

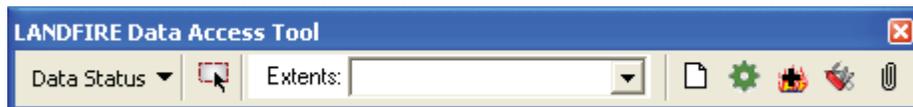
Introduction



The LANDFIRE Data Access Tool is an ArcGIS toolbar that allows users to interact with the USGS National Map and download LANDFIRE data directly from ArcMap. Once the data are downloaded, it can automatically process the data into raster formats ready for analysis.

Users should be familiar with the operation of the LANDFIRE data distribution web site on the USGS National Map (<http://landfire.cr.usgs.gov/viewer/>) prior to using this tool. In summary, the National Map provides a web browser interface where users can select LANDFIRE data layers for download, drag a box on a map to define an extent rectangle, and download the selected layers as zipped files in either ESRI ArcGRID or GeoTiff format. The downloaded files are given an eight-digit random number that needs to be changed to the LANDFIRE layer name. Also, depending on the size of the extent rectangle, the raster layers may be separated into multiple pieces that will need to be merged back together by the user after download.

The LANDFIRE Data Access Tool (LFDAT) allows an ArcGIS user to drag a box in an ArcMap session to define a download area, select the desired LANDFIRE layers, and then download data from the National Map for the specified extent rectangle. All of the randomly named zip files should be downloaded to a single folder. The downloaded zip files can be from any number of LANDFIRE layers, can include single-piece or multiple-piece downloads, and can include layers from any number of different spatial extent rectangles. Once all the data of interest have been downloaded as zip files to a single folder, the LANDFIRE Data Access Tool Smart Assembler will batch unzip the files, automatically rename the layers to correct LANDFIRE names, merge multiple-piece layers back into a single output layer if necessary, and reattach attribute fields to the output raster attribute tables. Output raster layers can be generated in ESRI GRID, Erdas Imagine, or GeoTiff formats.



NOTE: Users should be aware that by using the LANDFIRE Data Access Tool they will be bypassing information found on both the landfire.gov and National Map web sites. This includes important current information regarding data layers, including new updates, known issues with a particular layer, or other information critical to using LANDFIRE data. Users of the Data Access Tool are, therefore, strongly encouraged to consult the landfire.gov and National Map web sites on a regular basis to keep aware of new information. The download window in the Data Access Tool contains hyperlinks to landfire.gov pages with important information regarding data layers.

System prerequisites

LFDAT for ArcGIS 9.2/9.3/9.3.1 prerequisites:

- ArcGIS 9.2, 9.3, or 9.3.1
- Microsoft .NET Framework version 2.0 or later
- The ESRI .NET libraries for ArcGIS. These are usually located at C:\Program Files\ArcGIS\DotNet. The .NET framework should be installed prior to ArcGIS in order for these libraries to be added during installation. Otherwise users will need to modify the installation via the ArcGIS DVD after installing the .NET Framework. At 9.2, ESRI provides the .NET Framework on the installation DVD.

LFDAT for ArcGIS 10 prerequisites:

- ArcGIS 10
(Microsoft .NET Framework 3.5 SP1 is an ESRI system requirement for ArcGIS 10, so computers with ArcGIS 10 installed can be assumed to meet the .NET requirements for LFDAT)

Installation

LANDFIRE Data Access Tool can be accessed through a link on the landfire.gov web site. The installation package is a zip file containing a setup program and documentation. Please see the README_1st.txt file for important information prior to installing LFDAT.

Installation should be done with administrator privileges on the local computer. Previous versions of LFDAT should be uninstalled prior to installing LFDAT 2.3. Please note that uninstalling LFDAT will remove any previously saved extent rectangles. To preserve saved extents, make a backup copy of the Access database file named LFDT_UserData.mdb. This file is located in one of the following directories:

- LFDAT 2.0 – in the program installation folder, “C:\Program Files\LANDFIRE Data Access Tool” by default.
- LFDAT 2.1 – in the All Users profile folder for application data, normally “C:\Documents and Settings\All Users\Application Data\LANDFIRE Data Access Tool”
- LFDAT 2.2 – in the user-specific profile folder for application data. This folder is specified by the APPDATA environment variable. In a command prompt window, type the word "set" without quotes and press Enter. Scroll up to the line that begins "APPDATA=". The directory location specified by APPDATA contains a subdirectory named LFDAT where LFDT_UserData.mdb is stored.

With all ArcGIS programs closed, double-click the executable setup program to install LFDAT. On the next launch of ArcMap there will be a new dockable toolbar available called “LANDFIRE Data Access Tool.” If the toolbar does not appear, it can be activated from the ArcMap main menu by clicking View > Toolbars > LANDFIRE Data Access Tool.

After successfully installing LFDAT 2.3, previously saved extents can be restored if necessary by replacing the LFDT_UserData.mdb file with the backup copy referred to above.

NOTE: *LFDAT relies on configuration databases that store information about the LANDFIRE National Map system and LANDFIRE data layers. Users are encouraged to update these configuration databases periodically using the Web Update feature. Please see page 9 of this User Guide for more information on the update process.*

LANDFIRE Data Access Tool Quick Start



Command to add a layer to ArcMap showing LANDFIRE data availability by map zone

Dropdown of saved extent rectangles which can be reused for downloads

Command to add a new saved extent rectangle by entering coordinates

About form with Web Update

Raster Utilities: Reproject (GDAL-based), Build LCP, Attach DBF to VAT, and LCP-to-ArcGrids

Tool to drag an extent rectangle in ArcMap and download data from the National Map

Add Data button customized for LANDFIRE layers

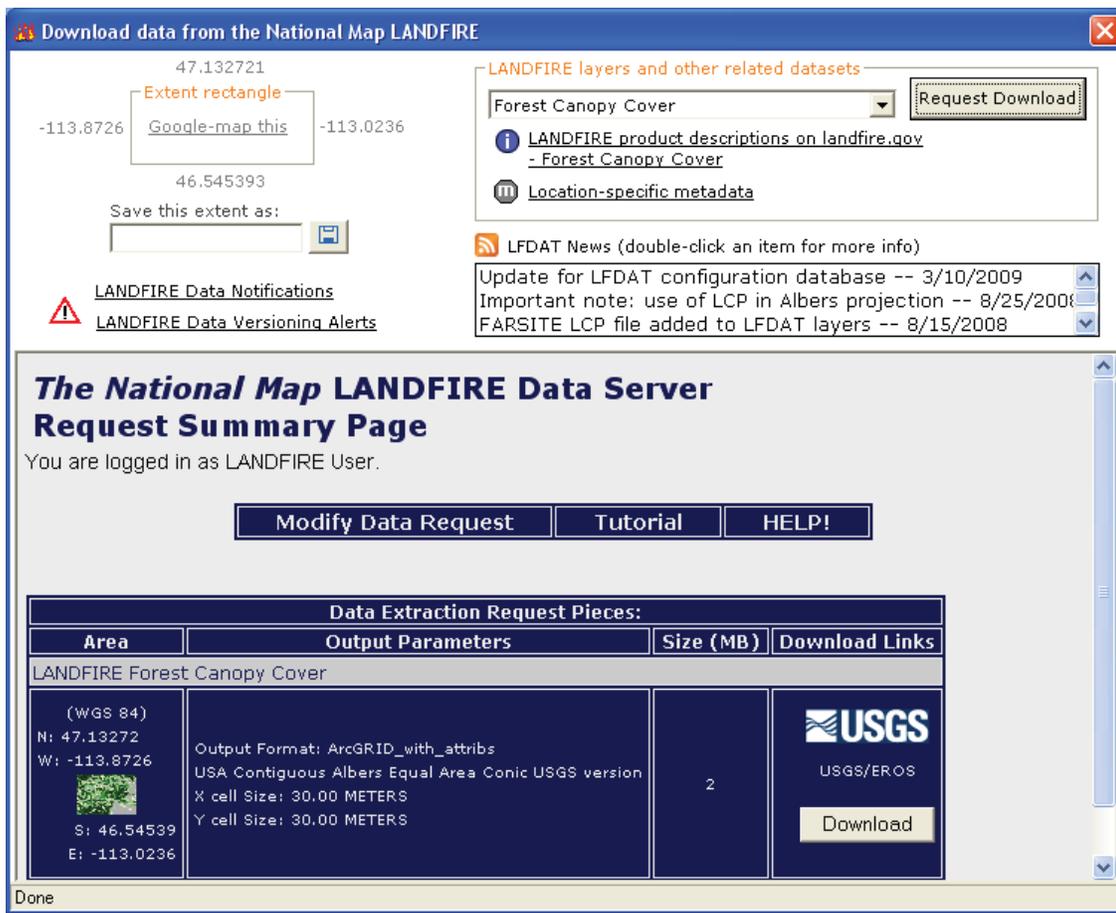
The LANDFIRE Smart Assembler processes zipped LANDFIRE data downloaded from the National Map. Specify an input folder containing the zip files and the Assembler will batch unzip the files, determine layer names, and merge multi-piece downloads if necessary. Optionally specify reprojection to a different coordinate system. Output is written to a specified folder in either ArcGrid, ERDAS Imagine, or GeoTiff format.

