NORTH ATLANTIC LANDSCAPE CONSERVATION COOPERATIVE GRANT 2014 PROGRESS REPORT

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

Grant Program, Number and Title: NALCC 2012-06: F11AC00223 MOD #3 NALCC 1420
Spatially explicit models for aquatic habitats

Organization: Downstream Strategies, LLC

Project Leader: John (Fritz) Boettner

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.

Were planned goals/objectives achieved last quarter?

The year two (2014) fourth quarter milestones—as with the third quarter— include performing all assessments for a list of species and having 15-20 models nearing the final stage of development. As detailed in the 2014 third quarter report, the project continues to be delayed and modified based on several factors. The Brook Trout model has been completed and now climate change scenarios are being completed. The coastal model —Winter Flounder—is being completed for the Narragansett Bay of Rhode Island, but data issues still remain.

In 2014 Quarter 4, DS finalized a modified scope of work with the NALCC to meet the goals of the project. DS was originally contracted by the NALCC to perform between 15-20 habitat assessments for areas within the NALCC region.

Specifically, DS will produce the following deliverables:

- Complete Chesapeake Bay brook trout model climate change scenarios. Supplementing the existing model with new climate change scenarios.
- Complete winter flounder case study for Narragansett Bay. Ongoing effort, the focus for this model is to develop useful products for winter flounder managers, but also to create a framework that could be applied to other coastal or estuarine species. This model is nearly complete.
- Winter flounder model for Long Island Sound. Using the framework developed for the Narragansett Bay, DS will apply this approach and develop a Long Island Sound winter flounder model.
- Develop a diadromous species framework for river herring. This effort will build from the TNC assessment, which compiled and analyzed river herring data for the Atlantic coast.
- All of the results produced in these efforts will be incorporated into a web-based decision support tool.

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

Due to the dynamic nature of the project and slow progress, several goals have not been accomplished since the project beginning. Listed below are the updated goals and accomplishment for the 4th quarter. However, in light of this setback, the project made progress on framework components that will make the project more efficient.

1. Phase-one goals:

a. Review and identify gaps
    i. Planned: DS will work with the NALCC stakeholders to identify a list of the predictor and response variables useful for documenting current conditions and assessing threats to the aquatic habitats of interest.
    ii. Actual:
        1. **1st Quarter:** Have begun the process and developed a plan for identifying data needs across the NALCC region. This process has begun by reaching out to stakeholders and experts in the field to determine data availability and procurement strategies.
        2. **2nd Quarter:** Presented the project overview at several meetings to a multitude of stakeholders across the region. Case study response and predictor variables were selected for the coastal portion of the project. The project team has begun to put together a methodology and approach that will be presented the coastal stakeholders
        3. **3rd Quarter:** Group decided on winter flounder as the case study species for the coastal assessment and has begun collecting and processing data for model development. Worked with Scott Schwenk to identify predictor datasets to be collected and processed for the NALCC region. Also, our project team connected with Ben Letcher's group at the USGS and has begun collaborative discussions about developing a Brook Trout model and sharing data.
        4. **4th Quarter:** Data acquisition has begun, data requests for both predictor and response datasets have been distributed. The project team is waiting on response datasets to arrive, with a hope of modeling in the 1st quarter of 2014. Predictor datasets have been identified and are being acquired, processed, and tracked.
        5. **1st Quarter (year two):** A list of models and response and predictor variables have been identified and progress is being made to finish existing models and start on a new set of assessments.
        6. **2st Quarter (year two):** Continued progress is being made to finish existing models and start on a new set of assessments.
        7. **3rd Quarter (year two):** Finalized Brook Trout Model, working towards climate change scenarios. Reviewing data for Chesapeake Bay River Herring and Long Island Sound Winter Flounder models.
        8. **4th Quarter (year two):** Continuing climate change scenarios with brook trout model. Continue to discuss coastal model framework and replication.
b. Assess needs
    i. Planned: DS will work with the NALCC to determine the best approach to address the gaps identified in prior goal.
    ii. Actual:
        1. **1st Quarter**: A plan was developed in coordination the NALCC project director, which outlines the step necessary to lead towards the first facilitated stakeholder meeting. These steps include a data needs assessment, formation of stakeholders and technical advisors, defining the preliminary modeling framework, defining draft biological priorities, developing and implement a survey, and setting the agenda and format for the stakeholder meeting.
        2. **2nd Quarter**: Several documents and tools where created and published to the project management website, these include:
            a. **Stakeholder contact database:** Over 100 categorized contacts housed online @ smartsheet.
            b. **Web-mapping application (ArcGIS online):** http://www.northatlanticlcc.org/projects/downstream-strategies-

