Framework for Monitoring Emerging Contaminants in the Lake Champlain Basin

Presentation to Vermont Citizens Advisory Committee

May 8, 2023

Lake Champlain Basin Program

Grand Isle VT and Virtual

Agenda

- Team introductions
- Program status
- Program overview
- Questions

Stone Team

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USGS

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Status of Program

The team was awarded two projects:

- 2023 - Framework for Monitoring Emerging Contaminants in the Lake Champlain Basin (*Contract pending*)
- 2024 - Framework for Monitoring Emerging Contaminants in the Lake Champlain Basin—Extended Monitoring (*Proposal accepted*)

Accessing funds from NOAA for the 2023 project has delayed the start of the program

The 2023 project delay and the successful proposal for 2024 funding allows us to take a “longer view” and better integrate the scopes of work

Once the 2023 funding is in place, we will convene the PAC and determine how best to utilize resources and plan field data collection

Rationale and Objectives

Contribute to LCBP's Opportunities for Action, Clean Water Goals, Objective I.B. Reduce Contaminants of Concern and Pathogens (LCPB, 2022) and LCBP's Toxic Substance Management Strategy (LCBP, 2012)

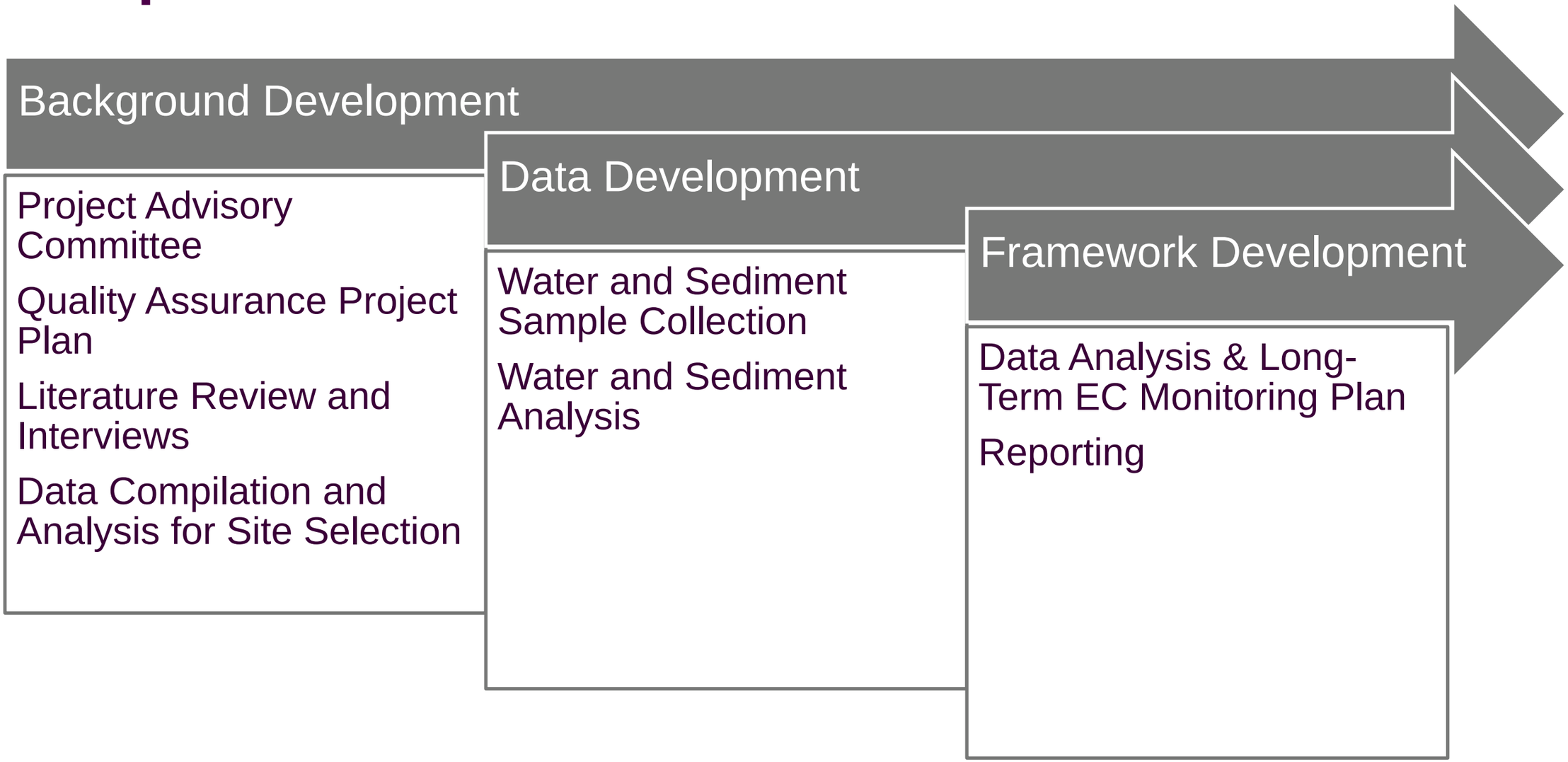
Build on research of contaminants potentially reaching aquatic environments in the Lake Champlain Basin (LCB)

