Bates-Morse Mountain Conservation Area

Spring 2017

Isobel Curtis '17 and biology professor, Brett Huggett, collecting samples of Hemlock woolly adelgid

Contents

Letter from the Director

Laura Sewall, PhD
Director, Bates-Morse Mountain Conservation Area + Shortridge Coastal Center
The Harward Center for Community Partnerships, Bates College

Reflecting on the last year at BMMCA is strangely comforting. My reflections are bracketed by the federal onslaught against environmental science and protection and, simultaneously, infused by the endless beauty and prevailing magic of the Morse Mountain marshes, the tides and wondrous, changing weather and wind.

The feeling recalls a phone conversation I had this morning. A woman called to ask if she could get married on Seawall beach. The BMMCA Corporation and Bates College do not allow weddings and, each year, I end up saying "no" to all sorts of romantic ideas. I then hear stories about why the bride or groom-to-be so badly wants to be married at BMMCA. In this case, the caller had lost her husband, mother and brother in a single nine-month period. With so much loss, she rented a house in Phippsburg—one as close to Morse Mountain as possible—so that she could walk through the woods and to the beach every day. "That place healed me," she said. I could only concur; my belief is that Morse Mountain heals all of us who wander there, whether we know it or not.

Also reassuring is the continued good work being done at BMMCA. During the 2016 summer two geology students, working with Bev Johnson on the Sprague Marsh, focused their thesis research on methane emissions from locations landward and seaward of ditch plugs, and on using plants (*Typha*, or cattails) as proxies for methane release. Methane is a potent green house gas and identifying sources is critical. Both projects were presented at professional geology meetings.

Longitudinal documentation of beach profiles and dune fronts is also critical in the context of climate change. This year marks a 25-year record of Seawall Beach profiling, progressively showing the juxtaposition of variable yet predictable seasonal shifts, and longer-term changes. In the later category, the center of the beach has moved landward by approximately 11 meters since 1990. For public education purposes, and at the request of the Small Point Association, Mike Retelle's summer interns developed a report documenting recent changes, including maps showing "dune health" and local "erosion hotspots."

The development and coordination of the Northeastern Coastal Stations Alliance (NeCSA) was a major project in 2015–2016. The final report on the consortium's progress, submitted to the National Science Foundation, was completed in July 2016. At that point, the consortium had developed a 10 year Strategic Plan and ten stations had committed to doing coordinated temperature monitoring, with seven or eight of those also working to coordinate intertidal surveys. The progress was satisfying, but I could not sustain leadership without administrative support, or without the gift of time. Still, NeCSA has quietly continued despite a lack of dedicated leadership. Since last summer, three grant proposals have been submitted; a subset of station directors and researchers met in January to hammer out final details on shared protocols (to be implemented this summer); a shared Artist-in-Residence program is taking shape; and water temperature records are now collected as part of our collaborative efforts.

Last, I must say that Morse Mountain, family members and many friends lost the spark of Peter Vickery on February 28th, 2017. Peter was central to the recognition of BMMCA and Seawall Beach as a place of migratory vibrancy—an annual pulse of life that connects hemispheres and can enliven any of us who might marvel at wild life. Peter documented the thousands of Sandpipers and Sanderlings feeding on Seawall Beach in the late summer, the diminishing Red Knots passing through (on their nearly 15,000 mile migration), and the raptors that sailed by in the fall. He was a keen observer, and he generously offered his knowledge of what he had seen and learned. It's fair to say that his lecture to the Small Point community, in 2010, changed hearts and minds—and behavior on the beach. A collective, community-wide shift seemed to take hold soon after Peter spoke, marked by fewer unleashed dogs and a palpable recognition of shared responsibility and stewardship. Peter, and his inspiring presence, will be missed.

Peter began watching birds at Morse Mountain, a place deeply dear to his heart, in 1970. He would surely like to know that more than a few migrant songbirds are reliably arriving now, and singing.

With gratitude,
Laura

Education and Research

Bates College courses: 13 courses, at least 30 visits

- Field Geology in Maine, Dyk Eusden
- The Changing Climate of Planet Earth, Mike Retelle
- Sedimentary Processes and Environments, Mike Retelle
- Hydrogeology, Bev Johnson
- Ecopsychology, Laura Sewall
- Creative Nonfiction, Elizabeth Rush-Mueller
- The Nature of Spirit, Cynthia Baker
- Plant Physiology, Brett Hugget
- The North Woods, Brett Hugget
- Avian Biology, Don Dearborn
- Coastal Hazards, Bev Johnson
- Body/Site/Create, Julie Fox
- Food and the Sacred, Cynthia Baker

Bates College senior theses: 3

- *Methane Emissions Above and Below a Ditch Plug, Sprague River Marsh Phippsburg, ME*, Kelsey Chenoweth (2017). Supervised by Bev Johnson and funded by Casco Bay Estuary Partnership and Sherman Fairchild. Presented at annual meetings for the Maine Association of Wetland Scientists and the Geological Society of Maine.

- *Assessing the effectiveness of using Typha as a proxy for estimating seasonal methane emissions on Maine's southeastern salt marshes*, Danny Stames (2017). Supervised by Bev Johnson and funded by Bates Faculty STEM Research Project. Presented at annual meetings for the Maine Association of Wetland Scientists and the Geological Society of Maine.

- *Eastern hemlock (Tsuga canadensis) physiology at Bates-Morse Mountain Conservation Area in response to a pathogenic insect, hemlock woolly adelgid (Adelges tsugae)*, Isobel Curtis (2017). Supervised by Brett Hugget.

Other colleges: 13 known visits; students served: at least 230

- Bowdoin: 7 visits
- Colby: 4
- Smith College: 1
- Maine College of Art: 1

Primary, secondary and high school visits: at least 14; students served: 357 recorded

- Notable visits:
  - Phippsburg Elementary School: 1 visit, 100 students
  - Hebron Academy: 18 Sixth grade STEM students of *Oceans, Ecosystems and Adaptation*
  - Morse High School: Clean up of woody debris along the Mountain Road

Research and Monitoring

- Sediment elevation tables: annual monitoring completed in June. Data held by Geology professor, Bev Johnson.

- Water temperature data: sensors (Tidbits) installed in June. First data set collected in September, in collaboration with NeCSA stations. Data uploaded to NeCSA storage site at the University of New Hampshire.

- Beach profiles: complete data set (11 transects on Seawall Beach) collected in June, July and August. Supervised by Geology professor, Mike Retelle. Summer interns developed a 2016 Beach Report, including maps and profiles documenting changes to Seawall, Popham and smaller area beaches, and the Sprague River.

- Saltmarsh Habitat and Avian Research Program (SHARP): Research conducted by ornithologists from the universities of Maine and New Hampshire, with study plots located at BMMCA and field assistants residing at Shortridge over four summers. Report found at: http://www.tidalmarshbirds.org/wp-content/uploads/downloads/2016/02/Maine-SHARP-summary.pdf

Publications

Johnson, Beverly J., Lovelock, Catherine E., and Herr, Dorothee. Climate Regulation: Salt Marshes and Blue Carbon. In: Finlayson, C.M. et al. (eds.), The Wetland Book. Springer Science + Business Media Dordrecht. 2016.

The Sprague River, mid-tide

Conservation and Wildlife

Piping plovers

On Seawall Beach: 7 pairs, 7 successful nests; 11 fledglings
Statewide: 66 pairs, 101 fledglings, representing the third largest number since 1977, when record keeping began.

Least terns

Attempted nesting by one pair. No fledglings reported. Most recent previous nesting: 2005, when a 17-nest colony was predated by fox or coyote.

Saltmarsh nesting birds

See previous note and http://www.tidalmarshbirds.org/wp-content/uploads/downloads/2016/02/Maine-SHARP-summary.pdf

Forest management

The recent identification of the invasive insect, Hemlock woolly adelgid, suggests significant hemlock die-off over the next decade. Hemlocks along the Mountain Road, where power lines are exposed to falling trees, necessitates the development of a Forest Management Plan.

