

## NLCD Sources for AERSURFACE

*Updated November 2024*

AERSURFACE processes land cover data from the National Land Cover Database (NLCD) stored as GeoTIFF files which are georeferenced files in the Tagged Image File Format (TIFF). For data years and areas where available, land cover data can be supplemented with percent impervious and percent tree canopy data that are also stored as GeoTIFF files.

AERSURFACE requires that the data in the GeoTIFF files are **not compressed**, meaning they should not be generated using a lossless compression algorithm including LZW, PACKBITS, or DEFLATE which are allowed per the TIFF 6.0 specifications but AERSURFACE is not able to interpret. Data in the GeoTIFF file must be stored **uncompressed** for AERSURFACE to extract the data from the file.

### NLCD Data Sources in GeoTIFF Format Compatible with AERSURFACE

There are currently two known sources of NLCD data in the GeoTIFF format that can be processed directly with AERSURFACE, without the need for further conversion. The primary source of NLCD data that are the most up-to-date and representative is the Multi-Resolution Land Characteristics (MRLC) Consortium at <https://www.mrlc.gov/>. The MRLC website should also be the primary source for documentation on the NLCD data. As a secondary source, the EPA has made available an archive of NLCD data products in GeoTIFF format on a public facing EPA server. Data from both of these sources can be accessed and downloaded using a web browser. The data products that are available and how to access and download them are discussed in the sections that follow.

### NLCD Data from the MRLC Website

Annual land cover and percent impervious data are available from the MRLC for the conterminous US (CONUS) for all years between 1985 and 2023. Percent tree canopy data are also available for the CONUS, Alaska, Hawaii, and Puerto Rico for all years between 2011 and 2021. Legacy NLCD land cover and percent impervious data for Alaska, Hawaii, and Puerto Rico are available for select years; an inventory of the NLCD products that are available from the MRLC for these areas is provided in Table 1.

Users should note that all previous NLCD years for the CONUS were updated and re-released in 2024 with the release of the new annual NLCD data products. All annual NLCD land cover years now use the 16 Anderson Level II land cover classes. Users should also note that AERSURFACE version 24142 cannot process the newly available pre-1993 NLCD years (i.e., 1985 to 1992) if the corresponding 4-digit year (e.g., “NLCD1985”, “NLCD1992”, etc.) is used due to differences in the land cover classification system used in the latest edition of these NLCD years and those hard coded in AERSURFACE. Therefore, users should use the 1993 DATAFILE keyword (i.e., “NLCD1993”) to process annual NLCD for years 1985 to 1992 until an updated version of AERSURFACE is released. Be sure to clearly document the representative NLCD year and edition that is processed (i.e., newly released annual NLCD or legacy NLCD).

**Table 1. Inventory of Land Cover and Impervious NLCD Data Products for Alaska, Hawaii, and Puerto Rico from the MRLC Consortium.**

<b>Year</b>	<b>Data</b>	<b>Alaska*</b>	<b>Hawaii</b>	<b>Puerto Rico</b>
2001	Land Cover	✓	✓	✓
	Impervious	✓	✓	✓
2011	Land Cover	✓		
	Impervious	✓		
2016	Land Cover	✓		
	Impervious	✓		
* Percent impervious and percent tree canopy data are available for only portions of Alaska and data types available do not overlap for all areas where available.				

## Downloading NLCD Products Using the MRLC Viewer

GeoTIFF files that are compatible with AERSURFACE can be downloaded for a user-specified area from the MRLC website using the MRLC Viewer tool found at <https://www.mrlc.gov/viewer/>. Follow the series of steps below to download a zip file that contains the GeoTIFF files that are available for the area you select. The Raleigh-Durham International Airport (RDU) is used as the example in the steps listed.

