


Vermont Wetland Program
Bioassessment Project:
Developing an Understanding
of Lake- and Stream-
Associated Wetlands

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Overview

- Purpose & Objectives
 - Site Selection & Sampling Methods
 - Sample Processing
 - Water Chemistry & Site Examples
 - Site Conclusions
 - Project Future
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Wetland Bioassessment Project

- Established in 2005 with the expectation to continue for several years
- Project aims to build a wetland bioassessment and biocriteria system to identify wetland biological integrity
- Sampling lake- and stream-associate wetlands
 - Methods partially derived from EPA “Methods for Evaluating Wetland Condition” modules and current VTDEC stream and lake sampling procedures

Project Purposes

➤ Plan

- Better understand wetland chemical, physical, and biological integrity for planning purposes
- Scientifically measure, detect, and predict impacts from human disturbance for permitting purposes

➤ Monitor

- Improve the wetland portion of the Vermont Water Quality Monitoring Program Strategy (2005)
- Increase awareness of the status and trends of Vermont wetlands

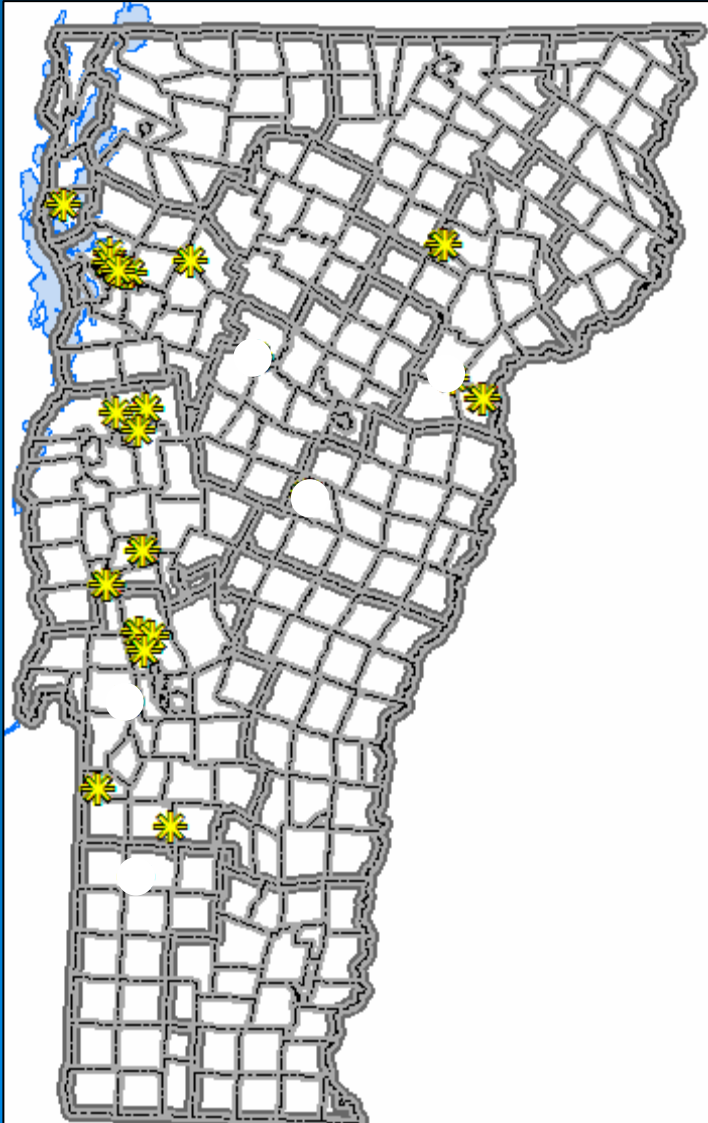
➤ Protect

- Refine protection of our wetlands with a better understanding of their biological condition
- Evaluate the success of wetland creation and restoration projects

Objectives

- Create a foundation of data on the chemical and physical condition of Vermont's riparian wetlands
- Use wetland data to identify biological integrity and assess overall wetland health
- Apply bioassessment results to construct scientifically-based wetland classification

