**Additional Detail on Proposed Operational Approach and
Description of Related Projects and Data Layers**

**Detailed Operational Approach:**

**Charge 1.0:**

Convene a **Conservation Design team** to coordinate the outputs of inter-related projects, steer technical meta-analytic processes, and frame key technical questions for a broader decision-making forum.

* 1. Develop among inter-related projects and key partners a common understanding of a modeling and **meta-analysis framework** that will perform at a Northeastern regional scale, perform within reasonable time and funding limitations, adapt to the outputs of diverse ongoing and future projects, and adapt to diverse Conservation Design needs;
	2. Identify **technical decision points** with significant design implications for specific stakeholders (for example, selection of spatial units to stratify relative landscape indices will strongly influence the spatial dispersion of values across the landscape), seek feedback on preferred modes of providing input and developing consensus, and schedule meetings and workshops to reach decisions in their proper context;
	3. Facilitate the **peer review** of technical products.

**Charge 2.0:**

Develop and implement an interim Information Management system to acquire, catalogue, and manage spatial data in support of the project. [Note: the NALCC Information Management needs assessment project and recommendations will develop concurrently with NELCD, but will not likely be implemented prior to project initiation]

* 1. Create **GIS technician** capacity to assist multiple projects and serve as a data sharing liaison among partners;
	2. Initiate data **sharing agreements** as necessary;
	3. Evaluate **storage capacity and networking capabilities** of FWS, UMASS, TNC, & Climate Science Center and select an interim host for data;
	4. Develop minimum quality control and cataloguing **standards,** including metadata standards, data life/time limits, spatial extents**;**
	5. **Manage data** in support of other operational tasks.

**Charge 3.0:**

Convene work groups to identify the ecological and cultural **landscape elements** to be assessed in the Northeast Landscape Conservation Design and conduct a rapid assessment of data available on the condition/integrity/vulnerability of each.

* 1. Amend/synchronize/finalize the lists of **SGCN** proposed in the “Regional focus areas network resilience, and adaptive capacity of NE SGCN” as necessary, and coordinate with project PIs to verify species data sources, project timelines, identify spatial data available for condition/ integrity/vulnerability analyses, confirm regional extent of data, and coordinate data sharing;
	2. Amend/synchronize/finalize the lists of **vulnerable species** to be included from recovery programs, regional vulnerability assessments, PARCAs, Galbraith, Prasad, and coordinate with project PIs to verify species data sources, project timelines, identify spatial data available for condition/integrity/vulnerability, confirm regional extent of data, and coordinate data sharing;
	3. For **Representative Species**, coordinate with project PIs to verify modeling status and project timelines, identify spatial data available for condition/integrity/vulnerability analyses, confirm regional extent of data, and coordinate data sharing;
	4. For **marine, terrestrial, and aquatic** **ecological systems**, coordinate with “Geospatial Condition Analysis” and “Designing Sustainable Landscape” project PIs to verify modeling status, project timelines, identify spatial data available for landscape analyses, confirm regional extent of data, coordinate data sharing and processing needs;
	5. Identify **important geographies or landscapes** that are already recognized as regional priorities for conservation, and engage program coordinators to identify key datasets.

**Charge 4.0:**

Building on the findings of Charge 3.0, comprehensively **compile environmental datasets** relevant to the target ecological and cultural landscape elements, including environmental stressors, climate change, landscape analyses, connectivity, human infrastructure, or any other natural resource or environmental data.

* 1. Convene a workgroup to assist with seeking and compiling environmental datasets;
	2. Draft or acquire metadata.

**Charge 5.0:**

Develop methodology to summarize environmental conditions across the full distribution of each target ecological and cultural landscape element (but limited to the extent of the Northeast region).

* 1. Develop and evaluate **environmental metrics** [= a list of derived variables for each element] to summarize relevant environmental data (e.g., settings variables) in ways that are relevant for each target ecological and cultural element—considering redundancy, interaction, weighting, and equal scaling for all metrics;
	2. Develop and evaluate algorithms to combine scaled metrics, resulting in **environmental** **condition indices** [= a series of derived scores summarizing environmental metrics for each element, and describing the spatial variation of abstract attributes, such as biological importance, ecological integrity, or climate vulnerability
	3. Define **environmental** **condition summary units** for each landscape element—each element will have a discrete set of units constrained to the NE region—consider the spatial dimension of the condition indices: is the spatial pattern of the elements described by a continuous surface, or should the index be applied to discrete patches, buffered points, or lines?

