ArcGIS Pro Engineering Tools

User Guide

February 2024

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Overview

User Requirements

GIS Skills – The HELC Tool requires use of ArcGIS Pro. Users require basic skills in ArcGIS Pro navigation, attributing, and map layout creation. Support from the State GIS Specialist and/or State Tool Administrator is required to ensure that users properly install and use the HELC Tool.

System Requirements

This HELC Tool requires the following software and accounts.

1. ArcGIS Pro version 3.0.3 or higher (3.1.x recommended). The created templates are NOT backward compatible with 2.9.x.
2. User account access to USDA GeoPortal if you want to use the CLU download tool.
3. A secure connection (in office, or VPN if out of office) to the USDA network is needed to download the latest CLU data for each project site, and possible NRCS Bare Earth elevation data if using the NRCS Bare Earth services, as well as to check out a Spatial Analyst extension if not already configured by a user.

Install Folder Reference

These lessons may refer to *<install folder>* directory path. This refers to the complete folder path above the *Engineering_Tools_Pro* folder. The developers recommend using **C:\GIS_Tools** as the install folder to contain the *Engineering_Tools_Pro* folder. Other locations should work, but have not been tested. The above path will be used as the reference in this guide.

User Guide Sections and Workflows

The basic workflow is to setup the HELC Tool on your computer and use the ArcGIS Pro templates provided by your State Tool Administrator to open a project and go through the workflow for a new request. Advanced features or workflows are covered in Appendix sections of this guide.

Part 1 – Installation and Configuration (One-time Process)

These lessons focus on installing and configuring the tool.

- Lesson 1 – Create GeoPortal Account
- Lesson 2 – Install Base Software (ArcGIS Pro)
- Lesson 3 – Install the Engineering Tool

Part 2 – Understanding ArcGIS Pro and Toolbox Tools (One-time Process)

These lessons focus on the basic customization to templates and ArcGIS Pro tool concepts.

- Lesson 4 – Create Local Template(s)
- Lesson 5 – Overview of ArcGIS Pro Interface
- Lesson 6 – Changing Portals in ArcGIS Pro

Part 3 – Toolbox A: Project Setup (Repeat for each request)

These lessons focus on starting a project, entering basic client information, and preparing a DEM.

- Lesson 7 – Create HEL Project
- Lesson 8 – Enter Project Info
- Lesson 9 – Prepare Site DEM (Optional)

Part 4 – Toolbox B: HEL Determination (Repeat for each request)

These lessons focus the steps to prepare for and complete the HEL Determination.

- Lesson 10 – Set Sodbust Values
- Lesson 11 – HEL Determination
- Lesson 12 – Override Field Determination Results (Optional)
- Lesson 13 – Export HEL Determination Map
- Lesson 14 – Create Form, Letter, Report
- Lesson 15 – Revision Workflows (As needed)

Lesson 1 – Create Portal Accounts

GeoPortal Account

This section describes how to create a GeoPortal Account so that you can access the CLU layer in the HELC Tool. You do not need to complete this section if you already have a GeoPortal account.

- Open Chrome or Edge, or a new tab in one of those browsers.
- Navigate to https://gis.sc.egov.usda.gov/portal/home
- Click *Sign In* in the top-right corner of the screen to sign-in with your LincPass or Eauth.
- After signing-in, you are done with GeoPortal account setup, and you can close your browser tab or window.

Lesson 2 – Install Base Software

All base software is available through Software Center. If there is any trouble with Software Center installs, you will need to contact CEC for assistance.

Install ArcGIS Pro

The HELC Tool is built within ArcGIS Pro. ArcGIS Pro can be installed from *Software Center*. As a large program, it is recommended to perform the install while connected to the USDA network via the best available network connection, typically the Service Center or duty station for an employee. It is recommended to install the version of ArcGIS Pro recommended by your State Tool Administrator or State GIS Specialist. The following versions are supported by the HELC Tool:

- **ArcGIS Pro 3.1.x (recommended)** – Install ArcGIS Pro 3.1.0 (v3.1.0.41833) followed by the latest ArcGIS Pro Patch for 3.1
- **ArcGIS Pro 3.2** - Has been tested and will work if installed

License ArcGIS Pro

USDA employees must configure *Concurrent Licensing* for ArcGIS Pro from the USDA license servers. Please refer to the *Licensing* section of the ***Indiana ArcGIS Pro Setup Guide*** from FPAC-GEO for details on configuring licenses. The *Advanced* license option for ArcGIS Pro is required for the Engineering tool. Note that Portals guidance in this document may supplement or exceed the Portals guidance from the *Getting Started with ArcGIS Pro* guide.

Note: ArcGIS Pro 3.1.x and later installations from Software Center automatically configure ArcGIS Pro licensing, although you may want to review the additional Extensions that you may need for other GIS work. Notes on selecting Extensions are included in the *Getting Started with ArcGIS Pro* guide referenced above. This tool does require the Spatial Analyst Extension, but it will automatically check out that extension while running if the user is on the USDA network.

Lesson 3 – Install the Engineering Tool

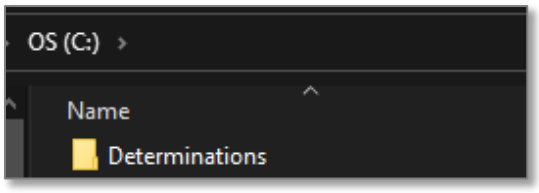
Download the HELC Tool

To install the Engineering tool, please navigate to F:\Data_Scripts and run "Update_Batch_Files.py" then run "GIS_Updates.bat-Shortcut" This will install/update the Engineering tools to your C:\GIS_Tools folder.

