Conference Agenda

Last Updated: January 23, 2026

2026 Lake Champlain Research Conference

January 26-27, 2026

University of Vermont – Dudley H. Davis Center

590 Main St, Burlington, VT 05401

https://www.uvm.edu/seagrant/programs/events/lake-champlain-research-conference

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Thank you to our Conference Sponsors!

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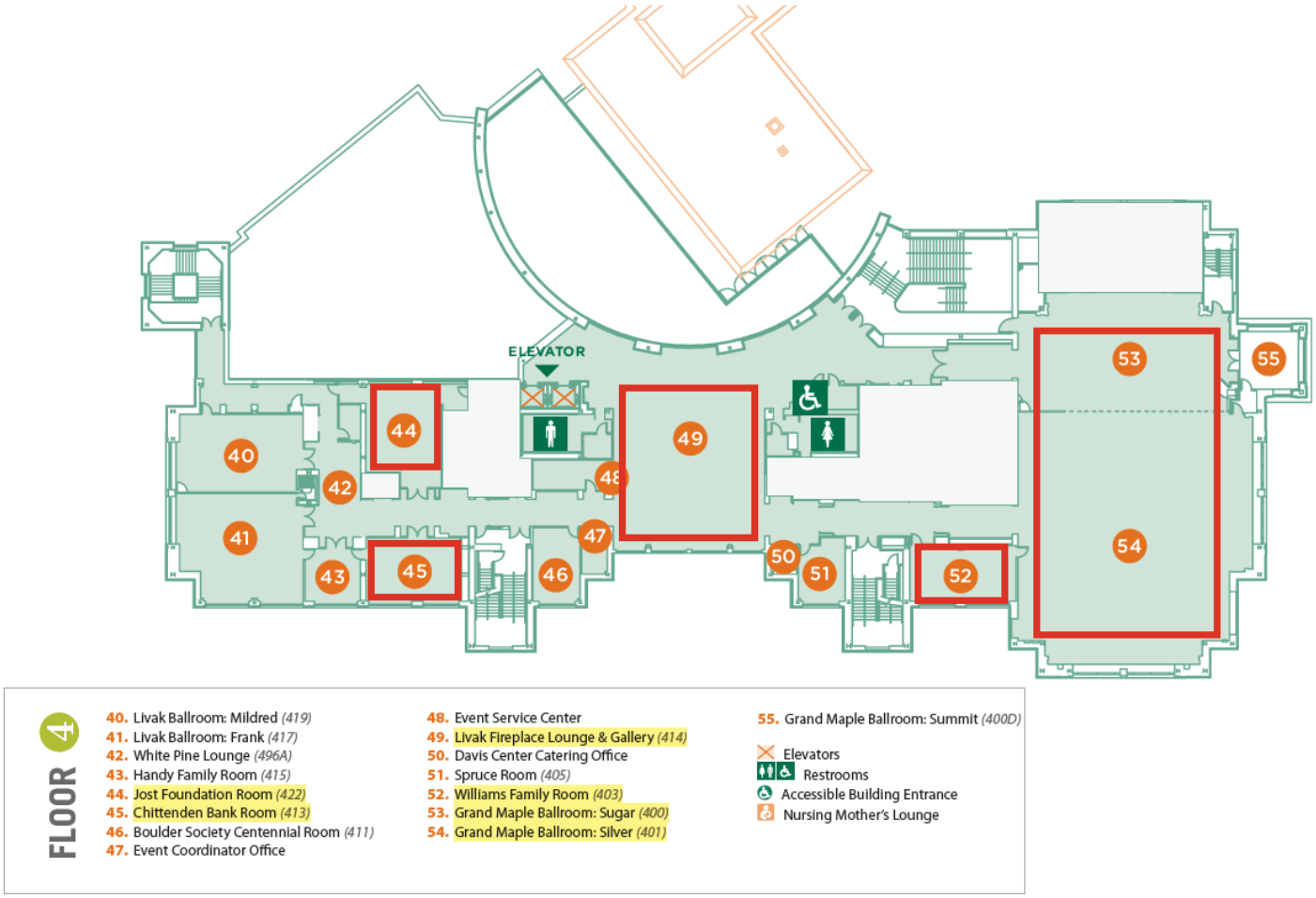

Conference event rooms are highlighted

Virtual Attendance Links

- Monday, January 26th, 2026
  - Jost Foundation Room (Tracks 1B, 2B and 3B)
  - Chittenden Bank Room (Tracks 1C, 2C, and 3C)
  - Williams Family Room (Tracks 1D, 2D and 3D)
- Tuesday, January 27th, 2026
  - Jost Foundation Room (Tracks 4B, 5B, and 6B)
  - Chittenden Bank Room (Tracks 4C, 5C, and 6C)
  - Williams Family Room (Tracks 4D, 5D, and 6D)

Agenda at a Glance

Day 1: Monday 1/26/2026

8:00am – 4pm: **Registration** ***Livak Fireplace Lounge***

8:00am – 8:45am: **Breakfast Buffet** ***Grand Maple Ballroom***

9:00am – 10:30am: **Welcoming Remarks & Keynote Address** ***Grand Maple Ballroom***

Welcoming Remarks

***Keynote Address:* Why History Matters: The Baroness and the Ranger in the Northern Campaign of 1777**– Dr. John Krueger

10:30am – 11:00am: **Break & Networking**

11:00am – 12:15pm: **Concurrent Session #1**

Track 1A	Track 1B	Track 1C	Track 1D
Nutrients *Grand Maple Ballroom*	**Fish, Fisheries, and Ecosystem Changes** *Jost Foundation Room*	**Meteorological Monitoring** *Chittenden Bank Room*	**History and Cultural Heritage** *Williams Family Room*

12:15pm – 1:15pm: **Lunch Buffet** ***Grand Maple Ballroom***

1:15pm – 2:30pm: **Concurrent Session #2**

Track 2A	Track 2B	Track 2C	Track 2D
Winter Nutrient Dynamics *Grand Maple Ballroom*	**Assessment and Monitoring for AIS** *Jost Foundation Room*	**Wetlands** *Chittenden Bank Room*	**Community Engagement Pt 1** *Williams Family Room*

2:30pm-2:45pm: **Break & Networking**

2:45pm – 4:00pm: **Concurrent Session #3**

Track 3A	Track 3B	Track 3C	Track 3D
Impacts of De-icing Salt *Grand Maple Ballroom*	**AIS: Round Goby** *Jost Foundation Room*	**Developed Lands** *Chittenden Bank Room*	**Community Engagement Pt 2** *Williams Family Room*

4:00pm – 5:00pm: **Poster Session 1 & Conference Reception** ***Livak Fireplace Lounge***

5pm – 6:30pm: **Film Screening** ***Grand Maple Ballroom***

- ***The Fish Thief: A Great Lakes Mystery Documentary***

6:30pm – 8:30pm: **Social and Networking Event** ***Burlington Beer Company***

Day 2: Tuesday 1/27/2026

8:00am – 1pm: **Registration** ***Livak Fireplace Lounge***

8:30 – 9:30am: **Breakfast Buffet** ***Grand Maple Ballroom***

9:00am – 10:30am: **Welcoming Remarks & Keynote Address** ***Grand Maple Ballroom***

- ***Welcoming Remarks***
- ***Keynote Address:*** **Water and the Machine: Preserving Water and People in the Age of A.I. -** Cynthia Barnett, Senior Lecturer and Director of Climate and Environment Reporting Initiatives – University of Florida

10:30am – 11:00am: **Break & Networking**

11:00am – 12:15pm: **Concurrent Session #4**

Track 4A	Track 4B	Track 4C	Track 4D
Technologies and Forecasting	**AIS: Monitoring and Data**	**Agriculture Pt 1**	**Flood Resilience**
Grand Maple Ballroom	*Jost Foundation Room*	*Chittenden Bank Room*	*Williams Family Room*

12:15pm – 1:15pm: **Lunch Buffet** ***Grand Maple Ballroom***

1:15pm – 2:30pm: **Concurrent Session #5**

Track 5A	Track 5B	Track 5C	Track 5D
Contaminants of Emerging Concern	**Lakes, Ponds, and Shorelines**	**Agriculture Pt 2**	**Panel: Mutual Aid for Flood Resilience**
Grand Maple Ballroom	*Jost Foundation Room*	*Chittenden Bank Room*	*Williams Family Room*

2:30pm-2:45pm: **Break & Networking**

2:45pm – 4:00pm: **Concurrent Session #6**

Track 6A	Track 6B	Track 6C	Track 6D
Lake and Watershed Ecology	**Streams, Rivers, and Floodplains**	**CIROH**	**Panel: Lake Champlain *"Unfiltered"***
Grand Maple Ballroom	*Jost Foundation Room*	*Chittenden Bank Room*	*Williams Family Room*

4:00pm – 5:00pm: **Poster Session 2 & Conference Reception** ***Livak Fireplace Lounge***

Agenda in Full

Day 1: Monday 1/26/2026

8:00am – 4pm: **Registration** ***Livak Fireplace Lounge***

9:00am – 10:30am: **Welcoming Remarks & Keynote Address** ***Grand Maple Ballroom***

Welcoming Remarks

- *Julie Moore, Secretary, Vermont Agency of Natural Resources*
- *James Paradissis, Office of Senator Bernie Sanders*
- *Rebecca Ellis, Office of Senator Peter Welch*
- *Ahren von Schnell, Office of Congresswoman Elise Stefanik*
- *Video greeting, Congresswoman Becca Balint*
- *Gregory McClinchey, Director, Policy and Legislative Affairs, Great Lakes Fishery Commission*

Keynote Address: **Why History Matters: The Baroness and the Ranger in the Northern Campaign of 1777** – Dr. John Krueger

10:30am – 11:00am: **Break & Networking**

11:00am – 12:15pm: **Concurrent Session #1**

Track 1A: Nutrients ***Grand Maple Ballroom***

Moderator: Peter Isles

- Phosphorus conditions and trends for Missisquoi Bay and its watershed
  - *Dr. Matthew C.H. Vaughan, Lake Champlain Basin Program/NEIWPCC. Additional Author: Dr. Peter Isles*
- Development of a Comprehensive Binational Phosphorus Mass Balance Analysis Toolkit for the Missisquoi Bay Watershed
  - *Michael Winchell, Stone Environmental, Inc. Additional Authors: Aubert Michaud, Andrew Schroth, Eric Roy, Bernard Conrad, Joshua Faulkner, Patrick Clemins.*
- Loads of Confusion: Why the nutrient load paradigm can get in the way of understanding lake-watershed connections
  - *Dr. Peter Isles. Additional Author: Dr. Matthew C.H. Vaughan*

Track 1B: Fish, Fisheries, and Ecosystem Change — *Jost Foundation Room*

Moderator: Ellen Martinsen

- Sex-specific Atlantic salmon upstream passage and fallback at a natural cascade after dam removal
  - *Kurt Heim, US Fish and Wildlife Service. Additional Authors: Jonah Withers, William Arden, Laurie Earley, David Minkhoff, Theodore Castro-Santos*
- Lightning Talk: Experimental net pen rearing of Atlantic salmon in the Saranac River
  - *Nicole Balk, New York State Department of Environmental Conservation. Additional Author: Kurt Heim*
- Lightning Talk: Post-stocking movements and survival of Atlantic Salmon in Lake Champlain: Acoustic telemetry insights from hatchery smolts and lake age-0 salmon
  - *Graham Montague, University of Vermont. Additional Authors: Laurie Earley, Kurt Heim, Paige Blaker, Kevin Kelsey, Bernie Pientka, Margaret Murphy, Mark Henderson*
- Examining the Ecological Impacts of Atlantic Salmon Fry Stocking in Headwater Tributaries of Lake Champlain
  - *Taher Fletcher, US Fish and Wildlife Service. Additional Authors: Heim, K. C., Ross, B. D., Balk, N. M., Earley, L. A.*
- Predation Risk for a Migrating Macroinvertebrate in Benthic and Pelagic Habitats
  - *Eden Forbes, Rubenstein Ecosystem Science Laboratory, University of Vermont. Additional Author: Dr. Jason Stockwell*
- Investigation into the diversity, distribution and prevalence of emerging Heterosporis parasites in Lake Champlain yellow perch (*Perca flavescens*)
  - *Dr. Ellen Martinsen, University of Vermont*

Track 1C: Advanced Meteorological Monitoring in the Lake Champlain Basin — *Chittenden Bank Room*

Moderator: Alison Spasyk

- Vermont Mesonet - A Statewide, Meteorological Monitoring Network
  - *Samantha Koehler, University of Vermont Water Resources Institute. Additional Author: Joshua Benes*
- Monitoring Mountain Meteorology and Snow Across Elevational Gradients in the Northeast Appalachians and Adirondacks
  - *Joshua Benes, University of Vermont. Additional Authors: See abstract for full list.*
- 50 years of Environmental Monitoring at Whiteface Mountain
  - *Scott McKim, University at Albany, Whiteface Mountain Observatory*

Track 1D: History and Cultural Heritage — *Williams Family Room*

Moderator: Angie Grove

- Local Untold Stories for the 250th
  - *Angie Grove, Ethan Allen Homestead Museum. Additional Authors: Glenn Fay, Daniel Cole, Zachary Bennett, Andrew Chesnut, Maddie Baum, Rich Rushlow, Carol Harris-Shapiro*
- Underwater Archaeology of the American Revolution on Lake Champlain
  - *Christopher Sabick, Lake Champlain Maritime Museum.*
- Underwater Cultural Resource Management: Preservation Practices and Marine Energy Infrastructure Development
  - *Paul Willard Gates, Lake Champlain Maritime Museum*

12:15pm – 1:15pm: **Lunch Buffet** — ***Grand Maple Ballroom***

1:15pm – 2:30pm: **Concurrent Session #2**

Track 2A: Winter Nutrient Dynamics *Grand Maple Ballroom*

Moderator: Sonya Vogel

- Winter's influence on seasonal nutrient cycling in agricultural and forested sites
  - *Madeline Winer, University of Vermont. Additional Authors: Carol Adair, Andrew Schroth, Max Landsman-Gerjoi, Megan Duffy*
- A comparative analysis of nutrient export dynamics during winter high flow events in characteristic watersheds of the Lake Champlain Basin
  - *Sonva Vogel, Lake Champlain Basin Program/NEIWPCC. Additional Authors: Megan Duffy, Andrew Schroth, E. Carol Adair, Meghan Taylor*
- Event-level end member mixing analysis reveals divergent patterns of soil-stream connectivity during mid-winter runoff events between three catchments in the Lake Champlain Basin
  - *Megan Duffy, University of Vermont. Additional Authors: Sonya Vogel, Andrew Schroth, E. Carol Adair*
- Winter nutrient and suspended solid transport in the LaPlatte River
  - *Clayton J. Williams, Saint Michael's College. Additional Authors: Alexi Roux, Jarret Muzzy, Zoe Devine*

Track 2B: Assessment and Monitoring for AIS Impacts *Jost Foundation Room*

Moderator: Meg Modley

- Hydroacoustic assessment of pelagic forage fishes in Lake Champlain during and after alewife invasion
  - *Amelia McReynolds, University of Vermont. Additional Authors: Bernie Pientka, Lars Rudstam, Ellen Marsden, Jason Stockwell*
- Forecasting Aquatic Invasions in the Lake Champlain Basin: Integrating eDNA with Spatial Risk Models for Early Detection and Management
  - *Richard Ross Shaker, SUNY College of Environmental Science and Forestry*
- AIS Early Detection Monitoring - Annual Environmental DNA (eDNA) Monitoring in Lake Champlain and its Gateways
  - *Laurie Earley, US Fish and Wildlife Service. Additional Authors: Steve Smith, Dylan Jennison, Aaron Maloy*

Track 2C: Wetlands *Chittenden Bank Room*

Moderator: Erin Vennie-Vollrath

- Field-based estimates of net phosphorus balance in restored, riparian wetlands on former agricultural land
  - *Tiffany Chin, University of Vermont. Additional Authors: Rebecca Diehl, Kristen Underwood, Xia Gillespie, Laura O'Brien, Eric Roy*
- Relative contributions of different size flood events to modeled net phosphorus balance on restored, riparian wetlands
  - *Eric Roy, University of Vermont. Additional Authors: Tiffany Chin, Rebecca Diehl, Kristen Underwood, Adrian Wiegman, Harrison Myers, Julianne Scamardo, Xia Gillespie, Laura O'Brien*

Track 2D: Community Engagement – Part 1 *Williams Family Room*

Moderator: Aude Lochet

- Late Night for the Planet! The power of comedy and entertainment in community engagement around Lake Champlain
  - *Curt Gervich, SUNY Plattsburgh Center for Earth and Environmental Science. Additional Authors: Kaiser Beckford, Alexandra Baker, Lillian Gilroy, Taygin Jump, Eli Lincoln-Robbins, Dean Parmelee, Madelynne Solan*
- Wool and Water: Communicating Science through the Arts
  - *Michale Glennon, Paul Smith's College Adirondack Watershed Institute*
- R/V Marcelle Melosira: A Platform for Research and Outreach on Lake Champlain
  - *Eleanor Duva, University of Vermont. Additional Authors: Ashley Eaton, Taylor Resnick*
- Uniting for Clean Waters: A Community Coalition Approach to a Foam-Free Lake Champlain Basin
  - *Aude Lochet, Lake Champlain Sea Grant at SUNY Plattsburgh. Additional Authors: Kris Stepenuck, Julie Silverman, Ashley Sullivan, Lindsey Cookson, Nicole Chochrek, Mike O'Brien, Chris Navitsky, Anne Jefferson*

2:30pm-2:45pm: **Break & Networking**

2:45pm – 4:00pm: **Concurrent Session #3**

Track 3A: Impacts of De-Icing Salt ***Grand Maple Ballroom***

Moderator: Kris Stepenuck

- Investigating landscape-level drivers of road salt pollution on lakes within the Lake Champlain Basin
  - *Mikala L'Hote, Dartmouth College. Additional Author: Brendan Wiltse*
- Chloride Concentrations and Loads in Lake Champlain Basin Streams Across an Urbanization Gradient
  - *Molly Costanza-Robinson, Middlebury College. Additional Authors: Isabella Infosino, Eric Moody*
- Understanding Chittenden County Road Salting to Inform Future Outreach
  - *Kris Stepenuck, University of Vermont and Lake Champlain Sea Grant. Additional Author: Dana Allen*
- Stormwater improvements and salt reduction alter chloride dynamics and mixing in Mirror Lake, NY
  - *Lija Treibergs, Paul Smith's College Adirondack Watershed Institute. Additional Authors: Bobby Clark, Joline Hall, Connor Vara, Brendan Wiltse, Hanna Wood, Elizabeth Yerger*

Track 3B: AIS: Round Goby ***Jost Foundation Room***

Moderator: Meg Modley

- Modeling the Predicted Distribution of the Invasive Round Goby in Lake Champlain
  - *Kyle Grasso, University of Vermont, Vermont Cooperative Fish and Wildlife Research Unit. Additional Authors: Peter Esselman, Ellen Marsden, Mark Henderson*
- The Marathon to Prevent Round Goby Introduction and Spread
  - *Meg Modley, Lake Champlain Basin Program/NEIWPCC. Additional Authors: QC MENV, VTFWD, VTDEC, NYSDEC, NYPA/Canals, USFWS, USGS*
- Triggering Action with eDNA: Early Detection and Management of Invasive Round Goby in the Champlain Canal
  - *Steven H. Pearson, New York State Department of Environmental Conservation. Additional Authors: Hannah Fiebboll, Kate Littreal*
- Status of Round Goby in Eastern North America: Implications for Lake Champlain
  - *Scott George, U.S. Geological Survey, New York Water Science Center*

Track 3C: Developed Lands ***Chittenden Bank Room***

Moderator: Ashley Eaton

- Lightning Talk: The Vermont Green Infrastructure Collaborative
  - *Jill Sarazen, Lake Champlain Sea Grant*
- Video: Building Resilience, A Rain Garden's Post-Flood Story
  - *Jill Sarazen, Lake Champlain Sea Grant*
- Lightning Talk: Rain Barrel Water Reuse: Summary of Research and Recommendations
  - *Morgan McKean, Lake Champlain Sea Grant. Additional author: Jill Sarazen*
- Green Schools: Slowing the Flow
  - *Ashley Eaton, University of Vermont/Lake Champlain Sea Grant*

Track 3D: Community Engagement – Part 2 ***Williams Family Room***

Moderator: Liliana Bettolo

- Lightning Talk: Extending our Reach into the Community: Benefitting from Regional Partners
  - *Karen Bates, Vermont ANR DEC WID Watershed Planning Program*
- Lightning Talk: Assessing and Educating about Flood Risks and Building Resilience: Empowering Vermont's Refugee and New American Community
  - *Alison Spasyk, University of Vermont. Additional authors: Dr. Mona Tolba, Dr. Lesley-Ann Dupigny-Giroux, Dr. Kyungsun Lee, Dr. Kathryn Semmens, Dr. Kristine Stepenuck, Samantha Grant*
- Lightning Talk: Engaging Real Estate Professionals in Conservation Topics
  - *Michelle Lockhart, Lake Champlain Sea Grant*
- Lightning Talk: Sketching Science: Using Student Drawings to Measure Watershed Literacy
  - *Alison Spasyk, University of Vermont. Additional Author: Dr. Kristine Stepenuck*
- Activity: Climate Collages
  - *Jasmine Perez, University of Vermont*

4:00pm – 5:00pm: **Poster Session 1 & Conference Reception** ***Livak Fireplace Lounge***

Posters:

- Evaluating Volunteer Retention in a Vermont State Water Monitoring Program
  - *Henry Motes, University of Vermont Rubenstein School of Environment and Natural Resources. Additional Author: Dr. Kristine Stepenuck*
- Salty Water Sampling: Creating Place-Based Learning Opportunities for K12 Classrooms in the Lake Champlain Basin
  - *Leif Goldie, Center for Earth and Environmental Science, SUNY Plattsburgh. Additional Authors: Nancy Price, Haylee Crowle, Mary Alldred*
- BLUE BTV On-the-Ground Survey and Flyer Campaign
  - *Michelle Lockhart, Lake Champlain Sea Grant*
- UVM FieldLabs Core
  - *Joshua Benes, University of Vermont Water Resources Institute. Additional Authors: Dr. Brendan Fisher, Lori Anderson*
- Evaluating Habitat Potential and Climate Change Impacts on Salmonids Using the Ecosystem Diagnosis & Treatment (EDT) Model
  - *Dr. Kim Brewitt, ICF. Additional Author: Laura McMullen*
- Investigating the impacts of increasingly dynamic winter hydrology and spatially variable deicing product application on winter chloride loading
  - *Savia Berlucchi, University of Vermont. Additional Authors: Kristine Stepenuck, Carol Adair, Matthew Vaughan, James Shanley, Megan Duffy, Andrew Schroth*
- Winter as a contributor to the annual nitrate budget in forested Vermont watersheds
  - *Addie Hedges, University of Vermont. Additional Authors: James Shanley, Megan Duffy, Donna M. Rizzo, Kevin Ryan, Carol Adair, Andrew Schroth*
- Development of a Thiamine Deficiency Complex-Tolerant Atlantic Salmon Broodstock and Implementation of Parentage-Based Tagging in Lake Champlain
  - *Bryan Ross, U.S. Fish & Wildlife Service - Lake Champlain FWCO. Additional Authors: Taher Fletcher, Paul Boynton, Kurt Heim, Laurie Earley*
- Automatic detection and categorization of behavior of the slimy sculpin Cottus cognatus
  - *Jonah Ballard, University of Vermont, Department of Computer Science. Additional Authors: Eden Forbes, Brian O'Malley, Jason Stockwell*
- Evaluating the Success of Released Atlantic Salmon Broodstock in Producing Viable Offspring in Wild Spawning Habitat
  - Simone Boutelle, University of Vermont
- Integrating eDNA and Electrofishing to Capture a Pre-Invasion Fish Community Baseline in the Upper Hudson River

- *Hannah Diebboll, NYSDEC/NYS Water Resources Institute. Additional Authors: James Stone, Steven Pearson*
- Road salt major ion effects on thermal tolerance of copepod Leptodiaptomus species
  - Sydney Sharp, University of Vermont. Additional Authors: Matthew Sasaki, Chiara Cohen, Katie Anthony, Anna McPeak, Melissa Pespeni
- Nutrient Loading from Headwater Streams in the Lake Champlain Basin: Quantifying High-Flow Events
  - *Alexander Amann, SUNY Plattsburgh. Additional Author: Dr. Colin Fuss*
- Advancing Water Quality Monitoring: Ion-Selective Sensors for Key Nutrients Detection in Water
  - *Monireh Dehabadi, Department of Civil and Environmental Engineering, University of Vermont. Additional Authors: Parmida Amngostar, Tian Xia, Appala Raju Badireddy*
- Climate-driven shifts in Lake Champlain physical and chemical phenology over the last three decades
  - *Kelsey Colbert, Lake Champlain Basin Program/NEIWPCC. Additional Author: Dr. Ana M Morales*
- Machine Learning reveals Environmental Drivers of Distinct Wetland Natural Communities in Floodplain Ecosystems
  - *Ijaz Ul Haq, Water Resources Institute. Additional Authors: Rebecca M. Diehl, Kristen L. Underwood, Elizabeth Doran*
- Shifts in cyanobacteria bloom phenology and phytoplankton community structure in response to two phosphorus immobilization strategies in Lake Carmi, VT
  - Audrey Manning, University of Vermont. Additional Authors: Andrew Schroth, Ana M. Morales
- The Effects of Starvation on the Thermal Limits of Lake Champlain Copepods
  - *Chanchal Saratkar, University of Vermont. Additional Authors: Matthew Sasaki, Victoria Marie Glynn, Sydeny Sharp, Melissa Pespeni*
- Effects of Hydrologic Disturbance on Cyanobacteria Bloom Dynamics in a Shallow Eutrophic Lake
  - *Jo Delahunt, University of Vermont. Additional Author: Ana M Morales*
- Finding Our Footing: Examining the Pedagogical Foundations in Environmental Education Research- A Literature Review
  - *Emilia Perez, University of Vermont. Additional Authors: Kimberly Coleman, Leon Walls, Claire Jenkins, Anna Hallock*

5pm – 6:30pm: **Film Screening** ***Grand Maple Ballroom***

- ***The Fish Thief: A Great Lakes Mystery Documentary***
  - *In the early twentieth century, a mysterious ecological crisis nearly wiped out the fish that most people cared about in the largest freshwater ecosystem on earth—the Great Lakes. The impact reverberated across the region, ruining local industries, damaging small town economies and indigenous communities, and destroying the livelihoods of people in the United States and Canada. With little reason for hope, a dedicated group of scientists, policymakers, and conservationists tackled the mystery.*

6:30pm – 8:30pm: **Social and Networking Event** ***Burlington Beer Company***

- **Burlington Beer Company** – 180 Flynn Ave, Burlington, VT 05401
  - Snacks will be provided; meals and drinks (alcoholic and non-alcoholic) will be available for purchase.

