POSTER PRESENTATION ABSTRACTS

November 16, 2019 | Keene State College

Abstracts are listed in alphabetical order by the lead author's last name. Presenters are denoted with an asterisk (*).

Assessment of a New Technology for Phosphorus Removal

Miles Fah[*1]*; Catherine Koning*[1]*; Shannon Stroble*[1]*; and Morris Jones*[1]
[1]*Franklin Pierce University*

Abstract: Too much phosphorus can cause a lake to become eutrophic, with the result that excessive algae blooms can release harmful toxins and can also lead to low dissolved oxygen. Pearly Pond in Rindge, NH is a eutrophic lake; recent modelling studies and ongoing water quality monitoring has shown that the Ingall's Road tributary, which drains a large wetland area, has high phosphorus inputs to the lake. These inputs are the result of historic wastewater inputs to the wetlands. Wetlands can only retain phosphorus when water levels are low or water is flowing rapidly. When water stagnates in wetlands, anaerobic conditions result, which allow phosphorus to be released from the soil. Phosphorus will react with iron under aerobic conditions. The Pearly Pond Management Committee received grant funding to construct an iron-enhanced sand filter at the outlet of the wetland complex. We took weekly water samples from the input and the output of the filter to determine if it was working, and analyzed the samples for total phosphorus. We also measured dissolved oxygen, pH, and temperature in the stream inflow. Preliminary results indicate that the filters are removing phosphorus when the dissolved oxygen is high enough, but most of the water is not flowing through the two arms of the filter, so modifications must be made to correct this problem.

Presenter Bio*: **Miles Fah** is a senior majoring in Environmental Science at Franklin Pierce University.*

The Effect of Buckthorn on Understory Plant Communities in a Southwest New Hampshire Pine Forest

Kassandra Jaskolski[*1] *and Rhine Singleton*[1]
[1]*Franklin Pierce University*

Abstract: In 2003, a long-term study was initiated in several forest types in natural areas on the Franklin Pierce University campus in Rindge, NH to investigate possible effects of the invasive shrub glossy buckthorn (*Frangula alnus*) on native plant communities. Re-sampling in 2008 identified white pine forests growing on wet soils as the forest type most likely to be impacted by buckthorn. This poster will present results from a 2019 study in which permanent plots within white pine forests were again re-sampled to monitor possible impacts of buckthorn on forest understory plants.

Presenter Bios*: **Kassandra Jaskolski** is a senior at Franklin Pierce University, majoring in Environmental Science. She is currently studying possible impacts of glossy buckthorn on forest understory communities.*

Bedrock Geology in Northern Keene, NH and How It Relates to Groundwater Quality

Charles Kerwin[*1] and Katie Woltner*[1]
[1]*Keene State College*

Abstract: In the vicinity of Keene, NH, many household wells are drilled into bedrock. The flow of water in crystalline aquifers primarily occurs between the joints and fractures of the bedrock such that porosity and permeability can be affected by the presence of brittle faults. In fault zones, the characteristics of the faults and the jointing can differ with each fault and even along the same fault line, affecting the flow of water within the aquifer.

In the summer of 2017, an area near the north of Keene was mapped, focusing on the identification and characterization of brittle fault structures, silicified fault zones, and jointing. Groundwater and rock samples were also taken in transect across the Mine Ledge Fault (MLF) with the goal of understanding how the bedrock geology affects groundwater flow and quality. Seven water samples from private wells were analyzed for water quality parameters as well as specific major, minor, and trace elements. Eight rock samples were collected from locations near the well sites and analyzed using Inductive Coupled-Mass Spectrometry. The primary element of interest was iron, due to the abundance of iron oxides and hydroxides in the section of the MLF where water samples were taken. The two wells closest to the MLF show elevated concentrations of iron in comparison to the wells farther away. On the contrary, the water and rock sample on the west side of the fault had elevated levels of manganese.

The MLF presents a silicified zone with fault breccia to the north, while to the south there is less silicification and more jointing. Even though jointing is present in the northern section of the fault, locally there seems to be little groundwater flow across the fault. Many of the faults in the study area are normal faults characterized by silicification in the fault plane or zones of bull quartz, however others show very little silicification and have zones that are heavily fractured and jointed. The structural and mineralogical characteristics of the bedrock play a role in the chemistry of the groundwater. The flow of groundwater within the study area is complexly controlled by the characteristics of the faults such that silicified zones impede the movement of the groundwater.

