NLCD Sources for AERSURFACE, Version 20060

Updated 4/23/2020

As with previous versions of AERSURFACE, version 20060 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 version 20060, 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

Land cover data are available from the MRLC for the conterminous US (CONUS) for 2001, 2006, 2011, and 2016. The MRLC has also released land cover data for several intermediate years, but AERSURFACE does not include keywords to process the intermediate years. Percent impervious and/or percent tree canopy data are also available for the CONUS for select years. Similarly, land cover, impervious, and tree canopy for Alaska, Hawaii, and Puerto Rico are available for select years.

Users should note that the 2001, 2006, and 2011 NLCDs were recently updated and released with the 2016 NLCD. The 2001, 2006, and 2011 NLCD products on the MRLC website are the most recent version and replace all earlier editions of these data. However, the updates do not include all products that were included with earlier editions. For example, the updated 2001 NLCD includes percent land cover and percent impervious data for the CONUS but does not include percent tree canopy, whereas the 2011 edition of the 2001 NLCD included all three data types for the CONUS. An inventory of the 2001, 2006, 2011, and 2016 NLCD products that are available from the MRLC is provided in Table 1.

Table 1. Inventory of NLCD Data Products from the MRLC Consortium.

Year	Data	Conterminous US	Alaska*	Hawaii	Puerto Rico
2001	Land Cover	✓	✓	✓	✓
	Impervious	✓	✓	✓	✓
	Canopy				
2006	Land Cover	✓			
	Impervious	✓			
	Canopy				
2011	Land Cover	✓	✓		
	Impervious	✓	✓		
	Canopy	✓	✓	✓	✓
2016	Land Cover	✓	✓		
	Impervious	✓	✓		
	Canopy	✓	✓	✓	✓

* *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.