**Step 1: Go to the MRLC Viewer at <https://www.mrlc.gov/viewer/>**

When the MRLC Viewer loads, it should look similar to the web page shown in

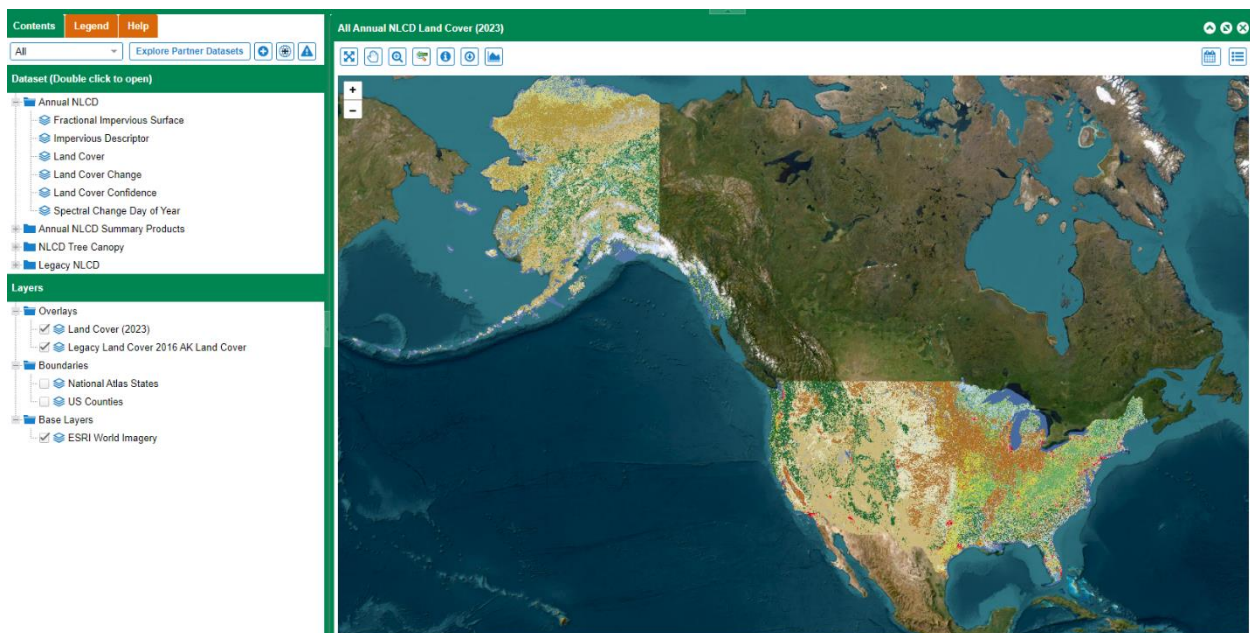


Figure 1. If the “NLCD Land Cover” folder in the left panel is not expanded as shown in

