Connectivity Blocks

Description

Landscape connectivity refers to the degree to which blocks of suitable habitat are connected to each other (Noss and Cooperrider 1994). Connectivity Blocks are the network of forest blocks that together provide terrestrial connectivity at the regional scale (across Vermont and to adjacent states and Québec) and connectivity between all Vermont biophysical regions. There is a high level of connectivity within individual forest blocks. The proximity of one forest block to another, the presence of riparian areas, and the characteristics of the intervening roads, agricultural lands, or development determine the effectiveness of the network of Connectivity Blocks in a particular area.

The composition and functions of connecting land are based on the scale at which it is considered. At the coarsest, eco-regional scale, connecting land in Vermont can be thought of as a "network" supporting genetic heterogeneity and movement of populations of wide-ranging mammal species across huge swaths of the landscape; such as between the Adirondacks Mountains of New York, Vermont's Green Mountains and the White Mountains of New Hampshire. It is a network in the sense that it includes 1)the largest blocks of contiguous, unfragmented core habitat, (the source and principle home area of many species as well as areas of diversity in the physical landscape), 2) connecting forest or "stepping stone blocks" (These may be smaller, but their landscape position between larger blocks make them integral to maintaining the network) and 3) local connections including riparian connectivity and wildlife road crossings.

Habitat is also connected at fine scales, for example by Riparian Connectivity and Wildlife Road Crossings, where individual terrestrial animals move along waterways and cross roads. This most local scale of movement may not necessarily be of regional significance, but of course, the regional connections cannot function without local movement. There can be no genetic exchange between wildlife populations in New York and Vermont, for example, without individual animals making sections of the trip, crossing roads and eventually breeding with other individuals. Therefore, local and regional connectivity are both vital to the long-term sustainability of wildlife populations and the ecological functions that they support. Habitat connectivity is captured in the following components:

Table 2.1 Habitat Connectivity at Regional & Local Scales

Scale	Component	Description
Regional Connectivity	Connectivity Blocks (Highest Priority)	Habitat blocks that are of the greatest importance for wildlife movement and genetic exchange
	Connectivity Blocks (Priority)	Habitat blocks that are perhaps of importance for wildlife movement and genetic exchange
	Riparian Connectivity	Lands along streams, rivers, lakes and ponds in natural-cover types. Does not include developed

Local Connectivity		lands and agricultural lands with cultivated crops, or pasture/hay.
	Wildlife Road Crossings	Locations where wildlife is likely to cross roads based on the presence of adjacent natural cover.

Ecological Function:

A network of Connectivity Blocks allows wide-ranging animals to move across their range, allows animals to find suitable habitat for their daily and annual life needs, allows young animals to disperse, allows plant and animal species to colonize new and appropriate habitat as climate and land uses change, and contributes to ecological processes, especially genetic exchange between populations (Austin et al. 2004). Maintaining the landscape connectivity function requires both Connectivity Blocks and Riparian Connectivity, especially in highly fragmented areas of Vermont. There is general agreement among conservation biologists that landscape connectivity and wildlife corridors can mitigate some of the adverse effects of habitat fragmentation on wildlife populations and biological diversity (Beier and Noss 1998; Noss and Cooperrider 1994; Haddad et al. 2003; Damschen et al. 2006). Specifically, climate change adaptation is enhanced if the long-distance movements of plants and animals is supported by a combination of short movements within large, topographically diverse forest blocks and short corridor movements between forest blocks (Beier 2012).

Guidelines for Maintaining Ecological Function

It is critically important to maintain or enhance the structural and functional connectivity that occurs on the margins of these blocks where they border other blocks. This can be accomplished by maintaining forest cover along the margins and by limiting development in these areas of block-to-block connectivity. Similar to Interior Forest Blocks, it is important to maintain the interior forest conditions in Connectivity Blocks by avoiding permanent interior forest fragmentation resulting from development. Connectivity within forest blocks will remain high if they remain unfragmented.

Connectivity Blocks Conservation Goal

Conserve connecting habitats that support seasonal and spatial patterns of wildlife movement and allow for movement between habitat patches across potential barriers. The larger conservation goal for landscape connectivity is to conserve a connected network of lands, waters, and riparian areas that allow for functioning of ecological processes across the landscape and dispersal, movement, and migration of plant and animal species in response to changing environmental conditions.

Component Mapping Goal

To identify and map the most vulnerable lands that contribute to connectivity at several scales. These important pinch points and stepping stones help form a multi-scaled network of connected land and water that includes core habitat, natural communities and connecting features.

Source Data and Selection Criteria

Connectivity Blocks were created by choosing a selection of Habitat Blocks from the updated 2023 Habitat Blocks dataset that form a connected pattern of forest that allows for wildlife movement across VT and beyond. The selection of blocks was made with reference to a variety of region-wide connectivity data and is the most current update of the network of connected lands and waters that the Fish & Wildlife Department first created in 2012.