Detailed Usage Instructions



Using the LANDFIRE Data Access Tool generally involves four steps:

1. (If necessary) Verify that LANDFIRE data are available from the National Map for the area of interest. The Data Status drop-down (button 1) adds a polygon layer to ArcMap for CONUS, Alaska, or Hawaii, depicting current data availability by LANDFIRE map zone.
2. Define an extent rectangle and download data.
First, add any layers in ArcMap that help define an area of interest. Clicking Button 2  activates a tool to click and drag a box in ArcMap. The box defines the download extent. When the mouse button is released, a form opens allowing LANDFIRE and related data layers to be downloaded from the National Map:



The coordinates of the current extent rectangle are shown in the upper left corner of the download form. The extent rectangle can be saved by typing a name up to 30 characters long in the box labeled “Save this extent as,” then clicking the Save button next to the text box. After saving an extent rectangle, its name will appear in the Saved Extents dropdown list on the main toolbar (labeled “3” in the screen shot above). Saved extents can be reused later to perform additional downloads with the exact same coordinates. In addition, the current extent rectangle can be displayed on a Google Map using the hyperlink labeled “Google-map this.”

In the top right portion of the download form, a LANDFIRE layer can be selected from the dropdown list of available layers. After a layer is selected, a hyperlink appears below the layer dropdown. Clicking the hyperlink opens a web browser to the landfire.gov product information page for the currently selected layer.

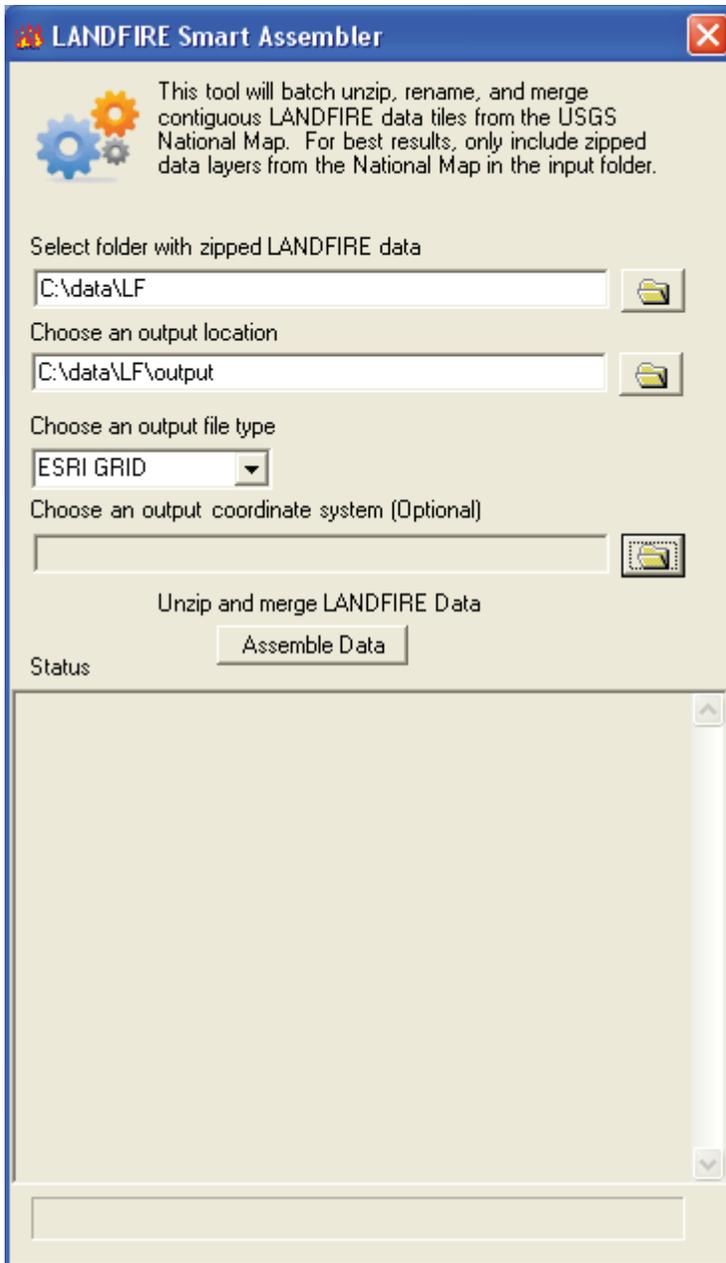
Clicking the Request Download button submits a download request to the USGS Seamless Data Distribution System. Results are returned inside the form window and include links to download the zipped data files for the selected layer. All downloaded zip files should be saved into a single folder. This folder should contain only zipped LANDFIRE data from the National Map. The zip files should not be renamed, and any number of zip files for any number of layers or extent rectangles can be saved in the same folder. The Smart Assembler tool will batch process all the zip files in the folder.

