US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

NEAEB 2010

March 17-19

Hotel Viking, Newport, Rhode Island

Hosted by the RI Dept. of Environmental Management

New England Association of Environmental Biologists 34th Annual Meeting

YSI

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

HACH®
Hydromet

biodrawversity
ecological consulting
and communications

TETRA TECH, INC.

Humboldt Field Research Institute
Advanced and specialty seminars for field biologists, researchers, educators, graduate students, natural resource managers, and restoration specialists.
Publishers of
Northeastern Naturalist: www.eaglehill.us/nena
Southeastern Naturalist: www.eaglehill.us/sena
www.eaglehill.us

NEIWPCC
New England Interstate Water Pollution Control Commission

US EPA ARCHIVE DOCUMENT

The New England Association of Environmental Biologists would like to thank the following organizations for their support:

New England Interstate Water Pollution Control Commission
www.neiwpcc.org

Kerry Strout
116 John Street
Lowell, MA 01852
Phone: (978) 349-2524
Fax: (978) 323-7919
kstrout@neiwpcc.org

Biodrawversity
www.biodrawversity.com

Ethan Nedeau
441 West Street
Amherst, MA 01002
Phone: (413) 253-6561
ethan@biodrawversity.com

Normandeau Associates Inc.
www.normandeau.com

Don Mason
25 Nashua Road
Bedford, NH 03110
Phone: (603) 472-5191
Fax: (603) 472-7052
dmason@normandeau.com

Tetra Tech, Inc.
www.ttwater.com

Benjamin Jessup
73 Main Street
Montpelier, VT 005602
(802) 229-1059
benjamin.jessup@tetratech.com

YSI
www.ysi.com

Barrett Gaylord
13 Atlantis Drive
Marion, MA 02738
Phone: (914) 909-2921
Fax: (508) 748-2543
bgaylord@ysi.com

Hach Hydromet
www.hach.com

Nichole Halsey
PO Box 389
5600 Lundberg Drive
Loveland, CO 80539
Phone: (970) 214-1269
Fax: (970) 461-3921
nhalsey@hach.com

Humboldt Field Research Institute and Eagle Hill Foundation
www.eaglehill.us

Joerg-Henner Lotze
PO Box 9
59 Eagle Hill Road
Steuben, ME 04680
Phone: (207) 546-2821
Fax: (207) 546-3042
joerg@eaglehill.us

NEAEB would also like to thank Sarah Macreading for her work designing the NEAEB t-shirt. For information on Sarah's design work visit her website at http://www.sarahmacreading.com/ or e-mail her at smacread@gmail.com

The Rhode Island Department of Environmental Management welcomes you to the 34th Annual Meeting of the New England Association of Environmental Biologists at the Hotel Viking in historic Newport, RI.

The sole objective of NEAEB is to provide a forum wherein ideas may be exchanged, projects, research and technology may be presented or displayed, and a temporary formal gathering place provided to enhance the advancement of environmental protection and management of the region's aquatic resources.

We are proud to offer a full program of content aimed at fulfilling NEAEB's objective. NEAEB 2010 attendees are a diverse group of stakeholders from state and federal agencies, nongovernmental organizations, private companies and academia representing all seven New England states, New York State and a handful of areas outside the region . With 55 oral presentations, 17 posters, a taxonomic workshop and a plenary featuring the EPA Region 1 Regional Administrator, Curt Spalding, and the Director of the Eastern U.S. Freshwater Program for The Nature Conservancy, Mark P. Smith, we hope that all attendees find the meeting interesting and informative.*

Thank you for your participation and welcome to Newport!

-Your friendly NEAEB 2010 Meeting Planners

Table of Contents

Meeting Summary and Map of Hotel ……..1

Agenda

- Wednesday ……..2
- Thursday ……..3
- Friday ……..4

Plenary Speaker Bios ……..5

Workshop Description ……..6

"It's a Shore Thing: A Coastal Cabaret" ……..6

Abstracts

- Oral Presentations ……..7
- Poster Presentations ……. 31

*Attendees should be on the lookout for meeting evaluations sent via e-mail shortly after the close of NEAEB

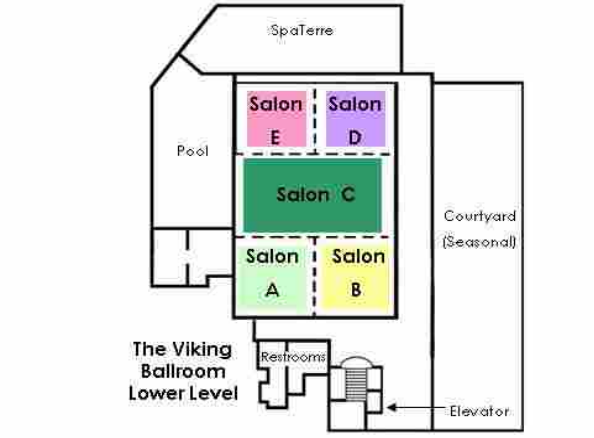
US EPA ARCHIVE DOCUMENT

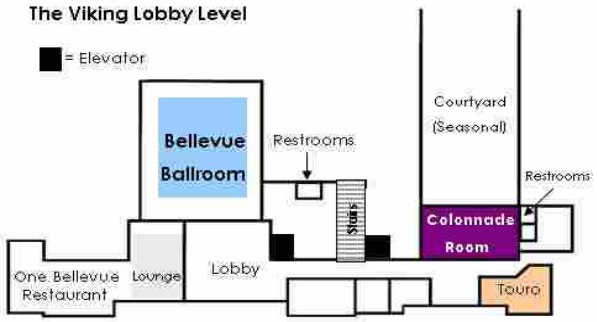
US EPA ARCHIVE DOCUMENT

New England Association of Environmental Biologists
34th Annual meeting, The Hotel Viking, Newport, RI
March 17-19, 2010 Conference Summary

Start Time	Wednesday 3/17			Thursday 3/18			Friday 3/19		
6:30 AM				Breakfast			Breakfast		
8:00 AM				Registration			Registration		
8:30 AM				Session 3A ***Freshwater Invasive Species***	Session 3B ***Bioassessment & the BCG***	Session 3C ***Outreach, Education & Communication***	Session 6A ***Streamflow & Thermal Regimes***	Session 6B ***Nutrients***	Free Time ***Taxonomy Workshop***
9:00 AM									
9:30 AM									
10:00 AM				AM Break 10:00 - 10:15			AM Break 10:00 - 10:30		
10:30 AM				***Plenary Session*** 10:15 11:30			Session 7A ***Fish Assemblages & Distributions***	Session 7B ***TMDLs***	***Taxonomy Workshop***
11:00 AM									
11:30 AM									
12:00 PM	Registration			**Buffet Lunch**					
12:30 PM									
1:00 PM	Session 1A ***Mapping***	Session 1B ***Wetlands & Amphibians***	Session 1C ***Critical Technical Elements I***	Session 4A ***Lakes: Monitoring***	Session 4B ***Stream Biomonitoring I***	Session 4C ***Estuaries& Coastal Resources***			
1:30 PM									
2:00 PM									
2:30 PM	PM Break			PM Break					
3:00 PM	Session 2A ***Phragmites***	Session 2B ***Wetland Assessments***	Session 2C ***Critical Technical Elements II***	Session 5A ***Lakes: Habitat & Bioassessment***	Session 5B ***Stream Biomonitoring II***	Session 5C ***Dam Removal & Streamflow Restoration***			
3:30 PM									
4:00 PM									
4:30 PM	Business Meeting			Free Time		Free Time			
5:00 PM				***Poster Reception***					
5:30 PM	Dinner on your own								
6:00 PM									
6:30 PM				**Dinner Banquet "It's a Shore Thing: A Coastal Cabaret"**					
7:00 PM									
7:30 PM									
8:00 PM	Celebrate St. Patrick's Day In Downtown Newport			Social at One Bellevue					

Salon A
Salon B
Salon C
Salon D
Salon E
Colonnade Room
Touro Room
Bellevue Ballroom





US EPA ARCHIVE DOCUMENT

New England Association of Environmental Biologists
34th Annual meeting, The Hotel Viking, Newport, RI
Wednesday, March 17

Start Time			
12:00 PM	Registration (Foyer)		
1:00 PM	Session 1A Salon A **Mapping** Moderator: Kerry Strout	Session 1B Salon D **Wetlands & Amphibians** Moderator: Veronica Masson	Session 1C Salon E **Critical Technical Elements I**
1:00 PM	*Characterizing, Mapping and Applying Level IV Ecoregions in New England for Integrated Ecosystem Assessment and Management* - Greg Hellyer, USEPA	*Incidence of Batrachochytrium dendrobatidis in Rhode Island Anuran Populations* - Mandy Gaudreau, Antioch University New England	*Evaluation of Critical Elements of a Bioassessment Program for the New England States* Susan P. Davies, Midwest Biodiversity Institute Chris O. Yoder, Midwest Biodiversity Institute
1:30 PM	*New York Ecoregional Mapping* - Gregory J. Edinger, New York State Department of Environmental Conservation	*Mapping & Inventory of Vernal Pools in the Wood-Pawcatuck Watershed* - Tom Kutcher, Rhode Island Natural History Survey	
2:00 PM	*Hidden Waters: The Invisible Streams of Central Massachusetts* - Betsey Colburn, Harvard Forest	*Assessing Occupancy Estimates of Pond-breeding Amphibians in Rhode Island* - Peter Paton, University of Rhode Island	
2:30 PM	PM Break (Salon B)		
3:00 PM	Session 2A Salon A **Phragmites** Moderator: Lisa McGreavy	Session 2B Salon D **Wetland Assessments** Moderator: TBD	Session 2C Salon E **Critical Technical Elements II**
3:00 PM	*Phragmites australis in Coastal Marshes: Perspectives of a Successful Plant Invader* - Laura A. Meyerson, University of Rhode Island	*Wetlands Functional Analysis and Designated Use Assessment: The Same thing by Different Names?* - Paul Currier, New Hampshire Department of Environmental Services	**Panel** *States Helping States: Common Issues in Implementation of Tiered Aquatic Life Uses (TALU)* Susan P. Davies, Midwest Biodiversity Institute (Moderator) Chris O. Yoder, Midwest Biodiversity Institute (Presenter) Panelists Traci Iott, CT Department of Environmental Protection Guy Hoffman, CT Department of Environmental Protection A.J. Smith, NYS Department of Environmental Conservation Steve Fiske, VT Department of Environmental Conservation
3:30 PM	*Restoration of Tidally Restricted Salt Marshes at Rumney Marsh, Revere, Massachusetts: Balancing Flood Protection with Marsh Restoration by Use of Self-Regulating Tidegates* - Edward Reiner, USEPA	*Update on the NARS and the 2011 National Wetland Condition Assessment* - Tom Faber and Jeanne Voorhees, USEPA	
4:00 PM	*Effective Herbicide Control of Phragmites australis for the Restoration of a Native Plant Community* - Keith Gazaille, Aquatic Control Technology, Inc.	*Rapid Assessment of Freshwater Wetlands in Rhode Island* - Tom Kutcher, Rhode Island Natural History Survey	
4:30 PM	**Business Meeting** Touro Room		
5:30 PM	Dinner - on your own		
8:00 PM	 Celebrate St. Patrick's Day in Downtown Newport		

US EPA ARCHIVE DOCUMENT

New England Association of Environmental Biologists
34th Annual meeting, The Hotel Viking, Newport, RI
Thursday, March 18

Start Time			
6:30 AM	**Breakfast** Bellevue Ballroom		
8:00 AM	Registration (Foyer)		
8:30 AM	Session 3A Salon A **Freshwater Invasive Species** Moderator: Lisa McGreavy	Session 3B Salon D **Bioassessment & the BCG** Moderator: Tom Danielson	Session 3C Salon E **Outreach, Education & Communication** Moderator: Jen West
8:30 AM	*Invasives Species Monitoring: Approaches for Volunteer Programs* - Elizabeth Herron, URI Cooperative Extension	*The New England Biological Condition Gradient (BCG) Model* - Ben Jessup, Tetra Tech, Inc.	*Watershed Protection: Enlisting Public Participation Through Outreach* - Gina DeMarco, Northern Rhode Island Conservation District
9:00 AM	*The Ups and Downs of Winter Lake Drawdown as Part of a Long-term Invasive Weed Control Program in a Massachusetts Lake* - Matt Ladewig, ESS Group, Inc.	*Comparisons of Biological Condition Gradient (BCG) Level Assignments Derived from Expert Panelists* - Jen Stamp, Tetra Tech, Inc.	*Working with Students, Macroinvertebrates and Kayaks* - Denise J. Poyer, Wood-Pawcatuck Watershed Association
9:30 AM	*Connecticut's Invasive Aquatic Plants: Search for Solutions* - Gregory J. Bugbee, The Connecticut Agricultural Experiment Station	*Bioassessment on the Delaware River: Challenges & Approaches for a Large River* - Erik L Silldorff, Delaware River Basin Commission	*Developing a Report Card of Assessed Waters in Connecticut* - Erik Bedan, Connecticut Department of Environmental Protection
10:00 AM	AM Break (Salon B)		
10:15 AM	**PLENARY TALKS**		
	Salon C Introduction by Michael Sullivan, Director, Rhode Island Department of Environmental Management Curt Spalding, Regional Administrator, EPA Region 1 *"Remarks from the Regional Administrator"* Mark P. Smith, Director, Eastern U.S. Freshwater Program, The Nature Conservancy *"Defining Success: What's Science Got To Do With It?"*		
11:30 AM	**Buffet Lunch** Bellevue Ballroom		
1:00 PM	Session 4A Salon A **Lakes: Monitoring** Moderator: Hilary Snook	Session 4B Salon D **Stream Biomonitoring I** Moderator: Robert Nuzzo	Session 4C Salon E **Estuaries & Coastal Resources** Moderator: Heidi Travers
1:00 PM	*Using EPA's National Lake Assessment to Assess the Condition of Vermont Lakes* - Mark Mitchell, Vermont Department of Environmental Conservation	*Application of the Index of Biotic Similarity (B) to the Analysis of the Data Generated by the Streams Project* - Carlos F. A. Pinkham, Norwich University	*Inverse Demographic Analysis of Compensatory Response to Resource Limitation in the Marine Mysid Americamysis bahia* - Jason Grear, USEPA Atlantic Ecology Division
1:30 PM	*A Remote Sensing Approach to Measure Water Quality in New England Lakes: Where Are We Now and What's Next?* - Shane R Bradt, Sea Grant & Water Resources, UNH Cooperative Extension	*Life in a Conduit* - Rosemary Gatter-Evarts, Connecticut Department of Environmental Protection	*A Changing World : A Changing Narragansett Bay?* Chris Deacutis, Narragansett Bay Estuary Program
2:00 PM	*Candlewood Lake Ice-In Ice-Out Report* - Alberto F. Mimo, Candlewood Lake Authority	*Distinguishing the Effects of Point Source from Those Caused by Upstream Nonpoint Source (NPS) Inputs: Refinement of a Watershed Development Index for New England* - Naomi E. Detenbeck, USEPA Atlantic Ecology Division	
2:30 PM	PM Break (Salon B)		
3:00 PM	Session 5A Salon A **Lakes: Habitat & Bioassessment** Moderator: Linda Green	Session 5B Salon D **Stream Biomonitoring II** Moderator: A. J. Smith	Session 5C Salon E **Dam Removal & Streamflow Restoration** Moderator: Alisa Richardson
3:00 PM	*Evaluation of the Lake Macroinvertebrate Integrity Index (LMII) and Alternate Indices for Eastern US Lakes and Reservoirs* - James Kurtenbach, USEPA Region 2	*Periphyton Community Dynamics in Lake George Sub-Watersheds* - Emily Porter-Goff, Rensselaer Polytechnic Institute	*Streamflow Management Alternatives for Aquatic Habitat and Herring Restoration in a Small Public Water Supply Reservoir System (First Herring Brook, Scituate MA)* - Margaret Kearns, Massachusetts Division of Ecological Restoration
3:30 PM	*Lentic Biomonitoring: Littoral Macroinvertebrate Community Response to Lakeshore Development* - Jeremy Deeds, Vermont Department of Environmental Conservation	*Exploring Algal Community Dynamics Across Varying Enrichment Conditions Using GIS and Statistical Methods to Develop Holistic Nutrient Criteria in Connecticut Rivers and Streams* - Mary Becker, Connecticut Department of Environmental Protection	*Halifax Dam Removal. What happens when the water goes down?* - Jennifer Burton-Reeve, Kleinschmidt Associates
4:00 PM	*How Much of a Buffer is Needed to Mitigate the Change to Littoral Habitat from Lakeshore Development?* - Kellie Merrell, Vermont Department of Environmental Conservation	*Stream Algal Model for Predicting Attainment of Maine Water Quality Classes* - Tom Danielson, Maine Department of Environmental Protection	*Road Crossings and Potential Barriers to Fish and Wildlife Movement: Rhode Island River and Stream Continuity* Project-Kathryn Zuromski, Rhode Island Resource Conservation & Development Council
4:30 PM	Free Time	*The Effects of Urban Development on Stream Ecosystems in the Northeastern Coastal Zone Ecoregion of New England* - James F. Coles, USGS	Free Time
5:00 PM	**Poster Reception** Colonnade Room		
6:30 PM	**Dinner Banquet** **"It's a Shore Thing: A Coastal Cabaret"** Bellevue Ballroom Cash Bar		
8:00 PM	**Social at One Bellevue Lounge** Cash Bar		