Site Selection



- Site quality ranges from reference to degraded
- Eleven stream-associated and six lake-associated sites were chosen using the ANR GIS database, orthophotos, and color infrared aerial photos

Macroinvertebrate Sampling

- Macroinvertebrates collected using a standard kick net with 500 μ mesh
- Each sample consisted of 4 sweeps (lakes) or kicks (streams)
- Samples preserved in 70% ethanol



Vegetation Sampling

- Vegetation sampled using 1 m³ plots along a transect perpendicular to wetland border
- Number of plots based upon wetland size and complexity



Additional Sampling

- Chemistry
 - Field and laboratory samples collected
 - pH, conductivity, DO, and water temperature collected in field using Hydrolab Surveyor 4A
 - Grab and filtered samples collected for laboratory samples and analyzed by the VTDEC R.A. LaRosa Laboratory
- Disturbance severity, landscape quality, and level of human disturbance subjectively determined
- GPS, Digital photos

Sample Processing

A scientist in a white lab coat is working at a lab bench. They are looking into a petri dish under a microscope. The bench is cluttered with various lab equipment, including a blue thermos, a petri dish, and a tray of samples. In the background, another person is visible, and there are more lab supplies on the bench.

➤ Macroinvertebrate Samples

- Sample picked to at least 300 bugs
- Sample sorted to order for taxonomic identification

➤ Water Chemistry

- Submitted to R.A. LaRosa Laboratory and processed within accepted time period

➤ Vegetation

- Herbarium specimens tagged, pressed, and mounted following site visit

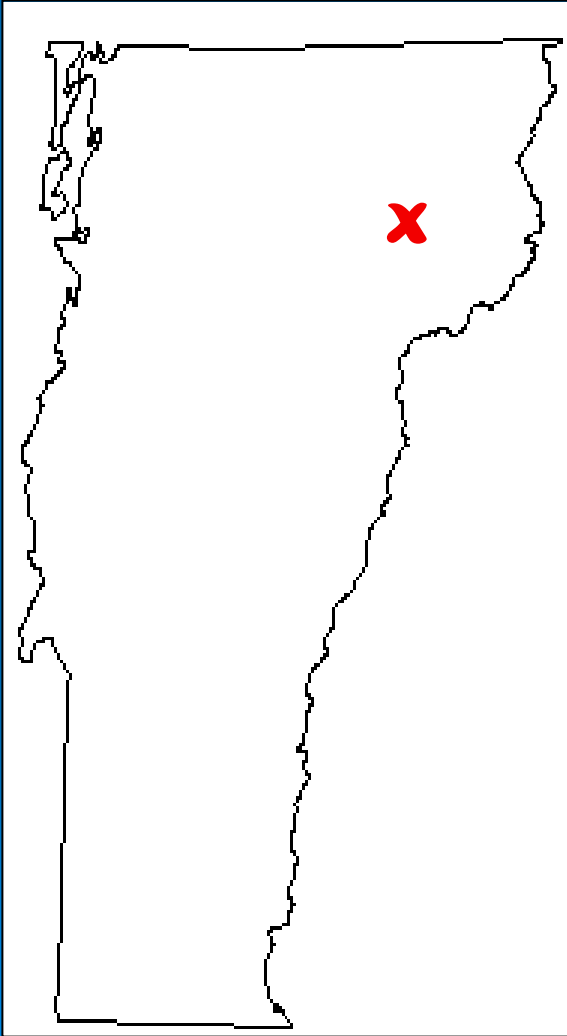
Project Status

- Sampling Parameters
 - Water chemistry results analyzed
 - Macroinvertebrates picked, sorted, and to be shipped to contractor for taxonomic identification
 - Vegetation pressed and mounted for herbarium preservation
- Site, water chemistry, and vegetation data entry completed

