2019 Lake Carmi Clean Water Progress Report

Vermont Department of Environmental Conservation

Clean Water Initiative Program

Watershed Planning Program

Lakes and Ponds Program

July 9, 2020

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Meeting Agenda

1. Welcome and Meeting Ground Rules
2. Remarks from DEC Commissioner Peter Walke
3. Presentation of the 2019 Lake Carmi Clean Water Progress Report
    - Clean Water Investments and Results
    - Lake Carmi Phosphorus TMDL Progress
        - *Katie Bockwoldt, Clean Water Initiative Program, DEC*
    - Lake Carmi Aeration System & Water Quality Trends
        - *Angela Shambaugh, Lakes and Ponds Program, DEC*
4. Summary and Next Steps
5. Question and Answer

Virtual Meeting Ground Rules

1. DEC staff will facilitate the meeting.
2. Please keep your microphones muted unless you are speaking during the Q&A.
3. During the Q&A, please use the “raise hand” feature in Teams if you want to speak, and we will call on you to speak.
4. Please identify yourself at the start of your comment and speak slowly and clearly.
5. Feel free to leave a written comment or question in the “Meeting Chat” box and we will address these comments, time permitting.
6. This is a public meeting so please be concise and respectful.
7. If you are having bandwidth issues, try turning off your video.
8. The meeting is being recorded and will be posted to the Carmi Webpage.

Lake Carmi Crisis Response Plan

- Lake Carmi was designated as a Lake in Crisis in 2018 due to persistent cyanobacteria blooms resulting from high in-lake phosphorus concentrations.
- The State of Vermont issued a Lake Carmi Crisis Response Plan outlining several high priority actions aimed at reducing phosphorus loading to Lake Carmi.
- The purpose of this report is to summarize work completed to date to meet Lake in Crisis Response Plan objectives that should translate into water quality improvements in Lake Carmi.

Message from DEC Commissioner Peter Walke

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Vermont's Clean Water Projects

- Clean water restoration plans, known as Total Maximum Daily Loads (TMDLs), identify the pollutant reductions a waterbody needs to meet Vermont's Water Quality Standards.
- The Lake Carmi Phosphorus TMDL was established by the State of Vermont and U.S. Environmental Protection Agency (EPA) in 2009. Phosphorus loading must be reduced by 611 kg/year to meet the TMDL and mitigate water quality issues.
- Clean water projects target nutrient and sediment pollution from various land use sectors.