Investigate types of sources and contributing land uses of emerging contaminants (EC)

Evaluate risk of ECs, referencing ecological and human health toxicological benchmarks, where established

Use results to inform an EC monitoring framework developed in consultation with State agencies, our Project Advisory Committee, and LCBP for the waters of the Lake Champlain Basin

Workplan 1 - Overview



Workplan 2 - Overview

Data Development

- Continue PAC Engagement
- Amend QAPP (as necessary)
- Additional Focused Water and Sediment Sample Collection
- Water and Sediment Sample Analysis

Framework Development

- Refine Data Analysis and Long-Term EC Monitoring Framework
- Reporting

Literature Review, Interviews, and Data Compilation

Compile database of EC concentration data from LCB studies

- Associated sampling information (collection site, collection date, sampling method, etc.)
- Provide human health and aquatic life benchmarks for reference

Assess information gained from interviews

- Roadmaps for addressing EC of concern
- On-going state agency monitoring

Analyze land use patterns and physical setting in watersheds

- Sewersheds draining to WWTPs, stormwater outfalls, urban and agricultural streams, and bays

Select monitoring sites at discharge locations and in receiving waters

Selection of Monitoring Locations

1. Our primary interest is in measuring concentrations of emerging organic pollutants from current sources.
2. Historic and/or inorganic pollutants are not included. For example, PCBs, dioxins and furans, arsenic, mercury, and lead will not be considered and known contaminated sites (such as the Pine Street Barge Canal, the Plattsburgh Air Force Base, and the many former coal gasification plants) will be avoided.
3. With input from LCBP and the PAC, select monitoring locations to maximize the likelihood of detecting ECs.

Site Type	Selection considerations	Analyses
WWTP effluent	• Service area: Village center, commercial strip, residential/subdivision, institutional, or urban • Treatment type: activated sludge and aerated lagoon systems likely priorities. At least one lagoon serving a village center should be included	HPCP, pharmaceuticals, PFAS, microplastics
CSOs	• Overflow event frequency: six LCB municipalities have one or more especially active CSOs. • Sampling feasibility • Geographic distribution, i.e., sample one active CSO in each community	
Stormwater outfall	• Land use: relatively homogeneous urban, commercial, or residential land use in their drainage areas • Extent: medium to large storm drains (~10-50 inlets) without dry weather flow	HPCP, pharmaceuticals, PFAS, microplastics, pesticides
Stream -- agricultural	• Intensity of agricultural use • Geographic distribution	
Stream -- urban	• Predominantly urban or suburban watersheds • Geographic distribution	
Lake --shallow bay	• Urban vs. agricultural watershed areas • Geographic distribution	

Sampling Plan—WWTPs and CSOs

Wastewater treatment plant

Candidate sites (select 4):

