Terrestrial and Wetland Connectivity Areas are those areas that enhance the connectivity and ecological function of landscapes that are important to support biodiversity, imperiled species, and Species of Greatest Conservation Need. Although the importance of connectivity is widely recognized, there is no single, simple way of mapping connectivity because of differences in mobility among species as well as differences that depend upon the time scales and mapping goals under consideration. Nature’s Network incorporates three complementary approaches to address connectivity in different contexts. We recommend that the resulting products be used in conjunction with other Nature’s Network products to more fully address connectivity for animals and plants.

The first approach consists of connectors between terrestrial and wetland core areas. These core-to-core connectors are designed to allow the movement of animals and plants between terrestrial and wetland core areas and across the landscape into the future. The core areas are relatively intact places that, if protected or maintained in their current condition, will support a broad diversity of fish, wildlife, plants, and the ecosystems on which they depend. Please see the QUICKSTART terrestrial and wetland cores, connectors and natural blocks document for more information on the Terrestrial Core-Connector Network. Collectively, core areas, connectors, and road-bounded natural blocks provide a network of resilient and intact ecosystems that will support biodiversity and natural processes under changing conditions and climate.

The second approach complements the first by considering connectivity independent of the terrestrial core-connector network. The regional flow product is a broad-scale representation of landscape connectivity, or “permeability,” which examines potential east-west and north-south movement (flow) patterns of animals and plants across the entire region. It measures how flow patterns become slowed, redirected, or channeled into concentration areas due to the spatial arrangement of cities, towns, farms, roads, and natural land. These patterns can help identify where population
movements and potential range shifts may become concentrated at pinch points or where they are well dispersed, and it is possible to evaluate the importance of an area by measuring how much flow passes through it, and how concentrated that flow is.

The third approach addresses the unique problem of connectivity of tidal marsh habitat to adjacent uplands and the need for marshes to move in response to sea level rise. Based on a NOAA analysis, this dataset depicts marsh migration zones at various sea level rise scenarios. Sites currently supporting marshes are broadly interpreted as the “initial condition” and adjacent undeveloped zones of potential marsh are depicted under varying sea level rise scenarios in 1 foot increments, from 1-6 feet of sea level rise.

While these are the three approaches designed specifically to address terrestrial connectivity, other components of Nature’s Network also contribute to connectivity across the landscape. Specifically, the Important Habitats for imperiled species dataset highlights riparian zones and ridges that may be considered natural corridors, supported in many locations by records of observed species.

### Intended uses

- Identify areas best able to support movement of animals and plants between core areas
- Place core-to-core connectors in the larger context of regional flow patterns
- Evaluate the importance of individual cores and connectors to larger flow patterns
- Conserve, restore, and manage connections between cores
- Locate areas to facilitate marsh migration and plan local conservation

### Get started

You can explore the three connectivity datasets in the Connectivity Components map on the North Atlantic LCC Conservation Planning Planning Atlas. You can use the Swipe Tool to examine areas of overlap among the components.

The core-to-core connectors (olive green, labeled “Terrestrial Core Connectors”) are included along with the terrestrial cores and associated datasets. You can zoom into
areas of interest using the Zoom Tool, and you can find information about why a core area is important using the Identify Tool.

You can also review the Regional Flow product. The legend can be interpreted as follows:

- **Diffuse Flow**: areas that are extremely intact and consequently facilitate high levels of dispersed flow that spreads out to follow many different and alternative pathways. A conservation strategy is to keep these areas intact and prevent the flow from becoming concentrated.

- **Low Diffuse Flow**: similar to Diffuse Flow, but the areas are not as intact and flow cannot disperse as readily.

- **Concentrated Flow**: areas where large quantities of flow are concentrated through a narrow area. Because of their importance in maintaining flow across a larger network these pinch points are good candidates for land conservation.

- **Constrained Flow**: areas of flow that are neither concentrated nor fully blocked but instead move across the landscape in a weak reticulated network. These areas present large conservation challenges and restoration may be necessary for effective connectivity to be achieved.