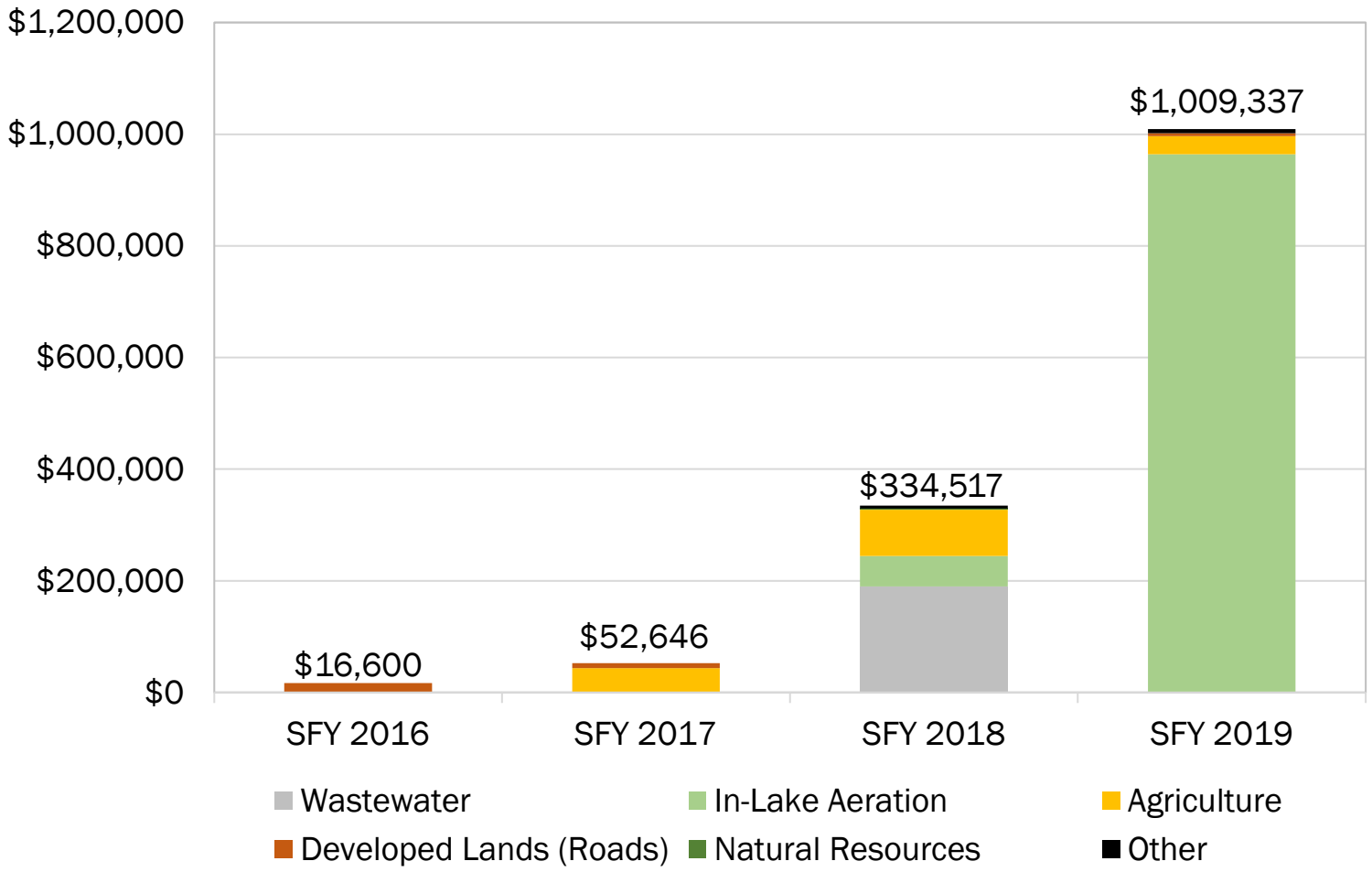
Clean Water Project Accountability Measures

Investment measures of how State of Vermont invests in clean water projects from planning to design and implementation

Project output measures that quantify the results of state-funded clean water projects

Pollutant reduction measures of estimated nutrient load reductions achieved by clean water projects

Vermont's Lake Carmi Clean Water Investments



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Results of Clean Water Investments

Agriculture Project Output Measures	2016	2017	2018	2019	Total
Acres of cover crop planted through AAFM's Farm Agronomic Practice Program	--	--	28	33	61
Estimated acres of cover crop planted through AAFM's Capital Equipment Assistance Program	--	--	--	92	92
Number of barnyard and production area practices installed	--	1	1	1	3
Acres of barnyard and production areas in full RAP compliance (based on AAFM inspections)	--	--	11	--	11
Acres of NRCS-funded conservation tillage	196	4	168	86	454
Acres of NRCS-funded cover crop	93	99	76	86	354
Acres of NRCS-funded forage and biomass (crop to hay)	89	35	76	--	200

Grassland shallow slot manure injector to be used within the Lake Carmi watershed. Manure is injected subsurface to reduce surface runoff of nutrients.