US EPA ARCHIVE DOCUMENT

New England Association of Environmental Biologists
34th Annual meeting, The Hotel Viking, Newport, RI
Friday, March 19

TIME			
6:30 AM	**Breakfast** Bellevue Ballroom		
8:00 AM	Registration (Foyer)		
8:30 AM	Session 6A Salon D **Streamflow & Thermal Regimes** Moderator: TBD	Session 6B Salon E **Nutrients** Moderator: Susy King	
8:30 AM	*Summer Water Temperatures in New Hampshire and Massachusetts Coldwater Streams* - Jennifer Jacobs, University of New Hampshire	*Use-perception Data in Wadeable Streams of New York State: Implications for Nutrient Criteria* - Alexander J. Smith, New York State Department of Environmental Conservation	
9:00 AM	*The Effects of Drought on Marcroinvertebrates and Fish in Connecticut Streams* - Michelle Tipton, Wesleyan University	*New USGS Regional Water Quality Modeling in New England* - Keith Robinson, USGS	**Taxonomy Workshop: EPT Forum** Dr. Steven Burian Southern Connecticut State University Touro Room
9:30 AM	*Stream Depletion Method to Establish Ecological Flows for Groundwater Withdrawals in Rhode Island* - Alisa Richardson, Rhode Island Department of Environmental Management	*Denitrification Hotspots in Fluvial Systems: The Role of Woody Debris* - Julia Hyman, University of Rhode Island	
10:00 AM	AM Break (Salon B)		
10:30 AM	Session 7A Salon D **Fish Assemblages & Distribution** Moderator: David Neils	Session 7B Salon E **TMDLs** Moderator: Liz Scott	**Taxonomy Workshop: EPT Forum** Dr. Steven Burian Southern Connecticut State University Touro Room
10:30 AM	*Pre-Columbian Freshwater Fish in Maine and New England* - Dave Halliwell, Maine Department of Environmental Protection	*So You Have an Impervious Cover TMDL, Now What?* - Chris Bellucci, Connecticut Department of Environmental Protection	
11:00 AM	*The New England Large River Fish Assemblage Assessment Project: Some Initial Findings* - Chris O. Yoder Midwest Biodiversity Institute	*Development of a Volunteer Based Chloride TMDL in the Hodgson Brook Watershed* - Ted Walsh, New Hampshire Department of Environmental Services	
11:30 AM	*Fish Assemblage Assessment of the Connecticut River Mainstem, 2008-9* - Chris O. Yoder Midwest Biodiversity Institute	*T-RFLP for the Bacterial Source Tracking of Escherichia coli from Feral Pigeons and Cattle in Agricultural Roof-Runoff* - Michael J. Turner, University of Connecticut	
12:00 PM	*Developing and Testing Refinements for a Fish Assemblage Assessment Index for Large Rivers in Maine: How to Incorporate Diadromous Species* - Chris O. Yoder Midwest Biodiversity Institute	*Using the Clean Water Act to Reduce Mercury in the Northeast: the Northeast Regional Mercury TMDL and 319(g) Petition* - Susannah King, New England Interstate Water Pollution Control Commission	

US EPA ARCHIVE DOCUMENT

Plenary Speaker Bios

Curt Spalding
Regional Administrator
EPA Region 1

H. Curtis "Curt" Spalding has extensive experience in the environmental protection field as an advocate, policy analyst and administrator. For almost 20 years, he served as Executive Director of Save The Bay in Rhode Island, a nationally recognized, 20,000-member environmental advocacy and education organization. He established the Narragansett BayKeeper and Habitat Restoration programs which reconnected Save The Bay to ecologically important Bay issues and oversaw the successful completion of the $9 million Explore The Bay Campaign and construction of the Save The Bay Center at Fields Point in Providence, RI. Prior to joining Save The Bay, Spalding was an Environmental Protection Specialist and Presidential Management Intern at EPA's offices in Boston and Washington, D.C. Spalding received his bachelor's degree from Hobart College and an M.P.A. from SUNY at Albany in Albany, NY.

On November 5, 2009, Environmental Protection Agency Administrator Lisa P. Jackson announced President Barack Obama's selection of H. Curtis "Curt" Spalding to be the Agency's Regional Administrator for EPA's region 1, and he was sworn in to the position on February 17, 2010.

Taken from EPA Press Release "Curt Spalding Named EPA Regional Administrator for New England"

Mark P. Smith
Director, Eastern U.S. Freshwater Program
The Nature Conservancy

Mark P. Smith is the Director of the Eastern U.S. Freshwater Program for The Nature Conservancy (TNC). The Freshwater Program works with the Conservancy's fourteen State Programs from Virginia to Maine to develop and implement conservation strategies to protect the natural biodiversity of freshwater systems.

Prior to joining The Nature Conservancy, Mark spent six years as the Director of Water Policy at the Massachusetts Executive Office of Environmental Affairs (EOEA). Prior to working for the State of Massachusetts, Mark spent six years with the U.S. Environmental Protection Agency in Boston as the project manager for the Casco Bay Estuary Project, part of EPA's National Estuary Program. He has a Masters degree in Urban and Environmental Policy from Tufts University and a bachelor's degree from Washington University in St. Louis.

Taken from U.S. Fish & Wildlife Service

US EPA ARCHIVE DOCUMENT

E.P.T. Taxonomy Workshop

Friday March 19, 2010 9:00 AM – 12:00 PM

Dr. Steven K. Burian
Deparment of Biology
Southern Connecticut State University
New Haven, CT

This workshop will focus on genus level taxonomy of Ephemeroptera, Plecoptera, and Trichoptera (E.P.T.) of the northeast region. Mayflies will be specifically highlighted, but Information will also be provided on regional genus level diversity of stoneflies and caddisflies. Some of the traditionally difficult to separate taxa will be discussed and some reference material will be available. The overall goal of the workshop is to provide direct taxonomic assistance to participants. Participants are encouraged to bring representative material to work on and any specimens that they would like to ask questions about. Participants should also bring a copy of the 4th edition of An Introduction to the Aquatic Insects of North America, or copies of the relevant EPT chapters, and their own scopes, light sources and bench tools (forceps etc.).

It's a Shore Thing: A Coastal Cabaret

Performance at the Dinner Banquet

"It's a Shore Thing: A Coastal Cabaret" uses music to take a look at global environmental change along Rhode Island's coastlines. The cabaret will feature original songs written by Judith Swift, URI professor of theatre and communications, and Charles Cofone, a former resident musical theater director at URI. Among the songs are *Ice is Nice*, a rap that examines the poles as air conditioners of the planet; *Song of the Nile*, an analysis of how politics and culture affect natural resources; *Scientific Oops*, a cautionary tale about global warming mitigation efforts; and *Be Careful*, which focuses on invasive species. Many of the songs are based on research conducted by URI faculty.

Abstracts for Oral Presentations

WEDNESDAY

Session 1A
Salon A
Mapping

1:00 PM
Characterizing, Mapping and Applying Level IV Ecoregions in New England for Integrated Ecosystem Assessment and Management
Greg Hellyer* (USEPA - New England Regional Lab)

EPA and a diverse group of federal, state and NGO partners have recently completed a three year collaborative, iterative process of delineating, characterizing, field checking and mapping Level IV ecoregions and slightly revised Level III ecoregions for New England. A USGS glossy poster, along with GIS data and metadata are now available. EPA's ecoregions are hierarchical, covering Canada, the conterminous U.S. and Mexico. They are defined as areas of similarity based on patterns and composition of aquatic and terrestrial ecosystem components of the abiotic (non-living), biotic (living) and cultural (human) environment, including geology, physiography, vegetation, climate, soils, hydrology, land use and wildlife, with humans being considered as part of the biota (Omernik 1995). Level IV ecoregions are the finest scale of ecoregional delineation, most useful for federal, state and NGO ecosystem assessment and environmental management. This talk will describe the ecoregional mapping process in New England, present the final products and discuss current and potential New England applications. At least 47 of the lower 48 states have used some form of ecoregions programmatically, including in their water and wildlife programs, among others. EPA-New England hopes this ecoregional delineation may further development of the New England Biological Condition Gradient (BCG) and Tiered Aquatic Life Use (TALU) models, regional biocriteria and numeric nutrient criteria, support the TMDL, nutrient and non-point source programs and 303(d)/305(b)/Integrated Reporting, in addition to other potential uses. A New England workshop to illustrate how states have applied ecoregions in their water programs is in planning for spring, 2010.

1:30 PM
Ecoregions of New York
Gregory J. Edinger* (New York Natural Heritage Program, New York State Department of Environmental Conservation)

Jim Omernik (USGS) and his team have been on a multi-year mission to accurately map Level III and IV ecoregions for every state in the nation. In 2008, only a couple states were missing from the picture with New York being one of the biggest gaps in the eastern U.S. A project kick-off meeting was held in Albany, NY that brought together partners from various government agencies and non-government organizations, including EPA, USDA NRCS, USGS, NYS DEC, NYNHP, TNC and NatureServe. Two years later, in March 2010, the final poster with the map and information about the Ecoregions of New York has been sent to the printers and is expected to be published later this year. This presentation will touch on the evolution of ecoregional mapping in NY that started with NYS DEC Ecozones in the early 1980s, followed by TNC's modified Bailey's Ecoregions in the 1990s, which brings us to the debut of Ecoregions of New York (Bryce, Omernik, et al. 2010). The remainder of the talk will present an overview of representative ecoregions of New York State highlighting the ecological communities, land use patterns and showcasing a few of the characteristic species in these ecoregions.

* Presenter

US EPA ARCHIVE DOCUMENT

Abstracts for Oral Presentations

2:00 PM

Hidden waters: The Invisible Streams of Central Massachusetts

Betsy A. Colburn* (Harvard Forest) and Robert T. Brooks (USDA Forest Service)

Effective regulatory protection and management of headwater streams depends on consistent and accurate identification and delineation of streams in the landscape. We surveyed a randomly selected sample of 30 blue-line stream terminuses on 7.5' USGS topographic maps of the Quabbin Reservoir watershed in central Massachusetts to (1) assess the accuracy of this delineation, and, if inaccurate, (2) characterize the extent and morphological attributes of the stream channel and riparian forest upstream of the mapped blue-line terminus. Five (17%) of the mapped blue-line terminuses depicted the true origin of the streams, with no unmapped, upstream segments. Above the remaining 25 blue-line terminuses (83%) we identified and surveyed 26 unmapped streams. Unmapped stream segments extended an average of 492 m above the blue line terminus with a cumulative length of 12,817 m. Flowing into 10 of the 26 unmapped headwaters were 20 unmapped tributaries, with average length of 129 m and cumulative length of 2,585 m. Unmapped headwater segments were significantly more likely to flow through and originate in wetlands than the mapped blueline terminuses or unmapped tributaries. Most channel characteristics of unmapped stream segments and tributaries did not differ from those of mapped blueline segments. Our results document a significant and complex stream network above most mapped stream (blue-line) terminuses in the study area. Limiting regulatory jurisdiction to mapped stream networks would allow for the disturbance or even destruction of the unmapped stream resources. We recommend that blueline streams on USGS topographic maps should not be used to define regulatory jurisdiction.

Session 1B

Salon D

Wetlands & Amphibians

1:00 PM

Incidence of Batrachochytrium dendrobatidis in Rhode Island Anuran Populations

Mandy M. Gaudreau* (Environmental Studies Department, Antioch University New England), Rachel K. Thiet (Environmental Studies Department, Antioch University New England) and Lou Perrotti (Roger Williams Park Zoo)

Chytridiomycosis is an emerging amphibian disease that has caused mass die-offs and species extinction worldwide. Chytridiomycosis is caused by infection of the keratinized epidermis of amphibians by the fungus *Batrachochytrium dendrobatidis* (Bd). Several anuran species commonly found in Rhode Island have tested positive for Bd in other northeastern states; typically these individuals present few or no clinical signs and do not suffer mortality from infection. Environmental factors have been shown to increase pathogenicity of Bd, making the geographical distribution of Bd important to know for conservation planning, particularly in light of predicted climate change. This study was conducted to evaluate whether Bd is present in Rhode Island anuran populations and to map its geographical distribution throughout the state. We also investigated whether land use patterns were correlated with distribution of positive Bd infection. Skin swab samples (n=47 at 11 sites) were taken from bullfrogs (*Lithobates catesbeianus*), green frogs (*Lithobates clamitans*), pickerel frogs (*Lithobates palustris*), American toads (*Anaxyrus americanus*), wood frogs (*Lithobates sylvatica*), and tadpoles. Twenty-one percent of samples tested positive for Bd in four anuran species. Results from this study will improve our understanding of Bd infection and distribution in New England and will aid in future anuran conservation planning.

* Presenter

US EPA ARCHIVE DOCUMENT

Abstracts for Oral Presentations

1:30 PM

Mapping and Inventory of Vernal Pools in the Wood-Pawcatuck Watershed

Tom Kutcher* (Rhode Island Natural History Survey)

This presentation describes a project aimed at field verification of potential vernal pools and amphibian breeding habitats previously mapped in the Wood-Pawcatuck Watershed in southern RI. RIDEM, in collaboration with NEIWPCC, RINHS, EPA and the Wood-Pawcatuck Watershed Association, developed a site selection procedure and field methods outlining criteria for confirming amphibian breeding habitat. Training was developed and provided to staff biologists and watershed volunteers. Field inspections were conducted in 2008 and 2009. 515 sites were inspected at least once. Results are being summarized. Information on confirmed pools will be shared with state, local and watershed programs.