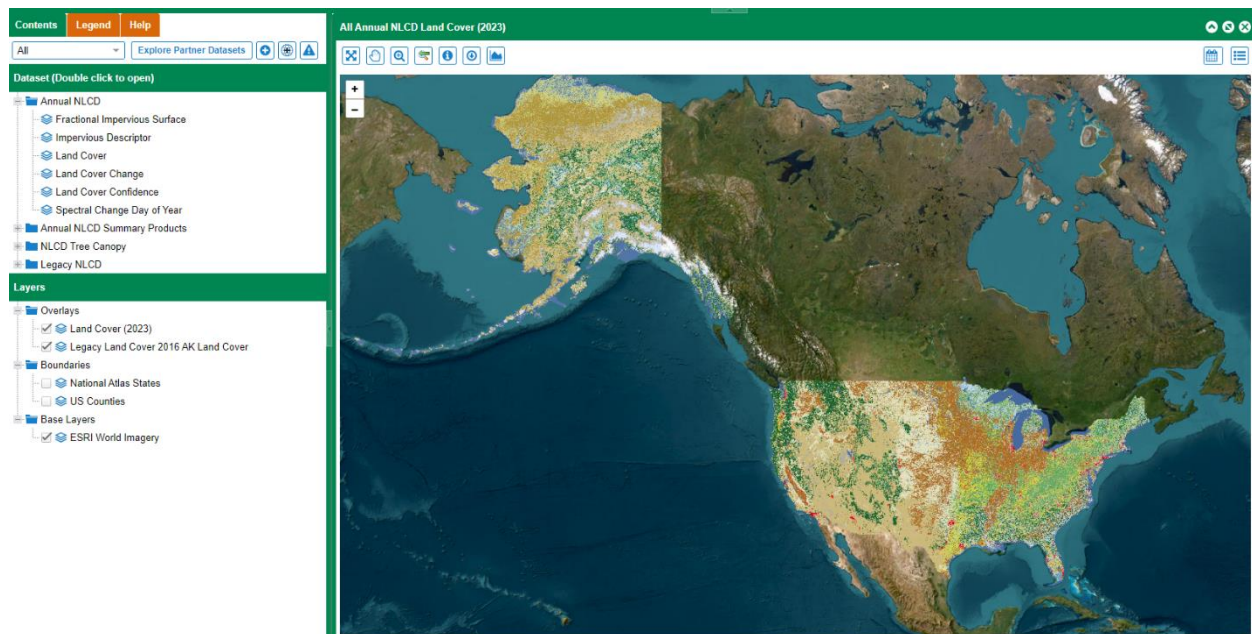


Figure 1, click on the “+” beside the folder icon to expand the “NLCD Land Cover” folder. The items in the expanded list are various land cover layers that can be displayed in the navigation panel on the right.