**Charge 6.0:**

Develop a **landscape conservation meta-analysis** to combine and refine environmental condition indices, allowing flexible parameters for non-technical decision-makers to set threshold levels and make prioritizing decisions.

* 1. Evaluate alternative descriptors (percent area, density, etc.) of the condition indexed distribution of each element, to be used later in **setting threshold levels** for the conservation of each element;
	2. Evaluate algorithms and spatial statistics to combine environmental condition indices across elements (possibly a subset for each element, depending on threshold levels) to yield several **landscape conservation indices** covering the extent of the NE region;
	3. Define **landscape** **conservation design units**—recognizing that conservation indices may yield a continuous surface covering the entire region, consider what “wall-to-wall” units would be useful to summarize the indices for conservation practitioners. For example, the summarized indices might identify important watersheds, towns, parcels, or even the cells of a grid at coarser scale than the index itself.
	4. Evaluate alternative **stratification variables** to define nested or **hierarchical spatial scaling** for element condition and landscape conservation indices—the result will assist in prioritization by allowing decision-makers to identify the highest scoring locations for any unit or level of the stratifying hierarchy. For example, stratifying by state would allow each state to identify the highest scoring locations as an even percentage of each state, whereas stratifying by ecoregion would yield an uneven distribution of scores across states.

**Charge 7.0**

Work with northeast states to synthesize regional information for use in State Wildlife Action Plan updates.

**Charge 8.0:**

Develop **Conservation Design structured decision-making (SDM) workshop** to demonstrate alternative parameter levels for meta-analysis and engage decision-makers to set threshold levels and make prioritizing decisions.

* 1. Develop demonstration materials and workshop content to assist decision-makers in selecting meta-analysis parameters, defining threshold levels, conservation design units, stratification variables, and making other prioritizing decisions leading to a **Landscape Conservation Design**;
	2. Contract a workshop facilitator to assist with workshop coordinator;
	3. Organize workshop logistics and convene workshop.

**Charge 9.0:**

**Implement NE Landscape Conservation Design analysis** parameters, threshold levels, conservation design units, stratification variables, and prioritization schemes indicated by Conservation Design SDM workshop, resulting in a data layers and maps.

* 1. Assemble the environmental condition datafor each element, summarized on relevant environmental condition summary units, and attributed with variables to define threshold levels;
	2. Assemble the landscape conservation design datafor the region, summarized on relevant landscape conservation design units, and attributed with variables to define appropriate spatial scaling;
	3. Assemble NE Landscape Conservation Design summary maps depicting the data and final design parameters as a system or network of lands.
	4. Draft technical manual;
	5. Disseminate materials.

**Charge 10.0:**

Building upon NE Landscape Conservation Design datasets**, translate data to provide tools** that reflect the specific values, scales, media, and decisions required by conservation practitioners, and develop a strategy to facilitate adoption of those tools**.**

**RELATED PROJECTS**

**Species Projects:**

* + - * Regional Focus Areas for SGCN, Network Resilience and Connectivity (Anderson et al., RCN 2008-3)
			* Representative Species modeling (Schwenk et al., NALCC)
			* Identification of Tidal Marsh Bird Focal Areas BCR 30 (Shriver et al., RCN 2010-3)
			* Rangewide New England Cottontail Initiative (Fuller et al., Comp. SWG 2009 and 2011)
			* Assessing Priority Amphibian and Reptile Conservation Areas (PARCAs) and Vulnerability to Climate Change in the North Atlantic Landscape Conservation Cooperative (NALCC 2011)
			* Mapping the Distribution, Abundance and Risk Assessment of Marine Birds in the Northwest Atlantic: Phase 1 (Jones et al., NALCC 2011)

**Terrestrial Mapping Projects:**

* + Northeast Terrestrial Habitat Classification System *(Doris Duke, PI: Sue Gawler and Leslie Sneddon, NatureServe)*
		- * Creation of Regional Habitat Cover Maps: Application of the NETHCS (*RCN 2007-1, PI: Mark Anderson, TNC)*
			* Iverson, Louis R.; Prasad, Anantha M.; Matthews, Stephen N.; Peters, Matthew. 2008. Estimating potential habitat for 134 eastern US tree species under six climate scenarios. Forest Ecology and Management. 254: 390-406.