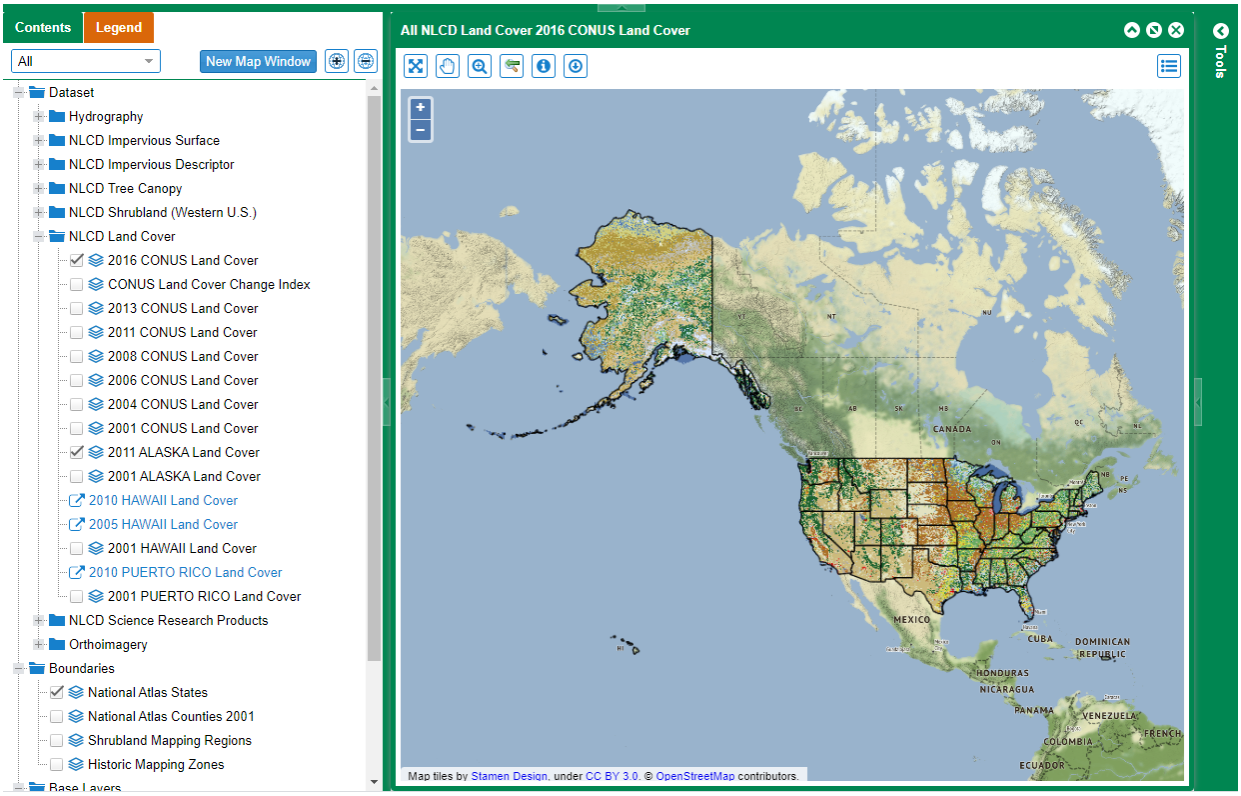

Figure 1. MRLC Viewer

Step 2: Zoom the area to download

In the navigation panel on the right, 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.)

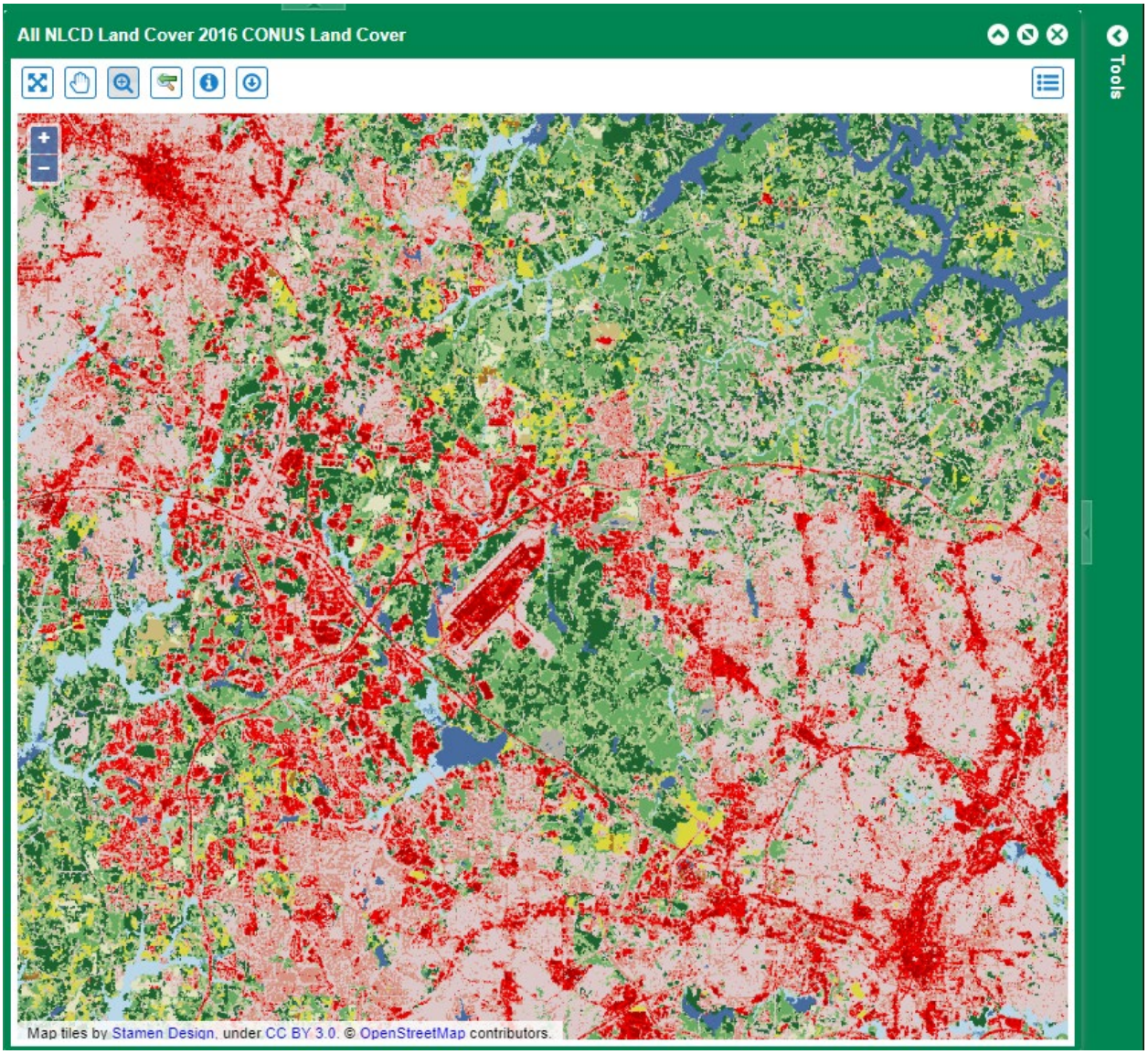

Figure 2. RDU Location in MRLC Viewer

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 where you will specify the type and years of data you want to download.

