This document attempts to provide instructions on selecting and downloading various USGS LiDAR data from the USGS Rockyweb server. This may be useful for times when TNM Download and/or LidarExplorer are/is acting up, or it may better fit your method of working.

You will need a GIS program capable of handling GeoPackage (.gpkg) files and a text editor with column mode, such as the free-for-the-downloading Notepad++.

You will likely also want to have a download manager such as the open-source uGet (for Windows and Linux) or some other way of downloading a group of files the URLs for which are listed in a TXT file (such as wget command in Linux). USGS provides instructions on downloading and using uGet here.

Please advise Glenn Borkenhagen <glenn@inlandgps.com> via email if you encounter any broken links or have suggestions on how to make this document more usable.

There may be cases, especially when attempting to download older data, where the reader will encounter directories and files that do not match the recent examples used to prepare these instructions. If this happens where there is an alternate method, try the other method. Use judgment and things will likely work out fine.

USGS breaks down their LiDAR mission into projects and work units. Each project consists of one or more work units - usually more than one.

The general starting point for accessing USGS LiDAR data from Rockyweb is -
https://rockyweb.usgs.gov/vdelivery/Datasets/Staged/Elevation/

LiDAR Point Cloud (LPC) data –
These source-level LAZ files typically cover an area 1 km x 1 km. For simplicity, these instructions will assume that all the desired tiles are within one work unit, the typical increment by which the USGS publishes LPC data. The reader can work out how to obtain tiles from other projects and work units as necessary.

1. The first order of business is to get an index to allow defining the desired tiles. These instructions will provide two methods of doing that.

    Method 1 – Use an index that covers only the work-unit area
    This method may not work for older LiDAR data sets. USGS has changed their delivery methods through the years.

    This is a two-step process: First identify the project and work unit and second download the index for that work unit. If you know the project and work unit you can skip Step A and go directly to Step B.

    Step A - Point your web browser here. Now we are interested in the file **WESM.gpkg** (WESM is an initialism for Work-unit Extent Spatial Metadata). Confirm that it is current; this file is typically uploaded every day. Download that file and open it in your GIS software.

    That layer should have more than 3,000 features, each feature representing a work unit in the USGS LiDAR effort for which source data is available.

    On the map, select the WESM layer and select the area including the area of interest. Check the attributes for the selected area, making note of the information in the **project** and **workunit** fields.

    Step B - From the server location used to obtain the **WESM.gpkg** file, now navigate to successive subdirectories named {**project**}, then {**workunit**}. Open the subdirectories **spatial_metadata** then **USGS**. From there, download the file with name ending **…TileIndex.zip**, extract that to access the shapefiles within, and open that dataset in your GIS software.

    Examining the attribute information for this layer shows that the field named **GridName** (may be **Tile_ID** or another name – it is the integer field that changes for each record) contains the information necessary to identify the individual tiles.

Method 2 – Use an index that covers all USGS data

If you know the project and work unit it is generally recommended to use Method 1 above, especially when working with recent LiDAR data sets. Use this method if the subdirectories in Step B of Method 1 do not appear as described. This will often be the case when working with older LiDAR data sets.

Point your web browser here. We are interested in the file **LPC_TESM.gpkg** (TESM is an initialism for Tile Extent Spatial Metadata). Confirm that it is current; this file is typically uploaded every day. Download that file and open it in your GIS software.

That layer should have more than eight million features, each feature representing a 1-km x 1-km LPC tile someplace in the USGS-covered area.

Examining the attribute information for this layer shows that the field named **tile_id** contains the information necessary to identify the individual tiles. It will be necessary to use that information to build URLs to actually access the individual tiles later in these instructions.

2. Select the layer created in Step 1 and select the desired tiles. Remember how many tiles are selected. Then export the selected features to a CSV or TXT file, exporting only the **GridName** or **tile_id** field, depending on whether you are using Method 1 or Method 2.

3. Create a new TXT file that will be used in uGet, wget, or other similar tool. May as well turn off wordwrap in your text editor at this time.

    Now we need to find an example that provides the structure for URLs to the desired tiles. Begin by pointing your web browser here. Now navigate to successive subdirectories named **{project}**, then **{workunit}**. Then open the file named **0_file_download_links.txt**. (If you want to download every LPC tile for the work unit you could simply use that file in uGet, wget, or other similar tool.)   Copy one line (does not to be for a desired tile – any line will do) of that file to clipboard and paste into the TXT file created earlier in this step.

4. Duplicate the chosen-at-random example URL from Step 3 to match the number of tiles selected in Step 2.

    If using Notepad++ and the number of selected tiles is small, simply place the cursor anywhere in the first line and execute **Ctrl + D** as many times as needed to generate the required number of lines.

    If using Notepad++ and the number of selected tiles is larger, place the cursor anywhere in the first line and use **Macro > Start Recording**, then **Ctrl + D**, then **Macro > Stop Recording**, then **Macro > Run a Macro Multiple Times…** In the dialog enter the number of selected tiles minus 2 in the **Run __ times** field and click **Run**.

5. Now substitute the tile-identification information from the CSV or TXT file from Step 2 to near the end (usually just before ".laz") of the URLs in the TXT file from Part 4.