**Aquatic Mapping Projects:**

* + Northeast Aquatic Habitat Classification System *(Doris Duke, PI: Arlene Olivero Sheldon, TNC)*

**Coastal and Marine Mapping Projects:**

* + Develop Regional Coastal and Marine Base Maps for Analyses of
	NE SGCN Data *(RCN 2011 RFP)*
	+ Coastal and Marine Spatial Planning *(NOAA, regional ocean partnerships)*
	+ Coastal Change Analysis Program (C-CAP) Land Cover Atlas *(NOAA Coastal Services Center)*

**Landscape Analysis Projects:**

* + - * Geospatial Condition Analysis (RCN 2009-5)
			* Secured Lands of the NE 2007 *(Doris Duke, PI: Melissa Clark and Mark Anderson, TNC)*
			* Designing Sustainable Landscapes *(NA LCC, PI: Kevin McGarigal, UMASS)*
			* Northern Appalachian Connectivity (Comp. SWG)
			* Permeable Landscapes for Species of Greatest Conservation Need (Anderson et al., NALCC 2011)
			* Completing the Northeast Regional Vulnerability Assessment incorporating the NatureServe Climate Change Vulnerability Index (Galbraith et al., NALCC 2011)
			* Rodenhouse, N.L., S.N. Matthews, K.P. McFarland, J.D. Lambert, L.R. Iverson, A.M. Prasad, T.S. Sillett, and R.T. Homes. 2008. Potential effects of climate change on birds of the Northeast. Mitigation and Adaptation Strategies for Global Change.

**TNC Datasets for the Northeast Region**

Anderson, M.G. and A. Olivero Sheldon. 2011. Conservation Status of Fish,

Wildlife, and Natural Habitats in the Northeast Landscape: Implementation

of the Northeast Monitoring Framework. The Nature Conservancy, Eastern

Conservation Science. 289 pp.

**Boundaries**

**1. States: Tele Atlas North America, Inc., 2009. U.S. States. 1:100,000 Tele Atlas Dynamap**

**Census Boundaries v. 11.0. ESRI® Data & Maps 2009 Data Update. Redlands, California,**

**USA.** U.S. State Boundaries represents the boundary lines of the states of the United States

**2. Counties: Tele Atlas North America, Inc., 2009. U.S. Counties. 1:100,000 Tele Atlas**

**StreetMap Premium v. 7.2 ESRI® Data & Maps: StreetMap. 2009 Data Update: North**

**America. Redlands, California, USA.** U.S. Counties represents the boundary lines of the

counties within the United States. Boundaries are consistent with state, tract, and block group

data sets.

**3. Watersheds, HUC8: USDA/NRCS - National Cartography & Geospatial Center. 1994.**

**(Data Access from NRCS 3/31/2009) 8-Digit HUC Hydrologic Units 1:250,000. Fort Worth,**

**TXOnline http://datagateway.nrcs.usda.gov/**

**Watersheds, HUC12: USDA/NRCS, National Cartography & Geospatial Center. 1999-2009**

**(Data Access from NRCS Data 3/31/2009) 12-Digit Watershed Boundary Data 1:24,000.**

**Fort Worth, TX. http://datagateway.nrcs.usda.gov/**

Hydrologic Unit Codes (HUC) data describe watersheds as polygons. Hydrologic units are

subdivisions of watersheds nested from largest to smallest areas and are used to organize

hydrologic data. HUC basins decrease in size with an increase in levels. For example, HUC6

watersheds are major river basins, while HUC12 watersheds are for 2nd and 3rd order streams.

The HUC codes are constructed as follows: the first two digits identify the region (HUC2), the

first four digits identify subregions (HUC4), the first six digits identify accounting units (HUC6),

the first eight digits identify cataloging units (HUC8), the first ten digits identify watershed units

(HUC10), and the full twelve digits identify subwatershed units (HUC12).