Geology professor Mike Retelle with students from First Year Seminars, *The Changing Climate of Planet Earth* and *Ecopsychology: The Human-Nature Relationship*

News, Events and Noteworthy

Workshops and field trips

- Geology professor Mike Retelle led a 3-day, field-based Paleoclimate Teacher Training workshop for 7 high school STEM teachers. Training focused on using experiential methods to teach climate science. Clamshell and tree rings served as visible proxies for climate records. Funded by the National Science Foundation. Shortridge served as home base for the workshop.
- Geology professors Bev Johnson and Dyk Eusden led independent field trips for approximately 95 participants of the New England Intercollegiate Geology Conference. Extensive and detailed field guides were developed for each trip.
  - Johnson's field trip: *The Ecogeomorphology of Two Salt Marshes in Midcoast Maine: Natural History and Human Impacts.*
  - Eusden's field trip: *Bedrock Geology of Small Point, Maine: A fresh look at stratigraphy, structure and metamorphism.*

Curtis Bohlen, Executive Director of the Casco Bay Estuary Partnership, and geology professor Bev Johnson on Seawall Beach

Portland Press Herald feature story

- Bev Johnson's blue carbon research at BMMCA highlighted on October 9, 2016. Found at http://www.pressherald.com/2016/10/09/at-bates-morse-mountain-theres-a-lot-more-going-on-besides-sunbathing/

Sustainability

- Students working with Professor Bev Johnson and Sustainability Coordinator, Tom Twist, estimate that the Sprague River salt marsh sequesters and stores 900 metric tons of CO2 per year. The figure represents approximately 1/10th of the college's annual carbon emissions. That percentage will grow as the college works toward carbon neutrality.

- A new solar installation at Shortridge is expected to generate 100% of the electricity needed to meet the facilities' needs.

Seawall Beach clean-up

- 22 Bates alums and staff, and Small Point community members, volunteered on April 29th; an estimated 100 lobster traps moved. Disposal pending.

Shortridge Coastal Center retreats: 24

- Number students, staff and faculty served: approximately 399

- 2016 Summer residents conducting research and other environmental work: 12

BMMCA Corporation

- New election process for Trustees implemented to allow election in advance of annual meetings in June. Term limits for Trustees also implemented.

Director's professional activity

- Sewall, L. (In press). *New Words, Lost Words and Terms of Endearment*, in Fleischner, Thomas (Editor), Nature, Love, Medicine: Essays on Healing in Wildness. Torrey House Press.

Upland forest mapping

Vegetation mapping and the establishment of permanent transects during Spring 2017 will provide baseline data and opportunities for students to conduct future research. Natural communities map (see page 13) will be significantly refined. Field work conducted by Isobel Curtis '17.

Sprague Marsh at high tide

The Gatekeeper's Log

(March 6–November 23, 2016)

Public visitation
22,691 visitors

Average per day of gate keeping
122

Number of first-timers
2,896

Lot full
67 times

Camps and clubs
11 groups recorded; 21 visits; 294 visitors

Conservation organizations
19 visits estimated, including Maine Audubon, The Nature Conservancy, Maine Department of Inland Fisheries and Wildlife, and Merrymeeting Audubon.

Other organizations
7 visits recorded, including the Heights Senior Center (Phippsburg), Sebasco Estates, Maine Adaptive Sports, and LL Bean Discovery School employees. 113 visitors recorded.

Professor Bev Johnson teaching short-term students about Sedimentation Elevation Tables (SETs) and salt marsh responses to sea level rise

A 10-year Log
(2006–2016)

Education

- Bates College courses at BMMCA: 64, representing 30 courses and 5 departments
- Primary and secondary schools: At least 198, serving 4,702 (recorded) students
- Shortridge Retreats (since 2008): 195, representing approximately 2,959 students, faculty and staff
- Community presentations on status & research of BMMCA and Seawall Beach: 52

Research

- Bates Senior theses completed at BMMCA and in vicinity: 23
- Student presentations at professional meetings: 22
- Research conducted by other institutions:
  - Saltmarsh Habitat and Avian Research Program (SHARP), universities of Maine and New Hampshire and others (https://www.tidalmarshbirds.org)
  - Popham Beach profiles, Smith College
  - Shorebird Monitoring, US Fish and Wildlife Services