    If using Notepad++, open the file from Step 2, hold down the **Alt** key to put Notepad++ into column mode, then left-click and drag to select all the necessary dataset values, then **Ctrl + C** to copy to clipboard.

    Then switch to the TXT file from Part 4, again hold down the **Alt** key to put Notepad++ into column mode, then select the characters to be overwritten with data from Step 2, then **Ctrl + V** to paste in the dataset values. Make sure you do not leave any blank spaces. Save the TXT file, which is now ready for use with uGet, wget, or other similar tool to download the desired tiles.

Original Product Resolution (OPR) one-meter DEMs

These source-level bare-earth one-meter digital-elevation-model tiles typically cover an area 1 km x 1 km and are published at the same time as the LPC data. If the product-level 10-km x 10-km tiles are available it is generally not recommended to use the OPR tiles. For simplicity, these instructions will assume that all the desired tiles are within one work unit, the typical increment by which the USGS publishes OPR data. The reader can work out how to obtain tiles from other projects and work units as necessary.

1. First we need to get an index to allow defining the desired tiles. These instructions will provide two methods of doing that.

   Method 1 – Use an index that covers only the work-unit area
   This method may not work for older LiDAR data sets. USGS has changed their delivery methods through the years.

   This is a two-step process: First identify the project and work unit and second download the index for that work unit. If you know the project and work unit you can skip Step A and go directly to Step B.

   Step A - Point your web browser here. Now we are interested in the file **WESM.gpkg** (WESM is an initialism for Work-unit Extent Spatial Metadata). Confirm that it is current; this file is typically uploaded every day. Download that file and open it in your GIS software.

   That layer should have more than 3,000 features, each feature representing a work unit in the USGS LiDAR effort for which source data is available.

   On the map, select the WESM layer and select the area including the area of interest. Check the attributes for the selected area, making note of the information in the **project** and **workunit** fields.

   Step B - From the server location used to obtain the **WESM.gpkg** file, now navigate to successive subdirectories named **{project}**, then {**workunit**}. Open the subdirectories **spatial_metadata** then **USGS**. From there, download the file named **opr_index.gpkg**, and open it in your GIS software.

   Examining the attribute information for this layer shows that a portion of the field named **location** contains the information necessary to identify the individual tiles.

   Method 2 – Use an index that covers all USGS data
   If you know the project and work unit it is generally recommended to use Method 1 above, especially when working with recent LiDAR data sets. Use this method if the subdirectories in Step B of Method 1 do not appear as described. This will often be the case when working with older LiDAR data sets.

   Point your web browser here. We are interested in the file **OPR_TESM.gpkg** (TESM is an initialism for Tile Extent Spatial Metadata). Confirm that it is current; this file is typically uploaded every day. Download that file and open it in your GIS software.

   That layer should have more than eight million features, each feature representing an OPR tile someplace in the USGS-covered area.

   Examining the attribute information for this layer shows that the field named **tile_id** contains the information necessary to identify the individual tiles. It will be necessary to use that information to build URLs to actually access the individual tiles later in these instructions.

2. Select the layer created in Step 1 and select the desired tiles. Remember how many tiles are selected. Then export the selected features to a CSV or TXT file, exporting only the **location** or **tile_id** field, depending on whether you are using Method 1 or Method 2.

3. Create a new TXT file that will be used in uGet, wget, or other similar tool. Will likely want to turn off wordwrap in your text editor at this time.

   Now we need to find an example that provides the structure for URLs to the desired tiles.

   Begin by pointing your web browser here. Now navigate to successive subdirectories named **{project}**, then **{workunit}**.

   Here again we are presented with two options – downloading from Rockyweb or downloading from Amazon Web Services (AWS).

Method 11 – Download from Rockyweb
Open the subdirectory **TIFF**. There you will see a listing of file names. Right-click on one file name (does not need to be for a desired tile – any line will do) and **Copy Link** or whatever command your web browser employs to copy a complete Rockyweb URL to the clipboard.

Method 12 – Download from AWS
Open the file named **0_file_download_links.txt**. (If you want to download every DEM tile for the work unit you could simply use that file in uGet, wget, or other similar tool.) Copy one line (does not need to be for a desired tile – any line will do) of that complete AWS URL to clipboard.

Paste the complete URL in the clipboard from either Method 11 or Method 12 into the TXT file created earlier in this step.

4. Duplicate the chosen-at-random example URL from Step 3 to match the number of tiles selected in Step 2.

   If using Notepad++ and the number of selected tiles is small, simply place the cursor anywhere in the first line and execute **Ctrl + D** as many times as needed to generate the required number of lines.

   If using Notepad++ and the number of selected tiles is larger, place the cursor anywhere in the first line and use **Macro > Start Recording**, then **Ctrl + D**, then **Macro > Stop Recording**, then **Macro > Run a Macro Multiple Times…** In the dialog enter the number of selected tiles minus 2 in the **Run __ times** field and click **Run**.

5. Now substitute the tile-identification information (the reader must exercise judgment here) from the CSV or TXT file from Step 2 to near the end (just before ".tif") of the URLs in the TXT file from Part 4.