2:00 PM

Assessing Occupancy Estimates of Pond-breeding Amphibians in Rhode Island

Peter Paton* (Dept. of Natural Resources Science, University of Rhode Island) and Annie Curtis (Massachusetts Army National Guard)

There is increased interest in understanding the habitat requirements of pond-breeding amphibians to implement conservation efforts. We identified within-pond and landscape-scale factors influencing patterns of occupancy for seven amphibian species by intensively sampling 36 isolated ponds in Rhode Island. Amphibian occurrence was sensitive to road density for *A. maculatum*, *A. opacum*, *R. clamitans,* and *R. sylvatica*. Canopy cover strongly enhanced occupancy estimates of ambystomatid salamanders and diminished occupancy estimates of *B. americanus, H. versicolor,* and *P. crucifer*. Predatory invertebrate family richness affected occupancy estimates of *B. americanus, H. versicolor, P. crucifer,* and *R. clamitans*. Vegetative characteristics enhanced occupancy estimates of *A. maculatum* (persistent emergents)*, H. versicolor* (woody pond edge)*, R. clamitans* (aquatic bed)*,* and *R. sylvatica* (woody within-pond). Knowledge of each species' habitat requirements can be used to conserve the diversity of wetlands required to support the entire assemblage.

Session 1C
Salon E
Critical Technical Elements I

1:00 PM

Evaluation of Critical Elements of a Bioassessment Program for the New England States

Susan P. Davies (Midwest Biodiversity Institute) and Chris O. Yoder (Midwest Biodiversity Institute)

Session 2A
Salon A
Phragmites

3:00 PM

Phragmites australis in Coastal Marshes: Perspectives of a Successful Plant Invader

Laura A. Meyerson* (Department of Natural Resources Science, University of Rhode Island)

Phragmites australis is arguably one of the most successful plant invaders in coastal marsh systems of the U.S. An aggressive *Phragmites* lineage "likely introduced to the northeastern U.S. in the 19th century" presently is sweeping through coastal wetlands of Atlantic states and can also be found in parts of the Gulf and Pacific coasts as well as inland habitats. While native *Phragmites* was previously found in many of these habitats, observation and experimental research have made it clear that the spread of introduced *Phragmites* is closely coupled with anthropogenic disturbance of the physical and chemical environment.

* Presenter

US EPA ARCHIVE DOCUMENT

The primary factors favoring establishment and spread of the introduced type are physical disturbance of wetland margins that opens up new sites for initial colonization and eutrophication, which relaxes interspecific competition for nutrients belowground and promotes the rhizomatous expansion of tall, dense monocultures. Overall, the ecological impacts of *Phragmites* invasion and expansion are viewed negatively, i.e., reduction/loss of native plant coverage and diversity, alteration of wetland hydrology, changes in ecosystem functions and perceived failures of wetland creation and restoration projects owing to *Phragmites* invasion. However, *Phragmites* wetlands must be considered effective sinks for nutrients, and their rapid growth and organic sediment accumulation rates may be sufficient to match projected rises in sea level, facilitating landward migration of salt marsh systems. My talk will summarize recent progress in the science and management of *Phragmites* including comparisons between the native and introduced lineages, characteristics that enhance the invasiveness of *Phragmites*, the consequences and benefits of *Phragmites* invasions and the role of *Phragmites* in marsh restoration.

3:30 PM

Restoration of Tidally Restricted Salt Marshes at Rumney Marsh, Revere, Massachusetts: Balancing Flood Protection with Marsh Restoration by Use of Self-Regulating Tidegates

Edward Reiner* (USEPA)

Tidegates were typically installed in coastal wetlands prior to enactment of legislation regulating such activities, to provide flood protection to low lying property within coastal floodplains. Those tidegates operated by unidirectional flow, often leading to impaired drainage and increased freshwater flooding. Impaired drainage and increased freshwater flooding resulted in colonization of former salt marshes by *Phragmites australis* (common reed) due to decreased salinity. Installing bidirectional flow tidegates can improve drainage conditions, increase saline tidal flow, help control *Phragmites* and restore normal salt marsh plant assemblages.

Prior to restoration actions, Rumney Marsh, located in Revere, Saugus and Lynn, Massachusetts had 21 missing, non- or poorly functional tidegates with up-gradient wetlands. These tidegates were located at 15 sites, and adversely affected more than 130 acres of wetlands. Between 1997 and 2001, 11 Self-Regulating Tidegates (SRTs) were installed at nine of these sites to provide controlled tidal flow to approximately 86 acres of wetlands. The goals of installing these SRTs were to both restore and enhance salt marsh ecology and provide flood protection. While flood protection has improved with the installation of these new tidegates, numerous problems, such as lack of maintenance of the tidegates and culverts, engineering error, vandalism and non-compliance with permit conditions, have limited the success of these efforts. This work in progress requires continued effort to correct deficiencies and achieve the desired flood protection and marsh restoration benefits.

This abstract represents the views of the author and does not necessarily reflect the position of the U.S. Environmental Protection Agency. No official endorsement by EPA is intended or inferred.

4:00 PM

Effective Herbicide Control of Phragmites australis for the Restoration of a Native Plant Community

Keith Gazaille* (Aquatic Control Technology, Inc.)

Invasive common reed (*Phragmites australis*) has growth characteristics that enable it to rapidly displace native plant species and establish dense monotypic stands in a variety of inland and coastal wetland habitats. As a result of the negative impacts to wetland habitats associated with the widespread colonization of *Phragmites*, significant money and effort have been spent on effectively and selectively controlling this invasive species. Over the last 15-20 years a number of different control techniques have been used for *Phragmites* control. Due to the effectiveness of aquatic herbicides experienced over the years, much of the current management work involves the application of herbicides on some level. An overview of *Phragmites* control options will be presented along with the reasoning and results of representative New England *Phragmites* control projects.

* Presenter

US EPA ARCHIVE DOCUMENT

Abstracts for Oral Presentations

Session 2B
Salon D
Wetland Assessments

3:00 PM
Wetlands Functional Analysis and Designated Use Assessment: The Same thing by Different Names?
Paul Currier* (New Hampshire Department of Environmental Services)

Discussions are in progress in New Hampshire about mechanisms for evaluating secondary or indirect impacts to surface waters from development projects that result in landscape change and require a wetlands permit. These projects also require 401 certification that surface water quality standards will be met. Functional analysis for wetlands has evolved into a semi-quantitative process, even as numeric water quality criteria for designated use support for wetlands are being developed. It may well be that these two methods for assessing wetlands are in fact evaluating ecosystem services from two different program perspectives. If so, wetlands scientists and surface water biologists could collaborate to create a unified process useful to both programs.

3:30 PM
Update on the NARS and the 2011 National Wetland Condition Assessment
Tom Faber (USEPA) and Jeanne Voorhees (USEPA)

EPA is collaborating with states, tribes, federal agencies and other partners to implement a field survey of the nation's wetlands in 2011 as part of EPA's on-going series of National Aquatic Resource Surveys (NARS). The NARS are monumental national efforts intended to improve the quality of information on the nation's aquatic resources and improve state and tribal water monitoring programs. The results of the wetlands survey will be used to judge progress toward the national goal of increasing the quantity and quality of the nation's wetlands. The findings will help ensure technical and financial resources are most efficiently allocated to address the greatest risks that confront wetland resources. We will sample 900 random sites using standardized monitoring protocols to characterize the vegetative and algal community, soil condition and hydrology of each sample location. In 2013, EPA will produce a statistically-valid assessment of wetland ecological integrity and the stressors most commonly associated with degraded wetlands. We will also explore ways to quantify the ecosystem services that are derived from wetlands and their restoration and provide the framework for the continued study of how climate change is impacting wetland quality.

4:00 PM
Rapid Assessment of Freshwater Wetlands in Rhode Island
Tom Kutcher* (Rhode Island Natural History Survey)

The Rhode Island Department of Environmental Management and the Rhode Island Natural History Survey have been working on developing a rapid assessment method (RAM) to characterize the condition of freshwater wetlands in the State. The project is being conducted as part of a freshwater monitoring and assessment program that aims to address State-identified objectives. The Rhode Island-specific RAM, RIRAM, was designed to characterize relative condition of a given wetland unit by generating a set of sub-indices representing the intensity and proportion of landscape and in-wetland stresses, and the cumulative impacts they cause to a set of indicators that control wetland function; these are summed to generate a numeric index of condition. RIRAM has been tested and demonstrated on 197 wetlands over three field seasons. RIRAM stress sub-indices have consistently correlated with impact sub-indices, clarifying some stress-response relationships that address State objectives. RIRAM has also been shown to correlate with independent biological and physical monitoring data. It additionally provides baseline ecological, functional, geospatial and classification data, and meets EPA-recommended criteria for

* Presenter

US EPA ARCHIVE DOCUMENT

identifying reference conditions for reference-based bio-monitoring. RIRAM may thus be a useful component in future wetland monitoring, assessment and inventory efforts.

Session 2C
Salon E
Critical Technical Elements II

3:00 PM
Panel: States Helping States Common Issues in Implementation of Tiered Aquatic Life Uses (TALU)
Moderator: Susan P. Davies (Midwest Biodiversity Institute)
Presenter: Chris O. Yoder (Midwest Biodiversity Institute)

Panelists
Traci Iott (CT Department of Environmental Protection)
Guy Hoffman (CT Department of Environmental Protection)
A.J. Smith (NYS Department of Environmental Conservation)
Steve Fiske (VT Department of Environmental Conservation)

THURSDAY

Session 3A
Salon A
Freshwater Invasive Species

8:30 AM
Invasive Species Monitoring: Approaches for Volunteer Programs
Elizabeth Herron* (URI Cooperative Extension)

Extensive research conducted on the subject of controlling invasive species suggests that prevention and early detection is the most effective approach, economically and practically. Training volunteers to monitor for invasive species can significantly enhance both prevention and early detection. Clearly, having more eyes in more places watching for potential invasive species will greatly improve the possibility of identifying a new invasion quickly, perhaps at a point when eradication is more feasible. Perhaps more important is the role volunteer monitoring plays in preventing the spread of invasive species through education, the development of an informed community and local stewardship.

Monitoring for invasive species can occur as a stand-alone program, or as part of a larger water quality monitoring effort. Various approaches will be presented, with existing New England programs and their experiences highlighted. Particularly useful websites and program contacts will also be provided to help you develop your strategy for monitoring invasive aquatic species with the help of volunteers.

9:00 AM
The Ups and Downs of Winter Lake Drawdown as Part of a Long-term Invasive Weed Control Program in a Massachusetts Lake
Matt Ladewig* (ESS Group, Inc.) and Carl Nielsen (ESS Group, Inc.)

As with many water bodies in New England, Nabnasset Lake in Westford, Massachusetts has suffered from decreased recreational value and reduced wildlife habitat due to infestations of curly-leaf pondweed (*Potamogeton crispus*) and variable-leaf milfoil (*Myriophyllum heterophyllum*).

* Presenter

US EPA ARCHIVE DOCUMENT

Lake bathymetry and hydraulic control made Nabnasset Lake an excellent candidate for management of milfoil through winter drawdown. However, the lake provides habitat for several sensitive species of freshwater mollusks and is hydrologically connected to a large wetland habitat known as Shipley Swamp. To protect these resources while addressing the weed problem, a flow chart was developed to guide management actions in the lake. An annual monitoring "report card" provides a user-friendly evaluation tool. Permitting of the lake management plan faced several hurdles but received final approval in 2003. Now in its seventh year of implementation, it has resulted in good control of milfoil. Curly-leaf pondweed was not as susceptible to drawdown and required more intensive management. By re-assessing the lake each year, management actions have been custom-tailored to the interannual variability in the lake ecosystem. This systematic approach has ensured the protection of native species while minimizing opportunity for new invasive species (e.g. purple loosestrife) to spread.

In many New England lakes, drawdown provides a viable alternative or companion to herbicide and other treatments for control of most aquatic invasive plants. However, as exemplified by Nabnasset Lake, successful management through drawdown requires careful monitoring and the flexibility to incorporate alternative management actions (hand pulling, herbicides, etc.) under a comprehensive management plan. Permitting challenges and components of the monitoring program will be discussed.

9:30 AM

Connecticut's Invasive Aquatic Plants: Search for Solutions

Gregory J. Bugbee (The Connecticut Agricultural Experiment Station) and Martha E. Balfour (The Connecticut Agricultural Experiment Station)

Connecticut's lakes and ponds face an imminent threat from invasive plants. Their dense stands often interfere with recreation, lower property values and alter aquatic ecosystems, leading to a decline in native species. Since 2004, the Connecticut Agricultural Experiment Station Invasive Aquatic Plant Program (CAES IAPP) has taken a multifaceted approach in its search for solutions to the invasive aquatic plant problem. We are assessing the severity of the State's invasive aquatic plant problem by conducting vegetation surveys of lakes and ponds. We have surveyed over 160 water bodies and documented over 90 native and 13 invasive plant species. Approximately two-thirds of the lakes and ponds contained one or more invasive species. Eurasian watermilfoil (*Myriophyllum spicatum*), variable watermilfoil (*Myriophyllum heterophyllum*), fanwort (*Cabomba caroliniana*), curly leaf pondweed (*Potamogeton crispus*) and minor naiad (*Najas minor*) are the most frequently found. Apparent new arrivals to the State include hydrilla (*Hydrilla verticillata*), Brazilian waterweed (*Egeria densa*), yellow floating heart (*Nymphoides peltata*), and a possible overwintering population of water hyacinth (*Eichhornia crassipes*). We are looking for the causal agents of the aquatic invasions, including hydrography, water chemistry and public access in the hope that introductions can be prevented. Once invasive aquatic plants are established, control is difficult. We are testing novel control methods such as reduced risk herbicides, biological agents and targeted water level drawdowns. We have designed a webpage to disseminate our information (www.ct.gov/caes/iapp).

Session 3B
Salon D
Bioassessment & the BCG

8:30 AM

The New England Biological Condition Gradient (BCG) Model

Ben Jessup (Tetra Tech, Inc.), Jeroen Gerritsen (Tetra Tech, Inc.) and Jen Stamp (Tetra Tech, Inc.)

Over the last several years, New England states, NEIWPCC and the EPA have partnered to work towards developing a consistent way to assess biological data, robust among multiple sampling protocols and compatible with theories of biological condition gradients (BCG). This past fall, these efforts culminated in

* Presenter

US EPA ARCHIVE DOCUMENT

the development of a New England BCG model for relatively high gradient streams. In this presentation we discuss the process that went into the development of the New England BCG model, the comprehensive set of decision rules that comprise the model and how this model compares to the previously developed Connecticut and New England Wadeable Stream (NEWS) BCG models. While the regional model can be used throughout the participating states to accurately assess biological conditions, calibrations to specific states and methods may be more accurate. The rate of agreement between the six BCG levels predicted by the model versus those assigned by the expert panel was 68%. The agreement increases to 91% when considering predictions within one level of the expert assignment.

9:00 AM

Comparisons of Biological Condition Gradient (BCG) Level Assignments Derived from Expert Panelists

Jen Stamp* (Tetra Tech, Inc.), Jeroen Gerritsen (Tetra Tech, Inc.) and Ben Jessup (Tetra Tech, Inc.)