Results of Clean Water Investments

Developed Lands Project Output Measures	2016	2017	2018	2019	Total
Number of private road improvement projects identified	--	--	22	--	22
Number of final (100%) road drainage culvert restoration designs completed	--	4	--	--	4
Linear feet of municipal road drainage and erosion control improvements	--	--	672	60	732

Before and after installation of stone-lined drainage ditch and road drainage culvert along Dewing Road. Project completed by the Town of Franklin and the Northwest Regional Planning Commission and funded through the Municipal Roads Grants-in-Aid Program.

Results of Clean Water Investments

Natural Resources Project Output Measures	2016	2017	2018	2019	Total
Number of Lake Wise check dams installed/repaired	--	--	3	--	3
Number of Lake Wise culvert armoring projects	--	--	6	--	6
Number of Lake Wise shoreland plantings	--	--	2	--	2
Number of riparian trees planted	--	--	250	--	250

Before (left) and after (right) stabilization of an eroding lakeshore access path to Lake Carmi, completed by the Franklin Watershed Committee as part of the Lake Wise Program with funding from DEC's Clean Water Initiative Program.

Results of Clean Water Investments

Wastewater Treatment Project Output Measures	2016	2017	2018	2019	Total
Number of wastewater treatment facility upgrades completed	--	--	1	--	1

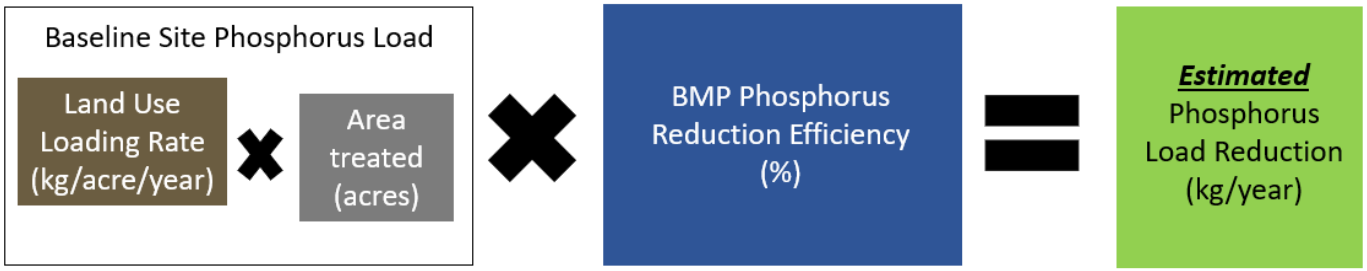
Lake Carmi State Park zero discharge wastewater treatment system under construction (left) and constructed with operational aeration "islands" (right).

Phosphorus Load Reduction Estimates

- Clean water projects installed in the Lake Carmi watershed are expected to reduce phosphorus pollution to Lake Carmi and improve water quality.
- While Lake Carmi's water quality is the ultimate indicator of progress, it will take time for Lake Carmi to realize the benefits of these projects.
- To provide incremental measures of accountability, the state ***estimates*** the phosphorus load reductions associated with clean water projects installed across state and federal funding programs and regulatory programs in Vermont.

