ORNL DAAC
DISTRIBUTED ACTIVE ARCHIVE CENTER
FOR BIOGEOCHEMICAL DYNAMICS

NASA

 Sign in

About Us | Products | Data | Tools | Help

DAAC Home > Data > Regional/Global > Vegetation Collections > Data Set Documentation

Land Cover and Land Use Classification for the State of New Hampshire, 1996-2001

Get Data

Documentation Revision Date: 2016-02-11

Data Set Version: 1

Summary

The New Hampshire Geographically Referenced Analysis and Information Transfer System (GRANIT) land cover data set provides a land cover and land use product at 30-m resolution with 23 individual classes across the state. The classification is based largely on the analysis of 12 Landsat Thematic Mapper (TM and ETM+) images. Over 1,400 new classification training site data points were collected to supplement 1,200 archived sites from previous projects. The classification represents a snapshot in time from 1996 to 2001. This time range spans the dates of the most recent acquisitions of a TM scene for each region of the state and the dates of the most recent field data collection.

A variety of other pre-existing data sources were used for non-forested sites, including Digital Orthophotoquads (DOQs), Digital Raster Graphics (DRGs), US Fish and Wildlife Service National Wetlands Inventory (NWI) maps, and local knowledge. Classification of forested sites, as well as some wetland and agricultural sites, required extensive field sampling.

Two GeoTIFFs are provided, each in a different coordinate reference system -- one is in unprojected geographic lat/lon and the other is projected in the New Hampshire State Plane coordinate system.
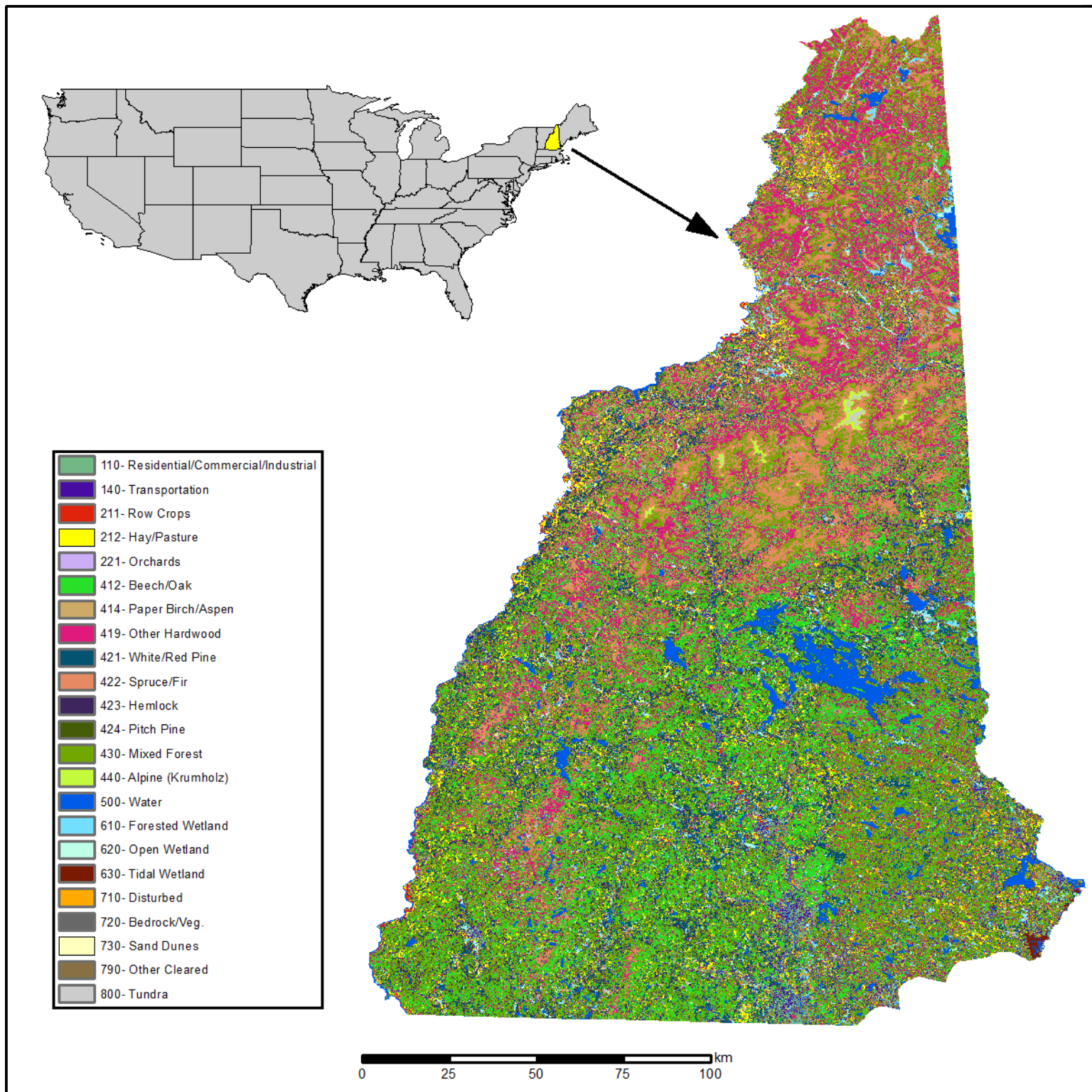
Figure 1. Land cover and land use classification for New Hampshire, 1996-2001, at 30-meter resolution. Legend includes all 23 class numbers and descriptions.

