Vermont was once entirely under a glacier (up until about 13,500 years ago). As the ice retreated, it blocked the northern end of what is now Lake Champlain (Lake Champlain now drains north to the St. Lawrence River and out to the Atlantic Ocean). Because the ice was blocking the northern end, freshwater filled in the area in blue, to form what was known as Lake Vermont. (The area in darker blue is the present day Lake Champlain, and the star is a mid point between Charlotte, Hinesburg, and Shelburne.) Most of the Champlain Valley was at the bottom of a lake! Because there was no vegetation as the glacier receded, lots of erosion occurred, and soils washed down rivers. Those that washed the furthest (the smallest sediments, clays), were deposited at the bottom of Lake Vermont. This means now that we (in the Champlain Valley) now have many clay soils, which are very fertile (so we have lots of agriculture). Clay soils hold nutrients (they bind to nutrients), and are highly erodible, and are also the last to settle out of the water column (ie. Big rocks drop out quickly, followed by smaller particles, followed by the smallest clay particles.) The clay soils, once moving in the water column by a big rain storm and erosion, get carried a long way (ie. to the lake) before settling out. Because they carry nutrients with them, this leads to increased nutrients in the lake.

Vermont Land Use History

- People have been affecting land and water since the beginning
- Abenaki people lived here
- Sheep
- Logging
- Dairy
- Re-growth of forests as farms went out of business
- Current day: Vermont is losing 1,500 acres of forest every year. "Over the last decade, Vermont lost about one percent of its forest cover due mostly to suburban and rural residential sprawl, reversing a 150-year trend of forest recovery and expansion." – Bill Keeton

Burlington Weekly Free, Press, October 3, 1873



The farmers of Pawlet are giving up sheep raising and going into the manufacture of cheese. The town has four cheese factories, and five other factories near its limits monopolize the surplus milk.

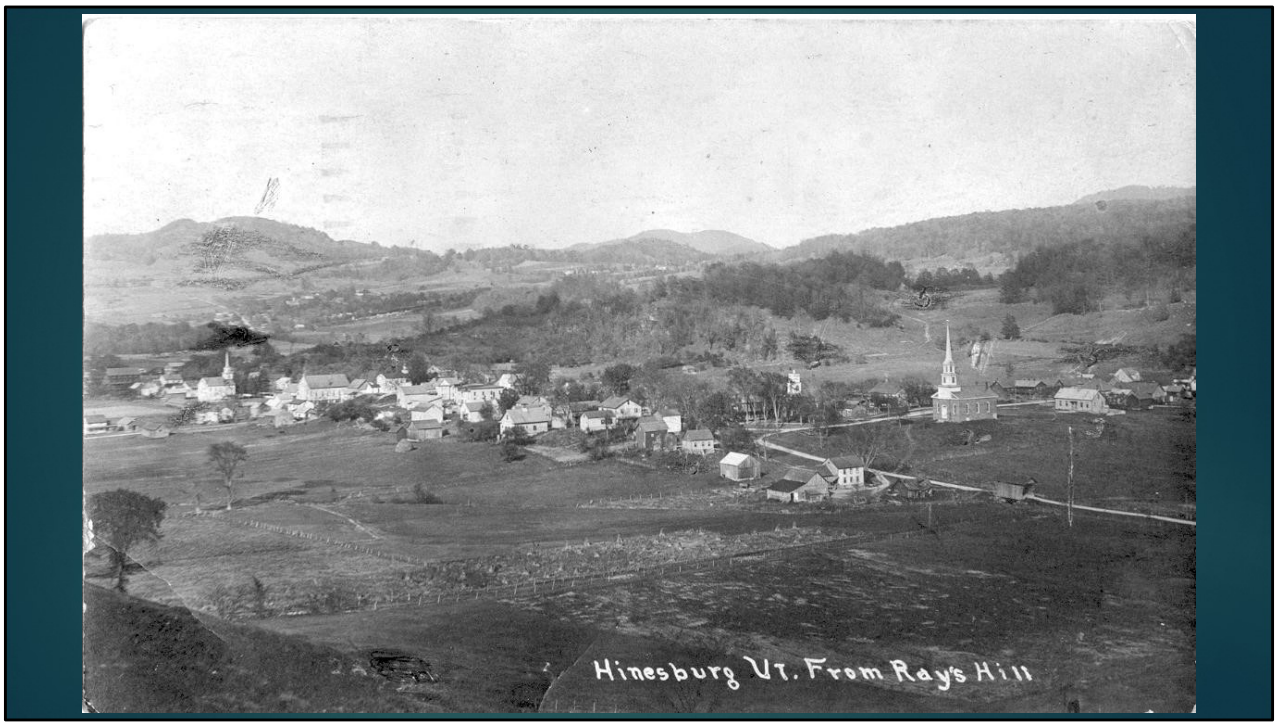
Substantial Abenaki settlements on floodplains of the Missisquoi, Winooski, and Otter Creek. Also settlements around Bristol, Monkton, and Vergennes. They relied on corn, beans, and squash, and wild plants. By 1609, the Abenaki left the Champlain Valley to escape warfare with the Mohawk tribe.

Europeans started largescale deforestation upon arrive to Vermont. Merino sheep craze began in the mid 1800s - By the 1840s, there were 6 sheep for every 1 person. 80% of land was cleared.

Logging was done for farming/clearing land, but also to create potash (they would burn trees to get the ashes, which could create lye for soap or for potash, fertilizer). Much erosion. Land couldn't support crops because of sheep overgrazing.

With the invention of the refrigerated boxcar, Mid-Late 1800s, switch to dairy.

In more modern times, forests have re-grown as farms went out of business. But now, we are starting to lose forests again, after 150 years of forest recovery and expansion.

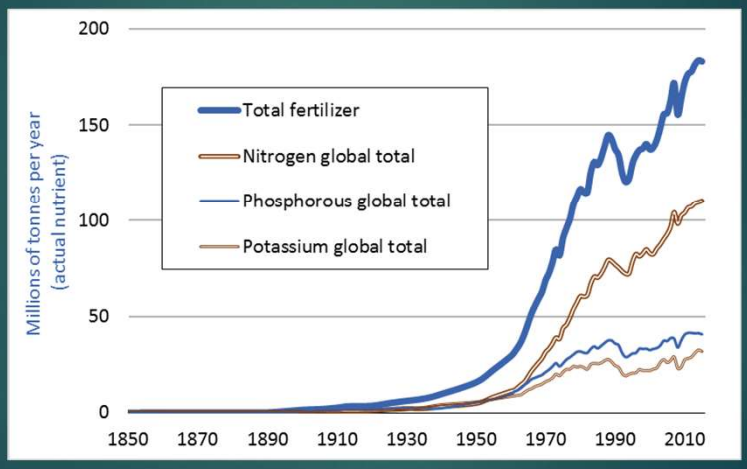


Hinesburg farmland (looking northeast from south of town and west of Silver St.) – lots of cleared land! The church on the right is no longer there.

Lake Iroquois from the west (looking east), Hinesburg VT – note cows and clearing

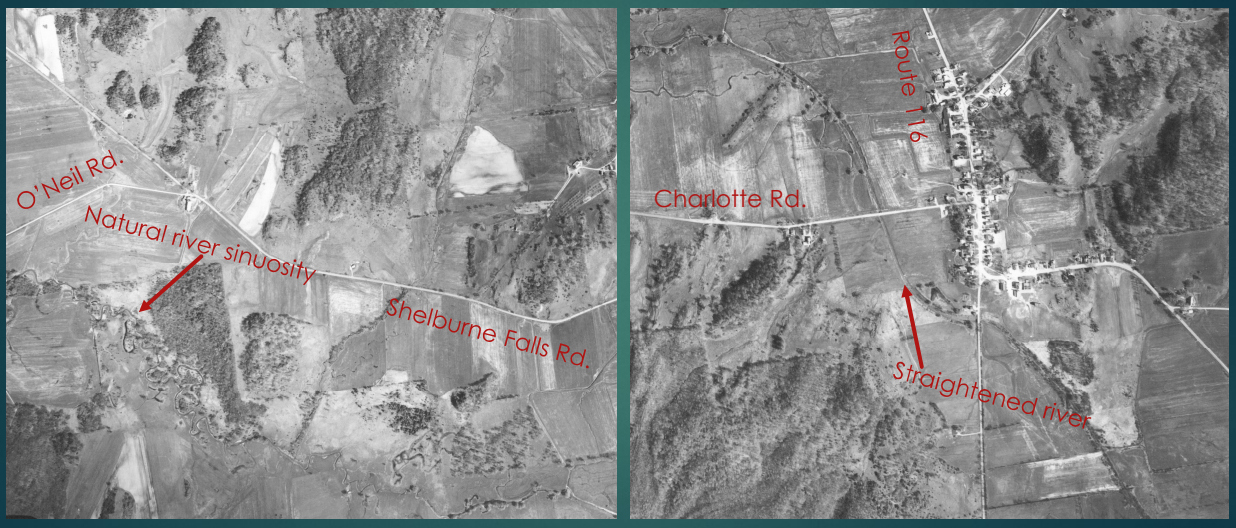
Log drive, on the White River near Sharon

Fertilizer use

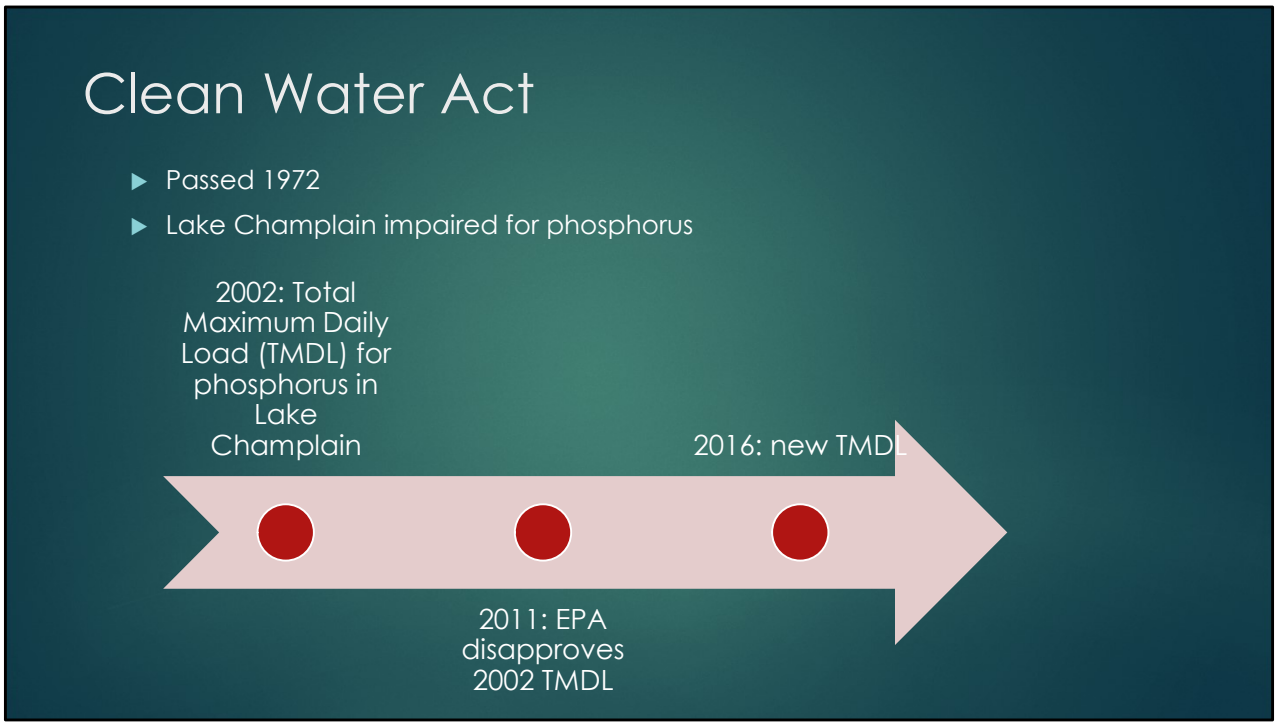


Post-WWII, many extra chemicals left over (they had excess nitrogen/nitrate from bombs). Much more fertilizer was applied to land. Now, this is referred to as “legacy phosphorus”. When streams erode, they take nutrients (along with the soil particles) down to the lake.