- Plattsburgh WRRF: Urban / activate sludge (extended)
- Burlington North WWTP: Residential / activated sludge
- Bartlett Bay WWTP: Commercial (strip) / activated sludge
- Pittsford WWTP: Village / activated sludge
- Hardwick WWTP: Village / aerated lagoon

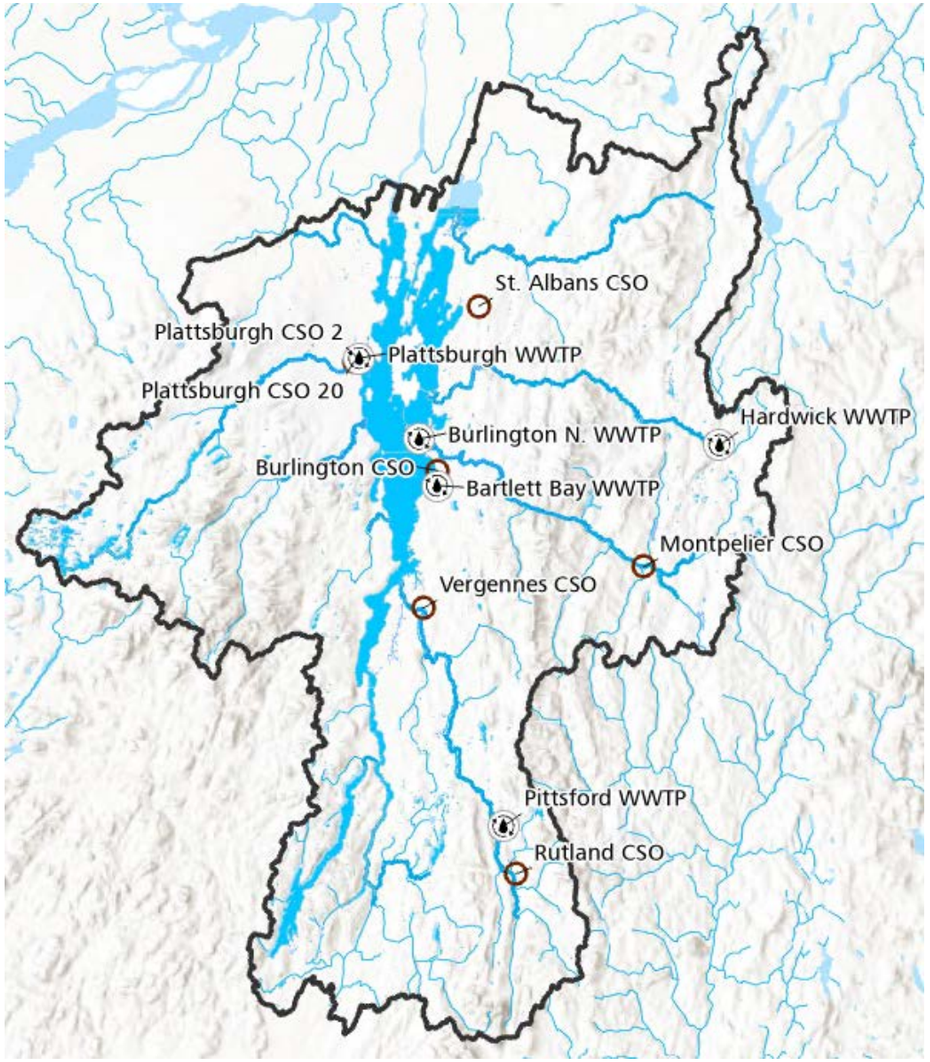
Events: 2 per site (discrete)
Sampling method: effluent grab sample
Total water samples: 9

Combined sewer overflows

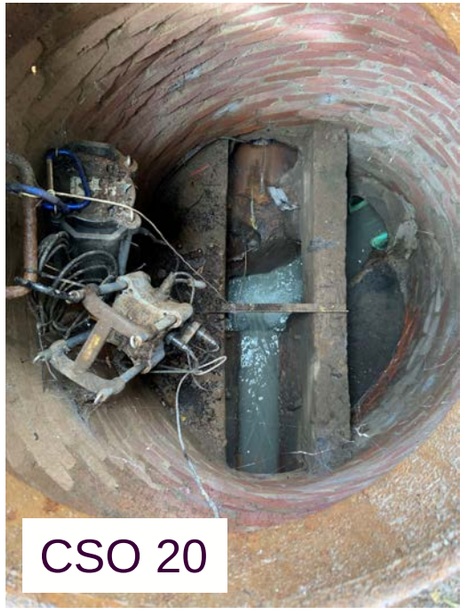
Candidate sites (select 4):

