NORTH ATLANTIC LANDSCAPE CONSERVATION COOPERATIVE GRANT 2016 PROGRESS REPORT

Quarter: (circle one)   <u>2016 1st</u>   2016 2nd   2016 3rd   2016 4th

Grant Program, Number and Title: Grant 2011-07; **ASSESSING PRIORITY AMPHIBIAN AND REPTILE CONSERVATION AREAS (PARCAS) AND VULNERABILITY TO CLIMATE CHANGE IN THE NORTH ATLANTIC LANDSCAPE CONSERVATION COOPERATIVE**

Organization: Association of Fish and Wildlife Agencies, University of Maine (USGS MCFWRU), Clemson University, Tennessee State University

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Project Scientists: Cynthia Loftin, U.S. Geological Survey-Maine Cooperative Fish and Wildlife Research Unit
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Kyle Barrett, Clemson University
Allison Moody, University of Maine (resigned from project August 2014)

Were planned goals/objectives achieved last quarter? The UMaine and Tennessee State University team have made significant progress towards completing project goals and objectives. We are on track to continue this progress in the next quarter. Details are provided below.

January-March 2016 Activity Summary
Objective 1: *Work directly with state fish and wildlife agency personnel throughout the NA-LCC states to gather data toward PARCA criteria review and proposed conservation area identification.*

Draft PARCA development and distribution to state experts for review
We have continued to correspond with states since approximately early November to address their questions and review their suggested revisions to the modeled PARCAs. We completed reviews with VA, DC, RI, VT, and CT in the previous quarter, and received feedback from MA, ME, MD, PA, NJ, NH, and NY this quarter. We are currently working with DE and an additional reviewer in NY on their reviews. We hope to finalize those reviews by the end of April. Our discussions have been via a combination of e-mails and conference calls, in several iterations depending on the feedback (e.g., no additional edits, additional review after revising, etc.).

Feedback has ranged from very positive of the project objectives with thorough and descriptive edits on the maps, to very unsupportive of the effort and limited written feedback that could be incorporated into the maps. Our discussions with state biologists have revealed the reasoning behind these assessments. Generally, states that have less undeveloped acreage, less land area overall, and larger human populations generally are more single (herpetofauna) species focused and may identify parcels for conservation that are omitted by a region-scale model because of their small size. In contrast, states that have more land area, with proportionally less developed land and less human population density may be more likely to focus conservation efforts on herpetofauna assemblages on larger parcels of land, which is more aligned with the guideline criteria and our modeling approach. Our final project report will summarize our discussions during state review of the modeled draft PARCAs and differences between the state feedback and the modeled PARCAs that may be explained by

apparent state conservation approaches and objectives, which will provide guidance for repeating this type of study in other regions.

Our planned approach for incorporating state feedback into "final edited draft PARCAs" has been to receive feedback on our maps as annotations indicating the state experts' review of the draft PARCAs as "retain, modify, or delete" and their explanation for those classifications. In fact, we have received a much broader range of responses in the state reviews. We have continued our effort to determine an approach to incorporate the variety of feedback we have received into the revised PARCA maps at both the state and region scale to reflect the states' conservation goals, while retaining a standardized approach so that we can develop guidelines for modeling PARCAs in other regions. We have incorporated feedback from VA, MD, ME, and CT into revised maps (these state maps attached; PLEASE DO NOT DISTRIBUTE THESE MAPS, WHICH ARE IN DRAFT FORM), while developing an approach that permits us to identify the source of the information for each polygon in the final map with state feedback. For example, each polygon will have an attribute identifying the model type and whether it included species richness, scaling, data source for species richness, inclusion of richness for all species or only priority species, state reason for specific PARCAs, and state-drawn PARCAs that were not modeled. This information is summarized in an attribute value that will become a pixel value for subsequent raster analysis about the vulnerability of draft PARCAs modeled with the various data sources and model types. We are continuing to incorporate feedback from the states and will complete the revised maps by the end of April.

While awaiting state feedback, we completed running models for all combinations of 1) species richness data type (state-provided and web-based species ranges), 2) model output based solely on the species distribution models and others that include richness data, 3) models scaled to within state ecoregions and at the state scale (disregarding ecoregions), and 4) models that are based only on priority species and including or excluding priority species richness. Ultimately, the model that best matches the state-provided feedback varies with each state, and our goal is to integrate that information (i.e., identifying which model best represent the state-provided feedback) in the final reviewed maps.

We are comparing maps resulting from the four model manipulations mentioned above to identify differences among model approaches (example maps of these comparisons are attached). For example, the attached ecoregion versus state-scaling map shows areas that are unique to the two models as well as those that overlap the two approaches to scaling; ecoregion-scaling results in a greater extent of PARCAs than state-scaling. Similarly, the state richness vs. range richness model version differs, with sampling bias contributing to identifying greater area in PARCAs than range richness data. We also have compared PARCAs modeled with only species distribution models (SDMs) and those modeled with SDMs and richness data. States that focus on priority species seem to more closely align with the SDM-only modeled areas than areas predicted in the SDM plus richness maps. Focusing solely on priority species, that is, comparing priority species models with priority species richness calculated from model summation is most similar to the approach taken for modeling PARCAs in the Southeast. This model produces less area in PARCAs and significant overlap between the richness-included and richness-omitted maps. The final project report will contain comparisons of each of these model outputs and state-provided feedback for each state, with a narrative to explain the data sources and effects of those on the outcome.