River Straightening



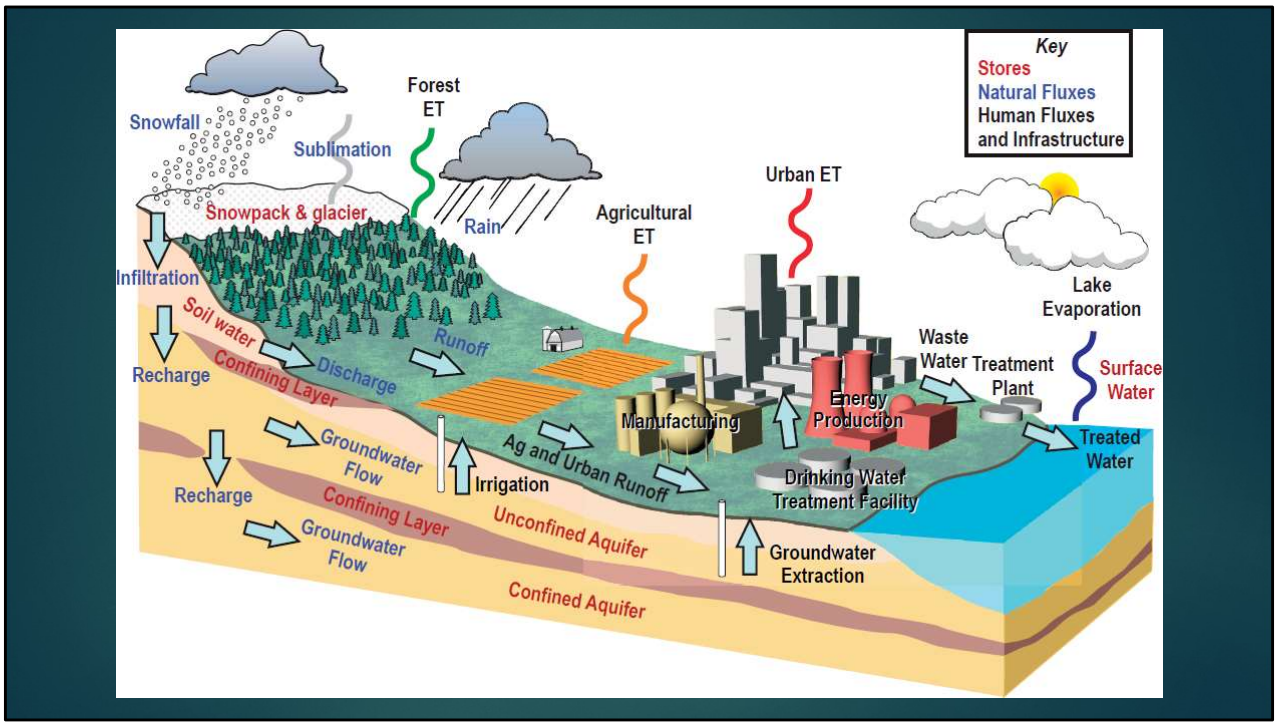
River straightening – Army Corps of Engineers straightened rivers between 1940s and 1960s in Hinesburg. On the left side is the LaPlatte River in Hinesburg near the intersection of O'Neil Rd. and Shelburne Falls Road (not straightened). Right side is LaPlatte River flowing through south and west side of Hinesburg (straightened). Both from 1962 aerial photos.



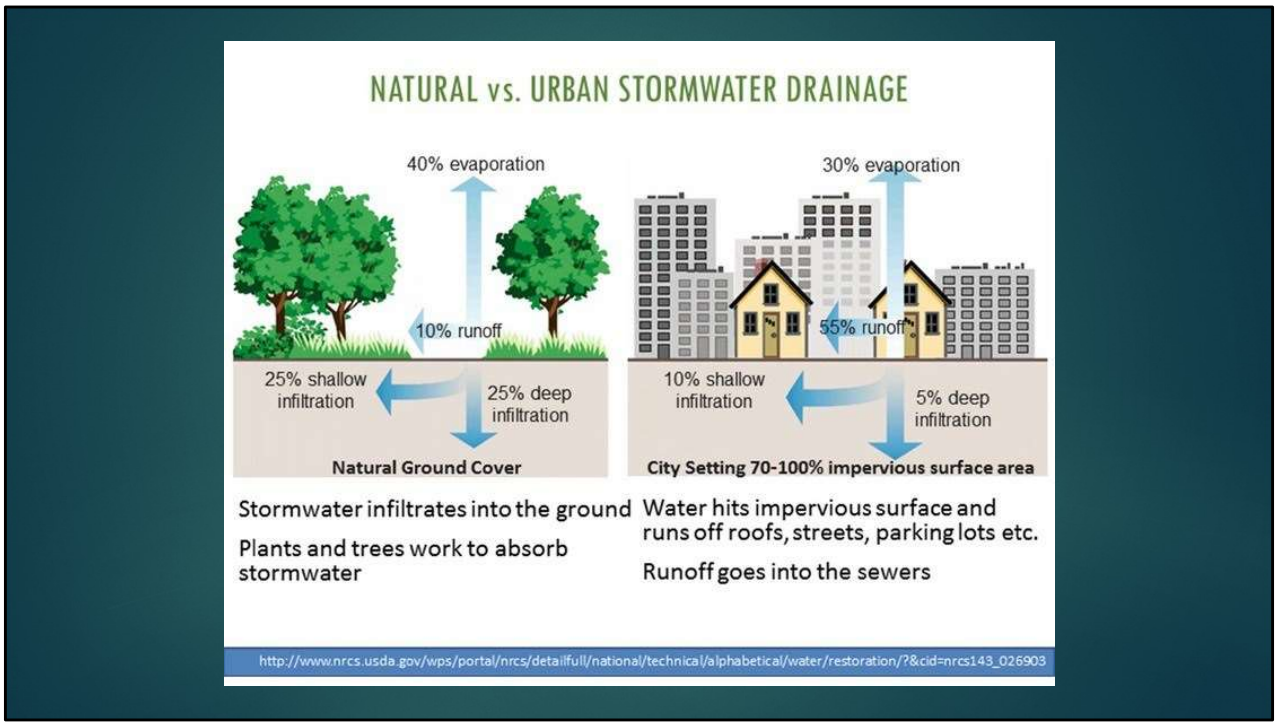
TMDL places a cap on the maximum amount of phosphorus that is allowed to enter the Lake and still meet Vermont's water quality standards

Hydrologic Cycle

AND EFFECTS OF IMPERVIOUS SURFACES ON WATER



Review water cycle – start on the left of the screen (precipitation from rain or snowfall, which naturally leads to infiltration and recharge of groundwater (can be limited by a confining layer). Some water runs off or enters surface water (stream/river/lake). There is evapotranspiration (ET) from many places, as well as evaporation from surface water. This forms clouds, which then rain/snow to start the cycle over. Humans have modified this system in many ways. We may pull water out of the ground (irrigation or for drinking water), and we change runoff patterns.



Note changes in % infiltration (with urban environment, less infiltration and evaporation, more runoff). This affects both the quality of the water going into our waterways (by direct pollution, dirt/oils, etc.) but also the quantity of water (more runoff = greater volume in our streams, which increases velocity/speed of the streams, and therefore erosion of streambanks (contributing to lake pollution because more sediment, which carries phosphorus, is moving to the lake).

https://youtu.be/6LAT1gLMPu4

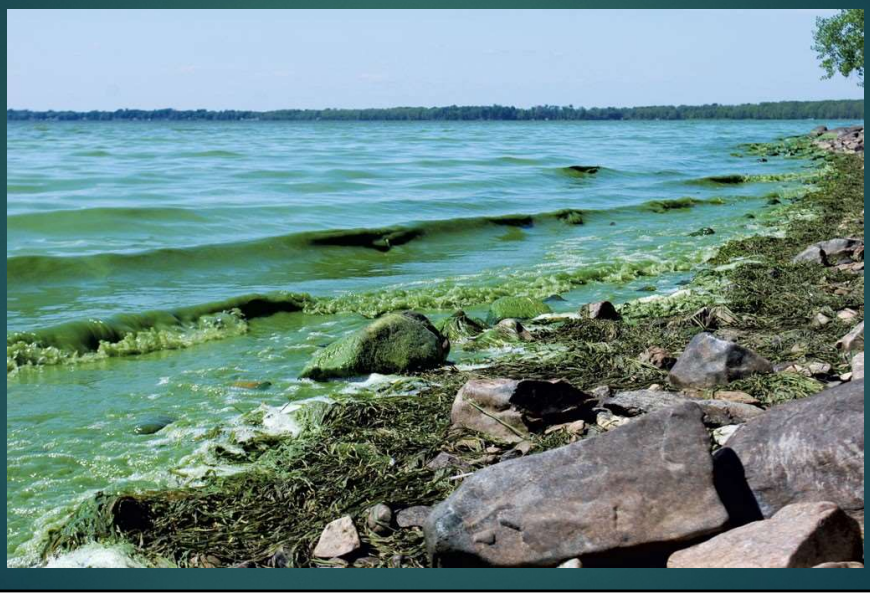
What happens when too many nutrients reach the lakes?

Impaired Rivers

- McCabe's Brook: impaired by nutrients **for aquatic life support**. Includes above and below wastewater treatment facility, with possible toxic impact below wastewater treatment facility; unstable channel above.
- Shelburne Bay: impaired by PCBs for **fish consumption** (lake trout), phosphorus enrichment
- Munroe Brook: impaired by **stormwater** (runoff, erosion, land development)
- LaPlatte River: **E. coli** (agricultural runoff), mercury (at mouth, in walleye)
- Mud Hollow Brook: **E. coli** (agricultural runoff, streambank erosion)

Reminder: Lake Champlain is impaired by phosphorus and has a TMDL. But some of our rivers and streams are also impaired waterways.

Why do we care?