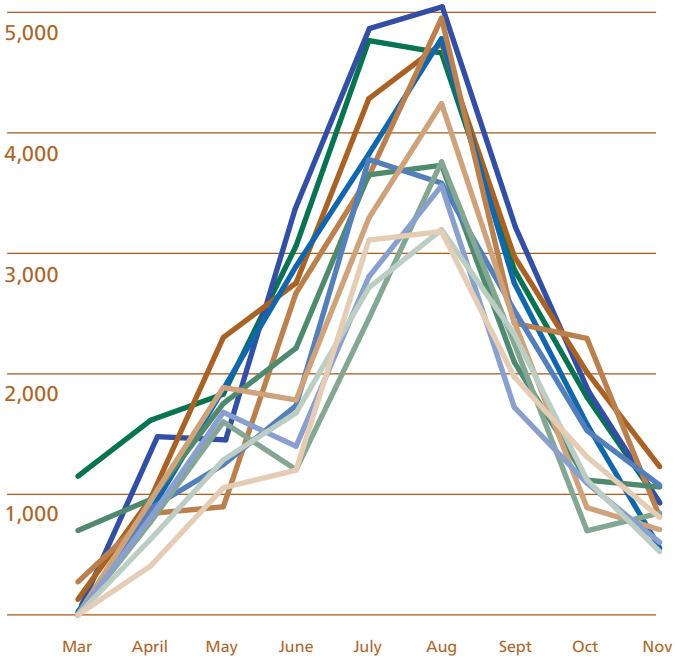
Public visitors

- Total over 10 years: 185,645
- In 2006: 13,067
  - Average per day: 78
- In 2016: 22,691
  - Average per day: 122
- Parking lot full:
  - 2010: 33 days
  - 2012: 30 days
  - 2014: 44 days
  - 2016: 67 days