Day 2: Tuesday 1/27/2026

9:00am – 10:30am: **Welcoming Remarks & Keynote Address** ***Grand Maple Ballroom***

Welcoming Remarks

- *Dr. Andrew Vermilyea, Executive Director, Lake Champlain Research Consortium*
- *Dr. Beverley C. Wemple, Faculty Director, UVM Water Resource Institute*
- *Dr. Eric Howe, NEIWPCC Program Director, Lake Champlain Basin Program & Champlain Valley National Heritage Partnership*
- *Dr. Anne Jefferson, Director of Water Resources and Lake Studies Center, Lake Champlain Sea Grant*

Keynote Address: **Water and the Machine: Preserving Water and People in the Age of A.I. -** Cynthia Barnett, Senior Lecturer and Director of Climate and Environment Reporting Initiatives – University of Florida

10:30am – 11:00am: **Break & Networking**

11:00am – 12:15pm: **Concurrent Session #4**

Track 4A: Innovative Technologies and Forecasting ***Grand Maple Ballroom***

Moderator: **Emma Janson**

- Drones & Deep Learning: The Future of Mapping Invasive Aquatic Plant Species
  - *Daniel Jarrad & Maxwell Solter, University of Vermont Spatial Analysis Lab. Additional Authors: Lauren Cresanti, Adam Zylka, Terry Barrett, Malia MacLeod, Eli Stein, Bennett Corteville, Maeve Naumann*
- Enhanced IoT-Based Optical Fluorometer–Nephelometer with Dual-Power Operation and Field Validation for Algae Monitoring in Lake Champlain
  - *Parmida Amngostar, University of Vermont. Additional Authors: Soheyl Faghir Hagh, Clayton J Williams, Ana M Morales, Tian Xia*
- Internet of Drones System with Onboard Machine Learning for 2-D and 3-D Water Quality Mapping, Chlorophyll-a Forecasting, and Adaptive Nutrient Sampling
  - *Soheyl Faghir Hagh, University of Vermont. Additional Authors: Tian Xia, Parmida Amngostar*
- First Demonstration of Nitrate Reduction Using Woodchip Bioreactor Technology at a Small Community Wastewater Treatment Plant
  - *Jim Sutherland, Scientific Adviser - Lake George Waterkeeper, Lake George Association. Additional Authors: Kathleen Suozzo, Chris Navitsky*

Track 4B: Aquatic Invasive Species – Monitoring and Data ***Jost Foundation Room***

Moderator: **Lauren Jenness Kneen**

- New York State Watercraft Inspection Steward program; Is it making a difference?
  - *Scott Jamieson, New York State Department of Environmental Conservation*
- Reducing the risk of AIS infestations and spread through watercraft inspection surveys and decontamination on Lake Champlain
  - *Meg Modley Gilbertson, Lake Champlain Basin Program/NEIWPCC. Additional Author: Lauren Jenness Kneen*
- Using Aquatic Invasive Species Data to Inform Management Decisions
  - *Mitchell O'Neill, New York Natural Heritage Program, SUNY-ESF.*

Track 4C: Agriculture – Part 1 *Chittenden Bank Room*

Moderator: Aubert Michaud

- Soil health diagnosis of Quebec portion of the Missisquoi Bay Basin following a remote sensing approach
  - *Aubert Michaud, Organisme de bassin versant de la baie Missisquoi (OBVBM). Additional Authors: Mohamed Abou Niang, Marc-Olivier Gasser*
- Challenges facing Québec's efforts to reduce phosphorus losses to the Missisquoi bay Watershed
  - *Louis Robert, Organisme de bassin versant de la baie Missisquoi (OBVBM)*
- Restoring Degraded Riparian Forested Buffers into Multi-Functional Habitats for Socio-Ecological Resilience
  - *Jess Rubin, University of Vermont ALE and MycoEvolve. Additional Authors: Josef Gorres, Carol McGranaghan, Luca Kolba*
- Management effects on surface and subsurface nutrient runoff from heavy clay soils in Vermont dairy production systems
  - *Claire Benning, University of Vermont Extension. Additional Authors: Joshua Faulkner, Heather Darby*

Track 4D: Flood Resilience *Williams Family Room*

Moderator: Curt Gervich

- Exploring the water quality impacts of flooding and drought in the Lake Champlain Basin
  - *Matthew C.H. Vaughan, Lake Champlain Basin Program / NEIWPCC*
- Improved Representation of Floodplains in Broad-Scale Hydrologic Models Supports Flood Resilience Assessments in Vermont
  - *Rebecca Diehl, University of Vermont. Additional Authors: David Baude, Ijaz Ul Haq, Kristen Underwood, Julianne Scamardo, Beverley Wemple*
- Data-driven models support erosion hazard mapping in Vermont
  - *Kristen Underwood, University of Vermont. Additional Authors: Alexander Prescott, Amelia Bohling, Nat Robtoy, Henry Leister, Rebecca Diehl*
- Floodlines: cultivating resilience in a transboundary waterway. Building capacity for resilience through transformative play
  - *Curt Gervich, SUNY Plattsburgh Center for Earth and Environmental Science. Additional Authors: Grace Calvelli, Taygin Jump*

12:15pm – 1:15pm: **Lunch Buffet** ***Grand Maple Ballroom***

1:15pm – 2:30pm: **Concurrent Session #5**

Track 5A: Contaminants of Emerging Concern *Grand Maple Ballroom*

Moderator: Vivien Taylor

- Lake Champlain Basin Emerging Contaminants Study
  - *Dave Braun, Stone Environmental*
- Implementing a nanobubble-assisted foam fractionation process to capture PFAS molecules from landfill leachate
  - *Sajjad Eftekhari, Department of Civil and Environmental Engineering, University of Vermont*
- Beneath the Surface: Assessing the Spatio-Temporal Distribution of Microplastics in Lake Champlain and its Tributaries
  - *Allison Morrow, SUNY Plattsburgh. Additional Authors: Timothy Lloyd, Grace Calvelli, Taygin Jump, Timothy Mihuc, Danielle Garneau, Nurjahan Begum, Andrea Stumpf, Anne Jefferson*
- Caffeine monitoring in Vermont lakes as a tool for motivating maintenance of septic systems
  - *Mark Mitchell, Lake Champlain Sea Grant and VT DEC Lakes Program*

Track 5B: Lakes, Ponds, and Shorelines *Jost Foundation Room*

Moderator: Kellie Merrell

- Lightning Talk: Volunteer Lake Monitors' Role and Communication Behaviors
  - *Sabrina Koetter, University of Vermont and Lake Champlain Sea Grant*
- Protecting Headwater Streams to Build Long Term Resilience of Vermont's Lakes
  - *Kellie Merrell, Vermont Department of Environmental Conservation*
- Lakeshore Biodiversity: Informing a Lake Wise Approach in the Adirondacks
  - *Michale Glennon, Paul Smith's College - Adirondack Watershed Institute. Additional Authors: Alec Cimini, Jesse Rock*
- The Adirondack Lake Assessment Program: Over two decades of water quality participatory science
  - *Sara Kelly, Paul Smith's College Adirondack Watershed Institute. Additional Authors: Elizabeth Yerger, Claudia Braymer, Michale Glennon, Maureen Cunningham*
- New York State's Drinking Water Source Protection Program (DWSP2) in the Lake Champlain Basin
  - *Madeline Silecchia, New York State Department of Health/NEIWPCC. Additional Author: Alyssa Bement*

Track 5C: Agriculture – Part 2 *Chittenden Bank Room*

Moderator: Jill Sarazen

- Investigating the environmental impact of an increased adoption of plant-based protein production in the Northeast U.S.: Assessment of Water Quality and Greenhouse Gas Emissions
  - *Liliana Bettolo, University of Vermont. Additional Authors: Sabrina Mehzabin, Zachary Easton, Joshua Faulkner*
- A Blueprint for Performance-Based Conservation: Lessons from Vermont's Pay-for-Performance Program
  - *Sumner LeBaron-Brien, Vermont Agency of Agriculture, Food, & Markets. Additional Authors: Nina Gage, Sonia Howlett, Judson Peck, Jamie Cohen, Jody Stryker, Andrew Gerlicz*
- Enhancement of Farm-PREP with Greenhouse Gas, Carbon, Nitrogen, and Soil Health Outcomes
  - *Jody Stryker, Stone Environmental. Additional Authors: Jens Kiesel, Hannah Rubin, Vermont Agency of Agriculture, Food & Markets (VAAFM)*

Track 5D: Panel – Mutual Aid for Flood Resilience *Williams Family Room*

Moderator: **Sarita Croce**

The goal of this session is to increase awareness and discuss opportunities for helping water and wastewater utilities develop proactive strategies for extreme weather events. The event will begin with a 20-minute presentation, followed by a 20-minute panel discussion. Attendees will then participate in a workgroup session to brainstorm creative, unconventional ideas for how water utilities can address the impact of extreme weather.
New York and Vermont WARN State Coordinators, and the NY/VT Emergency Management Assistance Compact Coordinator will be in attendance.

2:30pm – 2:45pm: **Break & Networking**

2:45pm – 4:00pm: **Concurrent Session #6**

Track 6A: Lake and Watershed Ecology *Grand Maple Ballroom*

Moderator: Tim Mihuc

- 30 Years of Plankton Monitoring in Lake Champlain: What have we learned?
  - *Tim Mihuc, SUNY Plattsburgh. Additional Authors: Luke Myers, Zach Cutter, Marshall Arnwine, Lily Delmarsh*
- Long-Term Zooplankton Monitoring Data: Putting Lake Champlain into a Global Context
  - *Jason Stockwell, University of Vermont. Additional Authors: Stephanie Figary, Tim Mihuc, Hannah Nygaard*
- The Monitoring and Management of Cyanobacteria HABs in Shallow, Nearshore Ecosystems such as Missisquoi Bay
  - *Fred Lubnow, Princeton Hydro, LLC*
- Spatial and temporal variation of tick-borne disease incidence in Vermont
  - *Carlos Amissah, University of Vermont. Additional Authors: Nicholas Gotelli, Ellen Martinsen*

Track 6B: Streams, Rivers, and Floodplains ***Jost Foundation Room***

Moderator: **Elizabeth Doran**

- Prioritizing Floodplain Reconnection to Improve Ecohydrological River Corridor Function
  - *Elizabeth Doran, University of Vermont. Additional Authors: Roy Schiff, Jody Stryker, Mike Kline*
- Urban Land Use Controls on Bedload and Suspended Sediment Transport: A Nested Monitoring Approach
  - *Anne J. Jefferson and Suffiyan Safdar, University of Vermont. Additional Authors: Andrea Stumpf, Kristen Underwood, Kayleigh Leary, Abbey Morse*
- The Compliance Bridge: Helping Conservation Projects Move from Vision to Action
  - *Arianna Porter, SWCA Environmental Consultants*

Track 6C: Cooperative Institute for Research to Operations in Hydrology ***Chittenden Bank Room***

Moderator: Beverly Wemple

- Enhancing Vermont Flood Inundation Mapping through Process-Based Classification
  - *David Baude, University of Vermont. Additional Authors: Rebecca Diehl, Ijaz Ul Haq, Kristen Underwood, Alexander Prescott, Beverley Wemple, Belize Lane, Colin Phillips*
- Drivers of National Water Model Performance in the northeastern US and implications for Lake Champlain basin communities
  - *Mirce Morales Velazquez, University of Vermont. Additional Authors: Beverley C. Wemple, Kristen L. Underwood, Donna M. Rizzo, Zachary Suriano, Patrick Clemins, Noah B. Beckage, Andrew W. Schroth*
- AURA: A Low-Power Embedded IoT System for Real-Time Acoustic Precipitation Phase Partitioning and Hydrological Monitoring via Machine Learning on the Edge
  - *Soheyl Faghir Hagh, University of Vermont. Additional Authors: Jordan Bourdeau, Julia Sober, Rachael Chertok, Christopher Jepsen, Parmida Amngostar, Lucas Levine, Casey Forey, Tian Xia, Christian Skalka*

Track 6D: Panel – Lake Champlain "*Unfiltered*" ***Williams Family Room***

Moderator: Mae Kate Campbell

Late career and newly retired environmental professionals share their experiences and guidance with students and early career professionals. Featuring a fantastic panel of experts:

- Dr. Breck Bowden, Robert and Genevieve Patrick Professor of Watershed Science and Planning Emeritus, University of Vermont and former Director, Lake Champlain Sea Grant
- Laura Hollowell, retired Lake Champlain Basin Program Resource Room Coordinator
- Dr. Ellen Marsden, Fisheries Biology Professor Emerita, University of Vermont

4:00pm – 5:00pm: **Poster Session 2 & Conference Reception** ***Livak Fireplace Lounge***

Posters:

- Modeling the Future of Dreissenid Mussels in Lake Champlain: A Bioenergetics Framework for Predicting Invasion Trends
  - *Emily Dombrowski, University of Vermont. Additional Author: Brent Lockwood.*
- The Lake Champlain Aquatic Nonindigenous Species Information System
  - *Noelle Hasan, Lake Champlain Sea Grant. Additional Authors: Kris Stepenuck, Emma Janson, Henry Motes, and Cayden Marrow*
- Degraded Plastic Distribution and Morphology along Lake Champlain Beaches
  - *Grace Massa, University of Vermont. Additional Authors: Nurjahan Begum, Anne Jefferson, Andrea Stumpf*
- Sustainable Protocol for Efficient Extraction and Comprehensive Characterization of Microplastics in Organic-Rich Urban Stormwater Runoff
  - *Kehinde Ojasanya, University of Vermont. Additional Authors: Appala Raju Badireddy, Liesel Greseth, James O'Connor*

- Shoreline Plastic Pollution in Lake Champlain: Abundance and Characteristics
  - *Nurjahan Begum, Rubenstein School of Environment and Natural Resources, University of Vermont. Additional Authors: Anne Jefferson, Andrea C Stumpf, Arden Degrenier, Grace Massa, Alyssa J. Warbeck, Allison Morrow, Timothy B. Mihuc, Danielle Garneau*
- Distribution and drivers of PFAS and mercury in Lake Champlain fish
  - *Vivien Taylor, Dartmouth College. Additional Authors: Jana Kraft, Celia Chen, Caroline Gillespie, Callie Carter.*
- Analyzing the Equity of Flood Impacts and Recovery in Vermont Communities
  - *Nat Robtoy, University of Vermont Transportation Research Center. Additional Authors: Dana Rowangould, Sarah Grajdura, Kristen Underwood*
- Habitat factors associated with river otter (Lontra canadensis) occurrence in the Lewis Creek Watershed
  - *Lydia Emry, University of Vermont. Additional Authors: Dr. James Murdoch, Dr. Brittany Mosher, Dr. Elizabeth Doran, Lilo Schultz, and Margreta Grady*
- An Preliminary Analysis of Distribution and Ecological Preferences of Vermont Stoneflies
  - *Maria Jankowski, SUNY Plattsburgh. Additional Authors: Dr. Scott Grubbs, Dr. Timothy Mihuc, Luke Myers*
- Storms Under Water: Impacts of Wind-Driven Events on Deep Lake Thermal Dynamics
  - *Miranda Rummell, Lake Champlain Research Institute. Additional Authors: Dr. Timothy Mihuc, Dr. Eric Leibensperger*
- Do lakemounts influence zooplankton biomass, density, and community composition in large lake system(s)?
  - *Samantha Gonsalves, University of Vermont. Additional Authors: Bianca Possamai, Jason Stockwell*
- Seasonal Shifts, Microbial Drifts: Changing Phenology impacts on Lake Champlain Microbial Communities
  - *Katie Bruno, Cate Kreutzen, and Kate Schroeder, Middlebury College. Additional Author: Erin Eggleston*
- Erosion and Deposition of Sediment in Vermont Rivers Following the 2023 and 2024 Floods
  - *Amelia Bohling, University of Vermont. Additional Authors: Nat Robtoy, Henry Leister, Kristen Underwood, Alexander Prescott, Ken Johnston, Rebecca Diehl*
- Trash movement in Potash Brook, South Burlington, Vermont
  - *Andrea Stumpf, University of Vermont. Additional Authors: Abbey Morse, Arden Clarke-Degrenier, Casey Benderoth, Hope Lagemann, Morgan Fletcher, Anne Jefferson*
- Geographic Information System for Fluvial Erosion Quantification of Great Brook Vermont
  - *Henry Leister*, University of Vermont. Additional Authors: *Kristen Underwood, Rebecca Manners Diehl, Nat Robtoy, Amelia Boehling*
- Evaluating Floodplain Habitat Function Using Ecogeomorphic Indicators in the Lewis Creek Watershed
  - *Lilo Schultz, University of Vermont. Additional Authors: Elizabeth Doran, Margreta Grady, James Murdoch, Elias Rosenblatt, Lydia Emery, Brittany Mosher, Kristen Underwood, Rebecca Diehl, Rose Watts, Kenneth Johnston*
- Assessing eco-geomorphic habitat factors associated with amphibian diversity in riparian floodplains of the Lewis Creek watershed
  - *Margreta Grady, University of Vermont. Additional Authors: Lilo Schultz, Dr. Elizabeth Doran, Lydia Emry, Dr. Brittany Mosher, Dr. James Murdoch, Dr. Kristen Underwood, Dr. Rebecca Diehl, Rose Watts, Kenneth Johnston*
- Advanced Methodologies for Microplastic Detection Across Diverse Environmental Matrices from the Arctic to the Lake Champlain Basin
  - *Olivia Rutkowski, Vermont State University, Castleton. Additional Author: Andy Vermilyea*
- Keeping our farms in the green: Using a nutrient mass balance assessment to prioritize sustainable dairy practices
  - *Luke Trombley, SUNY Plattsburgh. Additional Authors: Laura Klaiber, Quirine Ketterings*

Abstracts

Day 1: Monday 1/26/2026

11:00am – 12:15pm: **Concurrent Session #1**

Track 1A: Nutrients ***Grand Maple Ballroom***

1A-1: Phosphorus conditions and trends for Missisquoi Bay and its watershed

Dr. Matthew C. H. Vaughan, Lake Champlain Basin Program/NEIWPCC. Additional Author: Dr. Peter Isles.

Missisquoi Bay comprises approximately 7% of Lake Champlain's surface area but presents disproportionate water quality challenges due to its unique characteristics. With a shallow mean depth of 2.8 m and a high land-to-water ratio of 40:1 for its watershed, the bay is highly susceptible to eutrophication. Persistent water quality impairments have made Missisquoi Bay a focal point for intensive phosphorus reduction efforts, and the Vermont TMDL for this Lake Champlain segment requires a 64.3% reduction in external phosphorus loading to achieve the in-bay target concentration of 25 µg/L. This presentation evaluates current progress toward meeting both in-lake and watershed loading targets. Using thirty-five years of Lake Champlain Long-term Monitoring Program data, we examine long-term trends in in-bay phosphorus concentrations and external loads from tributaries. We will discuss the role of internal phosphorus loading, which complicates restoration efforts and delays the bay's response to watershed-based load reductions. We also incorporate insights from the Missisquoi Bay high-frequency monitoring buoy that captures short-term dynamics and episodic events often missed by traditional sampling methods. Finally, we will summarize other recent management-driven research initiatives focused on Missisquoi Bay's restoration.

1A-2: Development of a Comprehensive Binational Phosphorus Mass Balance Analysis Toolkit for the Missisquoi Bay Watershed

Michael Winchell, Stone Environmental. Additional Authors: Aubert Michaud, Andrew Schroth, Eric Roy, Bernard Conrad, Joshua Faulkner, Patrick Clemins

A recently completed binational P mass balance analysis for the Missisquoi Bay watershed produced several important outcomes and insights into how modifications to P management practices are projected to translate to changes in water quality within the Bay. The analysis included a comprehensive terrestrial P inventory that brought together the best available data and current science in quantifying current P inputs and stores throughout the entire watershed. The creation of a binational SWAT-based metamodel, inclusive of over 175,000 landscape units (HRUs), represents the only comprehensive basin-wide P loading model for the watershed and combines the benefits of a SWAT modeling approach with extensive validation from both field scale monitoring studies and in-stream monitoring studies throughout the entire watershed. This modeling approach generated Missisquoi Bay P loading projections for 90 different alternative management scenarios covering a range of agricultural BMPs and improvements to residential wastewater systems and urban wastewater treatment plants. The terrestrial metamodel was integrated with the AEM3D Bay model to provide a comprehensive view of how the Bay, given its current inventory of P in water and sediment, will respond to a range of projected P loadings derived from the alternative P management scenarios. The integrated terrestrial/Bay modeling approach demonstrated several alternative management scenarios whereby the average annual total P loads to the Bay would be reduced by 35% - 45%, translating to lower reductions in P concentrations due to the influence of legacy P within the Bay’s benthic sediment. Lastly, a web-based P Mass Balance Toolkit was developed that used the independent alternative scenarios simulated with the metamodel and AEM3D Bay model to enable evaluation of a nearly limitless range of possible conditions between the baseline P loading and the alternative representing the most aggressive P abatement strategy. Legacy P in shallow water bodies like Missisquoi Bay poses a challenge for long term water quality improvement efforts. In addition to the very beneficial land management practices aimed at reducing terrestrial source P loads, additional research into cost-effective approaches to reducing legacy P stores (both aquatic and terrestrial components) would provide the potential to expedite water quality improvement.

1A-3: Loads of Confusion: Why the nutrient load paradigm can get in the way of understanding lake-watershed connections

Dr. Peter Isles, VT Department of Environmental Conservation. Additional author: Dr. Matthew C. H. Vaughan

Since Vollenweider's work in Switzerland in 1968 linked lake eutrophication with loads of total phosphorus entering lakes from catchments, the concept of watershed phosphorus loading as a driver of eutrophication has become the foundation of nutrient management regimes worldwide. In the United States, this has frequently taken the form of Total Maximum Daily Loads (TMDLs), which set limits on nutrient loads to impaired surface waters. While the general principle that nutrients from catchments drive eutrophication is robust, the focus on nutrient loads rather than nutrient concentrations creates complications particularly when considering the impact of diffuse nutrient sources and variable and non-stationary discharge patterns. Furthermore, adoption of Vollenweider's focus on total phosphorus (TP), rather than specific constituents of the TP pool, further complications understanding the relationship between tributary and lake phosphorus. In this presentation, we unpack the concept of loads and flow-weighted mean concentrations (FWMCs), and we use long-term lake and tributary datasets to demonstrate the advantages of FWMCs in linking tributary inputs with lake phosphorus concentrations, improving our ability to detect trends in tributary inputs, and sometimes qualitatively changing the conclusions that we draw from tributary nutrient data. We use FWMCs to make clear that dissolved phosphorus inputs have a dominant role in determining lake nutrient concentrations and trophic status, particularly in deep, dimictic lakes (or lake segments). Finally, we use seasonal relationships between tributary FWMC and lake phosphorus to develop a simple index to quantify the importance of internal nutrient loading in lakes, which can provide a simple screening tool applicable to both dimictic and polymictic waterbodies.

Track 1B: Fish, Fisheries, and Ecosystem Change ***Jost Foundation Room***

1B-1: Sex-specific Atlantic salmon upstream passage and fallback at a natural cascade after dam removal

Kurt Heim, US Fish and Wildlife Service. Additional Authors: Jonah Withers, William Arden, Laurie Earley, David Minkhoff, Theordore Castro-Santos

Monitoring after dam removal is important to determine if aquatic organism passage is restored. In the Boquet River (NY, USA) a low-head dam set above a ~200-m long bedrock cascade was removed (2015) to provide passage for landlocked Atlantic salmon (*Salmo salar*). We used radio-telemetry to assess passage at the remaining cascade (2020, 2022). Only males entered the cascade (i.e., an attempt) despite females having higher lipid-content. Attempts increased with stream discharge, though overall passage-success was unaffected by environmental conditions and very low (1/50 fish passed the former dam location). Shallow depths—likely owing to an artificially-widened channel—appear to be the primary limitation. We also transported fish upstream but observed high fallback (72%) that was associated with fish weight and lipid-content. While delayed at the cascade, 15% of fish were caught by anglers. Following dam removal, the cascade continues to limit upstream passage resulting in increased vulnerability to angling.

1B-2: Experimental net pen rearing of Atlantic salmon in the Saranac River

Nicole Balk, New York State Department of Environmental Conservation. Additional Author: Kurt Heim

A 5-year experimental project concluded in April 2025. The number of salmon returning to the Saranac River had been low for several years, despite annual stocking. For over a decade, pen rearing on Lake Ontario had been successful in increasing returns of salmon to the river where they were reared. An experimental pen rearing study was begun in 2021 on the Saranac River to try to increase the returns of salmon to this river. Results from the first few years are available.

1B-3: Examining the Ecological Impacts of Atlantic Salmon Fry Stocking in Headwater Tributaries of Lake Champlain

Graham Montague, University of Vermont. Additional Authors: Laurie Earley, Kurt Heim, Paige Blaker, Kevin Kelsey, Bernie Pientka, Margaret Murphy, Mark Henderson

Landlocked Atlantic Salmon (*Salmo salar*) were extirpated from Lake Champlain in the 1800s, and despite ongoing restoration efforts involving annual stocking of ~300,000 smolts, little is known on their post stocking movements or survival. Therefore, we used the Lake Champlain Acoustic Telemetry Observation System (CATOS) to track

movements of both hatchery-reared smolts and lake age-0 Atlantic Salmon to better understanding post-stocking movement patterns and habitat use. In spring 2024, we surgically implanted V8 acoustic transmitters into 50 Ed Weed Fish Culture Station smolts and released them at three locations: Missisquoi River, Lamoille River, and Charlotte Ferry. In fall 2024, we tagged 30 lake age-0 salmon (>300mm) collected using boat electrofishing and anglers from both Vermont and New York waters with V13 transmitters. Initial results showed movements for 40 tagged smolts, with differences in movement patterns among release sites. Missisquoi River released smolts showed the lowest detection rates, while Charlotte Ferry and Lamoille River groups demonstrated higher detection frequency and more extensive movements throughout the lake. Preliminary data visualized with abacus plots from lake age-0 salmon indicate movement patterns throughout Lake Champlain. We expanded our telemetry study in 2025, tagging 120 smolts from both Ed Weed and Dwight D. Eisenhower (USFWS) hatcheries across six release sites, and 40 lake age-0 salmon. These results will inform optimal stocking locations and identify critical habitats for Atlantic Salmon restoration in Lake Champlain.

1B-4: Examining the Ecological Impacts of Atlantic Salmon Fry Stocking in Headwater Tributaries of Lake Champlain

Taher Fletcher, US Fish and Wildlife Service. Additional Authors: Kurt Heim, Bryan Ross, Nicole Balk, Laurie Earley

Landlocked Atlantic salmon Salmo salar were once abundant in the Lake Champlain basin, but were extirpated in the late 1800s because of overfishing, pollution from industrial and agricultural sources, and the presence of dams in important spawning tributaries. In the 1970s Atlantic salmon were reintroduced to Lake Champlain through collaborative stocking efforts of the Lake Champlain Fish and Wildlife Management Cooperative (New York State Department of Environmental Conservation, Vermont Fish and Wildlife Department, and U.S. Fish and Wildlife Service), and a popular recreational fishery now exists within the lake. The stocking of hatchery-raised fish as part of salmonid restoration is a common management practice, generally to increase recruitment to the fisheries or the spawning population. Depending on the life stage at which fish are stocked, stocking can significantly impact density-dependent factors such as growth, risk of predation, habitat availability, and competitive interactions within fish communities. Accordingly, post-stocking assessments of survival, dispersal, and subsequent ecological impacts are critical to evaluating the success of salmonid stocking programs. The purpose of this study was to evaluate the success of Atlantic salmon fry stocking efforts in headwater reaches of two New York tributaries of Lake Champlain. Specifically, we conducted backpack electrofishing surveys to evaluate the dispersal and size distribution of stocked fry in relation to distance from their stocking location. We also examined the impact of stocked fry on the distribution and size of native Brook Trout Salvelinus fontinalis within the streams. Our preliminary results indicate that the density of stocked fry decreases with increasing distance from stocking location, and that density is higher downstream than upstream. However, because of their larger body size and increased physical ability, the proportion of age-1 fish is higher upstream from the stocking location than downstream. Additionally, we found that the size of stocked fry increased with increasing distance from stocking location. This is consistent with the principle of density-dependent growth. Lastly, the stocking of salmon fry did not appear to significantly impact the density or size of native brook trout within the stream. These results will be used to inform future management decisions regarding the stocking of fry in the Lake Champlain basin.

1B-5: Predation Risk for a Migrating Macroinvertebrate in Benthic and Pelagic Habitats

Eden Forbes, Rubenstein Ecosystem Science Laboratory, University of Vermont. Additional Author: Dr. Jason Stockwell

Many aquatic organisms inhabit both benthic and pelagic habitats. Competing predation risks between benthic and pelagic habitats are important in structuring the behavior of those organisms. That said, building representative models of benthic predation is a difficult task given limited knowledge of benthic predator foraging behavior. As such, those relatively few models that directly compare benthic and pelagic habitats often extend assumptions about pelagic foraging to benthic predators. We developed new encounter rate models to compare the relative predation risk of a tactile predator in a 2D habitat and a visual predator in a 3D habitat. We parameterized our models based on the diel vertical migration (DVM) of Mysis, a migrating crustacean, and two of its freshwater predators, the rainbow smelt Osmerus mordax (pelagic, 3D) and the slimy sculpin Cottus cognatus (benthic, 2D). We employed these predation models to determine how balancing benthic-pelagic predation risk alone can structure DVM. A significant proportion of DVM was predicted to offset benthic predation risk. We also

demonstrated the consequences of varying pelagic and benthic predator capture success according to Mysis size classes. Smaller Mysis were predicted to migrate in greater proportion than larger Mysis. Finally, we explored the impact of tactile capture success by the slimy sculpin on predicted DVM distributions. We showed how less active benthic Mysis populations may be at greater benthic predation risk than more active populations when tactile foraging is even somewhat effective. Accounting for predator perception is important for generating predictions for predation models and experiments.