There are many different ways to collect and assess macroinvertebrate samples. Over the last several years, New England states, NEIWPCC and the EPA have partnered in efforts to develop a consistent way to assess biological data, independent of sampling protocols and compatible with theories of biological condition gradients (BCG). As part of these efforts, samples were collected at sites throughout New England using 6 different collection methods. This past fall, water quality ratings were derived for these samples using 4 different state assessment methods, the BCG, and the U.S. EPA Wadeable Stream Assessment (WSA) multimetric index. A number of comparative analyses were performed on these data. An evaluation of the differences in BCG level assignments both within and across state groups showed that BCG assignments were almost always within a single level of each other. BCG assignments were also compared to ratings derived from state assessment methods. Both the BCG and all of the state indexes separate out best from worst. The degree of agreement among experts and among states is a strong indication that the BCG reflects our best estimate of condition, and that additive multi-metric indexes have difficulties in sorting out the intermediate conditions (good and fair). This is consistent with known weaknesses of an additive, linear, un-weighted index built from data at hand.

9:30 AM

Bioassessment on the Delaware River: Challenges & Approaches for a Large River

Erik L Silldorff* (Delaware River Basin Commission) and Robert L Limbeck (Delaware River Basin Commission)

Bioassessment programs throughout the nation are developing methods to assess larger waterbodies (e.g., non-wadeable rivers) and previously unassessed aquatic systems (e.g., wetlands). Yet the lessons learned from decades of work in streams fail to provide complete solutions to the unique challenges presented by these new bioassessment endeavors. The Delaware River is among the class of large Atlantic slope rivers whose size fits between wadeable streams and the non-wadeable great rivers (Delaware River drainage area: 13,500 sq.mi. at the Atlantic Ocean; 6800 sq.mi. at the head-of-tide). In addition, the Delaware boasts of the longest free-flowing channel east of the Mississippi, high water clarity, coarse cobble substrate, dense freshwater mussels and relatively low nutrients for most of its length before reaching the tidal estuary (e.g., TP typically less that 40 µg/L, TN typically less than 0.9 mg/L). Among the challenges for assessing the Delaware River, therefore, is defining the expected condition of such a relatively intact and healthy ecosystem and setting thresholds along the gradient toward impairment. The Delaware River Basin Commission has begun efforts to assess the river using targeted macroinvertebrate sampling and has defined “reference” based on current conditions in the Delaware River itself. In this talk, we will explore both the justifications and implications of these decisions on classifying different zones of the Delaware for the DRBC integrated assessment.

* Presenter

US EPA ARCHIVE DOCUMENT

Abstracts for Oral Presentations

Session 3C
Salon E
Outreach, Education & Communication

8:30 AM
Watershed Protection: Enlisting Public Participation Through Outreach
Gina DeMarco* (Northern Rhode Island Conservation District)

The public is being bombarded with messages from a plethora of marketers desperate to sell their messages and often armed with excessive financial resources to do it. How can we be heard above all the noise? The Northern RI Conservation District (NRICD) has been using strategies that align the specific message with the intended audience, combined with a long term investment in the local community and partnerships to achieve our goals of protecting natural resources on a watershed level. This session will include examples of programs developed by NRICD through funding from Providence Water (The Scituate Reservoir Watershed Education Program), the RI Department of Environmental Management (wetland values and the problem of encroachment) and the US Environmental Protection Agency (The Do's and Dont's for the Woonasquatucket River).

9:00 AM
Working with Students, Macroinvertebrates and Kayaks
Denise J. Poyer* (Wood-Pawcatuck Watershed Association)

One way to engage the public is to reach out to public school students. Teachers in middle and high schools often are looking for ways to bring science into their classrooms. The Wood-Pawcatuck Watershed Association (WPWA) has run several programs over the years that not only bring science to the classrooms but also students into the field to do the science. One of our more successful programs is with the Chariho Middle School, helping them to monitor the Wood River. A big draw for the students and their families is the kayaking trip over different sections of the river to assess for human influence. This presentation will discuss a few of the different programs we run and some of the logistics involved in each.

9:30 AM
Developing a Report Card of Assessed Waters in Connecticut
Erik Bedan* (Connecticut Department of Environmental Protection) and Mary Becker (Connecticut Department of Environmental Protection)

Public outreach and participation is an important component for improving Connecticut's surface waters. As an example, rapid bioassessment of benthic invertebrates conducted by volunteers can be used to determine the aquatic life use support in wadeable streams. All surface water assessments must be reported to EPA, which results in a lengthy and technical document " CT's Integrated Water Quality Report". To assist the general public with such a challenging document, a Report Card of Assessed Waters in Connecticut was developed to provide a brief, graphical summary of assessments. Each assessed waterbody was listed in a table that included information such as sub-regional basin, segment location, associated municipalities, and designated uses. Hyperlinks in the table can provide an added benefit for end users; for instance, a segment location is hyperlinked to a GIS-based map of the basin. The level of use support is designated by segment with simple color coding for "supporting", "not supporting" and "unassessed" values. The finished product will be placed on the CT DEP website as pdf documents and a keyword search will be available for selection by waterbody or municipality. Making the assessments clear and simple will promote relationships with the general public and augment efforts to improve surface waters.

* Presenter

US EPA ARCHIVE DOCUMENT

Abstracts for Oral Presentations

Session 4A
Salon A
Lakes: Monitoring

1:00 PM
Using EPA's National Lake Assessment to Assess the Condition of Vermont Lakes
Mark Mitchell* (Vermont Department of Environmental Conservation), Neil Kamman (Vermont Department of Environmental Conservation), Steve Paulsen (USEPA) and Hilary Snook (USEPA)

Over the summers of 2007 and 2008, VTDEC sampled a total of 51 lakes using EPA's National Lake Assessment (NLA) approach. While 12 of these lakes were sampled to be included in the NLA, the additional lakes were sampled to permit a statistically-valid assessment of lakes for Vermont. With the development and release of the analytical methods used to process the NLA data at the Northern Appalachian Ecoregion and National scale, Vermont has begun to analyze their data set following these statistical criteria with EPA's assistance. Using thresholds developed for the Northern Appalachian Ecoregion and Nation, results from Vermont will be presented for direct comparisons. In addition, Vermont's own thresholds will be applied to investigate the utility of this approach in determining if lakes are meeting standards from a statewide perspective. This presentation aims to help other New England states consider their level of involvement in the next National Lake Assessment scheduled for 2012.

1:30 PM
A Remote Sensing Approach to Measure Water Quality in New England Lakes: Where Are We Now and What's Next?
Shane R Bradt* (Sea Grant & Water Resources, UNH Cooperative Extension) and James F Haney (Department of Biological Sciences, University of New Hampshire)

New England possesses a population of extremely diverse lakes in spite of its relatively small geographic size. Remote sensing has rarely been applied to measure lake water quality in this region, and as such, this research represents the first comprehensive effort in this arena. In partnership with EPA Region I and the New England States through the New England Lakes and Ponds Project and the National Lakes Assessment, we developed a library of 93 hyperspectral reflectance measurements from 64 lakes in the region. At each lake, we also collected samples for water quality parameters of interest (chlorophyll a, microcystins, CDOM, etc.). The selection of lakes covered all six New England states and represented a range of chlorophyll concentrations from 1 to over 100 ug/l. A wide variety of algorithms for the measurement of water quality were tested, both for on-lake reflectance measurements and satellite imagery.

This presentation will cover the following main points:

1) The best current on-lake remote sensing methods for measuring chlorophyll concentration and the probability of cyanobacterial toxins for lakes in New England
2) The best current satellite methods for measuring chlorophyll concentration and the probability of cyanobacterial toxins for lakes in New England
3) The potential for future applications of these techniques on a large scale in New England and shortcomings these approaches

2:00 PM
Candlewood Lake Ice-In Ice-Out Report
Alberto F. Mimo* (Candlewood Lake Authority, Research and Conservation)

To monitor ice-in and ice-out dates at Candlewood Lake in Connecticut we deployed four HOBO temperature/light probes at four selected locations. Data from the probes was collected in the spring and reveal that there were only two freeze over events during the winter, one in January and a small one in

* Presenter

US EPA ARCHIVE DOCUMENT

March. HOBO temperature/light probes can be used successfully to monitor ice events in lakes.

Session 4B
Salon D
Stream Biomonitoring I

1:00 PM
Application of the Index of Biotic Similarity (B) to the Analysis of the Data Generated by the Streams Project
Carlos F. A. Pinkham* (Biology Department, Norwich University), Declan J. McCabe (Biology Department, St Michael's College), Farley A. Brown (Biology Department, Sterling College) and Jonathon Lee Miller (formerly of Biology Department, Norwich University)

The Streams Project is a collaborative effort involving Universities, Colleges, VT DEC, and high schools, managed by VT EPSCoR (Experimental Programs to Stimulate Competitive Research). It is dedicated to collecting high-quality data on streams in the Champlain basin while training the next generation of scientists. Ultimately this database will be instrumental in understanding watershed dynamics around the state. To discern the implications of underlying dataset patterns we used BioSim2 to measure the Index of Biotic Similarity (B), and to cluster taxonomically similar sites. This approach revealed relationships among macroinvertebrate community samples identified by college students in 2008 as a reference collection for high schools. Four major clusters of sites were identified. Three pollution-intolerant taxa significantly grouped together in six sites, thus we regard these sites as the most pristine of those studied. There are two sites on Mettawee Creek, one on Otter Creek, and three Lamoille River tributaries. Four pollution-tolerant taxa significantly clustered with eight sites; all on Monroe Brook, thus we consider these sites to be the most degraded in the study. Between these extremes, five other sets of significantly grouped taxa totaling 20 pollution intermediate taxa, indicate both Otter Creek and Lamoille Rive have impacted sites, while Monroe Brook has no pristine site. An elevation factor was also present. It is hoped that 2009 samples will further illuminate these results, but the effort already suggests that a limited number of taxa, properly identified by trained students, can reveal a great deal about watershed dynamics.

1:30 PM
Life in a Conduit
Rosemary Gatter-Evarts* (Connecticut Department of Environmental Protection), Elizabeth Troop (Fuss and O'Neill) and Phillip Downey (Aquatec)

The Park River is a tributary to the Connecticut River in Hartford. The last two miles of this River are confined to a culvert underground. To assess the impacts of a power plant discharge in the lower portion of the Park River and to ascertain whether this discharge was having a negative impact on the Park River and/or the Connecticut River, a study was conducted by Fuss and O'Neill and Aquatec that included several sites within the conduit, both North and South Branches, that were sampled for fish, benthos, toxicity and chemistry. The results of this study will be presented including fish species, benthic organisms found, water chemistry results compared with water quality criteria and ambient toxicity studies.

* Presenter

US EPA ARCHIVE DOCUMENT

2:00 PM

Distinguishing the Effects of Point Source from Those Caused by Upstream Nonpoint Source (NPS) Inputs: Refinement of a Watershed Development Index for New England

Naomi E. Detenbeck* (USEPA Atlantic Ecology Division), L. Hayes (U.S. Geological Survey New Hampshire-Vermont Water Science Center), C. Rosiu (U.S. Environmental Protection Agency Region 1), J. Legros (University of Massachusetts-Amherst), D. Parsley (former US EPA student services contractor) and A. Sherman (University of Massachusetts-Amherst)

Assessment tools are being developed to predict diffuse NPS effects from watershed development and distinguish these from local impacts (point sources, contaminated sediments). Using EMAP data from the New England Wadeable Stream Survey and two state datasets (CT, ME), we are deriving macroinvertebrate community response curves for watersheds with different levels of development (n = 731 watersheds). Community metrics from Superfund sites are compared with the response curves to determine the degree to which sites are impaired beyond what is expected in watersheds with comparable development. Taxonomy, resolution and indicator values have been standardized across datasets to facilitate comparisons. Classification schemes are being compared to evaluate differences in sensitivity of response: Ecoregions, USFS Ecological Units, Nature Conservancy Aquatic Habitat Classes and hydrologic regime classes based on predicted peak and low flow statistics.

Six peak-flow classes and three low-flow classes can be distinguished based on watershed attributes. We applied NonMetric Dimensional Scaling ordination of macroinvertebrate community metrics to narrow down macroinvertebrate community endpoints to a subset explaining most of the variation within each dataset. Preliminary analysis for covariance indicated that Ecological Units tended to explain more variation than did Ecoregions, and that the USGS National Urban Intensity Index explained only slightly more variation in models than % impervious area. Both reference condition (y-intercept) and sensitivity to urbanization (slope) can vary by geographic unit and flow regime class. Additional analyses are underway to improve predictive power by including influences of land-use/land-cover at multiple scales, including local NHDPlus catchment and buffer-zone effects.

Session 4C
Salon E
Estuaries & Coastal Resources

1:00 PM

Complex population responses to food resources in the marine crustacean Americamysis bahia

Jason Grear* (USEPA Atlantic Ecology Division), Dodi Borsay-Horowitz (USEPA Atlantic Ecology Division) and Ruth Gutjahr-Gobell (USEPA Atlantic Ecology Division)

Most observations of stressor effects on marine crustaceans are made on individuals or even-aged cohorts. Results of these studies are difficult to translate into ecological predictions, either because life cycle models are incomplete, or because stressor effects on mixed age populations may differ from those observed in cohort studies. This problem is evident in several important environmental applications of population ecology, including ecological risk assessment of chemicals and futures analyses of ocean acidification. In particular, investigators have acknowledged the need for life cycle approaches in predicting adaptive responses to changing environments. To address this need, we developed an observational scheme that allows estimation of stage-specific vital rates (e.g., juvenile survival, adult survival, fecundity) from observations of mixed age *Americamysis bahia* populations. We used this system to examine life cycle responses to resource limitation (i.e., feeding rates), which is an oft-cited complication in applied population ecology. Population responses to resource limitation were driven primarily by changes in adult survival rather than early life stage survival or fecundity. However, we also observed complex compensatory responses, where impairments in one part of the life cycle were partially offset by improvements in other vital rates. This contrasts with cohort-based results, where resource

* Presenter

US EPA ARCHIVE DOCUMENT

effects on each vital rate were always positive. Our study suggests that emphasis in stressor-response studies on early life stages and even-aged cohorts may miss important demographic responses and should be augmented by observations of intact populations, especially as methods such as ours become more available.

1:30 PM

A Changing World : A Changing Narragansett Bay?

Christopher F. Deacutis* (URI Coastal Institute, Narragansett Bay Estuary Program)

The global changes in climate that have been occurring over the last several decades are also reflected in Narragansett Bay, at least in terms of water temperatures. In the last 30 years, the Bay surface waters have increased by approximately 1.5°C in winters and 0.8°C in summers. In addition, some researchers have found suggestive evidence for seasonal change in terms of decreased average wind speeds and increased cloud cover. No one has definitive data to prove how these changes have affected the Bay, but there are a number of hypotheses. This talk will touch on some of the biological changes that have been documented in the Bay over recent decades and their potential linkages to anthropogenic drivers as well as climate change.