Citation

Justice, D., A.K. Deely, and F. Rubin. 2016. Land Cover and Land Use Classification for the State of New Hampshire, 1996-2001. ORNL DAAC, Oak Ridge, Tennessee, USA. http://dx.doi.org/10.3334/ORNLDAAC/1305

Table of Contents

1. Data Set Overview

Investigators: Justice, D., A.K. Deely, and F. Rubin.

Description:

The New Hampshire GRANIT land cover data set categorizes land cover and land use into 23 classes, based largely on the classification of 12 Landsat Thematic Mapper (TM) images. Particular emphasis was placed on delivering as much detail as possible in the forested and agricultural classes. Class-specific classifications were accomplished through a series of image subsets, masks, and classification iterations of the TM data to produce the final product.

Acknowledgement(s): This data set was originally published by EOS-WEBSTER, a digital library of Earth Science Data and an Earth Science Information Partner, for the EOS-EarthData website at the University of New Hampshire, Durham, NH. The source data were provided to EOS-WEBSTER by NH GRANIT, Complex Systems Research Center, Institute for the Study of Earth, Oceans, and Space, University of New Hampshire. Several EOS-WEBSTER data products have been transferred to the ORNL DAAC for permanent archival.

2. Data Characteristics

Spatial Coverage: This data set represents the entire land area of the State of New Hampshire.

Spatial Resolution: 30 meter

Temporal Coverage: The data covers the period 1996-07-22 to 2001-12-01.

Temporal Resolution: Single estimate in time.

Study Area:

Study Area	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude
New Hampshire	-72.59305556	-70.66083333	45.305	42.69472222

Data File Information:

There are two data files in GeoTIFF format. One is in unprojected geographic lat/lon and the other is projected into the New Hampshire State Plane coordinate system.

The files are named NH_Granit_Landcover_2001-{CRS}.tif where "NH_Granit" is the organization that created the data set and CRS equals a short name for the coordinate reference system (GEO = geographic lat/lon; SPCS = State plane coordinate system).

The land classes corresponding to the GeoTIFF cell values are described in Section 4, Quality Assessment. Classification criteria are listed in Section 5.