Create Workspace Directory

The **C:\Workspace** folder should be created if it doesn't exist already. This folder will be used to house projects

- Open *File Explorer* and navigate to the *C:* drive.
- Confirm that a *Workspace* folder exists.
- If it does not exist, create a new folder at the *C:* drive level and name it *Workspace*. This should result in *C:\Workspace* now being present on your system.



Configure ArcGIS Pro

Configure ArcGIS Pro General Options

For best results, the Project Recovery setting in ArcGIS Pro should be disabled. This prevents inadvertent file locks being applied to temporary datasets used for processing in the tools if a script fails or if ArcGIS Pro crashes. These steps are needed after any ArcGIS Pro install or patch.

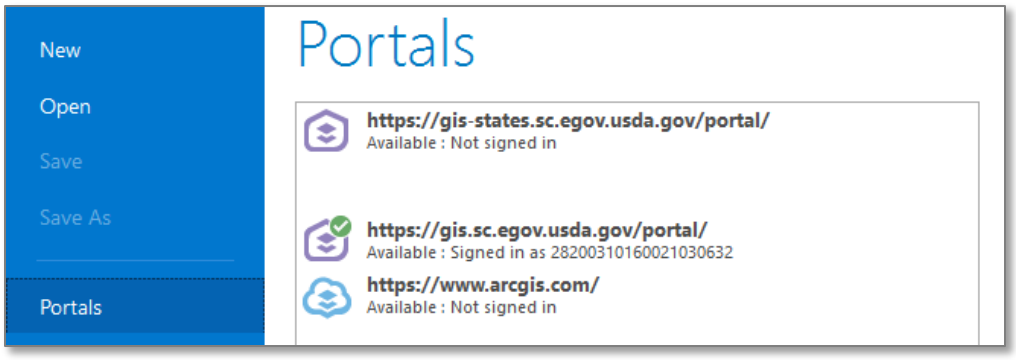
- Open any ArcGIS Pro project (blank or existing).
- Click *Project* or *Settings*, then click *Options*, and then click *General*.
- Expand *Project Recovery* and disable the *Create a backup…* option.

Configure Portals in ArcGIS Pro

The HELC Tool connects to the NRCS GeoPortal to operate. The steps in this section are specific to configuring access to your previously created Portal Account within ArcGIS Pro. Add GeoPortal in ArcGIS Pro after installing or updating ArcGIS Pro.

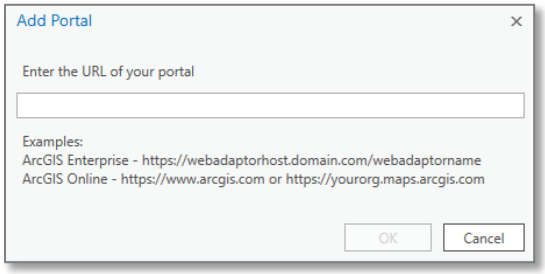
- Launch ArcGIS Pro (***Start → ArcGIS → ArcGIS Pro***). In the lower-left corner of the Pro window, click ***Settings***. From the list of settings, click ***Portals***.
  Note: If you are in an active project, click the ***Project*** tab to access the ***Portals*** menu.

- A list of portals will be displayed. It will contain ArcGIS Online (www.arcgis.com) by default, and any portals you've previously added. For first time users, only ArcGIS Online will be visible.



- If any the following portals are missing from your list, click ***Add Portal***, type the URL in the box, and then click ***OK***.

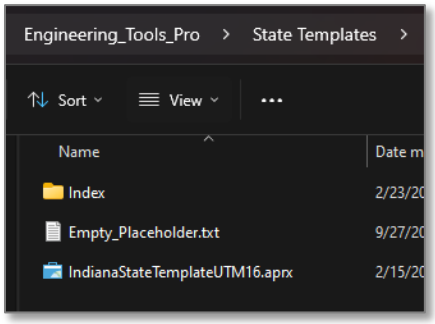
  https://gis.sc.egov.usda.gov/portal
  https://gis-states.sc.egov.usda.gov/portal



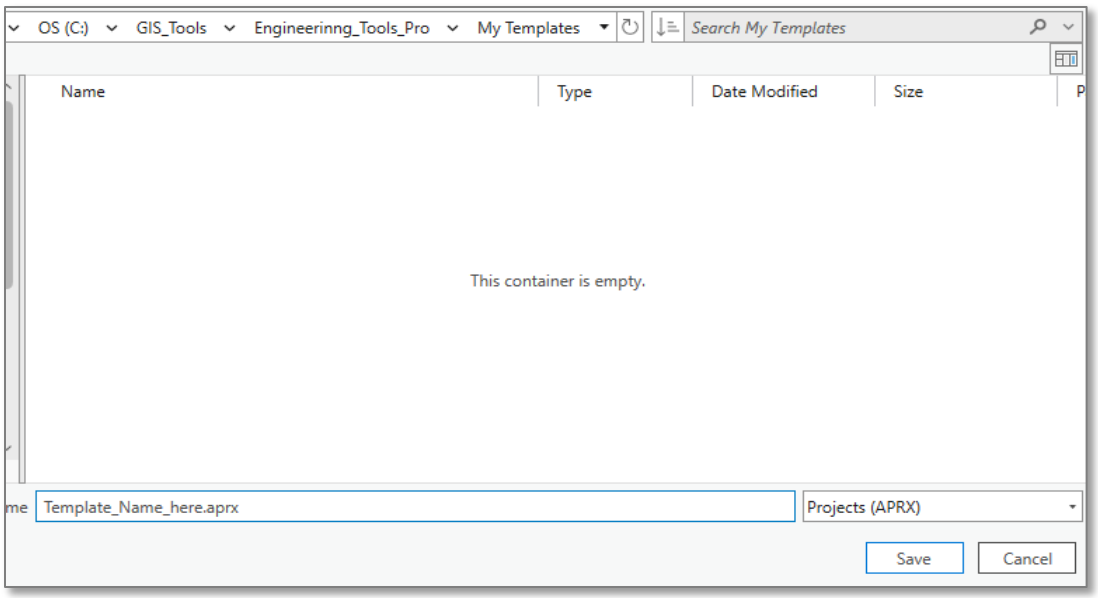
Lesson 4 – Create Local Template(s)