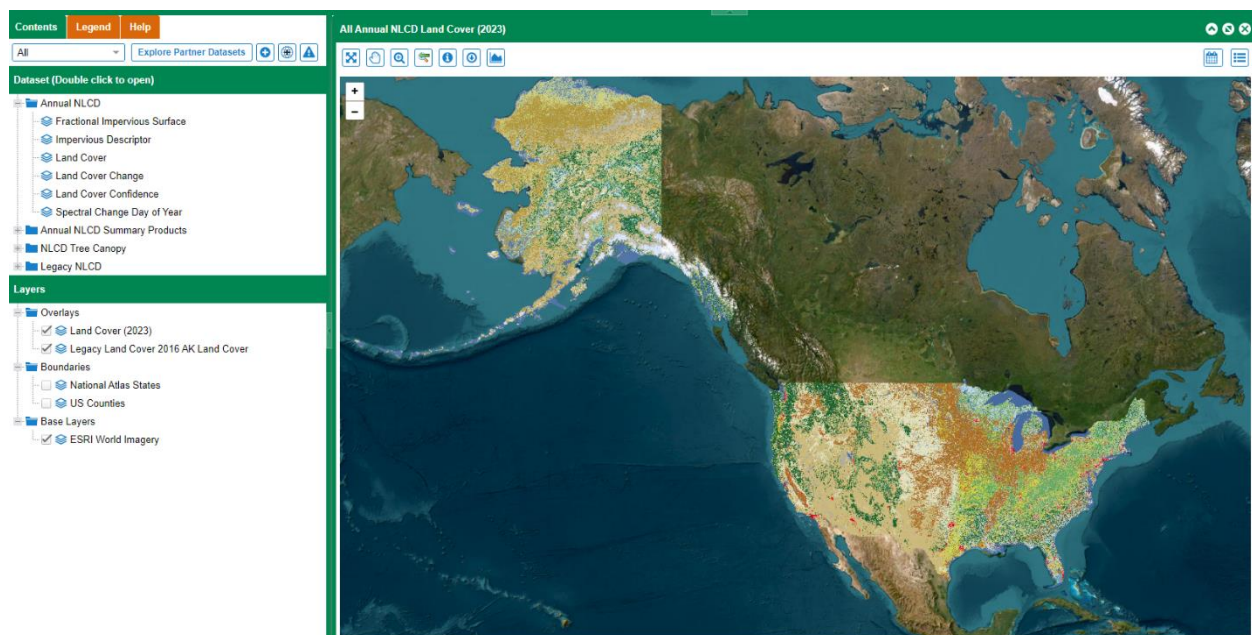
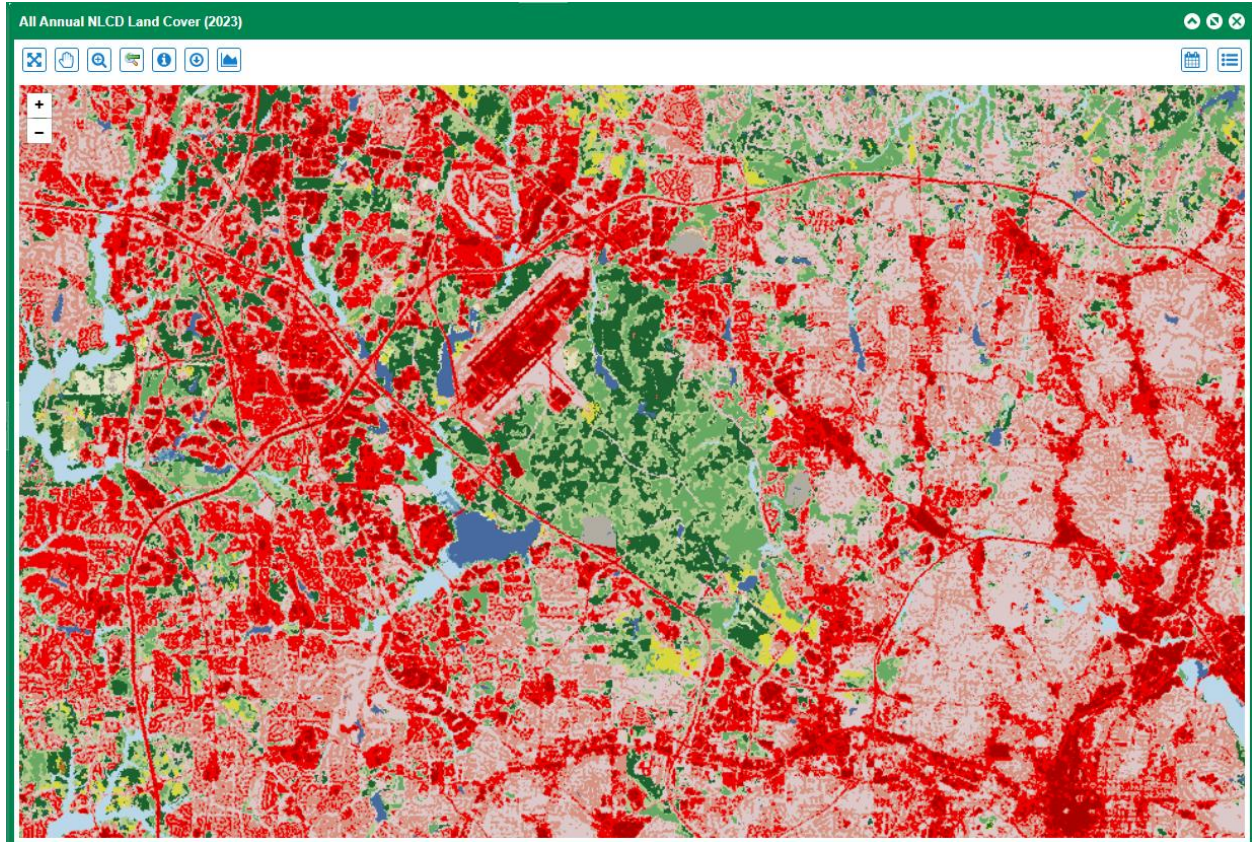


Figure 1. MRLC Viewer



## Step 2: Zoom the area to download

In the navigation panel above the map, use the magnifying glass icon to zoom in on the area you want to download. Click on the magnifying glass then click and drag the cursor to outline the area you want zoom in on. (Ex. RDU in Figure 2.)