Presenter Bio*: **Charles Kerwin**, Ph.D., works as a geology instructor at Keene State College. He has mapped several hundred square miles of New Hampshire bedrock under the EDMAP and STATEMAP programs, and has mentored students on senior mapping projects of their own.*

Spilt Rock Falls: A Geologic Puzzle

Charles Kerwin[*1] and Andrew Starace*[1]
[1]*Keene State College*

Abstract: The canyon known as Split Rock Falls, located in Surry, NH, has an unusual width to depth ratio for the size of the stream that flows through it. Merriam Brook is a small stream that incises a canyon roughly 50 feet deep and 250 feet wide through bedrock that is largely granitic. The size of the stream and granite's known resistance to weathering and erosion make it unlikely that Split Rock Falls was created by typical stream processes. Early field efforts led to the hypothesis that the stream was exploiting cracks (joints) in the rock. Later work proved that the joints are part of an unknown fault, which may be related to a larger unmapped fault system. Structural and compositional data were collected from seven locations along a 0.5-mile length of the canyon. This research will provide insight toward undocumented geologic structures in southwestern New Hampshire.

Presenter Bio: ***Charles Kerwin****, Ph.D., works as a geology instructor at Keene State College. He has mapped several hundred square miles of New Hampshire bedrock under the EDMAP and STATEMAP programs, and has mentored students on senior mapping projects of their own.*

Mapping Spatiotemporal Patterns of eBird Sampling Efforts to Inspire Citizen Science Action in the Monadnock Region

Steven Lamonde (Antioch University New England)*

Abstract: Since its inception in 2002, the Cornell Laboratory of Ornithology's eBird database has collected over 0.6 billion observations of birds from every country on the planet, Antarctica, and countless mid-ocean locations. Nearly 500,000 observers, the vast majority of which are citizen scientists, have contributed to this dataset, from which scientists have gained novel insights into broad-scale avian spatial and temporal patterns. While these findings have led to over 200 publications and many dozens of conservation actions, the eBird dataset still exhibits critical limitations typical of crowd-sourced datasets. Principal among these limitations is unequal sampling effort across regions and seasons. New Hampshire's Monadnock Region is no different, where eBird submissions are spatially clustered and inconsistent across seasons. To inspire greater sampling effort of under-studied places and seasons, I conducted a GIS analysis to identify trends in the spatial and seasonal distribution of eBird observations across the Monadnock Region. Using a tessellation layer of 2.5-mile-diameter hexagons generated in ArcGIS, I summarized and visualized total number, duration, and party-hours of all complete eBird checklists from 1999 to 2019, and total species observed. This analysis yielded predictable trends; most eBird observations over the past 20 years have been concentrated near population centers and during spring migration, where travel is minimal and when species diversity peaks, respectively. By increasing sampling effort of less-frequented places (e.g., Pisgah State Park) through local citizen science initiatives, regional conservation managers will gain a more complete picture of the Monadnock Region's bird populations. Furthermore, more evenly-distributed sampling will better inform the process of identifying and protecting species-rich breeding grounds, regionally important migration stopover sites, and critical resources for overwintering birds.

Presenter Bio*: Steven Lamonde* *is a Post-Graduate Fellow in the Department of Environmental Studies at Antioch University New England. While much of his current research investigates multi-scale patterns of habitat selection in* Vermivora *warblers within Vermont's Champlain Valley, Steven works on a variety of spatial projects from mapping historic cellar holes to identifying regional wildlife corridors. In his spare time, Steven co-coordinates the Antioch Bird Club and guides birding trips throughout New England. If you see Steven at the conference, ask him a bird question!*

Modeling Lowland Spruce Fir's Fundamental and Realized Niches to Inform Management at Andorra Forest, Stoddard, NH