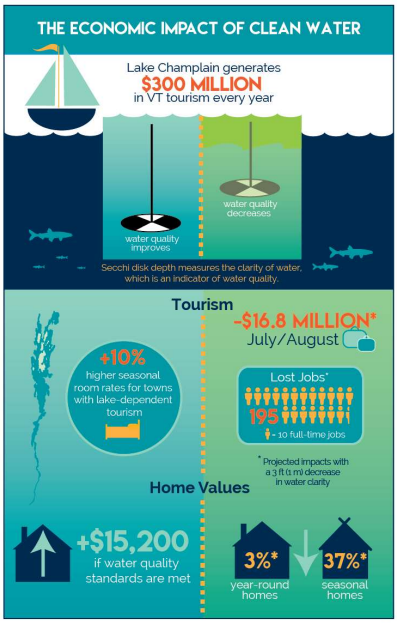


Two different answers: in Lake Champlain, TMDL is for phosphorus, which causes algal blooms, and can cause fish kills.

Roughly 20 million gallons of water are pumped from the Lake each day to supply drinking water to about 145,000 people.
Fish (and other aquatic life) kills and effects (nitrogen → impaired tadpole growth. Nutrients lead to deformities through increased parasite in frogs, see below for more details.)
Less ability to swim/recreate safely (some cyanobacteria (blue-green algae) release toxins that affect skin, kill dogs/kids, etc.).
Fish are unsafe to eat.
Property values decreased (in Georgia, recently reduced homes by $50k each due to blue green algae).

(Extra info on amphibian deformities if you wish to include it: Amphibians can be affected inadvertently by nutrients. In this case, nutrients caused an increase in snail populations. These snails host a flatworm parasite, which reproduces here before infecting tadpoles. infecting the cells that eventually give rise to the frog's limbs. Cysts form in the infected areas as the frogs develop, causing missing limbs, extra limbs, and other malformations.
The discovery of deformed frogs has caused concern for the survival of their populations. Without normal limbs, the frogs are easy targets for predatory birds.

What is more, many die long before they metamorphose from tadpoles to adult frogs.



From State of the Lake Report, Lake Champlain Basin Program

St. Albans Bay and Shelburne Bay suffered the most significant decreases in water clarity since 2010. In the past half decade, water clarity in Shelburne Bay decreased by 0.8 meters, and by about 0.7 meters in Saint Albans Bay.

The UVM study shows that with a decrease of just one meter of water clarity, Vermont lakeside communities would lose $16.8 million in economic activity, and approximately 200 full-time jobs. Seasonal homes would depreciate in value by 37 percent, and year round single family homes would suffer a three percent loss, according to the report, “An Assessment of the Economic Value of Clean Water in Lake Champlain.” Lake related tourism during the summer months faces a $12.6 million drop in summer expenditures, with a three foot decrease in clarity. Lakeside communities would endure these losses during the months of July and August alone, which are Vermont’s busiest months for tourism and seasonal lodging.

“This is $300 million at risk because of water quality problems” said John Erickson, an economist at the University of Vermont who worked on the study.

“It’s important for the public to know that any kind of improvement that we make in water quality, any kind of re-regulations that we put into place, have both big

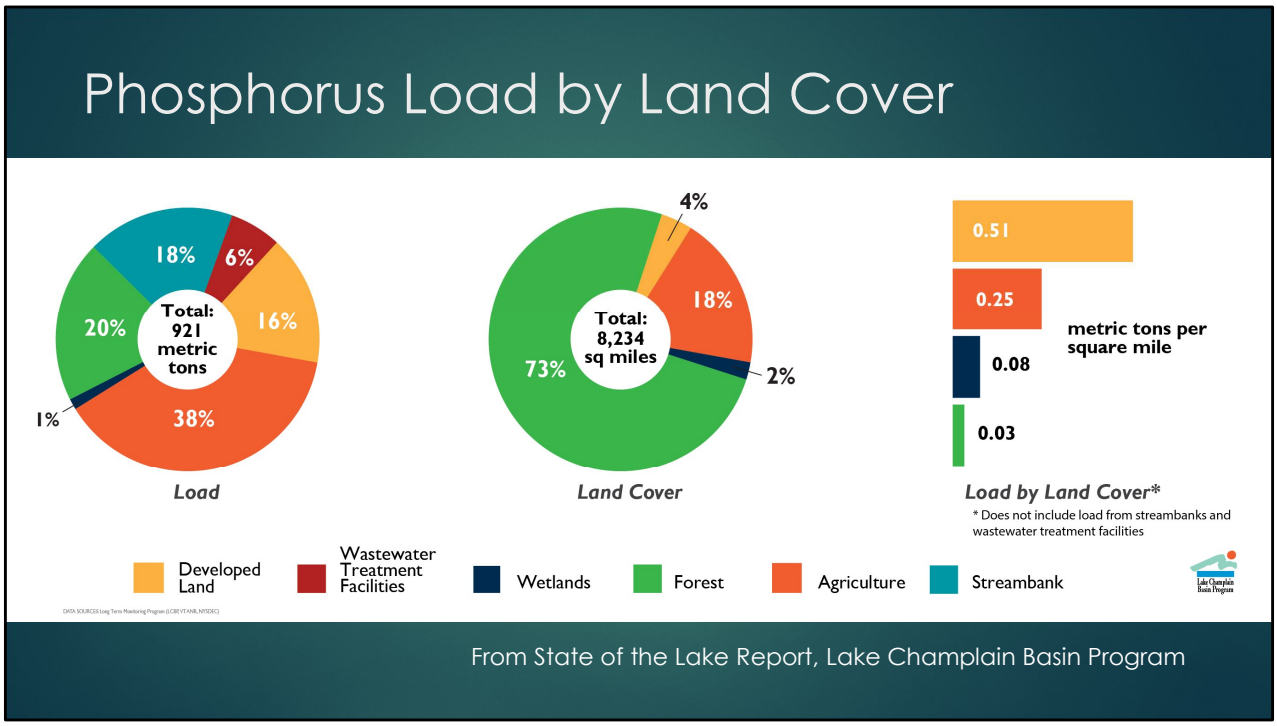
environmental benefits and huge economic benefits," Erickson said. "This is a part of the Vermont economy that is at risk to water quality problems."

Factors Affecting Water Quality

INTERACTIVE

https://youtu.be/21YAP8RF_sw

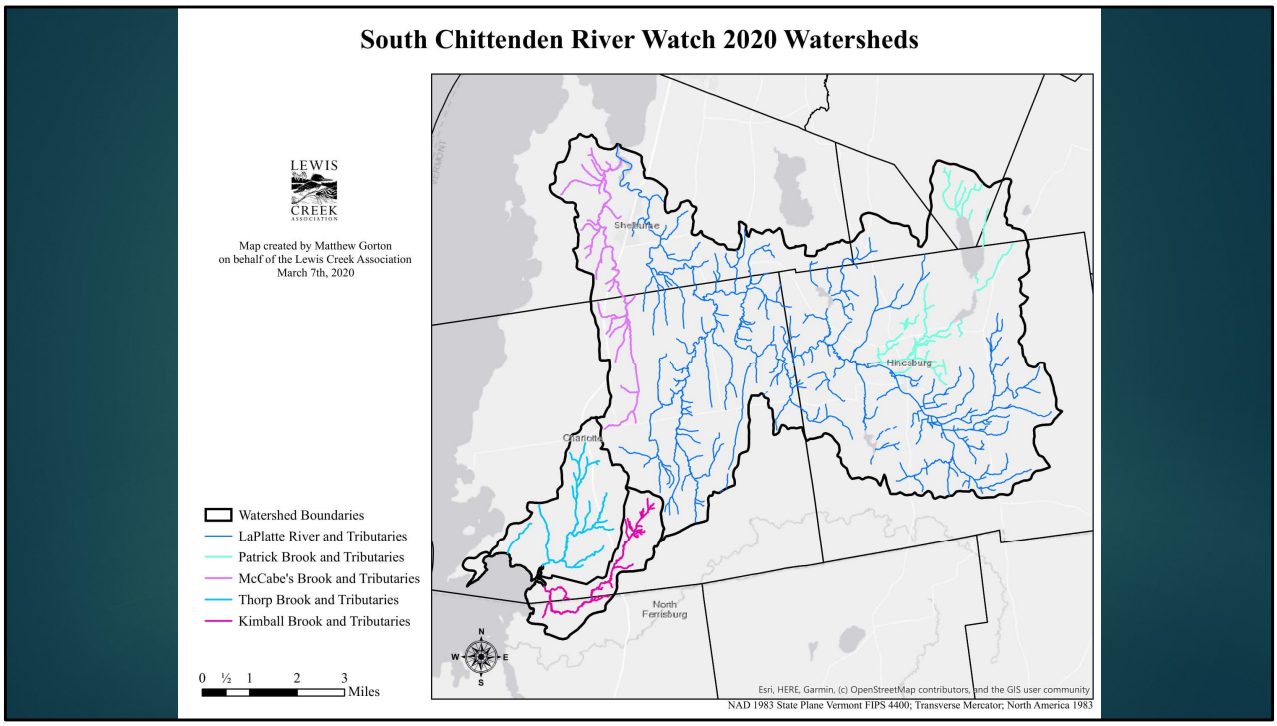
There are many factors that affect water quality. We will watch this short video to better understand some of them and how they might affect us. Note that the video shows a “good” condition (natural fix), followed by mistakes that have been made in the past. (Watch video). We need to undo what has been done in the past (such as river straightening) to minimize impacts of flooding in communities, and to allow for healthy water quality downstream (reminder that the erosion and sediment movement contributes to phosphorus loading in the lake downstream, especially with our highly erodible clay soils).