Nutrient Ranges

	Phosphorus ($\mu\text{gP}\cdot\text{L}^{-1}$)			Nitrogen ($\mu\text{gN}\cdot\text{L}^{-1}$)		Conductivity ($\mu\text{mhos}\cdot\text{L}^{-1}$)	
	Total	Dissolved	Site	Total	Site		Site
Low	9.22	5.65	Flagg Pond	0.15	Bresee Mill Brook	60.8	Pond North of Lake Dunmore
High	161	123	Pleasant Brook	0.96	Pleasant Brook	542	Sunderland Brook
Lake Average	9.3	19.5		0.49		117.5	
Stream Average	47.7	30.3		0.45		297.8	
Overall Average	38.9	22.9		0.46		243.1	

Flagg Pond

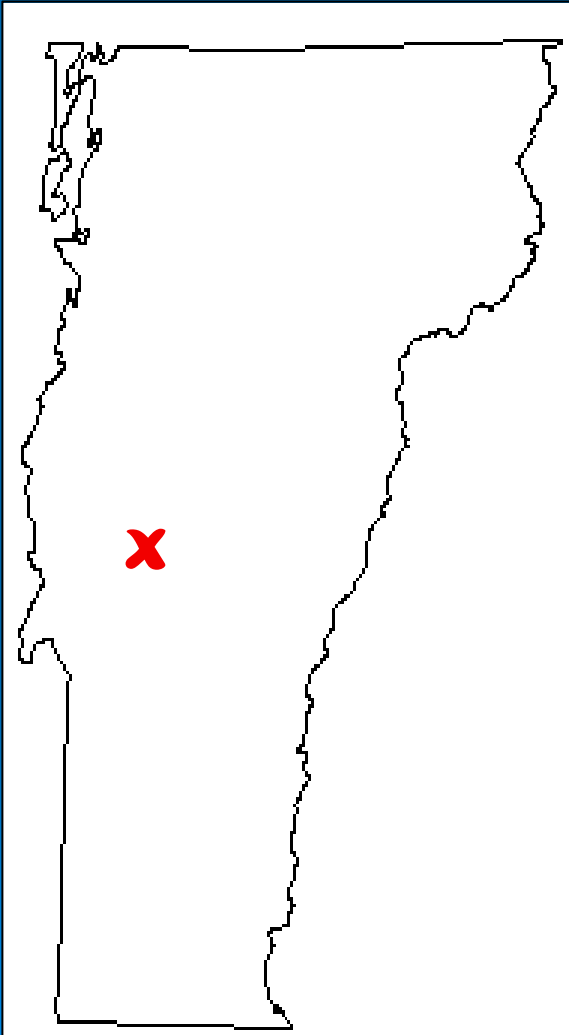


- Disturbance severity: minimal
- Current condition: very good
- Surrounding landscape undisturbed; some logging nearby

Flagg Pond

- Chemistry
 - Total P: $9.22 \mu\text{gP}\cdot\text{L}^{-1}$
 - Dissolved P: $5.65 \mu\text{gP}\cdot\text{L}^{-1}$
 - Total N: $0.35 \mu\text{gN}\cdot\text{L}^{-1}$
 - Conductivity: $73.2 \mu\text{mhos}\cdot\text{L}^{-1}$
 - pH: 8.94
- Vegetation
 - 29 species identified in 10 plots along the transect
 - Sedges, grasses, and sphagnum moss
- *Macroinvertebrates*