NH_Granit_Landcover_2001-GEO.tif

Spatial Data Properties

    Spatial Representation Type: Raster
    Pixel Depth: 16 bit
    Pixel Type: integer
    Compression Type: LZW
    Number of Bands: 1
    Raster Format: TIFF
    No Data Value: -9999
    Scale Factor: 1

    Number Columns: 6947
    Column Resolution: 0.00027778 degrees
    Number Rows: 9409
    Row Resolution: 0.00027778 degrees

    Extent in the item's coordinate system
    North: 45.3072395
    South: 42.6936075
    West: -72.5945282
    East: -70.6647905

Spatial Reference Properties

Type: Geographic
Geographic Coordinate Reference: WGS 1984

Open Geospatial Consortium (OGC) Well Known Text (WKT)
GEOGCS["WGS 84",
    DATUM["WGS_1984",
        SPHEROID["WGS 84",6378137,298.257223563,
            AUTHORITY["EPSG","7030"]],
        AUTHORITY["EPSG","6326"]],
    PRIMEM["Greenwich",0],
    UNIT["degree",0.0174532925199433],
    AUTHORITY["EPSG","4326"]]

NH_Granit_Landcover_2001-SPCS.tif

Spatial Data Properties

Spatial Representation Type: Raster
Pixel Depth: 16 bit
Pixel Type: integer
Compression Type: LZW
Number of Bands: 1
Raster Format: TIFF
No Data Value: -9999
Scale Factor: 0.999966667

Number Columns: 5311
Column Resolution: 30 meter
Number Rows: 10174
Row Resolution: 30 meter

Extent in the item's coordinate system
North: 311901.5
South: 21954.709
West: 227220.438
East: 378577.564

Spatial Reference Properties

Type: Projected
Geographic Coordinate Reference: NAD83
Projection: New Hampshire State Plane

Open Geospatial Consortium (OGC) Well Known Text (WKT)
PROJCS["NAD83 / New Hampshire",
    GEOGCS["NAD83",
        DATUM["North_American_Datum_1983",
            SPHEROID["GRS 1980",6378137,298.2572221010002,
                AUTHORITY["EPSG","7019"]],
            TOWGS84[0,0,0,0,0,0,0],
            AUTHORITY["EPSG","6269"]],
        PRIMEM["Greenwich",0],
        UNIT["degree",0.0174532925199433],
        AUTHORITY["EPSG","4269"]],
    PROJECTION["Transverse_Mercator"],
    PARAMETER["latitude_of_origin",42.5],
    PARAMETER["central_meridian",-71.66666666666667],
    PARAMETER["scale_factor",0.999966667],
    PARAMETER["false_easting",300000],
    PARAMETER["false_northing",0],
    UNIT["metre",1,
        AUTHORITY["EPSG","9001"]],
    AUTHORITY["EPSG","32110"]]

3. Application and Derivation

This land cover data set is relevant for a wide variety of environmental, land management, and modeling applications.

4. Quality Assessment

Classification Categories and Accuracies

The project achieved an overall accuracy of 82.2% at the full 23-class level. Below is a summary of User's and Producer's Accuracy for each of these classes.

CLASS	CODE	PRODUCER'S ACC.	USER'S ACC.
Residential/Commercial/Industrial	110	86.90%	88.30%
Transportation	140	100.00%	85.00%
Row Crops	211	94.60%	88.30%
Hay/Pasture	212	84.60%	91.70%
Orchards	221	97.40%	92.50%
Beech/Oak	412	68.10%	53.30%
Paper Birch/Aspen	414	28.60%	28.60%
Other Hardwood	419	53.20%	70.00%
White/Red Pine	421	90.70%	81.70%
Spruce/Fir	422	93.80%	80.40%
Hemlock	423	95.10%	65.00%
Pitch Pine	424	100.00%	97.50%
Mixed Forest	430	39.70%	62.50%
Alpine (Krumholz)	440	100.00%	80.00%
Water	500	100.00%	100.00%
Forested Wetland	610	74.30%	86.70%
Open Wetland	620	88.20%	75.00%
Tidal Wetland	630	100.00%	100.00%
Disturbed	710	90.00%	90.00%
Bedrock/Veg.	720	100.00%	100.00%
Sand Dunes	730	100.00%	100.00%