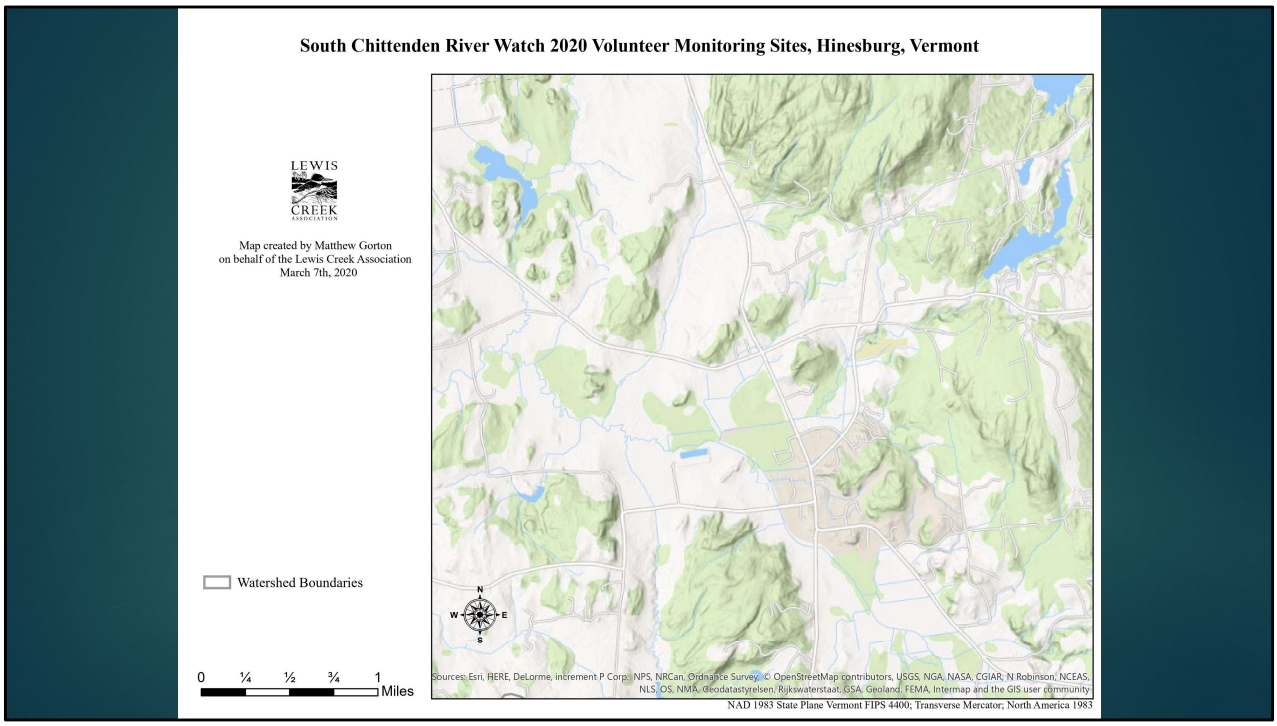
This graph shows how much phosphorus goes into the lake by the type of land cover (such as forest, agriculture, or developed). On the left is the amount of phosphorus that reaches the lake. In the middle is the land cover percentages for the Lake Champlain basin. And on the right, how much phosphorus reaches the lake by land cover type. It's worth noting that despite only covering 4% of the land, developed land contributes 16% of the phosphorus to the lake (the most load by land cover, 0.51 metric tons per square mile). Agriculture has the next highest load by land cover (0.25 metric tons per square mile). Although forests contribute very little load per square mile, because they make up so much land cover (73%) they contribute a fair bit of load (20%).

Water Quality Monitoring

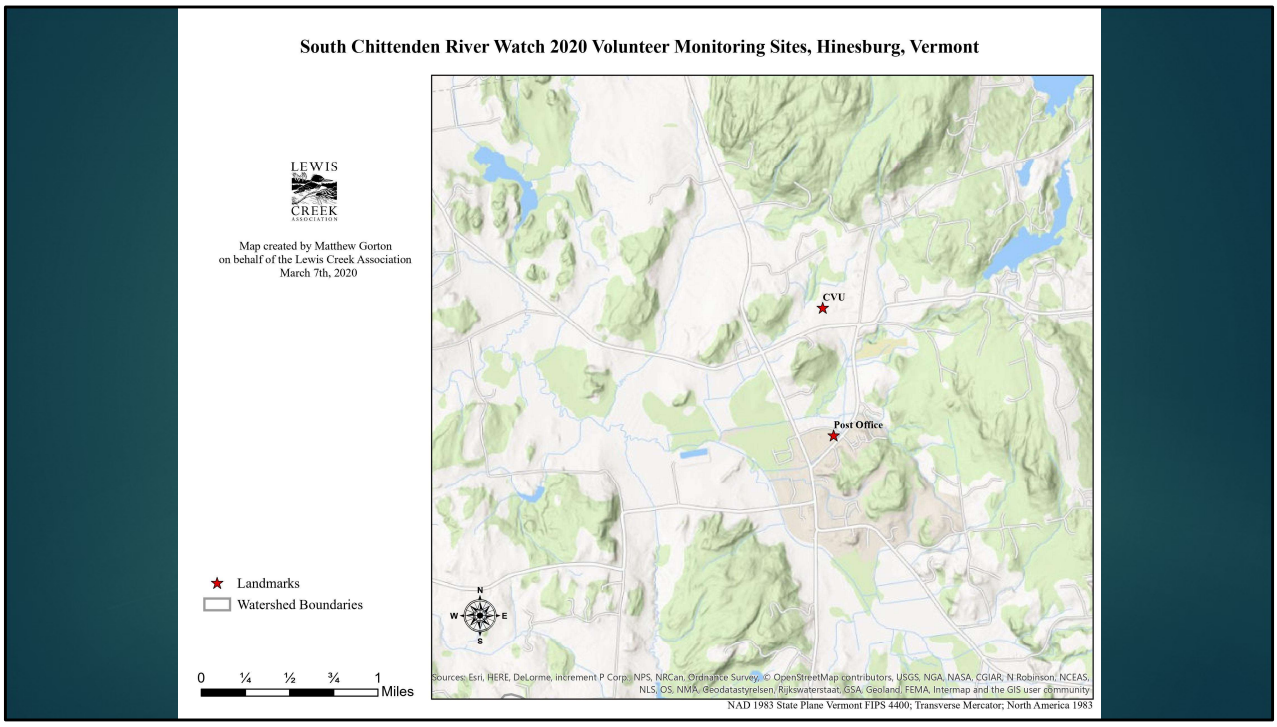
LEWIS CREEK ASSOCIATION'S SOUTH CHITTENDEN RIVER WATCH PROGRAM



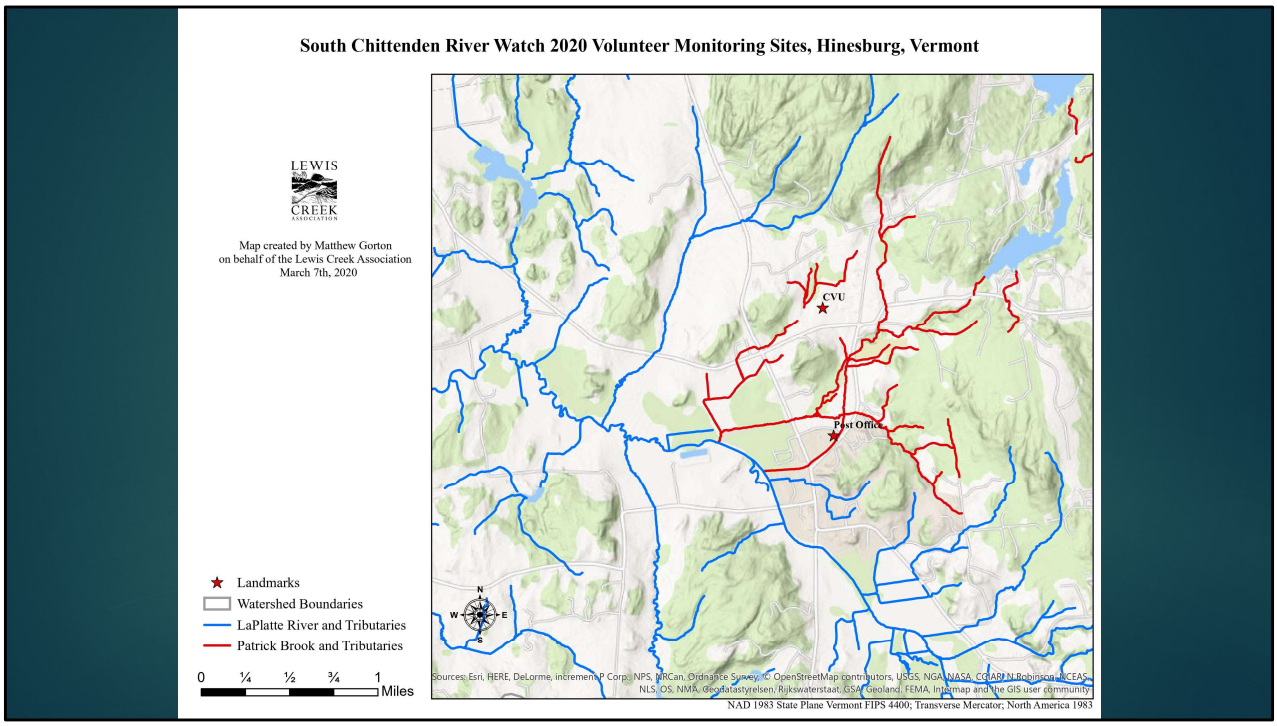
Overview of watersheds in the Shelburne/Charlotte/Hinesburg area that South Chittenden River Watch covers. Note that many of our towns waterways are interconnected (e.g. the LaPlatte River starts in Hinesburg, then flows through Charlotte and Shelburne). This is critical knowledge – what we do upstream affects the water quality downstream and in Lake Champlain.



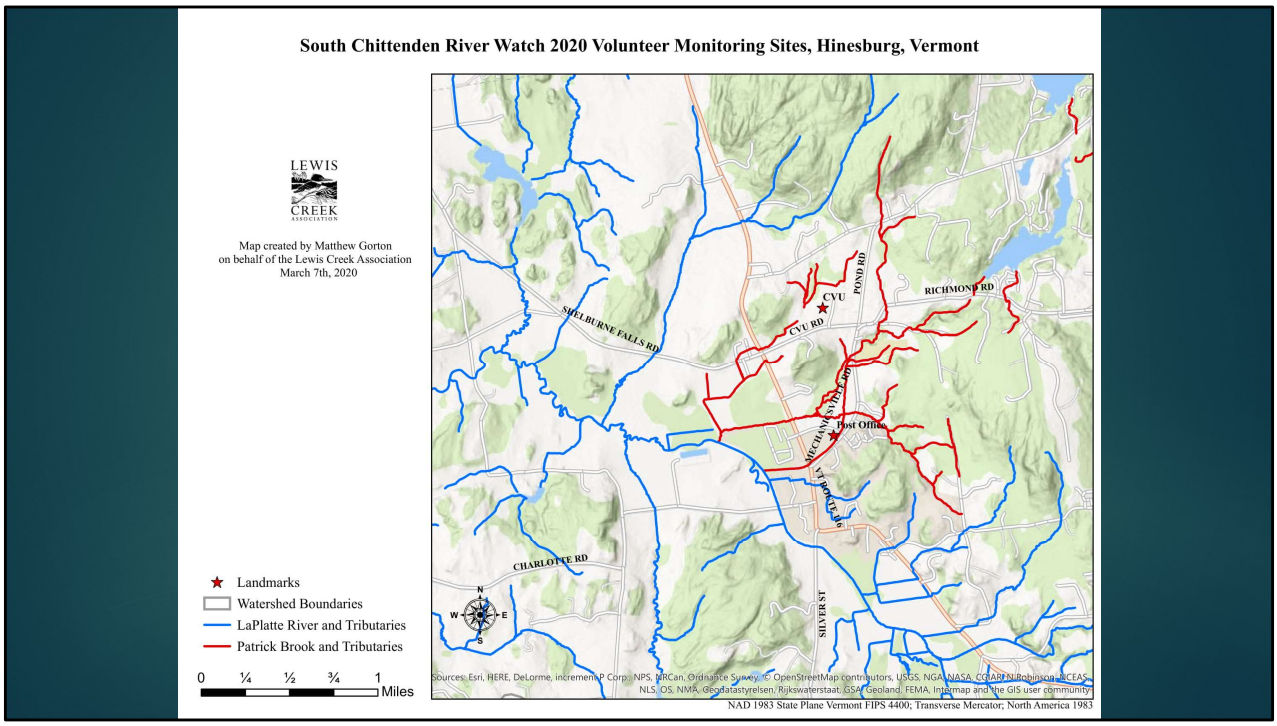
You are looking at an overhead view of Hinesburg. Route 116 runs approximately down the middle of this map.