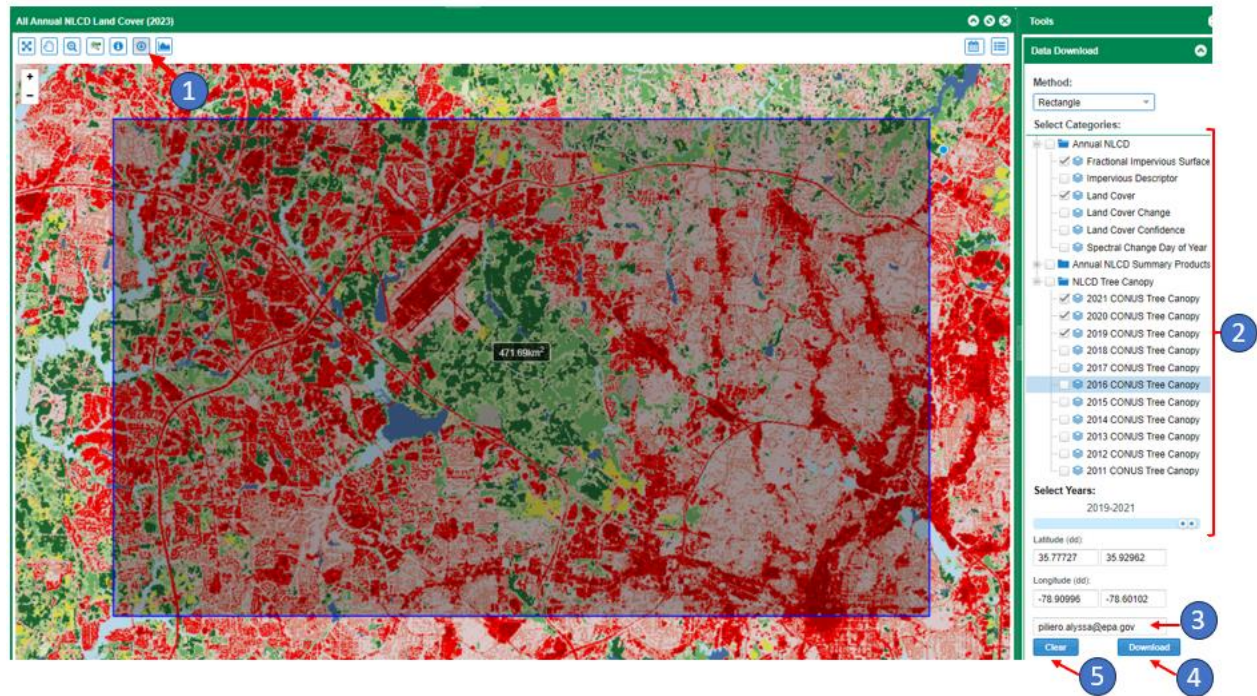


**Figure 2. RDU Location in MRLC Viewer**

### Step 3: Complete Download Form

To download the NLCD data for the area displayed, follow the numbered steps below which refer to the numbered items in Figure 3.

1. Click on the download button to initiate the download form. This will open a “Data Download” panel to the right and prompt you to draw a box around the area you would like to download data for. Once the box is drawn, you will specify the type and years of data you want to download in the panel on the right. When drawing the box around the area, please ensure that it is greater than 100 km<sup>2</sup> (10 km x 10 km) because AERSURFACE will give a fatal error for areas less than or equal to 100 km<sup>2</sup>.
2. The types of data that are available for the area displayed will be listed in the “Data Download panel”. Select the data types and year selection. For land cover and fractional impervious surface datasets, you should use the “Select Years” slider bar to select the years you wish to download. For tree canopy data, you should select the individual years by selecting the corresponding boxes. Note that depending on the size of the area and the data requested, this file could very large, on the order of one or more Gigabytes. EPA recommends downloading the land cover, impervious, and tree canopy data at the same time to ensure the files are the same size however, if file size is a concern they may be downloaded separately.
3. Enter the email address, where indicated, where you would like to receive notification when the file is ready to download.
4. Click the Download button. An information window will pop-up to inform you that your data request will be processed within 24 hours; however, it is usually within minutes.
5. If you need to redefine your selection, either to make a correction or a zoom to a different area, click on the Clear button and repeat the selection process.