project/web-mapping-test

c. **Midwest and Great Plains Assessment Models Data Summary**: The top five anthropogenic and top five natural variables from each model for each FHP and a regional model are summarized in this brief. This summary pinpoints only those variables that were most important in structuring the responses for each model. Across all models, each variable is tabulated for the number of times it is occurs as one of the most influential (top 5 of each category). This analysis presents the relative usefulness of the most important variables in structuring regional- and fhp-scale model responses.
d. **Preliminary Framework Concept: Inland fish habitat modeling for the North Atlantic Landscape Conservation Cooperative**: Downstream Strategies is committed to a stakeholder-driven process to guide each phase of this project; we propose the following methodology as a potential template for much of the work for inland stream modeling. It is not our intention to dictate the process, but inform the NALCC stakeholders about a generalized methodology that has shown to be useful in the past, and that could be implemented for this project, should the stakeholders find that it would meet their objectives and expectations.
e. **Incorporating future climate and land use changes into aquatic habitat assessments:** Case study that demonstrates how readily available downscaled climate change and land use development models can be incorporated into species distribution models to characterize potential future changes in aquatic conditions to better inform long-term conservation and restoration planning at the catchment level.
f. **Case Study: Analysis of scale on boosted regression tree fish habitat models:** Recent modeling efforts at the regional and FHP scale have indicated that smaller-scale models are likely necessary to pinpoint localized stressors. From discussions with experienced modelers and fishery professionals, HUC8 watersheds were agreed upon as the most appropriate scale. This report summarizes a case study that demonstrates the effect of scale on the assignment of stressors from predictive BRT models. Specifically, we modeled the same response at three different scales and for two separate HUC8 watersheds.
g. **Project Brochure:** A two page brochure providing an overview of the NALCC aquatic habitat assessment project.
h. **Proposed Methodology for Aquatic Assessments:** This document details a preliminary methodology that we will use to guide the modeling process. This document is a working document and will be updated as input is gathered and decisions on the methodology are made.
i. **Draft Review of Priority Aquatic Species:** To inform the aquatic assessment project, Downstream Strategies (DS) completed an initial review of priority species across all states within the North Atlantic Landscape Conservation Cooperative (NALCC). This list is intended to show existing priority species across the region in order to inform stakeholders and the project team as we collectively decide on a subset of species to include in the assessment project. The review provided here is in no way comprehensive and should therefore be viewed as an initial WORKING list of species occurring most frequently on state and federal management plans throughout the NALCC. Additional priority species or other biological endpoints identified by stakeholders can be integrated into

the matrix and used in the decision making progress.

j. **Spreadsheet of Preliminary Priority Aquatic Species:** To inform the aquatic assessment project, Downstream Strategies (DS) completed an initial review of priority species across all states within the North Atlantic Landscape Conservation Cooperative (NALCC). This list is intended to show existing priority species across the region in order to inform stakeholders and the project team as we collectively decide on a subset of species to include in the assessment project. The review provided here is in no way comprehensive and should therefore be viewed as an initial WORKING list of species occurring most frequently on state and federal management plans throughout the NALCC.

k. **Online project overview presentation:** Habitat Assessment Models and Decision Support Tools for Aquatic Habitats Fritz Boettner of Downstream Strategies presents on the North Atlantic LCC funded project to develop a decision support tool for an aquatic assessment of the Northeast. The presentation focuses on the development of a modeling methodology, process and outputs that came out of the modeling, and how stakeholders are needed for the project to be a success and develop quality assessment outputs. (http://applcc.org/resources/video-gallery-and-webinars/webinars/neighboring-lccs/habitat-assessment-models-and-decision-support-tools-for-aquatic-habitats)

