Inventory and Monitoring Program

National Park Service
U.S. Department of the Interior

PALMS Standard Operation Procedure

Landscape dynamics – pattern of natural landscapes

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Revision #	Date	Revision Summary	Revised by
0.1	2009_03_11	Initial version	David Theobald, CSU

Introduction

The purpose of the PALMS *Pattern of Natural Landscapes* indicator is to evaluate the pattern and fragmentation of natural landscapes, and their dynamics over time. In this application, land cover types are distinguished between "natural" and "human-modified" and are assigned binary values (1 for natural, 0 for human-modified). The strengths of this indicator is that it is characterizes natural landscape pattern using robust, multi-scale approach based on the proportion (*P*) of natural cover types and does not require delineation of patches.

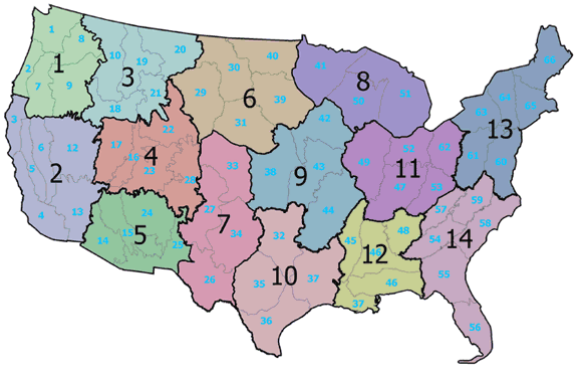
This document provides detailed instructions to estimate the pattern of natural landscapes using a multi-scale, integrated index of landscape connectivity. The key steps to produce this indicator are to: download data, execute a series of tools using ESRI ArcGIS, and then produce maps and graphs of the results. Papers by Riitters et al. (2002), Wickham et al. (2008), and Theobald (in prep.) describe the ecological context and interpretation of results.

Data Acquisition and Preprocessing

Data to be used in the analysis can be obtained from their original data sources, or from the NPS "national core indicator" dataset."

Get the National Land Cover Dataset

Land cover data used in this indicator are from the Multi-Resolution Land Characteristics Consortium's National Land Cover Dataset Retrofit Land Cover Change Product (NLCDr): http://www.mrlc.gov/multizone.php. NLCD data are delivered in "land cover zones" (see graph below).



Be sure to note that this is a different dataset specifically processed to allow change detection – do not use the original NLCD 1992 and NLCD 2001 for change comparison (analysis of patterns at individual time steps can be done on the original NLCD datasets, however). The NLCDr product was processed by: 1) reclassifying both 1992 and 2001 imagery using a decision tree classifier at Anderson Level I; 2) filtering intermediate results with confidence parameters; 3) determining changed vs. non-changed cells; and 4) labeling the final change product using a "from-to" classification code (Appendix I). The basic Anderson level I classes are the following:

Class	NLCDr Anderson Level 1 Descriptions
0	No Data
1	Open Water - All areas of open water, generally with less than 25% vegetation or soil cover.
2	Urban - Includes developed open spaces with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses such as large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. Also included are lands of low, medium, and high intensity with a mixture of constructed materials and vegetation, such as single-family housing units, multifamily housing units, and areas of retail, commercial, and industrial uses.
3	Barren - Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits, and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.
4	Forest - Areas dominated by trees generally taller than 5 meters, and greater than 20% of total vegetation cover. Includes deciduous forest, evergreen forest, and mixed forest.
5	Grassland/Shrub - Includes grassland areas dominated by gramminoid or herbaceous vegetation and shrub/scrub areas dominated by shrubs less than 5 m tall with shrub canopy typically greater than 20%

	of total vegetation, including true shrubs, young trees in an early successional stage, or trees stunted due to harsh environmental conditions. Management techniques that associate soil, water, and forage-vegetation resources are more suitable for rangeland management than are practices generally used in managing pastureland. Some rangelands have been or may be seeded to introduced or domesticated plant species. Includes those areas in the Eastern United States that commonly are called brushlands.
6	Agriculture - including cultivated crops and pasture/hay – Cultivated crops are described as areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. This class also includes all actively tilled land. Pasture/Hay is described as grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle.
7	Wetlands - including woody wetlands and herbaceous wetlands – Areas where forest or shrubland vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water. This class also includes areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
8	Ice/Snow - All areas characterized by a perennial cover of ice and/or snow, generally greater than 25% of total cover.

Download the raster file and load it into an ArcMap document. This is typically in ERDAS image form. Name the layer: nlcdr.

Note that we have also provided an example dataset around Rocky Mountain National Park to work with.

Get the housing density dataset (SERGoM)

A second dataset needed for this indicator is housing density to augment changes on the landscape that happen beyond the urban fringe. That is, urban/built-up land cover classes in most land cover products (including NLCD, NLCDr, LANDFIRE, etc.) does not identify locations of low housing density (typically less than 1 housing unit per 1 or 2 acres). As a consequence, here the land cover dataset is augmented by the human modified cover surrounding housing units in lower-density (exurban, rural) areas.

There are a variety of datasets that could be used here that are derived from US Census tract, block-group, or block level housing counts. Here housing density from the SERGoM (Spatially Explicit Regional Growth Model; Theobald 2001, 2003, 2005; EPA 2009) is used. The strengths of this dataset are that is uses the finest grain census data available and refines these data using protected lands, groundwater well density (in the western 11 states), NLCD land cover, and accessibility to cities along major road infrastructure. Also, forecasted housing density maps have been developed to reflect IPCC scenarios or "storylines" decadally out to 2050.

The SERGoM housing density can be obtained from: <<<URL to I&M's national core dataset>>>. These raster files are called "bhdYYYYus" (for block housing density, year, US extent).

Note: the raster datasets need to all be in the same projection – for national level applications preferably "Albers 1983".

Convert land cover to natural/human-modified

Convert "from-to" raster to 1992 and 2001 rasters

The NLCDr comes as a single raster with 1992 values in the "tens" column and 2001 values in the "ones" column. It is easier to deal with the dataset by splitting them into individual rasters, one each for 1992 and 2001. To do this, you could use the RECLASSIFY tool, but it tends to be not too robust, so it is recommended to use a CON statement (note throughout the Command Line form of Arc tools is provided – you could cut-and-paste this line into ArcMap command line box, assuming output is going to c:\temp directory), or set up your workspace using the "workspace" command (see below).

```
Workspace C:\temp
SingleOutputMapAlgebra_sa 'con ( nlcdr < 10, nlcdr, nlcdr / 10 )' nlcdr_1992 nlcdr
SingleOutputMapAlgebra_sa 'con (nlcdr < 10, nlcdr, nlcdr - ((nlcdr / 10 ) * 10))' nlcdr _2001 nlcdr
```

Compute natural/human-modified rasters

The next step is to reclassify NLCDr classes and assign a new value (1 for natural, 0 for human-modified) to the old NLCDr values. Here a simple binary scheme is used (e.g., forest = 1, agriculture = 0, but note that this methodology could also handle specifying partial or gradient values (e.g., agriculture = 0.2). The values used in this indicator are as follows:

