Using RECOVER: Identifying Watershed Basins Directly Impacted by a Wildfire

This tutorial will walk you through the process of identifying the HUC12 watershed basins (polygons) directly impacted by a wildfire event. That is, those watershed polygons that intersect the fire polygon. To complete this spatial analysis process you will need ArcGIS software (either ArcMap or ArcGIS Pro), access to ArcGIS Online (AGOL), and the fire perimeter polygon. We will download the watershed layer later in this tutorial.

1. Visit http://giscenter.isu.edu/files/WBD.zip to download a zip file containing ArcGIS map package with a link to the watersheds layer.
2. Using Windows Explorer, navigate to your downloads folder
   a. Locate the WBD.zip file
   b. Extract the ZIP file on your workstation

Processing in ArcMap
3. Locate the `ArcMap_HydrologicUnitSubwatershed.lyr` file that was just extracted.
4. Double-click this file to launch it with ArcMap (to use ArcGIS Pro for this process, skip to the ArcGIS Pro section below).
5. When prompted by ArcMap, log into ArcGIS Online (AGOL)
6. After successfully signing into AGOL, the watershed layer will draw (HINT: you may wish to stop the initial draw process as it can take a long time to render).
7. Now, let's add the fire perimeter polygon layer to this ArcMap document. To do this:

   a. Click the Add Data button from ArcMap's standard toolbar
   b. Use the Add Data dialog box to navigate your computer and locate the fire perimeter polygon layer. This may be a geodatabase feature class or shapefile.
   c. Once located, select the layer and click Add
   d. If the fire perimeter uses a geospatial reference system (often erroneously referred to as a "projection") that differs from the system used by the watershed's layer (Web Mercator) you will likely see this warning.
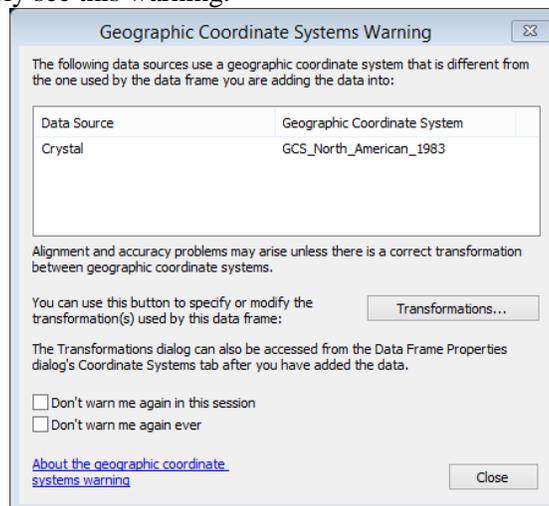
   e. Click Close to continue.
8. From ArcMap's table of contents, select the fire polygon you just added
9. Right-click this layer and choose Zoom to Layer…
10. The map area will look something like this (see below)

11. We will now complete some geoprocessing with these two layers.
    a. From ArcMap's menu click SELECTION—SELECT BY LOCATION
    b. Complete this tools dialog as shown below indicating that you want to select polygon features from the watersheds layer (target) using the fire polygon (source).
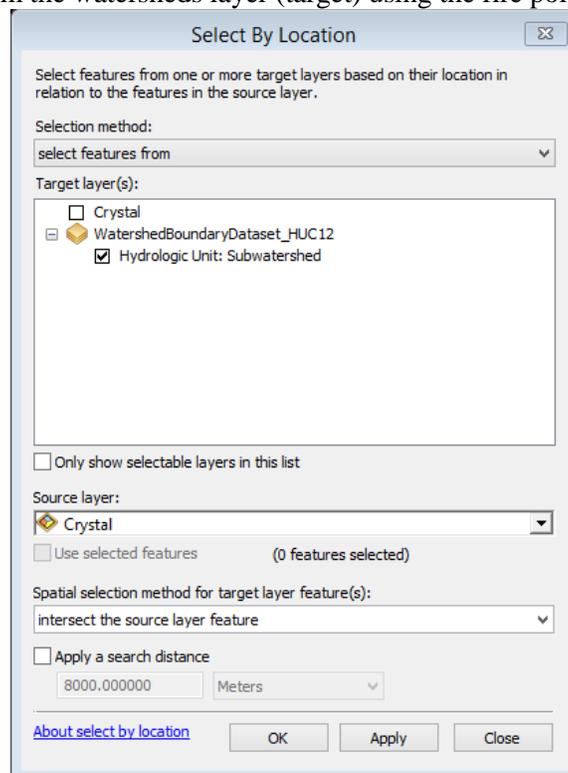
    c. Click OK

