Introduction

The LANDFIRE Data Access Tool (LFDAT) is an ArcGIS toolbar that allows users to interact with the LANDFIRE (LF) data distribution site (DDS) and download LF 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 LF DDS (http://www.landfire.gov/viewer/) prior to using this tool. The DDS provides a web browser interface where users can select LF 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. 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.

LFDAT allows an ArcGIS user to drag a box in an ArcMap session to define a download area, select the desired LF layers, and then download data from the DDS for the specified extent rectangle. All of the files should be downloaded to a single folder. The downloaded zip files can be from any number of LF 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 LFDAT Smart Assembler will batch unzip the files, 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 LFDAT they will be bypassing information found on both the landfire.gov and DDS 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 LF data. LFDAT users are strongly encouraged to consult the landfire.gov and DDS web sites on a regular basis to be aware of new information. The download window in LFDAT contains hyperlinks to landfire.gov with important information regarding data layers.*

System prerequisites

LFDAT for ArcGIS 10.3.x prerequisites:
- ArcGIS 10.3 or 10.3.1
  Microsoft .NET Framework 3.5 SP1 is an ESRI minimum system requirement for ArcGIS 10.3.x. However, later versions of the .NET framework (e.g. 4.5.2) can be installed and used for ArcGIS 10.3.x and LFDAT. The .NET framework must be installed prior installing ArcGIS for Desktop, so computers with ArcGIS 10.3.x installed can be assumed to meet the .NET requirements for LFDAT.

Installation

LFDAT can be accessed on landfire.gov. 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 2.6. 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:
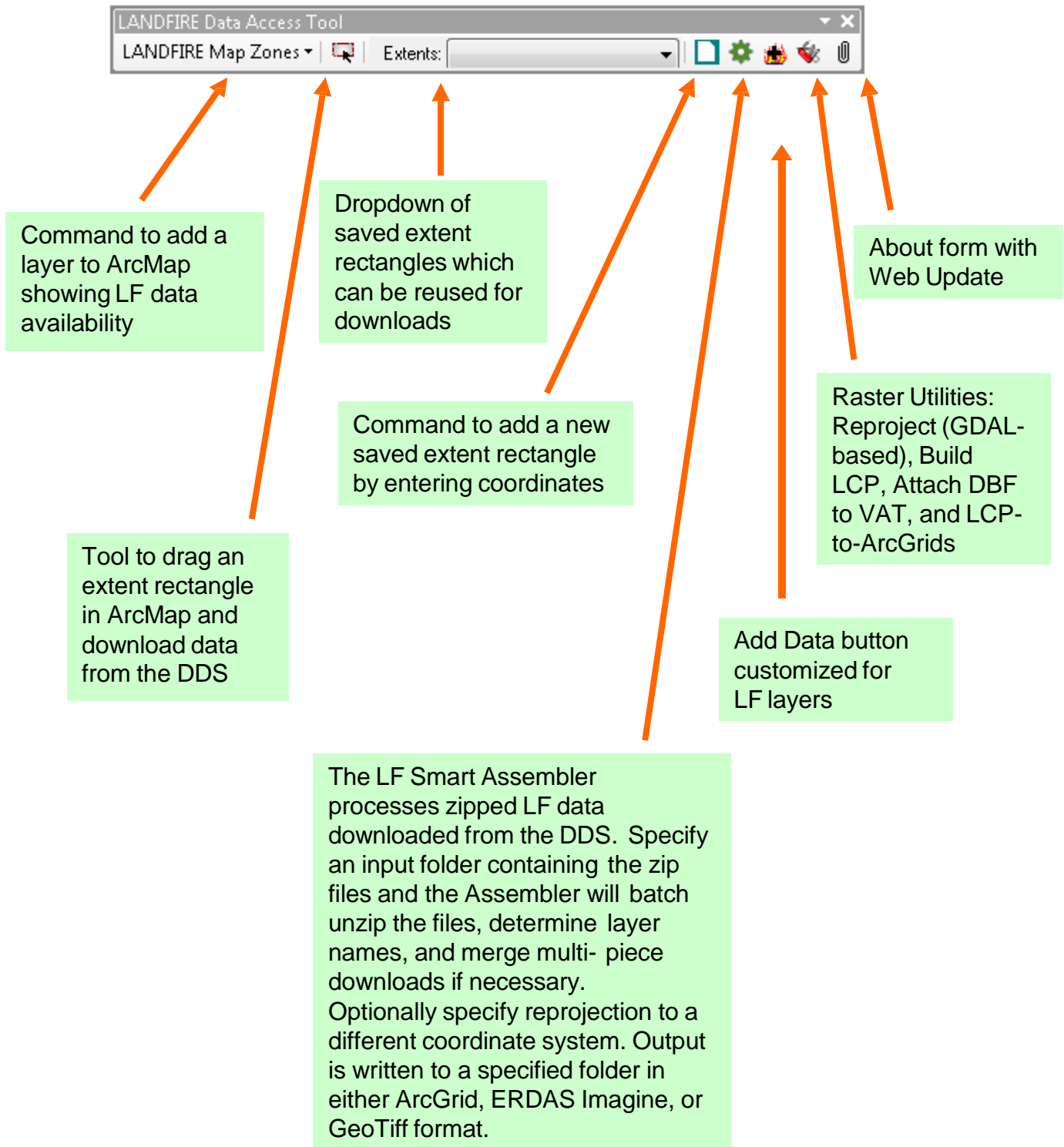
▪ LFDAT 2.0 – in the program installation folder, "C:\Program Files\LANDFIRE Data Access Tool" by default.