3. **3rd Quarter**: Performed research and examined existing datasets to develop a proposed framework and methodology for the Coastal Model.
4. **4th Quarter:** DS continues to hold meetings and discussions to facilitate the decision making process. Additionally, DS has given additional presentations and webinars to various stakeholders to encourage participation and decision making.
5. **1st Quarter (year two):** Technical committees have been coordinated for both Winter Flounder and Brook trout. Models are in development.
6. **2nd Quarter (year two):** Technical committees have been coordinated for both Winter Flounder and Brook trout. Brook Trout model is at draft stage and winter flounder model has gone through several iterations.
7. **3rd Quarter (year two):** Models completed, collecting data for two new models (Long Island Sounds Winter Flounder and Chesapeake Bay River Herring).
8. **4th Quarter (year two):** Climate change scenario models continuing, collecting data for two new models (Long Island Sounds Winter Flounder and Chesapeake Bay River Herring). Still determining final coastal approach, 3 options exist: 1. Long Island Sound model (trawl, adult-only) and residuals on the current Narragansett model. 2 Narragansett model (trawl, adult-only) plus residuals 3. Narragansett model (seine, YOY-only) plus residuals. More background work and data assessments are happening from the technical review team before moving forward.

c. Report on findings
   i. Planned: Drafting of an assessment report and creating a PowerPoint presentation for key stakeholders and the NALCC.
   ii. Actual:
      1. **2nd Quarter:** Pieces of the report have been completed (listed above) and were submitted for review in Q2. All of these briefs are hosted on the project website.
      2. **3rd Quarter**: As mentioned above, method and framework document has been created

2. Phase-two goals:

a. Coordinate Stakeholders: Several milestones have been reached regarding stakeholders:
    i. **2nd Quarter**: Stakeholder groups formed
        1. A project coordinators group has been developed, including representation from NALCC, USFWS, ACFHP, WVU, and DS. This group has been holding bi-monthly conference calls since May.
        2. The beginnings of a coastal/estuarine stakeholder group have developed, including the selection of case study species and key participants.
        3. Emily Greene and Julie Devers are leading the coastal and estuarine modeling portion, while Callie McMunigal is leading the inland modeling effort.
        4. Each of the leads has been pulling together key stakeholders and DS has been presenting (4-5 times) the project overview via webinars.
    ii. **3rd Quarter**: Technical stakeholder group has been established for the coastal assessment
    iii. **4th Quarter**: Semi-formal group has been identified for the Brook Trout models, still determining how the modeling effort will move forward. Additionally, several new team members have been added to the coordination team that are helping with the prioritization of species.
    iv. **1st Quarter (year two):** Winter founder and Brook tour models have technical review stakeholder committees.
    v. **2nd Quarter (year two):** Winter founder and Brook tour models have technical review stakeholder committees.
    vi. **3rd Quarter (year two):** Developed relationships with key data providers in the region, including TNC and EBTJV. New technical review committees are being formed for the final models
b. Develop model framework:
    i. **2nd Quarter**: A preliminary framework document has been written and will be modified during the case-study modeling process for both inland and coastal assessments.
    ii. **3rd Quarter**: Winter flounder was selected as the case study species for the Coastal assessments. A framework and methodology document has been provided to the project team and is being used as a working document for the team. A literature review was performed to drive the initial framework of the method document. Datasets, both predictor and response, are being collected and processed for use in the Winter Flounder model and other yet-to-be determined species.
    iii. **4th Quarter**: 1km hexagon grid for the coastal assessments has been created and finalized as the modeling unit for the coastal assessment. Also, the 3-mile nautical boundary was selected as the coastal model boundary
    iv. **1st Quarter (year two):** Chesapeake Bay was selected for a brook trout model
    v. **2nd Quarter (year two):** Chesapeake Bay was selected for a brook trout model and model was developed using existing framework and process. Stakeholders are continuing to discuss alternatives and next steps. Winter Flounder model framework has bed drafted, with structured response and predictor variables. Several model runs have been performed and fine tuning of the framework is underway.
    vi. **3rd Quarter (year two):** Frameworks for Long Island Sound Winter Flounder and Chesapeake Bay River Herring are being discussed. Project team is examining existing data to inform technical stakeholders.
    vii. **4th Quarter (year two):** Frameworks for Long Island Sound Winter Flounder and Chesapeake Bay River Herring are STILL being discussed. Project team is examining existing data to inform technical stakeholders.
c. Buy-in from stakeholders:
    i. **All quarters:** This is still in progress, but DS has given 6-9 presentations to a multitude of stakeholders