Session 5A
Salon A
Lakes: Habitat & Bioassessment

3:00 PM

Evaluation of the Lake Macroinvertebrate Integrity Index (LMII) and Alternate Indices for Eastern US Lakes and Reservoirs

James Kurtenbach* (USEPA Region 2), Sheila North (Dynamac Corp.), Karen Blocksom (USEPA, ORD-Western Ecology Division) and Frank Borsuk (USEPA Region 3)

We applied the Lake Macroinvertebrate Integrity Index (LMII) to 69 lakes and reservoirs across the Eastern United States. Genus-level sub-littoral benthos samples, collected by EPA Regions 2 and 3 in 2007 were used to calculate LMII scores for each lake. We investigated relationships between LMII and physical habitat, water chemistry and land use variables collected by the National Lakes Assessment (NLA) team in 2007. LMII was analyzed by its ability to discriminate between lakes of differing NLA impairment status and by its relationships to known physical, chemical and land use gradients. Using Barbour et al. (1996) box plot scoring guidance, LMII performed well for mixed sediment lakes, but poorly for muck lakes and sand lakes. LMII performed better for hard lakes (conductivity >100 uS) than soft lakes (conductivity < 100 uS) and for Region 2 than Region 3. Major patterns of environmental variation were detected by principal component analysis (PCA).

Because LMII performance was generally poor across lakes, we created two alternate indices using candidate metrics for widespread application. Thirty (30) additional metrics were considered, selecting those that demonstrated the strongest linkages to taxonomic and environmental distributions across the study area. Alternate indices differed from one another by relative foci on pollution tolerance versus other taxonomic attributes. Non-metric multidimensional scaling (NMS) revealed overall community composition by plotting lakes in species space. Rank-transformed Multi-Response Permutation Procedures (MRPP) validated NMS groupings. The model converged upon a 3-dimensional solution that captured 75% of species variation. Ordination joint plots and Spearman correlations linked biota composition to water chemistry and substrate gradients, revealing stronger linkages to both alternate indices than to the original LMII. Research findings can be used to implement biological criteria in state water quality programs in EPA Regions 2 and 3, more accurately determine aquatic life use support for 305 (b) reports and 303 (d) listing and prioritize lakes for protection.

* Presenter

US EPA ARCHIVE DOCUMENT

3:30 PM

Lentic Biomonitoring: Littoral Macroinvertebrate Community Response to Lakeshore Development

Jeremy Deeds* (Vermont Department of Environmental Conservation) and Kellie Merrell (Vermont Department of Environmental Conservation)

Previous research has shown that lakeshore development and removal of shoreline vegetation can adversely influence aquatic habitat. In the littoral zone near developed lakeshore sites, we have observed significant reductions in amounts of woody debris, leaf litter and aufwuchs coverage, and significant increases in embeddendess of substrate materials. To investigate the effects of shoreline development on littoral biota, we sampled macroinvertebrates along the 0.5 m depth contour in front of unbuffered-developed and undeveloped sites on eight large oligotrophic Vermont lakes. Two main habitat types were sampled: sandy littoral and rocky littoral. At sandy littoral sites, we used a 6.5cm diameter coring tube to collect the top 10cm of sediment. Five cores were taken at each site. Rocky littoral sites were sampled by demarcating three 1 m^2 quadrats and hand-washing cobble substrate within each quadrat into 500 µm mesh bags while snorkeling. The most common taxa in these rocky littoral habitats were Heptageniidae, Psephenidae, and Chironomidae. Site densities of macroinvertebrates ranged from 21 animals m^2 (Great Averill Lake) to 279 m^2 (Echo Lake). Preliminary results show alterations in community structure between unbuffered-developed and undeveloped rocky littoral sites.

4:00 PM

How Much of a Buffer is Needed to Mitigate the Change to Littoral Habitat from Lakeshore Development?

Kellie Merrell* (Vermont Department of Environmental Conservation) and Jeremy Deeds (Vermont Department of Environmental Conservation) Mark Mitchell (Vermont Department of Environmental Conservation), Eric Howe (Lake Champlain Basin Program) and Susan Warren (Vermont Department of Environmental Conservation)

Between 2005 and 2008, in a study of 40 Vermont lakes, VTDEC determined that unbuffered lakeshore development significantly alters littoral habitat from the reference condition. In 2009, VTDEC returned to the 8 lakes in the large oligotrophic lake class to measure littoral habitat conditions off buffered developed sites. The buffered developed sites were not significantly different from reference condition sites for the following littoral habitat characteristics: shading, large woody structure, leaf litter, percent sand and embeddedness. The mean width of the intact buffer at buffered developed sites was 23'. The main structure was set back an average of 66'. The immediate shoreline as viewed from the lake was made up of at least 40% trees ($\geq$ 15'), at least 20% shrubs and no more than 20% ground cover. The 25' x 25' riparian plots retained >30 saplings, <5% impervious surfaces, met Maine's 12 point minimum DBH score, was 60-80% duff or natural grasses/ferns, 10% tree trunks, 15% shrubs and <10% lawn/flower beds. Mean distance to the nearest structure was the same at both buffered and developed sites, suggesting that, for the above habitat parameters, setback distance is not as important as the vegetative cover. Other littoral habitat parameters at the buffered developed sites still differed from the reference condition. These were: fine and medium woody structure, aufwuchs and aquatic plant cover. In order to achieve no change in aufwuchs cover, main structures needed to be set back an additional 46' for a total of 112'. To achieve no change in fine woody structure cover, trees (>15') needed to make up 50% of the immediate lakeshore. This study was unable to determine what buffer characteristics would result in no change to medium woody structure or aquatic plant cover. Results from this study demonstrate that it is possible to develop a lakeshore and protect aquatic habitat, it simply requires maximizing the retention of natural vegetation and setting impervious surfaces back from the lakeshore.

* Presenter

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

Abstracts for Oral Presentations

Session 5B
Salon D
Stream Biomonitoring II

3:00 PM
Periphyton Community Dynamics in Lake George Sub-Watersheds
Emily Porter-Goff* (Darrin Fresh Water Institute and Department of Biology, Rensselaer Polytechnic Institute) Charles W. Boylen (Darrin Fresh Water Institute and Department of Biology, Rensselaer Polytechnic Institute) and Sandra A. Nierzwicki-Bauer (Darrin Fresh Water Institute and Department of Biology, Rensselaer Polytechnic Institute)

The composition of periphytic communities within streams change in response to the surrounding anthropogenic and natural conditions of the watershed in which they exist. Nutrients, flow, light, biotic competition, development, canopy cover, drainage basin and watershed characteristics are potential factors in periphytic community change. The dynamics of algal, bacterial, and fungal communities and total organic matter were evaluated in Lake George sub-watersheds using the following basic analytical methods: ash free dry mass, chlorophyll a analysis, bacterial counts and ergosterol quantification. A summation of several studies investigating which factors have the greatest effects on Lake George's sub-watershed periphyton community dynamics is presented. In general, it was found that there was greater periphytic biomass in more developed streams or reaches. While light was found to have a primary influence on community structure, nutrients did not. Community composition was greatly affected by sampling time and was not consistent between years. Each stream had a unique periphytic community structure. It was found that when a community was relocated to a new stream, the relocated community would shift in composition of biotic groups to match the new environment. This research lays the foundation for development of periphyton monitoring protocols.

3:30 PM
Exploring Algal Community Dynamics Across Varying Enrichment Conditions Using GIS and Statistical Methods to Develop Holistic Nutrient Criteria in Connecticut Rivers and Streams
Mary Becker* (Connecticut Department of Environmental Protection)

As a precautionary guided measure, CT DEP developed an interim management strategy for freshwater nutrients that focuses on mitigating anthropogenic enrichment by providing a site specific target nutrient load that directs implementation utilizing Geographic Information Systems (GIS) (Becker & Dunbar, 2009). The approach provides for a major statewide advancement in the level of phosphorus control that is expected to meet stream designated uses in most cases. However, because of the scientific uncertainty in establishing nutrient management goals for specific waterbodies, the Department is strengthening these efforts by working towards effects-based numeric nutrient criteria to ensure that aquatic life uses are met. Benthic diatom species composition is being examined for use in the assessment of enrichment conditions because it may provide a better indicator of enrichment condition in streams than assessment of water chemistry, macroinvertebrates or benthic algal biomass (EPA, 2000). Effective management requires the collective evaluation of all factors affecting adverse plant biomass and community dynamics caused by anthropogenic stressors over varying spatial and temporal scales (Snelder et al, 2004). CT DEP is currently exploring the use of algal community dynamics within a spatial context to characterize site specific waterbody enrichment conditions with GIS so that appropriate management can be applied at a statewide level. The goal of the assessment is to define a graduated range of enrichment conditions that protect aquatic life uses while accounting for natural variability and human presence that has permanently altered most ecosystems from effects of watershed uses and climate change rather than setting a goal that may misdirect efforts, or be unrealistic.

* Presenter

Abstracts for Oral Presentations

4:00 PM

Stream Algal Model for Predicting Attainment of Maine Water Quality Classes

Tom Danielson* (Maine Department of Environmental Protection), Cyndy Loftin (University of Maine), Leonidas Tsomides (Maine Department of Environmental Protection), Jeanne DiFranco (Maine Department of Environmental Protection) and Beth Connors (Maine Department of Environmental Protection)

The Maine Department of Environmental Protection is responsible for monitoring aquatic life in the State's rivers and streams and determining if they attain aquatic life criteria. Maine uses a tiered-use approach with four classes (AA, A, B, and C) for streams and rives. The Department currently relies on a statistical model using benthic macroinvertebrate data to predict the likelihood of a stream or river attaining biocriteria of its assigned class. The purpose of this study was to develop a second model using benthic algal data to predict class attainment. Adding a second taxonomic assemblage will improve the ability to detect environmental degradation and diagnose stressors. During 1999-2006, the Department collected 298 samples from 193 locations across the state. Five professional biologists independently interpreted algal community data and variables with Maine's narrative aquatic life criteria and the U.S. Environmental Protection Agency's Biological Condition Gradient framework and assigned a class attainment (i.e., AA/A, B, C, or non-attainment). The five biologists later convened and assigned consensus class attainment. A discriminant analysis model was developed to replicate professional judgment and was based on a combination of novel variables and variables from the literature that were empirically shown to respond to environmental disturbance. The model correctly predicted class attainment in more than 90% of samples in both the training and validation data sets.

4:30 PM

The Effects of Urban Development on Stream Ecosystems in the Northeastern Coastal Zone Ecoregion of New England

James F. Coles* (USGS Water Science Center), Thomas F. Cuffney (USGS Water Science Center), Gerard McMahon (USGS Water Science Center) and Karen M. Beaulieu (USGS Water Science Center)

Over the past decade, the USGS has studied the effects of urban development on stream ecosystems in 10 distinct regions across the U.S. One such study took place in New England within USEPA Ecoregion 59, the Northeastern Coastal Zone. For each of these studies, 30 sites were selected that varied by the percent urban land in their watersheds. This network of sites represented a gradient of urban development among the sites (from low to high values), and was used to relate urbanization to changes in water chemistry, stream habitat, and biological assemblages (algae, invertebrates, and fish). Multivariate ordination was used to develop simple index values for each of the chemistry, habitat, and biological data sets, and these were used as response variables for correlating against the gradient of urban development. In the New England study, urban development was significantly correlated with changes in habitat, water chemistry, and the biological community. The changes in the invertebrate assemblages were especially strong and were characterized by a loss of sensitive taxa, such as a decline in EPT richness and an overall shift toward more tolerant non-insect taxa. A similar loss of sensitive invertebrate taxa with urban development generally occurred across the U.S., except in regions where other intensive land use had already degraded the biological community prior to urbanization. The USGS urban study in Wisconsin is discussed as such an example, where land was converted from agriculture to urban and the invertebrate assemblages showed a weaker response to urbanization than in New England.

* Presenter

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

Abstracts for Oral Presentations

Session 5C
Salon E
Dam Removal & Streamflow Restoration

3:00 PM
Streamflow Management Alternatives for Aquatic Habitat and Herring Restoration in a Small Public Water Supply Reservoir System (First Herring Brook, Scituate MA)
Margaret Kearns* (Massachusetts Division of Ecological Restoration) Colin Apse (The Nature Conservancy), Mark P. Smith (The Nature Conservancy) and Brian Joyce (Stockholm Environment Institute)

First Herring Brook is a small coastal system in Scituate, MA that provides the majority of the town's drinking water. A volunteer streamflow monitoring effort documented low streamflow problems downstream of two reservoirs that cause both water resource and habitat concerns. As a result, a multiagency multidisciplinary working group was formed to better characterize the resources and the possible impacts. A major goal was to explore the requirements and options for restoring historical herring runs. The team was made up of federal, state, local and non-profit stakeholders. The team developed a set of environmental flow goals to restore aquatic habitat and herring migration passage, as well as a set of alternative water management options, including water conservation, reservoir dredging and a new water supply source. Through an EPA grant, The Nature Conservancy and Stockholm Environment Institute provided a decision support tool, the Water Evaluation and Assessment Program (WEAP), to help evaluate the effectiveness of water management alternatives in meeting the team's environmental goals. Model results will be discussed in the context of the team's progress toward restoring more environmentally sustainable streamflows while meeting the town's water supply needs.

3:30 PM
Halifax Dam Removal. What happens when the water goes down?
Jennifer Burton-Reeve* (Kleinschmidt Associates), Robert Richter (NextEra Energy) and Brandon Kulik (Kleinschmidt Associates)

The purpose of this project was the removal of the Fort Halifax Dam located on the Sebasticook River in Winslow, ME. The dam was removed due to financial constraints in accordance with an agreement to provide fish passage for anadromous fish. Concerns during the dam removal were fish stranding and the collection and relocation of two state threatened freshwater mussel populations. Post-removal issues were erosion and bank slumping. The tasks from the incidental take permit were a post-relocation mussel survey using pit tags and radio telemetry tags. This presentation shows the solutions and efforts taken to provide an acceptable transition from an impoundment into a free flowing river.

4:00 PM
Road Crossings and Potential Barriers to Fish and Wildlife Movement: Rhode Island River and Stream Continuity Project
Chris Modisette* (USDA - Natural Resources Conservation Service) and Kathryn Zuromski (RI Resource Conservation and Development Area Council)

As long linear ecosystems, rivers and streams are particularly vulnerable to fragmentation. A number of human activities can disrupt the continuity of river and stream ecosystems. The most familiar human-caused barriers are dams. With approximately 500 dams in RI this is a considerable issue. However, there is growing concern about the role of road crossings "and especially culverts" in altering aquatic habitat continuity and impeding fish and wildlife passage. Based on a GIS analysis conducted by the USDA Natural Resources Conservation Service (NRCS), it is estimated that there are over 4,300 road and railroad crossings affecting RI streams. In 2006, a partnership began in RI using information, assessment approaches and standards already developed through a similar project in Massachusetts. With assistance

* Presenter

from Trout Unlimited (TU) and the Wood-Pawcatuck Watershed Association (WPWA), the USDA-NRCS and the RI Resource Conservation and Development Council (RIRC&D) are coordinating an effort to create river and stream crossing standards and continuing a volunteer inventory program for culverts and other crossing structures. The objective is to more effectively identify and address barriers to fish movement and river and stream continuity. Currently, TU and WPWA volunteers have inventoried over 600 stream crossings in the Upper and Lower Wood, Queens, Beaver, Upper Pawcatuck, Clear and Millers River watersheds, and continue to survey the Branch and Pawcatuck River watersheds. Through this inventory, the greatest barriers to fish and wildlife movement can be identified for their restoration potential. Information is being compiled about fish and wildlife passage requirements, culvert design standards, and methodologies for evaluating barriers to fish and wildlife passage.

