NORTHEAST REGIONAL CONSERVATION NEEDS GRANT 2014 PROGRESS REPORT

Quarter: (circle one) 2014 1st 2014 2nd 2014 3rd **2014 4th**

Grant Program, Number and Title: RCN Grant 2012-02: **The conservation status of the brook floater mussel, *Alasmidonta varicosa*, in the Northeastern United States: trends in distribution, occurrence, and condition of populations**

Organization: Saint Anselm College

Project Leader: Barry J. Wicklow, Ph.D.

Abstract: Please provide a short (1-2 paragraphs) abstract that addresses EACH of the following: the objectives of your project, accomplishments to date, future plans and timelines with an estimate for when the project will be completed.

As part of our effort to close data gaps for *A. varicosa*, we have made progress toward objectives a, b, c, d, and e from the RCN proposal:

a. Gather and review all available occurrence data for each of 12 northeast states.
b. Build a comprehensive dataset that includes biological, habitat, and spatial parameters.
c. Map the spatial distribution of brook floaters using GIS.
d. Using GIS, analyze both natural features and anthropogenic modifications within watersheds where brook floater occur to further identify critical habitat and threats.
e. Analyze temporal trends using all available long-term datasets.

To determine conservation status of *A. varicosa* we gathered population and condition data from all 15 states that compose its US distribution range (objective a). We are expecting additional survey data from WV. Because of the wide variation in state datasets (based on how recent and how extensive brook floater surveys were conducted and how and to what extent the condition of element occurrences was determined), we relied primarily on the most recent survey reports and the opinion of mussel biologists and researchers to evaluate the condition of *A. varicosa* populations. Based on recent survey data, we updated population condition ranks for ME, VT, NY and PA. We are mapping populations within HUC 12 watersheds. We continue to explore the role of land cover on EO condition. In a preliminary model used to explain the variation in *A. varicosa* population condition ranking, we extracted and summarized environmental datasets for each HUC12 watershed containing a known population. We used National Land Cover Dataset (NLCD) for 1992 and 2011 and summarized climate trends from 1895-2012 derived from the PRISM dataset. With these data, we give a preliminary description of the watershed conditions associated with various levels of population viability using random forests (Breiman, 2001). We are at about 70-75% accuracy on any given model run. A proximity measure calculated by random forests model shows the need for a greater sample size in order to distinguish classes. Our future plans include: (1) Using state EO data to delineate brook floater populations and develop publication-quality, state-level maps of EO distribution, condition, and last survey date for all 15 states that compose the US distribution range; (2) We will continue to refine our maps to represent the condition of brook floater populations and continue to seek expert opinion from both state and regional mussel biologists and researchers to validate our population delineations; (3) Create regional impervious surface vs. forest cover plot with all EOs in study area. This insight into surrounding land cover will help us to both determine how much of a role (if any) land cover plays on population viability and to generate a threat/habitat condition index for watersheds; (4) Begin to develop a regional land use change analysis, including maps; (5) Generate models with a more complete sample size of EO condition classes. Our expected end date is December 2015.

Were planned goals/objectives achieved last quarter? We have made progress on all goals.

Progress Achieved: (For each Goal/Objective, list Planned and Actual Accomplishments)

1. Planned Activity: Complete publication-quality, state-level maps of EO distribution, condition, and last survey date.

To determine conservation status of *A. varicosa* we gathered population data from all 15 states that compose its US distribution range; we used NatureServe guidelines to rank population condition then mapped population and condition by state (objective a). We are waiting for additional survey data from WV. Because of the wide variation in state datasets (based on how recent and how extensive brook floater surveys were conducted and how and to what extent the condition of element occurrences was determined), we relied primarily on the most recent survey reports and the opinion of state mussel biologists and researchers to evaluate the condition of *A. varicosa* populations. For example, a recent report based on extensive surveys in the West River in Vermont provided a much clearer understanding of the change in population condition of *A. varicosa* within the last 20 years. We are mapping populations within HUC 12 watersheds. We continue to receive valuable population condition feedback from biologists and academic researchers. For example, we received feedback information and suggestions from ME, VT, NY, PA, MA, NJ and MD.

2. Planned Activity: We will continue to refine our maps to represent the condition of brook floater populations and continue to seek expert opinion from both state and regional mussel biologists and researchers to validate our population delineations.

We continue to receive valuable population condition feedback from biologists and academic researchers. For example, we received feedback information and suggestions from ME, VT, NY, PA, MA, NJ and MD.

3. Create regional impervious surface vs. forest cover plot with all EOs in study area. This insight into surrounding land cover will help us to both determine how much of a role (if any) land cover plays on population viability and to generate a threat/habitat condition index for watersheds.

We continue to develop plots to explore the role of land cover on EO condition for EOs in the study area using National Land Cover Dataset.

4. Planned Activity: Begin testing ways to generate watershed-level habitat condition indices or habitat models

We developed a preliminary habitat model to test. In an effort to explain the variation in *A. varicosa* population condition rankings, we extracted and summarized environmental datasets for each HUC12 watershed containing a known population. We used National Land Cover Dataset (NLCD) for 1992 and 2011 (land cover, percent forest cover, percent impervious surface), as well as summarized climate trends (ppt, tmin, tmax) from 1895-2012 derived from the freely available PRISM dataset. With these data, we give a preliminary description of the watershed conditions associated with various levels of population viability using random forests (Breiman, 2001), an empirical, nonparametric ensemble learning approach. The variables in the model beginning with the most important are mean temperature max trend, mean temperature min trend, sd of slope, mean slope, 1992 impervious surface, sd elevation, max elevation, 2011 impervious surface and 2011 shrub cover. We are at about 70-75% accuracy on any given model run. Using a proximity measure calculated by random forest to show how similar our samples (based on population condition class) are from one another shows the need for a greater sample size in order to distinguish classes.

Difficulties Encountered: State participation: All states have sent point data for *A. varicosa* EOs, however we are still waiting for the most recent survey data for Patterson Creek, WV. Although a report has not yet been written, the biologist who conducted this survey will be sending us this data soon. Population condition ranking methods vary from state to state (for example: no ranking, ranking based on the protection status of adjacent land, ranking based on old survey data). In our effort to be consistent in ranking populations based on NatureServe guidelines we used data from recent surveys, new reports and information from field biologists and researchers. This process is nearly complete.

Activities Anticipated Next Quarter:

1. Finish delineating *A. varicosa* populations and complete publication-quality, state-level maps of EO distribution, condition, and last survey date for all 15 states that compose the US distribution range.
2. We will continue to refine our maps to represent the condition of *A. varicosa* populations and continue to seek expert opinion from both state and regional mussel biologists and researchers to validate our population delineations.
3. Create regional impervious surface vs. forest cover plot with all EOs in study area. This insight into surrounding land cover will help us to both determine how much of a role (if any) land cover plays on population viability and to generate a threat/habitat condition index for watersheds.
4. Begin to develop a regional land use change analysis, including maps.
5. Generate models with a more complete sample size of EO condition classes.

Expected End Date: December 2015

Costs:

Total life to date expenses (include this quarter): $57,527.14

Total Approved Budgeted Funds: $72,940.00

Are you within the approved budget plan and categories? Yes

Signature:

Date: