



**Creation of Regional Habitat Cover Maps:
Extension of the Northeast Terrestrial Habitat Classification and Mapping to
Cover the US Forest Service Eastern Region**

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In response to USDA Forest Service needs for data and assessments supporting State Forest Resource Plans, NatureServe proposes an extension of its Northeast Wildlife Terrestrial Habitat Classification System and GIS map to the remainder of the USFS Eastern Region. **The primary products would be a classification of terrestrial wildlife habitats and a GIS coverage depicting those habitats across the 20-state region.**

The map will consist of a spatially comprehensive GIS grid of 30 meter pixels with a legend portraying the Northeastern and Upper Midwestern Terrestrial Habitat Classification System (NMTHCS). We envision a series of map legends that range from coarser-scale with higher accuracy (habitat systems or groups of systems) to finer-scale with lower accuracy (habitat systems with selected structural variables). This assumes that not every habitat type will be equally amenable to the mapping procedures described here.

Background: This project builds on work underway in the 13 northeastern states (Maine – West Virginia). That work has produced the Northeastern Terrestrial Habitat Classification System (NETHCS), a standardized terrestrial wildlife habitat classification system for the Northeast, funded through a 2006 State Comprehensive Wildlife Conservation Support Program grant to NatureServe.¹ The NETHCS is based on NatureServe's Ecological Systems classification (Comer et al. 2003), augmenting that classification with additional information from individual state wildlife classifications and other information specific to wildlife managers. The NETHCS was completed in September 2008. A follow-up project to produce a habitat map based on the NETHCS is underway, due to be completed in September 2009, coordinated by The Nature Conservancy's Eastern Region Office with support from NatureServe. Mapping procedures are using a variety of already developed GIS data layers, drawing from TNC's Ecological Land Unit (ELU) classification (Anderson and Olivero 2001), National Land Cover Dataset (NLCD) as well as data developed in the course of ongoing mapping efforts. NatureServe is a partner in two major national mapping efforts, LandFire and GAP, providing expertise in the application of the Terrestrial Ecological Systems Classification. Current data, compiled for the entire region, includes bedrock and surficial geology, landforms, elevation zones, climate zones, land cover and canopy density, roads, forest inventory points and natural heritage community inventory points. Major field datasets include Forest Inventory and Analysis (FIA) data and state natural heritage program field data.

The northeastern work covers the 13 states plus the District of Columbia. Extending this work to the USFS Eastern Region would add eight states: Ohio, Indiana, Illinois, Missouri, Iowa, Minnesota, Wisconsin, and Michigan. Virginia, covered in the northeastern work, is not included in the USFS Eastern Region and would be excluded from this project.

Products:

- The Northeastern and Upper Midwestern Terrestrial Habitat Classification System (NMTHCS). This classification system will be an extension of the Northeastern Terrestrial Habitat Classification System (NETHCS). Ecological systems of the upper Midwest that are not included in the NETHCS will be incorporated into the classification framework and adapted as wildlife habitat systems.
- GIS-based map of wildlife habitat systems across the USFS 20-state Eastern Region, with supporting data layers.
Map products provided as a result of this project will be digital as well as hard copy. Digital products will include raster data with classification by habitat system, NLCD, conservation

¹ In the 2006 project, NatureServe partnered with The Nature Conservancy (TNC) to fully develop the classification and augment it with additional information specific to the needs of wildlife managers. That project also delivered the regional Northeast Aquatic Habitat Classification System (NEAHCS) and map based on aquatic habitat mapping techniques developed by The Nature Conservancy and Aquatic GAP.

ownership, ELU, and the component classes making up each ELU: elevation class, bedrock class, and landform unit (derived from digital elevation models). The proposed NMTHCS map will resemble Figure 1 in scale, with a legend of habitat systems rather than ecological systems, and further refined as a result of additional compiled field data.

Tasks:

Task 1: Gather and evaluate data for classification. Add to the habitat and systems data already in hand (FIA, heritage EOs, etc.) with additional species and community data relevant to wildlife (Partners in Flight, etc.). Solicit species and community data from state heritage programs and wildlife agencies that can be tagged to specific habitat systems.

Task 2: Develop GIS biophysical data. Use available layers including DEM, NLCD, soils, and geology to develop enhanced Ecological Land Units (ELUs) for the portion of the region for which ELUs are not available; solicit review. These will depict combinations of slope, substrate, topographic position, moisture index, elevation, landform, and other variables, that can be used to predict the range and extent of vegetation types. Figure 1 depicts a simplified map of ecological land units that are being used to inform the northeastern mapping project.