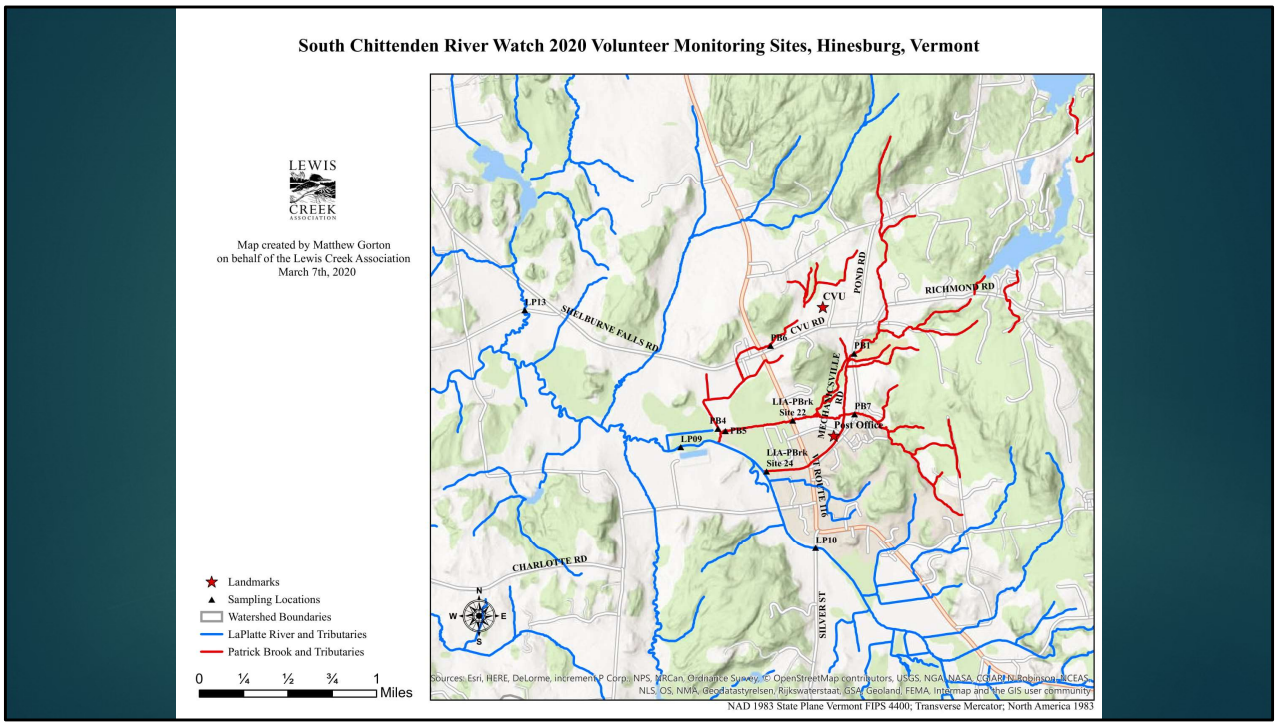
Here are a couple landmarks to orient you – CVU at the top of the screen, the post office in the middle, and Hinesburg Community School at the bottom.



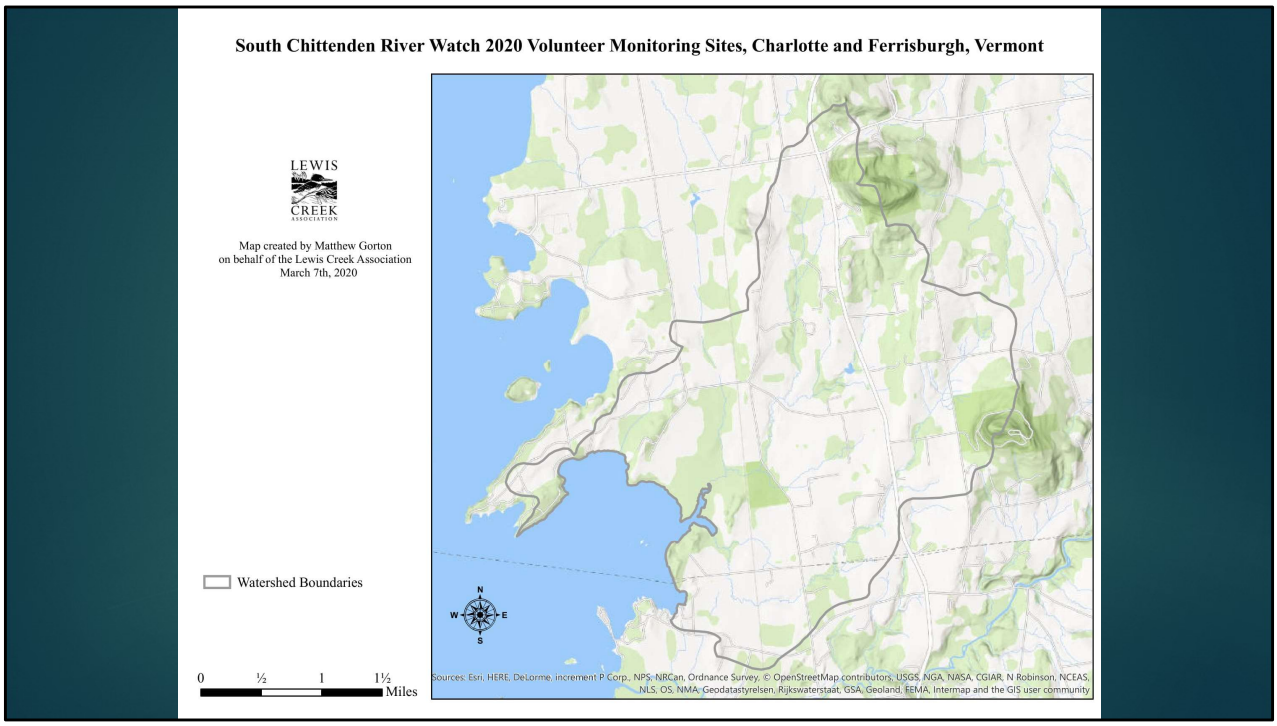
Streams, rivers, brooks, and tributaries that are in this watershed. In blue is the LaPlatte River, which starts off the screen to the south (bottom) and its tributaries, and in red, Patrick Brook and its tributaries. (note: Patrick Brook is also a tributary of the LaPlatte River, and starts up at Lake Iroquois outflow). We have done a lot to straighten and mess with these rivers as well, such as digging a canal for Patrick Brook instead of having it run its natural course, and straightening many streams.



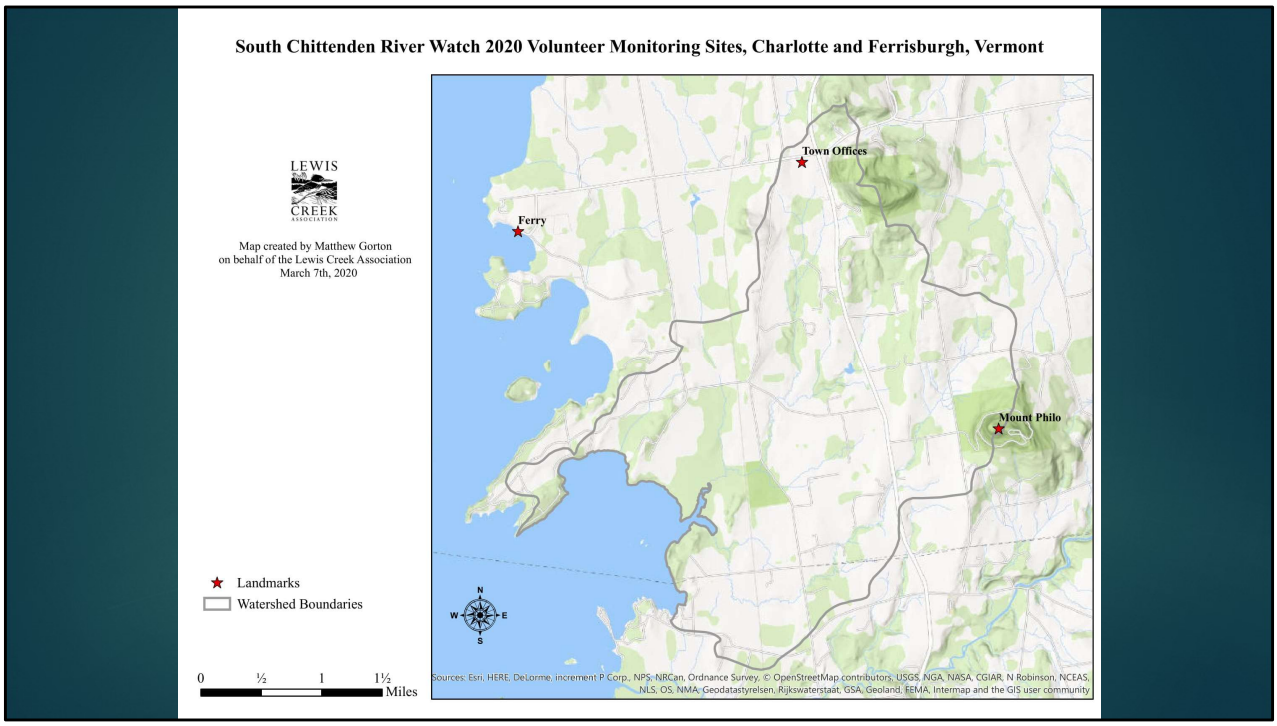
Here are roads to help orient you.