12. Numerous watershed polygons may have been selected. To view the full extent of these features, right-click the Hydrologic Unit: Subwatershed item from the table of contents and choose SELECTION—ZOOM TO SELECTED FEATURES
13. Next, we will export these features to a shapefile for use in the NASA RECOVER Generator. Here's how:
    a. Right-click the Hydrologic Unit: Subwatershed layer from the table of contents
    b. From the fly-out menu choose DATA—EXPORT DATA
    c. Make sure to export the Selected features.
    d. Use the same coordinates as the layer's source data
    e. Provide an output feature class name/location by clicking the file browser button
    f. Navigate to the location where you would like this shapefile stored.
    g. Be sure to select Shapefile as the "Save as type"
    h. Provide a name for the new shapefile. The "Saving data" window will look similar to the one shown below:
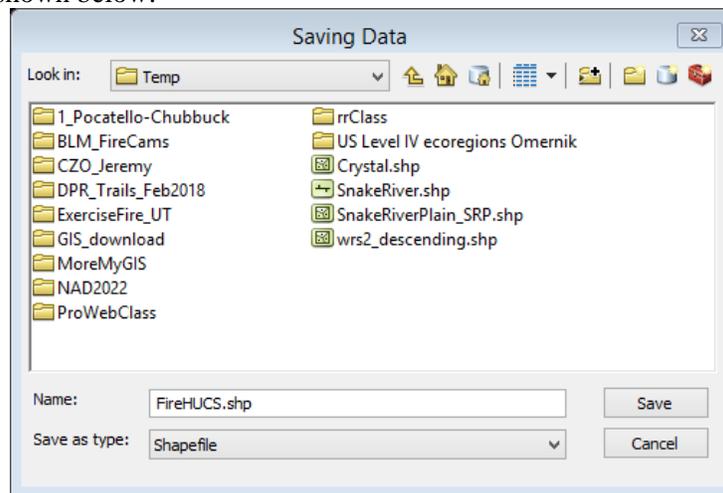
    i. Click Save
    j. The completed Export Data window should look very similar to the following:
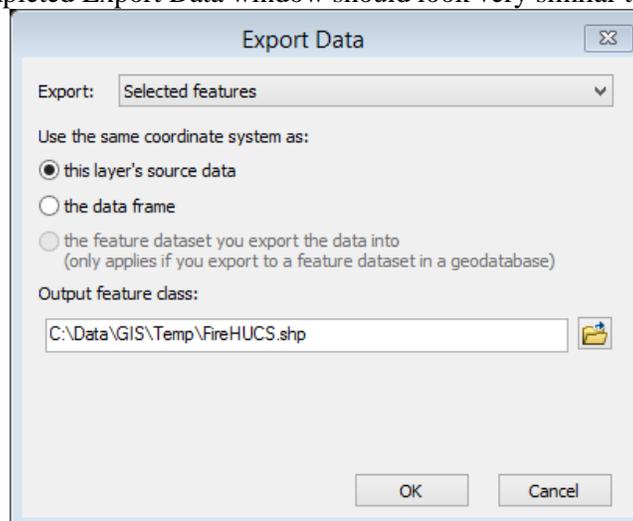
    k. Click OK
14. When processing has completed you will be asked if you want to add these data as a new map layer. It is a good idea to do this to ensure the export completed as you wanted. Click Yes.

The total extent of these watershed basins can become very large. Currently, the NASA RECOVER Generator can process an area of interest (AOI) up to 3 million acres in size. If the AOI for your watershed basins exceeds this size, the Generator will fail. In this case, please contact the RECOVER team (recoverdss@gmail.com) and let us know.