1B-6: Investigation into the diversity, distribution, and prevalence of emerging Heterosporis parasites in Lake Champlain yellow perch (*Perca flavescens*)

Dr. Ellen Martinsen, University of Vermont. Additional Authors: Emma Privett, Inga Sidor, Matthew Bodnar, Tom Jones, Sara Helms Cahan

Emerging infectious diseases are increasing in occurrence and frequency in captive and wild fish populations and species worldwide. In this study, we document the presence of emerging microsporidian parasites of the genus Heterosporis in yellow perch (Perca flavescens) in Lake Champlain. As Heterosporis parasites liquify muscle tissue, infected tissue has a freezer-burned appearance with muscle loss from severe infections causing fish to curve inwards. Though first discovered in yellow perch in Lake Champlain in 2015, little is known about the distribution or identity of Heterosporis parasites in the lake. Through necropsy, histopathology, and molecular analysis, we document the pathology and diversity of Heterosporis parasites in yellow perch in Lake Champlain and investigate their relationship to invasive Heterosporis species of yellow perch and other fish species from the Great Lakes. Through collaboration with state and UVM fish biologists as well as anglers, we surveyed hundreds of yellow perch sampled from sites along Lake Champlain for the presence of Heterosporis parasites and document their geographic distribution. Our results support the Great Lakes origin of Heterosporis parasites in Lake Champlain yellow perch. We also document the widespread distribution of Heterosporis infection in yellow perch in Lake Champlain but also differences in prevalence that may be related to body condition and other host related factors.

Track 1C: Advanced Meteorological Monitoring in the Lake Champlain Basin ***Chittenden Bank Room***

1C-1: Vermont Mesonet – A Statewide, Meteorological Monitoring Network

Samantha Koehler, University of Vermont Water Resources Institute. Additional Author: Joshua Benes

With the increasing frequency and intensity of flooding across Vermont's complex terrain, the need for a high-quality weather monitoring network has become essential. The Water Resources Institute at the University of Vermont is developing a mesoscale weather network, or mesonet, to address this need and fill the gap in real-time environmental monitoring. The network will consist of 10-meter towers strategically located across the state to support organizations such as the National Weather Service, Vermont Emergency Management, and the Vermont Agency of Transportation, while also providing local communities with data for informed decision-making. Stations will report every five minutes, with sampling rates as high as once every three seconds. The Vermont Mesonet aims to include at least one station per county, with site suitability analysis guiding station placement. The first prototype station is located in Lyndonville, Vermont. The goal of this network is to provide high resolution, long term observations that are essential for characterizing and forecasting Vermont's changing weather and climate.

1C-2: Monitoring Mountain Meteorology and Snow Across Elevational Gradients in the Northeast Appalachians and Adirondacks

Joshua Benes, University of Vermont. Additional Authors: Mark Beauharnois, Arne Bomblies, Jay Brocccolo, Elizabeth Burakowski, Paul Casson, Jordan Clayton, Patrick J. Clemins, Aliz Contosta, Vamsi Dondeti, Keith Garrett, Anna Grunes, Heather Hoffman, Samantha Koehler, Sara Lance, Braedon Lineman, Cara McCarthy, Scott McKim, Justin Minder, Colby Morris, Georgia Murray, Chris Nadeau, Sarah Nelson, Kyler Phillips, Melissa Webb

The Northeast Network of Mountain Observatories (NENMO) is focused on monitoring mountain meteorology and snow at several elevational gradients to support the prediction of extreme weather events regionally and contribute to the Unified High Elevation Observing Platform (UHOP) to enhance understanding of climate change internationally. The partnership includes the State University of New York's Atmospheric Sciences Research Center (Whiteface Mountain Observatory in New York's Adirondack Mountains), the University of Vermont Summit to Shore Environmental Observation Network, and the Mount Washington Observatory in New Hampshire. Additionally, the Northeast Snow Survey (NESS) Feasibility Study solicited input from 170+ interest holders and identified data needs to support three primary network objectives for regional monitoring: (1) flood and water supply forecasting, (2) safe community access to public lands and outdoor recreation infrastructure, and (3) inform

management strategies on working lands and enhance understanding of natural ecosystems. This session will explore these initiatives and how they will enhance the prediction of extreme weather dynamics and snow forecasting across the Lake Champlain Basin and throughout northern New York and New England.

1C-3: 50 years of Environmental Monitoring at Whiteface Mountain

Scott McKim, University of Albany, Whiteface Mountain Observatory

For more than half a century, the Whiteface Mountain Field Station—operated by the Atmospheric Sciences Research Center at the University at Albany—has served as one of the most comprehensive long-term environmental monitoring sites in the northeastern United States. Perched at 1,483 meters in New York's Adirondack Mountains, the observatory provides a unique high-elevation vantage point to measure and understand regional and global atmospheric change. Whiteface has built an unparalleled environmental record encompassing meteorology, air chemistry, cloud and precipitation chemistry, visibility, aerosols, greenhouse gases, and trace metals. These long-term datasets have been foundational in documenting the success of the Clean Air Act, tracking the decline of acid deposition, and characterizing regional air quality trends. In recent decades, the observatory has expanded its scope to include climate and ecosystem interactions, serving as a critical node in national and international atmospheric networks. Current research focuses on understanding the evolving composition of the atmosphere and the intersection of air quality, climate, and ecosystem health. Ongoing measurements include continuous monitoring of ozone, nitrogen oxides, sulfur species, black carbon, and carbon dioxide, as well as advanced aerosol and cloud water chemistry analyses. A vertically pointing Doppler LiDAR and microwave radiometer characterize boundary layer dynamics, while automated precipitation and snowpack instruments track hydrologic and cryospheric change. These observations are complemented by regional meteorological stations, a network of research-grade atmospheric sampling platforms. Today, Whiteface is positioned to address emerging environmental challenges such as wildfire smoke transport, greenhouse gas variability, and the sensitivity of high-elevation ecosystems to climate change. Its unique continuity of observations and expanding suite of measurement technologies make it one of the few places in the Northeast capable of linking atmospheric processes to ecological and human outcomes across timescales. This presentation will highlight major findings from five decades of monitoring, introduce ongoing collaborations, and outline future directions for sustaining high-elevation environmental science in a rapidly changing climate.

Track 1D: History and Cultural Heritage ***Williams Family Room***

1D-1: Local Untold Stories for the 250th

Angie Grove, Ethan Allen Homestead Museum. Additional Authors: Glenn Fay, Daniel Cole, Zachary Bennett, Andrew Chesnut, Maddie Baum, Rich Rushlow, Carol Harris-Shapiro

You've heard of Ethan Allen, but have you heard of Martha Powell? William Marsh? Newport? Fanny Buchanan? Joseph Gill? Behind every famous name from the Revolution are dozens of other stories. Volunteers and staff at the Ethan Allen Homestead Museum researched previously untold stories of how the Revolution affected a variety of people affiliated with the Homestead land along the Winooski River and Lake Champlain. In turn, this research became the inspiration for new art pieces by local artists, now featured in a new public exhibit, "Voices of the Revolution". This presentation will feature some of these untold stories and some of the challenges and joys of historical research of "untold stories".

1D-2: Underwater Archaeology of the American Revolution on Lake Champlain

Christopher Sabick, Lake Champlain Maritime Museum

Lake Champlain played a vital role in the early years of the American Revolution and while we have an extensive historical record of these events, archaeological research has added tremendously to the depth and fullness of our understanding of these pivotal moments. This presentation will discuss previous, current, and future underwater archaeological investigations into the American Revolution on Lake Champlain and how that research is helping to reinforce, refute, or refine our understanding of the past and the people that experienced it first hand.

1D-3: Underwater Cultural Resource Management: Preservation Practices and Marine Energy Infrastructure Development

Paul Willard Gates, Lake Champlain Maritime Museum. Additional Authors: Taylor Picard

For the past three years, the Archaeology Department at the Lake Champlain Maritime Museum worked with stakeholders on the Champlain Hudson Power Express Project. Known by the acronym "CHPE," the endeavor is the result of planning by New York state to reach its renewable energy goals for 2030. The project runs from the U.S.-Canadian border, south through Lake Champlain, along and under the Hudson River, under the Harlem River, and finally to a converter station in Astoria, Queens, New York. As part of Federal and State regulations such as Section 106 of the National Historic Preservation Act, the Archaeology Department worked with the CHPE project in underwater cultural resource management of shipwrecks and historic infrastructure located along the CHPE submarine power cable transmission line in Lake Champlain. The goal of this presentation is to review the Archaeology Department's best practices in preservation of the submerged cultural resources located along the CHPE marine route survey. A summary of the work done in accordance with state and federal regulations will be described. The methods we use as stewards of Lake Champlain to investigate, research, document, analyze, plan, and if needed, mitigate for the protection of cultural resources will be reviewed. More importantly, we will illustrate how our work assists in determining if underwater cultural resources are potentially eligible for nomination to the National Register of Historic Places and State Registers of Historic sites. We will also demonstrate how the Archaeology Department engages with our local community and broader audience through education, professional conferences, and discussion.

1:15pm – 2:30pm: **Concurrent Session #2**

Track 2A: Winter Nutrient Dynamics ***Grand Maple Ballroom***

2A-1: Winter's influence on seasonal nutrient cycling in agricultural and forested sites

Madeline Winer, University of Vermont. Additional Authors: Carol Adair, Andrew Schroth, Max Landsman-Gerjoi, Megan Duffy

Water quality impairment in Lake Champlain requires that land owners and managers throughout the basin take appropriate mitigative action on their land, including forest land owners. The Lake Champlain Basin is approximately 66 percent forested with roughly 80 percent of that land in private ownership. Forested lands are more common in headwater locations that are spatially removed from the lake. This study therefore seeks to understand the level of concern for lake water quality and the engagement of forest landowners in the management practices occurring on their land that might mitigate impairment in downstream water bodies. The study collected 19 landowner interviews during the summer of 2019 and fall of 2020 using a semi-structured interview approach. The interviews were coded and analyzed using NVivo software. Findings suggest that landowners interviewed are not generally aware that while sedimentation from forest management activities is undesirable, coarse woody debris is a beneficial byproduct that can enhance soil and water and habitat. These findings suggest a clear need for landowner education activities that clearly address the difference between these two potential forest management impacts and what forest landowners can do to manage their harvesting activities in ways that benefit forest health without compromising downstream water quality.

2A-2: A comparative analysis of nutrient export dynamics during winter high flow events in characteristic watersheds of the Lake Champlain Basin

Sonya Vogel, Lake Champlain Basin Program. Additional Authors: Andrew Schroth, Carol Adair, Megan Duffy, Meghan Taylor, Saul Blocher, Satish Serchan

2A-3: Event-level end member mixing analysis reveals divergent patterns of soil-stream connectivity during mid-winter runoff events between three catchments in the Lake Champlain Basin

Dr. Megan Duffy, University of Vermont. Additional Authors: Sonya Vogel, Andrew Schroth, E. Carol Adair

Changes in catchment hydrologic flowpaths impact the timing, magnitude, and geochemistry of runoff during melt events, yet the impact of changing winter conditions on flowpath routing is unknown. More frequent and intense rain-on-snow events and mid-winter thermal thaws, as well as thinner and inconsistent snowpack that could increase soil frost depth, are projected for the northeastern USA. Particularly across land use/land cover regimes, it is critical to understand how warming winters mobilize water and nutrients in order to manage and predict water quality. In this study, we explored three complementary high-resolution approaches to investigate water and nutrient evolution during different types of winter runoff events: in situ stream measurements of nutrients, measurements of soil nutrient availability, and event-level end-member mixing analysis (EMMA) to determine sub-daily source contributions to streamflow during individual mid-winter to spring melt events at three low-order

streams – one forested, one agricultural, and one suburban – in the Lake Champlain Basin for the winters of 2023, 2024, and 2025. We found that soil available nitrate, phosphate, and ammonium were present throughout each winter for transport, comparable to the growing season. For all runoff events, streamwater was best described by three end-member sources: groundwater, snowmelt, and soil water mixtures from dry and wet catchment transects. The winters of 2023 and 2024 were relatively wet and warm in the Lake Champlain Basin, with runoff events beginning in January. In contrast, the winter of 2025 was colder, had more consistent snowpack, and was without runoff events until late February. In all three catchments, event-level EMMAs reveal that streamflow during winters 2023 and 2024 rapidly responded to runoff events and successional meltwater and soil water pulses. In contrast, the colder winter of 2025 had slower responses during runoff events, with meltwater and soil water pulses overall contributing less to streamflow than during warmer, wetter winters. Such event-level views into flowpath dynamics are critical for understanding and predicting winter's changing role in nutrient cycling and export in the Lake Champlain basin.

2A-4: Winter nutrient and suspended solid transport in the LaPlatte River

Dr. Cayton J. Williams, Saint Michael's College. Additional Authors: Alexi Roux, Jarret Muzzy, Zoe Devine

Our project explored how different winter rain, snow, and snow melt weather events impacted the water quality and the erosion of soil into the La Platte River, which is one of Lake Champlain's direct drainages into Shelburne Bay. This study hoped to fill knowledge gaps around nutrient and suspended solid transport during winter and changing winters, which could shift nutrient loadings to the lake. From November 2024 through July 2025, we sampled the La Platte River (Vermont, USA) once every two weeks and more frequently when a weather event caused higher flows in the river. Four locations from downstream to upstream on the main branch of the La Platte River were sampled regularly with a fifth river branch sample more intermittently. Temperature and level loggers were placed at the main branch sites, and stage and discharge data were collected from the USGS Shelburne Falls gauging station. Preliminary analysis suggests that suspended solid levels were similar throughout the main branch of the river system. Winter suspended solid levels relative to river stage did not appear distinctly different from the other seasons. However, the winter during our sampling year was considered a traditional Vermont winter with few rain-on-snow events and little mid-winter snow melt. These weather conditions likely influenced our main finding as the ground remained frozen for the winter period and the river was iced over for several months. In addition, late fall, winter, and spring river conditions proved particularly challenging when attempting measure stream discharging using wading rod methods. Streams generally were not safe to enter and winter flow-depth rating curves could not be built. We are still working to better explore the data to see if more subtle patterns in suspended solid and nutrient transport occurred around high and low flow events.

Track 2B: Assessment and Monitoring for AIS Impacts ***Jost Foundation Room***

2B-1: Hydroacoustic assessment of pelagic forage fishes in Lake Champlain during and after alewife invasion

Amelia McReynolds, University of Vermont. Additional Authors: Bernie Pientka, Lars Rudstam, Ellen Marsden, Jason Stockwell

Small-bodied pelagic prey species (forage fish) play an important role in the food webs of large lakes – they serve as an energy conduit from lower to higher trophic levels. Assessments of forage fish populations inform sustainable rates of piscivore stocking and harvest and provide early warning signs of potential fishery decline. In Lake Champlain, native rainbow smelt (*Osmerus mordax*) dominated the coldwater pelagic forage base until 2003, when alewife (*Alosa pseudoharengus*) invaded. From 2005-2015, a hydroacoustic and midwater trawl survey of pelagic forage fishes was conducted annually in the three major lake basins. From 2015-2025, forage fish were sampled during a bottom trawl survey targeting juvenile lake trout; standardized sites and effort were implemented in 2024. Concerns about the lake's predator-prey balance have grown following increased wild recruitment of lake trout (*Salvelinus namaycush*), continued stocking of Atlantic salmon (*Salmo salar*), and declining salmonid condition factor. To gain a forage fish abundance estimate that is directly comparable to the 2005-2015 surveys, we repeated the acoustic and midwater trawl survey in 2024 (in the Main Lake basin) and 2025 (in the whole lake). Hydroacoustic data were processed using standard procedures used in the Great Lakes to generate annual estimates of alewife and rainbow smelt abundance. The 2005-2015 surveys captured declines in rainbow smelt and increases in alewife in the shallower basins of the lake (Malletts Bay and the Inland Sea). The 2024-25 surveys indicated that alewife continued to dominate the forage base in Malletts Bay and the Inland Sea, while the Main Lake basin contains a more equal proportion of alewife and rainbow smelt. Future work will

determine relationships between forage fish and piscivore indices to identify relevant management targets, aiding in the development of a long-term survey of forage fish in Lake Champlain.

2B-2: Forecasting Aquatic Invasions in the Lake Champlain Basin: Integrating eDNA with Spatial Risk Models for Early Detection and Management

Richard Ross Shaker, SUNY College of Environmental Science and Forestry

Aquatic invasive species (AIS) increasingly pose substantial ecological, economic, and social threats to the Lake Champlain Basin (LCB). Current AIS detection and management methods remain logistically complex, economically demanding, and insufficiently sensitive, highlighting a critical need for more effective monitoring technologies and improved predictive tools. In the proposed research, we will rigorously evaluate the efficacy and operational feasibility of passive environmental DNA (eDNA) sampling methods relative to conventional eDNA sampling and traditional field surveys. Additionally, we will employ spatially explicit predictive models to forecast AIS invasion risks across the LCB. Specifically, this research will answer three research questions (RQ): RQ.1: Does passive eDNA water sampling improve detection sensitivity or efficiency compared to conventional eDNA sampling techniques? RQ.2: How do results from passive and conventional eDNA sampling compare to traditional field-based (in situ) AIS survey methods? RQ.3: How well do lake-landscape models predicting AIS in the Adirondack region transfer across all Lake Champlain Basin waterbodies? Employing an integrated approach, this research will engage and support environmental resource managers, policymakers, local communities, and lake associations in their battle against harmful AIS. In doing so, this applied study will provide actionable, science-based decision-support tools that will benefit all people equally across the study area. The main outcomes of this study are: 1) improved understanding of eDNA use and benefits in applied AIS monitoring and management; and 2) a predictive assessment of future AIS risk across all LCB waterways. Other anticipated outcomes include enhanced detection sensitivity of AIS, cost-efficient monitoring protocols, management prioritization strategies, improved water quality, stronger biodiversity protection, and reduced economic impacts from invasive species. The proposed aligns explicitly with Lake Champlain Sea Grant Strategic Plan Goals: protecting and restoring healthy ecosystems (Goal 3), utilizing science-based management strategies (Goal 4), and fostering resilient communities and economies (Goal 7). The research will cultivate lasting and meaningful partnerships and deliver clear human-environmental system improvements by ensuring broad accessibility and usability of results for informed environmental management and policy decisions.

2B-3: AIS Early Detection Monitoring – Annual Environmental DNA (eDNA) Monitoring in Lake Champlain and its Gateways

Laurie Earley, US Fish and Wildlife Service. Additional Authors: Steve Smith, Dylan Jennison, Aaron Maloy

Lake Champlain is uniquely positioned, connecting to both the Hudson River watershed and New York State Canal System (and ultimately the Great Lakes) through the Champlain Canal to the south and the St. Lawrence River watershed via the Richelieu River to the north. Lake Champlain is home to 51 established non-native or invasive species that have entered either through one of these pathways or through accidental or intentional introduction. Existing dams, locks, less frequent trans-basin boat travel, and public awareness have slowed the spread of aquatic invasive species (AIS) into Lake Champlain, relative to the Great Lakes, but it has not been eliminated. Currently, Round Goby (*Neogobius melanostomus*) is one of the AIS of greatest concern. Now present in both bordering watersheds, early detection and monitoring have become a high priority for resource managers. While Round Goby represents the latest AIS threatening Lake Champlain, other threats are present. For these reasons, the U.S. Fish and Wildlife Service (USFWS), in coordination with the Lake Champlain Rapid Response Task force, began annual environmental DNA (eDNA) collection to maintain awareness of species presence and progressive distribution to enhance our ability to respond rapidly and effectively. From 2022-2025, eDNA samples were collected throughout Lake Champlain proper and the Champlain Canal. In 2022, samples were also collected in Québec. Approximately 80 samples are collected annually and analyzed using metabarcoding at the USFWS Northeast Fisheries Center. Metabarcoding provides an assessment of the broader fish community (84 species) based on the presence of DNA in a water sample, thus providing data on the native community along with potential AIS threats. The major advantages of metabarcoding are that no prior knowledge of AIS identity is needed and that dozens of AIS can be monitored simultaneously. This presentation will provide a summary of these efforts and highlight the importance of continued monitoring.

Track 2C: Wetlands ***Chittenden Bank Room***

2C-1: Field-based estimates of net phosphorus balance in restored, riparian wetlands on former agricultural land

Tiffany Chin, University of Vermont. Additional Authors: Rebecca Diehl, Kristen Underwood, Xia Gillespie, Laura O'Brien, Eric Roy

Excess phosphorus (P) in the Lake Champlain watershed has led to declining water quality and frequent cyanobacteria blooms. A reduction in P runoff to the lake is mandated by a Total Maximum Daily Load (TMDL), and wetland restoration is a nature-based solution used to retain P in the watershed. Many riparian wetlands in Vermont were historically converted to farmland, and much of the land suitable for wetland restoration contains legacy soil P from past manure and fertilizer applications. As such, it is important to assess both trapping of particulate P and release of dissolved P from soils. We monitored water quality during flood events on five restored, riparian wetlands on formerly farmed land from 2022-2024, including the July 2023 flood. Water grab samples were collected from wetlands and adjacent rivers on the rising and falling limbs of flood events and analyzed for TP, SRP, and TSS. Water quality data were combined with measurements of annual surface accretion, soil characterization, and high frequency dissolved oxygen and water level measurements. Results suggest net P retention at all monitoring sites, primarily driven by particulate P capture. Subwatershed-level differences were observed in soluble reactive phosphorus (SRP) gains/losses. Our findings can be used to inform future wetland restoration projects and watershed management planning in the region.

2C-2: Relative contributions of different size flood events to modeled net phosphorus balance on restored, riparian wetlands

Dr. Eric Roy, University of Vermont. Additional Authors: Tiffany Chin, Rebecca Diehl, Kristen Underwood, Adrian Wiegman, Harrison Myers, Julianne Scamardo, Xia Gillespie, Laura O'Brien

In the northeastern US, timing and magnitude of flood events have changed in recent decades, as warmer and wetter conditions result in earlier and more frequent snowmelt and larger summer rain events. To understand the influence of flood events of different magnitudes on the overall function of restored wetlands as net sinks or sources of P, we estimated net P balance (TP, DIP, particulate P) on an annual basis and over individual flood events at five wetland sites in two subwatersheds of Lake Champlain using two years of field monitoring data and a two-year process-based model simulation using “wetlandP”. All model scenarios indicate net TP retention at all five sites, ranging from 0.11 to 2.15 g-P m-2 yr-1. Net DIP loss was estimated during the largest flood events (>1.5m peak water depth) at all sites where they were observed. Site-specific properties seem to control outcomes when flood magnitudes are low (<1m), but outcomes are similar across sites during the largest events. At all sites, modeled net TP retention is driven by particulate P retention. These findings help clarify drivers of riparian wetland function under different flood conditions and site characteristics, and they will inform location and design considerations of wetland restoration projects where net TP retention is the primary metric of success.

Track 2D: Community Engagement – Part 1 ***Adirondack D Classroom***

2D-1: Late Night for the Planet! The power of comedy and entertainment in community engagement around Lake Champlain

Dr. Curt Gervich, SUNY Plattsburgh Center for Earth and Environmental Science. Additional Authors: Kaiser Beckford, Alexandra Baker, Lillian Gilroy, Taygin Jump, Eli Lincoln-Robbins, Dean Parmelee, Madelynne Solan

Late Night for the Planet is the Lake Champlain Basin’s one and only, premier, and top rated-talk/game show about regional environmental and social justice issues. Now in its seventh season of live performances and streaming on YouTube, the show breaks down barriers to community engagement by bringing science education to the public in a new format: at a bar, with live music, interviews and audience participation games. LN4TP is produced by SUNY Plattsburgh faculty and students, and is funded by an education and outreach grant from the Lake Champlain Basin Program. The objectives of the project are to raise awareness about regional environmental and social justice challenges and assets; celebrate the individuals working to solve, protect and enhance environmental problems and resources in the region; and build community through laughter. It is modeled after National Public Radio’s Wait, Wait Don’t Tell Me and takes place at Olive Ridley’s Bistro in Plattsburgh on the second Wednesday of each month from 7:30-9pm (during the academic year). Recently the show has begun touring, performing tailored shows at Paul Smith’s College, The Wild Center’s Youth Climate Summit, and Planet Forward’s Storyfest in Washington D.C. This presentation will describe the development and evolution of the project and present data measuring the impact of the show over the past several seasons. We will discuss lessons learned about

transformative media, community engagement, the role of the project in building community in Plattsburgh, and how we plan to build on the momentum of the show to advance environmental progress in the region.

2D-2: Wool and Water: Communicating Science through the Arts

Dr. Michale Glennon, Paul Smith's College Adirondack Watershed Institute

Wool and Water is a collaborative data art project that merges fiber art with scientific information to communicate the stories and challenges of our waterways. Originally developed to celebrate the 50th anniversary of the Clean Water Act in 2022, the project highlights the enduring legacy of clean water protection in the Adirondacks, the Lake Champlain Basin, and beyond. Through knitting, crochet, weaving, and other fiber arts, Wool and Water transforms watershed science into accessible, visually engaging works that inspire awareness and stewardship. The exhibition features more than 70 fiber artworks by more than 30 artists and makers illustrating topics such as lake stratification and turnover, pollutants, invasive species, climate change, and road salt contamination—key research and monitoring themes of the Adirondack Watershed Institute (AWI) and the Lake Champlain Basin Program (LCBP). A project of Paul Smith's College Adirondack Watershed Institute, Wool and Water has been supported by the Lake Champlain Basin Program, the Champlain Valley National Heritage Partnership, Northern New York Audubon, and the New York State Council on the Arts. The exhibit and its associated activities engage residents and visitors in scientific learning about water quality through both physical displays and digital platforms. Project outputs include a traveling exhibit, a companion website, and a social survey examining the role of participatory environmental art in promoting continued learning and behavior change. An associated "Watershed Action Card" highlights best practices for water protection and encourages tangible stewardship actions. Outcomes from Wool and Water demonstrate that art can serve as an effective bridge between science and community, increasing public understanding of watershed issues, strengthening appreciation for regional water resources, and motivating citizens to adopt more lake- and watershed-friendly behaviors.

2D-3: R/V Marcelle Melosira: A Platform for Research and Outreach on Lake Champlain

Eleanor Duva, University of Vermont. Additional Authors: Ashley Eaton, Taylor Resnick

This presentation will highlight the capabilities of the R/V Marcelle Melosira as a research tool and platform for education and outreach on Lake Champlain. In July 2023, the University of Vermont (UVM) welcomed Research Vessel (R/V) Marcelle Melosira to the waters of Lake Champlain. R/V Marcelle Melosira is a 64-foot catamaran equipped with a hybrid electric-diesel propulsion system. The vessel is a valuable new resource for research and education taking place on Lake Champlain. The hybrid propulsion system means that the vessel can operate in electric mode, drawing from lithium battery packs, for up to three hours. R/V Marcelle Melosira is equipped with on-board equipment to facilitate research activities, such as a hydraulic A-frame, two trawl winches, a rosette sampler, and a center winch capable of live data transmission. The vessel's ability to operate quietly in electric mode also presents opportunities for new research questions. In addition to research, the Marcelle was designed to facilitate education and outreach with an open and modular classroom space and a passenger capacity of 32 persons. Since July 2023, nearly 6000 people have experienced Lake Champlain from the Marcelle Melosira. Many of these passengers were Vermont K-12 students participating in hands-on environmental science programming with Lake Champlain SeaGrant. Other groups included laboratory sessions for UVM students and community outreach events such as birding trips.