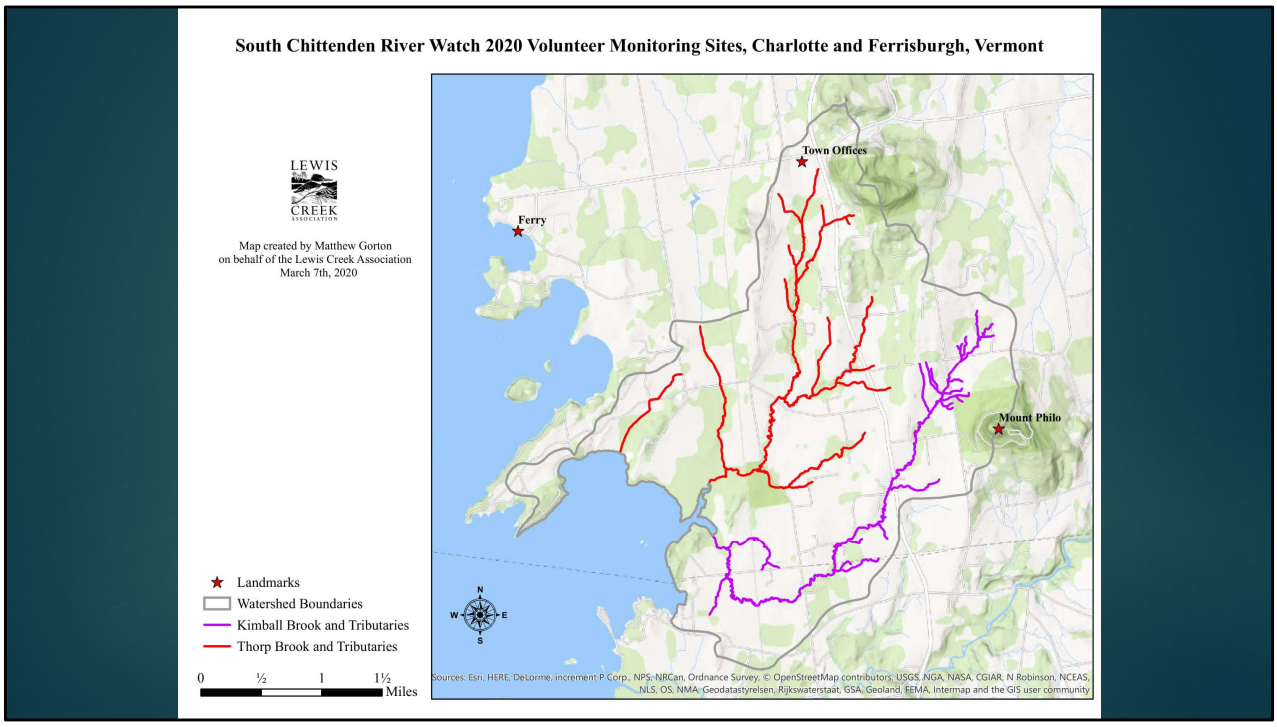
Our sampling stations. We sample at these specific locations to help us understand how much phosphorus or other pollutants are coming from different tributaries/stretches of river. This helps us figure out where fixes may be required. We also sample upstream and downstream of the wastewater treatment plant (LP9 and LP7a). We vary this sampling plan year to year to focus on different areas of the watershed and fine tune our understanding of pollutant levels and where fixes are needed.



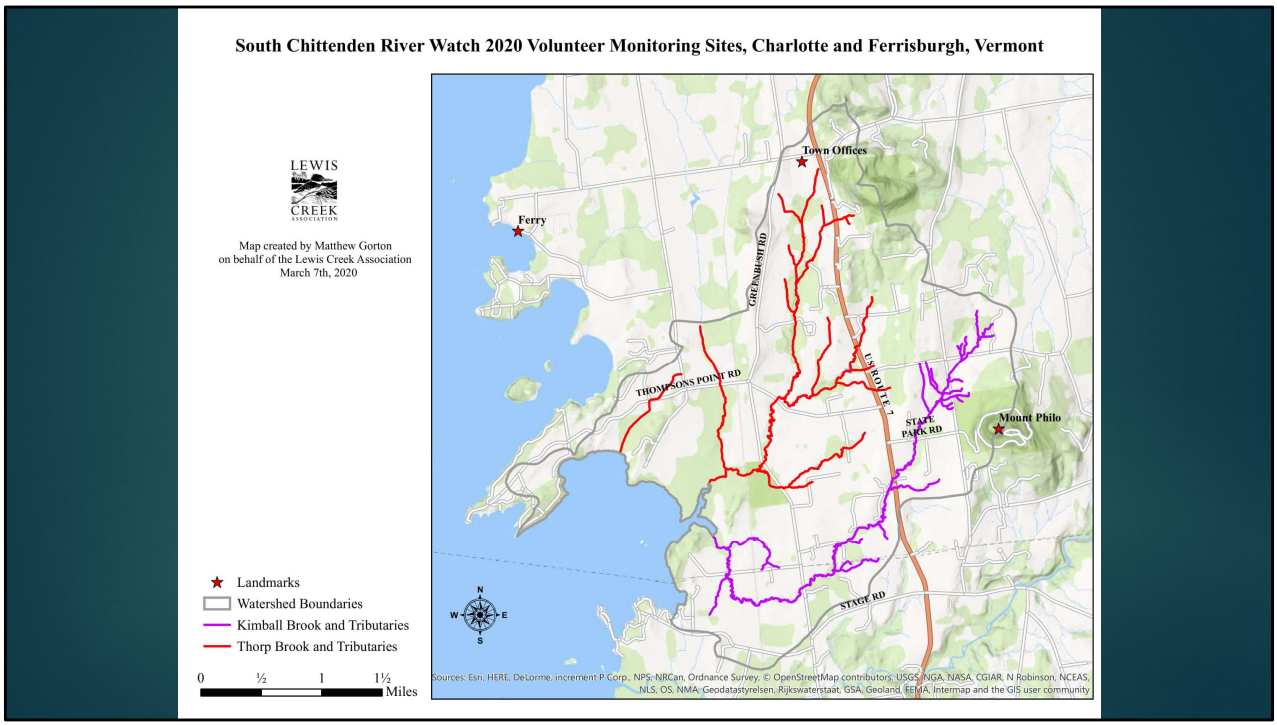
You are looking at an overhead view of Charlotte & Ferrisburgh.



Here are a few landmarks to orient you – the town offices are at the top of the screen, the ferry is on the left, and Mt. Philo is further south.



Streams, rivers, brooks, and tributaries that are in this area. In red is Thorp Brook and its tributaries, and in purple, Kimball Brook and its tributaries. Note these drain directly into Lake Champlain, in Town Farm Bay.



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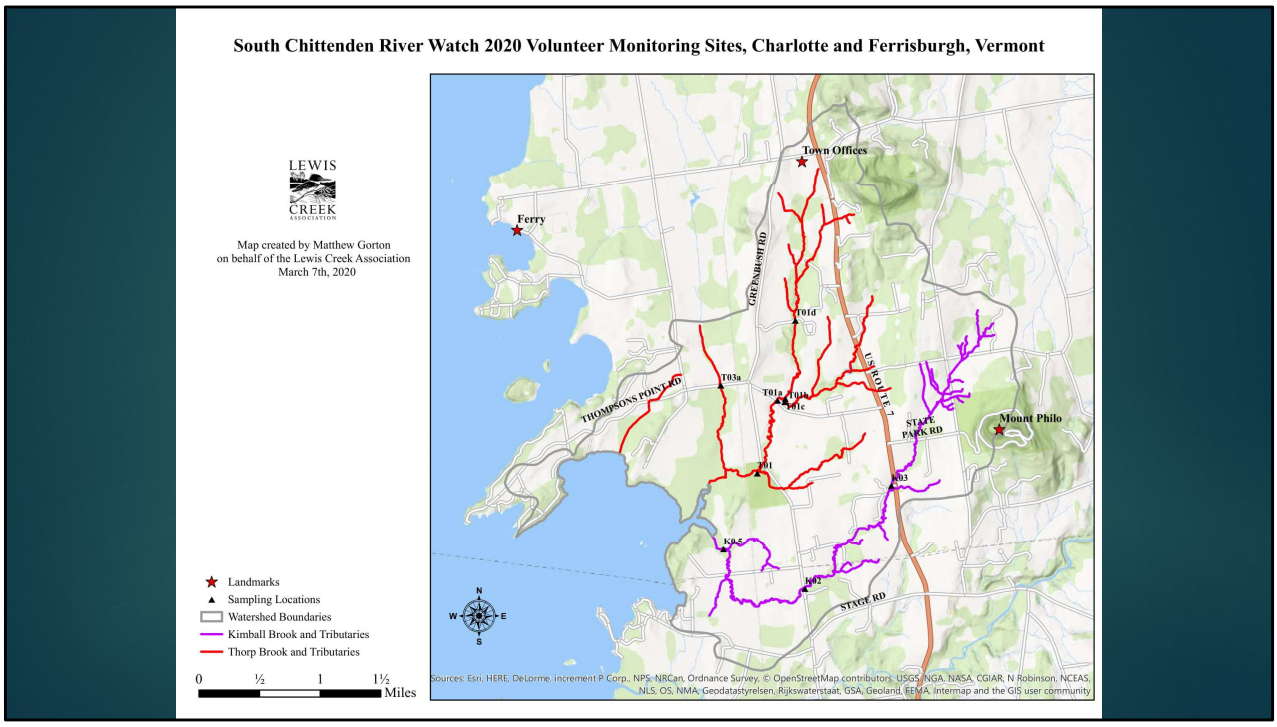
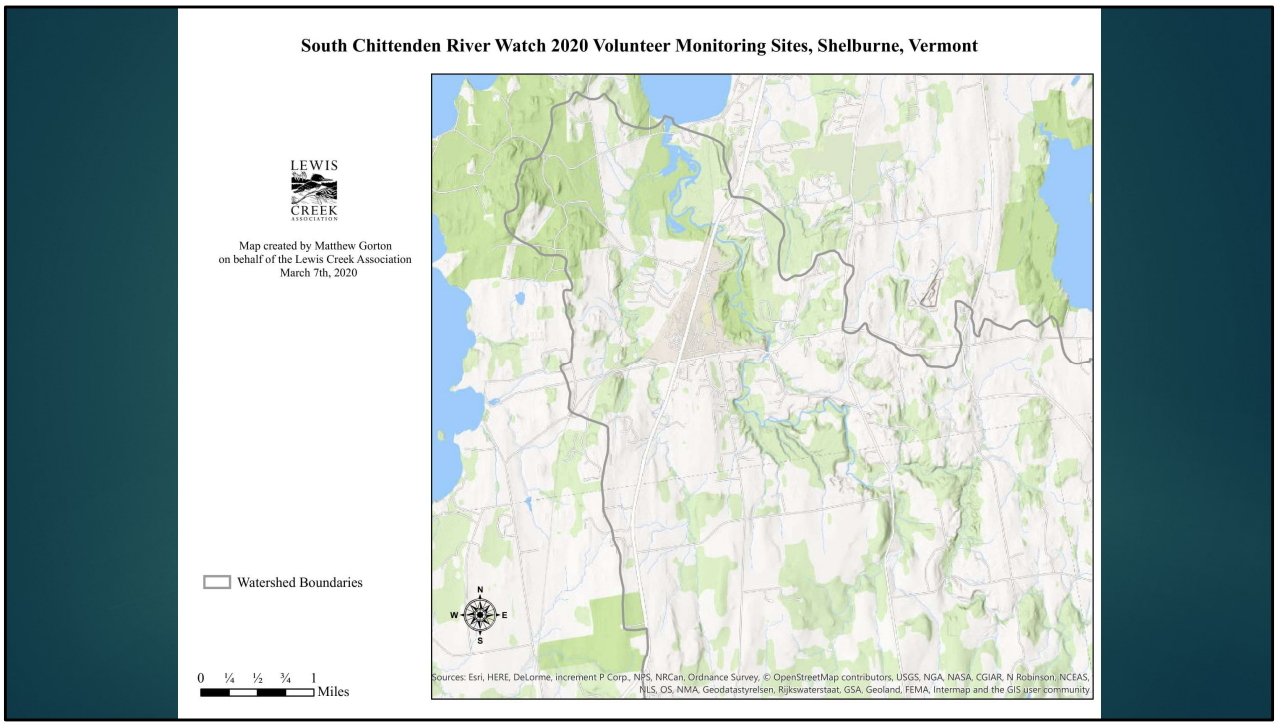
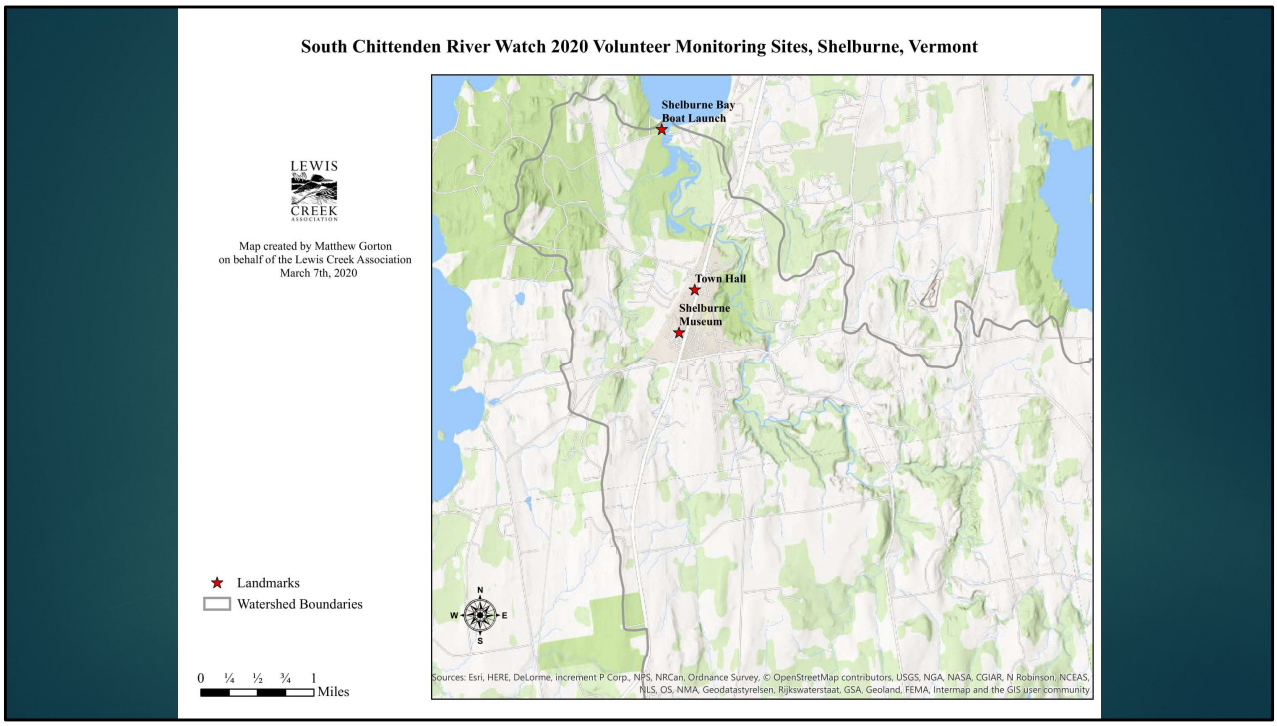