Description

1. Vermont Habitat Blocks, Hawkins-Hilke et al. 2023. Vermont Fish & Wildlife Department.

Habitat blocks show all areas of natural cover (Combining 2016 Forest canopy, Shrubland, & Wetland landcover data from University of Vermont Spatial Analysis Lab) surrounded by roads, development and agriculture, ranging in size from 150-acres to 150,000-acres and prioritized for biological importance.

2. Northern Appalachian/Acadian Ecoregion: Priority Locations for Conservation Action Trombulak et al., 2008. This work identifies priority linkages at the ecoregional scale.

3. Resilient sites for terrestrial conservation in the Northeast and Mid-Atlantic region. Anderson et al., 2012. Using Circuitscape software this work models flow concentration areas to assess regional-scale connectedness and pinch points.

4. From the Adirondacks to Acadia: A Wildlands Network Design for the Greater Northern Appalachians. Reining et al., 2006). This work identifies a network design for regional connectivity based on habitat models for far-ranging mammals.

5. Linkage Areas of the Northern Appalachian and Acadian Ecoregion. 2012. Staying Connected Initiative. Staying Connected used models and field data to identify high priority linkages which were incorporated in their entirety because of their finer granularity.

6. Anderson, M.G., Barnett, A., Clark, M., Prince, J., Olivero Sheldon, A. and Vickery B. 2016. Resilient and Connected Landscapes for Terrestrial Conservation. The Nature Conservancy, Eastern Conservation Science, Eastern Regional Office. Boston, MA.

Selection Criteria

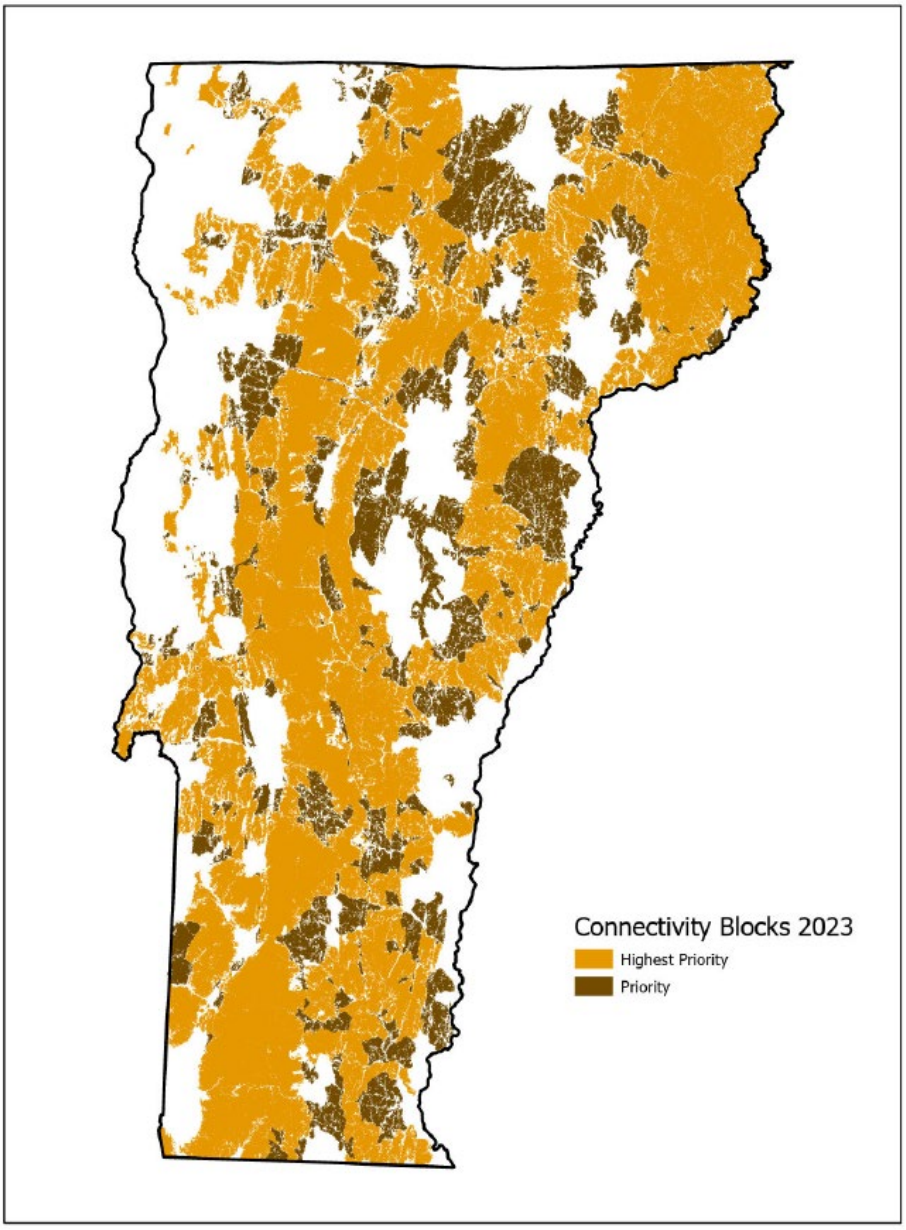
The 2023 Connectivity Blocks dataset is a refinement of the 2016 Connectivity Blocks, which was an update to the 2012 Network of Connected Lands. The 2016 edits refined the network into two tiers, highest priority and priority based on a review by the BioFinder Core team that included where blocks connect to areas of diversity in the physical landscape and the riparian network. In 2023, additional habitat blocks were selected for inclusion by the Core Team, to further fine tune the network with inclusion of additional smaller connecting blocks within the larger network. The Connectivity Blocks dataset reflects an understanding of connectivity that connects core habitat, areas of diversity in the physical landscape and the riparian network.