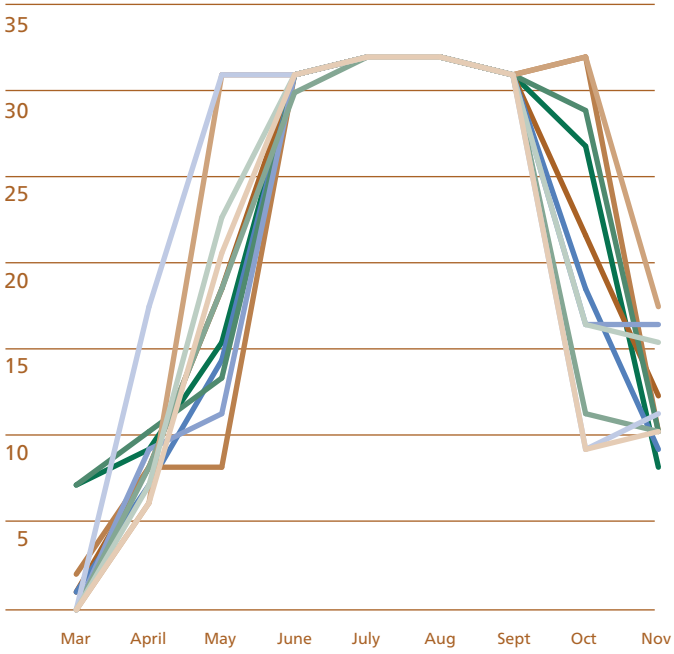
Appendix

Public visitation

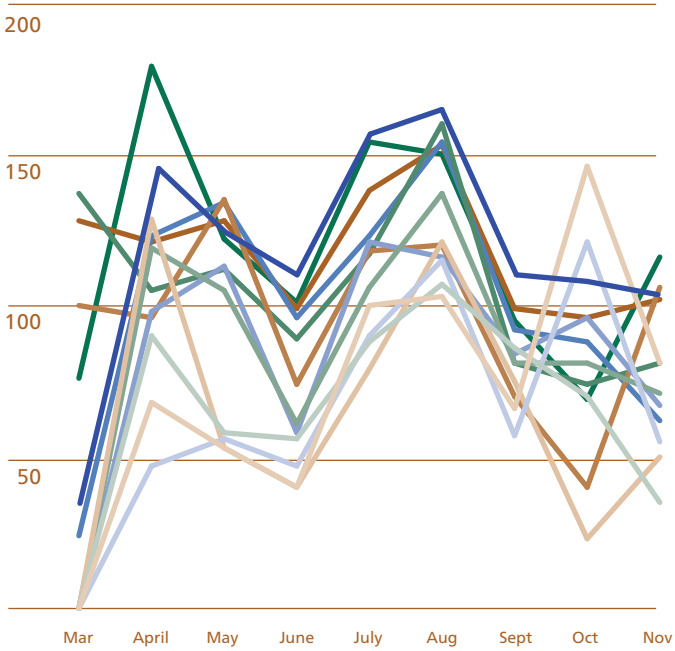
Visits 2006–2017



Days 2006–2016



Per Day Average 2006–2017



Annual Totals

Year	Visits	Days	Per Day Average
2006	13,049	167	78
2007	13,477	182	74
2008	13,671	189	72
2009	13,589	206	66
2010	16,182	168	96
2011	16,361	174	94
2012	17,286	190	91
2013	18,802	181	104
2014	19,147	171	112
2015	21,390	182	118
2016	22,691	187	122

2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016

Senior thesis abstracts

Methane Emissions Above and Below a Ditch Plug, Sprague River Marsh Phippsburg, ME, Kelsey Chenoweth (2017). Funded by Casco Bay Estuary Partnership and Sherman Fairchild.

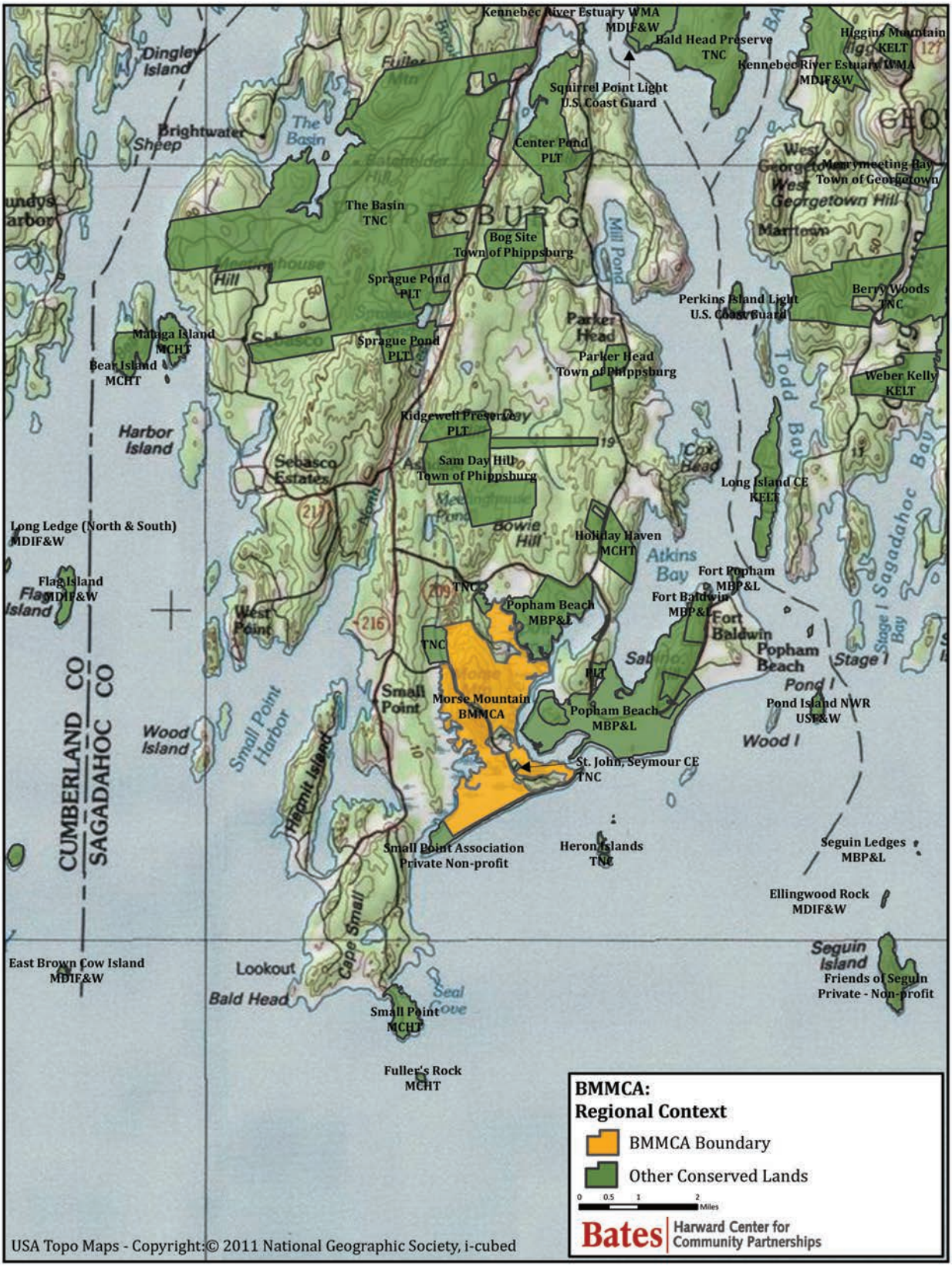
This study investigates methane emissions behind a ditch plug installation in the Sprague River Marsh, Phippsburg, Maine. Ditch plugs are common man-made tidal restrictions that inhibit tidal flow in marshes. Previous work has shown that higher methane emissions are associated with lower salinities. However, the effects of ditch plugs on methane emissions are previously unknown. Static gas chambers were used to collect monthly samples of air above and below the ditch plug over the summer of 2016. The air samples were analyzed using a GC-FID in the Environmental Geochemistry Laboratory, Bates College. There is no statistically significant difference in methane emissions above or below the ditch plug at the Sprague River Marsh, likely due to the fact that high salinities are maintained above and below the ditch plug. While the presence of the ditch plug in the SE alcove of the Sprague River Marsh did not result in an increase of methane emissions on the marsh, other tidal restrictions can cause an increase in CH4 emission, particularly if the system freshens in response.

