Determining Mitigation Needs for NiSource Natural Gas Transmission Facilities - Implementation of the Multi-Species Habitat Conservation Plan (MSHCP)

Decision Support Framework for Evaluating and Ranking Mitigation Sites

Section 6 Cooperative Endangered Species Conservation Fund Grant
(IDFW Subtask 2.3)
Prepared by The Conservation Fund
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Decision Support Framework Summary

A key to implementing the NiSource Multi-species Habitat Conservation Plan (MSHCP) is to evaluate and rank potential mitigation opportunities for take species. The Conservation Fund (the Fund) has prepared a comprehensive set of decision support tools to facilitate the selection of the best possible mitigation opportunities as they arise over the course of the implementation of the MSHCP.

GIS Map Document

The Fund has delivered a customized ESRI ArcGIS™ map document (.mxd) that includes key Geographic Information System (GIS) layers for decision support for desktop use. This map document and data were used to prepare the species mitigation site reports for task 2.2. The GIS layers help place mitigation projects in a regional green infrastructure context and help visually demonstrate how a potential mitigation opportunity will contribute to the protection of the species across its range. Below is a summary list of the data provided in the map document:

Freshwater Mussels: Potential Freshwater Mussel Mitigation Opportunities, Take Mussel Species Counties of Occurrence, NiSource Potential Take Counties for Mussels (based on draft HCP Chapter 6), Freshwater Mussel 8-digit HUC Occurrences, Mussel Species Modeling Results (James Spinymussel, Clubshell, Fanshell, Northern Riffleshell, Sheepnose)

Indiana Bat: Potential Indiana Bat Mitigation Opportunities, Counties within 10-Mile Buffer of Priority I/II Hibernacula, Counties with Occurrences (ESI AnaBat Summer 2009), Counties with Known Summer Habitat, NiSource Potential Take Counties for Indiana Bat (based on draft HCP Chapter 6), Modeled Habitat Patches and Quality (Maxent Suitability Model)

Bog Turtle: Potential Bog Turtle Mitigation Opportunities, Bog Turtle Counties of Occurrence, Bog Turtle Recovery Subunits

Nashville Crayfish: Potential Nashville Crayfish Mitigation Opportunities, Mill Creek Watershed + Streams, Mill Creek Greenways, Mill Creek Floodway + 75 Feet, Mill Creek Davidson County Open Space, Mill Creek – Detailed Land Cover, Nashville Crayfish Habitat Suitability Model

Madison Cave Isopod: Potential Madison Cave Isopod Mitigation Opportunities, Madison Cave Isopod 8-Digit HUCs, Madison Cave Isopod Occurrence and Potential Take Counties, Madison Cave Isopod Geologic Units (Index of Cave and Closed Depression Densities)

Green Infrastructure Network Design: Mature Hardwood Forests (PA, TN, KY, OH only), Core Aquatic Habitats, Aquatic Corridors, Core Wetlands, Wetland Corridors, Core Forests, Forest Corridors, Hubs, Characterized Green Infrastructure Network

References for Searches and Display: State and County Boundaries, NiSource Covered Lands Counties, Ecoregions, Hydrologic Units (HUCs), NiSource Covered Lands, Protected Lands