d. Finalize process:
    i. Not accomplished
3. Phase 3, perform assessments:
    i. Final Assessment have been completed for Brook Trout and many iterations have been completed for Winter Flounder in N. Bay

Difficulties Encountered:

1st Quarter (year two): Difficulties encountered during this project continue to be the time needed to organize stakeholders, encourage participation, and make decisions. It was anticipated that it would be a quick exercise to get people involved and make decisions; this has proven to be difficult. Data collection is another activity that is taking more time than anticipated. The project team assumed the data could be gathered in a timely manner and provided to the modelers. Efforts are being made by the coordination team to collect data and we hope to be modeling by the beginning of Q1 of 2014. A technical committee has been formed for Winter Flounder and Brook Trout. Additionally, a list of prioritized species has been put forward by stakeholders, which will help determine future models as part of this project. The delay in the project timeline has created budget issues, which will likely decrease the quantity of models the project team will be able to create.

2nd Quarter (year two): The difficulties listed above in the 1st quarter remain to be a road-block to completing models. There was an overestimate of stakeholder capacity for these assessments as proposed. At this point the coordination team are reviewing the present budget and determine a path forward to successful competition to this project. Below are our recommendations.

Recommendations moving forward

- Continue with the Winter Flounder model, focusing more on creating a spatial and modeling framework that can be applied for any coastal species. Spend the time and effort on creating a replicable modeling framework and an example model that can be used for other coastal species.
- Continue with the Brook Trout Model, slowing the process down to accommodate the requests from stakeholders and integrating new scenarios, variables, tools, and data that are based on user input. Focus on creating results and tools that will be extremely useful to the stakeholders and allow time for a peer review process.
- Develop a diadromous species modeling framework and case study model, possibly River Herring. Similar to the coastal assessment, spend time creating a replicable framework and a case study model.

Final deliverables

- Brook Trout model
    - Spend more time with stakeholders and process
        - Integrate new variables
        - Develop climate change scenarios
        - Explore invasive species integration
        - Peer review process
    - Possibly hold a workshop with all stakeholders (including other modeling efforts) to refine the process and outputs
    - Input final brook trout model into final Decision Support Tool
- Winter Flounder model
    - Replicable coastal assessment methodology
        - Continue to work with technical team to create a useful model and apraoch
    - Winter flounder model
    - Input into the decision support tool
- Diadromous (River Herring) model
    - Replicable diadromous assessment methodology
        - Continue to work with technical team to create a useful model and apraoch
    - River Herring (or other species) model

- Input into the decision support tool

3th Quarter (year two): Based on the information presented above, a modified scope of work has been finalized and signed by the project coordinator.

The project team will develop:

Task 1. Inland model (Chesapeake Bay watershed brook trout model)

The brook trout model is complete. To meet stakeholder needs, DS slowed the model development process and allowed an increased role for stakeholder feedback, which has led to additional related analyses.

DS has already completed the following tasks, which were modifications to the original scope:

- Reexamined predictor variables to ensure all relevant and available data is being utilized for model development.
- Provided additional opportunities for in-depth model review.
- Explore the inclusion of invasive species effects on brook trout distribution.
- Completed brook trout assessment model.