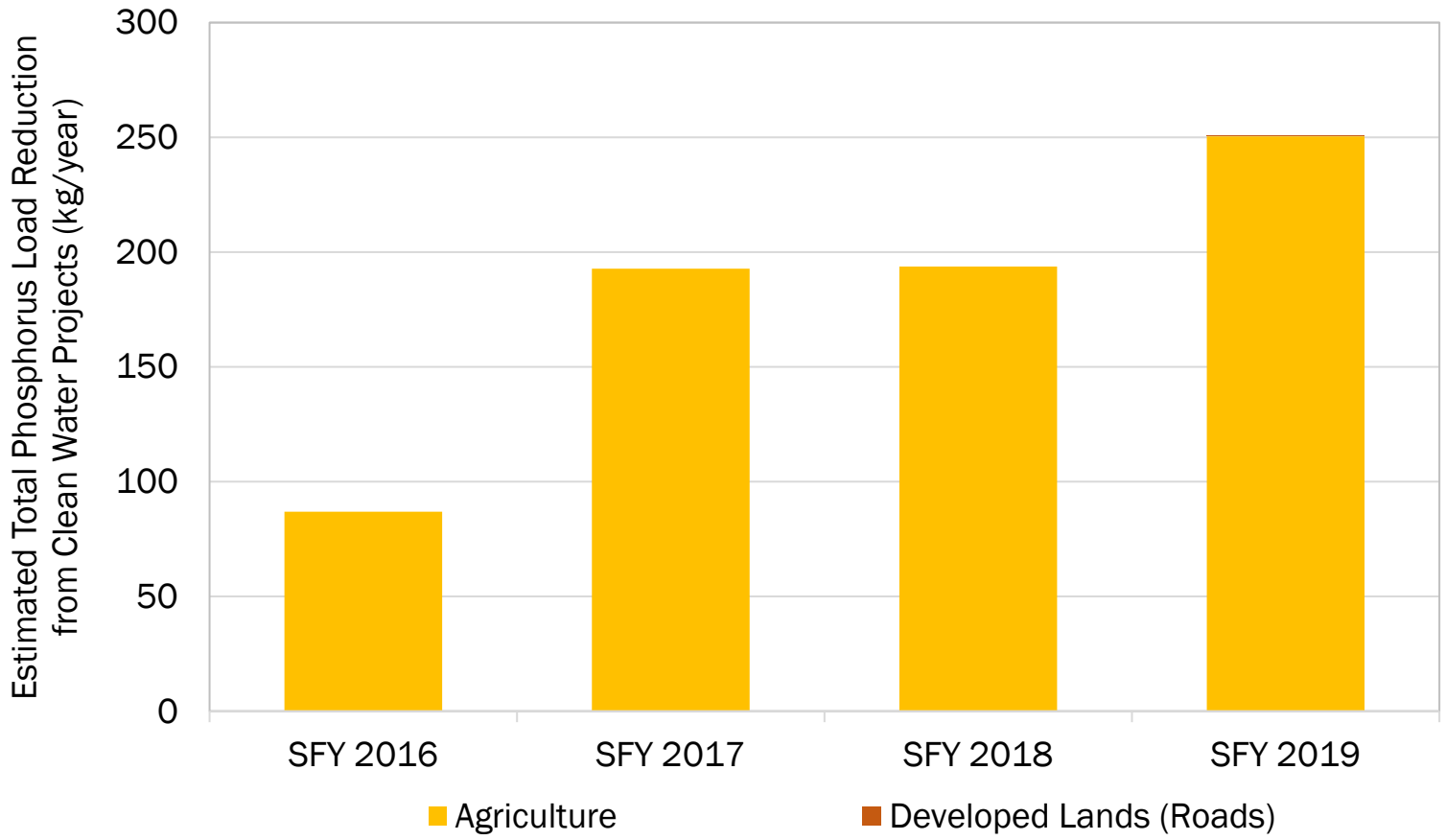
Phosphorus Load Reduction Estimates

- Phosphorus load reduction estimates are ***modeled*** at the individual clean water project-level based on the best available science.



- Phosphorus load reduction estimates reported by the state:
  1. Are only associated with clean water project implementation.
  2. Reflect the estimated phosphorus load reduced from the watershed, not the phosphorus reduction within the lake.
  3. Are not currently available for all clean water project types.