Users have the option to create one or more Local Template(s) as needed for their work. This requires modifying the State Template(s) APRX files provided by the State Tool Administrator. Local Templates may not be necessary if the State Templates already provide enough data. The typical reason to create a Local Template is to add additional geodata to the State Template for use in your work area, such as specific imagery or DEMs you may use for your area.

- Navigate to *C:\GIS_Tools\Engineering_Tools_Pro\State Templates* folder and open the state customized Template APRX file to be modified.
  Note: Open the one with the UTM Zone appropriate to the area you will be covering.



- You may be prompted to sign-in to GeoPortal when you open the project. Do so.
- Click ***Project → Save Project As…***
- Navigate to: *C:\GIS_Tools\Engineering_Tools_Pro\My Templates*



- Type a name for the template and click ***Save***. You can continue to include the UTM Zone number in your project name if it is relevant.
- Add additional data to the template using ***Add Data***. Arrange layer order or adjust the symbology or labels as needed, and then click ***Save***.
- Close the Template you created. Repeat this lesson to create additional templates, as needed.

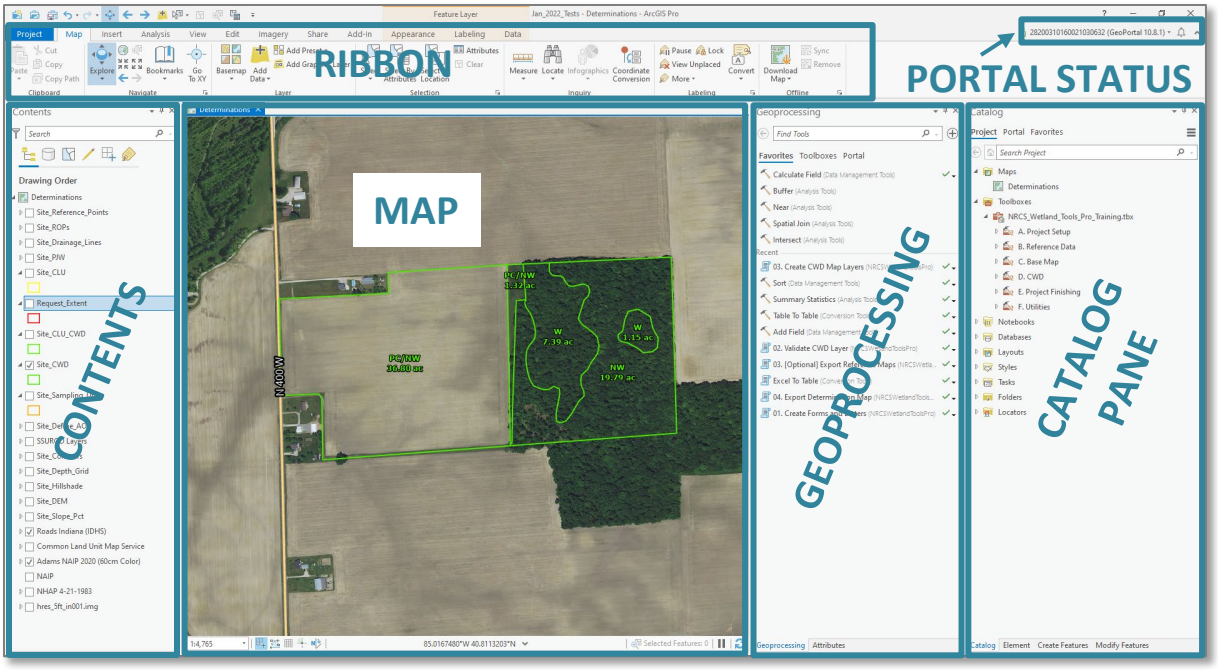
Lesson 5 – Overview of the ArcGIS Pro Interface

This section describes the basics of the ArcGIS Pro interface. Some panels may float or be docked differently than where shown in the following screenshots.

Definitions

The following terms are defined for use in the Engineering Tool workflow.