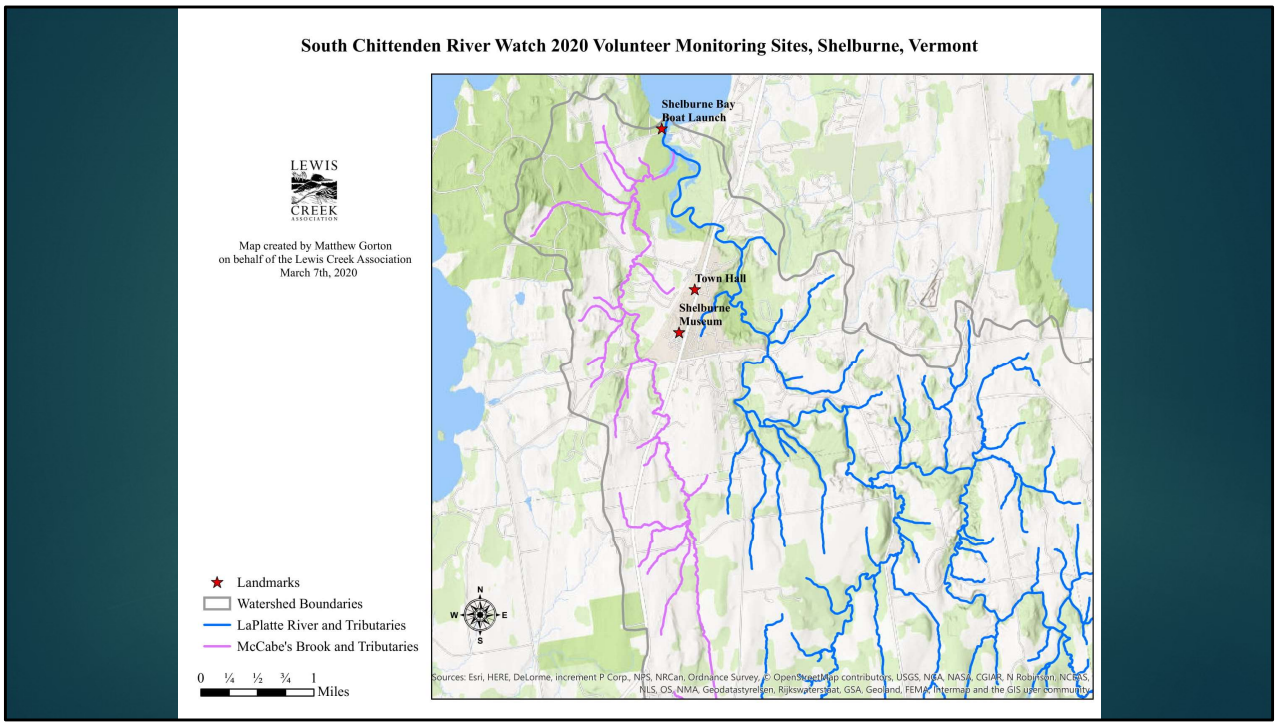
Our sampling stations. We sample at these specific locations to help us understand how much phosphorus or other pollutants are coming from different tributaries/stretches of river. This helps us figure out where fixes may be required. We also sample around some fixes that have been made (Thompsons Point Rd, Big Oak Lane) to help document water quality improvements. We vary this sampling plan year to year to focus on different areas of the watershed and fine tune our understanding of pollutant levels and where fixes are needed.



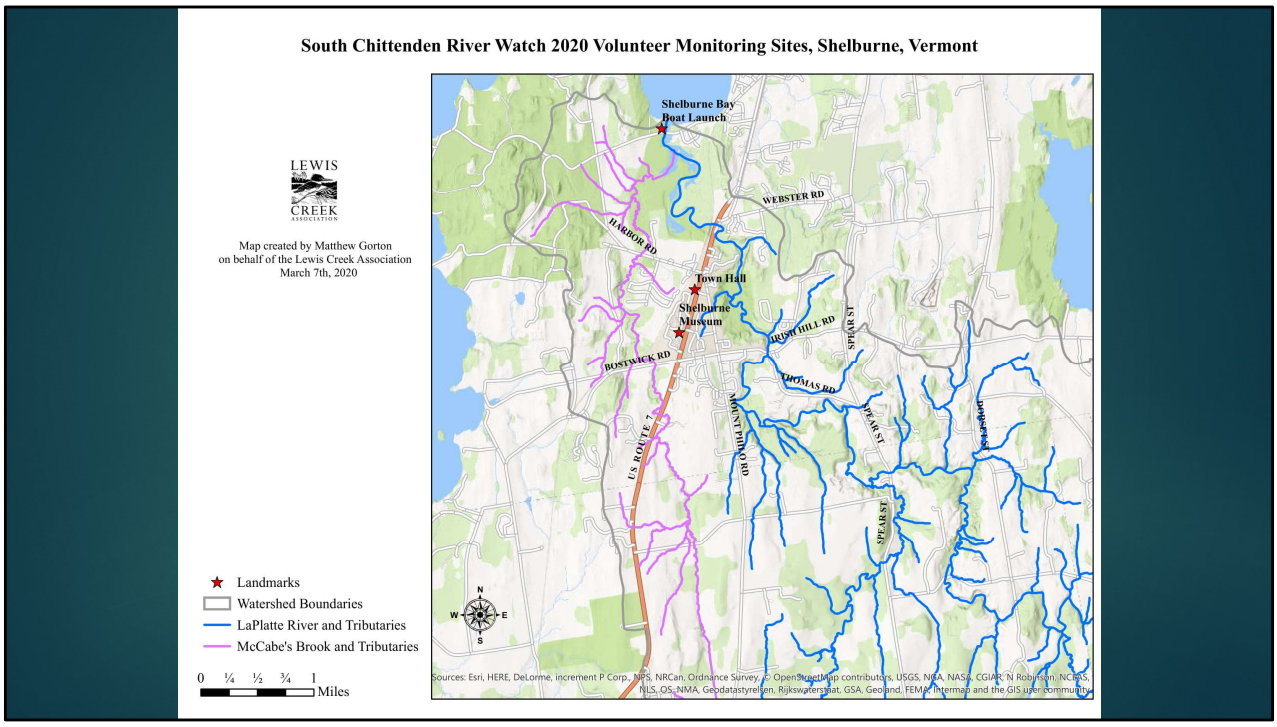
You are looking at an overhead view of a portion of Shelburne. Shelburne Bay is the northern end of the map (Shelburne Pond is along the eastern margin of the map, and Lake Champlain is to the west).



Here are a few landmarks to orient you – the town hall and Shelburne Museum are near the center, and the Shelburne Bay Boat Launch is to the north.



Streams, rivers, brooks, and tributaries that are in this area. In blue is the LaPlatte River and its tributaries, and in purple, McCabe's Brook and its tributaries. Both drain into Shelburne Bay.