▪ 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 to 2.6 – 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.

Close all ArcGIS programs, 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, activate it from the ArcMap main menu by clicking View > Toolbars > LANDFIRE Data Access Tool.

After successfully installing LFDAT 2.6, 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 LF DDS and data layers. Users are encouraged to update these configuration databases periodically using the Web Update feature. See Product Updates for more information on the update process.*

LANDFIRE Data Access Tool Quick Start

Command to add a layer to ArcMap showing LF data availability

Dropdown of saved extent rectangles which can be reused for downloads

About form with Web Update

Command to add a new saved extent rectangle by entering coordinates

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 DDS

Add Data button customized for LF layers

The LF Smart Assembler processes zipped LF data downloaded from the DDS. 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.

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Detailed Usage Instructions

1 **2** **3** **4 5 6 7 8**

LFDAT generally involves four steps:

1. Verify LF data are available from the DDS 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 LF 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 LF and related data layers to be downloaded from the DDS:

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 (button 3). Saved extents can be reused later to perform additional downloads with the 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 LF 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 Request Download submits a download request to the DDS. 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 LF data from the DDS. 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 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 LF data files from the DDS. The input folder should contain only LF 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 DDS will need to be processed manually by the user.*

Clicking the Assemble Data button begins the following sequence of processing steps:
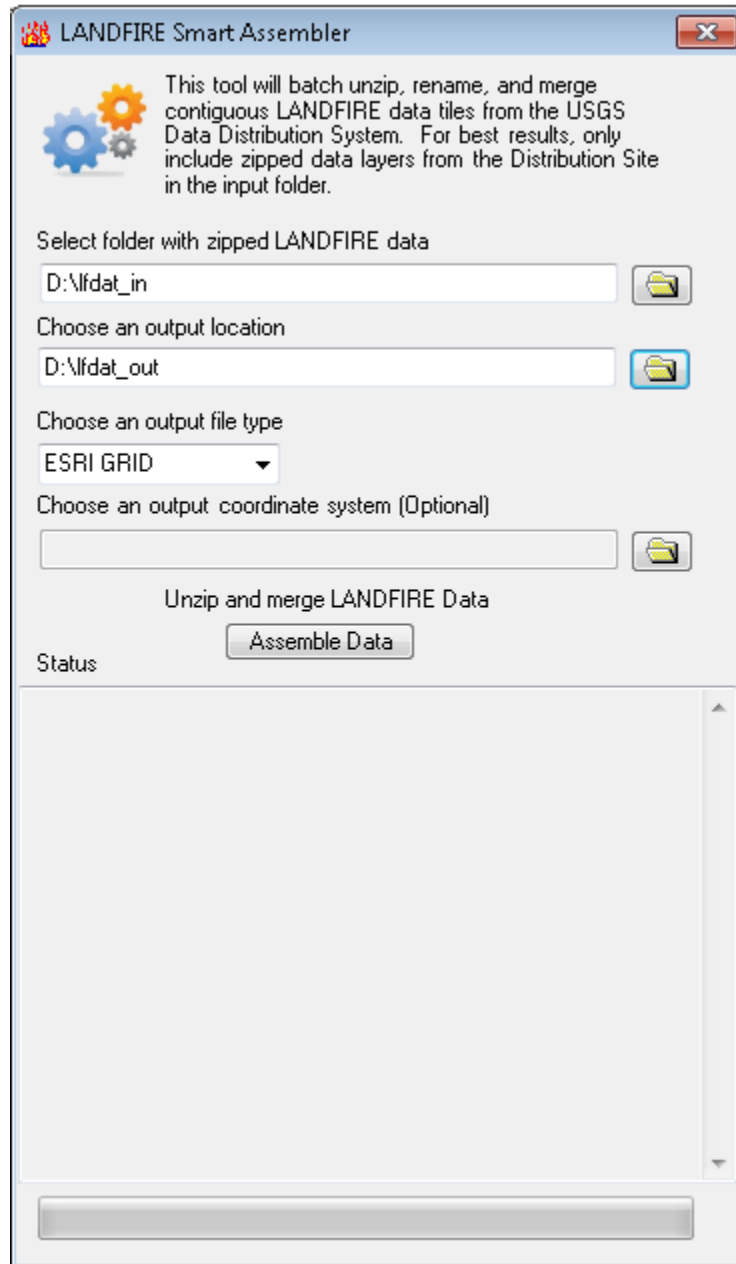
a. Zip files are extracted to a temporary subfolder under the specified output folder.
b. The metadata for each input raster piece is read to obtain the layer name and the spatial extent of the piece.
c. Attributes are read from each input raster piece to obtain a master lookup table of attributes for 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 LF 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 LF data to ArcMap.