Task 3: Complete terrestrial classification for the eight states. Include upper-midwestern ecological systems, and transitional vegetation that is relevant for wildlife habitat. Review, and if necessary revise, NETHCS structural variables. These structural variables form an additional layer that can be combined with the system units to better characterize wildlife habitats.

Task 4: Hold a workshop to review draft classification with state wildlife representatives.

Task 5: Refine classification concepts based on reviews and finalize NMTHCS.

Task 6: Complete draft regional habitat systems map based on the NMTHCS.

- a) Assemble existing land form, NLCD, and other ancillary data sets for the region.
- b) Assign a habitat system to each georeferenced data point from Task 1.
- d) Using ArcGIS software, intersect the habitat point data to the land form and NLCD data layers, reserving a portion of the points for accuracy assessment.
- e) Perform deductive and inductive modeling to identify connections between biophysical data and existing data.
- f) Develop draft habitat map: using the diagnostic classifiers and known range information of each habitat system, assign a habitat system type to each mapped combination of variables. The mapping process at this stage will be iterative, with stepwise addition of other ancillary data sets to help further refine the map.

Task 7: Develop GIS add-on to habitat systems map using structural information that is available as GIS layers.

Task 8: Solicit review of map from Heritage Programs and Wildlife Agencies in the eight states. Ecologists and wildlife biologists will scrutinize the map for obvious errors based on their previous experience, then will compile a list of errors and submit them to NatureServe.

Task 9: Finalize map of NMTHCS, incorporating expert review feedback, e.g. adjusting geographic ranges of habitats, or other errors identified during the review.

Task 10: Final Report.