15. If you are concerned that the size of your AOI may exceed 3 million acres, you can use the following steps to determine the size of the AOI for the affected watershed basins:
    a. Create a new, blank polygon shapefile (use the figure below to assist you)

> **Create New Shapefile**
>
> Name: AOI_test
>
> Feature Type: Polygon
>
> Spatial Reference
>
> Description:
>
> Projected Coordinate System:
>   Name: USA_Contiguous_Albers_Equal_Area_Conic_USG
>
> Geographic Coordinate System:
>   Name: GCS_North_American_1983
>
> ☐ Show Details   Edit...
>
> ☐ Coordinates will contain M values. Used to store route data.
> ☐ Coordinates will contain Z values. Used to store 3D data.
>
> OK   Cancel

    b. With the new AOI shapefile added to your ArcMap document, begin an edit session.
    c. Create a new polygon feature as a rectangle that encompasses all the watershed basins you previously identified.
    d. Save your edits.
    e. Stop the edit session.

    f. Open the attribute table for your AOI shapefile (to do this, right-click the shapefile from ArcMap's table of contents and select open attribute table).

    g. Click the Table options menu near the upper-left corner of the Table window and choose Add field.
    h. Name this new field "Acres"
    i. Set its data type to Long Integer
    j. Click OK

    k. Right-click the new Acres field and choose Calculate Geometry
    l. Set the units to Acres in the Calculate Geometry window
    m. Click OK

    n. If the area of your AOI exceeds 3,000,000 (acres) you will not be able to use this in the RECOVER Generator. Please contact the RECOVER team at recoverdss@gmail.com
16. If you are happy with these results, you can close ArcMap.
17. Skip to the "Using the RECOVER Generator" section to continue.

Processing in ArcGIS Pro
1. Launch ArcGIS Pro and sign in (based on how you sign in to use ArcGIS Pro, you may be prompted to sign in again when you add the layer file below).

2. From a new Map, click the Add Data button [Add Data]
   a. First, add the fire perimeter polygon
   b. Secondly, add the watershed basins polygon layer. To do this navigate to the folder where you extracted the watershed basins layer file. Locate the `ArcGIS_Pro_HydrologicUnitSubwatershed.lyrx` layer file and add it to your map.

3. From the ArcGIS Pro Map ribbon, click the Select by Location button [Select By Location]
   a. This opens the Geoprocessing pane
   b. Ensure the "Input Feature layer" is the Hydrologic Unit: Subwatershed layer
   c. Similarly, ensure the "Selecting Features" has been set to your fire perimeter polygon layer.
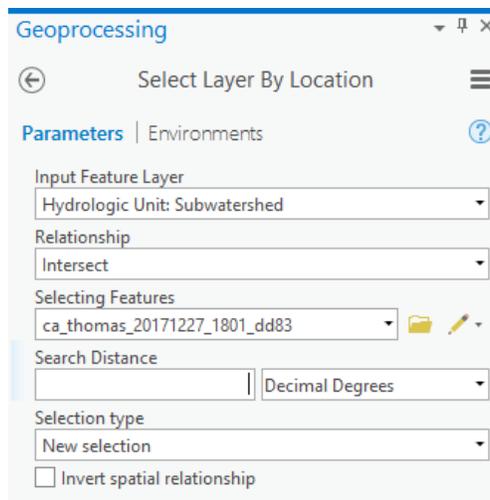
   d. Click Run near the bottom of the Geoprocessing pane.
4. When the selection geoprocessing completes you may need to zoom out to see the extent of the watershed polygon selected.
5. Next, we will export these features to a shapefile for use in the NASA RECOVER Generator. Here's how:
   a. Right-click the watershed layer
   b. From the fly-out menu, select DATA—EXPORT FEATURES
   c. A new geoprocessing tool will open.
   d. Complete this dialog as shown below, making sure to save the output feature class as a shapefile so it is ready for use in the RECOVER Generator.
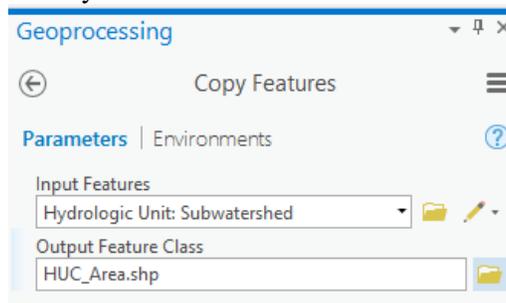
   e. Click Run