- **Map** – A *Map* is an object in ArcGIS Pro in which you display GIS layers or data. The *Map* is synonymous with the *Data Frame* view in ArcMap. The HELC Tool templates come with a *Map* named *HEL Determination*. This is the map that must be used for HELC Tool work.
- **Map Frame** - The *Map Frame* is the object within a *Layout* that shows the contents and extent of a *Map* on the *Layout*. It is synonymous with the *Layout* view from ArcMap.
- **Layout** – A *Layout* is an object in ArcGIS Pro that consists of a preview page on which a *Map* and other elements are formatted for the creation of map products, such as a *Map PDF*.
- **Map PDF** – This refers to an exported PDF map product created using the HELC Tool. The term *Map PDF* is used to distinguish it from the ArcGIS Pro *Map* object, defined above.
- **Contents Pane** – While a *Map* in ArcGIS Pro is open, the *Contents* pane is where the layers will be listed and can have their visibility and other properties controlled. This is synonymous with the Table of Contents in ArcMap.
- **Ribbon** – The interface at the top consisting of different tabs (menus), each of which contains different ArcGIS Pro functions. The ribbon is context sensitive, and different tools become active when items are selected on other panels such as a map, layout, or layer name.
- **Geoprocessing** – A window in ArcGIS Pro where the HELC Tool forms will open and be run.
- **Catalog Pane** – A pane in an ArcGIS Pro project to view the project's contents, including all its *Maps, Layouts,* and *Toolboxes*. The *Catalog Pane* is described in more detail later in this section.
- **Portal Status** – This is a menu in the top-right of ArcGIS Pro where you can switch your active Portal and manage your sign-in status for one or more Portals, if you have multiple Portals.



Catalog Pane

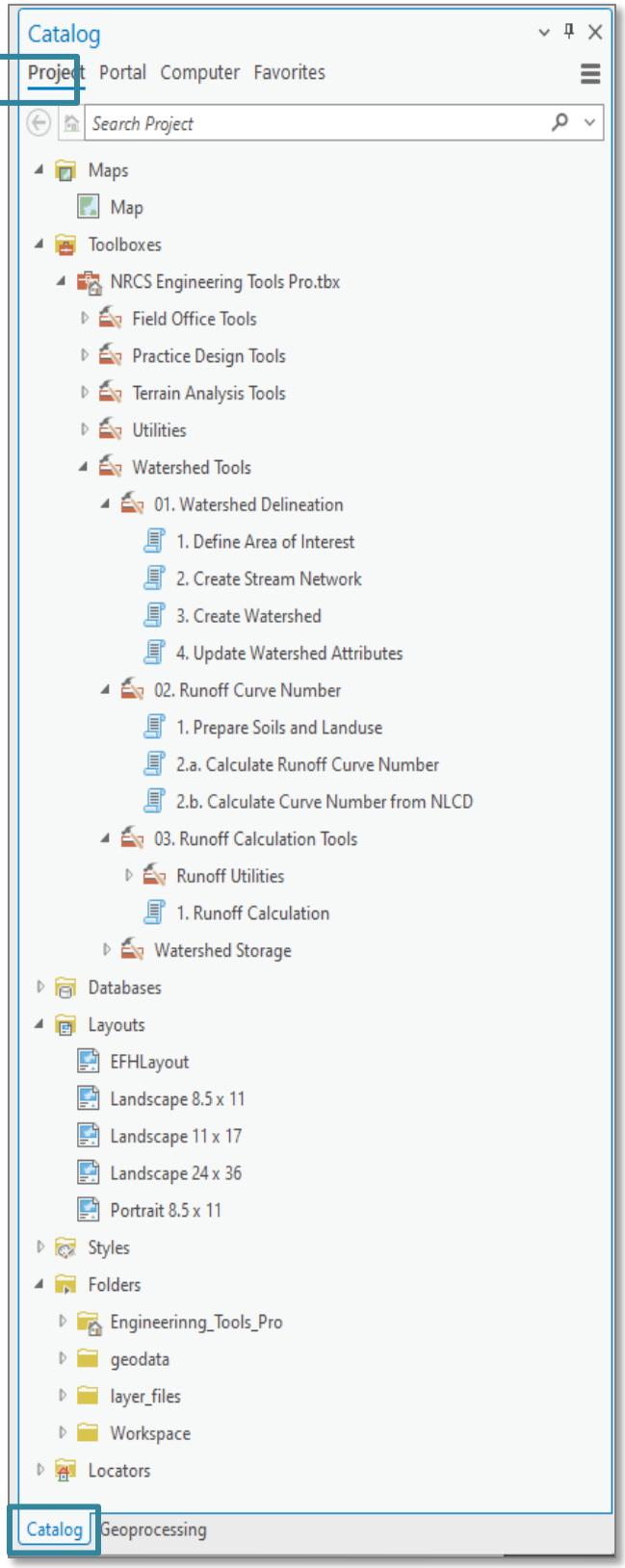
All aspects of the Engineering Tool can be managed through the *Catalog Pane*. This pane displays all the components of the current project (APRX) file. If a *Map*, *Layout*, or *Toolbox* is closed and you can't find it, go to the *Catalog Pane* and expand the heading for the content type you are seeking, and then double-click an item to expand or open it.

To access the *Catalog Pane* (if it is not visible):

- Click the *View* tab on the *Ribbon* in ArcGIS Pro.
- Click *Catalog Pane*.
- The *Catalog Pane* should open or appear if it's not already open.
- The *Catalog Pane* may be floating on another monitor (if you have multiple) or it may already be docked.
- It is possible to overlap docked panes in Pro, and if so, the different panes are denoted by tabs on the edge of any pane (see the bottom of the accompanying screenshot as an example). Click on the desired tab to bring it to the foreground (such as the one labeled *Catalog* in this example). The active tab has different colored text for its label than the other tabs (blue vs. grey in this example).