2D-4: Uniting for Clean Waters: A Community Coalition Approach to a Foam-Free Lake Champlain Basin

Dr. Aude Lochet, Lake Champlain Sea Grant at SUNY Plattsburgh. Additional Authors: Kris Stepenuck, Julie Silverman, Ashley Sullivan, Lindsey Cookson, Nicole Chochrek, Mike O'Brien, Chris Navitsky, Anne Jefferson

Marine debris often accumulates along the shorelines of Lake Champlain and Lake George. Defined as human-made material ending up as trash in our waterways, marine debris can impact the environment, human health, and the economy of our region. Polystyrene foam is a common type of marine debris on our shorelines and is a form of plastic pollution. Despite recent regulations in both New York and Vermont, plastic foam products are still used for boating and fishing, construction, shipping, and packaging, remaining a potential source of water pollution. Since 2024, six organizations in the basin – Lake Champlain Sea Grant, Conservation Law Foundation, Rozalia Project, Lake Champlain Committee, Vermont Boat and Marine Association, Lake George Association - have formed the Lake Champlain Basin marine debris coalition. Its goals are to raise public awareness and cut down on marine debris, especially plastic foam, in Lake Champlain, Lake George, and the rivers and streams that flow into these waterbodies. Like other forms of plastic pollution, plastic foam never goes away, breaks up into microplastics

that are nearly impossible to clean up, and can leach toxic chemicals. This presentation will discuss the Coalition's efforts towards a foam-free Lake Champlain basin through community cleanups, youth education programming, and support to lakeshore businesses and residents. The presentation will also report key results of surveys to lakeshore businesses and residents to understand their use of foam-based products and their willingness to switch to foam-free alternatives.

2:45pm – 4:00pm: **Concurrent Session #3**

Track 3A: Impacts of De-Icing Salt ***Grand Maple Ballroom***

3A-1: Investigating landscape-level drivers of road salt pollution on lakes within the Lake Champlain Basin

Mikala L'Hote, Dartmouth College. Additional Author: Brendan Wiltse

Historically, road salt (NaCl) has been relied on as a winter road management tool, providing safe and accessible roadways to the public for decades. Although an effective deicer, road salt has increasingly been recognized as an emerging pollutant throughout regions of the Midwest and Northeast United States due to its observed environmental impacts. Centered in the Lake Champlain Basin, this research investigates impacts of road salt by drawing connections between in-lake water quality measurements and watershed scale geospatial variables. Exploratory methods and modeling techniques, including multilinear regression analysis, were employed to address whether dominant land use, road type, road density, soil hydrology, elevation, climate normals, and/or state jurisdiction are able to help identify waterbodies at high risk of salinization due to road salt pollution. Addressing road salt impacts across jurisdictional boundaries can provide further insight to differences in road salt application practices and assist in the targeted implementation of salt reduction and best management practices.

3A-2: Chloride Concentrations and Loads in Lake Champlain Basin Streams Across an Urbanization Gradient

Molly Costanza-Robsinson, Middlebury College. Additional Authors: Isabella Infosino and Eric Moody

Winter deicing practices are a growing source of chloride contamination in the Lake Champlain Basin, threatening aquatic biodiversity. While chloride concentrations are routinely monitored, quantifying how much salt actually flows from urban streams into the lake remains a key data gap. This study uses high-frequency sensor data (specific conductance and stage), grab-sample data (chloride concentrations), and preliminary rating curves from six Vermont streams located across an urbanization gradient to estimate chloride fluxes and assess temporal patterns in chloride transport. Site-specific relationships between lab-measured chloride concentrations in grab samples and field-measured specific conductance were developed and applied to 10-minute interval sensor data to generate continuous chloride concentration and load estimates. Chloride flux was then evaluated across streams and time frames to assess the influence of land use. Preliminary analysis of the most urbanized watershed (CATA) suggests that as much as ~970 metric tons of chloride, equivalent to roughly 1,600 metric tons of road salt (NaCl), may be exported annually. These findings highlight the potential magnitude of road-salt inputs to Lake Champlain and underscore the importance of continued monitoring and management to mitigate long-term salinization of urban watersheds.

3A-3: Understanding Chittenden County Road Salting to Inform Future Outreach

Dr. Kris Stepenuck, University of Vermont. Additional Author: Dana Allen

Over the past 15 years, chloride has been identified as an emerging contaminant in the Lake Champlain basin. Chloride concentrations are increasing in Lake Champlain and its tributaries. The presence of chloride in surface waters is commonly attributed to the use of chloride-based products such as sodium chloride (i.e., road salt) during winter snow and ice management. As of 2022, Vermont has listed seven stream segments as impaired due to chloride. All of these streams flow within Chittenden County, Vermont, which is the most urbanized area of the state. Fortunately, there are sustainable salting practices that, if employed, can reduce use of salt significantly, benefiting not only the environment, but also infrastructure and community budgets by saving on salt costs. To best be able to offer education about sustainable salting practices, we must first understand what practices are currently in use and the barriers and motivations communities face to adopting such practices. During this presentation we will share results of interviews with Chittenden County highway foremen about their road salting practices, introduce a variety of sustainable practices and the level of their use in these communities, and share recommendations for future outreach to encourage further adoption of sustainable salting practices.

3A-4: Stormwater improvements and salt reduction alter chloride dynamics and mixing in Mirror Lake, NY

Lija Treibergs, Paul Smith's College Adirondack Watershed Institute. Additional Authors: Bobby Clark, Joline Hall, Connor Vara, Brenden Wiltse, Hanna Wood, Elizabeth Yerger

Mirror Lake, located in the Village of Lake Placid (NY), has one of the most developed watersheds in the New York portion of the Lake Champlain Basin and has been a focus of road salt research in the region due to the unique impacts of salt runoff on the lake's mixing regime. Stormwater with chloride concentrations up to 10,000 mg/l, discharges directly to the lake, creating a late winter chloride gradient that can reduce spring mixing. Between 2019 and 2023, the Village implemented a series of salt reduction strategies including reduced application rates, operational changes in winter maintenance, and major stormwater infrastructure upgrades, including installing underground retention basins designed to promote infiltration and reduce direct salt inputs. To assess the impact of these strategies, long-term monitoring data from Mirror Lake were analyzed, comparing pre-improvement (2017–2019) and post-improvement (2023–2025) conditions. Results show declines in total chloride retention, surface chloride concentrations, and peak winter bottom-water chloride, leading to a weakening of the late-winter chloride gradient. Despite these reductions, the lake did not fully mix in 2023. Complete mixing occurred in 2024, while 2025 exhibited a weak but persistent spring chloride gradient. These findings highlight the success of salt reduction efforts for chloride retention but also suggest that the recovery of natural mixing dynamics may be gradual and sensitive to even reduced salt inputs.

Track 3B: AIS: Round Goby ***Jost Foundation Room***

3B-1: Modeling the Predicted Distribution of the Invasive Round Goby in Lake Champlain

Kyle Grasso, University of Vermont, Vermont Cooperative Fish and Wildlife Research Institute. Additional Authors: Peter Esselman, Ellen Marsden, Mark Henderson

The round goby (*Neogobius melanostomus),* a small benthic fish native to the Ponto-Caspian region, has become one of the most widespread and problematic invasive fishes in North America and in parts of Europe outside its native range. Introduced to the Great Lakes watershed via ballast water from commercial shipping vessels, the species was first detected in the St. Clair River in 1990. In the Great Lakes, the round goby has been shown to outcompete native species for resources, consume the eggs and fry of native fishes, transmit diseases, and alter food webs. Following establishment throughout the Great Lakes, the species has spread inland through tributaries and canals and now threatens to invade Lake Champlain via the Richelieu River north of the lake and the Champlain Canal to the south. Lake Champlain managers need tools to prepare for this potential invasion and address possible ecological impacts. This project will apply an ensemble species distribution modeling approach, using occurrence data from Lakes Ontario, Huron, and Michigan, to predict the areas within Lake Champlain most likely to support round goby establishment in the event of an invasion. The resulting models will inform management strategies, enhance early detection efforts, and improve understanding of the environmental factors influencing round goby distributions across their current range in the United States.

3B-2: The Marathon to Prevent Round Goby Introduction and Spread

Meg Modley, Lake Champlain Basin Program/NEIWPCC. Additional Authors: QC MENV, VTFWD, VTDEC, NYSDEC, NYPA/Canals, USFWS, USGS

Round goby was first detected in the Hudson/Mohawk River system in 2021 and since then a collaboration of multiple state, federal, and local partners have been working to prevent the species movement north through the Champlain Canal to Lake Champlain. Similarly, the species has been detected in the St. Lawrence and Richelieu Rivers and collaboration with the QC Ministry of Environment and Parcs Canada has been underway to track round goby movement through the system and address spread through the Chambly Canal. Learn about the most recent efforts to support early detection and prevention of round goby introduction to Lake Champlain and possible mitigation measures that could prevent movement through the canals.

3B-3: Triggering Action with eDNA: Early Detection and Management of Invasive Round Goby in the Champlain Canal

Steven H. Pearson, New York State Department of Environmental Conservation. Additional Authors: Hannah Fiebboll, Kate Littreal

Environmental DNA (eDNA) sampling serves as a powerful tool for the early detection of newly introduced taxa. During its eastward expansion through the Erie Canal System, invasive round goby DNA was detected at sites up to four years before individuals were captured using traditional sampling methods. Leveraging this sensitivity, eDNA sampling is now being employed alongside traditional methods to monitor the upstream expansion of round goby in the Upper Hudson River as part of a Rapid Response Plan aimed at mitigating its spread through the Champlain Canal System in New York State. The Rapid Response Plan outlines an adaptive strategy integrating prevention, early detection, and rapid response actions that respond to changes in round goby distribution. Results from eDNA and traditional monitoring are used to guide management activities, particularly those concerning operation of the Champlain Canal lock system. Management actions, such as flushing the downstream side of lock gates prior to opening for boat traffic or scheduled lockages, are designed to reduce the likelihood of upstream round goby dispersal towards Lake Champlain via the Canal. Together, these efforts demonstrate how eDNA monitoring can be embedded within adaptive management frameworks to enhance early detection and containment of aquatic invasive species across connected waterways.

3B-4: Status of Round Goby in Eastern North America: Implications for Lake Champlain

Scott George, U.S. Geological Survey, New York Water Science Center

Invasive round goby (*Neogobius melanostomus*) have advanced eastward through New York and Quebec over the past two decades and now threaten to reach Lake Champlain from the north and south. This presentation describes monitoring efforts funded by the Lake Champlain Basin Program to track the distribution of round goby on the southern approach to Lake Champlain via the Hudson River/Champlain Canal system. Monitoring relied heavily on environmental DNA (eDNA), as well as physical capture methods including near-shore backpack electrofishing and benthic trawling. Viral hemorrhagic septicemia virus (VHSV) testing was also conducted to determine if the invasion front was carrying this high-profile fish pathogen. This presentation will cover results from the 2022-2025 field seasons and discuss the challenges of interpreting molecular data and physical capture data together.

Track 3C: Developed Lands ***Chittenden Bank Room***

3C-1: Building Resilience, A Rain Garden's Post-Flood Story (Video)

Jill Sarazen, Lake Champlain Sea Grant

The video was made in partnership with Peregrine Productions, EcoLibrium, EastRise Credit Union, and Lake Champlain Basin Program.

3C-2: Rain Barrel Water Reuse: Summary of Research and Recommendations (Lightning Talk)

Morgan McKean, Lake Champlain Sea Grant. Additional Author: Jill Sarazen

Across Vermont and the Lake Champlain Basin, rain barrels are promoted as low-cost tools for stormwater management and household water conservation. However, questions remain about the safety of reusing rainwater that has come into contact with rooftops and collection systems. To address these concerns, Lake Champlain Sea Grant developed a white paper synthesizing findings from peer-reviewed studies and Cooperative Extension "fact sheets" to provide clear, science-based guidance for technical service providers and the public.

Our literature review examined national and international research on microbial and chemical contaminants in harvested rainwater, as well as university extension recommendations for best management practices (BMPs). A consistent finding across studies is that rain barrel water should be used for non-potable purposes only. Frequent detection of E. coli, coliform bacteria, and trace metals such as zinc and lead underscores the importance of avoiding contact with edible plant surfaces and limiting use to soil-level irrigation, lawn watering, and cleaning tools. Roof material and system maintenance emerged as key factors influencing water quality. Metal and tile roofs tend to yield cleaner water than shingle or organic roofs, but no system is risk-free. Routine cleaning, first-flush diverters, mesh screening, and clear labeling are widely recommended to reduce contamination. Recent field studies demonstrate that when these BMPs are implemented— especially through proper overflow routing and seasonal maintenance— rain barrels can safely support non-potable garden and landscape irrigation while reducing runoff and promoting infiltration. By comparing findings from primary research with public guidance documents, this project bridges the gap between laboratory science and homeowner practice. The resulting synthesis supports Vermont communities in making informed choices about rainwater harvesting systems and aligns with broader regional goals for green infrastructure, stormwater mitigation, and watershed health in the Lake Champlain Basin.

3C-3: The Vermont Green Infrastructure Collaborative: Highlights from the past four years and developing new initiatives (Lightning Talk)

Jill Sarazen, Lake Champlain Sea Grant

The Green Infrastructure Collaborative aims to bridge the gap between research, extension, and application of green stormwater infrastructure across the state and the Lake Champlain Basin. In this presentation, I will explain a brief background on the history of how the position and partnerships have evolved, highlight recent accomplishments (i.e., development of guidance manuals and resources, GSI trainings) and outline plans to update the strategic plan in 2026 with input from the Vermont stormwater and green infrastructure community.

3C-4: Green Schools: Slowing the Flow

Ashley Eaton, University of Vermont, Lake Champlain Sea Grant

This session will discuss the Vermont Green Schools initiative, a project that Lake Champlain Sea Grant is partnering with the Vermont Department of Environmental Conservation and Greenprint Partners on to reduce stormwater runoff and pollution entering Lake Champlain via public school grounds. This initiative is providing funding and technical assistance to help public schools and state colleges meet the Three-Acre General Permit stormwater regulation. This session will include partners from DEC and K-12 student leaders as co-presenters.

Track 3D: Community Engagement – Part 2 ***Williams Family Room***

3D-1: Extending our Reach into the Community: Benefitting from Regional Partners (Lightning Talk)

Karen Bates, VT Department of Environmental Conservation Watershed Planning Program

Engaging regional partners in developing and implementing a communication plan helped to extend the range of outreach into a community about the tactical basin planning process and the plan. WID watershed planner developed a communication plan as part of the Northern Lake Champlain Direct Drainages with the assistance of regional partners. These partners include watershed groups, regional planning commissions and Natural Resource Conservation Districts. Performance was quantified and measured to determine the impact of regional partners efforts to send out Water Investment Division's Watershed Planning Program's (WPP) messaging. The regional partners distribution of WPP messaging is associated with a subsequent higher number of views on WPP Story Maps and Instagram than when they were not involved.

3D-2: Assessing and Educating about Flood Risks and Rebuilding Resilience: Empowering Vermont's Refugee and New American Community (Lightning Talk)

Alison Spasyk, University of Vermont. Additional Authors: Mona Tolba, Lesley-Ann Dupigny-Giroux, Kyungsun Lee, Kathryn Semmens, Kristine Stepenuck, Samantha Grant

Following the devastating floods of 2023, many refugee and New American families in Vermont witnessed damage to their homes, lost essential garden plots, and suffered significant financial hardships, highlighting the urgent need for targeted support and effective resilience strategies. This project, led by the Islamic Society of Vermont in partnership with the Thriving Earth Exchange and University of Vermont, aimed to strengthen community resilience through a co-developed flood preparedness and recovery workshop, translated materials, and shared resources. The initiative began with a focus group of flood-affected individuals to understand their experiences and identify what information they needed to be better prepared for future flooding. Key findings were that language barriers prevent timely and accessible emergency warnings and that community members needed guidance on how to prevent damage from flooding at home. To help address this, the project team organized a flood resilience workshop that taught participants where to access emergency alerts, practical steps for preventing flood damage at home, and safe cleanup practices to prevent mold growth after a flood. All resources and materials were translated to ensure accessibility. Grant funding also supported the purchase of flood recovery equipment, such as pumps, hoses, vacuums, and dehumidifiers, that can be shared among community members to assist in recovery and reduce financial hardship. By integrating community knowledge, scientific expertise, and culturally responsive engagement, this project created a replicable model for other cultural communities. The participatory workshop approach can also be adapted to address other natural hazard threats, ensuring that residents are not only informed but actively engaged in developing their own resilience strategies. Ultimately, this work demonstrates how centering community voices and language accessibility can close critical communication

gaps, empower residents, and build lasting capacity for preparedness and recovery. This presentation will summarize key highlights of the process to inform others interested in replicating the approach.

3D-3: Engaging Real Estate Professionals in Conservation Topics (Lightning Talk)

Michelle Lockhart, Lake Champlain Sea Grant

It's beneficial to target real estate professionals across the Lake Champlain Basin for engagement with conservation topics. We've partnered with VT DEC staff to build workshops on topics like Shoreland Protection Act, Onsite Wastewater Systems, and Wetland Identification etc. This talk will cover how we structure workshops to increase engagement and participation and how these programs benefit real estate professionals.

3D-4: Sketching Science: Using Student Drawings to Measure Watershed Literacy (Lightning Talk)

Alison Spasyk, University of Vermont. Additional Author: Dr. Kristine Stepenuck

The watershed concept provides a unique instructional tool to teach students about the complex interactions between humans, water, and the environment, and requires the application of knowledge and skills from many different subjects. Watershed education initiatives can take many forms, but the common theme is learning about watershed science and exploring issues such as water quality or land-use impacts. One long-running example of watershed education is the Lake Champlain Sea Grant's Watershed Alliance, which aims to increase awareness and knowledge of watershed issues in youth throughout the Lake Champlain Basin. This study investigates changes in watershed literacy among participants of the Steam Monitoring and Stewardship Program using a novel pre- and post-test design, which included a drawing-based assessment and short-answer questions. Overall, students made significant improvements in their understanding of the watershed concept, regional watershed knowledge, hydrologic connectivity, stormwater runoff, human impact to watersheds, and stewardship actions. The results of this study demonstrate the feasibility of using student drawings to assess learning outcomes and support the use of scoring rubrics as a reliable tool for assessing drawings and short-answer questions in a pre- and post-test manner. Additionally, this study demonstrates that the watershed literacy framework provides a valuable model for evaluating watershed education programs that include both knowledge- and stewardship-based competencies.

3D-5: Climate Collages (Activity)

Jasmine Persez, University of Vermont

Our climate is rapidly changing, and understanding the science behind it can feel confusing and overwhelming. In fact, the global challenge of climate change manifests in our own backyard here in the Lake Champlain basin. From the steady decline in winters where Lake Champlain freezes over, to the steady incline in global temperatures that warm Lake Champlain's water and encourage the proliferation of harmful algal blooms, these are just a few examples of many that exhibit the extreme importance of climate research. Ultimately, it is precisely this research that directly impacts the health of Lake Champlain, and other aquatic ecosystems all around the world. And yet, while climate research is full of vital information which directly affects our collective future, this critical knowledge often remains locked behind complex terminology, and financial paywalls, creating a barrier for many. The Climate Collage activity is designed to break down those barriers. It recognizes that everyone has a valuable perspective and the power to engage with this information creatively. Through the creation of collages, we encourage creative thinking and visual storytelling about the climate by integrating the intersection of science, storytelling, and visual art. Participants will be invited to freely create a collage, or follow a pre-determined prompt such as, "What does an environmentally just future look like?" Ultimately, this session will offer a space for researchers, educators, youth, and everyone in between to bridge the gap between science and art to ultimately convey a climate story. All art/collage materials will be sourced second-hand.

4:00pm – 5:00pm: **Poster Session 1** ***Livak Fireplace Lounge***

P1-01: Evaluating Volunteer Retention in a Vermont State Water Monitoring Program

Henry Motes, University of Vermont Rubenstein School of Environment and Natural Resources. Additional Author: Dr. Kristine Stepenuck

Participatory science programming can allow organizations to effectively engage in large-scale environmental data collection and conservation. Often times, organizations are reliant on the involvement of volunteers in orchestrating said programming. Despite the environmental and personal benefits often associated with involvement in participatory science, some organizations observe varied interannual or interseasonal retention rates amongst volunteer populations. Past work has identified factors correlated with volunteer retention, but these studies may not yield holistic pictures of factors that influence volunteer retention in Vermont. To better understand factors that influence volunteer retention in Vermont-based participatory science initiatives, to carry out this mixed-methods study, volunteers in watershed organizations working with the State of Vermont's LaRosa Stream and Tributary Monitoring Program were surveyed and interviewed. The survey aimed to identify general motivations of volunteers to participate in the LaRosa Program, and what barriers may exist to their continued involvement. Following the survey, 16 in-person interviews were carried out with select survey respondents. The interviews were conducted to develop a deeper understanding of how the personal beliefs of individuals impacted their willingness to volunteer, what barriers influenced their decision to stay involved, and to characterize how participants interact with the LaRosa Program. This presentation will present a summary of study findings, identifying primary motivations and barriers to volunteers' continued involvement in the LaRosa Program. This presentation will also highlight the implications of these findings, reflecting on the importance of programmatic, organizational, and individual characteristics in influencing volunteer retention. Finally, the presentation will make recommendations that may inform practices of other participatory science programs to increase retention of volunteer populations.

P1-02: Salty Water Sampling: Creating Place-Based Learning Opportunities for K12 Classrooms in the Lake Champlain Basin

Leif Goldie, Center for Earth and Environmental Science, SUNY Plattsburgh. Additional Authors: Nancy Price, Haylee Crowle, Mary Alldred

Chloride contamination from the application of road salt is an important management challenge within the Lake Champlain Basin. Our project builds place-based lesson plans that use real scientific methods and data to help middle- and high-school students connect human activities to the increase in chloride in watersheds. In our first project year we selected sites for routine monitoring, collected stream samples and developed a protocol to analyze them for chloride, and built lesson plans and chloride-measurement kits for deployment in local schools. We sampled the Saranac River weekly and the Little Chazy, Little Ausable, and Ausable Rivers biweekly as conditions allowed. Samples were analyzed for chloride concentration using a Vernier ® chloride ion probe. For each of these sites, we used discharge data from nearby USGS gauging stations to calculate total export of chloride for each sampling date. Our preliminary data support a link between the export of chloride from streams and the timing of road salt use and peak discharge. We also found differences in both chloride concentrations and total chloride export among streams. These data will be used to create a database that students, who may lack access or transportation to nearby streams, may query to test hypotheses about patterns of chloride contamination over space and time.

P1-03: BLUE BTV On-the-Ground Survey and Flyer Campaign

Michelle Lockhart, Lake Champlain Sea Grant

Results from on-the-ground mapping that was completed in the spring semester of 2025 highlighting which residential properties in the Combine Sewer System had stormwater infrastructure or stormwater shedding toward the street. Flyers were then distributed at 200 properties from the determined priority areas. This resulted in BLUE stormwater evaluation sign-ups and the installation of green stormwater infrastructure.

P1-04: UVM FieldLabs Core

Joshua Benes, University of Vermont Water Resources Institute. Additional Authors: Dr. Brendan Fisher, Lori Anderson, Tim Rademacher, Jess Wikle, Guy Roberts, Dar Gibson, Max Landsman-Gerjoi, Patrick Ewing, Alsion Adams, Sara Cahan

FieldLabs is a new Core Facility approved by UVM leadership in 2024. Its purpose is to enhance the accessibility and use of UVM's field sites, facilities, and long-term monitoring infrastructure for research, education, and stewardship. FieldLabs spotlights UVM's premier assemblage of over 3,200 acres of field sites, spanning from the top of Mount Mansfield to the depths of Lake Champlain. FieldLabs is positioned under the Water Resources Institute (WRI) within the Office of the Vice President for Research (OVPR). It uses a matrix organization model: it directly manages the UVM Natural Areas while supporting standardization and collaboration across all other university field sites.

P1-05: Evaluating Habitat Potential and Climate Change Impacts on Salmonoids Using the Ecosystem Diagnosis & Treatment (EDT) Model

Dr. Kim Brewitt, ICF. Additional Author: Laura McMullen

The Ecosystem Diagnosis & Treatment (EDT) model is a spatially explicit, habitat-based tool designed to evaluate the potential of freshwater and estuarine ecosystems to support salmonid populations. By simulating thousands of life history pathways shaped by species-specific movement, timing, and habitat use, EDT predicts population performance metrics aligned with NOAA's Viable Salmonid Population (VSP) framework—abundance, productivity, capacity, and diversity. EDT is a valuable tool for deepening understanding of factors limiting salmonid performance in watersheds and predicting benefits (or detriments) of different actions to populations of modeled species. Its outputs provide technical assistance in a variety of areas including watershed restoration and protection prioritization and planning, prioritization of culvert removals and repairs, evaluation of effects of alternate dam and reservoir management on ecosystems, and limiting factor analyses for anadromous salmonid species. The model's "splice" analysis capability can identify strongholds and limiting factors for species throughout their geography and assess what habitat components are most important under changing climate conditions. The EDT model has been successfully applied throughout the Pacific Northwest to answer questions such as evaluating the impact of climate change (e.g. through elevated stream temperatures and altered flow regimes) on population performance within a watershed, or for assessing the relative benefits of different restoration actions on population performance. EDT could be developed to answer similar questions throughout the Northeast; it's application supports strategic planning for species recovery, restoration effectiveness, and long-term ecosystem management.

P1-06: Investigating the impacts of increasingly dynamic winter hydrology and spatially variable deicing product application on winter chloride loading

Savia Berlucchi, University of Vermont. Additional Authors: Kristine Stepenuck, Carol Adair, Matthew Vaughan, James Shanley, Megan Duffy, Andrew Schroth

The long-term rise in deicing salt application across the Lake Champlain Basin is threatening regional water quality by elevating chloride concentrations in streams and subsequently transporting chloride into Lake Champlain. The region is also experiencing warmer, more hydrologically active winters, increasing the frequency of runoff events that transport road salt into streams. However, winter water quality monitoring programs designed to observe these effects are limited. Therefore, we established a spatially distributed sensor network in four subwatersheds of the Lake Champlain Basin that monitor specific conductance at high frequency across events, seasons, and watershed characteristics. Two focal watersheds, Englesby Brook and Potash Brook, are urban streams in Burlington, Vermont, with low-elevation winter conditions. The other two watersheds, Little River and Trout River, are larger and mostly forested with a high-elevation winter climate but contain the major road networks that serve two of Vermont's largest ski areas. High-frequency specific conductance sensors paired with water samples were used to create chloride-conductance regression equations for each watershed, allowing estimation of chloride concentrations. Streamflow at co-located gages was used to calculate watershed-scale chloride fluxes, and hysteresis metrics were used to identify chloride transport pathways and sources. In winter 2024-2025, chloride concentrations differed substantially as expected between the two watershed types, ranging from 1.4 – 39 mg/L in the montane watersheds and from 28 – 6916 mg/L in the urban watersheds. Winter high-flow events exhibited a "first flush" pattern, with chloride peaking sharply at event onset before rapidly declining despite rising streamflow. First flush generated the highest concentrations in the time-series for the urban watersheds. In contrast, concentrations in the montane watersheds peaked during baseflow conditions in the late summer/early fall. Across all four watersheds in non-winter seasons, Cl concentrations gradually increased during baseflow and were diluted during high-flow events, suggesting legacy chloride stored in groundwater as a significant source outside of winter. These results provide insight into the impact of changing winters on chloride loading in the Lake Champlain Basin and can inform management decisions for deicing salt application.

P1-07: Winter as a contributor to the annual nitrate budget in forested Vermont watersheds

Addie Hedges, University of Vermont. Additional Authors: James Shanley, Megan Duffy, Donna M. Rizzo, Kevin Ryan, Carol Adair, Andrew Schroth

Winters in Vermont are increasingly hydrologically active as temperatures warm and a larger fraction of precipitation falls as rain. This has led to an increase in the occurrence of winter high-flow events, yet little is known about the pathways and processes that govern nutrient fate and transport during winter thaws and rain-on-snow events. Drivers of winter export may be unique when compared to those in the growing season and spring freshet. Here, we utilize Sleepers River Watershed 9, in northeastern Vermont, as the site provides rich contextual data and associated studies of nutrient export, to study nitrate export patterns and provenance during the winter. We deployed a winterized in-stream UV-vis spectrophotometer to measure nitrate at 15-minute frequency. We also collected grab and automated stream water samples, and event-based soil water and snowmelt water for analysis of solutes and water isotopes. We applied these data in an end-member mixing analysis (EMMA) to assess how the source of stream water shifted over the course of winter and how these shifts correspond to event and seasonal trends in nitrate behavior. The continuous time series demonstrates that winter is a “hot moment” for nitrate export, with a large portion of annual export occurring during winter. Early winter events facilitated a recovery from the autumn nitrate “crash” during leaf fall, and there was a general increase in nitrate concentration throughout the winter, with higher peaks during each event, before decreasing following peak streamflow in freshet. EMMA provides insight on processes driving this: preferential elution of atmospheric nitrate during early snowmelt, followed by increased connectivity to soil nitrate pools, both of which become depleted over the course of the freshet. Clockwise NO3-Q hysteresis demonstrates that flushing behavior dominates winter event nitrate dynamics, suggesting that sources in winter are proximal to the stream, becoming connected during initial stages of events. Our research indicates that winter export constitutes an underestimated component of annual nitrate budgets in forested watersheds, becoming more important as winter rain events occur more frequently. Such findings can be applied to inform management decisions in forests throughout the state, including the Lake Champlain Basin.