The total extent of these watershed basins can become very large. Currently, the NASA RECOVER Generator can process an area of interest (AOI) up to 3 million acres in size. If the AOI for your watershed basins exceeds this size, the Generator will fail. In this case, please contact the RECOVER team (recoverdss@gmail.com) and let us know.

6. If you are concerned that the size of your AOI may exceed 3 million acres, you can use the following steps to determine the size of the AOI for the affected watershed basins:
    a. Create a new, blank polygon feature class in your default geodatabase. To do this, first open the Catalog pane in ArcGIS Pro.
    b. Navigate your default geodatabase (or really, any geodatabase where you have write permissions).
    c. Right-click the geodatabase
    d. From the fly out menu choose NEW—FEATURE CLASS
    e. A geoprocessing tool pane will open. Complete this dialog similar to that shown below.
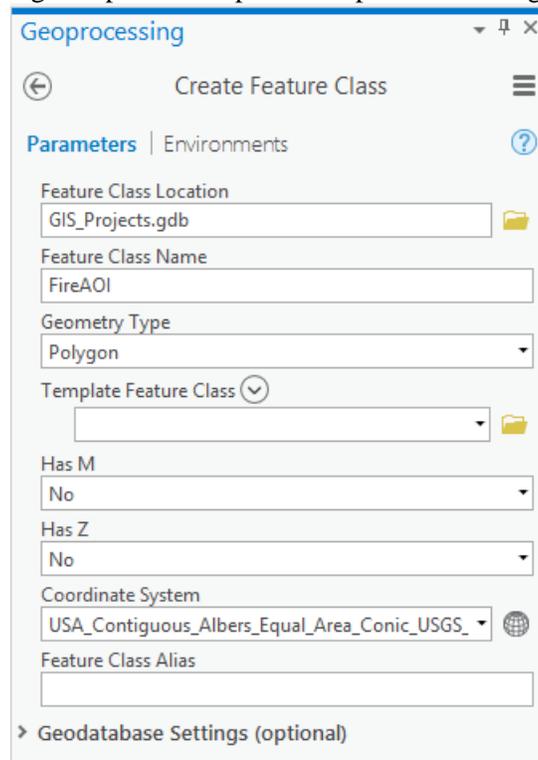
    f. Click Run
7. With a new AOI feature class added to your map, we will now enter an edit session and create a polygon feature. To do this:
    a. Select (highlight) the new AOI feature class in the Contents pane (left side of ArcGIS Pro)
    b. Open the Edit ribbon
    c. Click the Create Features button Create
    d. From the Create Features pane, select the AOI layer to indicate this is the layer you wish to edit.
    e. A box with edit option will open beneath this layer (in the Create Features pane)
    f. Choose the rectangle drawing tool.
    g. Move the mouse cursor into the map area
    h. Click once to set the location of the upper left corner for the new polygon

<li style="list-style-type: lower-roman" value="9">Move the cursor and click the left mouse button again to indicate the upper right corner for the polygon
Now, move the cursor down and click the left mouse button once again to designate the lower right corner of the new polygon
This will finish the sketch
From the Edit ribbon, click the save button.