- Plattsburgh (#2 or #20)
- Burlington (Pine St.)
- Rutland (#1, #2, #3, or #5)
- Vergennes (#002)
- Montpelier (#1, #7, or #9)
- St. Albans (Lower Welden St.)

Events: 2 per site (discrete)
Sampling method: autosampler (enable by flow)
Total water samples: 8




CSO 2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Sampling Plan—Stormwater and Streams

Agricultural Streams

Candidate streams (select 3-4 per regions)

Rock River, Jewett Brook, Little Otter Creek. Hospital Creek, Lemon Fair River, Dead Creek, South Slang Creek

Events: 2 events (2023 low flow, 2024 spring storm)

Sampling method: grab sample composite by region

Total samples: 18 water, 9 sediment

Urban Streams

Candidate streams (select 3-4 per regions)

Englesby Brook (Burlington), Potash Brook (S. Burlington), Stevens Brook (St. Albans), Morehouse Brook (Winooski), Moon Brook (Rutland), Mussey Brook (Rutland), East Creek (Rutland), Smith Creek (Colchester)

Events: 2 events (2023 low flow, 2024 spring storm)

Sampling method: grab sample composite by region

Total samples: 18 water, 9 sediment

Stormwater Outfalls

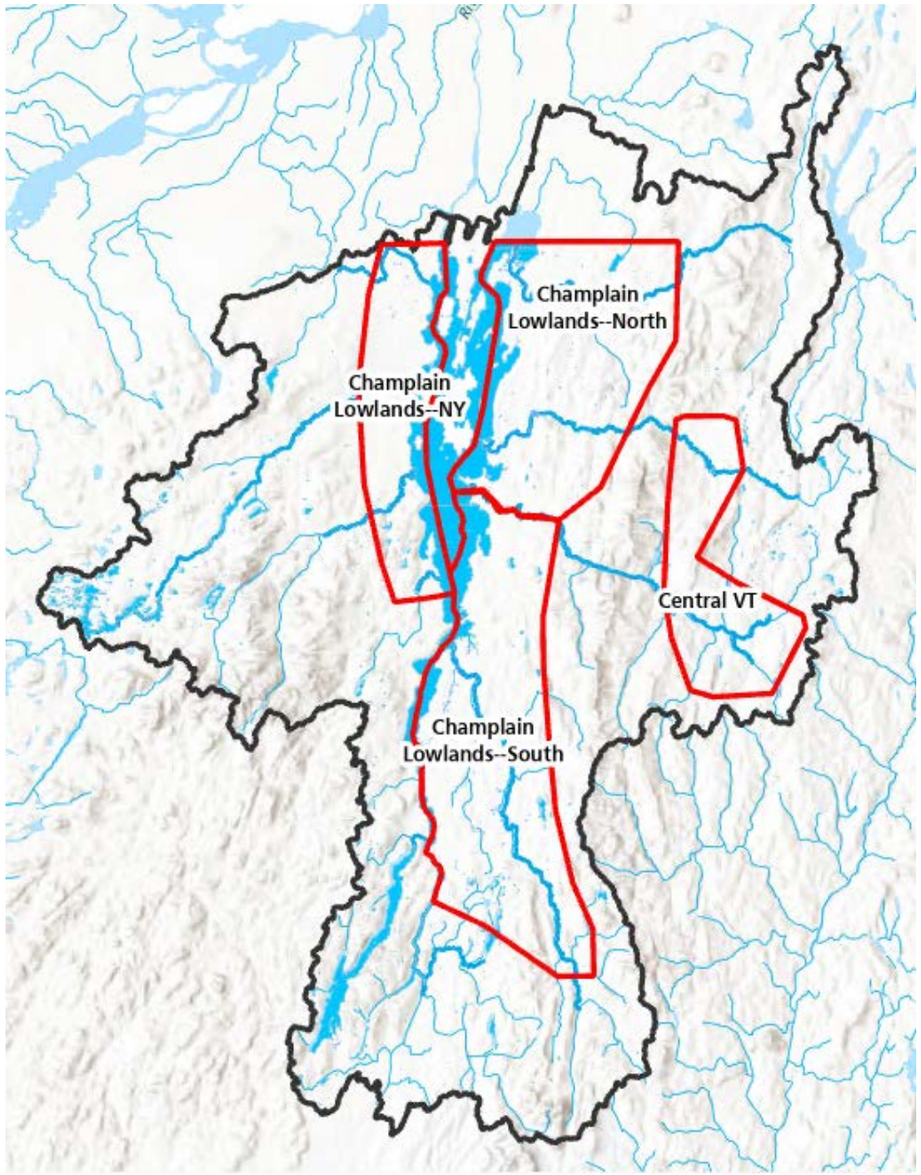
Candidate stormdrains: (select 3-4 per regions)