Phosphorus Load Reduction Estimates



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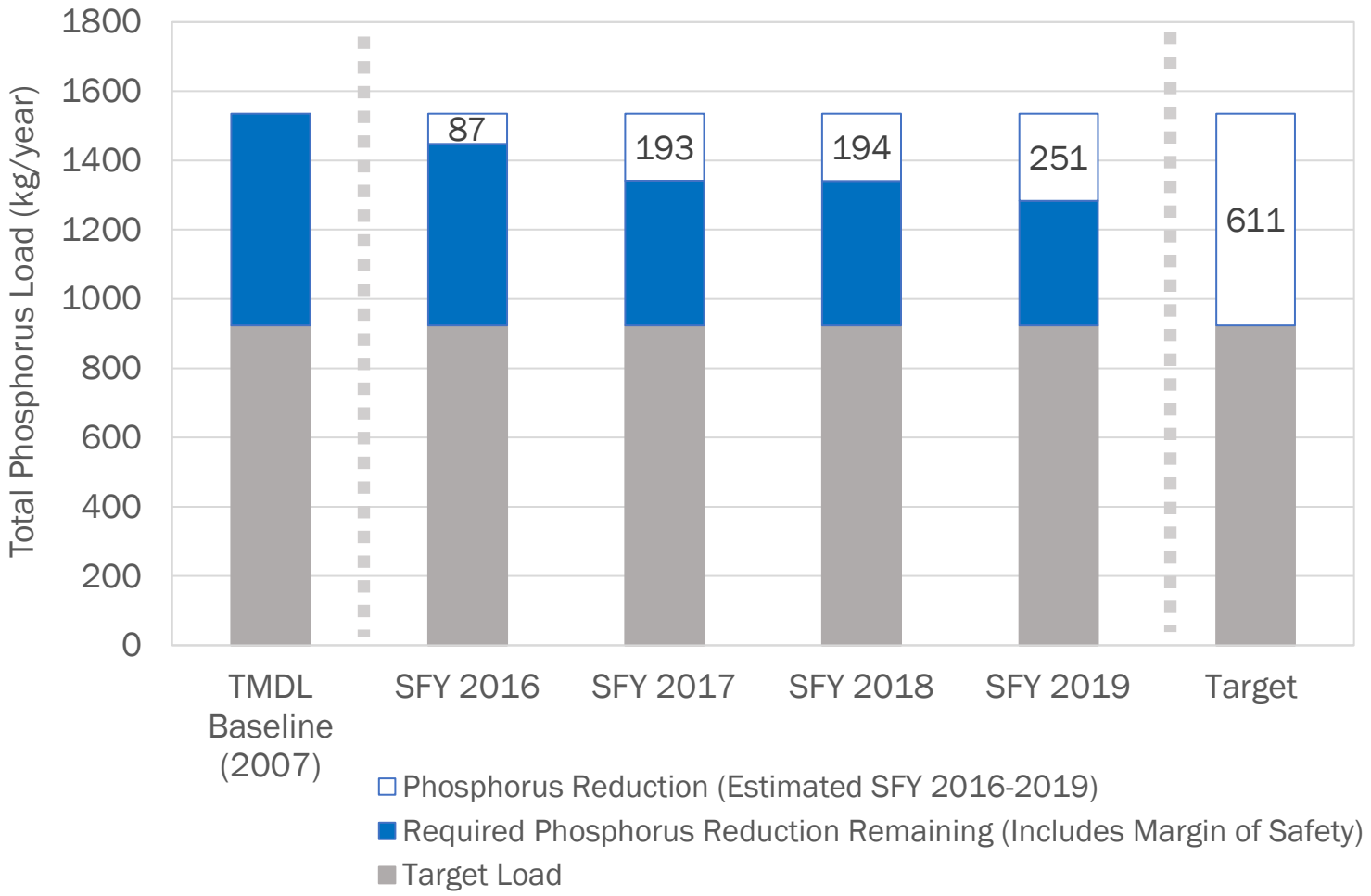
Lake Carmi Phosphorus TMDL Progress



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Lake Carmi Water Quality Monitoring

