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North Atlantic Landscape Conservation Cooperative Preliminary Proposal

Project Title

Designing Sustainable Landscapes: Phase 3

Principal Investigator:

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Project Scope and Objectives

This project is designed to extend the Designing Sustainable Landscape project of the North Atlantic Landscape Conservation Cooperative (NALCC) and Northeast Climate Science Center (NECSC). Phase 1 and 2 combined resulted in the development and preliminary application of the Landscape Change, Assessment and Design (LCAD) model to the Northeast Region. Importantly, the focus in phase 1 and 2 was to develop the overall modeling framework and develop regional products to demonstrate proof of concept and to provide conservation practitioners with some decision support. This has resulted in the development of a thorough modeling framework and numerous datasets for the full Northeast region. However, the current LCAD model is limited in several important ways. The model currently does not explicitly simulate several important disturbance processes, most notably timber harvest, nor does it adequately address the management of early seral vegetation for wildlife. In addition, the conservation design component of the model is in its early stages as we are just now in the process of piloting the Landscape Conservation Design (LCD) process in the Connecticut River watershed. The experience we are gaining by working with partners in the pilot will be of great value in advancing the design tools and disseminating their use across the region, but we have not yet developed the software to facilitate the custom application of LCD by conservation practitioners.

Among the many possibilities for phase 3 of this project discussed with the NALCC staff, it was recommended that we propose the following three options:

1. *Landscape Conservation Design Decision-Support Tool*. To realize the full conservation potential of the Designing Sustainable Landscapes project, it is essential that the DSL data, models, and design tools be widely adopted and used across the region. The pilot LCD in the Connecticut River watershed is proving invaluable for working out the details of the Design process through substantial engagement and participation of the major conservation stakeholders in the watershed. However, it is not realistic to expect the NALCC to invest this kind of time and physical participation in multiple other areas simultaneously. Consequently, it should be possible to make more of the process interactive and automated, which will allow us to create a Design for the entire Region and, more importantly, provide conservation practitioners with a tool that will allow them to develop custom LCD applications. Here, we propose to develop a separate stand-alone software tool for interactive custom LCD. This would facilitate use of the tools

by partners in other subregions interested in conservation design such as in Chesapeake Bay and the Gulf of Maine. There are still many unknowns to this endeavor as we have not completed the pilot LCD and there will certainly be significant computational challenges to overcome. We propose to develop this DSS in two phases over a two year period. In phase 1, we would develop a set of functions to semi-automate the LCD process that could be applied by technically trained users, and we will work with one or more parties (e.g., Chesapeake Bay and Gulf of Maine groups) to apply the approach. However, this phase would not result in stand-alone software and would require some level of technical training via a workshop that we would provide. In phase 2, we would implement the DSS in a stand-alone software package that would be accessible to a wide audience of users and host a workshop on its use. At a minimum we expect this task to require the PI for 4 weeks, one research fellow (Compton) for 52 weeks, two research fellows (Plunkett and Grand) for 30 weeks each, and one full-time consulting computer programmer (for operational software development) for a total budget of $320,000 over two years.

2. *Habitat management and restoration*. The LCAD model currently does not accommodate several habitat management and restoration activities that our stakeholders, through workshops and other venues, have identified as important. In particular, given the emphasis on shrubland wildlife species in the Region, the LCAD model does not allow for sufficient control in assigning management actions directed at these species or in maintaining sites in early seral stages for extended periods of time. Here, we proposed to work with the state agencies to compile spatial data on the locations of early seral management which will serve as an input to the LCAD model and develop a mechanism for prioritizing the creation of new early seral management sites. In addition, our stakeholders identified the restoration of agricultural lands to wetlands and/or forest as an important conservation activity that is not accounted for in the LCAD model. Here, we propose to develop a mechanism for identifying priorities for agricultural conversion to wetland/forest similar to the existing mechanism for identifying priority opportunities to improve terrestrial and aquatic connectivity. We expect this task to require one research fellow (Compton) for 26 weeks, and two research fellows (Plunkett and Grand) for 4 weeks each for a total NALCC budget of $70,000 over two years (or this could be done in one year). This would also leverage 26 weeks of post-doc support (DeLuca) by the NECSC.

3. *Timber harvest*. The LCAD model currently simulates generic vegetation disturbances and succession as a stochastic process based on empirically observed intensities and patterns of vegetation disturbances in each ecoregion. Importantly, timber harvest is combined and thus confounded with other anthropogenic and natural causes of disturbances. Given the importance of timber harvesting and its role as the dominant vegetation disturbance agent in the region, our stakeholders have identified this as critically important to the model. Simulating realist timber harvest is fraught with numerous challenges owing to the many different silvicultural practices employed by different agencies, organizations and individuals and the changes in those practices over time. Nonetheless, it is important that we make the model as realistic as possible in this regard. Given the complexity of modeling timber harvest, there are two options to consider: a low-end version and a high-end version.

The low-end version would entail compiling spatial data on silvicultural practices to emulate the most common practices used in each subregion or in each forest type and to constrain those practices to the appropriate land ownerships. This version of the implementation would require obtaining land ownership data and developing a limited suite of algorithms to represent the major silvicultural practices, implemented within the existing LCAD model framework. This version would allow us to simulate realistic timber harvest but would provide only limited ability to design alternative silvicultural treatment scenarios. We expect this version to require the PI for 2 weeks, one research fellow (Plunkett) for 26 weeks, and one research fellow (Grand) for 4 weeks for a total NALCC budget of $66,000 over two years (although this could be done in one year). This would also leverage 26 weeks of post-doc work (DeLuca) supported through the NECSC.

The high-end version would involve integrating the timber harvest module in the Rocky Mountain Landscape Simulator (RMLands) into the LCAD model. The RMLands model which we developed for applications in the western U.S. contains an extremely sophisticated and flexible approach for modeling vegetation treatments, including 13 different treatment types and numerous controls (both static spatial and dynamic) on the distribution of treatments in space and time, and a user interface that allows for easy scenario development and application. This version of the implementation would require the PI for 4 weeks, three research fellows (Compton, Plunkett and Grand) for 52, 32 and 26 weeks, respectively, and one post-doc (Deluca) for 26 weeks to compile spatial data, synthesize information on silvicultural practices across the region, parameterize the model, and run the simulations, and a full-time programmer for 52 weeks to integrate the RMLands and LCAD computer code for a total NALCC budget of roughly $320,000 over two years.

Relationship to Hurricane Sandy Support

The DSL project expects to receive $240,000 over the next two years from the Hurricane Sandy relief fund to integrate existing information and models and tools for understanding future impacts of sea level rise and storms on tidal wetlands that can be used to make critical decisions for increasing resiliency and habitat suitability through marsh and adjacent upland restoration, management and protection at regional and local scales. The specific objectives of this project are to:

1. Develop and apply a tidal restriction stressor metric and salt marsh ditching stressor metric and incorporate them into the overall ecological integrity assessment for salt marsh ecosystems across the Northeast;
2. Develop landscape capability models for additional tidal marsh obligate species and piping plover in collaboration with partners and apply the models across the Northeast;
3. Work with LCC partners and coastal decision-makers to test and refine the coastal ecological integrity and landscape capability models, and
4. Incorporate these additional metrics and models into the overall Designing Sustainable Landscapes Landscape Change Assessment and Design model along with sea-level rise models and create and evaluate coastal conservation designs.

Thus, the tasks associated with the Hurricane Sandy project are complementary to and non-redundant with the tasks outlined in this preliminary proposal.