Assessing the effectiveness of using Typha as a proxy for estimating seasonal methane emissions on Maine's southeastern salt marshes, Danny Stames (2017). funded by Bates Faculty STEM Research Project (2016–2017)

This study focuses on seasonal methane emissions in four different southeastern Maine salt marshes, where each site is located in a brackish to fresh salinity regime and contains similar vegetation (*Typha latifolifa*, and *Typha angustafolia*). The aims of this study were twofold: to test the efficacy of using *Typha* as a proxy for determining seasonal methane emissions and to determine what degree methane emissions in regions of *Typha* differ across marshes in close proximity within the same season. The project used static gas chambers to sample CH4 emissions in four different marshes from May 2016 to September 2016, including Long Marsh (in Harpswell), the Small Point and Sprague River Marshes (in Phippsburg), and the Little River Marsh (in Georgetown). The methane emissions were measured using a gas chromatograph and flame ionization detector (GC-FID). The study found relatively low and similar seasonal methane fluxes across three of four marshes; the average flux of methane over the sampling season was 12.74 +/- 8.0 umol/(m2*hr). The Little River Marsh had much higher CH4 fluxes, up to 188.0 umol/(m2*hr), likely due to a combination of factors included the presence of pooled fresh water upstream from a tidal restriction and sediment characteristics. The variability in CH4 fluxes measured for *Typha* habitat at four different marshes indicate that the presence of *Typha* alone should not be used as a proxy for CH4 emissions, but may indicate areas where CH4 emissions are high and worthy of additional study.

Eastern hemlock (Tsuga canadensis) physiology at Bates-Morse Mountain Conservation Area in response to a pathogenic insect, hemlock woolly adelgid (Adelges tsugae), Isobel Curtis (2017).