Figure 1 – GIS Map Document
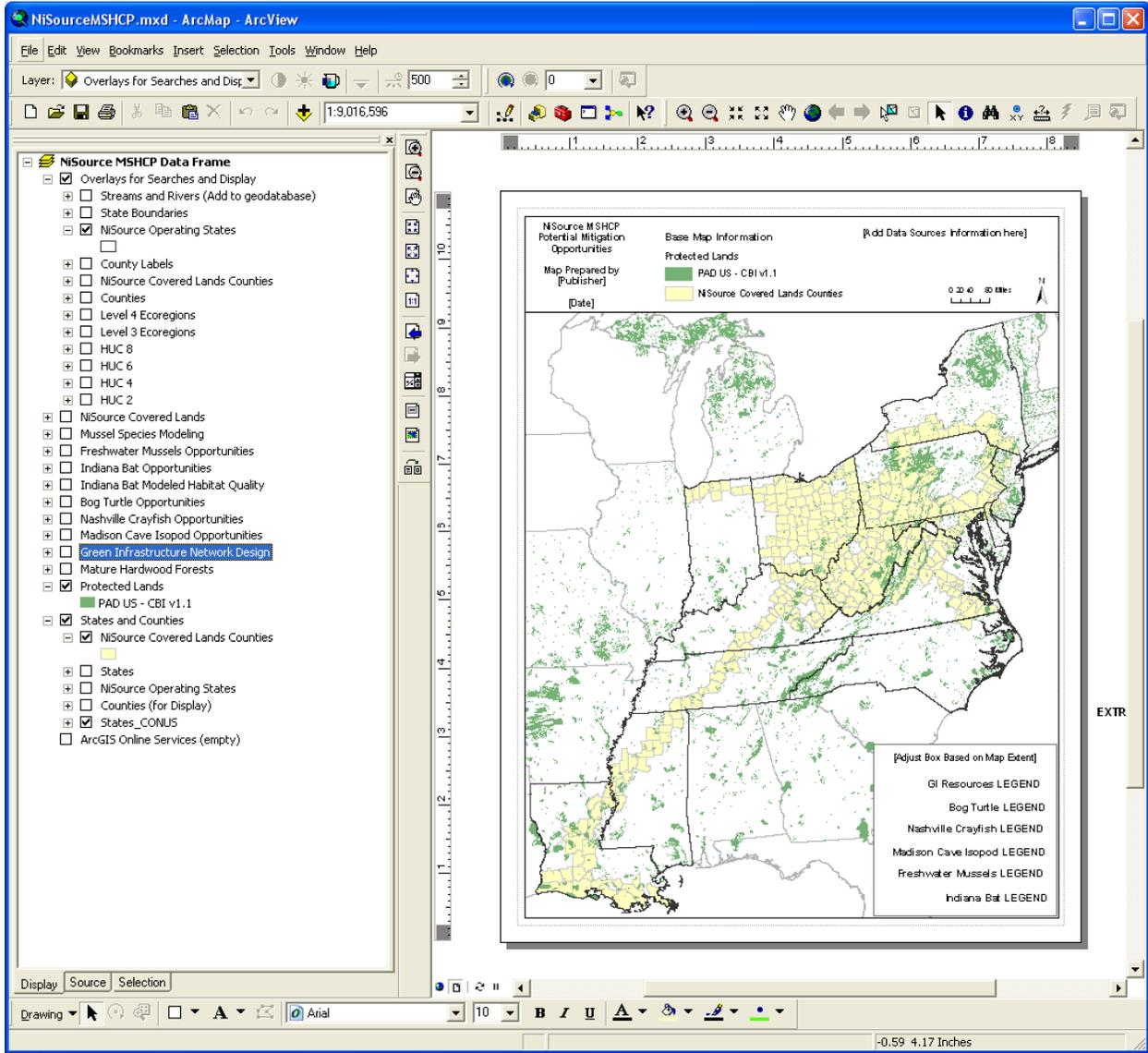
Decision Tree Software

For each take species, maps, spreadsheets, and species habitat information were collected and synthesized into a 'decision tree'. A decision tree is a set of criteria and weights that will be used to quantitatively evaluate the benefits of potential mitigation opportunities on a consistent scale so that projects can be appropriately compared. Each criterion spans a range of characteristics from most to least suitable in terms of meet species mitigation requirements. Where each project falls within this range is represented numerically on a standard scale from 0-100 that represents how well it satisfies that particular criteria (100 being the highest). In addition to the score for each criterion, weights are assigned relative to other criteria within its 'branch of the tree', since some factors are more important than others in evaluating a potential project. In addition, criteria have a 'logic structure' that designates them as mandatory, sufficient, or desired based on the contribution to species protection.

The design of the decision trees is based on a state-of-the-art method known as 'logic scoring of preference' (LSP) to ensure that all criteria and weightings are designed to reflect fundamental properties of human reasoning and ensure that the benefits calculated accurately reflect the desired intent of decision makers. Dr. Jozo Dujmović, one of the world's pioneers in the use of LSP for decision making, has designed a customized desktop software package (ISEE) and a web-based application (LSPWeb) to support the ongoing refinement of the species decision trees as the MSHCP begins to be implemented in 2011. Please see the species mitigation report deliverables for subtask 2.2 and the application user manuals for more information on their use.