Pond North of Lake Dunmore

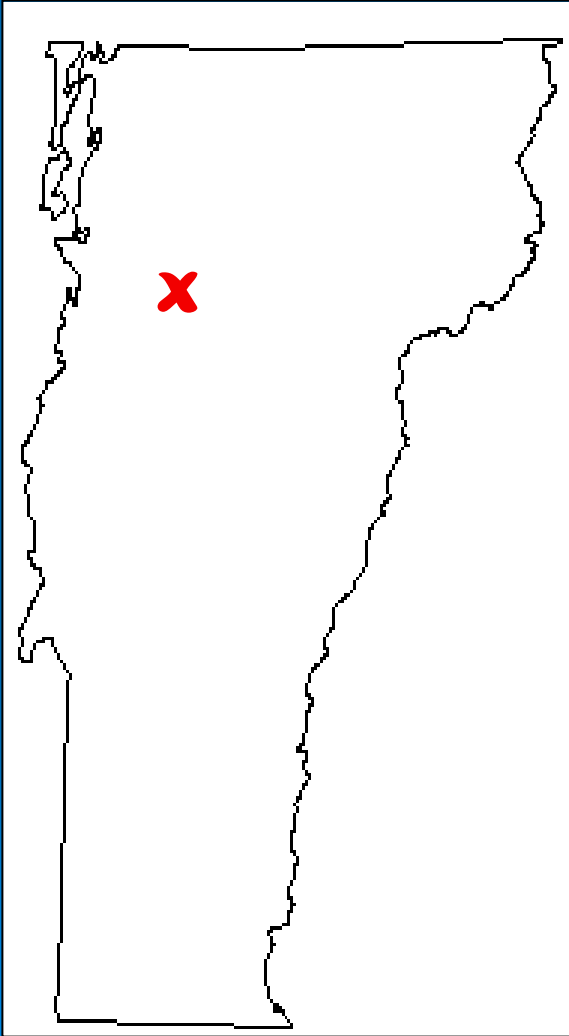


- Disturbance severity high
- Current condition moderate
- Landscape primarily surrounded by forest; some agriculture

Pond North of Lake Dunmore

- **Chemistry**
 - Total P: N/A
 - Dissolved P: $13.8 \mu\text{gP}\cdot\text{L}^{-1}$
 - Total N: $0.35 \mu\text{gN}\cdot\text{L}^{-1}$
 - Conductivity: $60.8 \mu\text{mhos}\cdot\text{L}^{-1}$
 - pH: 6.42
- **Vegetation**
 - 30 species identified in 8 plots along the transect
 - Rushes, sphagnum moss, woolgrass, ferns
- ***Macroinvertebrates***

Hogback Meadow Brook

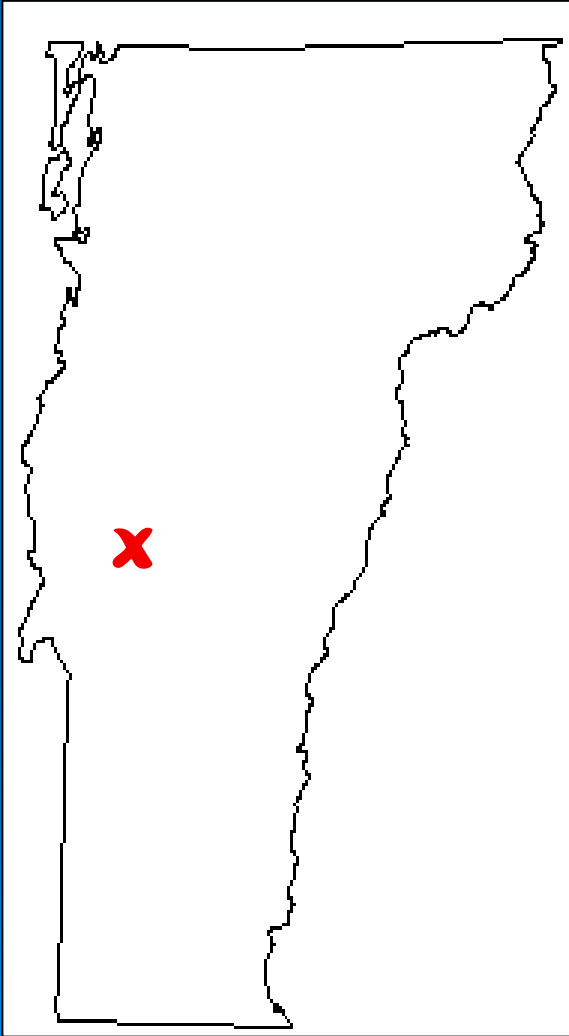


- Disturbance severity minimal
- Current condition good
- Landscape surrounded by forest and agriculture