   If using Notepad++, open the file from Step 2, hold down the **Alt** key to put Notepad++ into column mode, then left-click and drag to select all the necessary dataset values, then **Ctrl + C** to copy to clipboard.

   Then switch to the TXT file from Part 4, again hold down the **Alt** key to put Notepad++ into column mode, then select the characters to be overwritten with data from Step 2, then **Ctrl + V** to paste in the dataset values. Make sure you do not leave any blank spaces. Save the TXT file, which is now ready for use with uGet, wget, or other similar tool to download the desired tiles.

3D Elevation Program (3DEP) one-meter DEMs
These product-level bare-earth one-meter digital-elevation-model tiles are typically 10 km x 10 km and are generally published after all the LPCs and OPRs from work units for a project are published. For simplicity, these instructions will assume that all the desired tiles are within one project. The reader can work out how to obtain tiles from other projects as necessary.

1. The first thing to do is to get an index to allow defining the desired tiles.

   Point your web browser here. We are interested in the file **10_km_cell_grid.gpkg**. Confirm that it is reasonably current; this file appears to be uploaded periodically. Download that file and open it in your GIS software.

   That layer should have more than 184,000 features, each feature representing a 10-km x 10-km location tile someplace in the USGS-covered area. In contrast to the information for the LPCs and OPRs provided above, these features exist whether or not there is actually data for that location tile. Also note that there are areas of overlapping grids; these are at changes in Universal Transverse Mercator (UTM) zones that happen at every six degrees of longitude.

   Examining the attribute information for this layer shows that the fields named **name** and **utm_zone** contain the information necessary to identify the individual files. It will be necessary to use that information to build URLs to actually access the individual files later in these instructions.

   If you are certain that the area of interest is covered by product-level DEMs you can now go to Step 2. If not, we need to determine the areas for which data is available. Click here and get **FESM_1m.gpkg**

(FESM is believed to be an initialism for Full Extent Spatial Metadata). Download that file and add the layer named **fesm_1m** to your project.

That layer should have around 900 features, each feature representing a "completed" LiDAR project someplace in the USGS-covered area.

2. On the map, select the **10_km_cell_grid** layer and select the area of interest. (Make sure the area of interest is covered by the **fesm_1m** layer if there is any question.) Remember how many features are selected. Then export the selected features to a CSV or TXT file, exporting only the **name** and **utm_zone** fields.

3. Create a new TXT file that will be used in uGet, wget, or other similar tool. Should turn off wordwrap in your text editor at this time.

   Now we need to find an example that provides the structure for URLs to the desired tiles. Begin by pointing your web browser [here](). Now navigate to the subfolder named **{project}**.

   Here again we are presented with two options – downloading from Rockyweb or downloading from Amazon Web Services (AWS).

   Method 21 – Download from Rockyweb
   Open the subdirectory **TIFF**. There you will see a listing of file names. Right-click on one file name (does not need to be for a desired tile – any line will do) and **Copy Link** or whatever command your web browser employs to copy a complete Rockyweb URL to the clipboard.

   Method 22 – Download from AWS
   Open the file named **0_file_download_links.txt**. (If you want to download every DEM tile for the work unit you could simply use that file in uGet, wget, or other similar tool.)   Copy one line (does not need to be for a desired tile – any line will do) of that complete AWS URL to clipboard.

   Paste the complete URL in the clipboard from either Method 21 or Method 22 into the TXT file created earlier in this step.

4. Duplicate the chosen-at-random example URL from Step 3 to match the number of tiles (features) selected in Step 2.

   If using Notepad++ and the number of selected tiles is small, simply place the cursor anywhere in the first line and execute **Ctrl + D** as many times as needed to generate the required number of lines.

   If using Notepad++ and the number of selected tiles is larger, place the cursor anywhere in the first line and use **Macro > Start Recording**, then **Ctrl + D**, then **Macro > Stop Recording**, then **Macro > Run a Macro Multiple Times…** In the dialog enter the number of selected tiles minus 2 in the **Run __ times** field and click **Run**.

5. Now substitute the tile-identification information (**name** and **utm_zone**) from the CSV or TXT file from Step 2 to near the end (after "TIFF/" and before ".tif") of the URLs in the TXT file from Part 4. **Pay particular attention to the two-digit UTM zone (typically between "1M_" and "_x") – it is very possible for an area of interest to span multiple UTM zones!**

   If using Notepad++, open the file from Step 2, hold down the **Alt** key to put Notepad++ into column mode, then left-click and drag to select the necessary and appropriate dataset values, then **Ctrl + C** to copy to clipboard.

   Then switch to the TXT file from Part 4, again hold down the **Alt** key to put Notepad++ into column mode, then select the characters to be overwritten with data from Step 2, then **Ctrl + V** to paste in the dataset values. Make sure you do not leave any blank spaces. Save the TXT file, which is now ready for use with uGet, wget, or other similar tool to download the desired tiles.

   If the desired data spans more than one UTM zone the copy-and-paste routine described in the previous two paragraphs will need to be repeated multiple times to get all the URLs correct.