P1-08: Development of a Thiamine Deficiency Complex-Tolerant Atlantic Salmon Broodstock and Implementation of Parentage-Based Tagging in Lake Champlain

Bryan Ross, U.S. Fish & Wildlife Service – Lake Champlain FWCO. Additional Authors: Taher Fletcher, Paul Boynton, Kurt Heim, Laurie Earley

Dietary thiamine deficiency complex (TDC) is emerging as a global issue for salmonids. This condition is often associated with consumption of lipid-rich prey items with high thiaminase activity, and afflicted female salmon experience severe offspring mortality. Landlocked Atlantic salmon in Lake Champlain developed TDC following Alewife invasion in 2003. Here, we describe efforts to develop and monitor a TDC-tolerant salmon population. From 2016-2018, we conducted offspring survival trials on 114 mating-pairs of wild-reared salmon to identify putatively TDC-tolerant individuals. Of these, 56 pairs (≈49%) produced viable offspring, while the remainder experienced complete offspring mortality from TDC. Genomic analysis and RNA sequencing suggested a strong genetic basis for TDC tolerance among surviving and non-surviving families. Therefore, surviving offspring of the 56 successful pairs were used as founders for a captive broodstock (putatively TDC-tolerant). A separate control broodstock with higher genetic diversity was also developed (MAX). These broodstocks now produce approximately 400,000 salmon annually for stocking in Lake Champlain, and parentage-based tagging (PBT) was implemented to study the relative performance of the MAX and TDC-tolerant populations. Mass marking with PBT is also being used to investigate other applied research questions related to various stocking alternatives (e.g., location, net-pen rearing, and stocking age).

P1-09: Automatic detection and categorization of behavior of the slimy sculpin (*Cottus cognatus*)

Jonah Ballard, University of Vermont, Department of Computer Science. Additional Authors: Eden Forbes, Brian O'Malley, Jason Stockwell

Sculpins (superfamily Cottoidea) play critical roles in many fresh and saltwater ecosystems throughout the northern hemisphere and are regularly used for ecological impact assessments in North America. That said, little is

known about the behavior and foraging strategies of benthic organisms, including sculpins. Fortunately, new techniques allow continuous video recording of natural behavior in the benthic habitat. Hours of underwater video, spanning multiple years (2015 – 2017) and locations in Lake Champlain, provided the opportunity to capture and analyze the in situ behavior of the slimy sculpin Cottus cognatus using machine learning. These video data could provide empirical data to parameterize predator-prey interaction models in the understudied benthic habitat of deep lake systems. We used an open-source deep learning toolbox designed for animal pose estimation (DeepLabCut) to collect data from the videos. DeepLabCut applies a machine learning model to track labeled body parts based on a series of hand-labeled frames from videos. Using six points on each fish (the head, mid-body, left pectoral fin, right pectoral fin, dorsal midpoint, and tail), we captured both movement and posture of individual sculpin which provided sufficient data (sculpin body part positions for each frame of video) to track movement paths. We analyzed data from over 100 movement sequences, and then constructed an analytic pipeline to estimate several measures to describe the saltatory movement of more than 50 slimy sculpin. We calculated size distributions of the sculpin captured in the video, assessed sculpin movement including rest and movement times, distances, and velocities, and characterized different behaviors (pursuit, cruising, intraspecific interaction) according to sequences of these movements. We then compared movement and behavior measurements across size classes. In sum, we measured foraging and movement effort for an otherwise understudied species. These measures can aid in estimating benthic trophic relationships in Lake Champlain, with broader consequences for benthic food webs in other systems.

P1-10: Evaluating the Success of Released Atlantic Salmon Broodstock in Producing Viable Offspring in Wild Spawning Habitat

Simone Boutelle, University of Vermont

Atlantic Salmon (*Salmo salar*) historically inhabited Lake Champlain and much of the northeastern United States until overfishing, habitat alteration, and pollution led to their extirpation in the 1830s. Current restoration efforts rely entirely on hatchery propagation, as no wild populations remain. This study evaluates the extent to which released hatchery broodstock can successfully reproduce in the wild along with how their reproductive contribution compares to that of populations previously stocked. Between 2020 and 2023, a total of 644 retired broodstock from the White River National Fish Hatchery (Vermont) were released into the North Branch of the Boquet River. All broodstock were flow-tagged and genetically sampled prior to release. Redd surveys were conducted each fall, and summer surveys targeted potential offspring near documented redds. Using Sequoia and SNP-based parentage analysis, relationships between sampled juveniles and released adults were assessed. Preliminary results show strong evidence of natural reproduction: 424 dams and 345 sires have been assigned to 975 juvenile salmon, with several hatchery-origin adults producing more than 50 offspring each. These results suggest that broodstock releases can contribute to natural production and may serve as an effective component of Atlantic Salmon restoration in Lake Champlain. Ongoing analyses will further quantify reproductive success, survival, and cohort structure to evaluate the long-term effectiveness of this strategy.

P1-11: Integrating eDNA and Electrofishing to Capture a Pre-Invasion Fish Community Baseline in the Upper Hudson River

Hannah Diebboll, NYS Department of Environmental Conservation, NYS Water Resources Institute. Additional Authors: James Stone, Steven Pearson

The first lock of the Champlain Canal (Lock C1 in Waterford, NY) currently represents the upstream invasion front of round goby (*Neogobius melanostomus)* in the Upper Hudson River. Establishing a comprehensive baseline of fish community composition prior to the arrival of round goby is essential for evaluating potential ecological impacts and guiding management responses. This study employs complementary approaches—traditional boat electrofishing and environmental DNA (eDNA) metabarcoding—to characterize fish communities and assess the effectiveness of each method for community monitoring. In September 2025, eleven sites in the Upper Hudson River from Northumberland to Fort Edward were sampled for eDNA and electrofishing within a two-week period. At each site, water samples were collected from multiple points and depths, pooled, and filtered to produce a spatially integrated eDNA sample. Electrofishing surveys followed eDNA collection, and all captured fish were

identified to species and measured. Although eDNA analyses are ongoing, electrofishing surveys have already provided a robust foundation for a potential multi-year baseline dataset for the Champlain Canal portion of the Upper Hudson River. Once complete, species detections from both methods will be compared using richness and similarity indices to evaluate community overlap and identify taxa uniquely detected by each approach. By integrating molecular and traditional methods, this project will establish a comprehensive pre-invasion fish community baseline for the Upper Hudson River. The comparison between eDNA metabarcoding and electrofishing will inform future monitoring strategies by revealing how these tools can be jointly leveraged to enhance detection sensitivity, reduce sampling bias, and strengthen long-term surveillance for aquatic invasive species such as round goby.

P1-12: Road salt major ion effects on thermal tolerance of copepod Leptodiaptomus species

Sydney Sharp, University of Vermont. Additional Authors: Matthew Sasaki, Chiara Cohen, Katie Anthony, Anna McPeak, Melissa Pespeni

Increasingly frequent winter warming events cause the environment to alternate from freezing to melting which can have a major impact on lake ecosystems. Specifically, road salt applications followed by melting leads to runoff and increased salinity in freshwater ecosystems with detrimental effects on zooplankton communities such as reduction in thermal tolerance. Stressors of high salinity may occur in an isolated manner or in tandem with warming events. Previous work from our lab demonstrated the negative impacts road salt has on copepod survivorship, however, the same negative effects were not observed with artificial sea water. This project seeks to test the effects of major ions found in road salt, NaCl, $MgCl_2$, $CaCl_2$, on survival and thermal tolerance in two freshwater copepod species, Leptodiaptomus minutus and L. sicilis. Copepods were exposed to 8 doses of each salt during a 5-day survivorship experiment followed by critical thermal tolerance (CTmax) assays. L. minutus is present in the lake from August to January while L. sicilis is present in the lake from November to June. Given this temporal distribution, I predict L. sicilis may be more resilient to changes in salinity than L. minutus. Limited work has been performed on freshwater copepod response to salinity despite the fact that salinity increases and warming are increasingly concurrent stressors in our current climate conditions. This work aims to fill that gap to help inform policy and management to protect our lake ecosystem.

P1-13: Nutrient Loading from Headwater Streams in the Lake Champlain Basin: Quantifying High-Flow Events

Alexander Amann, SUNY Plattsburgh. Additional Author: Dr. Colin Fuss

Rapid shifts in water quality during episodic high-flow events can disproportionately affect annual nutrient loading from forested headwater catchments. In the Northeastern United States, observed increases in total and extreme precipitation over the past century - trends expected to intensify with ongoing climate change - raise concerns about how these events drive watershed nutrient fluxes. In recent decades, several flooding events in the Lake Champlain Basin (LCB) of NY/VT have been associated with acute deterioration of lake water quality and traditional long-term sampling regimes may underestimate episodic contributions. We are collecting and analyzing high-flow event stream water from four LCB headwater catchments in the Adirondack Mountains of New York. These catchments vary principally in their forest management history and age, occupying a spectrum from recently harvested timberland to old growth forest. Our focus is on total and dissolved forms of nitrogen and phosphorus, as well as major cations and anions. Of particular interest is determining precipitation thresholds required to activate strong nutrient export responses, as well as how the timing and magnitude of these exports varies in each of the catchments during a specific event. We expect the data to generally show increased nutrient exports during high-flow events; however, we suspect that younger forests will export a lower magnitude of dissolved nutrients given greater plant uptake of the aggrading biomass. Conversely, we expect older forests to export more dissolved nutrients yet retain particulate-bound nutrients due to greater in-stream large woody debris and other flowpath characteristics. This study will contribute to ongoing efforts to refine watershed nutrient budgets and inform nonpoint source pollution mitigation strategies that address downstream water quality issues such as eutrophication under variable hydroclimatic regimes.

P1-14: Advancing Water Quality Monitoring: Ion Selective Sensors for Key Nutrients Detection in Water

Monireh Dehabadi, Department of Civil and Environmental Engineering, University of Vermont. Additional Authors: Parmida Amngostar, Tian Xia, Appala Raju Badireddy

Nutrients stem from agricultural runoffs containing fertilizers, industrial discharge, and urban waste. Elevated concentrations of nutrients like nitrogen and phosphorus lead to eutrophication that depletes dissolved oxygen

content in water and threatens aquatic ecosystems and human health. Monitoring these nutrients is vital to safeguarding water quality, aquatic life, and human health. Due to the vital importance of nutrients, there is an urgent need for affordable nutrients monitoring systems that do not require any chemicals, are not prone to interference from water turbidity, offer fast response, and feature simple fabrication and ease of operation without compromising sensitivity or precision. This research addresses this need by developing ion-selective electrodes that provide more suitable and practical methods for analyzing nutrients levels in the environment. In this study, polymeric ion-selective sensors were developed for detecting nitrate, ammonium, and monohydrogen phosphate ions as key nutrient species in water. Each membrane cocktail was composed of the polymeric matrix, plasticizing solvent mediator, and a specific ionophore tailored to the target nutrient. Sensing layers were prepared by drop-casting membrane cocktails onto circular gold working electrodes. Potentiometric measurements were carried out using a potentiostat at a constant temperature of 20 °C and pH of 7.4. Potentiometric results showed that ionophore-based membrane electrodes exhibited pronounced sensitivity to aqueous solutions of the nutrient species within wide concentration ranges, with Nernstian response slopes of 59.1, −59.4, and −28.3 mV/dec for ammonium, nitrate, and phosphate respectively, with a response time of less than 30 s. All sensors exhibited good reproducibility (SD<±3 mV). Limits of detection were 0.02, 0.06, and 1 ppm, for ammonium, nitrate, and phosphate, respectively. The selectivity coefficient values for each nutrient revealed negligible interference from common co-existing ions for ammonium and nitrate sensors, and some interference from nitrate and bromide for phosphate sensor. To test the sensors in real-world conditions, we evaluated the sensors response at different temperatures from 6-30 ˚C to achieve the temperature compensation equation. We used the sensors array for measuring nutrients at one catchment in Vermont. We will demonstrate the sensors' potential to provide reliable data and their potential practicality as a promising analytical tool.

P1-15: Climate-driven shifts in Lake Champlain physical and chemical phenology over the last three decades

Kelsey Colbert, Lake Champlain Basin Program/NEIWPCC. Additional Author: Dr. Ana M. Morales

Northern temperate lakes are experiencing heightened regime shifts in response to climate change, including changes in oxygen and thermal regimes. In Lake Champlain, ice cover has decreased over the study monitoring period of 1995-2025, which has cascading impacts on lake phenology and ecosystem function. The goal of our study is to understand long-term trends in physical and chemical phenology including thermal stratification, mixing, and dissolved oxygen in Lake Champlain. We leverage a 30-year monitoring record of temperature and oxygen profiles across 16 monitoring sites to address these questions. Our results demonstrate that Lake Champlain is warming differently across the basin, with deeper water remaining cool. These trends are likely to increase the strength and duration of stratification, reflected in variable Schmidt stability trends, with impacts on lake mixing, nutrient cycling, and habitat. Dissolved oxygen saturation appears to be decreasing in bottom waters at some sites, but not in all basins. Together, these results provide insight into the trajectory of climate impacts in Lake Champlain and broaden our understanding of shifting phenology in Northern temperate lakes.

P1-16: Machine Learning Reveals Environmental Drivers of Distinct Wetland Natural Communities in Floodplain Ecosystems

Ijaz Ul Haq, University of Vermont Water Resources Institute. Additional Authors: Rebecca M. Diehl, Kristen L. Underwood, Elizabeth Doran

Wetland habitats in floodplain environments support distinct ecological communities driven by nonlinear and complex interactions between hydrology, geomorphology, and soil properties. Classifying wetland habitats is essential for better understanding these relationships, to inform conservation strategies and enable prediction of ecosystem responses to changing flood and drought frequency and magnitude. Many traditional habitat classification approaches assume linear relationships and often fail to capture generalizable patterns, limiting our ability to project habitat distributions under future conditions. In our Vermont study area, we used machine learning (ML) algorithms for their ability to reveal the complex and nonlinear relationships between environmental drivers and habitat distributions, and for their efficiency in handling large data sets. We compiled 265,826 georeferenced observations across six watersheds representing seven wetland natural community types: Hardwood Swamp Forests, Floodplain Forests, Emergent Marshes, Shrub Swamps, Coniferous Swamp Forests, Peatlands & Specialized Wetlands, and Shoreline & Riparian Communities. We applied multiple ML algorithms—Random Forests, XGBoost, and neural networks—to uncover complex relationships between habitat distributions

and environmental factors including flood probability, water table dynamics, soil properties, geomorphic position, and vegetation structure. This ensemble approach revealed both linear and nonlinear ecological patterns while quantifying prediction uncertainty and moved beyond simple correlations to reveal mechanistic insights for how physical gradients may shape biological communities that occupy these riparian environments. Our multi-model machine learning framework is transferable to other ecoregions and provides tools for projecting habitat distributions under different water management scenarios and identifying priority conservation areas. This work demonstrates how advanced analytical approaches can transform large-scale ecological data into actionable conservation intelligence, supporting adaptive management of critical wetland ecosystems across diverse landscapes.

P1-17: Shifts in cyanobacteria bloom phenology and phytoplankton community structure in response to two phosphorus immobilization strategies in Lake Carmi, VT

Audrey Manning, University of Vermont. Additional Authors: Andrew Schroth, Ana M. Morales

Lake Carmi is a shallow eutrophic lake in Franklin County, Vermont, that has experienced persistent cyanobacteria blooms over the past several decades. Despite reductions in watershed nutrient export, legacy phosphorus (P) in the sediment coupled with a disproportionate contribution of nutrients from agricultural land use, have slowed mitigation of eutrophication in Lake Carmi. Previous management efforts aimed to immobilize sediment P via aeration, however, due to aerator malfunction and destabilization of the water column, cyanobacteria bloom phenology shifted, and biomass increased over the management period. Specifically, fall diatom blooms were displaced and replaced with coccoid cyanobacteria (Microcystis spp.). An aluminum sulfate ("alum") treatment was applied in fall 2025 aimed at immobilizing sediment P and decreasing cyanobacteria biomass. This approach has been previously employed successfully is several Vermont lakes, including Lake Morey and Ticklenaked Pond. Here we provide an initial assessment of fall cyanobacteria bloom composition and biomass prior to, during, and following both management strategies (aeration and alum). Ongoing work will assess phytoplankton community composition, functional diversity, and cyanobacteria bloom phenology post-alum treatment.

P1-18: The Effects of Starvation on the Thermal Limits of Lake Champlain Copepods

Chanchal Saratkar, University of Vermont. Additional Authors: Matthew Sasaki, Victoria Marie Glynn, Sydney Sharp, Melissa Pespeni

Eutrophication, the excess of nutrients in a water body, is the major cause of harmful algal blooms (HABs), which threaten aquatic ecosystems with cyanotoxins. Heat is often the major trigger for HABs. Copepods are ecologically crucial animals due to their role in making energy available as primary consumers. Copepods are selective grazers and avoid eating the toxins that HABs produce, which results in copepods starving in warming waters. Currently, it is unknown how starvation and heat stress affect the thermal plasticity of copepods. To study the impacts HABs and heat can have on copepods in Lake Champlain, I conducted an experiment to observe the effects of starvation, heat stress, and duration of treatments on thermal tolerance, measured by Critical Temperature maxima (CTmax). The copepods were subjected to starvation or feeding, temperatures equal to their collection temperature or 2°C higher, and a duration of two days or four days. Fed copepods had higher CTmax values than starving copepods. Copepods acclimated to warmer temperatures had higher CTmax values than ones acclimated to cooler temperatures. Starved copepods demonstrated the ability to acclimate to a limited degree compared to fed copepods. The results indicate copepods in Lake Champlain can acclimate to higher temperatures, even while enduring starvation. The thermal plasticity capabilities are and will continue to be a valuable asset to the copepods as the lake continues to heat and HABs occur year after year.

P1-19: Effects of Hydrologic Disturbance on Cyanobacteria Bloom Dynamics in a Shallow Eutrophic Lake

Jo Delahunt, University of Vermont. Additional Author: Dr. Ana M. Morales

Nutrient drivers of cyanobacteria blooms are well understood, but blooms remain challenging to predict because we do not fully understand how disturbance events interact with these mechanisms in eutrophic lakes. In Shelburne Pond, VT, We focused on the impacts of hydrologic disturbance on cyanobacteria bloom dynamics through bi-weekly sampling during the 2024 and 2025 ice free seasons. We collected whole water phytoplankton

samples, total and dissolved nutrients at 1 m depth, water column temperature and oxygen profile data. In the summer of 2024, the remnants of Hurricane Beryl created an intense disturbance event that strongly stratified the polymictic lake due to a cold water intrusion. Oxygen profiles taken before and after the disturbance show a bloom collapse, with initial observations of phytoplankton reflecting a shift in density and taxa presence. The 2025 season had a rainy spring into June, followed by an intense drought that continued through early October. This drought allowed blooms to intensify with little disturbance to cause a collapse, though intensity lessened after August. These results suggest that the cyanobacteria community in Shelburne Pond is most successful in hot mixed conditions, with periods of stratification and cold intrusions being met with bloom collapse or partial die-off. Further, our work provides valuable insight into bloom phenology in eutrophic, polymictic lakes in response to extreme hydrologic events.

P1-20: Finding Our Footing: Examining the Pedagogical Foundations in Environmental Education Research- A Literature Review

Emilia Perez, University of Vermont. Additional Authors: Kimberly Coleman, Leon Walls, Claire Jenkins, Anna Hallock

In the United States, the environmental movement was pioneered by white supremacists who participated in the eugenics movement. This movement gave birth to the field of environmentalism and resulting environmental careers we are familiar with today. While the racial and ethnic makeup of the United States population has evolved significantly since the early 1900's, the makeup of the environmental workforce has remained largely the same. For example, a 2014 study of 166 environmental nonprofits in the US revealed that only 12% of staff identified as Black, Indigenous, and People of Color (BIPOC). Diversifying the racial and ethnic makeup of the environmental field will result in more impactful and relevant research outcomes for diverse populations. While DEI programs have been implemented across the field to increase diversity, many fail to meaningfully engage with DEI, retain diverse employees in the long-term, or change workplace culture to better support diverse employees. In particular, the field of Environmental Education (EE) has increasingly sought to create opportunities for diverse individuals and there has been an increase in the number of academic papers at the intersection of EE and environmental justice. However, not all these papers engage with justice content in an authentic way. This lack of authentic engagement represents a missed opportunity, given that research rooted in critical pedagogy can result in more inclusive and relevant knowledge creation for all groups. To explore this trend, we conducted a Systematic Literature Review (SLR) by collecting studies about equity and justice that were published in five top EE journals over the past 10 years. We analyzed articles that published results of empirical studies and first separated articles into two groups: studies rooted in critical theory, and studies that were not. We then assessed each article in the first group to determine if critical theory was meaningfully applied throughout the research process. We will conclude with recommendations for researchers interested in conducting authentic justice oriented work in the context of EE.

5:00pm – 6:30pm: **Film Screening** ***Grand Maple Ballroom***

The Fish Thief: A Great Lakes Mystery Documentary

- *In the early twentieth century, a mysterious ecological crisis nearly wiped out the fish that most people cared about in the largest freshwater ecosystem on earth—the Great Lakes. The impact reverberated across the region, ruining local industries, damaging small town economies and indigenous communities, and destroying the livelihoods of people in the United States and Canada. With little reason for hope, a dedicated group of scientists, policymakers, and conservationists tackled the mystery.*

Day 2: Tuesday 1/27/2026

11:00am – 12:15pm: **Concurrent Session #4**

Track 4A: Innovative Technologies and Forecasting ***Grand Maple Ballroom***

4A-1: Drones & Deep Learning: The Future of Mapping Invasive Aquatic Plan Species

Daniel Jarrad and Maxwell Solter, University of Vermont. Additional Authors: Lauren Cresanti, Adam Zylka, Terry Barrett, Malia MacLeod, Eli Stein, Bennett Corteville, Maeve Naumann

The Non-Indigenous Aquatic Plant Species (NIAPS) project is funded by the United States Army Corps of Engineers. The overall goal is to research the most effective methods and technologies for unoccupied system mapping and monitoring of NIAPS. Advancements in these methodologies will assist in ecological and resource management of NIAPS, as well as support civil and military uses of U.S. waterways. The University of Vermont, in partnership with the University of Mississippi, has been tasked with utilizing Unoccupied Aircraft Systems (UAS) to capture aerial imagery of Yellow Floating Heart, Phragmites, Japanese Knotweed, Water Chestnut, and Eurasian Watermilfoil at various sites across Vermont and New York. Using machine learning techniques, a Convolutional Neural Network (CNN) has been trained to classify NIAPS in the collected imagery. Custom Python code was developed to implement an AI-based classification tool capable of identifying NIAPS in newly collected imagery. In the first year of the NIAPS project, the University of Vermont UAS team successfully identified and collaborated with community members to gain access to five NIAPS sites that were visited weekly from May through September. This schedule was designed to maximize the volume of imagery collected and capture the phenological variations exhibited by NIAPS throughout the growing season. Aerial imagery was collected using a WingtraOne Gen II UAS equipped with the RGB61 TC camera and the MicaSense RedEdge-P multispectral camera. The Python code was adapted to run on the university's high-performance computing infrastructure, leveraging GPU resources provided by the Advanced Computing Center. The remotely collected NIAPS data was manually digitized to train the CNN. Results from the first year of CNN training were promising, achieving classification accuracy with confidence levels of over 95%. This is an ongoing project that has just completed its second year of data collection. Due to the initial success of the CNN model in classifying NIAPS, current efforts are focused on developing a more complex foundational model to further improve classification accuracy. Additional capabilities of the Python tool include the generation of polygons corresponding to specific NIAPS classifications, enabling easy visualization and access to classification results.

4A-2: Enhanced IoT-Based Optical Fluorometer-Nephelometer with Dual-Power Operation and Field Validation for Algae Monitoring in Lake Champlain

Parmida Amngostar, University of Vermont. Additional Authors: Soheyl Faghir Hagh, Clayton J. Williams, Ana M. Morales, Tian Xia

Accurate and continuous monitoring of water quality is essential for early detection of algal blooms and for understanding nutrient dynamics in freshwater ecosystems. This study presents an upgraded version of a low-cost LoRa optical fluorometer–nephelometer system originally developed for real-time measurement of key optical and environmental parameters. This research presents an electronic circuit designed for long-term autonomous deployment in natural waters. The system can operate using either a lithium-polymer (Li-Po) battery or a solar panel coupled with a lead-acid battery, providing flexibility under various environmental conditions and significantly extending its deployment time. The sensing platform measures temperature, turbidity, chlorophyll-a, and phycocyanin concentrations using amber (590 nm), blue (465 nm), and near-infrared (870 nm) light-emitting diodes combined with orthogonally placed silicon photodiodes and long-pass optical filters. The electronic circuit features low-noise transimpedance amplifiers, signal conditioner, and adaptive power regulator that balances energy distribution among the sensing, processing, and wireless communication units. Data acquisition and transmission are handled by an Arduino Feather M0 microcontroller integrated with a LoRa wireless transceiver, enabling low-power long-range communication. All measurements are logged onto a micro-SD card and transmitted through The Things Network (TTN) to the Datacake cloud dashboard for real-time visualization and analysis. Laboratory calibration shows linear responses for turbidity (3–200 FTU), chlorophyll-a (1–50 µg/L), and phycocyanin (0.025–2.5 mg/L) with relative errors below 10 percent. The system is currently under field testing in Lake Champlain for continuous algae detection and water quality monitoring at three sites: Oakledge Park, North Beach, and Leddy Beach. These deployments are being used to evaluate long-term performance, environmental robustness, and calibration improvements.

In upcoming research, a new compact single-board version is being designed to integrate all subsystems on one circuit board, providing improved connectivity, enhanced power management, and simplified field assembly. Overall, this enhanced IoT-based optical sensing system represents a scalable, energy-efficient, and low-cost solution for real-time environmental monitoring and algal bloom detection in freshwater bodies.

4A-3: Internet of Drones System with Onboard Machine Learning for 2-D and 3-D Water Quality Mapping, Chlorophyll-a Forecasting, and Adaptive Nutrient Sampling

Soheyl Faghir Hagh, University of Vermont. Additional Authors: Tian Xia, Parmida Amngostar

Emerging technologies that unify real-time sensing, volumetric modeling, and predictive analytics are transforming water resource monitoring and nutrient-load forecasting. This work presents a fully developed Internet of Drones (IoD) system that performs real-time wireless water quality sensing, 2-D mapping, and true 3-D depth profiling through an embedded multi-sampler and multi-sensor and onboard intelligence. Unlike conventional UAVs, buoys, or static sondes, the proposed IoD platform integrates five in-situ sensors, including temperature, pH, turbidity, total dissolved solids (TDS), and depth sensors, into a single-actuator rotary valve water sampler that collects four discrete 50 mL samples via TDS-, depth-, or Machine Learning-triggered logic, minimizing cross-contamination and enabling selective, depth-resolved collection. The dual-mode wireless communication architecture combines LoRa/LoRaWAN for ultra-low-power telemetry with LTE for broadband data streaming. A custom Wireless Innovative Sensing Electronics (WISE) board, featuring a microcontroller, wireless communication transceiver, GPS, data logging, and power switching, manages water sensing, actuation, data recording, and wireless transfer. Time-synchronized data are geo-tagged and relayed via The Things Stack and Datacake webhook for cloud visualization. A high-resolution continuous interpolation algorithm is implemented to reconstruct volumetric (3-D) water quality fields from UAV missions over a 3 × 3 × 21 quasi-grid (0.4 m × 0.4 m × 0.05 m spacing) and planar (2-D) mapping over a 4 × 4 quasi-grid (45 m node spacing). The piecewise-linear tetrahedral interpolation preserves gradient continuity across depth layers, outperforming conventional slice-based methods. Field deployments at Lake Erie's Old Woman Creek Reserve validated the system's accuracy in capturing fine-scale temperature, pH, TDS, and turbidity gradients, and reconstructing 2- and 3-dimensional water quality profiles. An embedded machine-learning engine executes Random Forest Regression (RFR) and Support Vector Regression (SVR) models trained on historical Lake Erie buoy data (2023–2025), with RFR achieving $R^2 = 0.912$ (train) and $R^2 = 0.855$ (test). When real-time chlorophyll-a predictions exceed 25 µg/L, indicating hypereutrophic conditions, the controller autonomously triggers sampling, enabling fully edge-based adaptive decision-making. This IoD-enabled, ML-driven architecture establishes a new paradigm for predictive aquatic monitoring, providing a scalable and energy-efficient platform for nutrient-load modeling, HAB early warning, and adaptive resource management across inland and coastal ecosystems.