New Value	NLCDr classes	Label
0	Urban/built-up = 2 Agricultural = 6	Human-modified
1	Forest = 4 Grassland/shrub = 5 Wetlands = 7 Snow/ice = 8	Natural
No Data	Water = 1 Barren = 3	Excluded because could be natural or human-modified

To compute the natural/human-modified ("nh") rasters, we compute the "naturals" in a numerator, then the total possible "natural" and "human-modified", but not NoData in a denominator. This is typically done at 30 m (original) resolution.

```
SingleOutputMapAlgebra_sa 'con (nlcdr_1992 == 4 OR nlcdr_1992 == 5 OR nlcdr_1992 == 7 OR nlcdr_1992 == 8, 1, 0)' t1_1992 nlcdr_1992
SingleOutputMapAlgebra_sa 'con (nlcdr_1992 == 2 OR nlcdr_1992 == 4 OR nlcdr_1992 == 5 OR nlcdr_1992 == 6 OR nlcdr_1992 == 7 OR nlcdr_1992 == 8, 1, 0)' t2_1992 nlcdr_1992
SingleOutputMapAlgebra_sa 'con (nlcdr_2001 == 4 OR nlcdr_2001 == 5 OR nlcdr_2001 == 7 OR nlcdr_2001 == 8, 1, 0)' t1_2001 nlcdr_2001
SingleOutputMapAlgebra_sa 'con (nlcdr_2001 == 2 OR nlcdr_2001 == 4 OR nlcdr_2001 == 5 OR nlcdr_2001 == 6 OR nlcdr_2001 == 7 OR nlcdr_2001 == 8, 1, 0)' t2_2001 nlcdr_2001
```

Next, aggregate up from 30 m to 90 m, and compute the proportion by averaging across a 3x3 window (of 90 m cells).

```
Aggregate_sa t1_1992 t1_1992_3 3 SUM EXPAND DATA
Aggregate_sa t2_1992 t2_1992_3 3 SUM EXPAND DATA
SingleOutputMapAlgebra_sa 'con (t2_1992_3 <> 0 AND t1_1992_3 == 0, 0.0, focalsum(t1_1992_3 / float ( t2_1992_3)) * (t1_1992_3 / float ( t2_1992_3 )) / focalsum( t1_1992_3 / float ( t2_1992_3 ) ) ) ' t3_1992_3 t2_1992_3
Aggregate_sa t3_1992_3 t4_1992_9 3 MEAN EXPAND DATA
```

Aggregate_sa t1_2001 c:\temp\t1_2001_3 3 SUM EXPAND DATA

Aggregate_sa t2_2001 c:\temp\t2_2001_3 3 SUM EXPAND DATA

SingleOutputMapAlgebra_sa 'con (t2_2001_3 <> 0 AND t1_2001_3 == 0, 0.0, focalsum(t1_2001_3 / float (t2_2001_3)) * (t1_2001_3 / float (t2_2001_3)) / focalsum(t1_2001_3 / float (t2_2001_3))) ' t3_2001_3 t2_2001_3

Aggregate_sa t3_2001_3 t4_2001_9 3 MEAN EXPAND DATA

In sum, the t4_1992_9 raster is the proportion of natural in 1992 at 270 m. This is done both for computational efficiency, but also because the proportional index doesn't make much sense at scales smaller than 90 to 270 m or so.

Compute percent human modified from housing density

Housing density was converted to the percent of a cell (at 100 m cells or 1 ha resolution) that is modified by a housing unit. This is based on an estimate of the average "footprint" of development visible on aerial photographs (n=300, Leinwand unpublished master's thesis). The footprint size per unit changes based on the land use type (urban/suburban, exurban, rural). The percent human modified was computed as an integer raster, with values multiplied by 1000 to minimize file size (i.e., a 100% human modified value would have a raster value of 1000). Note that the percent modified can range from 0 to 100%, or values from 0 to 1000.

Land use class	Footprint (ha) per unit
Urban/suburban	0.188
Exurban	0.461
Rural	1.660

SingleOutputMapAlgebra_sa min(1000, int(con (bhd1990us < 62, bhd1990us * 1.66, con(bhd1990us < 1454, bhd1990us * 0.461, bhd1990us * 0.188)))) hmck1990 #

SingleOutputMapAlgebra_sa min(1000, int(con (bhd2000us < 62, bhd2000us * 1.66, con(bhd2000us < 1454, bhd2000us * 0.461, bhd2000us * 0.188)))) hmck2000 #

SingleOutputMapAlgebra_sa min(1000, int(con (bhd2030us < 62, bhd2030us * 1.66, con(bhd2030us < 1454, bhd2030us * 0.461, bhd2030us * 0.188)))) hmck2030 #

These rasters of human modified from housing density are then resampled up to 270 m to match the resolution of the natural/human-modified rasters.

Resample_management hmck1990 hmck1990x 270 BILINEAR

Resample_management hmck2000 hmck2000x 270 BILINEAR

Resample_management hmck2030 hmck2030x 270 BILINEAR

Compute Integrated Landscape Connectivity Index

The Integrated Landscape Connectivity Index (ILCI) metric is computed as:

$$ILCI = \sum_{i}^{n} p_c p_i \Big/ n$$

where P_c and P_i is the proportion of a class in the center and neighboring cell using 8 neighbors, at a resolution *j*. Note that center cell *c* is included in the neighborhood of *i* to *n* cells, so *n*=9. To integrate across multiple scales, the proportion of natural is computed at a given resolution, then aggregated up to the next level using the mean value. A logarithmic, hierarchical progression of neighborhood sizes is used (after Riitters et al. 2002): 7.3, 65.6, 590.5, 5,314.4, and 47,829.7 ha (this corresponds to 9, 27, 81, 243, 729, and 2187 cell width). After the proportion is computed at each scale, the simple arithmetic mean of ILCI values from each scale is calculated. Because neighborhoods are overlapping "distance" bands, as opposed to incremental (i.e. "O" rings) bands, the values of cells close in fact have a greater weight because they are included at multiple scales. This means that the effective weighting at each scale is 29%, 24%, 19%, 14%, 10%, and 5% (at window sizes of 3, 9, 27, 81, 243, 729, and 2187 cells).

Adjust natural/human-modified rasters by proportion modified by low-density housing

The first step is to reduce the proportion natural in each cell (270 m) by the "footprint" of human-modified land cover. Note the assumption here is that these are not additive, rather the maximum of disturbance recorded by either the NLCDr or housing density is recorded. Note that the 1990 housing density is combined with the NLCDr 1992, the 2000 housing density with the NLCDr 2001, and the 2030 housing density with the NLCDr 2001 (to get roughly a near-future natural landscape).

SingleOutputMapAlgebra_sa 'con (isnull (hmck1990x), t4_1992_9, min(t4_1992_9, 1.0 - (hmck1990x / 1000.0)))' ilci1992_9 hmck1990x;t4_1992_9

SingleOutputMapAlgebra_sa 'con (isnull (hmck2000x), t4_2001_9, min(t4_2001_9, 1.0 - (hmck2000x / 1000.0)))' ilci2001_9 hmck2000x;t4_2001_9

SingleOutputMapAlgebra_sa 'con (isnull (hmck2030x), t4_2001_9, min(t4_2001_9, 1.0 - (hmck2030x / 1000.0)))' ilci2001_9 hmck2030x;t4_2030_9

Aggregate up to compute ILCI at increasing scales

Note that below the example is shown just for 1992, but would need to be repeated for 2001 and 2030 if desired.