Using the *Catalog Pane*:

- If the contents of the project are not visible in the *Catalog Pane*, click the ***Project*** tab at the top-left of the pane so it is underlined (see the top of the accompanying screenshot).
- Expand the carats/arrows in front of an item in the Catalog to explore the contents of the project.
- Double-click an item in the pane to open it (e.g. a *Map*, a *Toolbox*, a *Layout*, etc…).



Explore the Catalog Pane

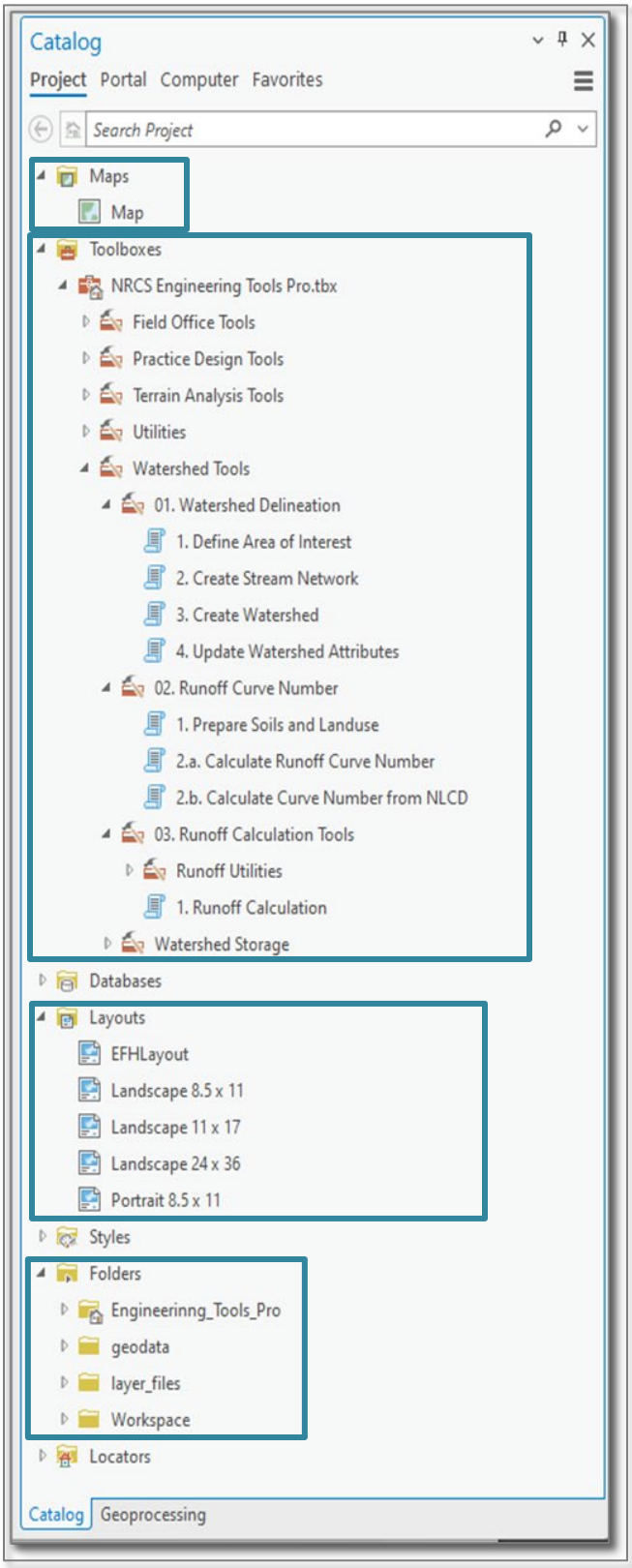
The following parts of the Catalog Pane are commonly used in the HELC Tool workflows:

- ***Maps*** – Stores the map for the Engineering Tool templates. If you close the map for any reason, you can expand the *Maps* heading/icon of the *Catalog Pane* and then double-click the *HEL Determination* map to re-open it.

- ***Toolboxes*** – Stores the ArcToolbox for the Engineering Tool, called *NRCS Engineering Tools Pro*. To access the tools, expand the *Toolboxes* section of the *Catalog* pane, expand the *NRCS Engineering Tools Pro* toolbox, then expand the toolset (group of tools) for a desired step, and then double-click a tool to open it.

- ***Layouts*** – Layouts can be used to create maps. Predefined layouts can be accessed from the *Layouts* section of the *Catalog Pane*.

- ***Folders*** – This lists the folder connections stored in the project. You can map additional folder connections as needed. To do so:
    - Right-click the ***Folders*** heading/icon in the *Catalog Pane*.
    - Click ***Add Folder Connection***.
    - Use the browse window to navigate to and select a folder.
    - Click ***OK***.



Map (Map Frame)

A *Map* is an object in ArcGIS Pro in which you display GIS layers or data. The *Map* is synonymous with the *Data Frame* view in ArcMap. When you open templates created from the Engineering Tool, the *Map* map should be open by default. If not, it can be opened from the *Maps* section of the *Catalog Pane* (see previous section). The map should occupy the central viewing area of the ArcGIS Pro interface.

The main tools for interacting with the map are the *Explore* tool, the *Select* tool, the *Measure* tool, and various editing tools (see tab descriptions in the sections below).