Other Cleared	790	82.40%	93.30%
Tundra	800	100.00%	100.00%

When the classification is collapsed to the 17-class level, the overall accuracy is 88.4%, and the User's and Producer's Accuracies are as follows:

CLASS	CODE	PRODUCER'S ACC.	USER'S ACC.
Residential/Commercial/Industrial	110	86.90%	88.30%
Transportation	140	100.00%	85.00%
Crops/Pasture	211-212	95.00%	95.80%
Orchards	221	97.40%	92.50%
Deciduous Forest	410-419	90.70%	94.80%
Coniferous Forest	420-429	97.30%	81.90%
Mixed Forest	430	39.70%	62.50%
Alpine (Krumholz)	440	100.00%	80.00%
Water	500	100.00%	100.00%
Forested Wetland	610	74.30%	86.70%
Open Wetland	620	88.20%	75.00%
Tidal Wetland	630	100.00%	100.00%
Disturbed	710	90.00%	90.00%
Bedrock/Veg.	720	100.00%	100.00%
Sand Dunes	730	100.00%	100.00%
Other Cleared	790	82.40%	93.30%
Tundra	800	100.00%	100.00%

5. Data Acquisition, Materials, and Methods

Source Data for this Project

Landsat Thematic Mapper Images

Image Type	Path-Row	Bands	Date	Georeferencing/Terrain Correction performed by:
Landsat 5 TM	12-30	1-7	8-Sep-90	Complex Systems Research Center, University of New Hampshire
Landsat 5 TM	12-30	1-7	14-May-94	US Geological Survey
Landsat 5 TM	12-30	1-7	24-Oct-95	Complex Systems Research Center, University of New Hampshire
Landsat 5 TM	12-30	1-7	22-Jul-96	US Geological Survey
Landsat 5 TM	13-29	1-7	13-May-91	US Geological Survey
Landsat 5 TM	13-29	1-5	7 6-Oct-92	US Geological Survey
Landsat 5 TM	13-29	1-7	12-Oct-94	US Geological Survey
Landsat 7 ETM+	13-29	1-8	31-Aug-99	ImageLinks, Inc.
Landsat 5 TM	13-30	1-5	7 6-Oct-92	US Geological Survey
Landsat 5 TM	13-30	1-7	28-Oct-94	US Geological Survey
Landsat 5 TM	13-30	1-7	14-Apr-98	US Geological Survey
Landsat 7 ETM+	13-30	1-8	31-Aug-99	ImageLinks, Inc.

Landsat Image Classification Training Data

Over 1,400 new training site data points were collected to supplement 1,200 archived sites from previous projects. Forested sites, as well as some wetland and agricultural sites, required extensive field sampling.

Ancillary Data

A variety of other data sources were utilized in addition to TM imagery. Data for a large number of non-forested sites were available from pre-existing sources within the holdings from the NH GRANIT archive (the NH statewide GIS), including watershed boundaries, panchromatic Digital Orthophotoquads (DOQs), Digital Raster Graphics (DRGs), USGS Digital Line Graphs (DLGs) for hydrography, NH Department of Transportation road centerlines, Digital Elevation Models (DEMs), SPOT panchromatic (10 meter resolution) images, protected lands, and US Fish and Wildlife Service National Wetlands Inventory (NWI) maps.

Classification Processing

Particular emphasis was placed on delivering as much detail as possible in the forested and agricultural classes. Class-specific classifications were accomplished through a series of image subsets, masks, and classification iterations of the TM data to produce the final product. The classification represents a snapshot in time from 1996 to 2001. This time range spans the dates of the most recent acquisitions of a TM scene for each region of the state (July of 1996 and August of 1999) and the dates of the most recent field data collection (December 2001).