LMP update

Automated sampling buoy

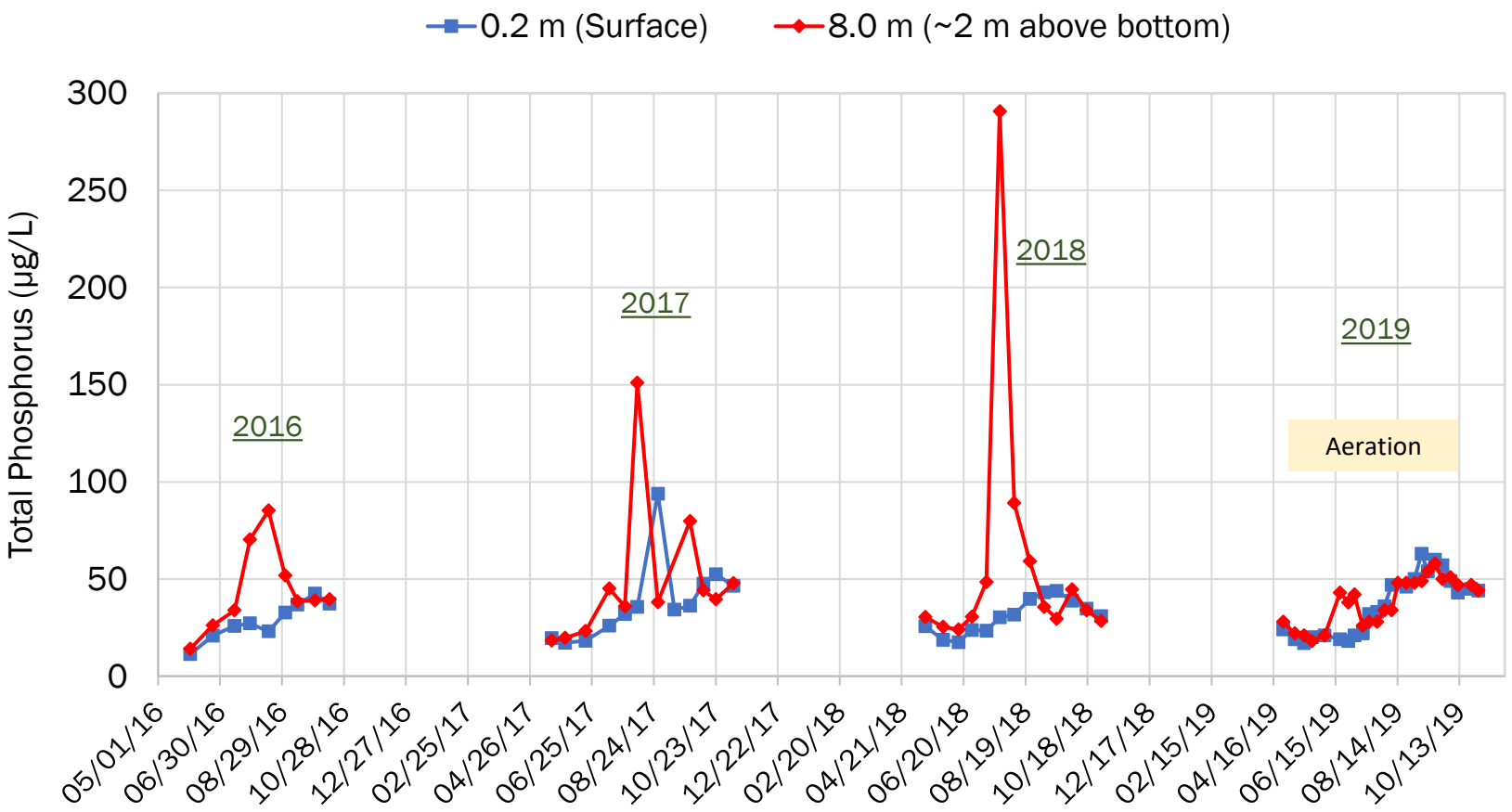
Lake tributary monitoring

Groundwater study

Lake Carmi Aeration System

Lake Carmi aeration system compressor cabinet at Lake Carmi State Park (left) and bubbles produced in the lake by the aeration system during operation (right).