Aggregate_sa ilci1992_9 t5_1992_27 3 MEAN EXPAND DATA

SingleOutputMapAlgebra_sa '(focalsum(t5_1992_27) * t5_1992_27) / 9.0' ilci1992_27 t5_1992_27

Aggregate_sa ilci1992_27 t5_1992_81 3 MEAN EXPAND DATA

SingleOutputMapAlgebra_sa '(focalsum(t5_1992_81) * t5_1992_81) / 9.0' ilci1992_81 t5_1992_81

Aggregate_sa ilci1992_81 t5_1992_243 3 MEAN EXPAND DATA

SingleOutputMapAlgebra_sa '(focalsum(t5_1992_243) * t5_1992_243) / 9.0' ilci1992_243 t5_1992_243

Aggregate_sa ilci1992_243 t5_1992_729 3 MEAN EXPAND DATA

SingleOutputMapAlgebra_sa '(focalsum(t5_1992_729) * t5_1992_729) / 9.0' ilci1992_729 t5_1992_729

Aggregate_sa ilci1992_729 t5_1992_2187 3 MEAN EXPAND DATA

SingleOutputMapAlgebra_sa '(focalsum(t5_1992_2187) * t5_1992_2187) / 9.0' ilci1992_2187 t5_1992_2187

Compute integrated index using AVERAGE values across scales

To integrate the maps of ILCI values at different scales, the average value is computed. The setting on the computation must either be Minimum cell size, or set

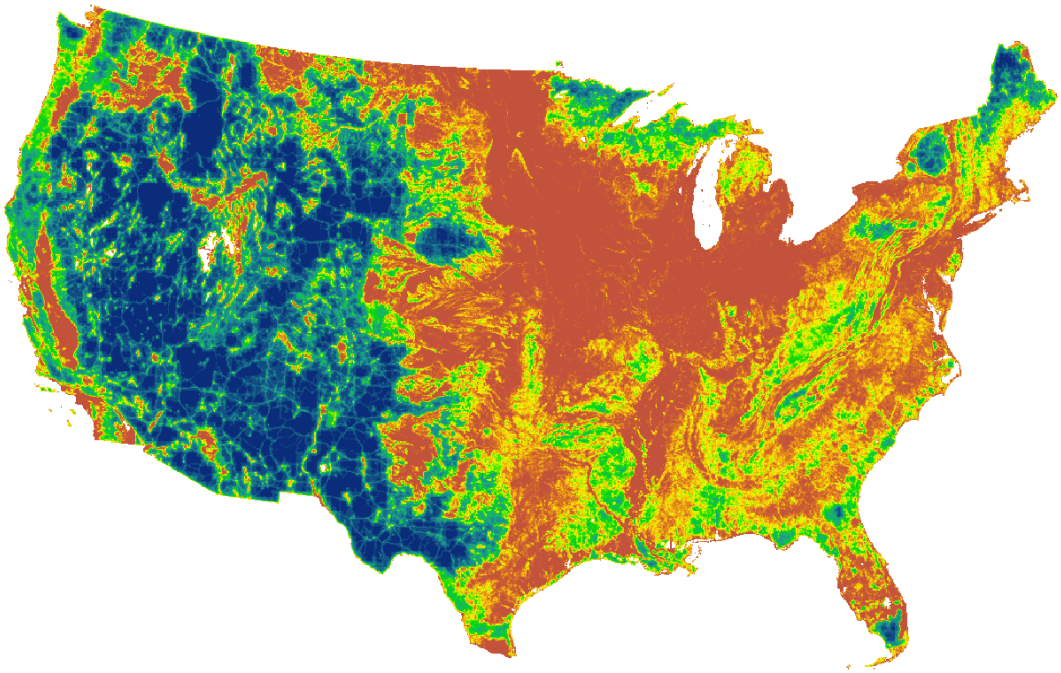
```
cellSize 270

CellStatistics_sa ilci1992_9 ilci1992_27 ilci1992_81 ilci1992_243 ilci1992_729 ilci1992_2187 ilci_1992 MEAN
```

Remember to reset the cellsize – any subsequent processing through the Command Line will be forced to this cell size.

Summarize results and interpret

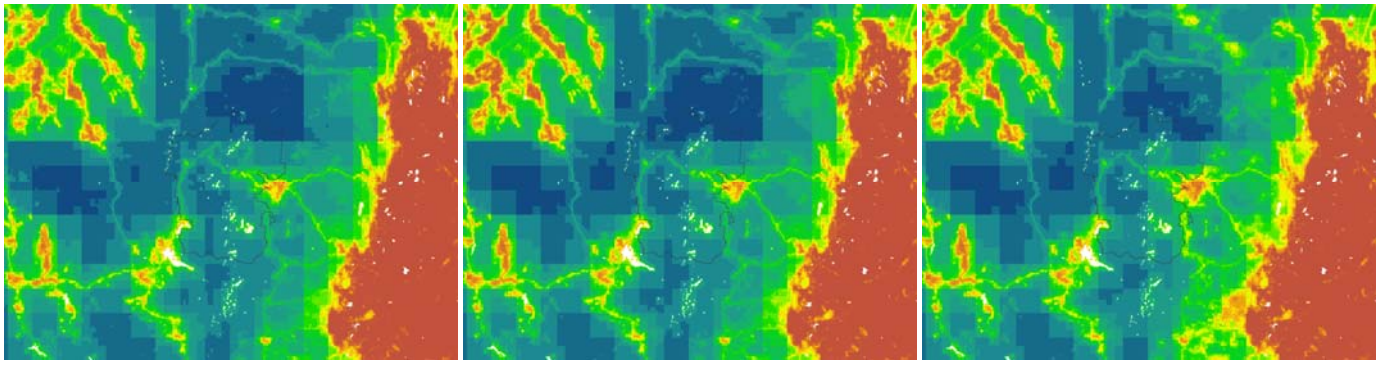
A national level Pattern of Natural Landscapes indicator is pre-computed for rapid use (see below – blue is high natural, green moderate, red low natural or human-modified). These data are available through NPS I&M national core indicators dataset, or through the TOPS platform <<<URL???>>>.



The ILCI value can then be summarized using ZonalStats tool to examine the landscape dynamics around national parks. For example, the ILCIc score for Rocky Mountain National Park, was 0.802 in 1992. This signifies that the park is placed within a fairly high "natural" setting (both locally and regionally). Currently (in 2001) the ILCIc rose slightly to 0.806 – this is most likely due to a slight decline in agricultural (cropland) cover types observed in the NLCD dataset (around ROMO, this is likely an artifact of satellite processing, not a significant phenomenon occurring on the ground). By 2030, ILCIc is expected to decline to 0.789, due solely to forecast growth of low-density residential housing.