8. Next, we will add geometry attributes to determine the acreage of the AOI. To do this:
   a. From the Geoprocessing pane, search for Add Geometry
   b. While typing this, ArcGIS Pro will quickly find the Add Geometry Attributes data management tool for you. Click this tool to open its dialog pane.
   c. Complete the tool's input as shown below making sure to calculate acreage for the AOI rectangle.
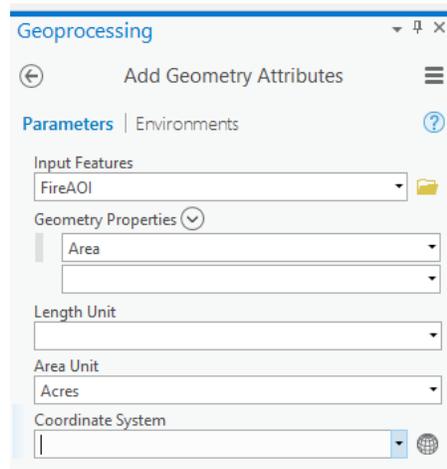
   d. If the acreage of your AOI exceeds 3,000,000 (acres) you will not be able to use this in the RECOVER Generator. Please contact the RECOVER team at recoverdss@gmail.com for assistance.

9. If you are happy with these results, you can save and close ArcGIS Pro.

Using the RECOVER Generator

1. Using Windows Explorer, locate the shapefile you just created (note: there will be numerous (approximately seven) files that comprise this shapefile. Each one is important to make sure the next steps work correctly).
2. Select all files associated with your new shapefile.
3. Right-click this selection and choose to add these files to a new ZIP file (note: based on the ZIP software you are using, this process will vary slightly. Ultimately you will produce a ZIP file containing the shapefile).
4. Launch the NASA RECOVER Generator by clicking
   https://recover.giscenter.isu.edu/recover3/webmapgenerator/
   a. Log-in when prompted
   b. From the Step 1 window, click the Load Local Shapefile button
   c. Navigate to the location where the ZIP file you created in steps 1-3 above is located.
   d. Select this file
   e. Click Open

The Generator will open this file, zoom to the extent of this file, and display it on Generator's map. Based on your previous work, you know the fire polygon is contained within these watershed polygons so we can now continue to Generator's second step.

   f. Using the Step 2 window, provide a Fire Name
   g. Select the State in which this fire burned
   h. Click the Upload file button.
   i. At this step, want to be sure to upload the actual fire polygon (not the watershed polygons). Be sure to navigate to and select the fire polygon ZIP file (note: you can create this in the same manner as described above).
   j. The next section requires you to identify an Area of Interest. I like to use the rectangle draw tool, so select that tool now.
   k. Move the mouse cursor into Generator's map area and draw the rectangle ensuring it includes the entire area identified by the watershed polygons currently displayed. See the figure below as a guideline.
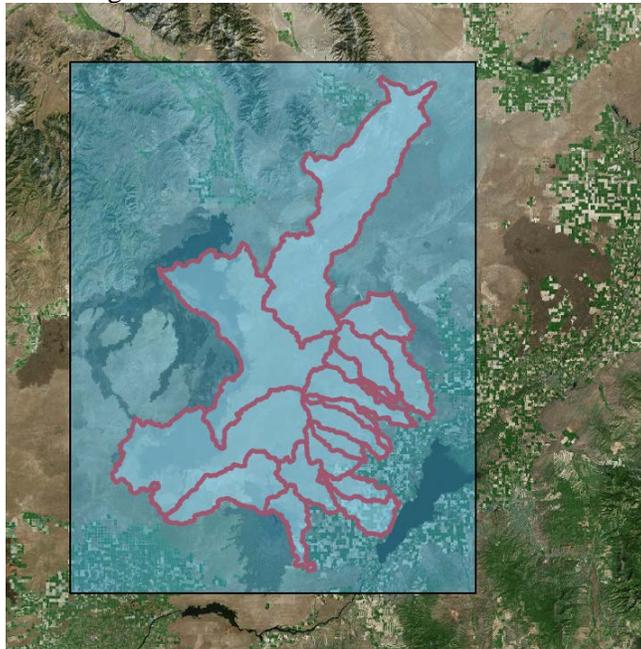
l. Scroll down the Step 2 window.
m. The last piece of required information is that you provide your contact email address. Make sure this is correct as RECOVER's servers will email you the URL to the new site it creates for you.
n. Click Submit.

In approximately 5-minutes the process will be completed and you should receive an email with the URL to the RECOVER DSS site created for you. If you have any questions, please contact the RECOVER team at recoverdss@gmail.com for assistance.

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