We have had some discussion with state biologists about modifying the name of the PARCAs, because this label suggests finality to the area designation as a PARCA, when our intention is to present these areas as *draft, potentially suitable habitat to consider* for priority reptile and amphibian species conservation. We will explore other names to identify an alternative label for these areas that does not suggest <u>final</u> designation as a conservation area, and use that label in our final project summary report and manuscripts.

Objective 2*: Provide spatially-explicit maps of current and future climatic suitability for priority amphibians and reptiles in the NA-LCC region, and then use these data a) to rank species vulnerability to climate change based projected losses in the species' ranges, and b) to identify areas within the NA-LCC where either there are high losses of vulnerable species or there is high potential for climatic refugia for priority species, and c) identify species for which this Objective cannot be completed due to gaps in current known distributional data and thus identifies priorities for species data acquisition.*

Model output for the four combinations of models listed above have been provided to Tennessee State University with which to begin structuring the vulnerability analysis. We will also use the state-modified PARCA maps in this analysis once they are finalized. We have created spatially-explicit climate maps of current and future climate suitability for priority amphibian and reptile species in the northeastern United States. We have produced climate suitability maps for all species that we were able to collect adequate species locality data across the respective geographic distributions. We have summarized these individual species rasters into a complete map of climate suitability for current, and RCP 4.5 and 8.5 greenhouse gas emission scenarios. We subtracted each of the greenhouse gas emission scenarios species sums from the current climate species sum to create a mean climate suitability map for priority amphibian and reptile species. These mean suitability maps will be incorporated as part of the PARCA vulnerability assessment process. In terms of species we are unable to model climatic suitability, two species (Wood Turtle and Spotted Turtle) present issues due specifically to their extensive ranges outside of the northeastern United States. We lack sufficient point density for these species and are therefore unable to estimate current and projected climate suitability. We are currently attempting to acquire additional points for the under-represented species and estimate current and projected climatic distributions for these species, and depending on our ability to access additional occurrences, we will develop estimates for these species. We have created an excel spreadsheet with the total number of occurrences by species for all priority species throughout the northeastern United States.

Objective 3*: Summarize these results with respect to species occurring on lands under current state and federal management.*
Our draft PARCAs are mapped with lands identified in conservation management in the PADUS v.1.3 Protected Areas Database (http://gapanalysis.usgs.gov/padus/) so that state experts can identify where draft PARCAs and conservation lands co-occur. The state-provided feedback is displayed with the PADUS maps for Maine in an attached map. We will evaluate the final PARCAs (i.e., each of the final versions discussed in Objective 1) with respect to the National Conservation Easement Database (http://conservationeasement.us/) and other conservation areas (e.g., Important Bird Areas, TNC NE Aquatic Connectivity areas, others?) once the PARCA maps are finalized.

Objective 4: *Conduct an analysis of candidate PARCAs to help identify those highest priority conservation areas supporting reptiles and amphibians in the Northeast that are not currently protected.*

This objective will be addressed during May 2016 pending final feedback from state experts on draft PARCAs.

Objective 5*: Incorporate climate vulnerability projections into final PARCA analysis, including a ranking of high priority current and future conservation areas.*

Significant progress on this objective has been completed. We have acquired all of the spatial data necessary for this process and have begun assembling these layers and will likely have this process finished by mid-May. We have developed a draft layer of habitat heterogeneity, which will be used as one of the layers to evaluate vulnerability. One challenge we are currently addressing, which includes rendering binary data layers, such as protected areas, sea-level rise, and land-use data layers into the final vulnerability layer. The ultimate goal is to derived combined data layers (rasters) that will be used to represent exposure, adaptive capacity, sensitivity, resilience, and vulnerability. We will apply the vulnerability framework developed by Drs. Sutton and Barrett to candidate PARCAs during late May 2016.

Objective 6: *Communicate results to key state, federal, and NGO partners via publications and a Northeast regional workshop.*

We presented a summary of the PARCA modeling efforts to date at the Northeast Fish and Wildlife Agencies meeting in Annapolis, MD, in April (Loftin), and will be presenting our work at the North American Congress for Conservation Biology in Madison, WI, in July (Loftin and Sutton), and The Wildlife Society Annual Meeting in Raleigh, NC, in October (Loftin and Sutton). Loftin and Sutton have begun drafting a manuscript summarizing the PARCA modeling process and outlining the project summary report.

Activities Anticipated Next Quarter:

- Complete draft PARCA feedback process and incorporate suggested edits into the PARCA maps by end of April
- Distribute final PARCA maps to state experts (May).
- Continue evaluation of PARCAs resulting from SE and CA PARCA mapping approaches with comparison to our approach.
- Continue evaluation of PARCAs modeled with Maine GAP maps vs SDMs
- Review approach used in the California PARCA project; if we determine that our data area comparable, we will apply the California methods to our data to compare PARCAs mapping approaches.
- Evaluate draft PARCAs with respect to conservation lands in the PADUS, National Conservation Easement, and other relevant conservation areas datasets (e.g., TNC NE Aquatic Biodiversity project).
- We will incorporate the finalized PARCAs into the vulnerability assessment.
- We will continue development of manuscripts summarizing the project.

Expected End Date:
       June 30, 2016

Costs:

Total life to date expenses (include this quarter):
- University of Maine= $164,439.82; UMaine reimbursed WMI $2,481.87. Final expenditures by UMaine =$161,957.95. No new expenses this quarter.
- Tennessee State University: financial report is forthcoming.

Are you within the approved budget plan and categories? Yes.

Signature: *Cynthia S. Loftin*

Date: April 14, 2016

(Figures depicting draft areas - at the request of authors, these have been removed pending further review and approval)