**Conservation Land**

**1. Secured Lands: The Nature Conservancy. 2009. Eastern U.S. Secured Lands. Various scales.**

**Compiled from multiple sources.**

https://lfa.tnc.org/t/Eastern\_Division\_Secured\_Lands\_2009\_External

. A spatial dataset of public

and private lands and waters secured by a conservation situation that includes an explicit level of

security from future conversion and current incompatible uses. For more information on sources,

please see the detailed secured lands source metadata in the secured lands chapter.

lease see the detailed secured lanGeodatabase, TNC Maine March 2010.

 TNC New Hampshire Conservation Lands, GRANIT, April 2010. US Forest Service

Management Areas, US Forest Service, 2009.

anagement Areas, US Forest Service, 2009. NIT, April 2010. US Forest Service ter. o

2010. Vermont Land Trust Conservation Land Database, 2010. The Nature

Conservancy of Vermont, 2010.

onservancy of Vermont, 2010. ervOpenspace Database, MassGIS, February 2010.

 February 2010.y 2010.ruary 2010.ary 2010. Database, 2010. The NatureService ter

Management, April 2010. State Conservation and Parks Layer, , RI State Department of

Environmental Management, April 2010.

nvironmental Management, April 2010. ation and Parks Layer, , RI State Department of

Protected Open Space Phase 2, CT Department of Environmental Protection, 2010. TNC

Connecticut, 2008. Municipal and Private Open Space, Connecticut Office of Policy and

Management 1997. DEP Property, Connecticut Department of Environmental Protection,

2010.

010.: NYS Parks and Historic Sites Boundaries, NY OPRHP, 2008, NYSDEC Division

of Lands & Forests, 2008. NYC DEP Property - Division of Lands & Forests, GIS 2008.

NYC DEP, 2008, NYC DEP propert . Open Space Institute. Albany County Land

Conservancy. Agricultural Stewardship Association. Finger Lakes Land Trust. Lake

George Land Conservancy. Hudson Highlands Land Trust. Rondout Esopus Land

Conservancy. Wallkill Valley Land Trust, Inc. Shawangunk Conservancy. Genesee Land

Trust. Scenic Hudson, Inc. Tug Hill Tomorrow Land Trust. Mohonk Preserve. Saratoga

PLAN.

LAN. rve. Saratogaratoga. Tug Hill Tomorrow Land Trust. Mohonk Preserve. Saratog

Conservation Fund, 2004. Pennsylvania State Game Lands, PA Game Commission, July

2009. PA State Forests and State Parks, PA Bureau of Forestry, July 2009. Boundaries of

State Parks in PA, Pennsylvania Department of Conservation and Natural Resources,

2008. County Parcel Data: Chester County (2001), Clinton County (2003), Elk County

(2005), Juniata County (2007), Lancaster County (2001), Monroe County (2009),

Northampton County (2007), Pike County (2005), Venango County (2004), Wayne

County (2003). Lands owned by Western Pennsylvania Conservancy, Western

Pennsylvania Conservancy, October 2009. Northeast Pennsylvania Protected Lands,

Natural Lands Trust, July 2009. Lands owned by Fish and Boat Commission,

Pennsylvania Fish and Boat Commission, July 2009.

ennsylvania Fish and Boat Commission, July 2009. sh and Boat Commission, Lands,

Acres Tracts, New Jersey Department of Environmental Protection, January 2010. Power

Company TNC Land, PSEG, May 2007. Farmland Preservation File, New Jersey

Department of Agriculture (NJDA) and State Agriculture Development Committee

(SADC), July 2007.

SADC), July 2007. lture (NJDA) and State Agriculture Development Committee0. Pow

Preserves, DNREC Division of Parks and Recreation, 2008. Outdoor Recreation

Inventory, DNREC Division of Parks and Recreation, 2008. Forest Easements, Delaware

Forest Service, 2010. State Agriculture Easements, Delaware Department of Agriculture,

2010.