Figure 2 – LSPWeb Software
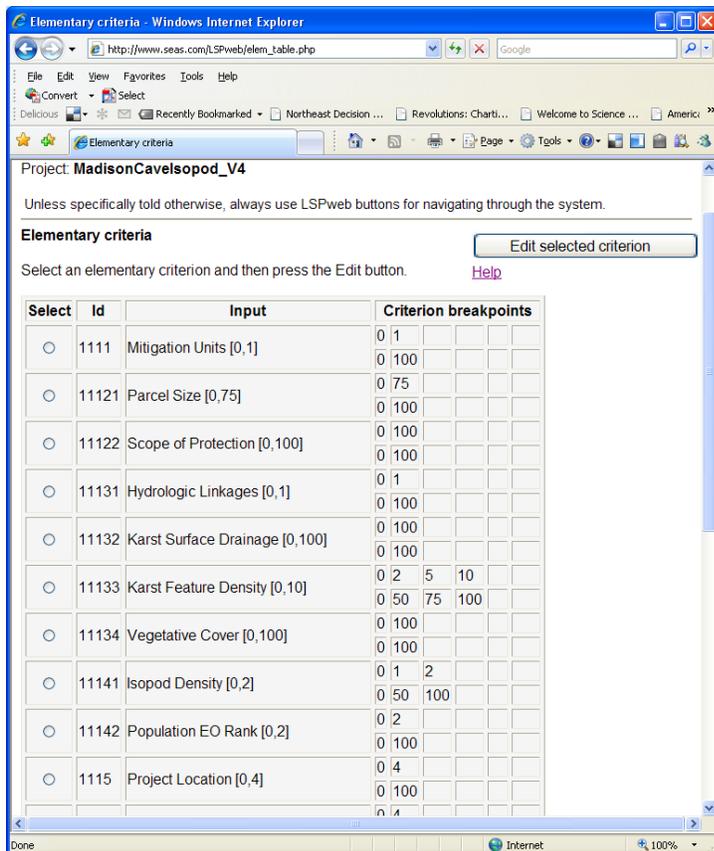
Optimization Software

The Fund has provided an Excel™ based application that allows users to identify an optimal set of mitigation projects within a fixed budget and/or to explore the relative cost effectiveness of potential projects. The Fund collaborated with Dr. Kent Messer from the University of Delaware to develop the Optimization Decision Support Tool (ODST). The ODST is an Excel™ based application that allows users to evaluate mitigation opportunities based on a variety of evaluation techniques: (1) identifying an optimal set of mitigation projects within a fixed budget constraint, (2) exploring the relative cost effectiveness of mitigation projects and selecting the portfolio with the highest benefit: cost ratio, and/or (3) identifying the minimum cost required to achieve a defined benefit level.

The Fund believes that optimization tools will assist decision makers in dramatically extending the limited financial resources devoted to mitigation. The Fund and Dr. Messer have demonstrated that utilizing optimization in conservation programs yields significantly more acreage with higher overall conservation benefits than does applying more traditional project selection approaches. Please see the application user manual for more information on its use.

Figure 3 – ODST Software

Decision Support Tool User Manuals

ISEE - SEAS. Integrated System Evaluation Environment - ISEE User Manual - V1.1 © 2010

LSPWeb - SEAS. LSP method for evaluation over the Internet V1.0 © 2010

ODST – Messer, Kent D. and Dmitry Volodin, University of Delaware, Optimization Decision Support Tool Reference Guide - Lite Version ©2010

Next Steps

In mid-December 2010, the Fund contacted state agency staff and provided a final project status report. It is expected that the MSHCP Federal Register notice will be released in late January 2011. State officials were informed about the range of reports and GIS resources completed through the project and their availability on the Fund web portal site. As the Federal Register notice and potential issuance of an Incidental Take Permit will take place outside the contract period for the Section 6 grant, the Fund has provided a set of tools that anticipates that elements of the MSHCP will be adjusted over time. The Fund informed the states that it will host a webinar for USFWS staff and state officials on the green infrastructure network and to provide an orientation to participants on the material covered within mitigation site reports in 2011. It is anticipated that the Fund may be requested by NiSource, USFWS or state agencies to provide additional training and/or modify the decision support tools over time. These adjustments to decision support tools fit naturally within the course of a planning cycle.