Examining these scores in the context of a park's ecoregional average helps to understand the relative role a park is playing in the landscape. ROMO lies within the Southern Rocky Mountain ecoregion, whose ILCIc score is 0.791, 0.782, and 0.776 (respectively). This shows that the region as a whole is undergoing development and the extent of natural landscape has declined in the past decade, and is expected to continue into the near future. For all three time periods ROMO has better than ecoregion scores.

ILCIc for 1992, 2001, and 2030 for Rocky Mountain National Park.



Appendix 2 provides a listing of the Pattern of Natural Landscapes score computed for all National Park units, with the ecoregional averages as a context.

Literature Cited

Riitters, K.H., J.D. Wickham, R.V. O'Neill, K.B. Jones, E.R. Smith, J.W. Coulston, T.G. Wade, and J.H. Smith. 2002. Fragmentation of continental United States forests. *Ecosystems* 5: 815-822.

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Wickham, J.D., K.H. Riitters, T.G. Wade, and C. Homer. 2008. Temporal change in fragmentation of continental US forests. *Landscape Ecology* 23: 891-898.

Appendix 1 – Full NLCDr class description

Class	NLCDr Anderson Level 1 Descriptions
0	No Data
1	Open Water - All areas of open water, generally with less than 25% vegetation or soil cover. Pixels coded to a value of 1 have not changed between 1992 and 2001.
2	Urban - Includes developed open spaces with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses such as large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. Also included are lands of low, medium, and high intensity with a mixture of constructed materials and vegetation, such as single-family housing units, multifamily housing units, and areas of retail, commercial, and industrial uses. Pixels coded to a value of 2 have not changed between 1992 and 2001.
3	Barren - Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits, and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover. Pixels coded to a value of 3 have not changed between 1992 and 2001.
4	Forest - Areas dominated by trees generally taller than 5 meters, and greater than 20% of total vegetation cover. Includes deciduous forest, evergreen forest, and mixed forest. Pixels coded to a value of 4 have not changed between 1992 and 2001.
5	Grassland/Shrub - Includes grassland areas dominated by gramminoid or herbaceous vegetation and shrub/scrub areas dominated by shrubs less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation, including true shrubs, young trees in an early successional stage, or trees stunted due to harsh environmental conditions. Management techniques that associate soil, water, and forage-vegetation resources are more suitable for rangeland management than are practices generally used in managing pastureland. Some rangelands have been or may be seeded to introduced or domesticated plant species. Includes those areas in the Eastern United States that commonly are called brushlands. Pixels coded to a value of 5 have not changed between 1992 and 2001 (Anderson, et al., 1976).
6	Agriculture - including cultivated crops and pasture/hay – Cultivated crops are described as areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. This class also includes all actively tilled land. Pasture/Hay is described as grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pixels coded to a value of 6 have not changed between 1992 and 2001.
7	Wetlands - including woody wetlands and herbaceous wetlands – Areas where forest or shrubland vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water. This class also includes areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water. Pixels coded to a value of 7 have not changed between 1992 and 2001.
8	Ice/Snow - All areas characterized by a perennial cover of ice and/or snow, generally greater than 25% of total cover. Pixels coded to a value of 8 have not changed between 1992 and 2001.
12	Open Water to Urban
13	Open Water to Barren
14	Open Water to Forest
15	Open Water to Grassland/Shrub
16	Open Water to Agriculture
17	Open Water to Wetlands
18	Open Water to Ice/Snow
21	Urban to Open Water
23	Urban to Barren
24	Urban to Forest
25	Urban to Grassland/Shrub
26	Urban to Agriculture
27	Urban to Wetlands
28	Urban to Ice/Snow
31	Barren to Open Water

32	Barren to Urban
34	Barren to Forest
35	Barren to Grassland/Shrub
36	Barren to Agriculture
37	Barren to Wetlands
38	Barren to Ice/Snow
41	Forest to Open Water
42	Forest to Urban
43	Forest to Barren
45	Forest to Grassland/Shrub
46	Forest to Agriculture
47	Forest to Wetlands
48	Forest to Ice/Snow
51	Grassland/Shrub to Open Water
52	Grassland/Shrub to Urban
53	Grassland/Shrub to Barren
54	Grassland/Shrub to Forest
56	Grassland/Shrub to Agriculture
57	Grassland/Shrub to Wetlands
58	Grassland/Shrub to Ice/Snow
61	Agriculture to Open Water
62	Agriculture to Urban
63	Agriculture to Barren
64	Agriculture to Forest
65	Agriculture to Grassland/Shrub
67	Agriculture to Wetlands
68	Agriculture to Ice/Snow
71	Wetlands to Open Water
72	Wetlands to Urban
73	Wetlands to Barren
74	Wetlands to Forest
75	Wetlands to Grassland/Shrub
76	Wetlands to Agriculture
81	Ice/snow to Open Water
82	Ice/snow to Urban
83	Ice/snow to Barren
84	Ice/snow to Forest
85	Ice/snow to Grassland/Shrub
86	Ice/snow to Agriculture
87	Ice/snow to Wetland

Appendix 2. A summary of Pattern of Natural Landscape scores for park units, showing the integrated landscape connectivity index (ILCIc) values. ALso, the ratio of the park to ecoregional ILCIc scores is shown – greater than 1.0 means that park units are in a more natural landscape context than the ecoregion as a whole.

NPS UNIT	ILCIc scores				Park to Ecoregion ratio		
	1992	2001	2030	ECOREGION	1992	2001	2030
ABLI	0.351	0.342	0.342	Interior Low Plateau	2.62	2.59	2.60
ACAD	0.404	0.400	0.400	Northern Appalachian / Acadian	0.63	0.64	0.64
AGFO	0.724	0.751	0.749	Northern Great Plains Steppe	1.53	1.55	1.55
ALFL	0.773	0.839	0.827	Southern Shortgrass Prairie	1.43	1.51	1.49
ALPO	0.309	0.322	0.323	Central Appalachian Forest	1.06	1.10	1.10
AMIS	0.600	0.643	0.596	Chihuahuan Desert	0.69	0.74	0.69
ANDE	0.196	0.195	0.195	East Gulf Coastal Plain	0.60	0.61	0.61
ANJO	0.000	0.000	0.000	Cumberlands/So. Ridge & Valley	0.00	0.00	0.00
ANTI	0.011	0.010	0.010	Central Appalachian Forest	0.04	0.03	0.03
APCO	0.125	0.128	0.128	Piedmont	0.55	0.59	0.60
APIS	0.370	0.370	0.370	Great Lakes	1.59	1.47	1.47
ARCH	0.880	0.869	0.870	Colorado Plateau	1.02	1.01	1.01
ARHO	0.012	0.012	0.012	Lower New England	0.05	0.06	0.06
ARPO	0.207	0.215	0.215	Mississippi River Alluvial Plain	1.84	1.88	1.89
ASIS	0.288	0.302	0.302	Chesapeake Bay Lowlands	2.11	2.21	2.26
AZRU	0.235	0.224	0.211	Colorado Plateau	0.27	0.26	0.25
BADL	0.511	0.516	0.515	Northern Great Plains Steppe	1.08	1.07	1.07
BAND	0.858	0.849	0.845	Southern Rocky Mountains	1.08	1.09	1.09
BEOL	0.296	0.341	0.341	Central Shortgrass Prairie	1.00	1.13	1.14
BIBE	0.850	0.849	0.849	Chihuahuan Desert	0.98	0.98	0.98
BICA	0.795	0.838	0.836	Northern Great Plains Steppe	1.68	1.73	1.73
BICY	0.851	0.872	0.872	Tropical Florida	1.65	1.66	1.69
BISC	0.398	0.405	0.397	Tropical Florida	0.77	0.77	0.77
BISO	0.616	0.606	0.606	Cumberlands/So. Ridge & Valley	1.92	1.97	1.97
BITH	0.597	0.587	0.587	West Gulf Coastal Plain	1.23	1.25	1.25
BLCA	0.745	0.737	0.736	Southern Rocky Mountains	0.94	0.94	0.95
BLRI	0.358	0.345	0.344	Central Appalachian Forest	1.22	1.18	1.18
BLUE	0.456	0.447	0.447	Central Appalachian Forest	1.56	1.52	1.53