Button 6 🔥 works like the standard ArcMap Add Data button, but it is customized for adding LF 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. LF 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:
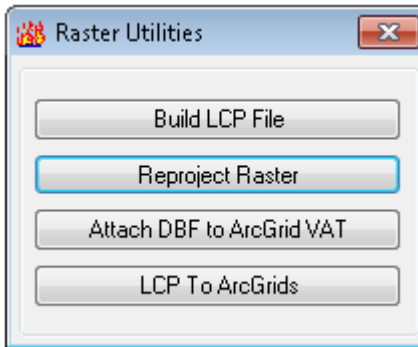
Reproject Raster
Reprojection in LFDAT is implemented with the `gdalwarp` command-line utility from the Geospatial Data Abstraction Library (GDAL – www.gdal.org). Using GDAL for reproject provides a consistent method across all ArcGIS versions, with full support for datum transformation. The Reproject 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.*
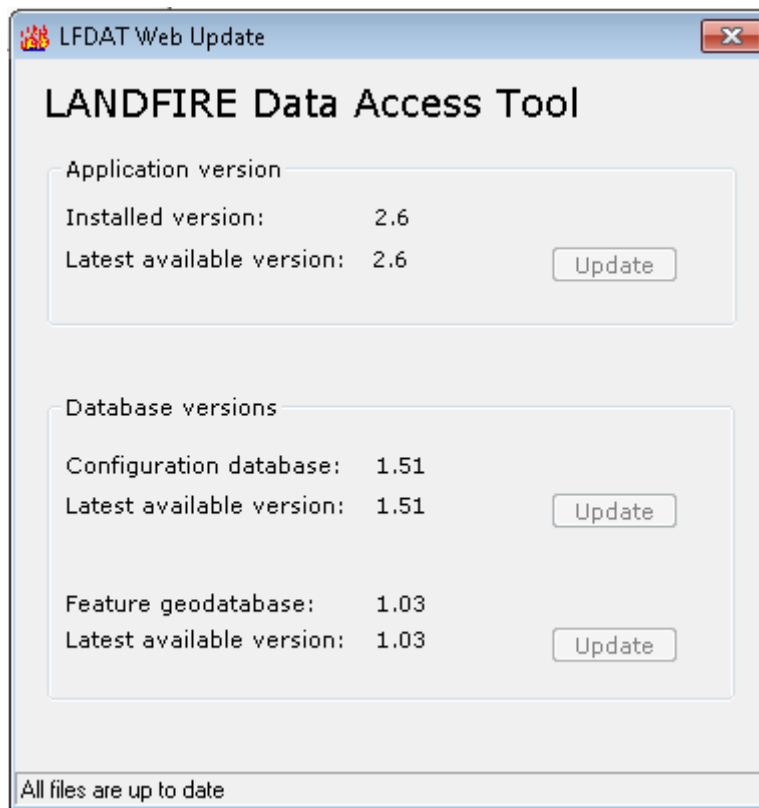
Known Issues

1. Installation issue

The specific requirements listed above under **System prerequisites** need to be met in order for LFDAT 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