3. Batch process the downloaded zip files.

Button 5  opens the Smart Assembler. This tool automates the assembly of downloaded zip files into usable raster formats and will handle any arbitrary collection of zipped LANDFIRE data files from the National Map. The input folder should contain only LANDFIRE zip files. *The output location should have ample disk space to hold the uncompressed output raster files, plus additional temporary space for processing.* Output raster files can be in ArcGRID, Erdas Imagine, or GeoTiff format.

NOTE: *This version of the Smart Assembler does not process vector data. Vector layers downloaded from the National Map will need to be processed manually by the user.*

Clicking the Assemble Data button begins the following sequence of processing steps:

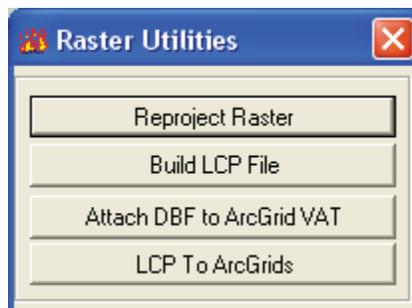


- a. Zip files are extracted to a temporary subfolder under the specified output folder.
- b. The metadata for each input raster piece is read to obtain the layer name and the spatial extent of the piece.
- c. Attributes are read from each input raster piece to obtain a master lookup table of attributes for each layer.
- d. If multiple raster pieces exist for a layer, an algorithm is used to determine which pieces belong in a contiguous spatial extent rectangle.
- e. Multiple-piece layers are merged into a single output layer.
- f. Output layers are renamed to descriptive LANDFIRE layer names.

- g. (*Optional*) Output layers are reprojected if a new coordinate system is specified.
 - h. Attributes are reattached to output ArcGRIDs and written to a .dbf file. Attributes are not reattached to Imagine or Tiff images.
 - i. Original metadata from each input raster piece is copied to a metadata subfolder of the output folder, grouped by layer.
 - j. A log file of processing steps is written in the output folder.
 - k. Temporary files are deleted when the Smart Assembler form is closed.
4. Add LANDFIRE data to ArcMap.
- Button 6  works like the standard ArcMap Add Data button, but it is customized for adding LANDFIRE raster data with colormaps. Specifically, it fixes a known issue with ArcMap 9.0 where pixel values of four or more digits will not automatically display their color and will appear blank within ArcMap and ArcCatalog. LANDFIRE layers added with Button 6 will have the correct colormap display. The customized Add Data button prompts the user for an appropriate field to use as a label in the legend and table of contents.