Areas that are not mapped indicate blocked flow (typically urbanized areas) where organisms are unlikely to be able to cross or pass through.

You can also zoom into coastal areas to look at the Marsh Migration Zones. The reddish and orange colors indicate areas that are not currently tidal marsh, but have potential to become marsh under scenarios of sea level rise, assuming they are managed and protected in a way that would allow the development of tidal marshes.

The connectivity products can be used in combination with other sources of information; use the Add Datasets button to bring them into your map. You might explore this package of data in combination with:

The probability of development layers (2030 and 2080) and regional vulnerability layers to identify places in the core-connector network that are relatively vulnerable to future development, and thus could represent priorities to preserve connectivity.

With a free DataBasin account, you can upload your organization’s priorities into a private map for comparison with the connectivity products, or you can download the data if your organization has GIS analysis capabilities.
**Background**

The Terrestrial Core-connector Network is based on sophisticated scientific analyses to assess the physical and biological value of resources across the Northeast and Mid-Atlantic, and to identify the most important places and connections for them. Connectors, identified by UMass Amherst, are intended to represent the best areas for movement between core areas for a variety of species with varying abilities to move and disperse. They are based on existing natural landscapes and were identified by the accumulation of random low cost paths modeled between core areas, taking into account the similarity of the cores and the distance between them.

Regional Flow examines large scale permeability across the landscape and does not rely on existing core areas. Regional flow has been mapped by The Nature Conservancy as a component of their work to identify resilient and connected landscapes for terrestrial conservation (Anderson et al., 2016). Regional flow is a component of landscape permeability, the degree to which regional landscapes will sustain ecological processes and are conductive to the movement of organisms. Regional flow was mapped using a wall-to-wall circuitscape model which applies electrical circuit theory to identify ecological flows in the landscape depending on degrees of naturalness. These modeled flows were then tested against data from independent connectivity studies in the region conducted across a range of scales and using a variety of methods. Full technical details of the regional flow modeling are provided in Anderson et al. (2016).

Marsh migration areas were mapped using sea level rise data from NOAA developed in association with the sea level rise viewer in combination with elevation and tidal range data to examine the extent of undeveloped upland available for migration.

**Known issues and Uncertainties**

As with any project carried out across such a large area, the Connectivity products are subject to limitations. The results by themselves are not a prescription for on-the-ground action; users are encouraged to verify, with field visits and site-specific knowledge, the value of any areas identified in the project. Known issues and uncertainties include the following:

- The results do not incorporate important social, economic, or feasibility factors.
- Users are cautioned against using the data on too small an area (for example, a small parcel of land), as the data may not be sufficiently accurate at that level of resolution.
- The mapping of ecosystem locations and development is known to be imperfect, which consequently affects the mapping of resistance of the landscape to movement of organisms and classification of areas as being...
condusive to connectivity. While the ecosystem mapping is anticipated to correctly reflect broad patterns of ecosystem occurrence, errors in classification and placement do occur, as with any regional GIS data. In addition, errors in mapping and alignment of development, roads, traffic rates, and a number of other data layers can affect the model results.

- Connectors and regional flow patterns are intended to reflect the connectivity needs of many species simultaneously, but they may not match the needs of any given species of interest. The ability of dispersal-limited species (e.g., plants, amphibians) to traverse the landscape may be less than suggested by the connectivity products, and conversely species that can move readily (e.g., migratory birds) may not be as constrained in their movements as the connectivity products could imply.

- Marsh Migration Zones do not incorporate future changes in coastal geomorphology and assumes present conditions will persist; for additional limitations see the technical documentation (link below).

Links for technical information

UMass Amherst: [Documentation for the Terrestrial Core-Connector Network](#)

Regional flow: The Nature Conservancy Report [Resilient and Connected Landscapes](#)

NOAA [Detailed Method for Mapping Sea Level Rise Marsh Migration](#)