DS will perform the following tasks in order fulfill the modified scope of work:

- Develop future climate change scenarios to evaluate brook trout vulnerability to climate change.
- Produce a report that will document the methodology, data needs requirements, constraints and limitations.
- Integrate results into the decision support tool.
- Explore the inclusion of other brook trout research into the decision support tool.

Task 2. Narragansett Bay winter flounder model

Winter flounder and the Narragansett Bay were chosen as a case study model because of the relative data richness and availability. Despite the seemingly abundant data, creating strong models for this localized area has proven to be more difficult than the models DS created for inland habitats. Despite the challenges that remain, DS along with the ACFHP and the winter flounder technical review team have made significant progress in developing a useful model for stakeholders.

DS has already completed the following tasks, which were modifications to the original scope of work:

- Revisit predictor variables to ensure all relevant and available data is being utilized for model development.
- Make modifications to response variable data to remove potential sources of bias.
- Provide additional opportunities for in-depth model review.

DS will perform the following tasks in order fulfill the modified scope of work:

- Finalize the Narragansett Bay winter flounder model.
- Continue to work with ACFHP and other stakeholders to ensure that resulting products from this effort will be useful and replicable.
- Produce a report that will document the methodology, data needs requirements, constraints, and limitations.
- Integrate results into the decision support tool.

Task 3: Long Island Sound winter flounder model

DS acquired data collected by ACFHP from multiple entities for Long Island Sound. Data coverage since 2000 is good and the majority of the data is from trawl surveys. DS will develop a model to predict winter flounder relative abundance (or relative abundance of YOY/juvenile winter flounder), where predictor data is readily available. Due to time and budget constraints, review and stakeholder participation will need to be strictly limited. Critical decisions that are outside of the capabilities of DS will need to be quickly addressed by the core coordinators for winter flounder (i.e. Julie Devers, Lisa Havel, Caroly Shumway).

Specifically, DS will perform the following tasks:

- Develop a winter flounder model for the Long Island Sound based on existing data sources, with efficient support help from ACFHP technical team.

- Develop report summarizing results, methodology, data needs requirements, constraints, and limitations.
- Integrate results into the decision support tool.

Task 4. Diadromous species case study

After examining fish sample data compiled from multiple sources, DS will attempt to utilize the run count information from the TNC and Dauwalter reports to create a statistical characterization or prediction of the distribution and/or threats to river herring. At the present time, the exact methodology, project outputs, and likely success of this pilot project cannot be determined, but DS will work with stakeholders to exhaust all options in utilizing the run count data to produce a reliable and useful product for restoration managers. Ideally, DS will be able to create a model that predicts run strength based on habitat variables. This run strength model will allow managers to assess likely habitats outside the current distribution. This model will focus potential restoration efforts to sites that allow access to areas currently unreachable by river herring. If successful, this model MAY also point to additional stressors (such as imperviousness for instance) that are depressing current run strength.

As an alternative, if DS finds the run count data to be insufficient, the creation of a surrogate species model has potential to inform restoration decisions. If an inland species or group of species that inhabit preferred spawning habitat for river herring can be modeled, there is potential to use those predictions in concert with existing efforts to map known and historical locations of river.

If neither of the above options produce usable results, DS can incorporate the results from the TNC river herring restoration project into the final decision support tool. Currently, the TNC report is available in paper form, but has not yet been transferred into a web mapping environment.

Specifically, DS will perform the following tasks:

- Examine the possibility of creating a prediction of distribution and/or threats from the run-count data.
- Examine alternative modeling approaches that could be useful to stakeholders.
- Develop report summarizing results, methodology, data needs requirements, constraints, and limitations.
- Integrate results—of this modeling effort and/or TNC results— into the decision support tool.

Activities Anticipated Next Quarter:

- Winter Flounder and Brook Trout climate models complete.
- Draft Long Island sound model, Final N. Bay Models, and Diadramous framework drafted

Expected End Date: May 31, 2015

Costs:

Total life to date expenses (include this quarter): $159,416.47

Total Approved Budgeted Funds: $250,000

Are you within the approved budget plan and categories? Yes

Signature:

Date: December 24, 2014