Representative Physical Landscapes (L4)

Description

Physical landscapes (often referred to as enduring features) are the parts of the landscape that resist change. They are the hills and valleys, the underlying bedrock, and the deposits left behind by glaciers. They remain largely unchanged when changes in land cover and wildlife occur, as plants and animals move, and even as the climate changes. However, these physical landscapes cannot continue to drive ecological processes or support plants, animals, or natural communities if they are developed or otherwise altered by human activities.

If nature is likened to a dramatic play, it's possible to think of the enduring features as the stage and the individual species as the actors. The play is the natural communities and habitats that occur in a given place at a given time, but regardless of the action, the stage does not change. These sorts of physical characteristics are often used as a surrogate for understanding biological diversity and predicting habitat conditions and species presence and there is recent research corroborating the long-held notion (see Vermont Biodiversity Project) that diverse landscapes support diverse natural communities and species (Anderson & Ferree, 2010).

In the context of BioFinder, physical landscapes were represented by Land Type Associations (LTA), a modeled product developed with statewide coverage for Green Mountain National Forest by The Nature Conservancy and Vermont Land Trust (Ferree & Thompson 2008). "Land type associations are landscape scale map units defined by multiple biotic and abiotic factors, including a dominant geomorphic process type, similar landforms, surficial and near-surface geologic formations, and associations of soil families and potential natural vegetation at the series level" (Forman and Godron 1986, Bailey and Avers 1993, Cleland et al. 1997).

Of Vermont's more common Land Type Associations (i.e. the LTAs not included in rare physical landscapes), certain examples (LTA sub-blocks) were selected for inclusion in this component called representative physical landscapes. These representative areas were selected based on their condition using Land Cover Index and patch size to determine which were in the best condition.

The concept of representativeness is difficult to understand but is an effective tool in conservation planning for ensuring that all parts of Vermont's landscape appear in the assessment. Common species and natural communities in Vermont are every bit as important as the rare species we often focus on, but without datasets like this, it can be difficult to put them on the same map along with smaller scale features such as very rare and rare species.

Ecological Importance

Enduring features are important for understanding biological diversity and informing conservation planning because they can serve as a surrogate, or substitute, for information on natural communities and species when that information is not available. Conserving and providing stewardship for the diversity of enduring features will in turn help protect the diversity of natural communities and species.

Some enduring features are helpful in locating specific natural communities and species. For example, the Valley Clayplain Forest is a natural community that is associated with the Valley Floor Glacial Lake/Marine Plains LTA and is found exclusively on clay soils. Two of its component plant species, bur oak and barren strawberry, are also most common on those soils. Therefore, it is possible to examine information on surficial geology to determine where clay deposits exist and, with that information, predict the potential location of a Valley Clayplain Forest and its component species. Conservation scientists and practitioners have used specific physical landscape features successfully to locate places to search for particular natural communities or rare species.

In the face of global climate change, it is clear that plant and animal species will continue to move around on the landscape to adjust their ranges to more climatically suitable conditions. Areas of diversity in the physical landscape are likely to continue as the stage for diversity in the biological landscape even as species composition changes.

Representative Physical Landscape Conservation Goal

Conserve examples of all of Vermont's physical landscapes in settings that support natural communities under the influence of natural ecological processes. This conservation should include examples of the more common physical landscapes (representative physical landscape) at the scale at which they naturally occur and conserved examples should be part of a network of ecologically connected lands, waters, and riparian areas.

Component Mapping Goal

To identify a subset of the common physical landscapes that is representative of the full diversity of landscapes, and that also has broad geographic representation.

Source Data and Selection Criteria

Land Type Association. Ferree & Thompson 2008.

Description

Land Type Associations are a modeled product for use as analysis units to organize broad areas by suitability, identify restoration priorities, and serves as a coarse filter for protecting biodiversity. LTAs are landscape scale map units defined by multiple biotic and abiotic factors.

Selection Criteria

LTA sub-blocks were created from the LTA dataset in order to have smaller scale units for BioFinder analysis. A Land Cover Index (LCI) metric was used to select sub-block examples that were most intact compared with others. To the extent possible, sub-blocks were selected based on contiguity to other selected sub-blocks. Table X below the percentage of each LTA type selected.

Table 1. Percentage of Representative Land Type Associations Selected

Land Type Association	% of Total LTA in Component
Dissected low to mid-elev calc/metamorphic hills	36.84%
Hills/footslopes; Bedrock hills (Champlain Valley)	33.81%
Low rolling upland	48.08%
Mountain Slopes	44.29%
Rolling low to mid-elev calc/metamorphic hills	31.54%
Temperate oaky hills of southeastern Vermont	34.82%
Valley bottom; Floodplain-riparian (Champlain Valley)	72.13%

Component Strengths

LTAs selected as best examples of common LTA types were filtered for naturalness of cover and acreage. The use of the Land Cover Index (LCI) metric allowed us to select examples that were most intact compared with others. This was an advantage of other conservation planning datasets available that ignore current land use. Land Cover Index (Anderson et al., 2006) is a simple metric to quantify the degree of human conversion of natural land cover within and in the immediate neighborhood of each of a set of polygons or cell-based (raster) occurrences.

