Ecological Connectivity

As part of their natural functioning, ecological systems remove particulate matter and carbon dioxide from the air, purify surface and ground water, reduce flooding, and maintain biological diversity. These functions depend on a connected ecological "framework" of high-quality land consisting of central hubs interconnected by corridors that provide for the movement of energy, matter, and species across the landscape. This framework of connectivity is threatened by agricultural and silvicultural practices, road development, and "urban sprawl" that fragment the landscape. Maintaining ecological connectivity protects the entire system.

This indicator is directly derived from the National Ecological Framework (NEF), which is a GIS dataset that was developed by EPA Region 4. The NEF is an indicator of critical connectivity between important ecological areas in the contiguous U.S. It consists of a framework that captures the connectivity of important natural areas and ecological systems across the contiguous United States. Four ecological aspects contribute to the functionality of the NEF infrastructure (see Carr et al., 2002, for additional details). The most important of the four, hub and corridor connectivity, forms the basis for this indicator. Hub and corridor connectivity shows the connections among critical ecological systems. Hubs are large areas of important natural ecosystems such as the Okefenokee National Wildlife Refuge in Georgia and the Osceola National Forest in Florida. Connections, referred to as "corridors," are links to support the functionality of the hubs (e.g., the Pinhook Swamp which connects the Okefenokee and Osceola hubs). The NEF is based on land cover data obtained from the 2001 National Land Cover Database (NLCD), which was constructed from satellite imagery (Landsat) showing land cover, impervious surface, and canopy density of the contiguous United States circa 2001 (MRLC Consortium, 2012).

What the Data Show

Exhibit 1 displays the ecological hubs and corridors across the contiguous United States. The hub and connection framework covers 53.2 percent of the total land and water resources in the contiguous 48 states: 50.6 percent classified as hubs and 2.6 percent as corridors (Exhibit 2). Currently, 49.0 percent of this framework area is protected as conservation land, 3.1 percent is in the public domain as open water, and an additional 3.9 percent is classified as wetlands, for a total of 56.0 percent of hub and corridor acreage being afforded some type of long-term protection (Exhibit 3).

Limitations

- Due to both the limited availability of data (ecological data not available or not in digital or geographic information system [GIS] format) and the NEF parameter that sets a size threshold of 5,000 acres for ecological hubs, the results do not comprehensively include each and every ecologically important area in the United States. The NEF's purpose is to identify critical connectivity between important ecological areas. The appropriate geographic scale of connectivity depends on the species and communities that are the focus of particular protection efforts (Carr et al., 2002).
- Trend information is not available for this indicator. The most important data layer used in the NEF development is the 2001 NLCD. Improvements in mapping methodology, input data, and

minor mapping legend modification confound the comparison between NCLD 2001 and the previous NLCD, circa 1992 (Homer et al., 2007). Future versions of the NLCD might make it possible to examine trends over time, however.

- NLCD is updated approximately every 5 years. It typically takes a few years for a full set of NLCD data to be organized and analyzed for release, plus it takes additional time to conduct the supplemental analysis that supports this ROE indicator. Thus, while the data may appear to be several years old, this indicator uses the most recent analysis available.

Data Sources

The ecological connectivity hub and corridor map is derived from EPA Region 4's NEF dataset. Summary statistics are shown in Exhibits 2 and 3. This analysis was based on the 2001 NLCD (http://www.mrlc.gov/nlcd2001.php) (U.S. EPA, 2012) and several additional datasets such as the U.S. Geological Survey (USGS) Protected Areas Data Set, Nature Conservancy Portfolio Sites, U.S. Fish and Wildlife Service (FWS) Critical Habitat, and National Hydrography Data First Order Stream Catchments. These data layers are publicly available from websites of the associated agencies. A Web-based mapping application is being developed to facilitate access to the NEF data.