BOAF	0.007	0.007	0.007	North Atlantic Coast	0.05	0.05	0.05
BOHA	0.108	0.115	0.115	North Atlantic Coast	0.67	0.72	0.74
BOST	0.006	0.006	0.006	North Atlantic Coast	0.04	0.04	0.04
BOWA	0.159	0.157	0.157	Piedmont	0.70	0.72	0.74
BRCA	0.786	0.781	0.782	Utah High Plateaus	0.97	0.97	0.97
BUFF	0.473	0.468	0.468	Ozarks	2.14	2.19	2.19
CABR	0.025	0.025	0.025	California South Coast	0.06	0.06	0.06
CACH	0.900	0.905	0.902	Colorado Plateau	1.04	1.05	1.05
CACO	0.265	0.275	0.274	North Atlantic Coast	1.64	1.72	1.77
CAGR	0.116	0.118	0.117	Sonoran Desert	0.16	0.17	0.17
CAHA	0.217	0.221	0.219	Mid-Atlantic Coastal Plain	0.92	0.94	0.95
CALO	0.275	0.276	0.276	Mid-Atlantic Coastal Plain	1.16	1.18	1.19
CANA	0.420	0.430	0.428	Florida Peninsula	2.05	2.13	2.18
CANY	0.952	0.946	0.946	Colorado Plateau	1.10	1.10	1.10
CARE	0.862	0.859	0.859	Utah High Plateaus	1.06	1.07	1.07
CARI	0.019	0.014	0.014	West Gulf Coastal Plain	0.04	0.03	0.03
CARL	0.162	0.158	0.157	Southern Blue Ridge	0.38	0.38	0.38
CASA	0.015	0.015	0.013	Florida Peninsula	0.07	0.07	0.07
CATO	0.412	0.413	0.408	Central Appalachian Forest	1.41	1.41	1.40
CAVE	0.924	0.950	0.950	Chihuahuan Desert	1.07	1.10	1.10
CAVO	0.778	0.805	0.805	Southern Shortgrass Prairie	1.44	1.45	1.45
CEBE	0.056	0.056	0.056	Central Appalachian Forest	0.19	0.19	0.19
CEBR	0.703	0.698	0.688	Utah High Plateaus	0.86	0.87	0.85
CHAM	0.017	0.016	0.012	Chihuahuan Desert	0.02	0.02	0.01
CHAT	0.167	0.135	0.126	Piedmont	0.74	0.62	0.59
CHCH	0.257	0.250	0.249	Cumberlands/So. Ridge & Valley	0.80	0.81	0.81
CHCU	0.943	0.941	0.938	Colorado Plateau	1.09	1.09	1.09
CHIC	0.325	0.314	0.314	Crosstimbers Tallgrass Prairie	1.72	1.65	1.68
CHIR	0.900	0.912	0.912	Apache Highlands	1.04	1.06	1.07
CHIS	0.517	0.519	0.519	California South Coast	1.21	1.23	1.27
CHOH	0.224	0.235	0.234	Central Appalachian Forest	0.77	0.80	0.80
CHPI	0.107	0.089	0.088	Mid-Atlantic Coastal Plain	0.45	0.38	0.38
CHRO	0.412	0.416	0.416	Northern Great Plains Steppe	0.87	0.86	0.86
CHSC	0.001	0.001	0.000	Ouachita Mountains	0.00	0.00	0.00
CIRO	0.708	0.712	0.712	Columbia Plateau	1.18	1.18	1.18

COLM	0.733	0.715	0.713	Colorado Plateau	0.85	0.83	0.83
COLO	0.262	0.260	0.255	Chesapeake Bay Lowlands	1.92	1.90	1.91
CORO	0.576	0.575	0.571	Apache Highlands	0.67	0.67	0.67
COSW	0.602	0.598	0.588	Mid-Atlantic Coastal Plain	2.54	2.55	2.54
COWP	0.146	0.146	0.146	Piedmont	0.64	0.67	0.68
CRLA	0.822	0.821	0.821	West Cascades	1.05	1.05	1.05
CRMO	0.485	0.488	0.488	Columbia Plateau	0.81	0.81	0.81
CUGA	0.518	0.513	0.513	Cumberlands/So. Ridge & Valley	1.61	1.66	1.67
CUIS	0.468	0.457	0.450	South Atlantic Coastal Plain	1.35	1.37	1.37
CURE	0.726	0.720	0.720	Southern Rocky Mountains	0.92	0.92	0.93
CUVA	0.234	0.248	0.248	Great Lakes	1.00	0.99	0.99
DAAV	0.000	0.000	0.000	North Central Tillplain	0.00	0.00	0.00
DEPO	0.887	0.883	0.882	Sierra Nevada	1.08	1.08	1.09
DESO	0.082	0.082	0.082	Florida Peninsula	0.40	0.41	0.42
DETO	0.841	0.824	0.824	Black Hills	1.04	1.03	1.03
DEVA	0.939	0.940	0.940	Mojave Desert	1.12	1.12	1.13
DEWA	0.365	0.369	0.354	High Allegheny Plateau	1.04	1.07	1.04
DINO	0.931	0.921	0.921	Utah-Wyoming Rocky Mountains	1.13	1.12	1.12
DRTO	0.281	0.282	0.282				
EBLA	0.102	0.093	0.093	Willamette Valley - Puget Trough	0.41	0.39	0.39
EDIS	0.001	0.001	0.001	Lower New England	0.00	0.00	0.00
EFMO	0.284	0.315	0.316	Prairie-Forest Border	5.15	5.49	5.50
EISE	0.002	0.002	0.002	Lower New England	0.01	0.01	0.01
ELMA	0.790	0.789	0.789	Arizona-New Mexico Mountains	0.88	0.88	0.89
ELMO	0.836	0.833	0.833	Arizona-New Mexico Mountains	0.93	0.93	0.94
ELRO	0.139	0.138	0.136	Lower New England	0.63	0.65	0.64
EUON	0.171	0.170	0.131	California Central Coast	0.35	0.35	0.27
EVER	0.735	0.743	0.742	Tropical Florida	1.43	1.42	1.44
FIIS	0.144	0.153	0.153	North Atlantic Coast	0.89	0.95	0.98
FLFO	0.763	0.734	0.702	Southern Rocky Mountains	0.96	0.94	0.90
FLNI	0.162	0.197	0.197	Central Appalachian Forest	0.55	0.67	0.67
FOBO	0.853	0.854	0.855	Apache Highlands	0.99	1.00	1.00
FOBU	0.810	0.808	0.808	Wyoming Basins	0.99	0.99	0.99
FOCA	0.156	0.151	0.148	South Atlantic Coastal Plain	0.45	0.45	0.45
FODA	0.768	0.761	0.756	Chihuahuan Desert	0.89	0.88	0.88