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. Often, you will have the option to download "All Years" or "2016 Only." 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. If file size is a concern, consider downloading land cover, impervious, and tree canopy data 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.

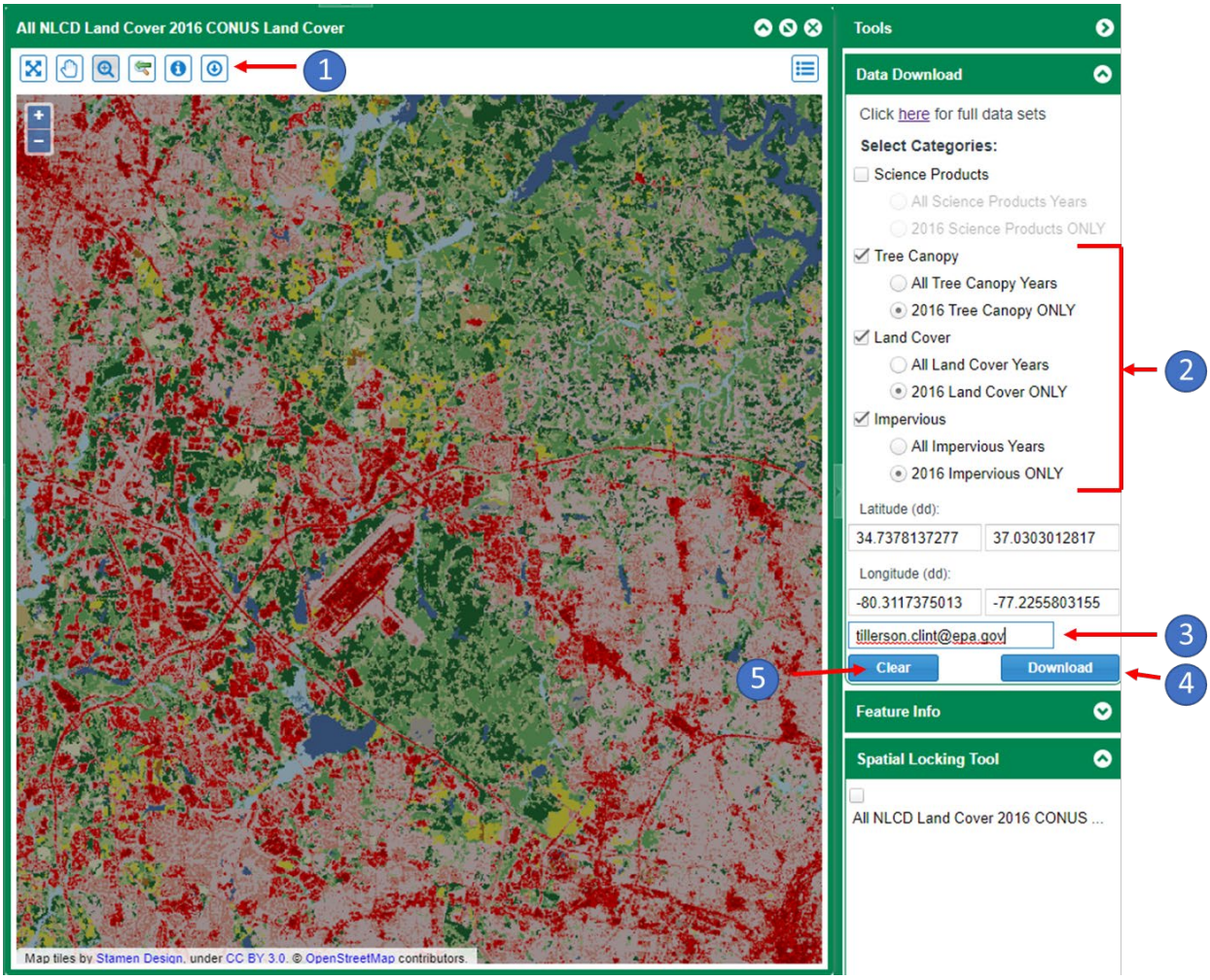

Figure 3. MRLC Data Download

Step 4: Download and 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 2 and Figure 3, above. The land

cover, tree canopy, and impervious data files in GeoTIFF format that can be processed with AERSURFACE are highlighted.