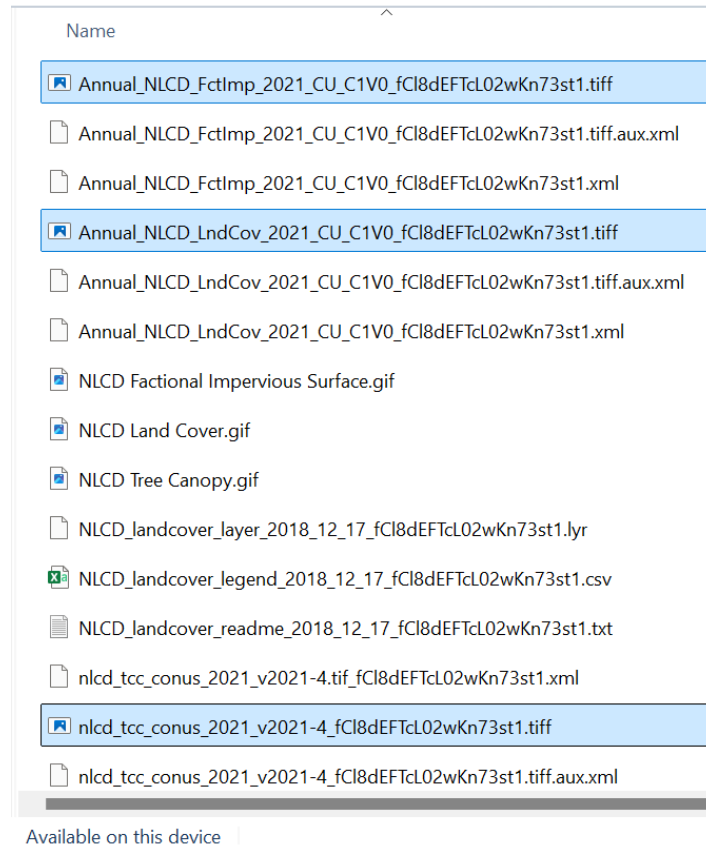


**Figure 3. MRLC Data Download**

#### **Step 4: Download a Zipped NLCD Data File**

Once the data requested have been processed, you will receive an email with a link to download a zipped file that contains the data requested. As stated previously, depending on the size of the area and the data requested, this file can be very large, on the order of one or more Gigabytes. The zipped file will contain other NLCD products in addition to those needed for AERSURFACE, such as change indices, a legend, and various other metadata files some of which are also GeoTIFF files. Depending on the data requested, look for land cover, tree canopy, and impervious files with a .tiff extension. Figure 4 shows a listing of files within the zipped file downloaded for the area at RDU shown in Figure 3, above. The land cover, tree canopy, and impervious data files in GeoTIFF format that can be processed with AERSURFACE are highlighted.





**Figure 4. RDU Zipped File Contents from MRLC Viewer**

## Downloading NLCD Data Products on the EPA FTP Server

A secondary source for obtaining NLCD data files that are compatible with AERSURFACE is the EPA FTP server at <https://gaftp.epa.gov/aqmg/nlcd/>. Using nationwide NLCD files available from the MRLC website in ERDAS IMAGINE File Format (IMG), the EPA has generated sets of GeoTIFF files for the 2001, 2006, 2011, 2013, 2016, 2019, and 2021 NLCD land cover, tree canopy, and impervious files, for the CONUS only at this time, that can be processed directly with AERSURFACE. The EPA also generated a comparable set of GeoTIFF files for the 1992 NLCD using nationwide ArcGrid files previously archived by the EPA. When processing the old edition of the 1992 NLCD available on the EPA's FTP site, use the DATAFILE keyword "NLCD1992" with AERSURFACE version 24142.