FRIDAY

Session 6A
Salon D
Streamflow & Thermal Regimes

8:30 AM
Summer Water Temperatures in New Hampshire and Massachusetts Coldwater Streams
Jennifer Jacobs* (Environmental Research Group, University of New Hampshire), Ralph Abele (US Environmental Protection Agency, Region 1) and Todd Richards (MA Division of Fisheries and Wildlife)

A priori knowledge of baseline or natural stream thermal conditions is necessary to determine if there is a detrimental change to a stream's thermal regime. Here, recent research results that quantify the thermal regime of New England streams having coldwater fish are presented. Massachusetts Division of Fisheries and Wildlife and the New Hampshire Fish and Game Department stream temperature data from over 50 different stream reaches throughout New Hampshire and Massachusetts were analyzed. The natural variability in stream temperatures was quantified using an approach that parallels the Nature Conservancy's Indicators of Hydrologic Alteration (IHA) approach used for stream flow studies. Baseline temperature metrics are the magnitude, frequency, timing, duration, and rate of change for measured stream temperature. Metrics for all sites were combined and show a range of variability across the observed coldwater streams. Implications of urbanization and climate change on stream water temperatures are considered. These results are presented within management and conservation context that is relevant for maintaining water quality in temperature sensitive aquatic ecosystems.

9:00 AM
The Effect of Drought on Marcroinvertebrates and Fish in Connecticut Streams
Michelle Tipton* (Wesleyan University), Kate Miller (Wesleyan University) and Barry Chernoff (Wesleyan University)

Understanding the effects of drought on the biological communities of stream ecosystems is critical to protect these systems from anthropogenic influences on stream flow such as water withdrawals and climate change. While drought is not uncommon, it is unpredictable, and studies capturing a drought event are rare. With such a small empirical database to extrapolate from, state water flow guidelines may be based on streams outside their region, despite the fact that the hydrology and biology may be quite different. More studies are needed to provide critical and accurate information for the development of stream flow rules and regulations such as those passed in Maine and under consideration in Connecticut. Our study of Connecticut streams reveals a significant drought effect on the macroinvertebrate and fish communities. This study spans six years of sampling multiple streams and sites for fishes, macroinvertebrates and some physical and chemical water characteristics. During this period, 2005 and 2007 contained droughts. Our findings reveal an important temporal difference in the biological

* Presenter

US EPA ARCHIVE DOCUMENT

community's response. Both the richness and abundance of macroinvertebrates decrease significantly ($p<0.006$) in the year following a drought; this effect is experienced in the fish community as well, though within the drought year ($p<0.03$). Both communities recover original richness and abundance one year after the decline, if that year is not also a drought year. This multi-year data set provides information that can be incorporated in developing a baseline for minimum water flow levels for maintaining the viability and diversity of Connecticut streams.

9:30 AM

Stream Depletion Method to Establish Ecological Flows for Groundwater Withdrawals in Rhode Island

Alisa Richardson* (Rhode Island Department of Environmental Management)

So, how much water is enough? For years we have been regulating hydropower projects and flow releases with USFWS – Aquatic Base Flow. But how do we define ecological thresholds for groundwater withdrawals? Water suppliers and permitting agencies are looking for guaranteed amounts of water that can be withdrawn, but what about the dry periods? What are the impacts? How do you determine a sustainable yield of water that will not impact fisheries during dry periods or at any time? Well, these are the same questions we have been asking ourselves for the last few years and have derived (with much help from other people's work) one method that may be useful. In this session, we will be looking for your input on the biological connections.

Session 6B
Salon E
Nutrients

8:30 AM

Use-perception Data in Wadeable Streams of New York State: Implications for Nutrient Criteria

Alexander J. Smith* (New York State Department of Environmental Conservation), Roger Thomas (Academy of Natural Sciences Patrick Center for Environmental Research), J. Kelly Nolan (Watershed Assessment Associates) and Brian T. Duffy (New York State Department of Environmental Conservation)

Use-perception data have historically been collected as part of lake and reservoir monitoring programs with the intent of assessing recreational use impairment. Little information exists from streams and rivers. Nutrient enrichment can be a significant factor affecting a person's perceived ability to recreate in and on the water. Algal blooms can make fishing difficult and rafting and tubing unpleasant. During 2008, macroinvertebrates, periphyton and water chemistry data were collected from 100 wadeable streams in two aggregate nutrient ecoregions of New York State for the development of nutrient criteria. During the investigation, each field crew filled out a user perception survey, assessing their perceived ability to recreate. Strong relationships were identified between mean total phosphorus (TP), total nitrogen (TN), suspended chlorophyll-a (Chl-a), turbidity (Tb) and results of the user perception survey. Conditional probability analysis suggested the threshold of perceived recreational use impairment for primary contact was between 15-20 µg/l TP, 530-628 µg/l TN, 1.86-4.72 µg/l Chl-a, and 2-2.4 NTU Tb. For secondary contact recreation the thresholds were higher, 20-21 µg/l TP, 640-1909 µg/l TN, 3.75-6.44 µg/l Chl-a, and 3.1-3.4 NTU Tb. Multiple variables affecting use perception were evaluated with periphyton cover being the most highly correlated with both primary and secondary contact recreation followed by water clarity and odor. The user-perception survey is a useful tool in assessing perceived waterbody impairment and is a good predictor of nutrient enrichment. Thresholds developed in this survey will be used to establish nutrient criteria for recreational use in New York State.

* Presenter

US EPA ARCHIVE DOCUMENT

9:00 AM

New USGS Regional Water Quality Modeling in New England

Keith Robinson* (USGS), Richard Moore (USGS), Jamie Shanley (USGS) and Craig Johnston (USGS)

The US Geological Survey is completing two new regional water-quality modeling studies in the New England Region. The first are new nutrient SPARROW models being done as part of the USGS National Water Quality Assessment Program. These models for total phosphorus and total nitrogen include the northeastern United States coastal drainages from Chesapeake Bay northward. The total phosphorus model characterizes phosphorus input to selected lakes in the region and comparisons to probabilistic monitoring results are made. The total nitrogen model is used to describe nitrogen loadings to coastal waters.

The second modeling study is a New England-wide model to characterize factors influencing mercury levels in freshwater fish tissue. The model, known as MERGANSER (Mercury Geospatial Assessments for the New England Region), is being applied to larger lakes and impoundments throughout the region. Atmospheric sources of mercury and how watershed features influence mercury in fish tissue are being explored. Model form, significant predictors and other model results will be presented. Potential applications of the SPARROW and MERGANSER models will be discussed.

9:30 AM

Denitrification Hotspots in Fluvial Systems: The Role of Woody Debris

Julia Hyman* (University of Rhode Island)

Watersheds have a profound capacity to retain and remove nitrogen (N) inputs before entering coastal waters. Basins of vastly different scales, from < 1000 ha to thousands of square kilometers, convey only 10-30% of watershed N inputs, an important factor given that N inputs are linked to accelerated eutrophication and hypoxia in estuarine waters. Research suggests that much of this N retention occurs within aquatic ecosystems, e.g., lakes, streams and wetlands, which serve as hotspots of N transformation. I examined the effects of woody debris on nitrate disappearance and denitrification in streams of different N enrichment levels. The study employed three different standardized substrates (fresh wood blocks, bundles of naturally occurring streambed wood, and clay-fired blocks) that were expected to vary in their pool of labile carbon. These substrates were placed into a high nitrate agricultural stream in PA and a low nitrate forested stream in RI for 8-10 weeks, collected with minimal disturbance and subjected to a series of lab-based mesocosm assays. Three different approaches were used to estimate denitrification rates: mass balance, 15N tracer and Acetylene Block method. Gas samples were taken at 4 time points over 18 hours. Preliminary results indicate the clay-fired blocks in the low nitrate stream generate negligible denitrification, regardless of the extent of biofilms that had developed while the substrates were within the stream. Preliminary results follow other research, which shows labile carbon to be important for maximizing denitrification potential. This suggests that fresh inputs of natural woody debris, like branches and tree trunks, may be an important nitrate sink in streams, further bolstering efforts that promote mature forest cover in riparian settings.

Session 7A
Salon D
Fish Assemblages & Distribution

10:30 AM

Pre-Columbian Freshwater Fish in Maine and New England

Dave Halliwell* (Maine Department of Environmental Protection) and Arthur Spiess (Maine Historic Preservation Commission)

The freshwater fish fauna of New England proper, east of the Champlain drainage in Vermont, is naturally

* Presenter

US EPA ARCHIVE DOCUMENT

very depauperate "following Pleistocene glaciations, which receded 12,000 to 14,000 years ago". Only 64 resident freshwater fish species occur in Maine, one-third of which are introduced non-native species from afar. In southern New England states, nearly one-half of the resident freshwater fish fauna are non-native species. This presentation examines which indigenous fish species would be of a suitable size and wide distribution to have been harvested by Native Americans prior to European arrival (n = 16), and which species have actually been identified in Maine pre-Columbian archaeological sites (n = 12). Coastal (salt-tolerant) inhabitants include estuarine (tomcod and white perch) and diadromous fish species (alewife, eel, lamprey, salmon, shad, smelt, striped bass, and sturgeon). In Maine, an additional 4 indigenous freshwater fish species are widely distributed and attain a harvestable size, inclusive of brook trout (char species), white sucker, yellow perch and brown bullhead. All of these species, except white perch and lamprey, "which (along with sturgeon) have a cartilaginous skeleton", show up as bone (bony scutes from sturgeon) specimens in Maine pre-Columbian archaeological sites. Another four indigenous fish species of suitable size and distribution would possibly include white perch, fallfish, chain pickerel and whitefish. Actual aboriginal New England place names include: salmon, trout, alewives, eel, pickerel and sturgeon. Note: we are currently developing an artificial key to Pre-European fish remains in New England, inclusive of freshwater, diadromous, estuarine and marine fish species.

11:00 AM

The New England Large River Fish Assemblage Assessment Project: Some Initial Findings

Chris O. Yoder* (Midwest Biodiversity Institute & Center for Applied Bioassessment and Biocriteria) and Lon E. Hersha (Midwest Biodiversity Institute & Center for Applied Bioassessment and Biocriteria)

Field sampling for a fish assemblage assessment of rivers in New England was initiated in 2008 and completed in 2009. A standardized raft and boat mounted electrofishing method that was previously developed and tested in Maine during 2002-7 was used to sample the fish assemblages of various rivers. The base design was a probabilistic draw of sites from the National Rivers and Streams Assessment (NRSA) and an equal number of NRSA overdraw sites to provide the basis for an assessment of the condition of fish assemblages and habitat for New England. Intensive surveys of selected mainstem rivers were also accomplished and provided the opportunity to compare the outcome of these different sampling designs. The correspondence of REMAP sites with NRSA sites also provided an opportunity to compare the different methods used in this survey vs. the NRSA at approximately 70 sites. This will help determine how useful the respective methods are for different assessment purposes including routine use by state programs. In terms of survey logistics, less that 10% of the original REMAP sites were rejected for all reasons. Reasons for rejection included sites being wadeable (the target was for raft-able and boat-able sites) and problems with access and safety of sampling. The expected outcomes of this project include a standardized protocol and a baseline assessment of the condition of New England rivers.

11:30 AM

Fish Assemblage Assessment of the Connecticut River Mainstem, 2008-9

Chris O. Yoder* (Midwest Biodiversity Institute & Center for Applied Bioassessment and Biocriteria), Lon E. Hersha (Midwest Biodiversity Institute & Center for Applied Bioassessment and Biocriteria) and Bryan J. Apell (Kleinschmidt Associates)

We conducted an assessment of the Connecticut River fish assemblage between Lake Francis in New Hampshire to just upstream from the I-95 bridge in Old Saybrook, Connecticut during 2008-9. A total of 73 sites were sampled for fish during a summer-early fall seasonal index period and using a standardized boat and raft mounted pulsed D.C. electrofishing method that was previously established in a study of Maine rivers in 2002-7. An intensive pollution survey sampling design was used to determine how the assemblage changed in an upriver to downriver direction and in relation to both natural changes and human caused stressor gradients. Sampling sites were positioned within, above, and below major changes such as dams, impoundments, flow diversions, urban areas, and pollution sources. We used a preliminary cold water fish assemblage IBI, a relevant regional IBI and the component metrics and other assemblage attributes to assess the condition and responses of the assemblage to natural and human

* Presenter

US EPA ARCHIVE DOCUMENT

caused gradients. A total of 40 probabilistic sites associated with the National Rivers and Streams Assessment and a Regional EMAP project were part of the 73 mainstem sites and presented the opportunity to examine any differences in assessment outcomes between these two fundamentally different survey designs. The fish assemblage exhibited an expected change from a cold water dominated fauna in the upper 50-100 miles to a warm water and diadromous focused assemblage downstream. A key issue is what part of this transition was due at least in part to the accumulation of hydrological, habitat, and pollution influences that were encountered in a down river direction.

12:00 PM

Developing and Testing Refinements for a Fish Assemblage Assessment Index for Large Rivers in Maine: How to Incorporate Diadromous Species

Chris O. Yoder* (Midwest Biodiversity Institute & Center for Applied Bioassessment and Biocriteria), Brandon H. Kulik (Kleinschmidt Associates), Lon E. Hersha (Midwest Biodiversity Institute & Center for Applied Bioassessment and Biocriteria) and David B. Halliwell (Maine Department of Environmental Protection)

We conducted systematic sampling of the fish assemblages of the non-wadeable rivers of Maine during 2002-9. Statewide coverage was achieved in 2007 and further application of an interim Index of Biotic Integrity (IBI) was tested in 2008-9. The U.S. EPA Biological Condition Gradient (BCG) was used to visualize how river fish assemblages respond to incremental stressors. This knowledge was then used to develop and calibrate IBI metrics. The interim IBI is based on a native cold water fish assemblage that typifies moderate-high gradient rivers throughout the state and it seems responsive to the common stressors such hydrological alterations, habitat, non-native species and general pollution. However, a question with the current IBI is how to incorporate the presence and expectations for diadromous species. Presently there are no metrics that directly incorporate the influence of these species, yet they are included in the conceptual BCG. In addition, the interim IBI scores are the lowest for the mainstem rivers that either have or have had an established presence of diadromous species. Since these species are seemingly "in addition to" the core cold water fish assemblage, an additive metric scoring procedure seems to make the most sense and this is presently part of our exploratory analyses. Such a modification would recognize the "additional presence" of diadromous species where they are expected to be present without altering the expectations for the native cold water assemblages that have been significantly altered by the same set of stressors in several Maine rivers.

Session 7B
Salon E
TMDLs

10:30 AM

So You Have an Impervious Cover TMDL, Now What?

Chris Bellucci* (Connecticut Department of Environmental Protection) and Chet Arnold (Center for Land Use Education and Research, University of Connecticut)

Eagleville Brook is a 2.4 square miles watershed located in northeastern Connecticut. Like many urbanized watersheds, the fish and macroinvertebrate communities in Eagleville Brook are poor and the stream has been listed on the State of Connecticut's Impaired Waters List. The Connecticut DEP has determined that a complex array of pollutants transported by stormwater runoff from impervious surfaces is the most probable cause of the habitat degradation and poor aquatic life in the brook and has developed a Total Maximum Daily Load (TMDL) using impervious cover as a surrogate measure. That is, rather than identifying specific pollutant reductions, the Eagleville TMDL establishes a target percentage of impervious cover. This presentation will discuss the implementation phase of the TMDL which includes the field inspection process and the development of a web-based mapping resource that identifies potential implementation project locations. This resource will provide a project implementation road map

* Presenter

US EPA ARCHIVE DOCUMENT

for impervious surface disconnects or treatment to achieve the goal of improving the aquatic life in Eagleville Brook.