010. Agriculture Land Preservation Foundation Easements/Districts, Maryland

Department of Agriculture, October 2006. County Parks, MD DNR, October 2007. MD

DNR Lands, MD DNR, October 2009. Environmental Trust Easements, Maryland

Environmental Trust, November 2009. Maryland Federal Lands, MD DNR, 2006. Forest

Legacy Easements, MD DNR, October 2009. Private Conservation Properties, MD DNR,

February 2009. Rural Legacy Properties, MD DRN, October 2009.

ebruary 2009. Rural Legacy Properties, MD DRN, October 200artment of Natural

Resource, October 2010. West Virginia Public Lands, West Virginia Department of

Natural Resources, October 2010. The Nature Conservancy West Virginia Field Office

Layer, TNC West Virginia, 2010.

ayer, TNC West Virginia, 2010. The Nat Virginia Department of Conservation and

Recreation, March 2010.

**Roads and Railroads**

**1. Roads: Tele Atlas North America, Inc., 2009. U.S. and Canada Streets Cartographic.**

**1:100,000 Tele Atlas StreetMap Premium v. 7.2 ESRI® Data & Maps: StreetMap. 2009**

**Data Update: North America. Redlands, California, USA.** U.S. and Canada Streets

Cartographic represents streets, highways, interstate highways, roads with and without limited

access, secondary and connecting roads, local and rural roads, roads with special characteristics,

access ramps, and ferries within the United States and Canada.

**2. Railroads: Tele Atlas North America, Inc. 2009. U.S. and Canada Railroads. 1:100,000.**

**ESRI® Data & Maps: StreetMap. 2009 Data Update: North America. Redlands,**

**California, USA.** U.S. and Canada Railroads represent the railroads of the United States and

Canada.

**Land Cover and Related Derivates**

**1. Land Cover: U.S. Geological Survey (USGS). National Land Cover Dataset 2001. Version**

**1. U.S. 30m cell. Sioux Falls, SD. http://www.epa.gov/mrlc/nlcd-2001.html**

 **Homer, C., C.**

**Huang, L. Yang, B. Wylie and M. Coan, 2004. Development of a 2001 national land cover**

**database for the United States. Photogrammetric Engineering and Remote Sensing.** The

National Land Cover Database 2001 land cover dataset was produced through a cooperative

project conducted by the Multi-Resolution Land Characteristics (MRLC) Consortium, a

partnership of federal agencies (www.mrlc.gov). The goal was to generate a current, consistent,

seamless, and accurate National Land Cover Database (NLCD) circa 2001 for the United States at

medium spatial resolution. The resultant product for the northeast distinguishes 15 land cover

classes: Open Water, Developed Open Space, Developed Low Intensity, Developed Medium

Intensity, Developed High Intensity, Barren Land (Rock/Sand/Clay), Deciduous Forest,

Evergreen Forest, Mixed Forest, Shrub/Scrub, Grassland/Herbaceous, Pasture/Hay, Cultivated

Crops, Woody Wetlands, and Emergent Herbaceous Wetlands.

2. **Imperviousness: U.S. Geological Survey (USGS). National Land Cover Dataset 2001**

**Imperviousness. Version 1. 30m cell. Sioux Falls, SD. http://www.epa.gov/mrlc/nlcd2001.html**

**Yang, L, C. Huang, C. Homer, B. Wylie, and M. Coan, 2002. An approach for mapping large-area impervious surfaces: Synergistic use of Landsat 7 ETM+ and high spatial resolution imagery. Canadian Journal of Remote Sensing, 29: 2, 230-240.** TheNationalLand Cover Database 2001 land cover datasetwas produced through a cooperativeprojectconducted bythe Multi-ResolutionLand Characteristics (MRLC) Consortium,apartnershipoffederal agencies([www.mrlc.gov](http://www.mrlc.gov)).Theimpervioussurface data classifieseach30mpixel into 101possiblevalues (0%-100%).

3. **Canopy Cover: U.S. Geological Survey (USGS). National Land Cover Dataset 2001 Canopy**

**Cover. Version 1. 30m cell. Sioux Falls, SD. http://www.epa.gov/mrlc/nlcd-2001.html**

**Huang, C., L. Yang, B. Wylie, and C. Homer, 2001. A strategy for estimating tree canopy**

**density using Landsat 7 ETM+ and high resolution images over large areas. In: Third**

**International Conference on Geospatial Information in Agriculture and Forestry;**

**November 5-7, 2001; Denver, Colorado. CD-ROM, 1 disk.** The National Land Cover

Database 2001 land cover dataset was produced through a cooperative project conducted by the

Multi-Resolution Land Characteristics (MRLC) Consortium, a partnership of federal agencies

(www.mrlc.gov). The canopy density database classifies each 30m pixel into 101 possible values

(0% - 100%). The canopy density estimates apply only to the forest cover.