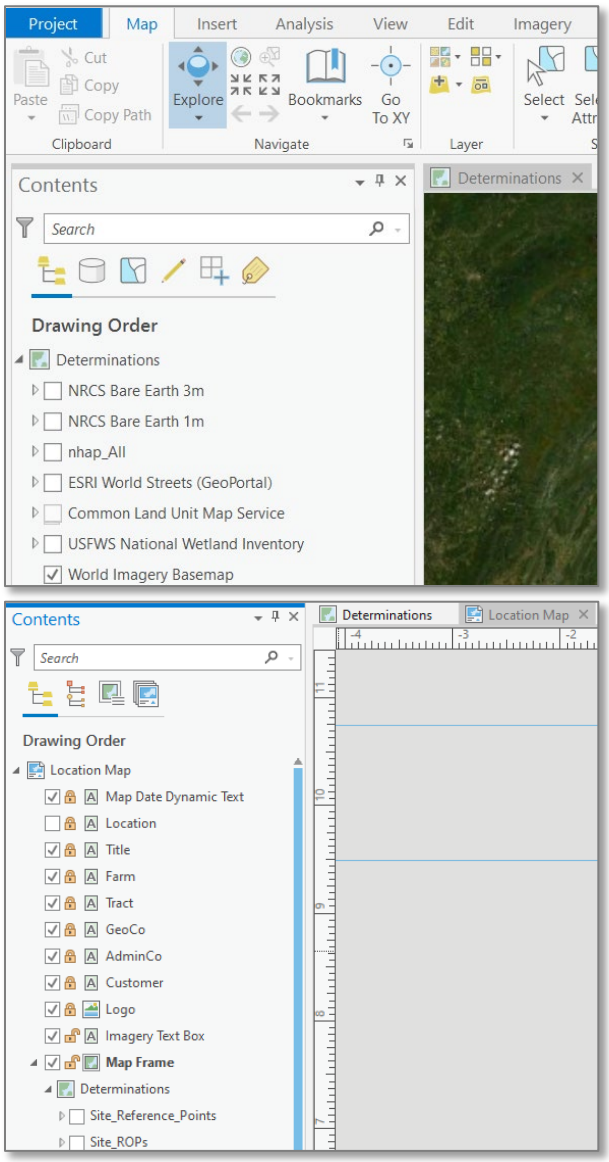
When a map object is viewed on a *Layout* it is referred to as a *Map Frame* by some tools and properties of the *Layout*.

Contents Pane

The *Contents* pane updates contextually based on what type of content you are working with in ArcGIS Pro, however it most frequently contains the list of layers and tables in a map, or the list of page elements in a layout. If the *Contents* pane is closed while you are actively working in a map or a layout, it can be restored by clicking the *View* tab on the *Ribbon* and then clicking *Contents*.

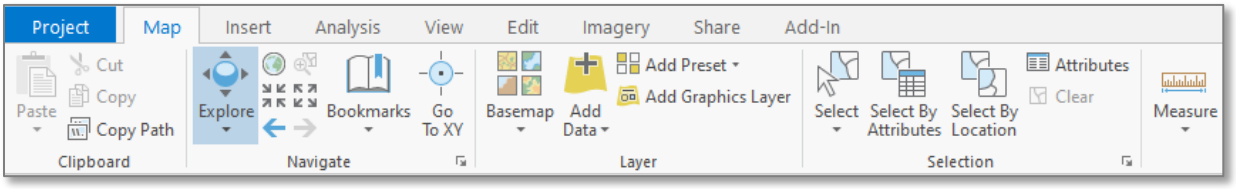
When working in a map, the list of its layers and visibility status is available in the *Contents* pane along with options to view the layers by drawing order, selectable layers, editable layers, snapping properties, or labeling status. In the Engineering Tool, most of the operational layers generated by the tool are created with specific names that should not be changed to preserve automation.

When working in a layout, the *Contents pane* contains a list of all elements on the layout page, as well as the associated map's contents in a group. Layout elements can be locked in the *Contents* pane so that they cannot be changed. The elements in the *Contents* of the provided layouts have specific names that should not be changed to preserve automation.



Map Tab

Most of the work in the tool involving navigating the map frame or adding data takes place on the *Map* tab of the *Ribbon*.



Commonly used ArcGIS Pro tools on the *Map* tab are:

- ***Explore*** – Used to navigate the map (pan/zoom) and to identify features. A variety of additional zooming options are available to the right of the *Explore* tool.

- ***Basemap*** – Select from a set of nationally available basemaps. Note: You may prefer to use local imagery or image services instead of basemaps for some projects.

- ***Add Data*** – Used to open a browser to find geodata files on your system, select them, and add them to the *Map*, where they will then appear in the *Contents* pane.

- ***Select*** – Used to select features in the *Map*.

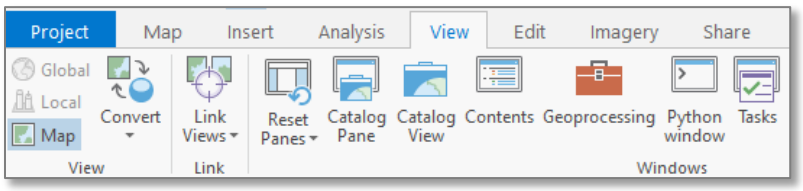
- ***Attributes*** – Used to open the *Attributes* pane. Also available on the *Edit* tab.

- ***Clear*** – Used to clear the currently selected features.

- ***Measure*** – Opens an interactive measuring widget for temporary, on-the-fly measurements.