Lake Carmi Aeration System



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Lake Carmi Water Quality Trends

Learn How Lakes Are Scored

Lake Area: 1415.2 acres

Basin Lake Area Ratio: 5

Max Depth: 10.1 meters

Mean Spring TP: 27.1 ug/L

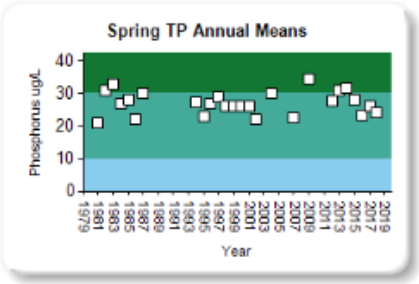
Mean Summer TP: 30.9 ug/L

Mean Summer Chla: 16.9 ug/L

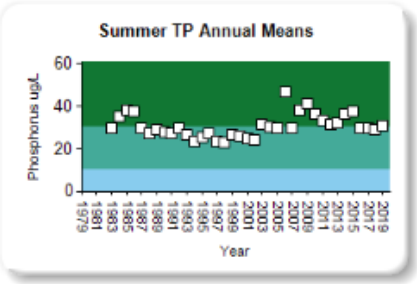
Mean Summer Secchi: 2.1 meters

Hypereutrophic
Eutrophic
Mesotrophic
Oligotrophic

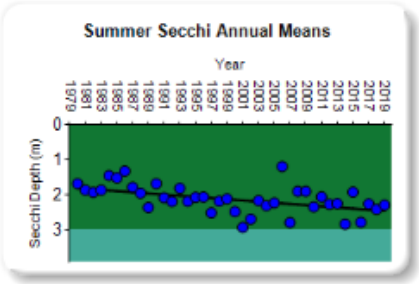
Spring TP Trend: p = 0.8943 | CV = 13
Stable



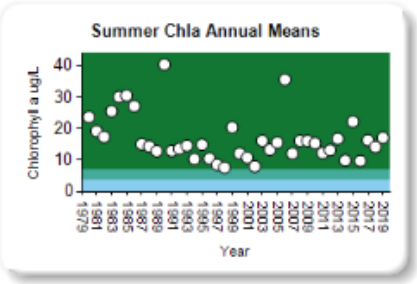
Summer TP Trend: p = 0.2775 | CV = 18
Stable



Summer Secchi Trend: p = 0.0004 | CV = 19
Highly significantly increasing



Summer Chla Trend: p = 0.1997 | CV = 45
Stable

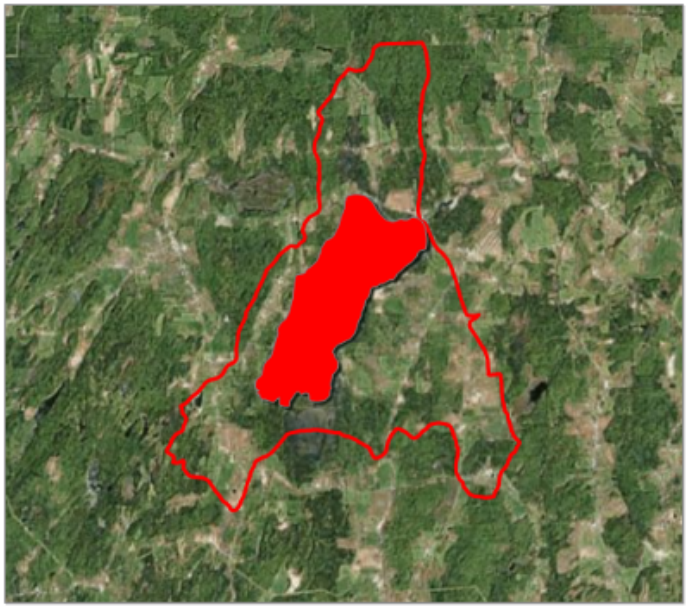


Stresses / Impairments
Stressed -- Escherichia coli
Stressed -- Flow alteration
Impaired -- Organic Enrichment - DO
Impaired -- Phosphorus

