Title	Ecological connectivity of terrestrial habitat
Abstract	This Indicator is a measure of local scale contribution to ecological carrying capacity. It accounts for the generalised quality of terrestrial habitats supporting biodiversity at each location, the fragmentation of habitat within its neighbourhood and its position in the landscape (e.g. as part of a habitat corridor, or a stepping stone). This indicator (3.1b) is part of a family of measures on the condition and connectivity of habitat, including its capacity to support the needs of native plants, animals and ecosystems in NSW, as a proportion relative to that in the pre-industrial era. Ecological condition and ecological carrying capacity are used to estimate the 'state of biodiversity including undiscovered species' and ecological condition is used to estimate 'expected survival of all known and undiscovered species' is one of a series of indicators on the status of biodiversity and ecological integrity in NSW developed to contribute to assessing the performance of the Biodiversity Conservation Act 2016. The overarching indicator framework which outlines how indicators are related and derived is presented in the "method to assess biodiversity and ecological integrity across New South Wales" (OEH, 2018).
Resource locator	
Data Quality Statement	Name: Data Quality Statement Protocol: WWW:DOWNLOAD-1.0-http--download Description: Data quality statement for Ecological connectivity of terrestrial native vegetation indicator Function: download
Download Package	Name: Download Package Protocol: WWW:DOWNLOAD-1.0-http--download Description: Raster Data (TIFF) Function: download
Unique resource identifier	
Code	1f1821af-ee82-41a3-9643-455a9143892e
Presentation form	Document digital
Edition	1
Dataset language	English
Metadata standard	
Name	ISO 19115
Edition	2016
Dataset URI	https://datasets.seed.nsw.gov.au/dataset/1f1821af-ee82-41a3-9643-455a9143892e
Purpose	Legislative and regulatory requirements
Status	Completed
Spatial representation type	grid

Spatial reference system

Code identifying the spatial reference system	4283

Spatial resolution	90 m
Additional information source	Love, J., Drielsma, M. J., Williams, K., Thapa, R., (2018) Data package for habitat condition indicators; 3.1a ecological condition, 3.1b ecological connectivity and 3.1c ecological carrying capacity. Biodiversity Indicator Program, NSW Office of Environment and Heritage, Sydney. OEH (2018). A Method to Assess Biodiversity and Ecological Integrity across New South Wales. NSW Office of Environment and Heritage, Sydney. Love, J., Drielsma, M. J., Williams, K., Thapa, R., (2018) A new integrated model-data fusion approach to measuring ecosystem quality for ecological integrity reporting. Biodiversity Indicator Program Implementation Report Series, NSW Office of Environment and Heritage, Sydney.

Topic category

Keyword set

keyword value	ECOLOGY-Habitat ECOLOGY-Community FLORA-Native VEGETATION ECOLOGY-Landscape

Originating controlled vocabulary

Title	ANZLIC Search Words
Reference date	2008-05-16

Geographic location

West bounding longitude	140.888672
East bounding longitude	153.720703
North bounding latitude	-36.809285
South bounding latitude	-27.994401
NSW Place Name	NSW

Vertical extent information

Minimum value	-100
Maximum value	2228

Coordinate reference system

Authority code	urn:ogc:def:cs:EPSG::
Code identifying the coordinate reference system	5711

Temporal extent

Begin position	1995-01-01

End position	N/A

Dataset reference date

Resource maintenance

Maintenance and update frequency	As needed
Contact info	
Contact position	Data Broker
Organisation name	NSW Department of Climate Change, Energy, the Environment and Water
Telephone number	131555
Email address	data.broker@environment.nsw.gov.au
Web address	https://www.nsw.gov.au/departments-and-agencies/dcceew
Responsible party role	pointOfContact