After the final classification was complete, NH Department of Transportation road data were "burned in" to the land cover data set, effectively overwriting any coincident class. Also, USGS Digital Line Graphs (DLGs) hydrography data were used to update double banked river, lake, and pond edges. Finally, several filters were applied to remove speckling and produce minimum map units of one acre.

Land Cover and Land Use Classification

The following classes, codes, and descriptions correspond with the legend of Figure 1 and the accuracy assessment tables in Section 4.

The following rules were used to determine forest type:

- Deciduous stands (41x) are forested stands comprising less than 25% coniferous basal area per acre.
- Coniferous stands (42x) are forested stands comprising greater than 65% coniferous basal area per acre.
- Mixed stands (430) are forested stands comprising greater than 25% and less than 65% coniferous basal area per acre.
- Alpine areas (440) contain stunted vegetation, either hardwood or softwood (usually paper birch or spruce/fir), and occur just below tree line in the White Mountains.
- Beech/oak stands (412) and deciduous stands comprising at least 30% beech and oak.
- Paper birch/aspen stands (414 are deciduous stands comprising at least 20% paper birch and aspen.
- Other deciduous stands (419) are deciduous stands not meeting either the beech/oak or paper birch/aspen criteria.
- White/red pine stands (421) are coniferous stands in which white and red pine constitute a plurality of the coniferous basal area.
- Spruce/fir stands (422) are coniferous stands in which spruce and fir constitute a plurality of the coniferous basal are.
- Hemlock stands (423) are coniferous stands in which hemlock constitutes a plurality of the coniferous basal area.
- Pitch pine stands (424) are coniferous stands in which pitch pine constitutes a plurality of the coniferous basal area.

Other class definitions are as follows:

- Developed (110 – built-up areas/ (Note that this class was coded as 100 in early releases of the data.).
- Active agriculture (200) – hay fields, row crops, plowed fields, etc
- Water (500) – lakes, ponds, some rivers or any other open water feature.
- Wetlands (600) – areas dominated by wetland characteristics defined by the U.S. Fish and Wildlife Service National Wetlands Inventory. Basically hydric soils, hydrophytic vegetation and the hydrologic conditions that result in water at or near the surface for extended periods of the growing season.
- Disturbed (710) – gravel pits, quarries or other areas where the earth and vegetation have been altered or exposed.
- Bedrock/vegetated (720) – exposed bedrock or ledge (usually in the mountains) that may have some forms of stunted vegetation growing in cracks or lichens growing on the surface rock.
- Sand dunes (730) – areas along the seacoast that are dominated by sand.
- Cleared/other open (790) – clear cut forest, old agricultural fields that are reverting to forest, etc.
- Tundra (800) – areas dominated by short vegetation that occurs above tree line in the White Mountains (only mapped on MT. Washington). (Note that this class was coded as 810 in early releases of data.

6. Data Access

This data is available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

Land Cover and Land Use Classification for the State of New Hampshire, 1996-2001

Contact for Data Center Access Information:

- E-mail: uso@daac.ornl.gov
- Telephone: +1 (865) 241-3952

7. References

Justice, D., A.K. Deely, and F. Rubin. 2002. New Hampshire Land Cover Assessment: Final Report. Complex Systems Research Center, University of New Hampshire, Durham, NH, 42 p.

OAK RIDGE
National Laboratory

Privacy Policy | Feedback | FAQs | Site Map   Follow @ORNLDAAC

Home	About Us	Products	Data	Tools	Help	Contact Us
	Who We Are	Product Overview	Complete Data Set List	Data Search	FAQs	
	User Working Group	Field Campaigns	Search for Data	Site Search	Tutorials	
	Biogeochemical Dynamics	Validation	Field Campaigns	Search by DOI	Data Management	
	Data Citation Policy	Regional/Global	Validation	WebGIS	Archival Interest	
	News	Model Archive	Regional/Global	SDAT		
	Newsletters		Model Archive	MODIS Land Subsets		
	Workshops			THREDDS		