Pete Maciaszek[*1] and Steven Lamonde*[1]
[1]*Antioch University New England*

Abstract: Lowland spruce fir (LSF) forests reach their southern extent in the southwestern highlands of New Hampshire and provide important habitat for endangered and threatened species. Managing and promoting LSF forest is a goal at Andorra Forest in Stoddard, NH. To inform these efforts, we used ArcGIS to perform a habitat suitability analysis for LSF forest based on key criteria for LSF growth. In addition, we used a binary model to determine LSF's fundamental niche, and a supervised image classification to determine its realized niche. Input criteria for these models included aerial imagery, elevation, slope, depth-to-restrictive surface, and soil data. Combined, the results of the spatial analyses identify distribution of current LSF forests and potential areas suitable for new LSF growth. Our analysis indicated that 17% of Andorra Forest is covered by LSF forest, 99% can potentially grow LSF forest, and 20% is most suitable for LSF forest. These findings will help Andorra Forest target areas for future LSF management efforts.

Presenter Bio*: Peter Maciaszek* *has a B.S. in Natural Resources Conservation with a concentration in Forestry from UMass Amherst, over two years of professional experience as a Forestry Technician, and an M.S. in Conservation Biology and a Certificate in Applied Spatial Analysis from Antioch University New England. In the future, he seeks to work toward conservation and management of landscapes for the benefit of landowners, forests, and wildlife.*

The Impact of Beaver Dams on Dissolved Oxygen

Jessica Nekowitsch (Keene State College / University of New Hampshire) and Denise Burchsted (Keene State College)*

Abstract: Natural dams, such as beaver dams, are well known for their physical disruption of waterways. The question is: do these dams affect the overall water quality of rivers? Currently, we are studying the effects of a beaver dam on Hosley Brook in Hancock, NH. The research focuses on the effects of the dam on dissolved oxygen levels within the brook. To collect our data, we placed dissolved oxygen sensors along the waterway in four locations: one upstream of the dam in a free-flowing reach, two more upstream of the dam in a beaver meadow and beaver pond, and one just downstream of the dam. We recorded data every 15 minutes for the first six months of 2015. Preliminary analysis shows that the dissolved oxygen levels are diurnal, meaning they are climbing during the day when the sun is out and then dropping down at night. Most likely, this trend is associated with algal daytime photosynthesis and nighttime respiration. Further analysis of the data indicates higher levels of dissolved oxygen in the beaver meadow when compared to those in the first free-flowing reach. We believe this is caused by photosynthesis in the meadow. The beaver pond we studied has the least amount of dissolved oxygen, indicating that a large amount of respiration is taking place in this area. This is probably due to a larger population of micro-organisms. The number of micro-organisms is higher in this area because they are decomposing organic matter found at the bottom of the pond. Finally, we found that dissolved oxygen levels are roughly the same in the free-flowing reach downstream of the dam as they are in the free-flowing reach upstream of the dam. This means that the dam isn't affecting the overall oxygen levels of the river, even if there are some localized fluctuations.

Presenter Bio*: Jessica Nekowitsch* *is a junior at Keene State College, working towards a bachelor's degree in environmental engineering. This summer was her first time as an intern doing research in environmental studies. She hopes to continue her work next summer.*

Blanding's Turtle Home Range Statistical Analysis in R

Erin Nichols[*1]; *Arianwen Jones*[*1]; *Steven Lamonde*[1]; and *Lisbeth Willey*[1]
[1]*Antioch University New England*

Abstract: Blanding's turtles (*Emydoidea blandingii*) are semi-aquatic freshwater turtles considered rare and declining throughout most of their northeastern range. Urban sprawl has increased habitat fragmentation and road mortality for these isolated and genetically distinct populations. As part of a collaborative, five-state regional conservation planning initiative supported by the USFWS Competitive State Wildlife Grants program, we conducted a radio telemetry study to evaluate home range size across multiple sites and quantify relationships between movement and habitat cover type. We calculated Minimum Convex Polygons (MCP) and Kernel Density Estimators (KDE) for 20 individuals in high priority areas in southern New Hampshire and northern Massachusetts over two years. We then compared home range sizes between sexes using a t-test, between sites using ANOVA, and across numerical habitat characteristics (e.g., percent cover of canopy, shrub, terrestrial herbaceous vegetation, emergent vegetation, submergent vegetation, and open water) using Spearman's Rank Correlation Coefficient. MCP size varied significantly between sites ($F=6.85$, $df=2$, $P=0.007$) but not between sexes ($t=0.857$, $df=14.64$, $P=0.40$), with males and females showing no significant differences in MCP size. Submergent vegetation ($rho=-0.499$, $P=0.027$) was the habitat characteristic with the strongest relationship with MCP size, and turtles in areas with more submergent vegetation moved significantly smaller distances. Results suggest that without submergent vegetation, habitat quality could decline for Blanding's turtles, possibly causing them to move further to find adequate resources, thereby increasing energy expenditure and the potential for mortality. Based on this information, we suggest that stakeholders promote wetland quality and seek ways to reduce habitat degradation that negatively impacts submergent vegetation. To further investigate this relationship, ideal density and species type of the submergent vegetation should be evaluated to inform additional management recommendations. Site-specific results can also be used to inform management at the local level for these high priority sites.