Lineage	Connectivity within and between habitats at multiple ecological scales is an important factor for native species as the movement it facilitates is necessary for many of the processes that individuals, populations and ecosystems require to persist, including foraging for food, searching for a mate, dispersing to other habitat, seasonal migration, or dispersing in response to long-term changes in the environment or returning after habitat altering events. Ecological connectivity (Biodiversity Indicator Program, Indicator 3.1b) measures the effectiveness of each grid cell (location) as a connector of contemporary habitat at multiple ecological scales. It estimates each cell's contribution to NSW-wide ecological carrying capacity (Indicator 3.1c). The connectivity value attributed to each grid cell is determined from both the amount and quality of its habitat, in this case defined by the ecological condition indicator, as well as its landscape position relative to connections with, and between other habitats. Ecological connectivity values are allocated by generating least cost paths (Dijkstra 1959) between pairs of sites and accumulating the permeability of paths at every cell they traverse. In this way, grid cells that are part of more permeable paths or paths between habitats with higher ecological condition, or those that are more frequently traversed are considered to provide a greater contribution to ecological carrying capacity and result in higher ecological connectivity values. Ecological connectivity is mapped using the Spatial Links Tool (Drielsma et al., 2007a) which is an application of Dijkstra's Least Cost Path (LCP) graph search algorithm (Dijkstra, 1959; Cormen et al., 2001) applied to rasterised spatial data. The approach to modelling ecological connectivity (Drielsma et al., in prep.) refines methods developed to model Landscape Value (LV) and inform native vegetation management benefits across NSW (Drielsma et al., 2013). Like LV, ecological connectivity is designed to be scale agnostic, avoiding preference towards any particular scale at which only a subset of species or processes may operate. Multiple spatial resolutions and appropriately scaled parameters are used as proxies for ecological scales. Unlike ecological connectivity, LV was designed to consider differences in habitat types and modelled connectivity separately for three different vegetation structural classes (Drielsma et al., 2013). In contrast, ecological connectivity as measured here provides a single, generalised measure of habitat connectivity across scales that considers only the amount, quality and position of habitat and its resulting contribution to connectivity. The Spatial Links Tool is applied using a complete sampling strategy termed the 'local links' approach. Local links improves on earlier applications of the Spatial Links Tool (Scott & Drielsma 2003, Drielsma et al., 2007a, Drielsma et al., 2013, Drielsma et al., 2015) that relied on a heuristic sampling strategy, referred to here as the 'regional links' approach. Using regional links, least cost paths are sampled between pairs of sites that are within a specified distance of each other and selected at random from a predefined pool of candidates probabilistically distributed towards areas of higher ecological condition. Instead of heuristically selecting path source and destinations, the local links approach generates every possible least cost path from every site to every other site within the bounds of parameterised constraints. The parameterised constraints used by the local links approach include a maximum search radius and 'effective' path distance beyond which, least cost paths are not generated, and a minimum ecological condition threshold below which, sites are not considered for least cost path sources or destinations. The complete sampling strategy of the local links approach allows for a consistent and controlled sampling of the entire analysis domain. This prevents a sampling bias commonly faced when performing the regional links approach that results in over-sampling of areas with a greater proportion of intact habitat, therefore having more candidate sites, and an under-sampling in those areas that are more consistently cleared or degraded. This would in turn under value the important contributions of remnant habitat in highly cleared landscapes such as stock reserves or paddock trees in the NSW wheat sheep belt. As this sampling bias is removed, the complete sampling strategy allows the algorithm to resolve patterns of habitat connectivity more efficiently than the traditional heuristic approach. Spatial inputs for ecological connectivity are sampled using multiple pixel offsets at each analysis scale to account for the loss of detail that occurs when aggregating raster data up to coarser resolutions. Spatial Links analysis is applied independently for each spatial resolution and at each sampled offset to produce a Spatial Links output grid for each. Once derived, output grids are resampled back to the original finest resolution before being additively combined with equal weighting to produce a single spatial product measuring ecological connectivity that considers multiple ecological scales, at each 90 by 90 metre grid cell across the State. For more information and identification of the data used in the indicator refer to the work flow and implementation report in the data package.
Limitations on public access	

Responsible party

Contact position	Data Broker
Organisation name	NSW Department of Climate Change, Energy, the Environment and Water
Telephone number	131555
Email address	data.broker@environment.nsw.gov.au
Web address	https://www.nsw.gov.au/departments-and-agencies/dcceew
Responsible party role	pointOfContact

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Metadata language