4. **Land Cover Change: U.S. Geological Survey (USGS). National Land Cover Database**

**(NLCD) 1992–2001 Land Cover Change Retrofit Product. 30m cell. Sioux Falls, SD.**

[**http://www.mrlc.gov/multizone.php**](http://www.mrlc.gov/multizone.php)

**Fry, J.A., Coan, M.J., Homer, C.G., Meyer, D.K., and Wickham, J.D., 2009, Completion of the National Land Cover Database (NLCD) 1992 -2001 Land Cover Change Retrofit product: U.S. Geological Survey Open-File Report 2008: 1379, 18 p.** New developments in mapping methodology, new sources of input data, and changes in themapping legend for the 2001 National Land Cover Database (NLCD 2001) will confound anydirect comparison between NLCD 2001 and the 1992 National Land Cover Dataset (NLCD 1992).Users are cautioned that direct comparison of these two independently created land cover products is not recommended. This NLCD 1992/2001 Retrofit Land Cover Change Product was developed to offer users more accurate direct change analysis between the two products. The

NLCD 1992/2001 Retrofit Land Cover Change Product uses a specially developed methodology

to provide land cover change information at the Anderson Level I classification scale relying on

decision tree classification of Landsat imagery from 1992 and 2001. Unchanged pixels between

the two dates are coded with the NLCD 2001 Anderson Level I class code, while changed pixels

are labeled with a "from-to" land cover change value. This product is designed for regional

application only and is not recommended for local scales.

5. **Local Connectivity: Brad Compton. 2010. Resistant Kernal. 90m cell. University of**

**Massachusetts. 2010.** The connectivity metric is derived from a resistant kernel analysis. A

resistance value is assigned to each cover type in a land-cover map. For land cover we used

classified data from the NLCD2001. The NLCD was supplemented with road information from

ESRI. The resistant kernel provides a measure of how connected each grid cell is versus an

“ideal” kernel with no resistance (ie completely natural). We used a 3km radius for the distance

of the kernel to define local connectivity. Please see the methods section for more information on

development of this dataset.

6. **Forest Types: U.S. Geological Survey. 2006. LANDFIRE 1.1.0: Existing Vegetation Type**

**layer. 30m. http://landfire.cr.usgs.gov/viewer/**

 The LANDFIRE existing vegetation layers represents the current distribution of the terrestrial ecological systems classification developed by NatureServe for the western Hemisphere. A terrestrial ecological system is defined as a group of plant community types (associations) that tend to co-occur within landscapes with similar ecological processes, substrates, and/or environmental gradients. Existing vegetation is mapped using predictive landscape models based on extensive field reference data, satellite imagery, biophysical gradient layers, and classification and regression trees.

**Rivers and Streams**

1. **Streams and Lakes: U.S. Geological Survey (USGS) and Environmental Protection Agency**

**(USEPA). 2006. National Hydrography Dataset Plus (NHD-Plus). 100,000.**

**http://www.horizonsystems.com/nhdplus/**

 The NHDPlus consists of nine components: a

greatly improved line and polygon 1:100K National Hydrography Dataset (NHD), a set of value

added attributes to enhance stream network navigation, an elevation-based catchment polygon for

each flowline in the stream network, catchment characteristics, headwater node areas, cumulative

drainage area characteristics, a flow direction grid, a flow accumulation grid, a elevation grid,

flowline min/max elevations and slopes, and flow volume & velocity estimates for each flowline

in the stream network.