>2000 in LCB

Events: 2 events (2023 & 2024 storms)

Sampling method: grab sample composite by region

Total samples: 18 water, 0 sediment



Sampling Plan—Shallow Bays

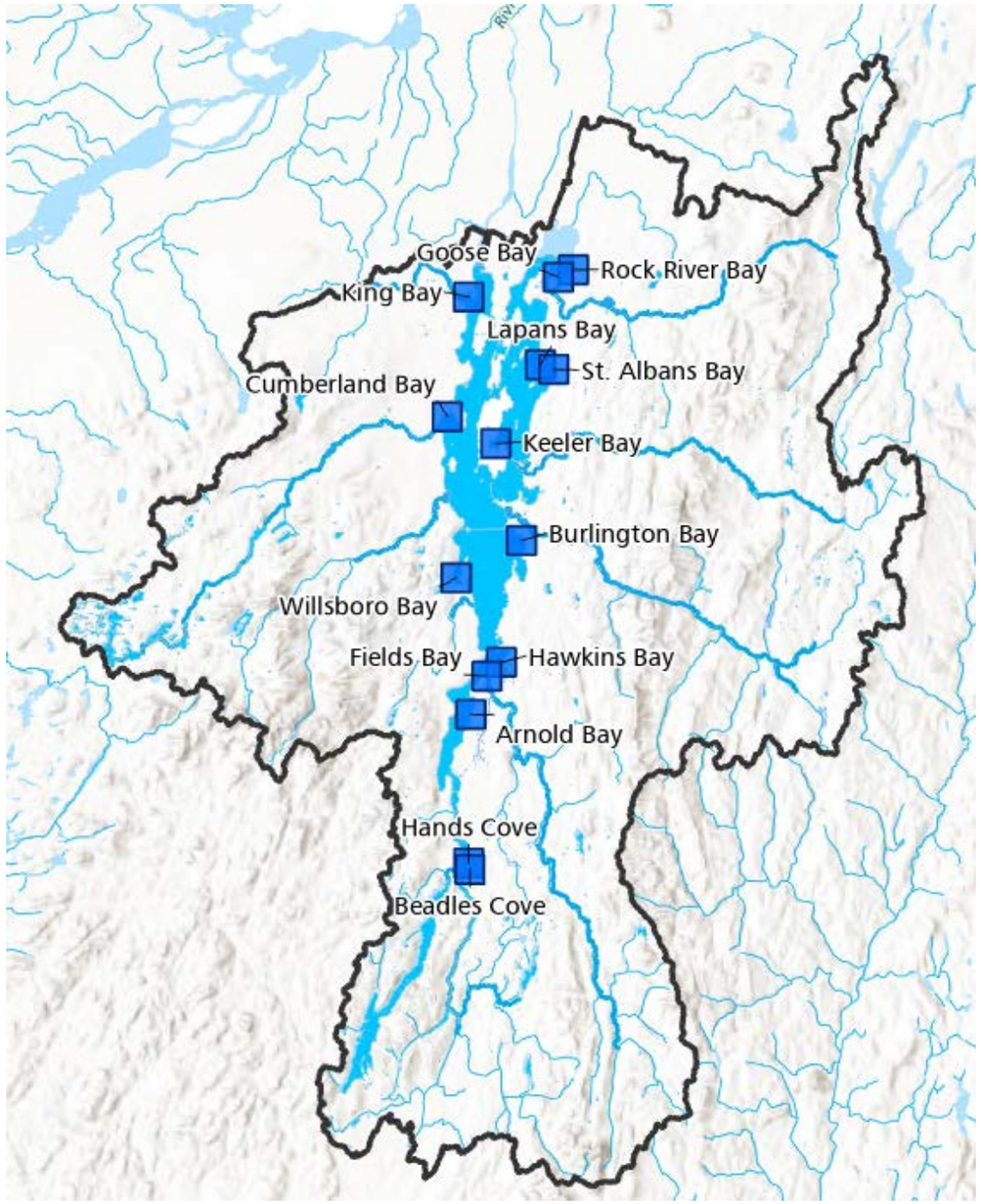
Candidate bays (select 4)