View Tab

The *View* tab has buttons that will open various other windows in ArcGIS Pro and is useful for finding or re-opening panes that you've closed either accidentally or on purpose.



Commonly used tools on the *View* tab are:

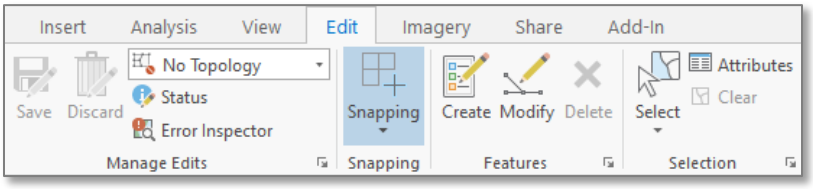
- ***Catalog Pane*** – Used to open the *Catalog* pane.

- ***Contents*** – Used to open the *Contents* pane.

- ***Geoprocessing*** – Used to open the *Geoprocessing* pane. As tools are run in the *NRCS Engineering Tools Pro* toolbox they will open within the *Geoprocessing* pane.

Edit Tab

The *Edit* tab has buttons that will be used during the editing steps of the Engineering Tool workflow.



Commonly used tools on the *Edit* tab are:

- ***Save [Edits]*** – Used to Save edits. This save icon is denoted by the pencil in front of it.

- ***Discard*** – Used to Discard Edits without saving them. This icon has the same editing pencil in front of it as the *Save* icon on the *Edit* tab.

- ***Attributes*** – Used to open the Attributes window to update Landuse and Hydrologic Soil Group status in those respective layers after the *Prepare Soils and Landuse* tool is run

Project Tab

The *Project* tab has buttons for saving projects, setting *Options*, managing Portals, and exiting ArcGIS Pro.

Quick Access Toolbar

The *Quick Access Toolbar* is a customizable toolbar that appears above the *Project* tab in the top-left corner of ArcGIS Pro. Tools on it are accessible, regardless of your current tab.

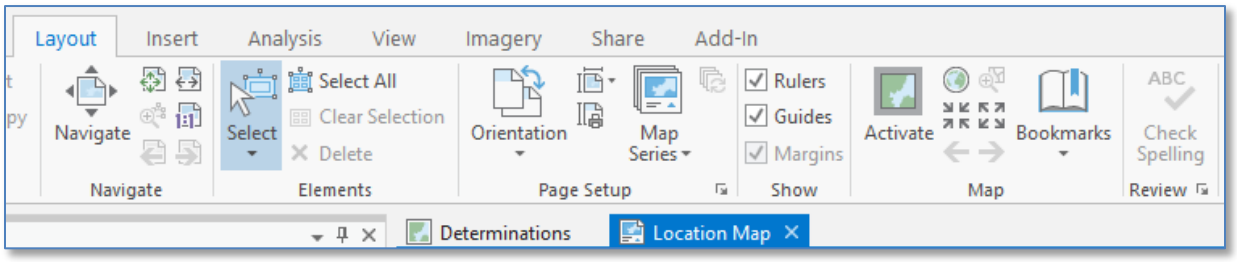
Some suggested tools to add to the *Quick Access Toolbar* are:

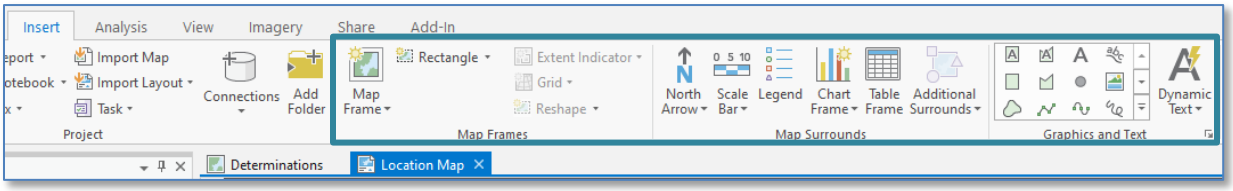
- ***Explore***
- ***Previous Extent***
- ***Next Extent***
- ***Add Data***
- ***Select (Features)***
- ***Clear (Selected Features)***
- ***Zoom to Selected Features***

Instructions for customizing the *Quick Access Toolbar* are available here (external link to the ArcGIS Pro Online Help page).

Layout

A *Layout* in ArcGIS Pro is a page view used to arrange and apply settings to map products elements prior to map production. Due to the context-driven menus in ArcGIS Pro, when a *Layout* is active in the view, the *Ribbon* changes to display different tabs and tools and the *Contents* pane changes to show *Layout Elements* in addition to the *Map Frame's* layers. The *Map* tab is replaced by the *Layout* tab, and the *Insert* tab is updated to show several tools for commonly used map making *Elements*. An *Element* is any object created on the *Layout* page, such as a *Map Frame*, *Legend*, *North Arrow*, *Scale Bar*, or *Text Box*.



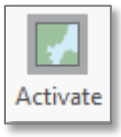


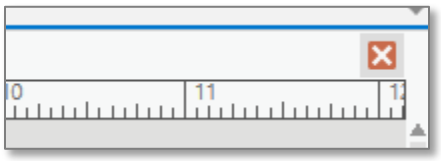
Commonly used tools on the *Layout* menu include:

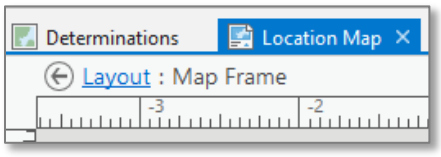
- ***Select*** – Use to select *Elements* on the page. Once selected, an *Element's* properties can be viewed and adjusted (note: element must be unlocked in Layout Contents pane to change it).