Trend Score: Good

WQ Standards Status: Impaired

Watershed Score: Highly Disturbed



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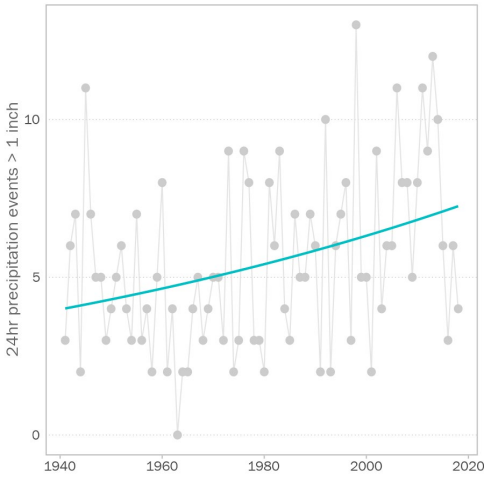
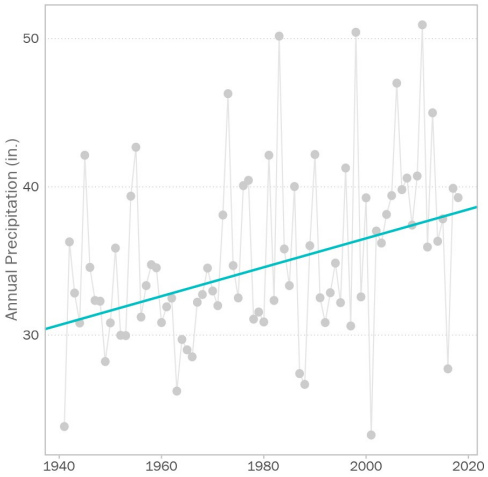
Factors Affecting Lake Carmi Water Quality

- Climate change
  - Increased temperatures favor cyanobacteria growth
  - Increased precipitation and frequency of storms leads to increased runoff and phosphorus loading from the watershed
- Land use change, such as the new development of impervious surfaces, can lead to increased runoff from the watershed
- Ecosystem response lag time





Source: NOAA BTV climate station

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Summary & Next Steps

- Most critical path projects from the 2018 Crisis Response Plan have been completed, are underway, or are being planned
- To observe consistent improvements in water quality in Lake Carmi, in-lake phosphorus remediation efforts must be complemented by continued interventions in the watershed.
- Climate and land use change may affect phosphorus loading and water quality.
- Carmi remains a priority for DEC, and as funding allows, the State will continue investing in and identifying new projects in Lake Carmi and its watershed to remediate this “Lake in Crisis.”
  - Specifically, in SFY21 we have an additional $50,000 from legislature, local organizations can continue to seek Clean Water Funding for specific projects, Basin Plan is key reference

Summary & Next Steps

- The state and partners will also continue outreach and educational efforts aimed at increasing community engagement and adoption of clean water practices.
    - Continued community engagement in clean water efforts is necessary to achieve Lake Carmi's clean water goals.
- Future *Lake Carmi Clean Water Progress Reports* will be concise annual updates since the previous state fiscal year.
- ***Once again, thanks to all who have supported this effort!***

Additional Information

- Restoring Lake Carmi webpage: https://dec.vermont.gov/watershed/restoring/carmi
- Vermont Clean Water Initiative reports and online tools: https://dec.vermont.gov/water-investment/cwi/projects
- Vermont clean water project tracking and accounting information: https://dec.vermont.gov/water-investment/cwi/projects/tracking-accounting
- Contact: Oliver Pierson, Lakes & Ponds Program Manager oliver.pierson@vermont.gov, 802-490-6198

Question & Answer Session

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