Hemlock woolly adelgid (Adelges tsugae; 'HWA') is an invasive insect that feeds upon the foliage of eastern hemlock (Tsuga canadensis) trees typically causing mortality in four to fifteen years. In the spring of 2015, HWA was discovered at Bates Morse Mountain Conservation Area (BMMCA) and current research aims to reveal the present extent of infestation and quantify morphological and physiological responses of hemlocks to infestation. Roughly 70% of the hemlocks within the primary grove were monitored for HWA density and extent of defoliation. Micro core samples and branch samples were collected to measure the hydraulic weighted mean diameter (HWMD) of current year growth and the average length of new growth. These findings were then analyzed for their relationship with features of hemlocks themselves and of the landscape. HWA density was highest among superstory trees and increased with proximity to the road. There was no significant difference in HWMD or new growth among infested and healthy trees, suggesting either HWA was introduced recently to the area or that the cold temperature of the northern climate hinders its survival and thus ability to impact host physiology. Results serve as a baseline for continued monitoring of HWA spread and hemlock decline, contribute to research on the negative impact of HWA on eastern hemlock trees, and help spread awareness about the presence of HWA in Maine.


Kennebec River Estuary WMA
MDIF&W
Bald Head Preserve
TNC
Higgins Mountain
KELT
Kennebec River Estuary WMA
MDIF&W
Squirrel Point Light
U.S. Coast Guard
Dingley Island
Brightwater Sheep
The Basin
Center Pond
PLT
Fuller Mtn
Batchelder Hill
Mearymeeting Bay
Town of Georgetown
West Georgetown Hill
Marrtown
The Basin
TNC
Bog Site
Town of Phippsburg
Mill Pond
Sprague Pond
PLT
Perkins Island Light
U.S. Coast Guard
Berry Woods
TNC
Parker Head
Mataga Island
MCHT
Bear Island
MCHT
Sprague Pond
PLT
Parker Head
Town of Phippsburg
Weber Kelly
KELT
Ridgewell Preserve
PLT
Harbor Island
Sebasco Estates
Sam Day Hill
Town of Phippsburg
Cox Head
Long Island CE
KELT
Long Ledge (North & South)
MDIF&W
Bowie Hill
Holiday Haven
MCHT
Atkins Bay
Fort Popham
MBP&L
Flag Island
MDIF&W
TNC
Popham Beach
MBP&L
Fort Baldwin
MBP&L
West Point
TNC
Fort Baldwin
Popham Beach
Stage I
Pond I
Small Point
Morse Mountain
BMMCA
PLT
Popham Beach
MBP&L
Pond Island NWR
USF&W
Wood Island
Small Point Harbor
Hermit Island
Wood I
St. John, Seymour CE
TNC
CUMBERLAND CO
SAGADAHOC CO
Small Point Association
Private Non-profit
Heron Islands
TNC
Seguin Ledges
MBP&L
Ellingwood Rock
MDIF&W
East Brown Cow Island
MDIF&W
Lookout
Bald Head
Cape Small
Seal Cove
Seguin Island
Friends of Seguin
Private - Non-profit
Small Point
MCHT
Fuller's Rock
MCHT
BMMCA:
Regional Context
BMMCA Boundary
Other Conserved Lands
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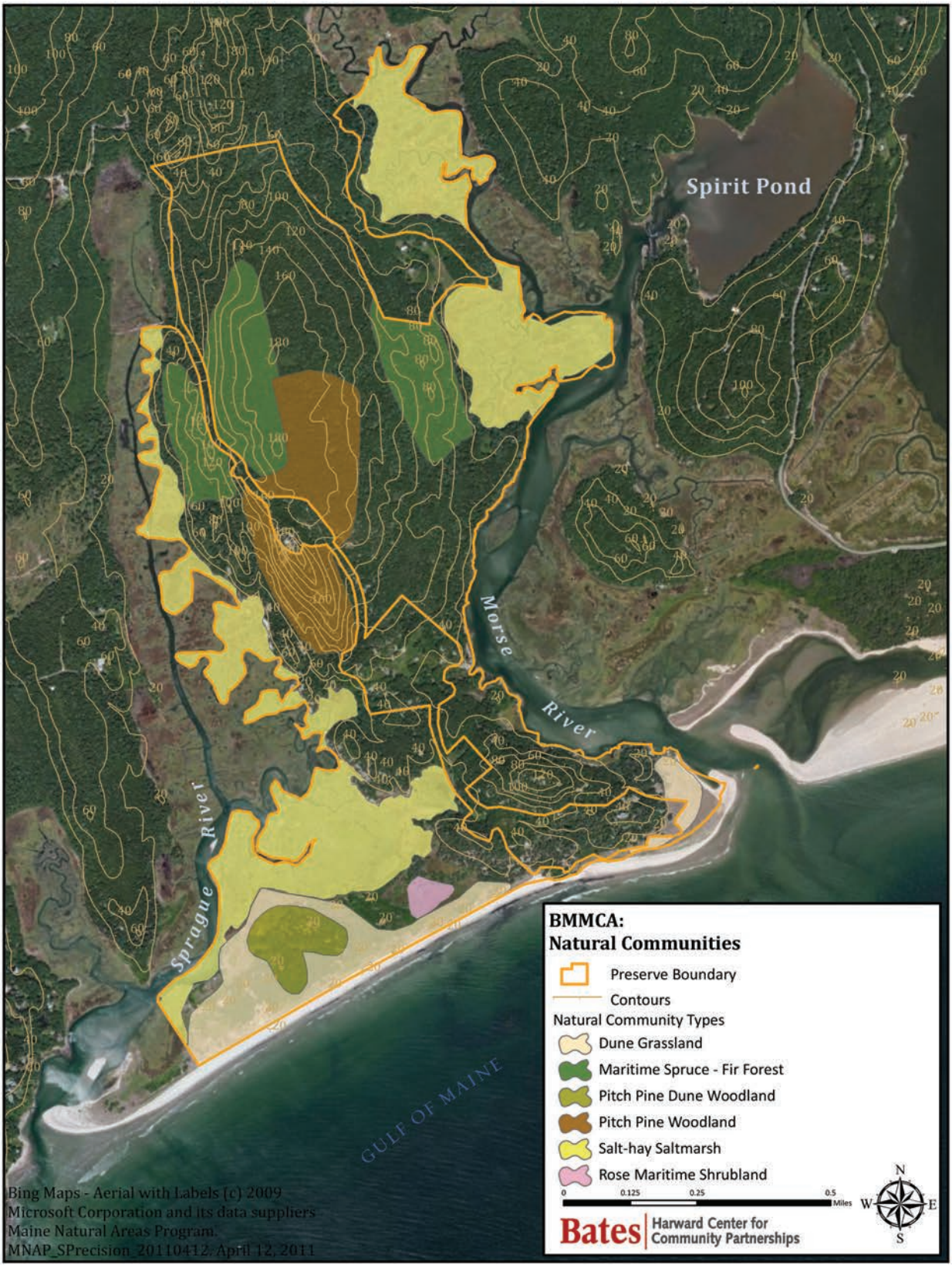
Miles
Bates
Harward Center for
Community Partnerships
USA Topo Maps - Copyright:© 2011 National Geographic Society, i-cubed


Spirit Pond
Morse River
Sprague River
GULF OF MAINE
BMMCA:
Natural Communities
Preserve Boundary
Contours
Natural Community Types
Dune Grassland
Maritime Spruce - Fir Forest
Pitch Pine Dune Woodland
Pitch Pine Woodland
Salt-hay Saltmarsh
Rose Maritime Shrubland
0 0.125 0.25 0.5 Miles
N
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S
Bates | Harward Center for Community Partnerships
Bing Maps - Aerial with Labels (c) 2009
Microsoft Corporation and its data suppliers
Maine Natural Areas Program.
MNAP_SPrecision_20110412. April 12, 2011

Bates-Morse Mountain Conservation Area

163 Wood Street
Lewiston, Maine 04240
Phone: 207-786-6078