Preliminary Framework Concept

Inland fish habitat modeling for the North Atlantic Landscape Conservation Cooperative

Prepared for the North Atlantic Landscape Conservation Cooperative (NALCC) Assessment Project
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Introduction

Downstream Strategies (DS) has produced predictive models for several fish habitat partnerships across the United States. These models utilized widely available landscape variables as predictors for instream aquatic responses, such as presence of certain guilds or species of fish. Boosted regression tree (BRT) models were utilized as the predictive statistical models for these analyses, and were chosen after careful consideration of their strengths and weaknesses compared to other available statistical methods. These models created a broad and unique understanding of the link between terrestrial and aquatic health, and allowed for the determination of stressors for each response.

Thus far, the models produced have been built at broad scales that encompassed thousands of square miles and stretched across many states. These large scale-models offered valuable insight to which landscape level stressors and natural conditions were structuring aquatic responses, but the determination of more local-level stressors proved more problematic as the broad patterns overshadowed those stressors that may structure aquatic responses at finer scales.

We found that large scale models were usually quite accurate in predicting presences and absences, but due to these issues of scale, were unable to accurately identify localized stressors for each aquatic response modeled. Given these considerations, we propose a combination of regional scale and finer-scaled models for the inland NALCC fish habitat modeling efforts.

Approach

While DS 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.

We propose that the NALCC agree upon three to four endpoints/responses for larger scale models that will help guide broad, regional decisions about general water quality, overall fish community health, and aquatic conditions. The results of these models will provide useful stand-alone information in guiding conservation decisions and identify broad-scale stressors. The results of these large scale models can then also be utilized to pinpoint critical watersheds that would benefit from finer-scale modeling. These smaller scale models (we propose utilizing HUC8 watersheds) will even further inform localized decisions for these critical watersheds.

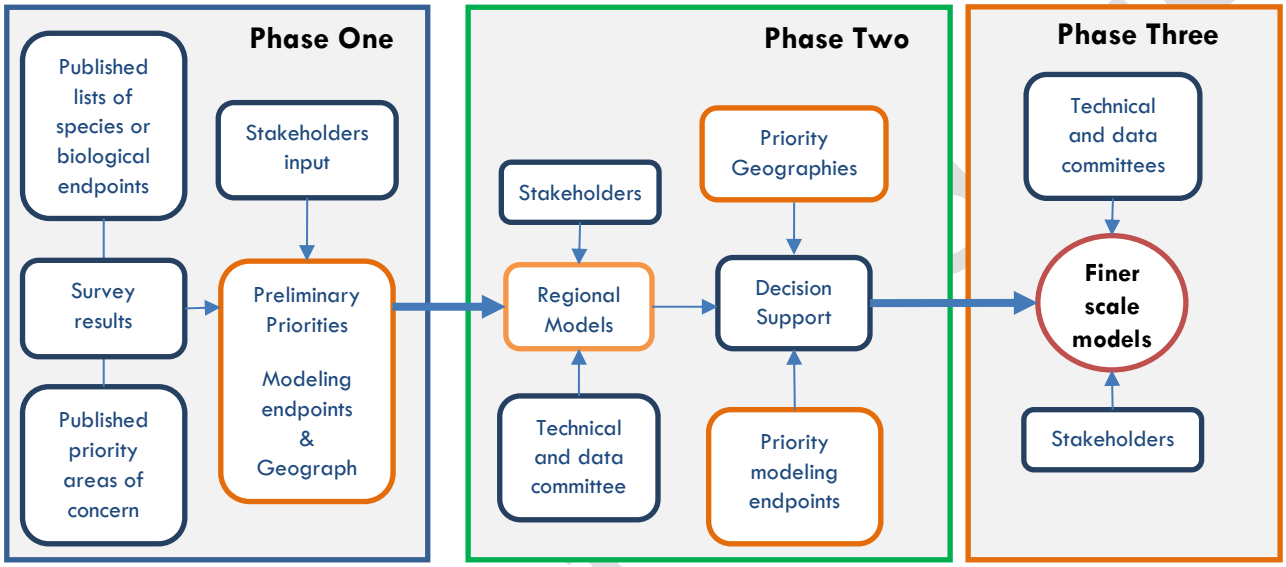
The Ohio River Basin Fish Habitat Partnership (ORBFHP) utilized FHP-wide fish habitat model results in this way to arrive at 27 priority HUC8 watersheds from the 152 total HUC8 watersheds within the partnership's boundary. These priority watersheds will allow the ORBFHP to focus protection and restoration efforts and to focus future analyses and modeling efforts to these smaller geographic regions.

The Midwest Fish Habitat Partnerships joined efforts and created a "regional assessment" for the entire Midwest to understand general conditions across the entire region. They chose three representative guilds of fish that inhabit high quality streams across the range of stream sizes. From this assessment, high quality coldwater, coolwater, and warmwater habitats were identified. These three models were then utilized to assess overall habitat quality of

each catchment within the assessment area. This effort proved useful in indicating broad regional patterns of high quality fish habitats, and a similar methodology could be utilized by the NALCC to assess fish habitat quality at a broad scale. Shown below in Figure 1 is the proposed phased approach to developing the inland assessment models.

Phase one

FIGURE 1: PHASED APPROACH



To begin the process, DS will research existing resources of conservation or species priority publications in the NALCC region. Along with biological endpoint priorities, published lists of priority areas, such as drainage basins, eco-regions, or other delineated management boundaries will be summarized. This catalog of priorities will be combined with a survey that will be administered to stakeholders during phase one. The survey results and lists will provide background information that will inform the decision making process by providing criteria and metrics for evaluation. Technical and data committees and stakeholder groups will be formed that will help with resources, technical review, providing input, and developing criteria for selecting priorities for assessment. In meetings facilitated by DS, these newly formed groups will meet, review results from survey and research, set priorities, and finalize and approve modeling framework for phases two and three.

Phase two

Phase two will take the outcomes of phase one and begin the modeling process, starting with several—three to four—regional models. These models could be based on a species guild that represents the priorities determined in phase one or a single species endpoint. These modeling efforts will be a joint effort with the stakeholder and technical committees, providing opportunity for review and adjustment. The regional model results will provide an additional set of criteria that can be used to focus phase three models into more discreet geographic areas or watersheds.

Phase three

Using additional stakeholder input and the results of the decision support tool to determine biological endpoints and areas of modeling are identified, DS will develop multiple—between 10-15—models across the region. DS suggests that models be created at the HUC-8 scale. Each model will require input from various stakeholders and

support from both data and technical advisors. The model development will follow our typical process, gathering data, processing variables, and develop preliminary models for stakeholder input. The preliminary models will be shared with key stakeholders and technical reviewers, providing the opportunity for refinement and adjustment.

Conclusion

We feel that the NALCC may be best served by utilizing a multi-scaled approach to modeling fish habitat conditions. This will provide general condition assessments for all stream reaches, while focusing remaining efforts on priority watersheds, where the scale of analysis will allow for more proper assignment of stressors. While the selection of the response variables/species modeled has not yet been made and those choices will have definitive impacts on the appropriate scale of analysis, we wanted to propose a methodology that we felt has been shown to be useful, while still allowing flexibility for decisions that are yet to be made. DS is fully committed to developing a modeling framework that is created by stakeholder input and feedback, and will meet the needs of the NALCC, and we feel that the proposed methodology should allow for all of those criteria to be met.