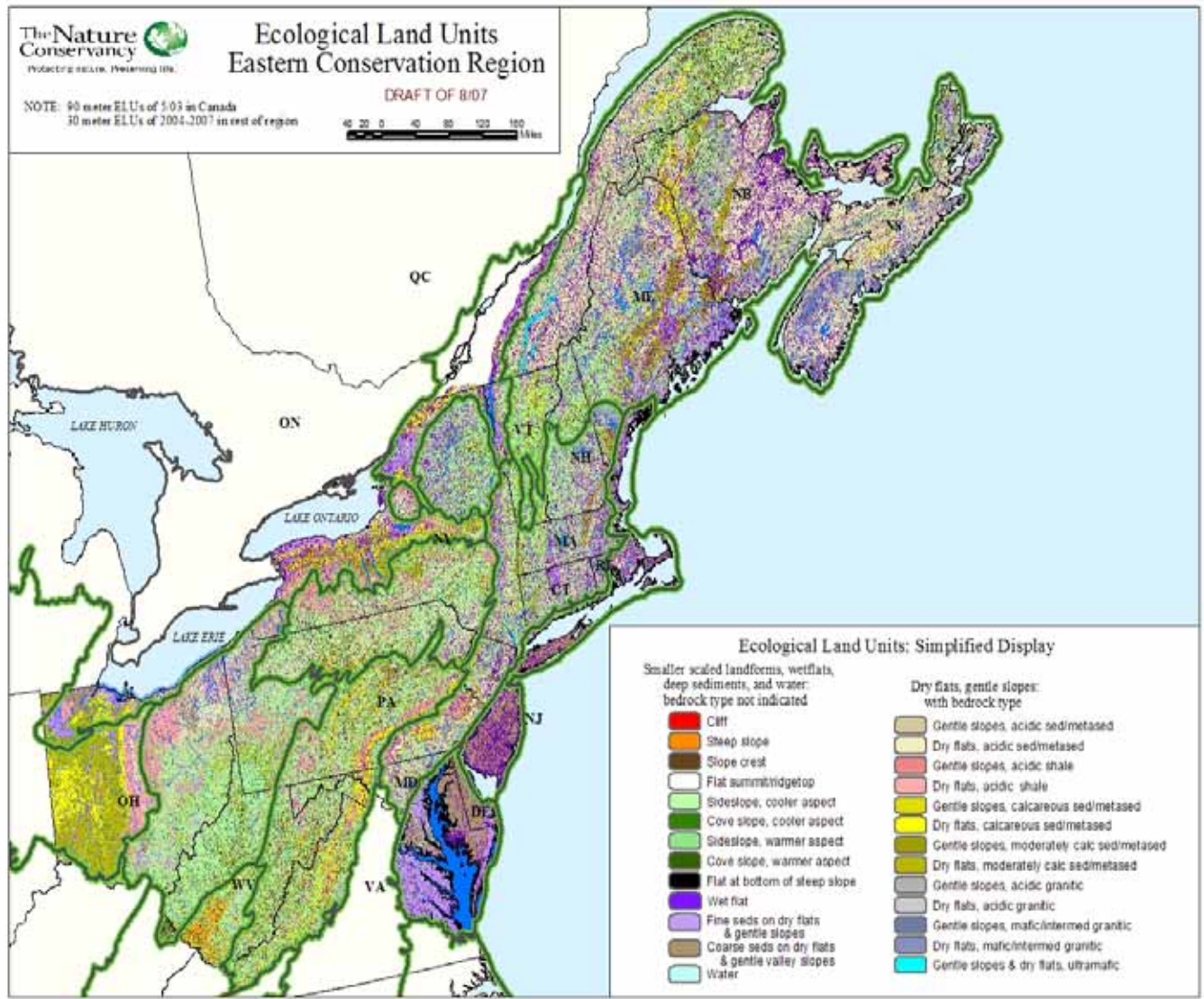


Figure 1 Ecological Land Units of the northeast.

Additional Information on Methods:

We will build on a method developed by The Nature Conservancy (Ferree et al. 2006) that models ecological features of the landscape to develop enhanced ecological land units (ELU). An ELU is a landscape feature depicting combinations of slope, substrate, topographic position, moisture index, elevation, landform, and other variables, that can be used to predict the range and extent of vegetation types. Examples of ELUs include mid-elevation acidic steep slope; low calcareous moist flat; and deep coarse sediments on dry flats. The addition of land cover data further subdivides ELU's into NMTHCS habitat systems that have been derived from the Ecological Systems classification plus additional classes for altered habitats. The method predicts the general location and extent of habitats by modeling underlying abiotic structure (“enduring features”) and current land cover.

The resulting map will identify where and how much of each habitat is predicted to occur in the region. Existing field data will be used to calibrate the draft map to actual conditions, and the map will then be revised.

We will seek the active collaboration of all state wildlife agencies in this project. We will draw from existing wildlife classifications, as well as their experience. We will communicate frequently, using conference calls as well as more informal communications. We will post interim products on the web and request detailed feedback. The current NETHCS project has established a node on the NBII portal on which all interim products as well as communications are posted. We will continue use of the NBII node for this project. We would like to explore the possibility of having a few states test the map quantitatively based on their own data, if they can provide the resources to do so (which can count as match). The final map will reflect a balance between the state needs and consistency across the region.

Other regional mapping projects, i.e GAP and LANDFIRE, will inform and be coordinated with this effort. NatureServe ecologists are providing ecological systems expertise over the entire project area to LANDFIRE's mapping efforts. Preliminary communication suggests a high level of correspondence in our approaches. Our intent is to apply refinements or new methods developed by our partner organizations to improve the map accuracy or usefulness, as we recognize there will be areas that need refinement.

Match:

We will be soliciting funding from the Doris Duke Foundation for complementary work that, if granted, can be used to fulfill the 1:1 non-federal match requirement for USFS funds. That work will address the major need of associating wildlife species or guilds to specific habitat systems or habitat units, thus allowing habitat and conservation needs modeling. We will develop a list of regionally important priority species, conduct habitat range mapping, and use existing information to assess habitat quality, which can then be tied in to conservation needs for the species.

Estimate of Project Costs (USFS funding):

Project Title: Region 9 Habitat Mapping
Funder Name: USFS
Date
Submitted: 10/23/2008

	Total Cost
I. Salary	\$ 53,753.47
Fringe Benefits (48%)	\$ 25,801.67
Subtotal Salaries	\$ 79,555.14
II. Other Direct Costs	
a. Travel	\$ 3,876.00
b. Technology and Data Management	\$ 9,449.37
c. Telecommunications, Postage/Shipping	\$ 1,343.84
d. Printing	\$ 268.77
e. Computer Hardware/Software & Supplies	\$ 537.53
Subtotal Other Direct Costs	\$ 15,475.51
III. Subagreements	
a. Subaward I	\$ 6,400.00
b. Subaward II	\$ 3,200.00
Subtotal Subagreements	\$ 9,600.00
IV. Indirect Cost @ 36.4%	\$ 38,085.56
V. TOTAL COST	\$ 142,716.20

References

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K., Snow, and J. Teague. 2003. Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems. NatureServe, Arlington, Virginia.

Ferree, C., M.G. Anderson, and A. Olivero. 2006 Draft. Supplementary Metadata for Systems Raster Dataset. Unpublished Report to The Nature Conservancy.

The Nature Conservancy (TNC) Conservation Science Support, Survey, US Geological , US Environmental Protection Agency, and USFWS, 2003, Ecological Land Units: CBY Ecoregion.

The Nature Conservancy (TNC) Conservation Science Support, Survey, US Geological , US Environmental Protection Agency, and USFWS, 2006, Ecological Land Units: NAC Ecoregion.