FODO	0.360	0.371	0.370	Interior Low Plateau	2.69	2.81	2.82
FOFR	0.486	0.456	0.427	South Atlantic Coastal Plain	1.41	1.37	1.30
FOLA	0.181	0.280	0.279	Northern Great Plains Steppe	0.38	0.58	0.58
FOLS	0.034	0.029	0.029	Central Mixed-Grass Prairie	0.12	0.10	0.10
FOMA	0.232	0.251	0.247	Florida Peninsula	1.13	1.25	1.26
FOMC	0.012	0.001	0.001	Chesapeake Bay Lowlands	0.09	0.00	0.00
FONE	0.329	0.334	0.334	Central Appalachian Forest	1.12	1.14	1.14
FOPU	0.438	0.434	0.424	South Atlantic Coastal Plain	1.27	1.30	1.29
FORA	0.236	0.228	0.223	Mid-Atlantic Coastal Plain	1.00	0.97	0.96
FOSC	0.005	0.005	0.005	Osage Plains/Flint Hills Prairie	0.03	0.03	0.03
FOSM	0.009	0.009	0.009	Crosstimbers/So. Tallgrass Prairie	0.05	0.05	0.05
FOST	0.003	0.002	0.002	Great Lakes	0.01	0.01	0.01
FOSU	0.056	0.043	0.040	Mid-Atlantic Coastal Plain	0.24	0.18	0.17
FOUN	0.917	0.912	0.911	Southern Shortgrass Prairie	1.69	1.64	1.64
FOUS	0.168	0.139	0.139	Northern Great Plains Steppe	0.36	0.29	0.29
FOVA	0.001	0.000	0.000	Willamette Valley - Puget Trough	0.00	0.00	0.00
FRHI	0.238	0.240	0.241	Western Allegheny Plateau	1.18	1.20	1.21
FRSP	0.246	0.243	0.220	Piedmont	1.08	1.12	1.03
GARI	0.572	0.570	0.570	Cumberlands / Southern Ridge & Valley	1.78	1.85	1.85
GATE	0.115	0.120	0.120	North Atlantic Coast	0.71	0.75	0.77
GERO	0.000	0.000	0.000	Interior Low Plateau	0.00	0.00	0.00
GETT	0.024	0.027	0.027	Lower New England	0.11	0.13	0.13
GEWA	0.072	0.076	0.076	Chesapeake Bay Lowlands	0.53	0.56	0.57
GICL	0.978	0.977	0.977	Arizona-New Mexico Mountains	1.09	1.09	1.10
GLAC	0.837	0.837	0.837	Canadian Rocky Mountains	1.05	1.05	1.05
GLCA	0.770	0.766	0.765	Colorado Plateau	0.89	0.89	0.89
GLDE	0.000	0.000	0.000	North Atlantic Coast	0.00	0.00	0.00
GOGA	0.369	0.368	0.368	California Central Coast	0.76	0.76	0.77
GOSP	0.491	0.475	0.474	Great Basin	0.58	0.57	0.57
GRBA	0.882	0.873	0.873	Great Basin	1.05	1.05	1.05
GRCA	0.951	0.949	0.949	Colorado Plateau	1.10	1.10	1.11
GREE	0.141	0.139	0.136	Chesapeake Bay Lowlands	1.03	1.01	1.02
GRKO	0.147	0.142	0.142	Middle Rockies - Blue Mountains	0.18	0.18	0.18
GRPO	0.519	0.519	0.517	Great Lakes	2.23	2.07	2.06
GRSA	0.731	0.730	0.729	Southern Rocky Mountains	0.92	0.93	0.94

GRSM	0.738	0.738	0.736	Southern Blue Ridge	1.75	1.79	1.79
GRSP	0.116	0.118	0.118	Piedmont	0.51	0.54	0.55
GRTE	0.796	0.798	0.795	Utah-Wyoming Rocky Mountains	0.97	0.97	0.97
GUCO	0.048	0.046	0.046	Piedmont	0.21	0.21	0.22
GUIS	0.081	0.099	0.099	East Gulf Coastal Plain	0.25	0.31	0.31
GUMO	0.836	0.851	0.850	Chihuahuan Desert	0.96	0.98	0.99
GWCA	0.030	0.030	0.030	Ozarks	0.14	0.14	0.14
GWMP	0.146	0.148	0.137	Piedmont	0.64	0.68	0.64
HAFE	0.168	0.170	0.160	Central Appalachian Forest	0.57	0.58	0.55
HAFO	0.314	0.316	0.316	Columbia Plateau	0.52	0.53	0.53
HAMP	0.018	0.018	0.018	Lower New England	0.08	0.08	0.08
HEHO	0.004	0.004	0.004	Central Tallgrass Prairie	0.15	0.14	0.14
HOBE	0.504	0.483	0.483	Piedmont	2.22	2.22	2.27
HOCU	0.028	0.029	0.029	North Central Tillplain	1.16	1.17	1.18
HOFR	0.176	0.178	0.171	Lower New England	0.80	0.83	0.81
HOFU	0.268	0.276	0.274	Lower New England	1.22	1.29	1.30
HOME	0.059	0.060	0.060	Central Tallgrass Prairie	1.98	1.89	1.90
HOSP	0.354	0.347	0.346	Ouachita Mountains	1.03	1.02	1.02
HOVE	0.712	0.699	0.698	Colorado Plateau	0.82	0.81	0.81
HSTR	0.000	0.000	0.000	Central Tallgrass Prairie	0.00	0.00	0.00
HUTR	0.686	0.677	0.673	Colorado Plateau	0.79	0.79	0.79
IATR	0.100	0.100	0.100	Prairie-Forest Border	1.81	1.74	1.74
ILMI	0.048	0.060	0.060	Great Lakes	0.20	0.24	0.24
INDE	0.000	0.000	0.000	North Atlantic Coast	0.00	0.00	0.00
INDU	0.141	0.193	0.191	Great Lakes	0.60	0.77	0.76
INPE	0.097	0.098	0.098	Aspen Parkland	3.06	2.46	2.46
ISRO	0.417	0.417	0.417	Great Lakes	1.79	1.66	1.66
JECA	0.811	0.796	0.795	Black Hills	1.00	0.99	0.99
JEFF	0.009	0.009	0.009	Ozarks	0.04	0.04	0.04
JELA	0.550	0.544	0.529	Gulf Coast Prairies And Marshes	2.51	2.51	2.46
JICA	0.119	0.107	0.107	East Gulf Coastal Plain	0.36	0.33	0.34
JODA	0.766	0.760	0.760	Columbia Plateau	1.27	1.26	1.26
JODR	0.909	0.908	0.908	Utah-Wyoming Rocky Mountains	1.11	1.10	1.11
JOFL	0.076	0.067	0.067	Central Appalachian Forest	0.26	0.23	0.23
JOMU	0.242	0.240	0.225	California Central Coast	0.50	0.50	0.47