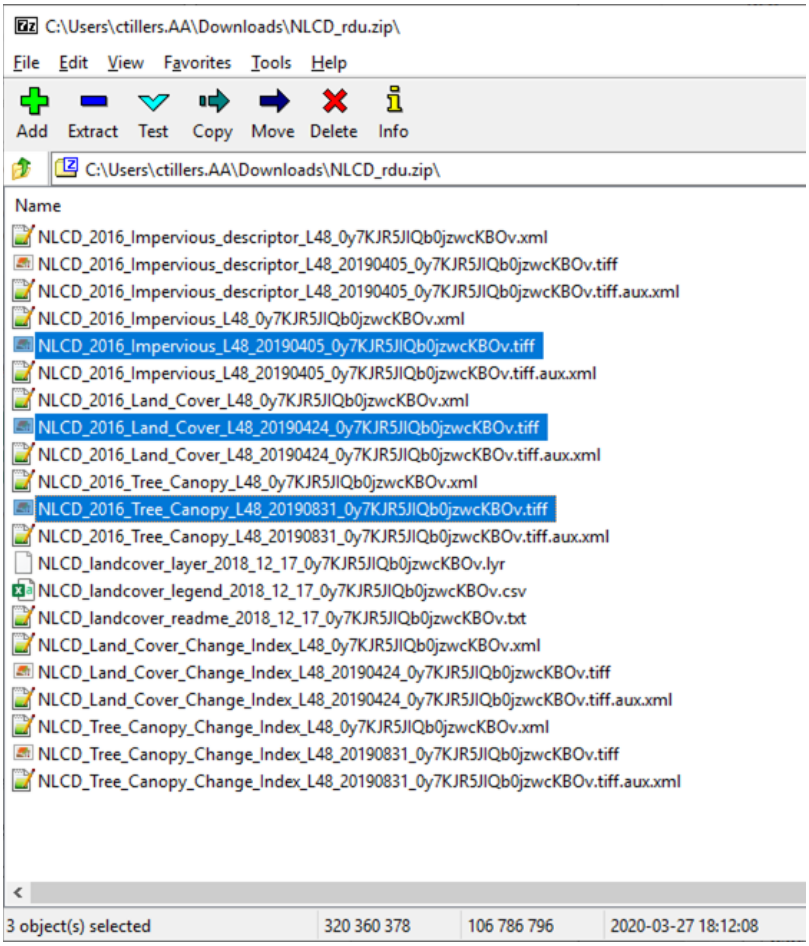

Figure 4. RDU Zipped File Contents from MRLC Viewer

Dowloading 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 ftp://newftp.epa.gov/Air/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 most recent release of the 2001, 2006, 2011, and 2016 NLCDs, for the CONUS only at this time, that can be processed directly with AERSURFACE version 20060. The EPA also generated a comparable set of GeoTIFF files for the 1992 NLCD using nationwide ArcGrid files previously archived by the EPA.

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. Because the recently released 2001 NLCD does not include tree canopy, the EPA has also 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 ftp://newftp.epa.gov/aqmg/nlcd/. Table 2 lists the subdirectories on the FTP server and a description of their contents.

Table 2. EPA FTP Directory Descriptions

Base Directory: ftp://newftp.epa.gov/aqmg/nlcd/	
Subdirectory	**Description**
1992/	1992 NLCD, partial/multi-state coverage
2001/	2001 NLCD, updated with 2016 NLCD release, partial/multi-state coverage
2001_2011ed/	2001 NLCD (2011 edition), state and 3x3 degree coverage
2006/	2006 NLCD, updated with 2016 NLCD release, partial/multi-state coverage
2011/	2011 NLCD, updated with 2016 NLCD release, partial/multi-state coverage
2016/	2016 NLCD, partial/multi-state coverage
region_state_jpg/	JPEG image files illustrating coverage of partial/multi-state GeoTIFFs

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.

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