11:00 AM

Development of a Volunteer Based Chloride TMDL in the Hodgson Brook Watershed

Ted Walsh* (New Hampshire Department of Environmental Services)

The New Hampshire Department of Environmental Services and the Hodgson Brook Restoration Project are partnering to develop a methodology to conduct a chloride TMDL in the Hodgson Brook watershed. Hodgson Brook is a highly impacted urban stream that is acutely impaired for chloride. A stream gage, water level data loggers and water quality monitoring data loggers are being used to determine the annual fluctuations in flow and chloride concentrations and to develop a flow-concentration relationship to determine the extent of pollutant reductions needed to meet water quality standards. GIS analysis is being used to determine road miles and parking lot acreage within the watershed subject to winter maintenance and salt application. This collaboration between a regulatory agency and volunteer based watershed group seeks to determine an inexpensive methodology for developing a chloride TMDL and using non-regulatory methods to implement policies to reduce chloride loadings to the watershed.

11:30 AM

T-RFLP for the Bacterial Source Tracking of Escherichia coli from Feral Pigeons and Cattle in Agricultural Roof-Runoff

Michael J. Turner* (Department of Natural Resources and the Environment, University of Connecticut), John C. Clausen (Department of Natural Resources and the Environment, University of Connecticut) and Bo Pietraszkiewicz (Department of Molecular and Cell Biology, University of Connecticut)

Pathogens sourced from the introduction of fecal matter to water represent a class of pollutants of special concern. The emerging discipline of Bacterial Source Tracking (BST) potentially offers powerful tools to detect the species responsible for fecal contamination in impaired watersheds. Many methods of BST have been examined with varying success in studies focusing on a variety of bacteria, phages and viruses. One rapid and cost-effective molecular assay used for Bacterial Source Tracking is Terminal Restriction Fragment Length Polymorphism analysis (T-RFLP). T-RFLP and other assays have been successfully used to distinguish fecal sources amongst many potential host species. However, no BST studies to date have examined feral pigeons (*Columba livia*) as a host-species for the common indicator bacteria, *Escherichia coli*. We set out to develop a method for the source tracking of *E. coli* in a constructed stormwater treatment wetland sourced by roof runoff from an agricultural facility which is host to a flock of over 100 feral pigeons. Ambiguities in published methods necessitated a prolonged series of preliminary experiments before source tracking could be implemented. Through this process, we have identified efficient methods for the extraction of bacterial DNA from fecal and aquatic matrices, polymerase chain reaction (PCR) to amplify a gene coding for the universal stress protein uspA in *E. coli*, restriction digestion of the amplicons, and capillary electrophoresis to separate the polymorphic DNA fragments. Resulting DNA signatures indicate different E. coli strains sourced from pigeons and cattle.

12:00 PM

Using the Clean Water Act to Reduce Mercury in the Northeast: the Northeast Regional Mercury TMDL and 319(g) Petition

Susannah King* (New England Interstate Water Pollution Control Commission)

In the Northeast, fish consumption advisories resulting from elevated levels of mercury in fish are of great concern. The vast majority of this mercury can be attributed to atmospheric deposition, a significant portion of which comes from outside the region. The challenge that the Northeast states face is the lack of regulatory options available to control out-of-region sources of atmospheric deposition. As a result, the New England Interstate Water Pollution Control Commission (NEIWPCC) and its member states have embarked on two interrelated efforts to compel reductions from out-of-region sources of mercury. These

* Presenter

US EPA ARCHIVE DOCUMENT

approaches are the Northeast Regional Mercury Total Maximum Daily Load (TMDL) and the Clean Water Act Section 319(g) Conference. The TMDL quantifies necessary reductions in fish tissue concentrations and atmospheric deposition of mercury, parses out reductions from in-region and out-of-region sources, and recommends that more stringent federal controls are placed on coal-fired power plants and other mercury sources. Following approval of the TMDL in December of 2007, the next step was to implement it. The states and NEIWPCC moved forward with developing and filing a Section 319(g) Petition, which requires the EPA Administrator to convene a management conference to come to an agreement on how to address mercury pollution from out-of-region states. The Petition was filed with EPA Headquarters in October 2008. This presentation will address technical and policy-related issues and outcomes associated with the TMDL and the Petition.

US EPA ARCHIVE DOCUMENT

* Presenter

Abstracts for Posters

Development of a Benthic Macroinvertebrate Index of Biological Integrity for Lakes in NYS

Brian Duffy* (New York State Department of Environmental Conservation), AJ Smith (New York State Department of Environmental Conservation), Scott Kishbaugh (New York State Department of Environmental Conservation) and David Newman (New York State Department of Environmental Conservation)

For decades NYS has successfully implemented biological assessments of water quality in streams and rivers throughout the state. However, the biological monitoring program has never investigated the use of biological assessment in lake environments. In 2008, the Statewide Waters Monitoring Section began building a lake littoral zone benthic macroinvertebrate dataset with the intentions of developing a multimetric index for lake assessment. Presented here are the early results of that effort.

Using the System-Wide-Monitoring-Program (SWMP) to Quantify Short-term Variability and Detect Long-term Changes in Estuaries

Daisy Durant, Ph.D* (Narragansett Bay National Estuarine Research Reserve) and Kenneth Raposa, Ph.D. (Narragansett Bay National Estuarine Research Reserve)

The Narragansett Bay Research Reserve (NBRR or Reserve) is one of 27 sites in the National Estuarine Research Reserve System (NERRS). The Reserve protects 1,780 hectares of land and water around Prudence, Patience, Hope and Dyer islands in Narragansett Bay. Its mission is to practice and promote estuarine stewardship through innovative research, education and training. A signature program of the NERRS is the System-Wide Monitoring Program (SWMP), which was developed in 1995 to quantify short-term variability and track long-term changes in estuaries to better understand how coastal ecosystems are affected by human activities and natural events. The SWMP is a phased monitoring program that focuses on three different ecosystem characteristics, including 1) atmospheric and water quality parameters, 2) biological parameters and 3) watershed and land-use classification and mapping. The NBRR initiated abiotic SWMP monitoring in 1995 and is currently implementing all three phases of the program. Here we present examples of the types of data that are available through the NBRR-SWMP, and discuss how they are used to support innovative research projects and improve stewardship and management of the Reserve and Narragansett Bay. Examples include 1) documenting meso-scale increases in winter water temperatures, 2) using NERRS biomonitoring protocols to map eelgrass in Narragansett Bay and 3) using the NERRS land-use classification system to study wading birds in urban habitats. The NBRR-SWMP provides a unique combination of long-term data for a variety of estuarine parameters and is an invaluable tool for Narragansett Bay's scientists, managers and decision makers.

How Many Streambed Invertebrates does it take to diagnose the Health of a stream? Assessing Effects of Sample Size on Rapid Bioassessment Protocol Metrics in RI

Graham Forrester* (Dept. of Natural Resources Science, University of Rhode Island) and Sandra Giovannini (Dept. of Biological Sciences, University of Rhode Island)

In order to protect our streams, stream health must be assessed quickly and effectively. The Rapid Bioassessment Protocol (RBP) combines two popular approaches: bioassessment, the use of living organisms to determine the environmental health, and the combination of several biological metrics into a single numeric result (the RBP score) that summarizes the health of the stream. Commonly, RBP scores are calculated using a fixed sample size, e.g. 100 macroinvertebrates from each stream. There has, however, been debate over the sample size needed to accurately diagnose stream health. In this study, we tested the effect of sample size on 8 individual biological metrics and the overall RBP score. We collected samples of 100, 200 and 400 macroinvertebrates from each of 8 Rhode Island streams. Three metrics that describe different aspects of biodiversity (taxa richness, # EPT taxa, and % dominance) were strongly affected by sample size, as predicted by ecological theory. Other metrics, which are designed to

*Presenter

US EPA ARCHIVE DOCUMENT

reflect pollution tolerance and the functional composition of the community, were less affected by sample size - though some of these estimates had low precision at all sample sizes and so may be less effective indicators of stream health. Our results suggest that if smaller samples are used (100 per stream), metrics exhibiting higher precision and least influenced by sampling effort might be favored. Use of the three metrics that describe "biodiversity" may require larger samples (possibly 200 per stream) to accurately the stream community.

Supporting Volunteer Water Quality Monitoring Efforts Throughout the Country

Linda Green* (URI Cooperative Extension & the Extension Volunteer Monitoring Network), Elizabeth Herron (URI Cooperative Extension & the Extension Volunteer Monitoring Network) and Kristine Stepenuck (Wisconsin Extension & the Extension Volunteer Monitoring Network)

The USDA Cooperative Extension-based Volunteer Water Quality Monitoring National Facilitation Project began in 2000. The goal was to build a comprehensive support system for volunteer water quality monitoring efforts across the country, to expand and strengthen the capacity of existing programs and support development of new ones. We developed the "Guide for Growing Volunteer Water Quality Monitoring Programs" as the centerpiece for our efforts, which can be found on-line at http://www.usawaterquality.org/volunteer. This Guide provides succinct, comprehensive and timely information distilled from successful programs across the country, packaged as a suite of factsheet learning modules, which can be accompanied by workshops. Modules exist to help program coordinators design a monitoring strategy, effectively train volunteers and support them over time, ensure data credibility and plan a data management system. Designed for "one-stop-shopping", the modules highlight techniques of successful programs and link to a multitude of available resources. This presentation will provide an overview of the Project, the Guide for Growing Programs and additional resources on our virtual hub.

Ecoregions of New England (Front and Back Side)

Griffith, G.E.*(Dynamac Corporation, c/o EPA-ORD Western Ecology Division), Omernik, J.M. (USGS, c/o EPA-ORD Western Ecology Division), Bryce, S.A. (Dynamac Corporation, c/o EPA-ORD Western Ecology Division), Royte, J. (The Nature Conservancy), Hoar, W.D. (Natural Resource Conservation Service (NRCS)), Homer, J., Keirstead, D., Metzler, K.J., and Hellyer, G. (EPA New England Regional Lab)

Ecoregions denote areas of general similarity in ecosystems and in the type, quality and quantity of environmental resources; they are designed to serve as a spatial framework for the research, assessment, management and monitoring of ecosystems and ecosystem components. By recognizing the spatial differences in the capacities and potentials of ecosystems, ecoregions stratify the environment by its probable response to disturbance (Bryce and others, 1999).

The New England ecoregion map was compiled at a scale of 1:250,000 through a collaborative federal, state and NGO process from 2007-2009. It revises and subdivides an earlier national ecoregion map that was originally compiled at a smaller scale (USEPA, 2009; Omernik, 1987). The approach used to compile this map is based on the premise that ecological regions can be identified through the analysis of the spatial patterns and the composition of biotic and abiotic phenomena that affect or reflect differences in ecosystem quality and integrity (Wiken, 1986; Omernik, 1987, 1995). These phenomena include geology, physiography, vegetation, climate, soils, land use, wildlife and hydrology. The relative importance of each characteristic varies from one ecological region to another regardless of the hierarchical level.

New England contains low coastal plains, rocky coasts, river floodplains, alluvial valleys, glacial lakes, forested mountains and alpine peaks. Ecological diversity is great. There are 5 level III ecoregions and 40 level IV ecoregions in the New England states and many continue into ecologically similar parts of adjacent states or provinces.

*Presenter

US EPA ARCHIVE DOCUMENT

Abstracts for Posters

Some Potential Federal, State and NGO Applications of EPA's Level III and IV Ecoregions

Greg Hellyer* (EPA New England Regional Lab), Katrina Kipp (EPA New England Regional Lab) and Diane Switzer (EPA New England Regional Lab)

EPA's ecoregions are defined as areas of similarity based on patterns and composition of aquatic and terrestrial ecosystem components of the abiotic (non-living), biotic (living) and cultural (human) environment, including geology, physiography, vegetation, climate, soils, hydrology, land use and wildlife, with humans being considered as part of the biota (Omernik 1995). EPA's ecoregions provide a spatial framework to support ecosystem-based research, assessment, management, and monitoring (Griffith et al. 2009).

Some federal, state and NGO applications of ecoregions in 47 of the lower 48 states have included: monitoring aquatic biota (e.g. fish, benthic macroinvertebrates, zooplankton, periphyton, and algae), identifying reference conditions and developing indices of ecological health and integrity, developing narrative and numeric biological criteria, water quality criteria and standards and nutrient criteria, development and monitoring of TMDLs, 305(b)/303(d) and Integrated Reporting, basin assessment, facilities permitting and waste management, statistical and spatial/geographic assessment and modeling (e.g. REMAP/EMAP data), large-scale monitoring of aquatic communities, ecosystem assessment of watersheds, identifying Target Fish Communities (TFC) and fisheries restoration goals, assessment and classification of streams, rivers, and lakes, point source and non-point source impact assessment, development of state Comprehensive Wildlife Conservation Strategies, Identifying critical habitat to preserve biodiversity, park land acquisition and planning, conservation and recreational planning, wetland protection: planning, permitting, mitigation and determining reference conditions, land cover status and trends, assessing urbanization and highway and road planning. A USGS glossy poster, along with GIS data and metadata, are now available.

Database to Support Ecosystem Services Research in Lakes of the Northeastern United States

Jeffrey W. Hollister* (USEPA Atlantic Ecology Division), W. Bryan Milstead (USEPA Atlantic Ecology Division), Henry A. Walker (USEPA Atlantic Ecology Division), John A. Kiddon (USEPA Atlantic Ecology Division), Jane L. Copeland SRA International, Inc., Harry W. Buffum (Raytheon), Michael A. Charpentier (Raytheon) and Darryl J Keith (USEPA Atlantic Ecology Division)

Northeastern lakes provide valuable ecosystem services that benefit residents and visitors, and are increasingly important for provisioning of recreational opportunities and amenities. Concurrently, however, population growth threatens lakes by, for instance, increasing nutrient loads. We are developing a database to explore the association between lake condition and the provisioning of ecosystem services. This database provides unique identification numbers for over 28,000 geographically referenced lakes. This allows us to combine data from the National Lake Survey, the New England Lakes and Ponds Survey, the USGS SPARROW model, aircraft based hyperspectral data of select lakes as well as other datasets. These data include standard physical-chemical measures of water quality and subjective assessments of the appeal, integrity, etc. of lakes. This poster describes the database development and provides examples of how we plan to utilize the database. We plan to provide access to: 1) lakes monitoring data, 2) modeled nutrient fluxes, 3) state specific data sets, 4) analytical tools and scripts for exploring associations between nutrients and lake ecosystem services, 5) tools for mapping lake ecosystem services and 6) prototype ecosystem service production functions that are sensitive to variations in predicted nitrogen and phosphorus loading. These efforts provide managers and researchers a better understanding of links between management decisions affecting nutrient fluxes and selected ecosystem services, support other novel research questions such as examining the link between ecological condition and human health, and provide the means for others to replicate our results and adapt our approaches and analyses in novel ways.

*Presenter

US EPA ARCHIVE DOCUMENT

Abstracts for Posters

Urban Impacts in the Watershed: Citizen Scientists Monitor Nutrients and Fecal Coliforms on Aquidneck Island, RI.