Component Limitations

There are multiple "solutions to the problem", or ways to choose one set of LTAs over another to represent the diversity of common physical landscapes of which examples to use (i.e. spatial areas used to represent these common species or natural communities). We used the best available data to compare the condition of these LTA sub-blocks for inclusion in this representative selection but LCI and acreage as metrics do not necessarily determine that one block is "better" than another. When choices had to be made, this was done based on expert opinion rather than a rigorous methodology. Also, Land Type Associations are only one way of classifying physical landscape characteristics and it is not known at this time which physical landscape characteristics are most likely to be relevant to conservation of biological diversity as climate changes.

Component Weight and Justification

Representative Physical Landscape was weighted a 4 on a scale of 1-10 (with 10 as highest contribution to biological diversity). This relatively lower score is based upon the inherently subjective nature of selecting best representative LTA sub-blocks when there are multiple solutions possible.

Summary Statistics for Representative Physical Landscapes

Table 2. BioFinder component datasets, component weights, and the distribution (%) of components across tiers

Data #	Weight	Component	Tier 1 Greatest	Tier 2 Very High	Tier 3 High	Tier 4 Moderate	Tier 5 Low
Landscapes							
L1	7	Habitat Blocks	12.7%	18.1%	30.1%	39.1%	0.0%
L2	3	Grasslands & Shrublands	4.3%	20.8%	22.7%	10.9%	41.3%
L3	9	Rare Physical Landscape	15.7%	53.9%	11.0%	19.4%	0.0%
L4	**4**	**Representative Physical Landscape**	**17.2%**	**19.1%**	**43.4%**	**13.7%**	**6.6%**
L5	7	Connecting Lands (<2000ac)	10.1%	23.4%	19.1%	47.4%	0.0%
L6	4	Connecting Blocks	9.2%	12.2%	24.0%	51.8%	2.7%
L7	3	Anchor Blocks	12.1%	19.7%	35.3%	32.7%	0.1%
L8	8	Riparian Connectivity	36.4%	52.9%	10.8%	0.0%	0.0%
L9	4	Wildlife Road Crossings	12.8%	28.1%	20.9%	26.8%	11.4%
Aquatics							
A1	6	Surface Waters & Riparian Areas	31.1%	48.6%	12.9%	7.4%	0.0%
A2	4	Representative Lakes	10.3%	84.5%	5.3%	0.0%	0.0%
A3	8	Important Aquatic Habitats & Species Assemblages	19.9%	75.2%	4.9%	0.0%	0.0%
Species & Natural Communities							
SN1	Tier 1	Rare Species	100.0%	0.0%	0.0%	0.0%	0.0%
SN2	6	Uncommon Species	62.1%	21.7%	10.0%	6.1%	0.0%
SN3	Tier 1	Rare Natural Communities	100.0%	0.0%	0.0%	0.0%	0.0%
SN4	6	Uncommon Natural Communities	57.4%	31.0%	11.4%	0.2%	0.0%
SN5	3	Common Natural Communities	9.8%	52.9%	37.1%	0.2%	0.0%
SN6	7	Vernal Pools (Confirmed)	20.5%	57.0%	8.3%	14.1%	0.0%
SN7	5	Vernal Pools (Potential)	6.0%	30.1%	52.3%	2.4%	9.2%
SN8	8	Wetlands	60.9%	31.0%	5.1%	3.0%	0.0%
SN9	4	Mast production areas	10.3%	49.3%	35.2%	4.0%	1.2%

The sum of percentages for each component is 100.

References

M. G. Anderson, K. Lombard, J. Lundgren, B. Allen, S. Antenen, D. Bechtel, A. Bowden, M. Carabetta, C. Ferree, M. Jordan, S. Khanna, D. Morse, A. Olivero, N. Sferra, M. Upmeyer. 2006. The North Atlantic Coast Ecoregional Assessment. The Nature Conservancy

Ferree, C. & L. Thompson. 2008 Land Type Association Descriptions for Vermont, report to the Vermont Forests, Parks & Recreation Department

For more information

A complete report on BioFinder development, methods and findings, including all 21 component summaries can be found at www.BioFinder.vt.us. For more information specific to this component, contact Jens Hilke, Vermont Fish & Wildlife Department, 802-879-5644, jens.hilke@state.vt.us.