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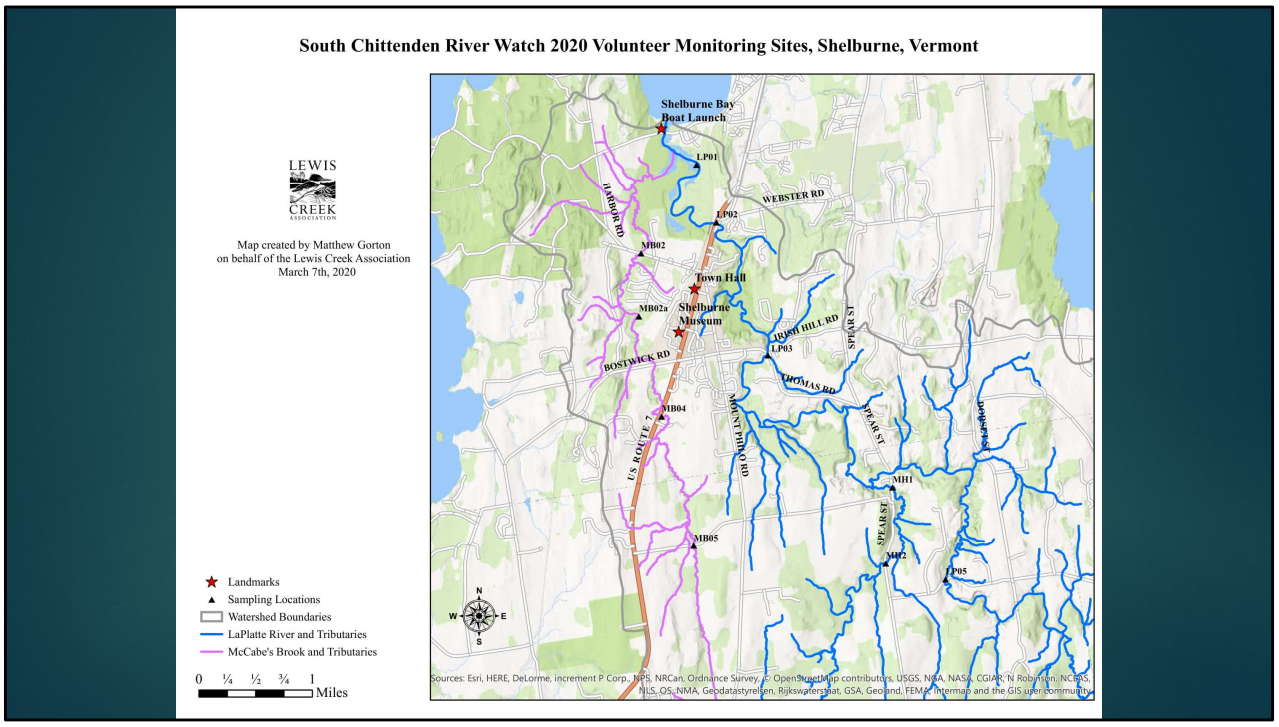

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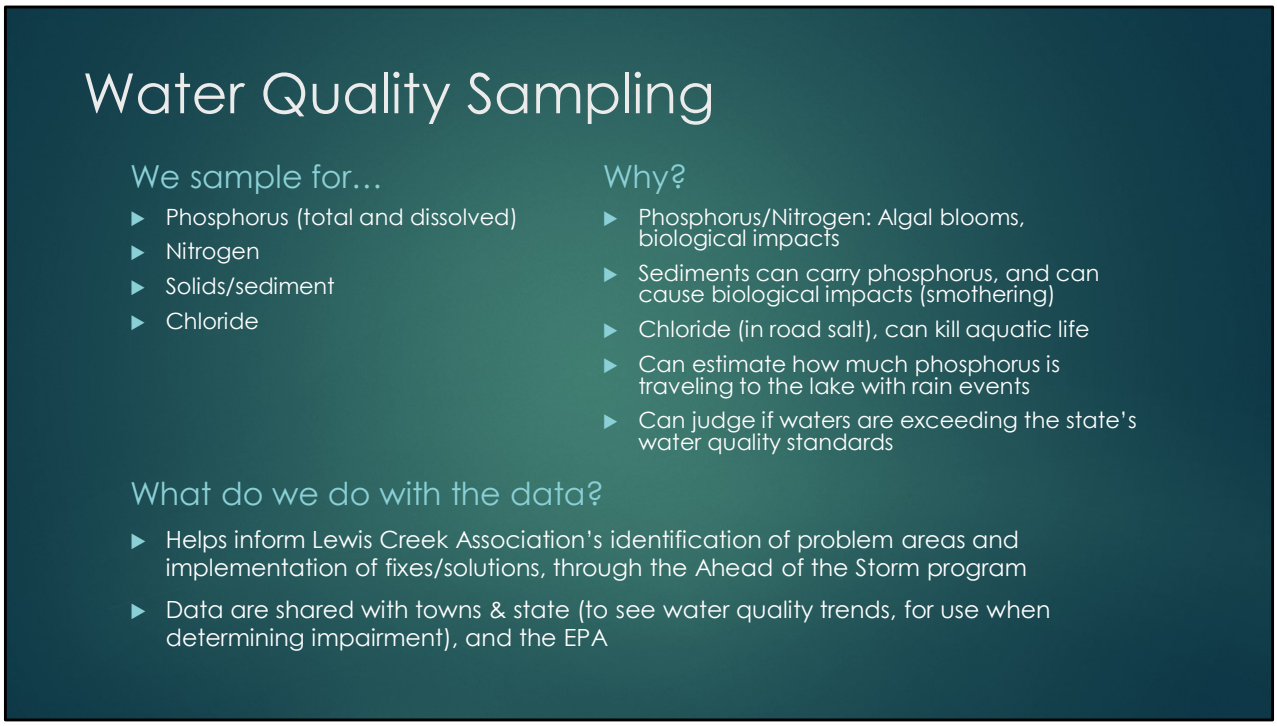
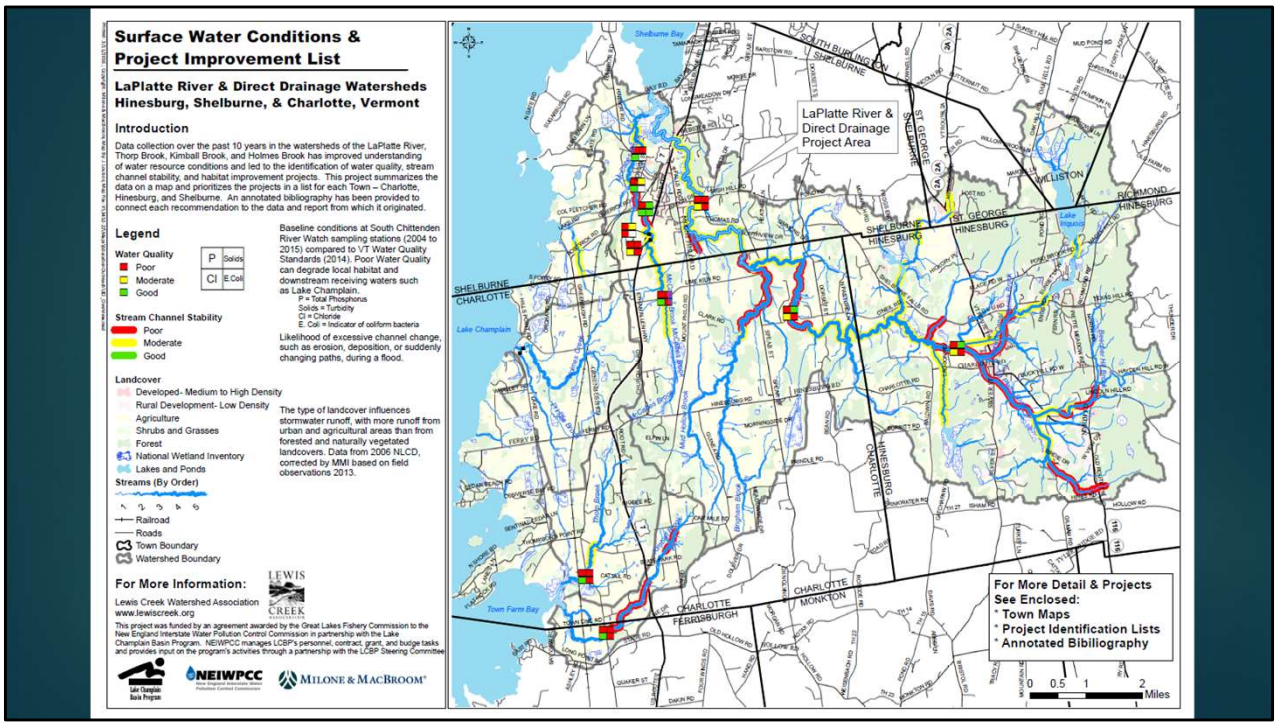
Here is what we do: take samples of water at these locations, usually after a rain storm. Samples get sent to the state lab, where they are analyzed. This is part of a larger program that is run by the state (Department of Environmental Conservation) to understand water quality.



We sample for phosphorus, nitrogen, solids/sediment, and chloride. (Read from screen for the why) and what we do with the data.

Additional info if you care to share it: Partners who use data include watershed towns, VT DEC, Vermont Agency of Agriculture, the Natural Resources Conservation Service and District offices, UVM Extension, USDA Farm Service Agency, US Fish & Wildlife Service, and Vermont Fish & Wildlife Department.



This shows the Laplatte River and direct to lake drainage areas in our three towns (Shelburne/Charlotte/Hinesburg). This map was developed in 2016, and was based on 10 years of water quality samples in these watersheds. Each square you see is a sampling location. With these, there are four squares that show conditions of different parameters (phosphorus, solids, chloride, and E. coli, which is a bacteria). Red means there is a lot of the parameter (and is poor water quality). Yellow is moderate, and green is good water quality. You'll notice that there are high levels of phosphorus throughout the watershed. Areas of the watershed also have high levels of solids, and sections of the LaPlatte (and Mud Hollow Brook) are impaired for E. coli. McCabe's is impaired by nutrients for aquatic life support.

What Can You Do to Help? The Three S's

Slow it down

Sink it in

Spread it out

Examples of the three s's in Lewis Creek Association's Ahead of the Storm (AOTS) program. AOTS helps communities change the way stormwater is managed on properties to reduce water pollution and be more prepared for extreme weather events and impacts of climate change. Fifteen municipal, commercial, and private properties have been selected to become demonstration sites to showcase more optimal conservation practices in a variety of landscape settings.

Slow water down by putting in check dams in ditches (E. Thompson's Point Rd. in Charlotte), to slow water down off a road ditch before it reaches the stream.
Sink it in: Shelburne Community School rain garden (allows water to filter through the soil, for nutrients like phosphorus to get used by the plants in the rain garden, and sink into the ground instead of going straight into pipes that go out to the brook).
Spread it out: Allow the brook to access its natural floodplain (Hinesburg Town Garage, Beecher Brook).

What Can You Do to Help?

- Cut grass no shorter than 3"
- Pick up pet waste
- Minimize use of fertilizer
- Rain barrels
- Redirect downspouts
- Maintain septic systems
- Reduce salt use in the winter
- Practice eco-friendly car care
- Install a rain garden
- Plant a buffer between you and waterways
- Plant native plants: no-mow area/minimize lawn
- Fix your private road or driveway: grade and enhance swales for climate change

Sign up to be a water quality sampling volunteer!

Kate Kelly, lewiscreekorg@gmail.com, 488-5203

These are just a few ideas: pick up one of our handouts for more resources!

Lawns

Courtesy of Friends of the Mad River, Storm Smart

https://vimeo.com/302073778

We'll watch a few videos to help you see some of these ideas in action. This is one of my favorites, because it doesn't require much work – in fact, for one of these solutions, it will save you time and work!!

Around your house

Courtesy of Rethink Runoff, Smart Waterways

https://youtu.be/VnlAcGM4AkE

Here are few more ideas of things you can do around your house to help water quality.

Driveways

Courtesy of Friends of the Mad River, Storm Smart

https://vimeo.com/302706886

And finally, if you live on a rural road or have a gravel driveway, here are some tips for maintaining your driveway so that you don't have large expenses with wash-outs, re-grading, etc.

Volunteer!

- Sign up to be a water quality sampling volunteer!
  Kate Kelly, lewiscreekorg@gmail.com, 488-5203
- Support your town's funding of Lewis Creek Association for water quality sampling (and invasives removal)
- Get involved in your town committees, improve river corridor protections
- Learn more at LCA's website, under South Chittenden River Watch and Ahead of the Storm

Questions?