4A-4: First Demonstration of Nitrate Reduction Using Woodchip Bioreactor Technology at a Small Community Wastewater Treatment Plant

Jim Sutherland, Lake George Waterkeeper, Lake George Association. Additional Authors: Kathleen Suozzo, Chris Navitsky

Eutrophication can be accelerated by excess amounts of reactive nitrogen (Nr) entering aquatic ecosystems. Historically, the circa 1960 Bolton Wastewater Treatment Plant, Warren County, New York (USA), discharged plant effluent for final polishing to natural sand infiltration beds, which entered the groundwater and then tributaries to Lake George. The absence of a denitrification unit process at the Bolton facility resulted in the construction of a woodchip bioreactor and a corresponding demonstration project to evaluate denitrification of plant effluent prior to sand bed discharge. This denitrifying bioreactor (DNBR) installation was the first real time, in-situ application of this "green technology" for a small wastewater treatment plant world-wide. The Bolton DNBR reduced nitrate-nitrogen concentrations in the tertiary effluent by 38% when compared with untreated tertiary effluent. Here we show that wastewater denitrification using this passive, environmentally compatible technology offers a low-cost, effective tool for small community wastewater treatment plants where excess Nr is problematic. Combined with diligent plant operator attention, this innovative treatment should move beyond concept into full scale field applications for other small community wastewater treatment plants globally, using lessons learned at the Bolton facility.

Track 4B: Aquatic Invasive Species – Monitoring and Data ***Jost Foundation Room***

4B-1: New York State Watercraft Inspection Steward program; Is it making a difference?

Scott Jamieson, NYS Department of Environmental Conservation

The watercraft inspection steward program (WISP) serves as the front line of defense against the transport of aquatic invasive species in New York State and its neighboring States. The United people enjoy the abundant lakes, ponds, and rivers. As people and their boats move between waterbodies, they can bring unwanted aquatic hitch hikers within transported waters attached to within the program can be mixed which creates the challenging question. Is the program working? In the effort to determine the success rate of the program a survey form (WISPA) was created to ask a series of questions that can dig deeper into the voluntary boat inspections success. This gives watercraft inspection stewards a pathway to engage with the public and standardize how the inspection process is completed. Furthermore, the data also allow managers to make decisions on early detection and rapid response. Since the induction of the program data collected has shown CDD protocols being followed by watercraft users moving from 40% in 2015 upwards of 80% in 2025.

4B-2: Reducing the risk of AIS infestations and spread through watercraft inspection surveys and decontamination on Lake Champlain

Meg Modley-Gilbertson, Lake Champlain Basin Program/NEIWPCC. Additional Author: Lauren Jenness Kneen

Across the Northeast United States and beyond, seasonal watercraft inspection program stewards share Clean, Drain, Dry messaging and perform voluntary watercraft inspection surveys and decontamination to reduce the introduction and transport of aquatic invasive species on boats and recreational equipment. Well over 100,000 watercraft launching and retrieving from Lake Champlain have been inspected over the last five years by LCBP/NEIWPCC-hired stewards, with an 11% detection rate of hitchhiking aquatic organisms. Their survey data, collected in the NYS WISPA Survey123 Platform, follows a U.S. EPA approved Quality Assurance Project Plan and is used by lake resource managers to understand boat launch and recreational use patterns and vectors of AIS spread. The data informs staffing decisions and the placement of stewards and watercraft decontamination stations around Lake Champlain. This presentation summarizes watercraft and aquatic organism vector patterns from data collected by Lake Champlain boat launch stewards between 2020-2025. As Lake Champlain remains a world-class fishing destination, attracting tournaments of all sizes, care must be taken by all lake-users to reduce the risk of aquatic invasive species spread. Continued analysis of the anonymized boat launch steward survey data will inform the appropriate evolution of the Lake Champlain boat launch steward program and related programs across the Northeast for decades to come.

4B-3: Using Aquatic Invasive Species Data to Inform Management Decisions

Mitchell O'Neill, New York Natural Heritage Program, SUNY-ESF

Aquatic invasives species impacts to natural resources are far-reaching and difficult to manage, often requiring managers to prioritize limited resources to select projects. Natural resource managers prioritize efforts based on species present, location, and other factors influenced by the diverse management goals of each region, community, parcel, and/or waterbody. Invasive species occurrence data, records of previous management in the region, and spatial layers representing landscape attributes can inform these difficult decisions that natural resource managers are regularly faced with. The New York Natural Heritage Program works with partners to compile information on invasive species and the native ecosystems, as well as develop analysis and visualization tools to facilitate the use of that collected information in management decisions. For example, natural resource managers use iMapInvasives (an online database and mapping system) to view invasive species survey and management records from many sources, as well as generate custom maps, species lists, and data summaries based on user selections. For species-based prioritization and regional management decisions, the Invasive Species Tiers framework uses a standardized set of definitions, data from locational databases (e.g., iMapInvasives, iNaturalist), impact assessments, and expert elicitation to categorize high-impact invasive species present in and surrounding the target regions. Additional data tools that aid managers include map viewers that highlight generalized outcomes of treatment efforts and the intersections of invasive species data with areas of conservation value (e.g., imperiled species locations, protected lands). This presentation will include an overview of invasive species data tools available to natural resource managers in the Lake Champlain basin and beyond. Some of these tools and frameworks were created with a New York focus and could be adapted for other areas.

Track 4C: Agriculture ***Chittenden Bank Room***

4C-1: Soil health diagnosis of Québec portion of the Missisquoi Bay Basin following a remote sensing approach

Dr. Aubert Michaud, Organisme de bassin versant de la baie Missisquoi (OBVBM). Additional Authors: Mohamed Abou Niang, Marc-Olivier Gasser

The main objective of the study was to develop a mapping tool to assess the extent and severity of soil compaction within the Missisquoi bay watershed. The developers used remote sensing technology to link locational portraits of surface drainage conditions, excess moisture, crop development and yield, and ultimately projected soil health indices on 50,000 ha of corn and soybean fields. Surface drainage gradients were projected through topographic indices developed from a high-resolution (1.0 m) digital terrain model (DTM) derived from LiDAR data. The Topographic Position Index (TPI), which discriminate emission from accumulation zones, demonstrated the best explanatory power for soil moisture patterns revealed by spring multi-spectral images (NDWI). Multi-spectral indices of soil wetness (NDWI) were selected over radar indices (SSM) to better explain corn and soybean canopies (NDVI indices). A multi-year spatial gradient of soil moisture was developed following the normalization of annual NDWI indices for the 2017-2023 period, and the estimation of their median values. Similarly, annual crop development indices (NDVI) for the 2017-2023 early July periods were normalized and median values determined using separate procedures for grain corn and soybean, providing homogeneous distributions of indices, independent of crop type. A final classification of soil health zones was obtained through deep learning regression and object-oriented classification of overall data set. Regression models were developed to explain crop development indices from soil moisture and topographic indices. Following this selection process, a spatial segmentation of NDVI, NDWI and TPI indices was obtained following an Object-Based Image Analysis (OBIA) method. Seven OBIA classes were finally selected as soil health indices, following a grouping procedure. A study component relating monitored corn yields to crop development indices further provided an evidence-based validation of the methodology. NDVI indices explained end-of-season grain corn yields following a simple linear regression method on 49 cultivated fields in 2022 and 2023 (1,015 ha), resulting in an average model's adjustment (R2) indicators of 0.74. Together with the development of the GIS toolkit, an on-farm action-research network has been coordinated by OBVBM staff, where participating farm managers provided management data to support the development and validation of the GIS deliverables.

4C-2: Challenges facing Québec's efforts to reduce phosphorus losses to the Missisquoi bay Watershed

Louis Robert, Organisme de bassin versant de la baie Missisquoi (OBVBM)

Over the past three decades, government programs, subsidies and other incentives, along with regulation have all failed to translate into any significant reduction in the phosphorus concentration of the water entering the bay. While we have been mainly focusing on erosion control measures to block P transfer from fields to waterbodies, research had long demonstrated that source reductions outperform any other kind when it comes to cost-benefit analysis. Farmers and agronomists alike falsely believe that complying to the current Dept of Environment regulation guarantees a minimal impact of farming in P pollution. Year in, year out, we keep pouring in 40 (no animal) to 100 kg P2O5/ha/yr (with manures), allowed under (« backed up » by) the regulation. On top of that, official fertilization guidelines lead to over-recommendations of phosphorus applications to corn by a 43 % margin over the requirements of the crop, research shows. Adjusting feed rations to better match the animal requirements would allow for further advances. But this all makes little sense if we keep allowing expansion of livestock, flock and herds within the watershed. As long as you let that much phosphorus come into the watersheds, there is no hope in any attempt to bring down [P] water.

4C-3: Restoring Degraded Riparian Forested Buffers into Multi-Functional Habitats for Socio-Ecological Resilience

Jess Rubin, University of Vermont ALE and MycoEvolve. Additional Authors: Josef Gorres, Carol McGranaghan, Luca Kolba

A pilot project tested whether mycorrhizae can improve water quality and pollinator functions of degraded riparian forested buffers (RFBs) in agricultural landscapes while facilitating Indigenous Abenaki access to ancestral lands. Two plots within a degraded RFB were restored with a multi-functional plant community, one plot inoculated with commercial mycorrhizae and the other without. A control plot remained in its degraded condition dominated by invasive shrub Rhamnus cathartica. The restoration palette of 32 plants included 28 species useful to Abenaki, allowing phosphorus (P) removal through harvesting. Monitoring data from 2020 to 2023 indicated consistently greater plant diversity in the restored plots, with 58 newcomer species. P decreased over time in all treatments. Comparisons between treatments were complex, likely due to commercial inoculant's incompatibility

with the local soil microbial community, soil/light spatial variability, or dynamics within the mutualism to parasiticism continuum. P biomass of five plant species differed among species but not among treatment plots. Nonetheless, Abenaki harvesting removes P and can be an effective form of phytoextraction. Back of the envelope calculations indicate somewhere between 0.5 -1.0 mg/kg/ha/yr can be removed if only a few species and one quarter of each, per the Honorable Harvest method, were removed. This investigation revealed trade-offs between P mitigation, indigenous use, and pollinator functions of RFBs. Fostering higher biodiversity, Indigenous land access, and P mitigation are solution-oriented objectives to balance when restoring degraded RFBs. Replication of research plots was tripled in 2024 with a more robust plant palette including herbaceous and ground cover species, 100% of which are edible, medicinal, utilitarian to Abenaki and the inoculated plots host endemic mycorrhizae. Results are still incoming. Year 1 data indicate that harvest of grasses and herbaceous species can remove more P than harvest of woody shrubs. Design and installation of diverse polyculture palettes for RFBs, non-chemical removal of R. cathartica, strategically timed harvest of P accumulating plants can maximize multiple functions of RFBs to support ecosystem resilience in both mitigating phosphorus pollution, increasing pollinator habitat, and increasing food and medicine security in the surrounding watershed community.

4C-4: Management effects on surface and subsurface nutrient runoff from heavy clay soils in Vermont dairy production systems

Claire Benning, University of Vermont Extension. Additional Authors: Joshua Faulkner, Heather Darby

Alternative management of agroecosystems has the potential to minimize erosion and nutrient loss during heavy storm events. In the Northeast, heavy precipitation events are increasingly frequent. In the Lake Champlain Basin predictions indicate that average precipitation per decade will increase between 9.1 and 12.8 mm-1 during the twenty-first century. As a result, the characteristically fine clay soils of the region become saturated more frequently and dairy producers are interested in adopting alternative management practices to manage poorly drained soils. Understanding the effects of best management practices (BMPs) under this new precipitation regime is critical for both maintaining crop productivity and reducing soil and nutrient loss from these agroecosystems via surface and subsurface runoff. To address this issue an on-farm replicated watershed research trial has been established in St. Albans, VT to monitor surface and subsurface phosphorus (P), nitrogen (N), and suspended sediment runoff. In this field trial we examine manure and cover crop management in tile drained and non-tile drained plots through continuous edge-of-field monitoring since 2021. We compare BMPs (manure injection and no-till planting) to conventional management (broadcast manure and tillage) and their effects on water quality, soil quality, and crop productivity.

Track 4D: Flood Resilience *Williams Family Room*

4D-1: Exploring the water quality impacts of flooding and drought in the Lake Champlain Basin

Dr. Matthew C. H. Vaughan, Lake Champlain Basin Program/NEIWPCC

Over the past three years, communities in the Lake Champlain Basin have experienced both historic flooding and a pronounced drought. This presentation examines how these contrasting hydrologic extremes affect water quality, placing recent events within the context of long-term observations and weather trends. Using data from the Lake Champlain Long-term Monitoring Program and the US Geological Survey stream gauge network, I estimate the daily phosphorus concentrations and loads for major tributaries to Lake Champlain dating back to the early 1990s. These estimates reveal how recent hydrologic events compare with typical conditions and other notable events in the past 35 years. I also apply quantile flow change analysis to assess which portions of each tributary's flow regime (e.g., low-, median-, or high-flow conditions) are changing over time and discuss what these shifts mean for the seasonal timing of nutrient transport. Finally, I evaluate how river flows and lake levels during the 2025 drought compare to other historically dry periods in the long-term record, highlighting implications for nutrient transport and ongoing water quality restoration efforts.

4D-2: Improved Representation of Floodplains in Broad-Scale Hydrologic Models Supports Flood Resilience Assessments in Vermont

Dr. Rebecca M. Diehl, University of Vermont. Additional Authors: David Baude, Ijaz Ul Haq, Kristen Underwood, Julianne Scamardo, Beverly Wemple

Floodplains can temporarily store flood waters, slowing flood waves and decreasing peaks, ultimately reducing impacts to downstream communities. Representation of floodplains within broad-scale flood prediction models

(e.g., NOAA National Water Model), however, is often highly simplified, introducing errors in streamflow predictions and limiting our understanding of how river networks influence flood routing dynamics. In this talk we describe how improved geometric and hydraulic characterization of floodplains can greatly enhance the performance of flood prediction models. Low model accuracy in watersheds with substantial floodplain storage, such as the Otter Creek, can be corrected largely through representation of accurate topography, with additional improvements because of the inclusion of more complex hydraulic processes. Leveraging these modeling advancements, we evaluate the landscape's potential to attenuate floods upstream of riverside communities in Vermont's Lake Champlain Basin. Through this work we are identifying how much floodplain restoration is needed within the upstream watershed to reduce flood levels and erosional power within riverside communities or at vulnerable points (i.e., at river crossings). Large variability in floodplain storage and attenuation potential exists across the region, determining the viability of incorporating floodplain restoration or conservation into a community's flood resilience plan. For some communities, our modeling suggests that even the most aggressive restoration can do little to reduce the power of future storms, requiring other interventions to build resilience.

4D-3: Data-driven models support erosion hazard mapping in Vermont

Dr. Kristen Underwood, University of Vermont. Additional Authors: Alexander Prescott, Amelia Bohling, Nat Robtoy, Henry Leister, Rebecca Diehl

Vermont communities have experienced increasing frequency of flash flooding events in recent years leading to substantial property and infrastructure damages resulting from streambank erosion, river-connected landslides and deposition of sediment and debris – particularly along steep, small streams. These erosional hazards are not fully represented on planning or regulatory maps, and predictive models of erosion are not available. In this talk we will review various data-driven modeling approaches being implemented to support erosion hazard mapping in Vermont as a complement to flood inundation mapping. Data-driven models (e.g., decision tree, Random Forest) using remotely sensed topographic features (e.g., valley confinement, channel geometry, slope, grain size) are able to reproduce six reach-scale classifications made by experts based on field measurements of channel and valley geometry in our Vermont study area. These reach types describe varying degrees of lateral and vertical channel-floodplain connectivity and relative dominance of sediment sourcing, transport and deposition processes under commonly occurring floods (i.e., 50% AEP). We are evaluating how these reach types may have shifted in response to the more extreme floods of 2023 and 2024, relying on multi-date LiDAR and orthophoto datasets. Using a novel evolutionary algorithm, we are disentangling the complex interplay of hydrologic, hydraulic, geomorphic, vegetative, and land use factors that influence spatial and temporal patterns of erosion (and deposition) through river networks, to inform a reach-scale predictive model of river erosion. Future work will produce integrated erosion hazard and inundation hazard mapping for the Lake Champlain region and a watershed response model in a target basin(s) to predict changing inundation and erosion hazards under scenarios of increased flood frequency and intensity.

4D-4: Floodlines: cultivating resilience in a transboundary waterway. Building capacity for resilience through transformative play

Dr. Curt Gervich, SUNY Plattsburgh Center for Earth and Environmental Science. Additional Authors: Grace Calvelli, Taygin Jump

The path to flood resilience requires more than geospatial modeling, scientific understanding and the ability to design nature-based and engineered solutions. Developing trusting relationships, understanding how to make difficult decisions, transdisciplinary knowledge integration and strong communication skills are also needed. Floodlines: cultivating resilience in a transboundary waterway is a role play game designed to assist planners, scientists, decision makers and others engaged in flood resilience work to develop these skills. Development of the game is funded by an education and outreach grant from the Lake Champlain Basin Program and it is designed by SUNY Plattsburgh students. Floodlines is about scientific consensus building and climate adaptation in a transboundary watershed. The simulation is based on the recent flood experiences of communities in the Lake Champlain Basin. Role play offers an important strategy for improving our capacity to manage wicked problems--especially those related to climate resilience. Wicked problems are characterized by complex webs of social, environmental, economic and political dynamics. Wicked problems carry high degrees of urgency, scientific uncertainty and ambiguity. These factors exacerbate intractable conflict. Engaging in wicked problem solving requires systems thinking, anticipatory visioning, collaboration, multi-disciplinary literacy, and moral and ethical awareness. These are competencies best practiced before urgent problems arise and outside of high stakes

decision making processes. Floodlines convenes environmental planners, scientists, policy makers, residents and others concerned with environmental change to simulate problem solving through role play. The game is played in a workshop setting, during which trained facilitators develop a high-trust atmosphere where experimentation is rewarded. This allows for the proactive development of skills and relationships that will enable climate adaptation when it matters. This presentation will document development of the game, learning outcomes, lessons learned from play tests with several regional water resource organizations, and plans for future game development.

1:15pm – 2:30pm: **Concurrent Session #5**

Track 5A: Contaminants of Emerging Concern ***Grand Maple Ballroom***

5A-1: Lake Champlain Basin Emerging Contaminants Study

Dr. Dave Braun, Stone Environmental

Concerns regarding the occurrence of emerging contaminants are related either to their potential human health effects from ingestion (i.e., consumption of drinking water and fish) or ecological effects related to toxicity to animals and plants. Stone Environmental, the United States Geological Survey, and Dr. Appala Raju Badireddy of the University of Vermont are working together to develop a long-term monitoring plan for emerging contaminants in surface water in the Lake Champlain Basin (LCB). This monitoring plan will be informed by contemporary local data and state agency representatives in Vermont and New York. To supplement the LCB dataset, the project team measured concentrations of six classes of emerging contaminants in 2025. We collected samples from eight stormwater outfalls, eight urban streams, nine agricultural streams, five rivers, and six Lake Champlain bays in the Vermont and New York portions of the basin. Samples were analyzed by three commercial labs (SGS AXYS, Eurofins, and Pace), USGS' Organic Chemistry Research Lab in Sacramento, CA, USGS' Organic Geochemistry Research Lab in Lawrence, KS, and Dr. Badireddy's lab in the UVM Department of Civil and Environmental Engineering. Samples were analyzed for 80 pharmaceuticals and personal care products, 141 pesticides, 34 per- and poly-fluoroalkyl substances (PFAS), 6PPD-quinone, and microplastics. Our review of the preliminary emerging contaminants concentration data received thus far suggests some interesting patterns. This presentation will explore patterns in the emerging contaminants data and place our findings in the context of published toxicological end points to illustrate which results indicate potential risk to human health or the environment.

5A-2: Implementing a nanobubble-assisted foam fractionation process to capture PFAS molecules from landfill leachate

Sajjad Eftekhari, University of Vermont Department of Civil and Environmental Engineering

Per and Polyfluoroalkyl substances (PFAS), have brilliant features like mechanical and thermal stability, and chemical resistance, which cause these substances to use in manufacturing highly demanded consumables. From Aqueous film forming foam (AFFF) to anti-stick cookware coatings and most polymeric and plastic materials consist of PFAS. This is because of the C-F bond which is the strongest in organic chemistry. This stability, however, results in persistence in the environment even decades after wasting. Due to non-biodegradability of PFAS, natural processes cannot degrade them in the environment. Also, prevalent physicochemical technologies are not potent enough to break the Carbon bond with Fluorine. Hence, developing a novel, easy to operate, economical, and environmentally friendly technology seems to be a hot research focus. As a PhD student in the University of Vermont (UVM), I am dedicating my research to developing a novel Foam Fractionation (FF) system to capture short and ultra-short chain PFAS molecules (less than 6 Carbon atoms in their structure) from highly polluted waters. FF is a simple process in which air, or other gas, bubbles are purged into a column of PFAS containing water, and due to the hydrophobic nature of air-water interface (bubbles' surface), PFAS molecules, which have hydrophobic nonpolar tails, tend to cling to the surface by tails toward the bubble and heads toward the aqueous environment. Because of low-density, bubbles tend to come out of column and, if the water has enough low surface tension and proper surfactant concentration, form a foam above the column that is concentrated in PFAS molecules. This simple process needs to be modified since short-chain PFAS molecules have low hydrophobicity and are very mobile, inside the aqueous environment because of high diffusion coefficient. Thus, we may tend to use synergistic effects of electrostatic interaction in addition to hydrophobic affinity to improve the rate of short chain PFAS molecules adsorption onto the bubbles surface. Also, another focus will be improving the available surface area of the bubbles inside the column to give the interested pollutants more opportunity to find the interface and cling to. This study will result in an optimized FF process which can alter the current state of PFAS concentrating systems from aqueous environments.

5A-3: Beneath the Surface: Assessing the Spatio-Temporal Distribution of Microplastics in Lake Champlain and its Tributaries

Allison Morrow, SUNY Plattsburgh. Additional Authors: Timothy Lloyd, Grace Calvelli, Taygin Jump, Timothy Mihuc, Danielle Garneau, Nurjahan Begum, Andrea Stumpf, Anne Jefferson

Microplastics are of increasing concern in our natural environment, with plastic production increasing at an annual rate of 8.4% (1950-2015). Once plastic is discarded, it fragments and travels via pathways as particulate macro and microplastic (<5mm). Microplastics are transported into the environment via improper manufacturing practices, land-cover runoff into rivers, wastewater effluent, airborne emissions, among others, polluting waterbodies. The focus of my research is to investigate the potential microplastic pollution pathways, distribution, and loading within waterbodies and in local fish communities to establish a baseline on microplastic contamination in Lake Champlain and its tributaries. Preliminary surveys in 2024 spanned five New York tributaries and were narrowed in 2025 to focus specifically on the Saranac and Ausable Rivers. Historic whole lake samples, collected for the Long Term Monitoring Program (LTM) (1992-2024), were used to determine microplastic concentrations over time in the major lake basins across 15 sampling stations. Previously sampled wastewater treatment plant surveys (2016-2018), spanning the Lake Champlain Basin in NY and VT, were used to draw conclusions on the potential for post-treatment effluent contributions. Data from previous fish dissections were analyzed to quantify microplastic retention. Preliminary findings show that fibers are the dominant microplastic type in NY rivers, with the more urban Saranac River contributing the greatest particulates. There are significant contributions of microplastic into Lake Champlain from wastewater treatment plants with particle morphology varying by plant. Approximately 600 fish from Lake Champlain were processed and microplastic retention within digestive tracts was primarily fibrous. By identifying potential microplastic pathways and their distribution throughout the lake, as well as their retention by fish species, we can better inform the public about the current state of microplastics within the Basin.

5A-4: Caffeine monitoring in Vermont lakes as a tool for motivating maintenance of septic systems

Mark Mitchell, Lake Champlain Sea Grant and VT Department of Environmental Conservation

Caffeine is an emerging contaminant in freshwater ecosystems and a specific indicator of anthropogenic pollution from domestic wastewater sources such as septic systems. If a septic system is not properly maintained, groundwater and surface water can be contaminated by pathogens and nutrients. Caffeine is a well-removed organic wastewater compound, and detecting it in lakes can indicate seepage of poorly treated wastewater from failing or outdated septic systems.
In 2023, the Vermont Agriculture and Environmental Laboratory was able to develop a low-cost test for caffeine in lake water samples collected by volunteers through the Vermont Lakes Lay Monitoring Program. Initially, the lab had set the detection Reporting Limit (RL) for caffeine at 0.5 ug/l, and only 8 out of 682 samples were above this RL across 77 lakes sampled every other week from June through August. However, 58 samples were above the Method Detection Limit (MDL) but below the RL. With this new knowledge, the lab then refined the test for caffeine down to an RL of 0.1 ug/l without increasing the cost. In 2024 and 2025, there were 69 and 116 results, respectively, above this lower RL. 55 of the 85 lakes monitored for caffeine between 2024 and 2025 had at least one sample above the RL, while 33 lakes had multiple samples above the RL.
In response to these preliminary results, the Orleans County Natural Resources Conservation District is piloting a septic inspection and pumping assistance program for a lake that has had repeated caffeine samples above the RL across all three years of sampling with two separate volunteers. Caffeine monitoring data will also be used to prioritize outreach to lake associations for holding Vermont Lake Wise Wastewater Workshops, where homeowners learn about the options for well-functioning septic systems and good maintenance practices on lakeshores.

Track 5B: Lakes, Ponds, and Shorelines

Jost Foundation Room 413

5B-1: Volunteer Lake Monitors' Role and Communication Behaviors (Lightning Talk)

Sabrina Koetter, Lake Champlain Sea Grant

Drawing on role theories to ask how volunteers in long-term lake monitoring programs perceive and enact their roles, this research aims to explore factors that influence volunteers' communication behaviors. Research on participatory water monitoring volunteers often focuses on data collection, learning outcomes, or volunteer motivations, while less is known about how they perceive and enact their unique positions as participatory scientists, especially within their communities. Exploring the relationship between roles, identities, and communication behaviors may provide insights into variables that influence communication practices. Using mixed methods – surveys followed by focus groups - data was collected from volunteer water monitors within four long-term lake monitoring programs in the United States. Findings can inform participatory lake monitoring programs by enhancing understanding of the multi-faceted role volunteer water monitors enact, and the influence of those perceived roles on their communication behaviors and community engagement.

5B-2: Protecting Headwater Streams to Build Long Term Resilience of Vermont's Lakes

Kellie Merrell, VT Department of Environmental Conservation

Vermont, like the nation, is losing its oligotrophic lakes to accelerated eutrophication. We do not know why Vermont is losing its oligotrophic lakes. Interestingly, Maine, has not seen a similar loss of oligotrophic lakes over the last forty years. Since 1971, Maine's Mandatory Shoreland Zoning Act has protected the natural vegetation along its lakeshores, rivers, saltwater bodies, wetlands and streams. While Vermont modeled it's 2014 Shoreland Protection Act after Maine's, unlike Maine's law, it only

applies to lakeshores. Ninety percent of the streams draining into Vermont's inland lakes are 1st, 2nd and 3rd order streams. In 2024, the Vermont legislature passed the Flood Safety Act, but it did not prescribe any protections for headwater streams. In 2023 and 2024, Vermont experienced record flooding. This talk will focus on lakes hit hard by those flood events and look at a breakdown of stream orders draining into those lakes. We'll look at the amount of human disturbance within 100' of tributaries using high resolution land cover data. A key element to building resilience to more frequent heavy rain events and to accelerated eutrophication of Vermont's lakes is the protection of natural vegetated buffers along headwater streams. Several avenues that can be pursued to build this resilience include the development of a model ordinance for towns, Stream Wise, defining increased protections that could be afforded streams draining into high quality, A1 or ORW lakes and the adaption of Maine's statewide standards to Vermont's streams.