Presenter Bio*: **Erin Nichols** and **Arianwen Jones** are second-year graduate students studying conservation biology at Antioch University New England.*

The Pearly Pond Water Quality Mystery

Victoria Prest[*1]; *Ryan Sasseville*[1]; *Catherine Koning*[1]; *Paul Kotila*[1]; *and Morris Jones*[1]
[1]*Franklin Pierce University*

Abstract: Pearly Pond is a eutrophic, nutrient-enriched lake in Rindge, NH. Most efforts to improve water quality have focused on phosphorus, which has caused the lake to be classified as eutrophic. However, data from the New Hampshire Volunteer Lake Assessment Program has shown that conductivity in the lake is steadily increasing. Conductivity measures ions in solution, and as such can be caused by a number of natural or anthropogenic sources. We targeted two subwatershed areas where high conductivity values are found to determine the possible sources and to identify the causes of the increased conductivity. We took weekly water samples from multiple locations, and analyzed them for iron, sulfides, chlorides, and coliform bacteria to determine if the problem originates in road salt build-up, leaking septic systems, or natural release of iron and other ions resulting from groundwater inputs, enhanced by beaver dam construction.

Presenter Bios*: **Victoria Prest** and **Ryan Sasseville** are seniors majoring in Environmental Science at Franklin Pierce University.*

The Effect of Buckthorn on Forest Plant Communities in Southwest New Hampshire

Rhine Singleton (Franklin Pierce University)*

Abstract: Glossy buckthorn (*Frangula alnus*) is a non-native invasive shrub found in a wide variety of habitat types throughout the Monadnock Region. In order to detect possible impacts of buckthorn on native forest plant communities, a long-term study was initiated in 2003. That year, forest communities were sampled in permanent 20 m x 20 m sampling plots located in five different forest types in natural areas on the Franklin Pierce University campus in Rindge, NH. After sampling, all buckthorn stems were removed from treatment plots. In 2008, all plots were re-sampled to test for possible effects of buckthorn on native plants. Results revealed either no effects or minor effects within white pine forests growing on wet soils. This study provides a baseline for continued sampling to assess potential long-term effects of buckthorn and other changes in forest plant communities.

Presenter Bio*: **Rhine Singleton** is a Professor of Biology and Environmental Science at Franklin Pierce University. He is a forest ecologist who has studied the long-term effects of land use history on forest species composition, the effects of invasive plants on native plant communities, and an endangered bird in Costa Rica.*

Factors Influencing the Survival of American Chestnut Saplings in a Mixed Forest in Southwest New Hampshire

Shigenobu Taki[1] and Rhine Singleton*[1]
[1]Franklin Pierce University*

Abstract: American chestnut (*Castanea dentata*) was a widespread forest canopy tree found throughout the eastern United States until an exotic fungal blight killed the majority of large trees in the first half of the 20th century. Though there are very few large trees left, small saplings can be found in forests in the Monadnock Region. These saplings do not get very large before they succumb to infection by the blight, but the roots typically survive and send up new stems. This poster will present results of a study of chestnut saplings in a mixed forest on the Franklin Pierce University campus in Rindge, NH. Factors influencing the survival of saplings will be explored.

Presenter Bio: *Shigenobu Taki is a senior at Franklin Pierce University, majoring in environmental science. He is currently studying factors affecting the survival of American chestnut saplings in a mixed forest in Rindge, NH.*