- Rock River Bay (of Mis. Bay)
- Goose Bay (of Mis. Bay)
- Lapans Bay
- St. Albans Bay
- Keeler Bay
- King Bay (NY)
- Burlington Bay
- Cumberland Bay (NY)
- Willsboro Bay (NY)
- Hawkins Bay
- Arnold Bay
- Fields Bay
- Hands Cove
- Beadles Cove

Events: 1 event (summer 2024)

Sampling method: spatial composite in bay

Total samples: 5 water, 5 sediment



Water and Sediment Analysis

Analytical Plan – Screening Methods

- Pesticides – USGS Method LCM57 Glyphosate and AMPA; LC/MS/MS for Neonicotinoids and other pesticides – 348 analytes
- Pharmaceuticals – USGS Method LCM56 GC/MS – 154 analytes
- HPCP – USGS Wastewater Method GCM37 LC/MS/MS – 219 analytes
- Plastics – ASTM Method D8332-20 – IR spectroscopy (UVM)
- PFAS – USEPA Method 537.1 (modified) LC/MS/MS – 24 analytes (contract lab)

EC Class and Example Chemicals
Pesticides: Neonicotinoids: acetamiprid, clothianidin, dinotefuran, imidacloprid, thiacloprid, thiamethoxam, and major metabolites; Herbicides: glyphosate, atrazine, metolachlor, acetochlor, and major metabolites
Pharmaceuticals: Examples include, caffeine, acetaminophen, nicotine, codeine, carbamazepine
Home and Personal Care Products : Examples include triclocarban, 4-nonylphenol, triclosan, and galaxolide; and plasticizers (phthalates, bisphenol A), tris(2-butoxyethyl) phosphate (TBEP), TCPP, NP2EO
Microplastics: size, shape, composition
PFAS: 24 per- and poly-fluoroalkyl compounds

Analytical Cost - Water	Unit Cost
USGS - Herbicides	$500
USGS - Insecticides	$540
USGS - Pharmaceuticals	$717
USGS - Waste Water Schedule	$881
UVM - Plastics	$650
Contract Lab - PFAS	$250
Total	$3,538

Analytical Cost - Sediment	Unit Cost
USGS - Waste Water Schedule	$1,100
UVM - Plastics	$650
Total	$1,750

Long-Term Emerging Contaminants Monitoring Plan

The plan will:

- Provide direction to resource agencies in Vermont and New York concerning ways to structure and coordinate monitoring activities related to emerging contaminants to derive the greatest value
- Specify analytes, monitoring locations, and sampling timeframes
- Estimate level of effort and analytical costs to implement each component of the plan
- Provide an improved understanding of the occurrence and concentrations of emerging contaminants in LCB surface water and sediment

Questions