2. **Stream Classification Types: Olivero and Anderson. 2008. Northeast Aquatic Habitat**

**Classification System. The Nature Conservancy. Boston, MA.** http://rcngrants.org/node/38

This project developed a standard Northeastern Aquatic Habitat Classification (NAHCS) and GIS

map for 13 northeastern states (ME, NH, VT, MA, RI, CT, NY, PA, NJ, DE, MD, VA, WV, and

DC.) that are part of the Northeast Association of Fish and Wildlife Agencies (NEAFWA). This

classification and a GIS dataset linked to the NHD-Plus 1:100,000 hydrography was designed to

consistently represent the natural aquatic habitat types across this region in a manner deemed

appropriate and useful for conservation planning by the participating states. This product was not

intended to override state classifications, but is meant to unify state classifications and allow for

looking at aquatic biodiversity patterns across the region. The NAHCS habitat classification is

based on a biophysical aquatic classification approach (Higgins et al. 2005) and uses four primary

classification attributes to define habitat types. These variables include size, gradient, geology,

and temperature. Ecologically meaningful class breaks within each of the four variables were

developed and the resultant variables and classes combined to yield a regional taxonomy with 259

stream types. The full types can be simplified using recommended prioritization and collapsing

rules.

3. **Brook Trout Distribution: Thieling, T.M. 2006. Assessment and predictive model for brook**

**trout (*Salvelinus fontinalis*) population status in the eastern United States. Masters Thesis.**

**James Madison University http://128.118.47.58/EBTJV/Thieling\_Thesis.pdf**

Over the last 200 years, brook trout (*Salvelinus fontinalis*) have been subjected to numerous anthropogenic physical, chemical, and biological perturbations that threaten the long term viability of brook trout throughout their historic native range. The study area included the historic native range of

brook trout in the eastern United States, covering 17 states stretching from Maine to northern

Georgia. The author developed numerous predictive models using known brook trout

subwatershed population status (Extirpated/Reduced/Intact) and subwatershed metrics derived

from GIS data. The purpose of the models was to predict subwatershed status for the

subwatersheds where the status was either unknown or only qualitative data were available. Six

core subwatershed and subwatershed water corridor metrics (percentage of forested land,

combined sulfate and nitrate deposition, percentage of mixed forest in the water corridor,

percentage of agriculture, road density, and latitude) were useful as predictors of brook trout

distribution and status. The most successful model, model 3, was used for NEAFWA reporting

brook trout distributions.

4. **Active River Area: Sheldon, A. O. 2009. Active River Area. 30m. The Nature Conservancy**

**Eastern Conservation Science. Boston, MA.** The Active River Area conservation framework

provides a conceptual and spatially explicit basis for the assessment, protection, management, and

restoration of freshwater floodplain and riparian ecosystems. GIS techniques allow the floodplain

and riparian active river area components to be identified over a range of spatial scales. At the

regional scale, as of 8/10/2009, the floodplain and riparian component of the Active River Area

has been mapped using a 30m DEM and 1:100,000 hydrography. The Riparian Active River

Area model delineates an ARA Riparian Base Zone using cost distance modeling and a moisture

index (wet flat) analysis. We expect the meander belts, riparian wetlands, ~100 year floodplains,

and lower terraces to be primarily within the ARA Riparian Base Zone, however these features

could not be separately distinguished within the regional scale model.

 **Dams. The Nature Conservancy. 2011. Northeast Regional Dam Dataset Version 3/1/2011.**

**The Nature Conservancy Eastern Conservation Science Office. Boston, MA.** This dataset

represents the result of a project to compile a dataset of dam barriers in the northeast states (ME,

NH, VT, MA, CT, RI, NY, PA, NJ, DE, MD, VA, WV, DC) and spatially link the dams to the

correct stream flowline in the USGS National Hydrography Plus (NHD-Plus) 1:100,000 stream

dataset. A standardized, repeatable, feasible, and most accurate dam snapping method was

developed and implemented to create this dataset. Primary steps included 1) snapping each state's

dams to the 1:100,000 NHD flowlines, using a 100m snapping tolerance, 2) coding the dams for

prioritization for manual review, 3) manual error checking of the prioritized dams, 4) returning

the data to the states for expert review, and 5) re-incorporated the state edits into the final snapped

dataset. Detailed data sources include

ataset. Detailed data sources include and 5) re-Publication date 1996. Retrieved April

2009.