JOTR	0.824	0.824	0.818	Mojave Desert	0.98	0.98	0.99
KEMO	0.198	0.188	0.179	Piedmont	0.87	0.86	0.84
KEWE	0.155	0.176	0.177	Great Lakes	0.66	0.70	0.70
KICA	0.737	0.737	0.736	Sierra Nevada	0.89	0.90	0.91
KIMO	0.465	0.449	0.447	Piedmont	2.05	2.07	2.09
KNRI	0.184	0.201	0.201	Northern Great Plains Steppe	0.39	0.41	0.42
LABE	0.642	0.642	0.642	East Cascades - Modoc Plateau	0.88	0.88	0.88
LACH	0.874	0.872	0.872	East Cascades - Modoc Plateau	1.20	1.20	1.20
LAME	0.856	0.857	0.852	Mojave Desert	1.02	1.02	1.03
LAMR	0.681	0.776	0.769	Southern Shortgrass Prairie	1.26	1.40	1.39
LARO	0.523	0.512	0.512	Canadian Rocky Mountains	0.65	0.64	0.64
LAVO	0.863	0.864	0.863	Klamath Mountains	1.24	1.25	1.25
LEWI	0.332	0.327	0.327	Pacific Northwest Coast	0.57	0.57	0.57
LIBI	0.452	0.444	0.444	Northern Great Plains Steppe	0.96	0.92	0.92
LIBO	0.192	0.194	0.194	Interior Low Plateau	1.43	1.47	1.48
LIRI	0.456	0.450	0.450	Cumberlands / Southern Ridge & Valley	1.42	1.46	1.46
LOWE	0.000	0.000	0.000	Lower New England	0.00	0.00	0.00
LYBA	0.010	0.007	0.007	Chesapeake Bay Lowlands	0.08	0.05	0.06
LYJO	0.343	0.303	0.300	Edwards Plateau	0.46	0.40	0.40
MABI	0.231	0.220	0.220	Northern Appalachian / Acadian	0.36	0.35	0.35
MACA	0.599	0.596	0.596	Interior Low Plateau	4.46	4.51	4.54
MALW	0.000	0.000	0.000	Chesapeake Bay Lowlands	0.00	0.00	0.00
MANA	0.072	0.072	0.071	Piedmont	0.32	0.33	0.33
MANZ	0.773	0.772	0.772	Mojave Desert	0.92	0.92	0.93
MAVA	0.008	0.004	0.004	Lower New England	0.04	0.02	0.02
MEVE	0.778	0.786	0.786	Colorado Plateau	0.90	0.91	0.92
MIIN	0.037	0.028	0.028	Columbia Plateau	0.06	0.05	0.05
MIMA	0.088	0.079	0.079	Lower New England	0.40	0.37	0.38
MISS	0.097	0.116	0.110	Prairie-Forest Border	1.75	2.02	1.92
MNRR	0.220	0.256	0.256	Dakota Mixed-Grass Prairie	2.15	2.36	2.37
MOCA	0.555	0.546	0.516	Apache Highlands	0.64	0.64	0.60
MOCR	0.394	0.349	0.345	Mid-Atlantic Coastal Plain	1.67	1.49	1.49
MOJA	0.900	0.901	0.900	Mojave Desert	1.07	1.08	1.09
MONO	0.012	0.011	0.011	Piedmont	0.05	0.05	0.05
MORA	0.829	0.824	0.824	West Cascades	1.06	1.06	1.06

MORR	0.335	0.334	0.324	Lower New England	1.52	1.56	1.54
MORU	0.708	0.693	0.692	Black Hills	0.88	0.86	0.86
MUWO	0.367	0.367	0.367	California Central Coast	0.76	0.76	0.77
NABR	0.831	0.834	0.834	Colorado Plateau	0.96	0.97	0.97
NACA	0.017	0.015	0.015	Lower New England	0.08	0.07	0.07
NACC	0.001	0.001	0.001	Chesapeake Bay Lowlands	0.01	0.00	0.00
NACE	0.045	0.042	0.039	Chesapeake Bay Lowlands	0.33	0.31	0.29
NATC	0.019	0.010	0.010	Mississippi River Alluvial Plain	0.17	0.08	0.09
NATR	0.239	0.240	0.238	Interior Low Plateau	1.78	1.82	1.81
NAVA	0.914	0.903	0.900	Colorado Plateau	1.05	1.05	1.05
NEBE	0.000	0.000	0.000	North Atlantic Coast	0.00	0.00	0.00
NEPE	0.583	0.581	0.581	Northern Great Plains Steppe	1.23	1.20	1.20
NERI	0.523	0.516	0.516	Cumberlands / Southern Ridge & Valley	1.63	1.67	1.68
NIOB	0.610	0.612	0.611	Dakota Mixed-Grass Prairie	5.96	5.65	5.65
NISI	0.296	0.237	0.237	Piedmont	1.30	1.09	1.11
NOCA	0.853	0.851	0.851	North Cascades	1.14	1.14	1.14
OBRI	0.472	0.448	0.448	Cumberlands / Southern Ridge & Valley	1.47	1.45	1.46
OCMU	0.185	0.184	0.184	South Atlantic Coastal Plain	0.53	0.55	0.56
OLYM	0.880	0.878	0.878	Pacific Northwest Coast	1.50	1.53	1.53
ORCA	0.650	0.646	0.646	Klamath Mountains	0.93	0.93	0.93
ORPI	0.850	0.850	0.849	Sonoran Desert	1.19	1.19	1.20
OZAR	0.573	0.567	0.567	Ozarks	2.59	2.65	2.66
PAAL	0.390	0.395	0.387	Tamaulipan Thorn Scrub	1.08	1.05	1.04
PAIS	0.389	0.390	0.390	Gulf Coast Prairies And Marshes	1.78	1.79	1.81
PECO	0.737	0.723	0.714	Southern Shortgrass Prairie	1.36	1.30	1.29
PEFO	0.919	0.915	0.914	Colorado Plateau	1.06	1.06	1.07
PERI	0.214	0.213	0.212	Ozarks	0.97	0.99	1.00
PETE	0.241	0.237	0.237	Mid-Atlantic Coastal Plain	1.02	1.01	1.02
PETR	0.592	0.571	0.556	Arizona-New Mexico Mountains	0.66	0.64	0.63
PEVI	0.066	0.067	0.067	Great Lakes	0.28	0.27	0.27
PIMA	0.266	0.273	0.272	Sonoran Desert	0.37	0.38	0.38
PINN	0.754	0.754	0.751	California Central Coast	1.56	1.56	1.57
PIPE	0.070	0.070	0.070	Northern Tallgrass Prairie	3.50	2.95	2.96
PIRO	0.582	0.595	0.595	Great Lakes	2.49	2.37	2.37
PISC	0.221	0.223	0.217	Chesapeake Bay Lowlands	1.62	1.63	1.62