5B-3: Lakeshore Biodiversity: Informing a Lake Wise Approach in the Adirondacks

Dr. Michale Glennon, Paul Smith's College Adirondack Watershed Institute. Additional Authors: Alec Cimini, Jesse Rock

The intactness of uplands surrounding lakes has direct consequences for water quality, with shoreland manipulations such as development, agricultural use, vegetation removal, and creation of impervious surface all contributing toward increased runoff, pollution, sedimentation, and declining water quality. Shorelines are also critical habitats for wildlife and natural corridors of movement through the landscape. Supported by Lake Champlain Sea Grant, the Adirondack Watershed Institute is engaged in research aimed at understanding the implications of shoreline management for wildlife, with a study focused on Upper Saranac Lake, one of the largest lakes in the Adirondack Park. While critical to biodiversity and protection of water quality, shorelines are also among the most impacted and at risk in the park. There is a long history of concern over the high proportion of development occurring on lakeshores in the park and the associated impacts. Landowner education and engagement are key components of improving shoreline management and protection. We are working with private landowners on Upper Saranac Lake and assessing occurrence and community structure of bird, mammal, amphibian and reptile communities and their relationship to measured characteristics of riparian, shoreline, and littoral habitat. Our objectives are to (1) investigate the extent to which lakeshore owners are implementing beneficial shoreline practices and management recommendations on Upper Saranac Lake, (2) examine how habitat characteristics on private lakeshores are associated with wildlife community characteristics and structure, and (3) determine how existing regulations and/or recommendations can be improved to better protect wildlife habitat, shoreline intactness, and water quality. We will share early findings from this ongoing project.

5B-4: The Adirondack Lake Assessment Program: Over two decades of water quality participatory science

Dr. Sara Kelly, Paul Smith's College Adirondack Watershed Institute. Additional Authors: Elizabeth Yerger, Claudia Braymer, Michale Glennon, Maureen Cunningham

The Adirondack Lake Assessment Program, or ALAP, is a volunteer-based water quality monitoring program that is a partnership between Protect the Adirondacks! and Paul Smith's College's Adirondack Watershed Institute (AWI). Sampling began on twelve lakes and ponds in 1998. Today more than 75 lakes and ponds are sampled by ALAP volunteer lake monitors for 16 different water quality parameters including pH, alkalinity, ammonia, calcium, sodium, chloride, total phosphorous, total nitrogen, chlorophyll-a, colored dissolved organic matter, dissolved organic carbon, apparent color, nitrate-nitrite, specific conductivity, sulfate, and transparency. Lake monitors are trained by research staff to collect samples, then samples are collected and brought to the AWI lab for analysis. Results are disseminated to monitors, lake associations, and the public in annual reports. ALAP data make up one of the longest and largest records of water quality monitoring data for developed lakes in the Adirondacks and help address questions of acid rain recovery, trophic state shifts, climate change impacts, and road salt impacts. This presentation highlights the successes and challenges with operating ALAP for the last 28 years.

5B-5: New York State's Drinking Water Source Protection Program (DWSP2) in the Lake Champlain Basin

Madeline Silecchia and Alyssa Bement, NYS Department of Health and NEIWPCC

Since its unique formation in 2017, the Drinking Water Source Protection Program (DWSP2) is a locally led, state-supported, interagency program that empowers municipalities to take actions to improve and protect their public water sources and the surrounding environment. Alyssa Bement and Madeline Silecchia are technical assistance providers for DWSP2 in the New York State Department of Health (NYSDOH) Capital Region, working with communities for free, including the Lake Champlain Basin. Technical assistance providers for DWSP2 work with municipalities to develop their source water protection plan through forming a stakeholder group, interpreting data, developing maps, identifying feasible protection methods, and understanding the community's long-term goals and stewardship for their DWSP2 plan. In addition to the technical assistance providers, the regional topic experts, chosen as stakeholder group members, provide support for project design, data collection, and potential funding sources to streamline holistic solutions for source water protection. In 2022, the Towns of Willsboro, Essex, and Chesterfield were accepted to participate in New York State's Drinking Water Source Protection Program (DWSP2). This plan assisted Essex, Port Kent, and Willsboro, three public water districts in New York State, which source their water from Lake Champlain's Main Lake segment. The Towns focused its DWSP2 planning on assessing the current and future water quality

concerns of the DEC-designated Main Lake. In 2025, the Lake Champlain DWSP2 Plan was state-accepted, and the stakeholder group reconvened to start working on implementation actions. Bloomingdale Water District in the Town of St. Armand is another implementation community in the Lake Champlain Basin, who developed a state-accepted DWSP2 plan in 2024, and is now completing early stages of land acquisition for source water protection (WQIP) and developing outreach and education materials. This presentation will provide an overview of New York State's Drinking Water Source Protection Program (DWSP2) and its applications in the Lake Champlain Basin.

Track 5C: Agriculture Part 2 *Chittenden Bank Room 413*

5C-1: Investigating the environmental impact of an increased adoption of plant-based protein production in the Northeast U.S.: Assessment of Water Quality and Greenhouse Gas Emissions

Liliana Bettolo, University of Vermont. Additional Authors: Sabrina Mehzabin, Zachary Easton, Joshua Faulkner

While the environmental benefits of plant-based diets are widely acknowledged at the global scale, this study explores their practical application within a regional context, focusing on the Lake Champlain Basin in the Northeastern U.S. By considering climate, topography, soil type, and current land management, the research assesses the water quality and greenhouse gas mitigation potential of transitioning to plant-based protein production (e.g., black beans and soybeans). Currently, regional croplands are primarily used for corn silage and hay to support dairy production. Diversifying these crops to include plant-based proteins for human consumption could potentially affect total runoff at watershed scale. Key water quality indicators like nutrient loads will be modeled using the Soil and Water Assessment Tool (SWAT) for the Little Otter Creek which drains an agricultural watershed dominated by dairy production and is a tributary to Lake Champlain. Incremental scenarios of cropland transition to black bean and soybean production will be analyzed to determine the optimal balance of land allocation for animal-based and plant-based protein production with the least environmental impact considering nonpoint source phosphorus pollution and greenhouse gas emissions.

5C-2: A Blueprint for Performance-Based Conservation: Lessons from Vermont's Pay-for-Performance Program

Sumner LeBaron-Brien, VT Agency of Agriculture, Food, & Markets. Additional Authors: Nina Gage, Sonia Howlett, Judson Peck, Jamie Cohen, Jody Stryker, Andrew Gerlicz

This session will highlight Vermont's pioneering Pay-for-Performance Program (VPFP), a nationally significant model for outcome-based agricultural conservation. Launched in 2021 by the Vermont Agency of Agriculture, Food & Markets (VAAFM), VPFP directly ties financial incentives to modeled phosphorus reductions at the farm-field level—rewarding farmers for environmental outcomes that exceed regulatory requirements. Developed in partnership with Stone Environmental and the Gund Institute for Environment at the University of Vermont, VPFP represents an innovative fusion of science, policy, and practice. Presenters will discuss how the FarmPREP modeling tool supports phosphorus estimation and guides compensation, and share new interdisciplinary insights into program implementation, challenges, and impacts. The session will feature the first public presentation of findings from a social and economic impact analysis by the Gund Institute (July 2025), including farmer experiences, equity and access, and perceived fairness. Through research-based reflections and moderated discussion, the session will examine lessons learned from VPFP's first four years and explore the potential of performance-based approaches to advance more equitable and effective conservation outcomes across working landscapes.

5C-3: Enhancement of Farm-PREP with Greenhouse Gas, Carbon, Nitrogen, and Soil Health Outcomes

Dr. Jody Stryker, Stone Environmental. Additional Authors: Jens Kiesel, Hannah Rubin, Vermont Agency of Agriculture, Food, & Markets

Agricultural management in Vermont has long prioritized the reduction of phosphorus loss from cropland and pasture systems to meet the state's total maximum daily load (TMDL) requirements for Lake Champlain and water quality goals across the state. This talk will present the outcomes of a multi-objective calibration/validation effort of the APEX model, conducted with the goal of enhancing the web-based tool Farm-PREP with field-scale predictions of the long-term impacts of agronomic management on nitrogen losses, greenhouse gas (GHG) emissions, carbon sequestration, and soil health metrics, in addition to predictions of phosphorus losses. A site-specific auto-calibration approach was implemented to determine a global parameter set for simulating agricultural fields across the state of Vermont. A second component of this work then evaluated the calibrated model response on multiple management and practice implementation scenarios on hypothetical fields designed to capture a wide range of soil and weather conditions. Practice and management scenarios were compared to a 'baseline' management scenario to estimate ranges of practice effectiveness/impact on a suite of predicted environmental metrics. Our modeling evaluation found that the APEX model reasonably captures observed patterns of runoff and erosion, nutrient losses, GHG emissions, carbon sequestration, and soil health metrics in Vermont, and appropriately represents the environmental impacts of alternative agronomic management practices. The outcome of model evaluation and multi-objective APEX calibration

approach is leading to an enhancement of Vermont's Farm-PREP tool to allow for environmentally holistic assessments of land management practices across mixed-use farms comprised of cropland, pasture, and non-agricultural working lands.

Track 5D: Mutual Aird for Flood Resilience (Panel) *Williams Family Room 403*

Sarita Croce, NEIWPCC

Extreme weather events can be devastating to communities, utilities, and our ecosystem. Some of the extreme weather events which we have experienced in the past 5 years include heat waves, freezes, heavy downpours, tornadoes, tropical cyclones, and floods. Electric utilities are well-equipped for these events in a way that water/wastewater utilities are not. Many times, we see electric utility trucks traveling from all over the country prepared to assist up to a week in advance of a predicted weather event. Recent floods, such as the July 2023 floods in Vermont, 2024 flooding in southern New England, and flooding across the country, which is covered in the news, have significantly impacted water/wastewater infrastructure on a regional scale. Some specific impacts include long term failure of infrastructure, inability to provide safe drinking water, and discharge of raw sewage to our waterways. Two programs exist that are ready to assist the water utility industry during these extreme events: Water/Wastewater Agency Response Network (WARN) and the Emergency Management Assistance Compact (EMAC). WARN are state-run programs that allow water and wastewater systems to receive rapid mutual aid and assistance from other systems in the same state. EMAC is a federally approved program which was authorized by Congress in 1996. EMAC is an interstate mutual aid agreement that enables states to share resources during times of disaster. Both these networks help restore facilities and associated infrastructure damaged by both natural and man-made incidents. While EMAC and WARN are robust programs capable of providing assistance, many utilities are not aware of these resources or how to get help before or during an extreme weather event.

The goal of this session is to increase awareness and discuss opportunities for helping water and wastewater utilities develop proactive strategies for extreme weather events. The event will begin with a 20-minute presentation, followed by a 20-minute panel discussion. Attendees will then participate in a workgroup session to brainstorm creative, unconventional ideas for how water utilities can address the impact of extreme weather. New York and Vermont WARN State Coordinators, and the NY/VT Emergency Management Assistance Compact Coordinator will be in attendance.

2:45pm – 4:00pm: **Concurrent Session #6**

Track 6A: Lake and Watershed Ecology *Grand Maple Ballroom*

6A-1: 30 Years of Plankton Monitoring in Lake Champlain: What have we learned?

Dr. Tim Mihuc, SUNY-Plattsburgh. Additional Authors: Luke Myers, Zach Cutter, Marshall Arnwine, Lily Delmarsh

The Lake Champlain Basin Program has conducted Long-Term Monitoring in Lake Champlain since the mid-1990s. This includes water quality monitoring and biological monitoring focused on planktonic communities. In this presentation we will discuss what we have learned from 30 years of monitoring the plankton community in Lake Champlain. Long-term records (1992-present) for native zooplankton in Lake Champlain illustrate the impact of invasive species on community structure over the past three decades. Zooplankton exhibited shifts in composition associated with invasive species, including a decline in rotifer and Mysid abundance in the mid-1990s, following invasion of zebra mussels (Dreissena polymorpha). More recent community alterations can be attributed to invasion of the Alewife (Alosa pseudoharengus) in 2006-08, Spiny Waterflea (Bythotrephes longimanus) in 2014 and Fishhook waterflea (Cercopagis pengoi) in 2018. These patterns represent major changes in community structure with potential implications for the Lake's food web dynamics. In addition, altered Diel Vertical Migration (DVM) behavior was observed in Lake Champlain following the Spiny Waterflea and Fishhook waterflea invasions. We also detected a decline in Mysis diluviana abundance following the zebra mussel invasion in Lake Champlain along with changes in population size structure over the past 3 decades. In addition, we compared phytoplankton community composition in Lake Champlain from 1970 to present demonstrating long-term shifts in composition of cyanobacteria and other taxa. Patterns in Lake Champlain's pelagic plankton communities illustrate the threat that invasive species and/or altered thermal regimes may pose to the ecological integrity of freshwater ecosystems.

6A-2: Long-Term Zooplankton Monitoring Data: Putting Lake Champlin into a Global Context

Dr. Jason Stockwell, University of Vermont. Additional Authors: Stephanie Figary, Tim Mihuc, Hannah Nygaard

Zooplankton play a critical role in lake food webs by serving as an energy conduit between primary producers and fish and as a critical recycler of nutrients. Lake Champlain provides a unique opportunity to examine zooplankton community composition across trophic states and food web structures due to its highly fragmented regions – essentially serving as an experimental gradient of lake types in one system. In addition, the recent publishing of the most temporally and spatially comprehensive data set of zooplankton and water quality data from > 300 lakes around the world (Zooplankton International Geospatial; ZIG) provides an unprecedented opportunity to examine the impacts of climate and land use change on zooplankton community

composition, biodiversity, and ecosystem function at local, regional, and global scales. In this work, we completed processing of historical zooplankton samples (1995-1999) from the Lake Champlain Long-Term Monitoring Project (LTMP), merged the resultant data with the extant data from 2000 to present-day, harmonized the entire temporal (1995 to present-day) and spatial (15 sites) zooplankton series with other limnological variables, and integrated them with the ZIG data set. We provide an overview of the newly updated LTMP zooplankton data set and its integration with ZIG, the availability of the data, and the questions we are addressing within Lake Champlain and across the globe.

6A-3: The Monitoring and Management of Cyanobacteria HABs in Shallow, Nearshore Ecosystems such as Missisquoi Bay

Dr. Fred Lubnow, Princeton Hydro

Cyanobacteria are a group of photosynthetic bacteria that have the potential to develop into large blooms that can negatively impact the water quality, ecological, recreational, potable-use and economic value of freshwater ecosystems. Many cyanobacteria have the potential to produce cyanotoxins, a group of compounds that can negatively impact the health of people, pets, livestock, and wildlife. Such conditions are commonly described as Harmful Algal Blooms (HABs). The impact of HABs has been well documented. However, the highest HAB-related impacts frequently occur in the nearshore areas, where there is a high degree of contact between people and the water. This presentation will describe the ecology of the cyanobacteria and how shallow, nearshore areas can serve as overwintering habitat for their cells. The presentation will also review the ecology of cyanobacteria in shallow, nearshore waters, using Missisquoi Bay as an ecosystem for discussion. The presentation will discuss both established and innovative measures for monitoring and predicting HABs in nearshore areas adjacent to sites of concern such as beaches, marinas, parks and nature preserves. Additionally, in-lake management measures designed to control, prevent, and/or mitigate HABs in these shallow, nearshore waters will be reviewed.

6A-4: Spatial and temporal variation of tick-borne disease incidence in Vermont

Carlos Amissah, University of Vermont. Additional Authors: Nicholas Gotelli, Ellen Martinsen

The incidence of tick-borne diseases is increasing globally, driven by factors such as climate change and tick range expansion. This study aimed to document spatial and temporal patterns of tick abundance, pathogen prevalence, and human disease incidence in Vermont, USA. We harmonized a data set collected from 254 towns surveyed with standardized sampling methods for ticks and pathogens in the years 2015-2023 with a data set reporting incidences of 5 human pathogens (Borrelia burgdorferi, *Anaplasma phagocytophilum*, Babesia microti, Borrelia miyamotoi, and Powassan virus) in these same locations and times. We also constructed environmental layers of average annual temperature, relative humidity, and elevation for each town. Not all towns were surveyed in all years for ticks and pathogens, so town, county, and year were treated as random factors in the different models. Data were analyzed initially at the town level and then were aggregated for analysis at the county level. Environmental correlates of disease incidence in humans were similar to environmental correlates of pathogen prevalence in ticks, but human disease incidence was also often related to town size. At the town level, Lyme disease incidence in humans decreased with human population size and NDVI but increased with temperature; anaplasmosis incidence in humans decreased with human population size and tick abundance but increased with precipitation and elevation. At the county level, Lyme disease incidence in humans increased with tick abundance and temperature but decreased with precipitation, whereas anaplasmosis incidence in humans increased with temperature, NDVI, and elevation but decreased with human population size. Babesiosis incidence in humans decreased with human population size. The findings highlight the divergent effects of biotic and abiotic factors on tick-borne disease risk.

Track 6B: Streams, Rivers, and Floodplains

Jost Foundation Room

6B-1: Prioritizing Floodplain Reconnection to Improve Ecohydrological River Corridor Function

Dr. Elizabeth Doran, University of Vermont. Additional Authors: Roy Schiff, Jody Stryker, Mike Kline

Functioning alluvial floodplains perform many ecosystem services including sediment and nutrient storage; flood attenuation; groundwater recharge; and the creation and maintenance of aquatic and riparian habitats, including forms that support plant and animal occurrence and adaptation. The Vermont Functioning Floodplain Initiative (FFI) tool provides an interactive framework for prioritization and tracking floodplain reconnection projects to support a) nutrient retention, b) community resilience to flooding, and c) instream and floodplain habitat function. This talk will introduce the newly developed instream and floodplain habitat project prioritization methodologies and validation using river habitat assessment data collected across the state and novel floodplain natural community and terrestrial mammal occupancy data collected in the Lewis Creek Watershed of the Lake Champlain Basin. We will demonstrate how that habitat methodology has been implemented in the FFI tool, how it can be used for project planning and prioritization, and how users can explore the potential habitat benefits of specific project/s implementation as a co-benefit of enhancing water quality and mitigating flood hazards. By providing users with estimates of not only water quality and flood hazard mitigation benefits of projects, but also concurrent habitat benefits, this approach will generate a greater societal interest in habitat-related values and the projects that might restore them.

6B-2: Urban Land Use Controls on Bedload and Sediment Transport: A Nested Monitoring Approach

Suffiyan Safdar, University of Vermont. Additional Authors: Anne Jefferson, Andrew Stumpf, Kristen Underwood, Kayleigh Leary, Abbey Morse

Urban development profoundly changes stream geomorphology and hydrology, yet the effects of land-use variation on suspended sediment and bedload transport remain underexplored in urban watersheds. We analyzed one year of high-frequency turbidity and discharge data collected at 6 paired upstream and downstream sites bracketing subwatersheds representing urban forest, floodplain wetlands, and urban farmland in South Burlington, Vermont. In addition, we conducted 14 bedload surveys using 480 tracers (32-128 mm) deployed across both ends of urban forest and floodplain wetland reaches. Event-scale turbidity peaked before discharge indicating a clockwise hysteresis for a predominance (>50%) of events at the urban forest and farmland stations. During low and moderate flow (< 1 m3/s), the urban forest reach functioned as a sediment sink due to increased channel width and reduced channel flow velocity. In contrast, during high flows, the same reach transitioned to a sediment source, reflecting bank erosion and resuspension of sediments deposited along the bed from previous storms. The urban farmland reach remained a consistent source of sediments, whereas the floodplain wetland reach showed altering source-sink behavior, suggesting dynamic sediment retention and transport processes. The event-based bedload tracer surveys showed an average tracer recovery rate of 99.5% and mobility rate of 13.5%. No bedload transport was recorded at the station upstream of the floodplain wetland, where tracers became buried by as much as 0.3 m of fine sediments. However, the highest mean displacement of bedload tracers (2.4 m) was observed downstream of the floodplain wetland reach, in contrast with the reach's modulation of suspended sediment transport. This work highlights that sediment transport in urban streams is complicated and influenced by heterogeneity of watershed land use and stream geomorphology.

6B-3: The Compliance Bridge: Helping Conservation Projects Move from Vision to Action

Arianna Porter, SWCA Environmental Consultants

SWCA Environmental Consultants is providing technical guidance and federal compliance review support to the National Fish and Wildlife Foundation (NFWF) for the America's Ecosystem Restoration Initiative program (AERI, formerly the America the Beautiful Challenge). The AERI is a grant program supported by multiple federal agencies and focused on implementing large-scale conservation, restoration, and capacity-building projects throughout the United States and its territories. SWCA works with prospective grantees and has successfully written awarded applications, as well as successful grantees (state governments, Tribal governments, and nonprofits primarily) to ensure compliance with federal mechanisms such as NEPA, ESA, and NHPA. After three years supporting AERI, SWCA has also begun to support NFWF's Healthy American Forests Initiative in the same capacity. This presentation will be focused on how consultants can provide guidance through the compliance process for grantees.

Track 6C: Cooperative Institute for Research to Operations in Hydrology (CIROH) *Chittenden Bank Room*

6C-1: Enhancing Vermont Flood Inundation Mapping Through Process-Based Classification

David Baude, University of Vermont. Additional Authors: Rebecca Diehl, Ijaz Ul Haq, Kristen Underwood, Alexander Prescott, Beverly Wemple, Belize Lane, Colin Phillips

Existing flood inundation mapping developed for the rivers in the Lake Champlain Basin, Vermont uses a low-complexity (i.e., HAND) approach. Flooding dynamics is oversimplified in some settings leading to errors in mapped extents, but may be adequate for parts of the river network. Differences in applicability and accuracy across the landscape may be a function of variability of hydraulic characteristics of the river and floodplain. To characterize the relationship between river settings and the suitability of HAND-based inundation mapping, we identified benchmark sites across a range of river reach types, classified based on similarities in hydraulically relevant topographic characteristics. We describe the range of HAND stages defined by the benchmark inundation maps and identify the HAND stages that optimize the agreement between benchmark maps and those developed using the HAND-SRC (synthetic rating curve) approach. Departures between optimized and synthetic rating curves from NOAA's National Water Model are described by their offset and slope and understood relative to attributes of the setting. We find that HAND-based inundation mapping performance may be described, in part, by classified reach types, and that adjustments to SRCs to optimize HAND-SRC inundation mapping accuracy are more similar within classes than across classes. Our approach suggests that hydraulically based classifications can facilitate spatially variable model selection and bias correction, supporting more computationally efficient approaches to large-scale flood inundation forecasts. We are using these adjustments to improve existing flood inundation maps for the Lake Champlain Basin, Vermont.

6C-2: Drivers of National Water Model Performance in the northeastern US and implications for Lake Champlain basin communities

Mirce Morales Velazquez, University of Vermont. Additional Authors: Beverly C. Wemple, Kristen L. Underwood, Donna M. Rizzo, Zachary Suriano, Patrick Clemins, Noah B. Beckage, Andrew W. Schroth

The National Water Model (NWM) is an operational hydrological forecasting model for the contiguous United States that provides streamflow forecasts at more than 2.7 million river reaches constituting the national hydrofabric, including all of those within the Lake Champlain Basin. Much of the northeastern U.S. is dominated by montane headwater catchments, and the recent floods in July 2023 and 2024 in Vermont and July 2024 in New York illustrate the need for accurate and timely forecasts for such systems. However, NWM forecast accuracy is often reduced in these systems with a tendency toward flow underestimation and event-based performance metrics are highly variable both temporally and spatially. Here, we examine the spatiotemporal pattern of NWM medium-range forecast performance for flood events in the region and disentangle the sources of NWM forecast error across multiple montane sites of the northeast US, including those in the Lake Champlain basin and beyond. We evaluated 888 flood events of 2-yr recurrence interval or greater, occurring from 2019 to 2024 at 128 montane sites across the northeast US (13 within the Lake Champlain basin). The selected events were classified using synoptic classification, a methodology that groups diverse atmospheric variables as a single category, enabling the linkage of large-scale atmospheric circulation patterns to NWM performance during high flow events. Along with the synoptic classification, basin characteristics (e.g. drainage area, drainage density, relief) are paired with evaluation metrics of the selected flood events and used as inputs for a Tandem Evolutionary Algorithm (TEVA) to partition the source of forecast errors. Across the sites analyzed, the NWM underpredicted peak magnitude, ranging from -28% to -84% on average, for forecasts made six hours to two days before the observed peak. Furthermore, the results indicate the type of atmospheric conditions (storm event types) and basin characteristics influencing NWM forecast skill. These findings suggest limited utility of the NWM as a tool for forecasting extreme events and associated risks in montane settings in its present configuration, but also that ancillary data related to event type and basin characteristics could be leveraged to improve model performance and utility for high flow event prediction in montane settings of this region.

6C-3: AURA: A Low-Power Embedded IoT System for Real-Time Acoustic Precipitation Phase Partitioning and Hydrological Monitoring via Machine Learning on the Edge

Soheyl Faghir Hagh, University of Vermont. Additional Authors: Jordan Bourdeau, Julia Saber, Rachael Chertok, Christopher Jepsen, Parmida Amngostar, Lucas Levine, Casey Forey, Tian Xia, Christian Skalka

Accurate, distributed precipitation phase detection is critical for hydrological modeling, snowpack prediction, and climate impact forecasting, yet current instruments remain costly, power-intensive, and spatially sparse. This work presents the Advanced Unified Rainfall and Atmospheric Monitoring (AURA) system, an embedded Internet of Things (IoT) platform that performs real-time acoustic precipitation phase partitioning using edge machine learning (ML) and Mel-Frequency Cepstral Coefficient (MFCC) feature extraction. The system integrates hardware, firmware, and signal-processing innovation into a unified, field-ready device designed for deployment in remote alpine hydrological basins. At its core, the custom AURA circuit board, built based on an ATmega2560 microprocessor, implements an optimized short-time Fourier transform (STFT) and MFCC pipeline for in-situ spectral feature extraction. The board includes an RFM9X Long-Range (LoRa) module, a RockBLOCK 9603 Iridium Satellite modem, DS3231 Real-time Clock, microSD data logger, DHT22 humidity/temperature, MB7092 ultrasonic snow-depth, FDS100 solar radiation, and anemometer sensors.

The AURA system detects the precipitation phase by capturing acoustic resonances within two conical and pyramidal chambers and extracting MFCCs from the precipitation impact signal, with MFCC extraction optimized for microcontroller-based signal processing. To address microcontroller memory and processing limits, two lightweight MFCC implementation methods are developed: (1) a flash-stored lookup table and (2) a compact linear filter model. Both models enable real-time STFT–MFCC computation within 4 kB of SRAM, supporting on-device precipitation classification via SVM and RF with accuracies of 98.07 % (simulated) and 85.99 % (field data). Noise robustness and SNR analysis confirm MFCC stability down to 15 dB SNR, with lower-order coefficients exhibiting the highest variance. The LoRa–Iridium hybrid network employs a Time-Domain Multiple-Access protocol for synchronized, low-power communication across distributed nodes, supporting near-real-time reporting and adaptive event logging. Current efforts focus on high-quality data collection and noise-canceled acoustic calibration using a Parsivel² disdrometer, as well as planned field deployments of fully operational systems, including those at the Jericho Research Forest (Vermont) by Winter 2027. The AURA network represents a scalable, low-cost hydrological observatory capable of transforming precipitation acoustics into actionable insights for phase partitioning, snowpack modeling, and climate resilience research.