Connectivity Blocks is a selection of 1,528 habitat blocks. Of those, 548 Habitat Blocks were selected to be Highest Priority Connectivity Blocks and 980 were selected as Priority. The 2023 Habitat blocks were selected based on overlap with the regional scale datasets (*Northern Appalachian/Acadian Ecoregion: Priority Locations for Conservation Action* Trombulak et al., 2008, *Resilient sites for terrestrial conservation in the Northeast and Mid-Atlantic region.* Anderson et al., 2012,

From the Adirondacks to Acadia: A Wildlands Network Design for the Greater Northern Appalachians. Reining et al., 2006, & S*taying Connected's Linkage Areas of the Northern Appalachian and Acadian Ecoregion.* 2012.) to represent connectedness within Vermont and outside of the state to the Adirondacks, Whites, Berkshires, Mahoosics, and Sutton Mountains, as well as numerous locations across the Connecticut River. Blocks were then split into Highest Priority and priority. The selection process for highest priority connectivity blocks focused on blocks that were critical in maintaining the ecological function of connectivity (highest priority) vs. those that supported connectivity but were somewhat "exchangeable" with other blocks (priority)

The Connectivity Blocks dataset is the best effort so far to map not only areas between core habitats for far ranging mammals, but also between areas of diversity in the physical landscape and connections to and with the riparian network. Together, these different types of connectivity combined offer us important insights into a resilient connected network that will maintain species movement and diversity into the future

Figure 2.2 Map of the Highest Priority and Priority Connectivity Blocks Component



Component Strengths

The Connectivity Blocks dataset addresses regional scale habitat connectivity and associated wildlife and ecological movement. It uses the regional flow data developed by The Nature Conservancy, as well as habitat linkage areas identified by the Vermont Habitat Block project. This gives us a sense of lands within the State that play a role in connectivity well beyond the state's borders. This makes it possible to identify a network within Vermont important for climate change adaptation and other regionally pressing issues that occur at regional scales

The Connectivity Blocks component has the strength of focusing on several types of connectivity. It includes the large core habitats and stepping stone blocks in between them important for far-ranging mammal movement, but also includes some habitat blocks that are connected through the Surface Waters & Riparian Areas dataset, which is to say, wildlife or ecological processes moving to or from this forest block would do so through the riparian system. In some cases, habitat blocks that connect areas of diversity in the physical landscape were selected and included in this dataset. Together, these different types of connectivity combined offer us important insights into a resilient connected network that will maintain species movement and diversity into the future

Component Limitations

The Connectivity Blocks dataset focuses on lands important for regional-scale habitat connectivity. Only places that allow for movement between contiguous habitat (such as the Adirondacks or Green Mountains) are considered important. This leaves out areas of the state that are critically important for wildlife at a local scale. Movement between patches of habitat remains important even if the wildlife populations in question aren't operating at a regional scale of movement.

The Connectivity Blocks component is a selection of habitat blocks, so by definition, this leaves out roadsides, agricultural and developed land. Connectivity Blocks are a statewide prioritization and as such, do not show the full extent of locally important connectivity areas, especially for amphibians and reptiles. We rely on the use of the Wildlife Road Crossings dataset and Riparian Connectivity dataset to address more local scale movement areas. The Connectivity Blocks component is not based on field data and site visits are always needed to identify specific locations of functioning connectivity within the mapped polygons.

Component Priority & Justification

Connectivity Blocks were separated into Highest Priority and Priority areas. The selection process for highest priority connectivity blocks focused on blocks that were critical in maintaining the ecological function of connectivity (highest priority) vs. those that supported connectivity but were somewhat "exchangeable" with other blocks (priority).

Priority: These are the forest blocks that provide a major supporting connectivity function for the "backbone" of highest priority Connectivity Blocks. They also provide alternative pathways for connectivity, as redundancy is a critical safeguard in ensuring the long-term effectiveness of the connectivity network.

Highest Priority: The terrestrial "backbone" of forest blocks is a subset of all Connectivity Blocks that provides connectivity to all biophysical regions. The "backbone" incorporates the spines of the major mountain ranges, connections outside Vermont to unfragmented habitat, and anchor blocks in fragmented biophysical regions based on abundant known occurrences of rare species and significant natural communities. Small forest blocks are included at pinch-points in the connectivity network as they are critical stepping stones.

References

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For more information

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