Hogback Meadow Brook

- Chemistry
 - Total P: $12.9 \mu\text{gP}\cdot\text{L}^{-1}$
 - Dissolved P: $10.5 \mu\text{gP}\cdot\text{L}^{-1}$
 - Total N: $0.24 \mu\text{gN}\cdot\text{L}^{-1}$
 - Conductivity: $92.3 \mu\text{mhos}\cdot\text{L}^{-1}$
 - pH: 6.98
- Vegetation
 - 30 species identified in 9 plots along the transect
 - Lake sedge, sensitive fern, jewelweed
- *Macroinvertebrates*

Bresee Mill Brook



- Disturbance severity moderate
- Current condition moderate
- Landscape surrounded by agriculture

Bresee Mill Brook

- **Chemistry**
 - Total P: $10.9 \mu\text{gP}\cdot\text{L}^{-1}$
 - Dissolved P: $8.52 \mu\text{gP}\cdot\text{L}^{-1}$
 - Total N: $0.15 \mu\text{gN}\cdot\text{L}^{-1}$
 - Conductivity: $241 \mu\text{mhos}\cdot\text{L}^{-1}$
 - pH: 7.53
- **Vegetation**
 - 17 species identified in 9 plots along the transect
 - Nearly 75% reed canary grass and lake sedge
- ***Macroinvertebrates***

Site Conclusions

➤ Water Chemistry

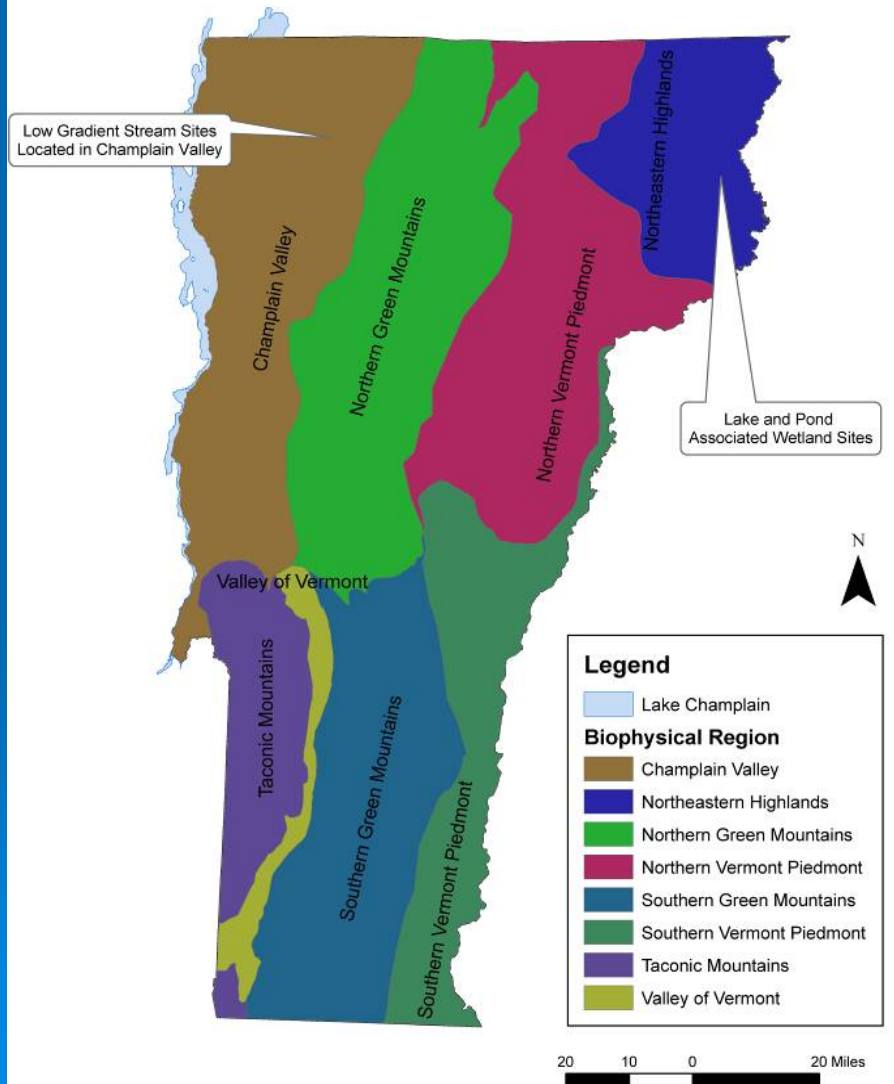
- Lower average conductivity, phosphorus levels in lake-associated wetlands
- Greater average nitrogen levels in stream-associated wetlands