Track 6D: Lake Champlain "Unfiltered" Panel ***Williams Family Room***

4:00pm – 5:00pm: **Poster Session 2** ***Livak Fireplace Lounge***

P2-01: Modeling the Future of Dreissenid Mussels in Lake Champlain: A Bioenergetics Framework for Predicting Invasion Trends

Emily Dombrowski, University of Vermont. Additional Author: Brent Lockwood

The 1990's introduction of zebra mussels (*Dreissena polymorpha*) in Lake Champlain has negatively impacted ecosystem dynamics. More recently, the closely related quagga mussel (*Dreissena bugensis*) has been detected in watersheds surrounding Lake Champlain and poses the threat of invasion. When zebra and quagga mussels cohabitate, quagga mussels often outcompete zebra mussels due to their increased thermal tolerance. Understanding physiological differences in how these mussels respond to temperature and food availability will inform future management strategies to reduce the impacts of potential quagga mussel invasion. This study used bioenergetics modeling and simulated quagga mussel physiology to understand particular regions of Lake Champlain where mussels will proliferate. A literature review was conducted to obtain estimates for quagga mussel bioenergetics parameters for multiple levels of competition. Environmental data combined with bioenergetics modeling tested the hypothesis that *differences in mussel bioenergetics will constrain quagga mussel invasion.* Results revealed that in warmer months, zebra mussels perform similarly to quagga mussels in larger lake basins, while in cooler months, quagga mussels have increased growth in smaller regions of the lake, such as Missisquoi and the North East channel. The major limitations of this study were lack of zebra mussel presence data to validate the model, and the lack of habitat preference and dispersal covariates. To capitalize on this simulation, future studies should leverage physiological properties of zebra and quagga mussel bioenergetics to create a more informed estimate of invasive capacity in Lake Champlain.

P2-02: The Lake Champlain Aquatic Nonindigenous Species Information System

Noelle Hasan, Lake Champlain Sea Grant. Additional Authors: Kris Stepenuck, Emma Janson, Henry Motes, and Cayden Marrow

The Lake Champlain Aquatic Nonindigenous Species Information System (LCANSIS) is a centralized, regional-specific database that aims to track and manage information on the 52 nonindigenous aquatic species within the Lake Champlain Basin, which spans Vermont, New York, and Quebec. LCANSIS mirrors the purpose and structure of other national and regional databases, like the U.S. Geological Survey's Nonindigenous Aquatic Species (NAS) database and the National Oceanic and Atmospheric Administration's Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS). LCANSIS will be comprised of species profiles that summarize each species' pathways of introduction, distribution throughout the basin and lake, ecological and economic impacts, regulations and policies, and biological, chemical, and physical management options. Each profile consists of information compiled from peer-reviewed studies, as well as management plans and reports developed by governmental, state, and nonprofit agencies. Experts and stakeholders will review profiles to ensure accuracy and consistency. LCANSIS will serve as a publicly accessible resource for scientists, natural resource managers, and community members. Users can utilize the database to conduct risk assessments, early detection, rapid response, and prevention efforts. By consolidating information on aquatic nonindigenous species across Vermont, New York, and Quebec, LCANSIS aims to advance regional efforts in understanding, monitoring, and responding to aquatic nonindigenous introductions, contributing to the long-term management efforts of the Lake Champlain Basin. This project is an initiative led by Lake Champlain Sea Grant, in partnership with the Lake Champlain Basin Program, Great Lakes Environmental Research Laboratory, US Geological Survey, and US Environmental Protection Agency.

P2-03: Degraded Plastic Distribution and Morphology along Lake Champlain Beaches

Grace Massa, University of Vermont. Additional Authors: Nurjahan Begum, Anne Jefferson, Andrea Stumpf

Macroplastics (plastics > 25 mm) are known to have detrimental effects on human health and ecology, especially when broken down into smaller microplastics (< 5mm) and mesoplastics (5-25 mm). However, the spatial distribution patterns involved in larger, freshwater lakes without commercial fishing are severely under researched. Anthropogenic activity and proximity to potential litter sources are potential key factors in how macroplastics are showing up along Lake Champlain beaches. In 2024, a 20 m2 transect was placed along 5 Vermont beaches bi-weekly to gather all visible anthropogenic materials > 0.1 mm along the lowest wrack line. Using this dataset, anthropogenic materials that fit into a standard microplastic morphology categorization were classified as "plastics" as opposed to identifiable trash which was classified as "surface litter", regardless of material type. Surface litter made up <18% of the anthropogenic materials collected in 2024, along with plastics concentrations (0.361m-2) being noticeably lower compared to previous Lake Champlain plastic work. A new sampling protocol was implemented in 2025 that utilized two transects perpendicular to the water and selected

based on perceived visitation frequency. In May 2025, thirty-five beaches across Lake Champlain were sampled using this new method and plastic concentrations jumped up to 1.10 m-2 with microplastics (0.566 m-2) and mesoplastics (0.394 m-2) being the most dominant size ranges. North and Oakledge beaches in Burlington, Vermont were visited bi-weekly and mesoplastics (0.473 m-2) dominated the lower overall plastic concentration (0.603 m-2). For the entire 2025 dataset, surface litter represented ~24% of all anthropogenic materials. Foam was the dominant plastic morphology among the 35 beaches, while fragments dominated the North and Oakledge analysis. A t-test demonstrated that high visitation transects showed no statistically significant difference (p=0.687) in plastic concentration, therefore we can assume the impacts of perceived visitation frequency for this study were negligible. Overall, our results indicate that beaches with urban visitation in a larger, freshwater lake without commercial fishing exhibit higher concentrations of smaller plastics (< 25 mm) compared to larger plastics (> 25 mm).

P2-04: Sustainable Protocol for Efficient Extraction and Comprehensive Characterization of Microplastics in Organic-Rich Urban Stormwater Runoff

Kehinde Ojasanya, University of Vermont. Additional Authors: Appala Raju Badireddy, Liesel Greseth, James O'Connor

Urban stormwater runoff represents a significant pathway for microplastic transport into aquatic systems, yet standardized and sustainable extraction methods remain limited. This study presents the development of a sustainable protocol for the efficient extraction and characterization of microplastics in urban stormwater runoff collected from multiple sites within the Lake Champlain Drainage Basin. The workflow integrates contamination control, size fractionation, organic digestion, density separation, vacuum and gravity filtration, and advanced analytical characterization, combining Dynamic Image Analysis for automated particle size and shape determination, fluorescence microscopy for morphological classification, and µ-FTIR hyperspectral imaging for polymer identification. Samples were pre-fractionated into three size ranges (1-20 µm, 20-150 µm, and 150-500 µm) and subjected to Fenton's reagent digestion for organic matter removal under temperature-controlled conditions. Post-digestion, brine solution ($\rho \approx 1.20$ g/cm³) enabled efficient density separation of buoyant polymers such as polyethylene and polypropylene. Microplastics were recovered via filtration, using PTFE and nylon membranes matched to particle size, and subsequently subjected to visual microscopic examination and particle counting. Quality assurance and quality control (QA/QC) were established using blank spike recovery experiments, ensuring reproducibility and quantifying method recovery efficiency. This sustainable protocol minimizes reagent consumption, promotes contamination control, and provides a reproducible framework for quantitative and qualitative assessment of microplastics in complex urban stormwater matrices. The developed method supports future efforts in urban water quality monitoring, source tracking, and pollution mitigation strategies within stormwater management systems.

P2-05: Shoreline Plastic Pollution in Lake Champlain: Abundance and Characteristics

Nurjahan Begum, Rubenstein School of Environment and Natural Resources, University of Vermont. Additional Authors: Anne Jefferson, Andrea C Stumpf, Arden Degrenier, Grace Massa, Alyssa J. Warbeck, Allison Morrow, Timothy B. Mihuc, Danielle Garneau

Microplastics and larger debris pervade freshwater, yet shoreline accumulation in inland lakes remains underexplored. This study reports 2024 data from eleven public Lake Champlain beaches (six Vermont and five New York). Across five visits (July–October 2024), 5 strandline sand samples per beach were collected. In total, 677 plastic particles were recorded: 304 from Vermont and 373 from New York. Vermont samples were fragment-dominated (62.3%), with most particles in the 2.36–4.75 mm and >4.75 mm fractions (68%); colors were led by transparent (34%) and white (31%).In New York, urban beaches, led by Plattsburgh City Beach, showed higher accumulation, with fine 1.18 to 2.36 mm particles (58%), fragments (84%), and white (33%) and black (28%) colors. Temporal signals showed modest month to month variation in Vermont, but a pronounced September peak at Plattsburgh City Beach in New York, largely driven by a single sample. Totals in November (Oakledge, n = 101; North, n = 52) exceeded July to October values, consistent with enhanced upper beach deposition relative to the summer active strandline. FTIR analysis of Vermont particles (49 particles confirmed as plastics out of 58) showed that polypropylene (25%), polystyrene (18%), high density polyethylene (16%), and polyurethane (16%) were the dominant polymers. These findings demonstrate consistently higher microplastic loads at urban beaches, variation

across strandline zones that may reflect differences cross-shore transport, and state-level contrasts in particle size and color, providing essential baseline data to guide expanded 2025 shoreline monitoring.

P2-06: Distribution and drivers of PFAS and mercury in Lake Champlain fish

Vivien Taylor, Dartmouth College. Additional Authors: Jana Kraft, Celia Chen, Caroline Gillespie, Callie Carter.

This study reports on the distribution of the widespread contaminants mercury (Hg) and per- and polyfluorinated alkyl substances (PFAS) in fish from the nearshore and offshore regions of Lake Champlain. Concentrations of Hg in major game fish species from Lake Champlain have been monitored since the 1980's through the LCBP fish Hg survey. A subset of fish from the 2022-23 Hg survey, including yellow perch, white perch and lake trout, and spanning all 7 basins of the lake, were analyzed for PFAS, to assess spatial variability in PFAS concentrations and compounds. In addition, fish frequently caught in nearshore environments, including carp, white suckers, sunfish and eels, were also sampled and analyzed for both Hg and PFAS. The study highlights differences in bioaccumulation trends in these pervasive contaminants and expands current data to include commonly caught nearshore species for which contaminant concentrations are scarce or lacking.

P2-07: Analyzing the Equity of Flood Impacts and Recovery in Vermont Communities

Nat Robtoy, University of Vermont Transportation Research Center. Additional Authors: Dana Rowangould, Sarah Grajdura, Kristen Underwood

Vermont communities have dealt with four devastating floods in the last few years. In the wake of these disasters, countless people have lost their homes, businesses, and some residents were injured or even lost their lives in these floods. Prior nationwide research has revealed that natural disasters tend to impact vulnerable individuals the most, especially minority and low-income populations. To examine the potential for such inequities in Vermont, this study explored the distribution of impacts from the Great Vermont Flood in July 2023 and another major event in December of the same year. Victims of these disasters were interviewed to gather information and ultimately examine which socioeconomic and demographic factors play a role in determining the impacts of a flood on an individual and their ability to recover. These impacts were broken down into seven categories of wellbeing that attempt to quantify the widespread, complex effects that natural disasters create. Binary logistic regression models for each facet of wellbeing were used to identify the most important factors in determining flood impacts and recovery. The results of this analysis will be passed on to community organizations and state and federal agencies to better inform flood preparedness and assistance measures.

P2-08: Habitat factors associated with river otter (Lontra canadensis) occurrence in the Lewis Creek Watershed

Lydia Emry, University of Vermont. Additional Authors: Dr. James Murdoch, Dr. Brittany Mosher, Dr. Elizabeth Doran, Lilo Schultz, and Margreta Grady

Human encroachment, development, and land-use change degrade the quality and functionality of floodplains throughout North America. River otters are often considered to be an indicator species of the health of freshwater and floodplain ecosystems, and a keystone species due to their effects on other species and ecosystem function. In Vermont, river otters are widespread, but are sensitive to environmental change such as habitat alteration, conversion, and loss. Habitat associations in the state are poorly understood and important for better understanding the species' ecology and responses to environmental change. We collected otter detection/nondetection data using camera traps at 49 sites located every 1.5-kilometers along a stream network in the Lewis Creek Watershed from May, 2024, to December, 2024. We predicted that river otter presence would be associated with conifer forests, silty soils, and incised banks, which provide sources of prey and shelter. Logistic regression and a model selection approach were used to determine the factors that had the greatest impact on river otter presence. The top model indicated that bank vegetation protection (+), the presence of agriculture (+), and medium intensity developed lands were the best predictors of river otter presence (+). It is possible that the increased implementation of riparian buffers and best management practices in Vermont's agricultural areas may result in an increase in vegetative protection around the entrance of river otter dens, reduce nutrient inputs that may hinder their abundance of prey, and improve the connectivity between aquatic and terrestrial habitats more efficiently than our original predictions.

P2-09: A Preliminary Analysis of Distribution and Ecological Preferences of Vermont Stoneflies

Maria Jankowski, SUNY Plattsburgh. Additional Authors: Dr. Scott Grubbs, Dr. Timothy Mihuc, Luke Myers

Stoneflies (Order Plecoptera) are a vastly diverse order of insects, essential to freshwater ecosystems. The Northeastern USA Regional Assessment of Stoneflies (Insecta: Plecoptera) Species in Greatest Conservation Need examines the distribution of 33 species of stoneflies (Order Plecoptera), deemed species of Regional Species of Greatest Conservation Need (RSGCN) status in the 13 Northeastern states. Vermont in particular has very few published studies of stoneflies. Those published are scattered across species descriptions, revisions, news postings and other sources. Understanding fundamental information on where a species occurs in addition to habitat l preferences of stoneflies is important to the future conservation of the order, and future distributional models for species of concern in the northeast. This study aims to examine the distribution, and ecological preferences of Vermont stoneflies. Specifically, we are examining preferences in regards to Level IV ecoregions, elevation and watersheds using data collected in the field, literature review and institutional collections.

P2-10: Storms Under Water: Impacts of Wind-Driven Events on Deep Lake Thermal Dynamics

Miranda Rummell, Lake Champlain Research Institute. Additional Authors: Dr. Timothy Mihuc, Dr. Eric Leibensperger

Lake Champlain is a large, deep, temperate freshwater lake that experiences summer stratification, which limits interactions between surface water, known as the epilimnion, and deep water, known as the hypolimnion. Wind-induced storms can disrupt this phenomenon altering thermal stability. From 2016-2024, a Fondreist CB-450 model buoy collected high frequency vertical temperature profiles in the Main Lake segment near Valcour Island. We utilized the rLakeAnalyzer package in R Studio to measure the frequency, duration, and intensity of thermal changes in the water column, then classified them into five severity levels. From 2016 to 2024, a total of 44 storms exceeded an epilimnion depth of 30m between July 15 and September 15. These events occurred one to seven times each fall, with the highest frequency in 2016, 2019, and 2021 when seven storms occurred, and the lowest in 2022 with only one. Each storm exhibited distinct dynamics likely influenced by variations in wind forcing and stratification strength. These findings provide a baseline for characterizing storm-induced thermal disturbances and highlight the need for expanded monitoring to assess ecosystem patterns.

P2-11: Do lakemounts influence zooplankton biomass, density, and community composition in large lake system(s)?

Samantha Gonsalves, University of Vermont. Additional Authors: Bianca Possamai, Jason Stockwell

Oceanic seamounts, steep underwater landforms in otherwise barren oceans, modify water circulation and promote upwelling of nutrient-rich water, boosting primary productivity. These bottom-up processes enhance seamount productivity, supporting high-yield fisheries, high biodiversity, and many ecosystem services. Consequently, seamounts are biological hotspots targeted for conservation. Lakemounts, steep reefs in open waters of large lakes, are hypothesized to serve as analogs to seamounts, but this hypothesis remains untested. We investigated this potential role of lakemounts by focusing on zooplankton, which serve as a mid-trophic level conduit in the food web and can indicate increased primary production and overall biological activity. We compared density, biomass, and community composition of zooplankton around three lakemounts (Schuyler Reef and Ferris Rock in Lake Champlain, USA; Superior Shoals in Lake Superior, CA) and their corresponding offshore habitats which served as controls. Sampling occurred day and night to account for the diurnal deficit, a pattern in which zooplankton are found in higher estimates at night than during the day, during summer 2025. We collected 132 samples from the epilimnion, metalimnion, and hypolimnion in all sites. Processing will be completed in December 2025. We expect to find support for the following three hypotheses: (H1) zooplankton density and biomass are higher on lakemounts than in adjacent open water habitats; (H2) communities on lakemounts are more diverse than those of open water habitats; and (H3) zooplankton density and biomass are consistently higher at night compared to daytime as a result of the diurnal deficit. Together, these findings would support the idea that lakemounts serve a functionally similar role to seamounts and may have further management and conservation implications for large freshwater lakes.

P2-12: Seasonal Shifts, Microbial Drifts: Changing Phenology impacts on Lake Champlain Microbial Communities

Katie Bruno, Cate Kreutzen, and Kate Schroeder, Middlebury College. Additional Author: Erin Eggleston

We investigated bacterial, archaeal, cyanobacterial, and viral community diversity and functional dynamics at three littoral Lake Champlain sites spanning trophic levels. Approximately weekly collection of samples at

Missisquoi, St. Albans, and Malletts Bay across all seasons has expanded our knowledge of the interannual dynamics of these systems. Bray-Curtis dissimilarity reveals differences in beta diversity by site and season for the bacterial and archaeal communities. Malletts Bay taxa were the most distinct from the other two sites, and had less variation by season, whereas Missisquoi Bay and St. Albans Bay shared more taxa and have more distinguished summer and winter/spring communities. Spearman correlation identified some interesting co-variance patterns associated with cyanobacterial blooms, including Roseomonas, Sediminibacterium, and Arenimonas. Preliminary viral analyses show the presence of auxiliary metabolic genes which can impact host metabolism.

P2-13: Erosion and Deposition of Sediment in Vermont Rivers Following the 2023 and 2024 Floods

Amelia Bohling, University of Vermont. Additional Authors: Nat Robtoy, Henry Leister, Kristen Underwood, Alexander Prescott, Ken Johnston, Rebecca Diehl

In 2023 and 2024, widespread flooding across Vermont resulted in significant erosion, damaging homes and infrastructure, and degrading water quality from the mass transport of sediment. As the frequency and intensity of events like these are expected to increase, we need to develop tools to identify where there are erosion hazards and where there are opportunities for capturing sediment. We used a novel dataset of reach-scale LiDAR-derived topography from before and after the floods of 2023 and 2024 to analyze morphologic change of streams throughout Vermont. From this dataset, we explore how geomorphic stream types influence a reach's susceptibility to erosion and deposition and determine where within the valley bottom topographic change occurred. To better understand the patterns of sourcing and storing sediment, we classified the riverscape into four morphological zones: channel, streambank, proximal floodplain, and distal floodplain. We digitized these zones for each study reach and created a tool in GIS, the "Zoner", to automate some of this process which could be used in future projects. We used topographic change maps to quantify the volume of sediment eroded and deposited in each zone. We are finding considerable variability in channel and floodplain response to flood events. This variability may be described, in part, by how well connected the river channel is to its floodplain and its location within the watershed. This data will help us better understand and manage rivers and floodplains in Vermont, particularly to mitigate flood related hazards and help communities plan to be more resilient.

P2-14: Trash movement in Potash Brook, South Burlington, Vermont

Andrea Stumpf, University of Vermont. Additional Authors: Abbey Morse, Arden Clarke-Degrenier, Casey Benderoth, Hope Lagemann, Morgan Fletcher, Anne Jefferson

Trash can move from urban areas and into streams, ultimately reaching lakes and oceans. This debris can degrade water quality, pose an entanglement hazard, break into microplastics, and enter the food chain. The movement and storage of trash in urban streams is an understudied problem globally, including here in the Lake Champlain basin. This study consisted of repeat trash surveys in 2024 and 2025 on Potash Brook which drains into Lake Champlain. At four different reaches, data on trash locations and characteristics were collected along 30 m transects. The surveys were conducted on at least 5 dates during each of the two warm seasons. Flow data for the reaches were also collected. For each interval between surveys, each piece of trash was classified according to whether it came into the reach, stayed where it was, moved within the reach, or moved out of the reach. In 2024 we collected data on almost 300 unique pieces of trash, and we found an average of 10 new pieces of trash per reach per visit. The site that had the most trash (127 unique pieces) was the site downstream of the most urban area and it also had the highest trash mobility. The most common trash at that site was plastic wrappers, but the two most common types overall were glass fragments and plastic bags. An average of 2 pieces of trash moved within the reach between each visit, although two sites had an average of 0 and one site had an average of 6. On average, 28% of trash had moved out of the reach when we looked for it again in the next survey, 44% of trash was in the same place, and 26% were trash items that had moved into the reach. Our results suggest land use, stormwater runoff, and other factors all contribute to trash input and movement in Potash Brook.

P2-15: Geographic Information System for Fluvial Erosion Quantification of Great Brook Vermont

Henry Leister, University of Vermont. Additional Authors: *Kristen Underwood, Rebecca Manners Diehl, Nat Robtoy, Amelia Boehling*

Over the last two years, Vermont has seen devastating floods and erosion, with hundreds of millions of dollars in damages to local communities. The town of Plainfield, VT, situated at the intersection of Great Brook and the Winooski River, has historically been impacted by flood events, with landslides commonly occurring along Great Brook. This site faced major flooding during July of 2023 and 2024, causing significant road and culvert washouts as

well as home damages to the heart of Plainfield. To learn more about the channel erosion patterns of Great Brook, this project looked at local flooding trends of 2024 using Uncrewed Aerial Survey (UAS) LiDAR imagery and field surveys. This information gathered through UAS was analyzed in ArcGIS using streambank mapping techniques. Three reaches were compared; M3.02A, M3.02B, and M3.02C. A combination of pre-flood and post-flood DEMs and orthoimagery were used to define changing streambank, water, and channel areas. For each of these zones, the difference between 2023 and 2024 DEM was used to quantify sediment erosion and deposition. The topographic change analysis indicates the M3.02 reaches of Great Brook to be a highly erosive system, with upwards of 327,000 m3 of streambank erosion following July 2024 extreme flooding (though only 48% the size of the longest reach, M3.02C saw the greatest streambank erosion). From a comparison of geomorphic properties, we hypothesize that the braided geometry of the reach was a factor in high erosion. We expected that geomorphic characteristics could help describe variability in topographic change, but many of the parameters typically used to describe the geomorphology of a river were not applicable to extreme flows. Understanding fluvial erosion is critical for the protection of flood prone communities, and the development of sustainable infrastructure without inhibiting the natural river services.

P2-16: Evaluating Floodplain Habitat Function Using Ecogeomorphic Indicators in the Lewis Creek Watershed

Lilo Schultz, University of Vermont. Additional Authors: Elizabeth Doran, Margreta Grady, James Murdoch, Elias Rosenblatt, Lydia Emery, Brittany Mosher, Kristen Underwood, Rebecca Diehl, Rose Watts, Kenneth Johnston

Floodplains provide critical ecosystem services such as groundwater recharge, flood and erosion control, and support habitats for a diverse range of plants and animals. However, human influence continues to erode the quality and quantity of floodplain habitat by altering its structure and function. Coarse-filter conservation approaches have been initiated in Vermont and have identified areas of highest priority in floodplain ecosystems, but have yet to be validated using finer-scale data such as in this study. This study aims to understand how ecogeomorphic function, the bidirectional feedback between ecological and geomorphological processes, impacts the quality and quantity of floodplain habitat for three indicator species with varying home range sizes and habitat associations. We will evaluate patterns of occupancy for American black bear (Ursus americanus), bobcat (Lynx rufus), and North American river otter (Lontra canadensis) in the Lewis Creek watershed in Vermont using camera trap data, alongside remote sensing, geomorphic, land use, and vegetation survey data. Trail cameras were installed approximately 1.5 kilometers apart at 49 sites along a 53-kilometer stream network and monitored from July 1, 2024 to July 1, 2025. Images were processed with TrapTagger, using a combination of AI and manual analyses to identify mammals to species level. These data will then be used to fit single season occupancy models for each species that evaluated the effect of multiple landscape factors such as habitat amounts and human-related variables including trails, roads, residential developments, and agriculture. We predict that the probability of occupancy increases as the area of surrounding available suitable habitat increases, that the probability of site occupancy is positively related to habitat complexity, and that the probability of occupancy decreases as the intensity of human-related variables increases for all species. The results of this study can be used to help inform future conservation and restoration efforts in the Lewis Creek watershed by identifying the highest priority sites where efforts will be most beneficial for terrestrial mammal species.

P2-17: Assessing eco-geomorphic habitat factors associated with amphibian diversity in riparian floodplains of the Lewis Creek watershed

Margreta Grady, University of Vermont. Additional Authors: Lilo Schultz, Dr. Elizabeth Doran, Lydia Emry, Dr. Brittany Mosher, Dr. James Murdoch, Dr. Kristen Underwood, Dr. Rebecca Diehl, Rose Watts, Kenneth Johnston

Functioning floodplains provide valuable habitat for a diverse array of wildlife, yet they are susceptible to threats such as altered hydrology, species invasions, and land use change. Prioritizing floodplain restoration and conservation projects for enhanced habitat objectives requires a thorough understanding of how wildlife use these habitats and respond to environmental changes. In this study, we use amphibian diversity to evaluate the habitat quality of 30 forested, agricultural, and developed floodplain sites in the Lewis Creek watershed, Vermont State, USA. Over two years, 6 amphibian surveys were conducted per site during early, mid-, and late summer when it was assumed the sites were closed to internal or external migration. Surveys included acoustic, visual encounter, and dip-netting techniques to maximize detection probability. Because amphibians often require a mosaic of

habitats to support their complex life histories, habitat composition proximate to each sampling location was assessed using a combination of vegetation and land use data. Spatial analysis was conducted for small, medium, and large home range sizes to account for differences in mobility among amphibian species. Completed lateral (upland) and longitudinal (riverine) floodplain connectivity metrics were also generated for each site. We hypothesize that amphibian diversity will be positively correlated with habitat connectivity and complexity as well as wetland, meadow, and forest cover. Additionally, we hypothesize that amphibian diversity will be negatively correlated with the proportion of developed and agricultural land cover within each home range. With the results from our analyses, we hope to demonstrate the importance of floodplain connectivity and habitat heterogeneity for amphibians to better inform prioritization of floodplain restoration in the Lake Champlain Basin.

P2-18: Advanced Methodologies for Microplastic Detection Across Diverse Environmental Matrices from the Arctic to the Lake Champlain Basin

Olivia Rutkowski, Vermont State University, Castleton. Additional Author: Dr. Andy Vermilyea

Microplastics are emerging contaminants of global concern, yet standardized analytical protocols for their detection across heterogeneous environmental matrices remain elusive. This study focuses on developing robust workflows for microplastic identification and characterization in snow, ice, water, soil, and sediment samples. Initial development efforts have targeted the Canadian Arctic, where soil, snow, and sea ice samples were collected to evaluate methodological performance in minimally disturbed environments. Further research will be extended to the Lake Champlain Basin, with particular emphasis on soil matrices which have received less attention due to the complexity of analysis. Our approach aims to incorporate high- and low-impact terrestrial environments to elucidate potential source areas contributing microplastics into our waterways. The proposed workflow integrates density separation, organic matter digestion, and infrared (IR) microscopy, complemented by staining and imaging techniques, to quantify particle abundance, size distribution, and polymer composition. By addressing analytical challenges in complex matrices—particularly soils—this work seeks to advance reproducible methods for microplastic monitoring and source attribution, thereby informing mitigation strategies in vulnerable ecosystems.

P2-19: Keeping our farms in the green: Using a nutrient mass balance assessment to prioritize sustainable dairy practices

Luke Trombley, SUNY Plattsburgh. Additional Authors: Laura Klaiber, Quirine Ketterings

The dairy industry is one of the largest economic sectors in New York, as one of five states that contributes more than half of the dairy production in the United States. Dairy farming practices can contribute significant nutrients to the atmosphere and watershed, which may also represent inefficiencies in the costs of farm maintenance and production. Quantifying inputs and outputs of nutrients to the farm can help us to identify inefficiencies in nutrient management. Addressing these inefficiencies can protect downstream ecosystems from eutrophication and save farms money. Our study developed a nutrient mass balance model for the William H. Miner Agricultural Institute in Chazy, NY to identify inefficiencies in the nutrient budgets of nitrogen, phosphorus, and potassium. The mass balance assessment helps farmers realize where they may be overusing or even underusing nutrients in certain aspects of their dairy production. After evaluating the farm's mass balance, we curated management options to help Miner reduce inefficiencies. As with many farms, we found that management options to reduce inefficiencies were primarily related to feed and fertilizer use.