PISP	0.818	0.852	0.850	Colorado Plateau	0.94	0.99	0.99
POPO	0.047	0.047	0.047	Mississippi River Alluvial Plain	0.41	0.41	0.41
PORE	0.483	0.482	0.482	California Central Coast	1.00	1.00	1.01
PRSF	0.000	0.000	0.000	California Central Coast	0.00	0.00	0.00
PRWI	0.473	0.460	0.448	Piedmont	2.08	2.11	2.10
RABR	0.832	0.829	0.827	Colorado Plateau	0.96	0.96	0.96
REDW	0.649	0.647	0.647	California North Coast	1.00	1.01	1.01
RICH	0.200	0.192	0.188	Chesapeake Bay Lowlands	1.46	1.41	1.41
ROCR	0.100	0.098	0.084	Lower New England	0.45	0.46	0.40
ROLA	0.767	0.765	0.765	North Cascades	1.02	1.03	1.03
ROMO	0.802	0.806	0.789	Southern Rocky Mountains	1.01	1.03	1.02
RORI	0.000	0.000	0.000	California Central Coast	0.00	0.00	0.00
RUCA	0.418	0.408	0.408	Cumberlands And Southern Ridge And Valley	1.30	1.32	1.33
SAAN	0.095	0.082	0.081	Crosstimbers And Southern Tallgrass Prairie	0.50	0.43	0.43
SACN	0.425	0.433	0.433	Superior Mixed Forest	0.91	0.92	0.91
SAGA	0.239	0.215	0.215	Lower New England	1.09	1.00	1.02
SAGU	0.766	0.756	0.737	Sonoran Desert	1.08	1.06	1.04
SAHI	0.134	0.132	0.130	North Atlantic Coast	0.83	0.82	0.84
SAIR	0.000	0.000	0.000	North Atlantic Coast	0.00	0.00	0.00
SAJH	0.109	0.108	0.108	Willamette Valley - Puget Trough	0.43	0.45	0.46
SAMO	0.322	0.319	0.309	California South Coast	0.76	0.75	0.75
SAND	0.417	0.394	0.394	Central Shortgrass Prairie	1.41	1.30	1.32
SAPU	0.837	0.828	0.826	Arizona-New Mexico Mountains	0.93	0.93	0.93
SARA	0.116	0.118	0.118	Lower New England	0.53	0.55	0.56
SCBL	0.283	0.295	0.295	Northern Great Plains Steppe	0.60	0.61	0.61
SEQU	0.784	0.784	0.775	Sierra Nevada	0.95	0.96	0.96
SHEN	0.545	0.544	0.543	Central Appalachian Forest	1.86	1.85	1.86
SHIL	0.229	0.223	0.223	Upper East Gulf Coastal Plain	0.97	0.94	0.94
SLBE	0.364	0.369	0.369	Great Lakes	1.56	1.47	1.47
SPAR	0.000	0.000	0.000	Lower New England	0.00	0.00	0.00
STEA	0.000	0.000	0.000	Central Appalachian Forest	0.00	0.00	0.00
STLI	0.009	0.009	0.009	Lower New England	0.04	0.04	0.04
STRI	0.048	0.047	0.047	Interior Low Plateau	0.36	0.35	0.36

SUCR	0.705	0.689	0.686	Arizona-New Mexico Mountains	0.78	0.77	0.77
TAPR	0.407	0.423	0.423	Osage Plains/Flint Hills Prairie	2.81	2.82	2.83
THIS	0.114	0.119	0.119	Lower New England	0.52	0.56	0.57
THRO	0.671	0.670	0.670	Northern Great Plains Steppe	1.42	1.38	1.39
THST	0.172	0.171	0.168	Chesapeake Bay Lowlands	1.26	1.25	1.26
TICA	0.665	0.662	0.648	Utah-Wyoming Rocky Mountains	0.81	0.80	0.79
TIMU	0.469	0.461	0.450	South Atlantic Coastal Plain	1.36	1.38	1.37
TONT	0.777	0.781	0.781	Sonoran Desert	1.09	1.10	1.10
TUAI	0.079	0.072	0.072	Upper East Gulf Coastal Plain	0.34	0.30	0.30
TUIN	0.032	0.029	0.029	Upper East Gulf Coastal Plain	0.13	0.12	0.12
TUMA	0.325	0.280	0.274	Apache Highlands	0.38	0.33	0.32
TUZI	0.544	0.548	0.522	Apache Highlands	0.63	0.64	0.61
UPDE	0.441	0.440	0.424	High Allegheny Plateau	1.26	1.28	1.25
VAFO	0.069	0.078	0.078	Lower New England	0.31	0.37	0.37
VAMA	0.138	0.141	0.136	Lower New England	0.62	0.66	0.65
VICK	0.203	0.196	0.196	Upper East Gulf Coastal Plain	0.86	0.83	0.83
VOYA	0.603	0.602	0.601	Superior Mixed Forest	1.29	1.27	1.27
WABA	0.198	0.445	0.445	Central Mixed-Grass Prairie	0.68	1.51	1.51
WACA	0.786	0.776	0.762	Arizona-New Mexico Mountains	0.87	0.87	0.86
WEFA	0.278	0.269	0.253	Lower New England	1.26	1.26	1.20
WHHO	0.000	0.000	0.000	Chesapeake Bay Lowlands	0.00	0.00	0.00
WHIS	0.638	0.633	0.632	Klamath Mountains	0.91	0.91	0.91
WHMI	0.015	0.015	0.015	Columbia Plateau	0.02	0.02	0.02
WHSA	0.616	0.611	0.611	Chihuahuan Desert	0.71	0.70	0.71
WICA	0.821	0.809	0.808	Black Hills	1.02	1.01	1.01
WICR	0.092	0.092	0.092	Ozarks	0.42	0.43	0.43
WIHO	0.000	0.000	0.000	Interior Low Plateau	0.00	0.00	0.00
WORI	0.003	0.003	0.003	Great Lakes	0.01	0.01	0.01
WOTR	0.050	0.049	0.040	Piedmont	0.22	0.23	0.19
WRBR	0.034	0.026	0.024	Mid-Atlantic Coastal Plain	0.14	0.11	0.10
WUPA	0.922	0.920	0.919	Colorado Plateau	1.06	1.07	1.07
YELL	0.917	0.915	0.915	Utah-Wyoming Rocky Mountains	1.11	1.11	1.12
YOSE	0.894	0.891	0.890	Sierra Nevada	1.09	1.09	1.10
YUHO	0.477	0.468	0.468	Colorado Plateau	0.55	0.54	0.54
ZION	0.822	0.824	0.819	Colorado Plateau	0.95	0.96	0.95