Raster Utilities

Button 7 opens the Raster Utilities toolkit:



Reproject Raster

Reprojection in LFDAT is implemented with the `gdalwarp` command-line utility from the Geospatial Data Abstraction Library (GDAL – www.gdal.org). Using GDAL for reproject provides a consistent method across all ArcGIS versions, with full support for datum transformation. The Reproject Raster utility provides a graphical interface to `gdalwarp` so that single raster layers can be reprojected with the same method used in the LFDAT Smart Assembler. The Reproject Raster utility also provides additional options including specification of the resampling method, output extent, and nodata value(s).

Build LCP File

This utility builds a FARSITE v.4 landscape (LCP) file from a set of input rasters. It supports specification of the output LCP extent, by matching an existing raster extent or by graphically drawing a rectangle on the display.

Attach DBF to ArcGrid VAT (DBF2VAT)

DBF2VAT accepts an input GRID and a corresponding attribute table in .dbf format. *Note: The Smart Assembler generates .dbf files in the Output directory by default in its automated data processing routine.* DBF2VAT joins the attributes included in the .dbf file to the Value Attribute Table (.vat) of the GRID. A field named Value must be present in the GRID table and the .dbf file.

LCP to ArcGrids

This utility disassembles a FARSITE LCP file into its individual component layers, with output in ArcGrid format. It supports assignment of a coordinate system to the output grids.

Product Updates

A product update feature is available from the About form, accessed from Button 8  on the toolbar. *Users are encouraged to check regularly for updates to the configuration database.*



Known Issues

1. Installation issue

The specific requirements listed above under **System prerequisites** need to be met in order for the LANDFIRE Data Access Tool to install and run correctly. A key requirement is that the appropriate Microsoft .NET Framework and ESRI .NET libraries must be installed on the system. If the .NET Framework was not on the system at the time ArcGIS was installed, then access to the ArcGIS installation media will be required to add the ESRI .NET libraries.

Contact your system administrator if you experience problems with the installation.

2. Attribute Tables for Imagine (.img) and GeoTiff (.tif) formats

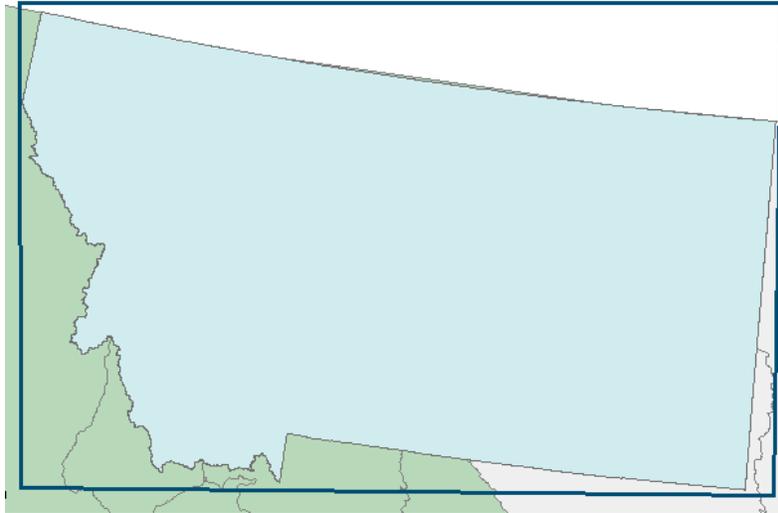
LANDFIRE Data Access Tool 2.3 does not reattach attributes if an Imagine (.img) or GeoTiff (.tif) format is selected for the output. A .dbf file containing the raster attribute table is written for each image.