The files available on EPA's FTP server range in coverage from partial state, as in the case of Texas and California, to multi-state depending on the size of individual and adjacent states. In the case of files with multi-state coverage, states have been combined based on EPA



Region. Coverage for the CONUS is split across 29 files. The NLCD directory on EPA's FTP server has been re-structured to organize the NLCD files by the release edition (i.e., 1992, 2011, 2016, and 2021) to provide the most recent version of each NLCD year. The most recently released 2001 NLCD does not include tree canopy, so EPA has included an archive of the 3 x 3 degree and state files from the 2011 edition of the 2001 NLCD, which included land cover, impervious, and tree canopy for the CONUS. Zipped files can be accessed and downloaded directly via a web browser at <https://gaftp.epa.gov/aqmg/nlcd/>. Table 2 lists the subdirectories on the FTP server and a description of their contents.

With the exception of the "2001\_2011ed/" directory, zipped files are named by data year, region, and state coverage and contain land cover, impervious, and tree canopy data as applicable for the year and area. For example, in the 2016 directory, the file "2016\_R01\_CT-MA-ME-NH-RI-VT.zip" contains land cover, impervious, and tree canopy data in GeoTIFF format that includes coverage for the following EPA Region 1 states: Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, and Vermont. The GeoTIFF files that can be processed by AERSURFACE end with the file extension ".tif." The zipped file also contains a text file that lists the file header information for each of the GeoTIFF files. As shown in Table 2, there is also a directory name "region\_state\_jpg" that contains JPEG files similarly named that illustrate the coverage of the comparable GeoTIFF files in the other directories.

The "2001\_2011ed" directory contains subfolders for zipped state and 3x3 degree files. Land cover, tree canopy, and impervious files are zipped separately. States files are named by NLCD year, data type, and state name. 3x3 degree files are named by NLCD year, data type, and latitude and longitude of the southeast corner of the file.

**Table 2. EPA FTP Directory Descriptions**

<b>Base Directory: <a href="https://gaftp.epa.gov/aqmg/nlcd/">https://gaftp.epa.gov/aqmg/nlcd/</a></b>		
<b>Subdirectory 1</b>	<b>Subdirectory 2</b>	<b>Description</b>
1992/		1992 NLCD, partial/multi-state coverage
2001_2011ed/		2001 NLCD (2011 edition), state and 3x3 degree coverage
2011-2016_2016ed/	2001/	2001 NLCD (2016 edition), partial/multi-state coverage
2011-2016_2016ed/	2006/	2006 NLCD (2016 edition), partial/multi-state coverage
2011-2016_2016ed/	2011/	2011 NLCD (2016 edition), partial/multi-state coverage
2011-2016_2016ed/	2016/	2016 NLCD (2016 edition), partial/multi-state coverage
2011-2021_2021ed/	2011/	2011 NLCD (2021 edition), partial/multi-state coverage
2011-2021_2021ed/	2013/	2013 NLCD (2021 edition), partial/multi-state coverage
2011-2021_2021ed/	2016/	2016 NLCD (2021 edition), partial/multi-state coverage
2011-2021_2021ed/	2019/	2019 NLCD (2021 edition), partial/multi-state coverage
2011-2021_2021ed/	2021/	2021 NLCD (2021 edition), partial/multi-state coverage
region_state_jpg/		JPEG image files illustrating coverage of partial/multi-state GeoTIFFs
Release-1900-x64-gdal-2-3-2-mapserver-7-2-1.zip		Opensource GDAL binaries (Windows x64) for command-line execution used to convert national-scale NLCD files into region/state-specific files as GeoTIFF files. Additional information and newer releases available at <a href="https://www.gisinternals.com/index.html">https://www.gisinternals.com/index.html</a> .

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