009. t. Detailed data sources

009. t. Detailed data sources include and 5) re-Pu

009. t. Detailed data sources include and 5) re-Publication date 1996

009. t. Detailed data sources include and 5rgency Management Agency (MEMA),

Maine Department of Environmental Protection (MEDEP)(comp., ed.), Maine Office of

Geographic Information Systems (comp., ed.). Publication date 2006

eographic Information Systems (comp., ed.). Public

eographic Informaau of Dam Safety and Flood Control Publication Date: 2001

eographic Informaau of Dam Safety and Flood Control Publication Date: 2001ice ofe

Center Retrieved 4/15/2009

enter Retrieved 4/15/2009m Safety and Flood Control Publication Date: 2001ice ofeved Ap

and Boat Commission Retrieved 7/20/2009

nd Boat Commission Retrieved 7/20/2009Flood Control P

nd Boat Commission Retrieved 7/20/2009Flood Con

nd Boat Commission Retrieved 7/20/2009Flood Control Publication Date: 2001ice ofeve

4/2009 & 11/2009

/2009 & DNR: Wildlife Diversity and Technical Support Units 9/2009; WV Non-coal dams

6/2002, DMR Dams 6/2009, NID dams 10/2000: WV State GIS Data Clearinghouse:

http://wvgis.wvu.edu/data/data.php

ttp://wvgis.wvu.edu/data/data.php 0/2000: WV State GIS Data Cl

 USGS Geographic Names Information System (GNIS) 1/2009

 **Waterfall: U.S. Geological Survey. 2009. Geographic Names Information System (GNIS)**

**1.2009. http://nhd.usgs.gov/gnis.html** Waterfall features were extracted from the Geographic

Names Information System (GNIS) system. The GNIS was developed by the U.S. Geological

Survey in cooperation with the U.S. Board on Geographic Names, and contains information about

physical and cultural geographic features in the United States and associated areas, both current

and historical. The database holds the Federally recognized name of each feature and defines the

location of the feature by state, county, USGS topographic map, and geographic coordinates.

**Flow:** **Carlisle, D.M. 2010. Linkages of Streamflow Alteration to Fish and**

**Macroinvertebrate Communities: Alteration of streamflow magnitudes and potential ecological consequences: a multiregional assessment. Front Ecol Environ 2010;**

doi:10.1890/100053 http://www.esajournals.org/doi/abs/10.1890/100053?journalCode=fron

Human impacts on watershed hydrology are widespread in the US, but the prevalence and

severity of stream-flow alteration and its potential ecological consequences have not been

quantified on a national scale. We assessed streamflow alteration at 2888 streamflow monitoring

sites throughout the conterminous US. The magnitudes of mean annual (1980–2007) minimum

and maximum streamflows were found to have been altered in 86% of assessed streams. The

occurrence, type, and severity of streamflow alteration differed markedly between arid and wet

climates. Biological assessments conducted on a subset of these streams showed that, relative to

eight chemical and physical covariates, diminished flow magnitudes were the primary predictors

of biological integrity for fish and macroinvertebrate communities.

7. **National Lake Assessment: U.S. Environmental Protection Agency (USEPA). 2009. National**

**Lakes Assessment: A Collaborative Survey of the Nation’s Lakes. EPA 841-R-09-001. U.S.**

**Environmental Protection Agency, Office of Water and Office of Research and**

**Development, Washington, D.C.** http://water.epa.gov/type/lakes/lakessurvey\_index.cfm

EPA and its state and tribal partners have conducted a survey of the nation's lakes, ponds and

reservoirs. This National Lakes Assessment is designed to provide statistically valid regional and

national estimates of the condition of lakes. It uses a probability-based sampling design to

represent the condition of all lakes in similar regions sharing similar ecological characteristics.

Consistent sampling and analytical procedures ensure that the results can be compared across the

country.

**8. Wadeable Stream Assessment: U.S. Environmental Protection Agency (USEPA). 2006.**

**Wadeable Streams Assessment: A Collaborative Survey of the Nation's Streams. EPA 841B-06-002**

**U.S. Environmental Protection Agency, Office of Water and Office of Research and Development, Washington, D.C.** http://water.epa.gov/type/rsl/monitoring/streamsurvey/index.cfm

The Wadeable Streams Assessment (WSA) is a first-ever statistically-valid survey of the biological condition of small streams throughout the U.S. EPA worked with the states to conduct the assessment in 2004-2005. 1,392 sites were selectedat random to represent the condition of all streams in regions that share similar ecological characteristics. Wadeable streams were chosen for study because they are a critical natural resource and because we have a well-established set of methods for monitoring them. Participants used the same standardized methods at all sites, to ensure results that are comparable across the nation.