References

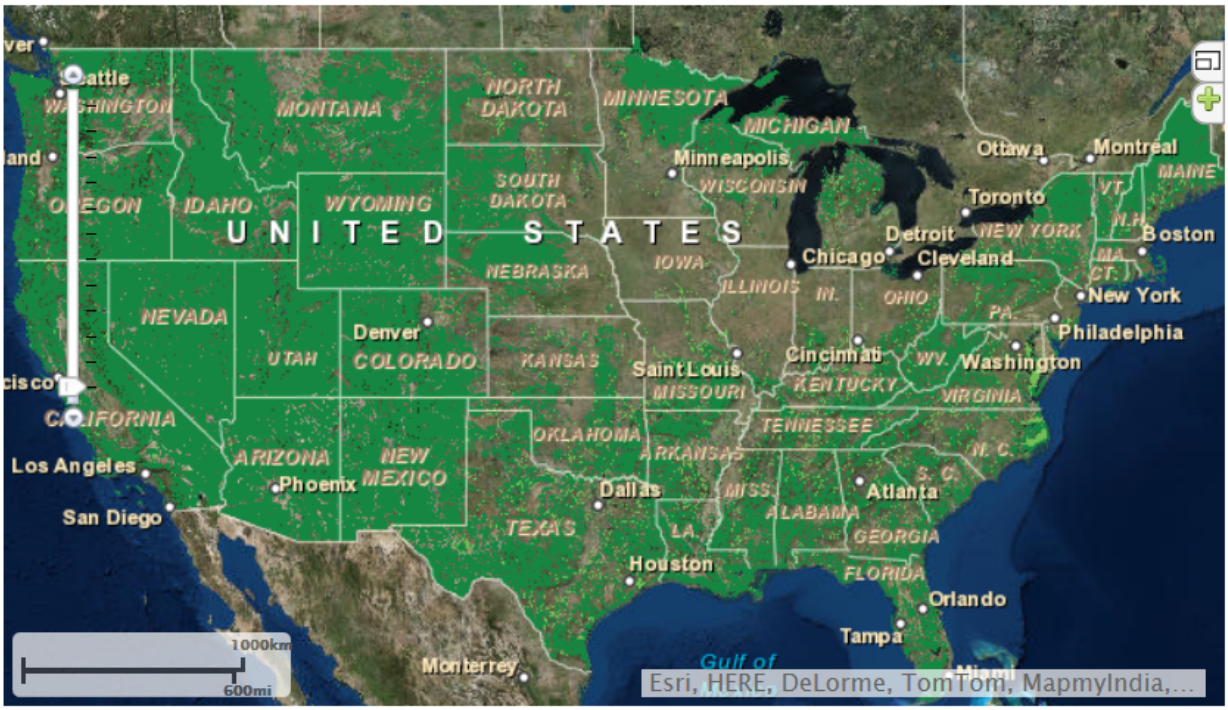
Carr, M.H., T.D. Hoctor, C. Goodison, P.D. Zwick, J. Green, P. Hernandez, C. McCain, J. Teisinger, and K. Whitney. 2002. Final report: Southeastern Ecological Framework. Region 4. Atlanta, GA: U.S. Environmental Protection Agency. http://geoplan.ufl.edu/epa/download/sef_report.pdf (PDF) (306 pp, 8.8MB).

Homer, C., J. Dewitz, J. Fry, M. Coan, N. Hossain, C. Larson, N. Herold, A. McKerrow, J.N. VanDriel, and J. Wickham. 2007. Completion of the 2001 National Land Cover Database for the conterminous United States. Photogrammetric Engineering and Remote Sensing 73(4):337-341. http://www.asprs.org/a/publications/pers/2007journal/april/highlight.pdf (PDF) (5 pp, 2.4MB)

Multi-Resolution Land Characterization (MRLC) Consortium. 2012. National Land Cover Database 2001 (NLCD 2001). Accessed 2012. http://www.mrlc.gov/nlcd2001.php.

U.S. EPA. 2012. National ecological framework. Data provided to ERG (an EPA contractor) by Neil Burns, EPA Region 4, August 2012.

Exhibit 1. Ecological hubs and corridors in the contiguous U.S., based on 2001 NLCD



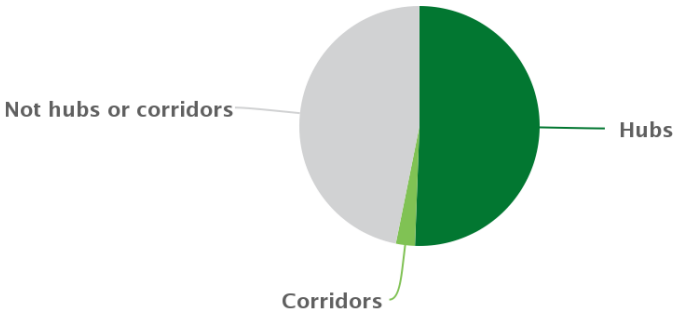
Opacity: Click here to toggle legend

Hubs Corridors

Trend analysis has not been conducted because these data represent a single snapshot in time. For more information about uncertainty, variability, and statistical analysis, view the technical documentation for this indicator.

Data source: U.S. EPA, 2012

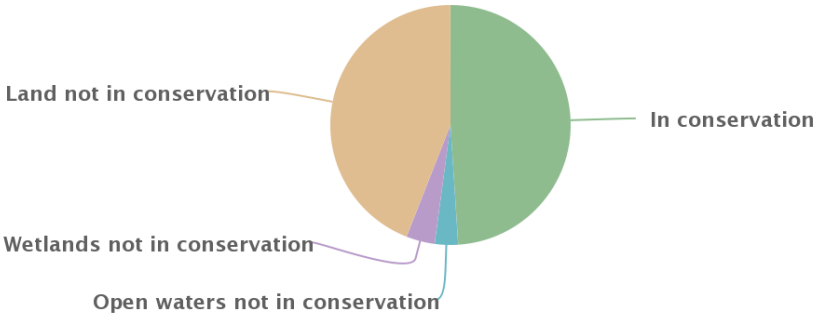
Exhibit 2. Distribution of ecological hubs and corridors in the contiguous U.S., based on 2001 NLCD



Trend analysis has not been conducted because these data represent a single snapshot in time. For more information about uncertainty, variability, and statistical analysis, view the technical documentation for this indicator.

Data source: U.S. EPA, 2012

Exhibit 3. Protected status of ecological hubs and corridors in the contiguous U.S., based on 2001 NLCD



Trend analysis has not been conducted because these data represent a single snapshot in time. For more information about uncertainty, variability, and statistical analysis, view the technical documentation for this indicator.

Data source: U.S. EPA, 2012