3. Extent rectangle request issue

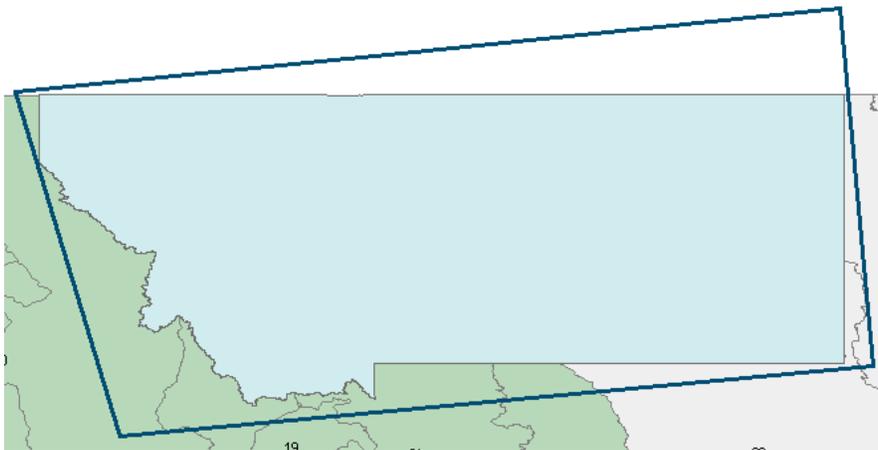
The LANDFIRE Data Access Tool mimics the functionality of the National Map ArcIMS system (<http://landfire.cr.usgs.gov/viewer/>) by allowing a user to click and drag a box to define a download area. The National Map interface displays data in a geographic map projection. When a user drags a box in the web interface the latitude and longitude of the upper left and lower right corners of the requested rectangle are captured and passed along to the seamless data extraction server.

LFDAT behaves in a similar manner. However, the view frame in an ArcMap session can be in any map projection. If the view frame is in a projected coordinate system then the rectangle bounding coordinates are reprojected to latitude and longitude and passed along to the data extraction server. This procedure introduces a subtle problem because the user-drawn rectangle becomes warped.

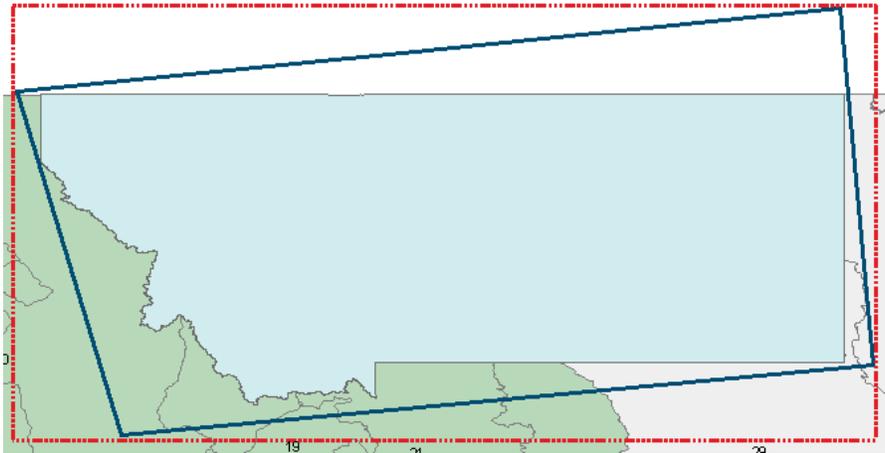
Consider the following example: a user opens a new session of ArcMap and uses the LFDAT interface to check which LANDFIRE zones have data available for download. This procedure brings a feature class of the LANDFIRE zones that are projected in the LANDFIRE Albers projection. The user drags the blue box below around an area of interest.



LFDAT grabs the corners of the rectangle and reprojects them from Albers to geographic coordinates. The warped rectangle and the corresponding request on the National Map website would look something like the example below. Please note that if the upper left and lower right coordinates of the warped rectangle are passed along to the server then part of the data request would be truncated.



To avoid this issue LFDAT makes a request to the data extraction server that encompasses the entire requested area. In this example that request would correspond to the dashed red line below. For large areas like the state of Montana this process results in a much larger extent request and data download. For smaller extent rectangles the effect will be less noticeable.



To avoid this issue, users can reproject the ArcMap data frame to the WGS84 Geographic projection prior to requesting data from the National Map System.

Acknowledgements

Development of the LANDFIRE Data Access Tool has been reliant on free and open source software:

Certain raster processing is done with the Geospatial Data Abstraction Library (GDAL). (<http://www.gdal.org>).

Zip file extraction is done with SharpZipLib. (<http://www.icsharpcode.net/OpenSource/SharpZipLib>).

Support/Questions/Comments/Bug Reports

For support and general questions, please contact the LANDFIRE Helpdesk: helpdesk@landfire.gov.

LANDFIRE Data Access Tool Developers:

Chris Toney, christoney@fs.fed.us

Jody Bramel

John Anderson

For more information on the LANDFIRE project please visit www.landfire.gov.