Elyse Judge* (Department of Biology and Biomedical Sciences, Salve Regina University), Lauren Bailey* (Department of Biology and Biomedical Sciences, Salve Regina University), Jameson F. Chace Ph.D.* (Department of Biology and Biomedical Sciences, Salve Regina University) and John Ryan Ph.D. (Department of Biology and Biomedical Sciences, Salve Regina University)

Aquidneck Island, Rhode Island is a heavily urbanized community that depends on surface water for drinking water supply. In October 2009 we established a citizen science watershed monitoring program. Water samples are taken every first and third Monday of the month and tested for fecal coliform bacteria, dissolved oxygen, and nutrients (phosphates, nitrates). Fecal coliform colonies per 100ml are determined using serial dilutions in a filter membrane method and selective and differential Eosin Methylene Blue agar. The Petri dishes are incubated for 48 hrs at 37°C. LaMotte color indicator tests are used for dissolved oxygen, phosphate and nitrate tests. Over the initial course of study the growth of bacteria on the membranes showed no evidence of *Escherichia*, but *Enterobacter* was present. Maidford River at Wyatt Road and Bailey Brook at East Main Road have overall shown the most bacterial growth over the past several collections. Overall, the dissolved oxygen results have been consistently high (> 8 ppm) at each testing site. The phosphate levels are low (< 2ppm) while the nitrate levels are more variable (0.25-18 ppm). Testing is ongoing and year-round, the results of which will provide time sensitive feedback to town planners, resource managers, land owners and the public.

Modeling Habitat Preferences and Constraints for the Common Loon at Multiple Scales in Northeastern North America

Anne Kuhn* (U.S. Environmental Protection Agency, Atlantic Ecology Division), Jane Copeland (SRA, Inc.), Diane Nacci (U.S. Environmental Protection Agency, Atlantic Ecology Division), John Cooley (Loon Preservation Committee of New Hampshire), Kate Taylor (Loon Preservation Committee of New Hampshire) and Harry Vogel (Loon Preservation Committee of New Hampshire)

The common loon, *Gavia immer*, is considered an ecologically important example of aquatic-dependent wildlife in North America. The common loon population in northeastern North America experiences a wide range of lake-specific habitats, water quality conditions and varying levels of human disturbance. Identifying critical habitat that supports and enhances individual fitness for loons is an important component of loon conservation management. We used an empirical landscape-habitat modeling approach to evaluate the relationship between landscape pattern and composition surrounding lakes and water quality measures associated with common loon presence and productivity. We developed a human disturbance index (HDI) based on boating traffic, public access, distance to human structures and percent developed shoreline. We used a multi-scale approach to evaluate the association of common loons and breeding habitat at multiple scales within three natural physiographic ecoregions of New Hampshire. Ecoregional multi-scale models were compared to single-scale models to evaluate model performance in distinguishing common loon breeding habitat. The presence of islands, lower total phosphorous, increasing lake size and elevation and decreasing developed shoreline and road density within 150 m surrounding nests were found to be significant factors related to common loon fitness. Increasing HDI values were found to have a statistically significant negative relationship with nest productivity. Based on information-theoretic statistics, multi-scale models outperformed single scale models within each of the three ecoregions. These results suggest common loons are selecting breeding habitat at multiple scales and differentially based on the varying landscape conditions loons encounter across northeastern North America.

*Presenter

US EPA ARCHIVE DOCUMENT

Abstracts for Posters

Microbial Source Tracking to Identify Fecal Pollution Sources in Two Vermont Watersheds

Leslie J. Matthews* (Vermont Department of Environmental Conservation), Laura Medalie (U.S. Geological Survey), Tim Clear (Vermont Department of Environmental Conservation) and Neil Kamman (Vermont Department of Environmental Conservation)

A feasibility study was conducted to develop bacteria Total Maximum Daily Loads (TMDLs) for Vermont streams using Bacteroidales-based 16S ribosomal RNA-genetic markers. Two impaired watersheds, the Huntington and Mettawee Rivers, were studied, each with different hypothetical bacterial sources based on land uses. Volunteer groups in these watersheds had documented intermittent exceedances of the Vermont water-quality standard for *Escherichia coli* in class B waters (77 organisms per 100 mL) with 8 years of weekly (Huntington) and 4 years of biweekly (Mettawee) *E. coli* concentration data, respectively. Stream-water samples collected by the U.S. Geological Survey and the Vermont Department of Environmental Conservation during storm and base-flow conditions in 2009 were analyzed for 16S rRNA genetic markers (General AllBac, Human qHF183, Ruminant BoBac, Canine BacCan, and Human BacHum) using quantitative polymerase chain reaction (qPCR) to identify human, ruminant and dog as potential sources of fecal bacterial pollution. Reference fecal samples were collected from each of the potential source groups, as well as from common species of wildlife found in the watersheds, in order to assess marker cross reactions that could generate false-positive source signals in water samples. Preliminary estimates of the relative contributions of potential fecal sources and a discussion of the feasibility of using this approach for TMDL development will be presented.

Assessing Distributions of Cyanobacteria in Lakes with Implications for Monitoring

Amanda Lee Murbey* (University of New Hampshire)

Cyanobacteria pose a threat to the health of humans and wildlife when concentrations are high and cyanobacteria are toxic. However, routine monitoring of cyanobacteria in lakes is not typical in the United States and, currently, there are no standards on the allowable limit for cyanotoxins in N.H. water bodies. This study evaluated phycocyanin (PC) fluorescence as an indicator for cyanobacteria densities, with implications for monitoring cyanobacteria and cyanotoxins in N.H. lakes. PC fluorescence was remarkably accurate in predicting cultured cyanobacteria cells ml-1 (Adj Rsqr 0.99, $p<0.001$). PC fluorescence was also useful for predicting microcystin (MC) concentrations among lakes of varying trophic status ($p<0.001$) and was slightly more significant than net cyanobacteria counts were for predicting microcystins in Barbadoes Pond ($p=0.049$). This study demonstrated high variability in the spatial distributions of cyanobacteria and microcystins across a range of trophic levels in N.H. lakes

Regional Assessment of the Brook Floater (Alasmidonta varicosa) in Rivers Throughout New England

Ethan Nedeau* (Biodrawversity LLC) and Steve Johnson* (Biodrawversity LLC)

The brook floater (Alasmidonta varicosa) is one of the rarest freshwater mussel species in the Northeast and is widely thought to be declining throughout its range due to habitat fragmentation, streamflow alterations, water quality and changes to the thermal regime and geomorphic processes of streams and rivers. In the last four years, Biodrawversity has conducted intensive qualitative and quantitative brook floater studies of all known brook floater populations in Massachusetts (six rivers), Connecticut (six rivers) and Vermont (one river), as well as nine rivers in Maine and one river in New Hampshire. Studies have collected data on spatial distribution, habitat preference, population density, demographics (age/size structure and recruitment), shell condition and local threats to these populations. Biodrawversity attempted to repeat prior quantitative surveys (if available) to determine population trends and to establish new baselines for populations for which little or no prior data were available. Studies have revealed that most known populations in southern New England and the Connecticut River Valley of Vermont and New Hampshire are highly fragmented, exhibit low population densities and poor

*Presenter

US EPA ARCHIVE DOCUMENT

recruitment, and may be declining at a rapid rate. Several populations are thought to be terminal and statewide extirpation is possible in Connecticut within 10-20 years. Biodrawversity is working with state agencies to develop strategies for protection and restoration and to establish long-term monitoring studies.

Zebra Mussels in Massachusetts!

Ethan Nedeau* (Biodrawversity LLC) and Steve Johnson* (Biodrawversity LLC)

Zebra mussels (*Dreissena polymorpha*) were discovered in Laurel Lake (Lee and Lenox, Massachusetts) in July 2009. In August, the Massachusetts Department of Conservation and Recreation awarded Biodrawversity LLC a contract to survey 17 Berkshire County lakes and the Housatonic River for zebra mussels and to assess the potential of these waterbodies to support zebra mussels based on physical, chemical and biological parameters. Data were collected at two to six sites per lake (84 total sites) and 31 sites in the Housatonic River including a continuous 0.5-mile reach downstream of Laurel Brook. Biological sampling included plankton sampling for veligers and SCUBA/snorkel surveys for adult zebra mussels, native mussels and snails and aquatic plants. Biodrawversity documented adult zebra mussels in the Housatonic River for the first time, where chemical conditions are ideal for the species. Waterbodies that were identified as being most capable of supporting zebra mussels were those with a pH near or above 8.0 and calcium greater than 20 mg/L. These waterbodies also tended to have a higher richness of aquatic plants and snails than more acidic lakes with less calcium. Ten waterbodies were identified as being particularly at risk, including the Cheshire Reservoir, Housatonic River, Lake Buel, Lake Mansfield, Laurel Lake, Onota Lake, Pontoosuc Lake, Prospect Lake, Richmond Pond and Stockbridge Bowl. Biodrawversity biologists have begun an intensive survey and monitoring program in the entire Housatonic watershed of Connecticut and Massachusetts.

Azolla caroliniana as a Potential Tool for Pharmaceutical Remediation

Anne Roberts* (Darrin Fresh Water Institute and Department of Biology, Rensselaer Polytechnic Institute), Charles W. Boylen (Darrin Fresh Water Institute and Department of Biology, Rensselaer Polytechnic Institute), Sandra A. Nierzwicki-Bauer (Darrin Fresh Water Institute and Department of Biology, Rensselaer Polytechnic Institute)

Azolla, a small floating water fern in symbiotic association with the nitrogen-fixing filamentous cyanobacterium *Anabaena*, is a leading candidate for the broad-spectrum phytoremediation of wastewater. This study aims to determine the ability of *Azolla caroliniana* to remove common pharmaceuticals from water that are found in wastewater effluents at relatively high concentrations. A seven day EC50 was performed using *Azolla caroliniana* with the analgesic drug, ibuprofen, to determine an appropriate range of concentrations to be used in detailed uptake experiments. Presented here is the effect of ibuprofen on the growth and productivity of *Azolla caroliniana* at 0, 1, 10, 100, and 1000 mg/L. Wet weight, chlorophyll a, chlorophyll b and caroteniods were used as an endpoint, and a microscopic examination of the symbiotic cyanobacteria for heterocyst frequency was conducted. A description of the uptake experiments to be performed are described. Finding effective and inexpensive methods for pharmaceutical remediation are critical as there is growing concern over the level of pharmaceuticals appearing in the aquatic environment and the associated ecological and health impacts that may accompany these pollutants.

*Presenter

US EPA ARCHIVE DOCUMENT

Abstracts for Posters

Spatial and Temporal Distribution of Hemigrapsus sanguineus in Narragansett Bay, RI: Implications for Invasive Species Management

Nicole Rohr* (University of Rhode Island), Kenneth Raposa (Narragansett Bay National Estuarine Research Reserve) and Carol Thornber (University of Rhode Island)

Hemigrapsus sanguineus invaded the coast of New England during the late 1980s. They displace the invasive *Carcinus maenas* from the intertidal zone of cobble beaches by out-competing *C. maenas* for habitat space and preferred prey resources, resulting in the replacement of one invasive by another; this invasional replacement may result in changes to current community interactions. The first step to investigating this is to determine the spatial and temporal distribution of *H. sanguineus*.

In order to determine the distribution of *H. sanguineus* on cobble beaches in Narragansett Bay, we sampled 15 sites monthly from June through October 2008. In addition, a long-term survey of four sites has been established on Prudence Island by the Narragansett Bay NERR. In both surveys, the abundance of *H. sanguineus* varied significantly among sites (NB: $p = 0.0014$; PI: $p < 0.0001$) with a significant interaction ($p < 0.0001$ for each), but only varied among months on Prudence Island (NB: $p = 0.0953$; PI: $p < 0.0001$). Carapace width varied significantly among sites (NB: $p = 0.0012$; PI: $p < 0.0001$) and months (NB: $p < 0.0001$; PI: $p = 0.0424$) with an interaction (NB: $p < 0.0001$; PI: $p = 0.0039$).

It is crucial to understand the distribution of *H. sanguineus* in order to best manage for subsequent invasions and range expansion. As coastal invasion rates continue to increase due to human-mediated dispersal and global climate change, invasive species research and mitigation techniques will be a key component of developing future ecosystem-based management plans.

Stewardship-Level Macroinvertebrate Index Development for Northern New Jersey High Gradient, Pinelands and Coastal Plain Streams

Jen Stamp* (Tetra Tech, Inc.), Ben Jessup (Tetra Tech, Inc.) and Danielle Donkersloot (New Jersey Department of Environmental Protection)

Biological measures that are indicative of environmental stresses have been used to assess the condition of stream resources. The New Jersey Department of Environmental Protection (NJDEP) Volunteer Monitoring Program and the Watershed Watch Network are two programs that allow volunteers to contribute to NJDEP stream assessment efforts. While the professional assessment efforts of the State have benefitted from development of specific analytical tools for measuring biological integrity in the Northern High Gradient, Coastal Plain, and Pinelands regions, the volunteer programs have relied on general assessment tools that have not been specifically calibrated for each ecoregion of the state. This project reviews and refines assessment tools that are applicable using volunteer-collected data throughout New Jersey by: 1) evaluating the effectiveness of the Volunteer Water Quality Index at discriminating between reference and stressed samples in the Northern High Gradient, Coastal Plain, and Pinelands regions; and 2) developing valid order level multi-metric indices for those regions in which the Volunteer Water Quality Index has limited effectiveness. Results showed that the Volunteer Water Quality Index performed well in the Northern High Gradient region. It was slightly less effective at discriminating between reference and stressed samples in the Coastal Plain region, and performed poorly in the Pinelands regions. Two new multi-metric indices, the Volunteer Coastal Plains Macroinvertebrate Index (VCPMI) and the Volunteer Pinelands Macroinvertebrate Index (VPMI), were developed to help assess volunteer-collected data in these regions.

*Presenter

US EPA ARCHIVE DOCUMENT

Abstracts for Posters

Potential Sources of Coastal Beach Enterococci to Adjacent Water Enterococcus Counts

Michie Yasuda* (University of Massachusetts Boston), Bruce Kline (University of Massachusetts Boston) and Michael Shiaris (University of Massachusetts Boston)

Abundance of the fecal contamination indicator bacterium, *Enterococcus*, was monitored in the water column, beach sand, and macroalgae in the intertidal zone at Wollaston Beach (Quincy, MA) from summer 2006 through winter 2007. Average *Enterococcus* counts in macroalgae and in 0-1 cm-depth layer sand were considerably higher (means of 10^3 MPN 100 g^{-1} and 100 cc^{-1}, respectively) than counts in the water column (means of 10^2 MPN 100 ml^{-1}) throughout the observed period. Beach water *Enterococcus* counts were positively correlated to flow rates in a nearby river. However, exceedance of water *Enterococcus* counts above the beach closure standard (104 CFU 100 ml^{-1}) did not occur in higher frequencies in wet weather than in dry weather indicating there are other sources of enterococci to the water column during dry weather. Water *Enterococcus* counts at two of the three sampling sites were positively correlated to the maximum wind gusts. Experiments showed that gentle agitation (1 oscillation s^{-1}) removed >50% of *Enterococcus* cells from beach sand and decaying macroalgae in less than 1 min, suggesting that resuspension from sand and algae may be a significant source to adjacent waters. Beaches along marine embayments had areas with high sand *Enterococcus* counts (~2.2×10^4 MPN 100 cc^{-1} sand). A new molecular method for species identification revealed that sand *Enterococcus* communities often consist of nonhuman-fecal species such as *E. hirae* and *E. durans*, and non-fecal species, *E. casseliflavus* and *E. mundtii*, together with common human-fecal species, *E. faecalis* and *E. faecium*.

*Presenter

US EPA ARCHIVE DOCUMENT