LFDAT 2.6 does not attach 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

LFDAT mimics the functionality of the DDS system (http://www.landfire.gov/viewer/) by allowing a user to click and drag a box to define a download area. The DDS 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 LF data are available for download. This procedure brings a feature class of the LANDFIRE map zones that are projected in the LF Albers projection. The user drags the blue box below around an area of interest.
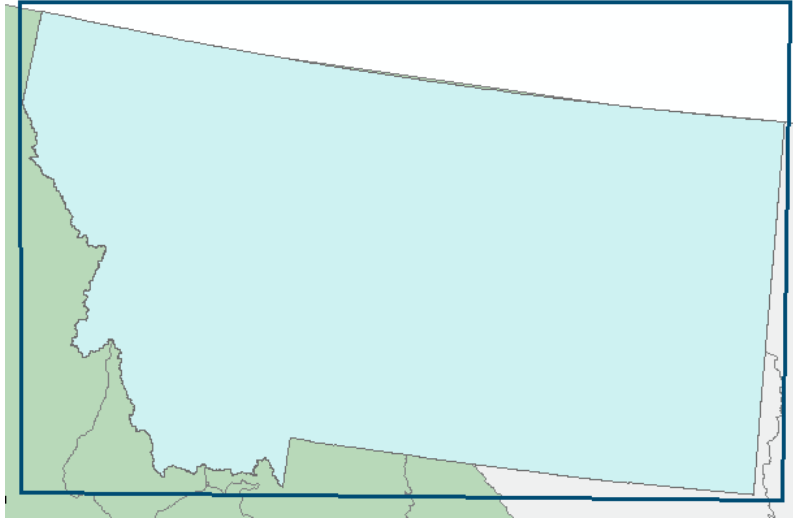
LFDAT grabs the corners of the rectangle and reprojects them from Albers to geographic coordinates. The warped rectangle and the corresponding request on the National Map website would look something like the example below. Please note that if the upper left and lower right coordinates of the warped rectangle are passed along to the server, then part of the data request would be truncated.
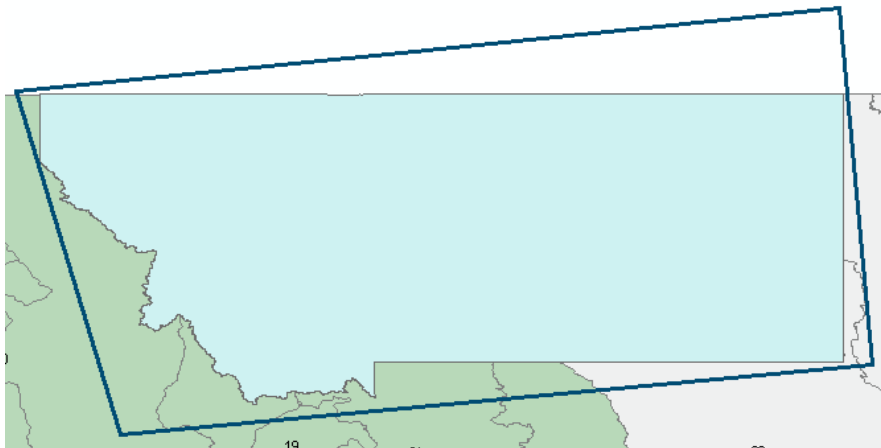
To avoid this issue LFDAT makes a request to the data extraction server that encompasses the entire requested area. In this example that request would correspond to the dashed red line below. For large areas like the state of Montana, this process results in a much larger extent request and data download. For smaller extent rectangles the effect will be less noticeable.
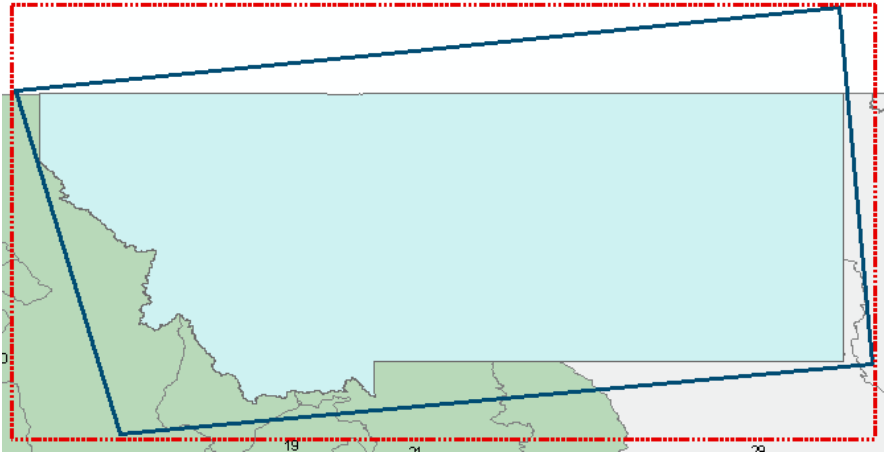
To avoid this issue, users can reproject the ArcMap data frame to the WGS84 Geographic projection prior to requesting data from the National Map System.

Acknowledgements

Development of LFDAT 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 LF Helpdesk.

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