➤ Vegetation

- Vegetative species richness not directly linked to disturbance severity
- Degraded sites with poorer water quality correlated with less species diversity

Project Future

Regions Targeted for Assessment



- Immediate
 - Data analysis and report production
- Long-term
 - Yearly monitoring of Vermont wetlands to link biological condition with Wetland Rules and Water Quality Standards

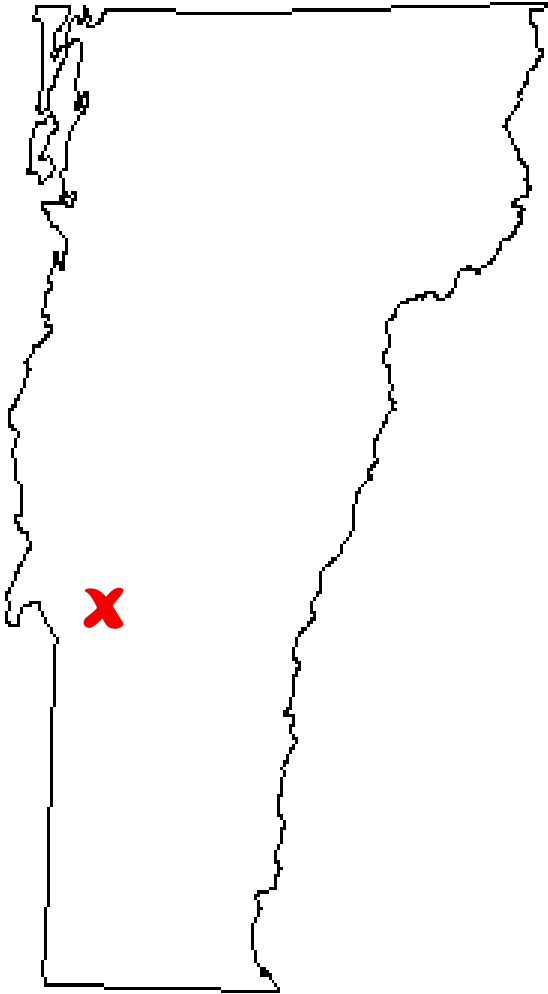
Acknowledgements

- USEPA
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 - Alan Quackenbush, Jim Kellogg, Lindsay Harris, Amy Norris, Rachel Sargent
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Questions?



Pleasant Brook



- Disturbance severity minimal
- Current condition moderate
- Landscape primarily undisturbed with some agriculture

Pleasant Brook



- Chemistry

- Total P: $161 \mu\text{gP}\cdot\text{L}^{-1}$
- Dissolved P: $123 \mu\text{gP}\cdot\text{L}^{-1}$
- Total N: $0.96 \mu\text{gN}\cdot\text{L}^{-1}$
- Conductivity: $344 \mu\text{mhos}\cdot\text{L}^{-1}$
- pH: 7.64

- Vegetation

- 17 species identified in 10 plots along the transect
- 60% broadleaf cattail, broadleaf arrowhead

- *Macroinvertebrates*

Pleasant Brook

- Disturbance severity minimal
- Current condition moderate
- Surrounding landscape undisturbed with some agriculture



Castleton River

- Disturbance severity high
- Current condition poor
- Landscape surrounded by forest and agriculture