- ***Navigate*** – Use to zoom in or out or pan around the *Layout* page, not the map within the page, if present.

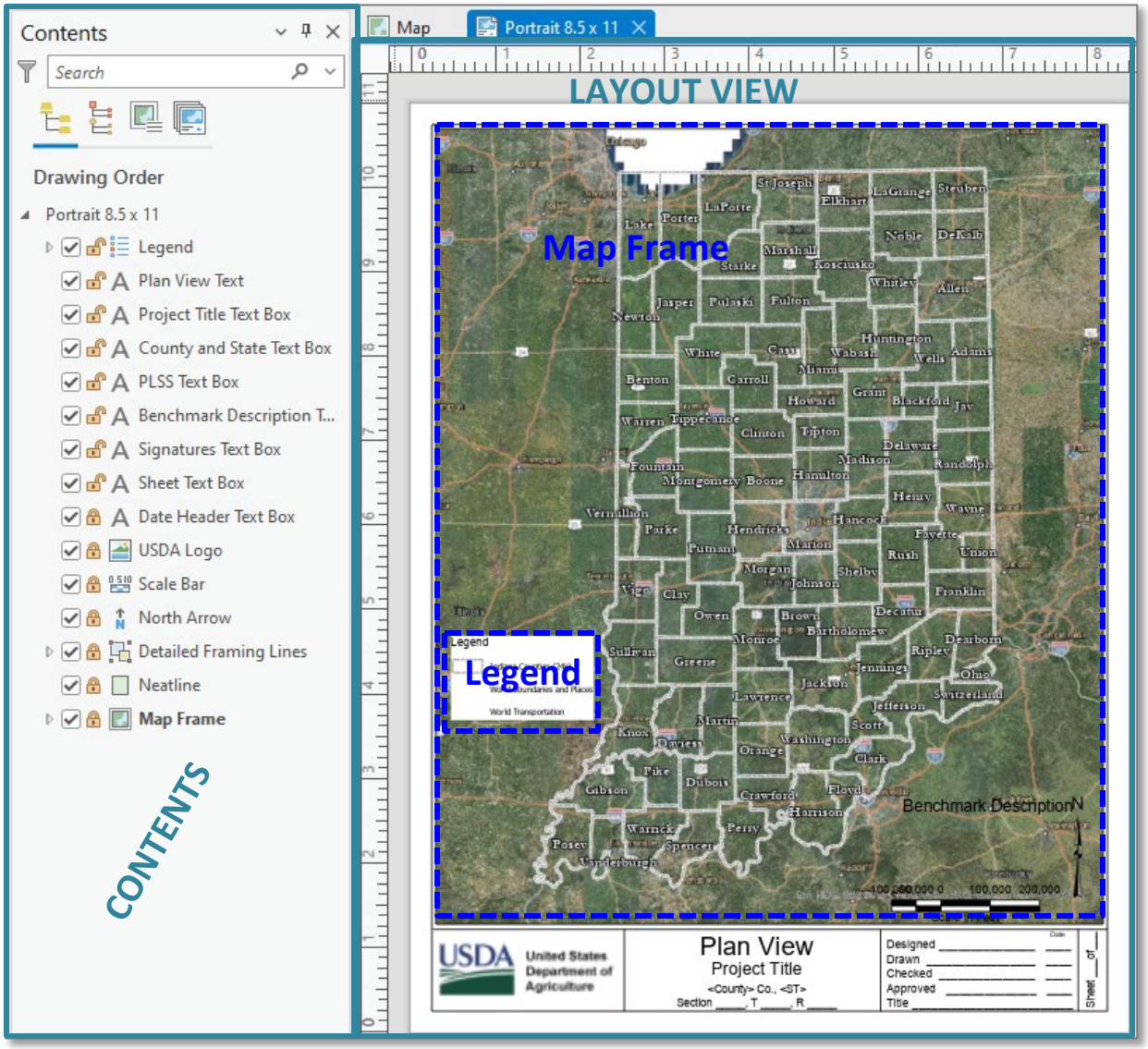
- ***Activate*** – This function is found in the *Map* section of the *Layout* tab. It is used to activate the selected *Map Frame* on the *Layout* page which changes the *Layout* tab back to the *Map* tab and allows you to use *Map* functions like ***Explore*** while viewing the *Layout* page. This is used to adjust the extent and scale within the *Map Frame* interactively while the *Layout* page is visible. *Activation* of a *Map Frame* must be closed to change back to the *Layout* tab and tools and work with *Layout Elements* again. This can be done by clicking the red "x" at the top-right of the ruler bars while a *Map Frame* is activated, or by clicking the *Back* button or *Layout* link at the top left of the *Layout View*.







The *Contents* pane for a *Layout* displays the *Layout's Elements*, as well as the *Map Frame* and its layers. In addition, the items listed on the *Contents* pane of a *Layout* can be locked or unlocked. Locked *Elements* cannot be renamed, resized, or repositioned. Unlocked *Elements* can be renamed, resized, and repositioned. You can right-click a selected *Element* on the *Layout* page, or right-click the *Element's* name in the *Contents* pane and choose *Properties* to view the *Element Pane* for the selected item and adjust its properties. Below is an example *Layout*.
Note: The *Map Frame* and *Legend Elements* in the *Contents* pane expand and behave like a group layer.



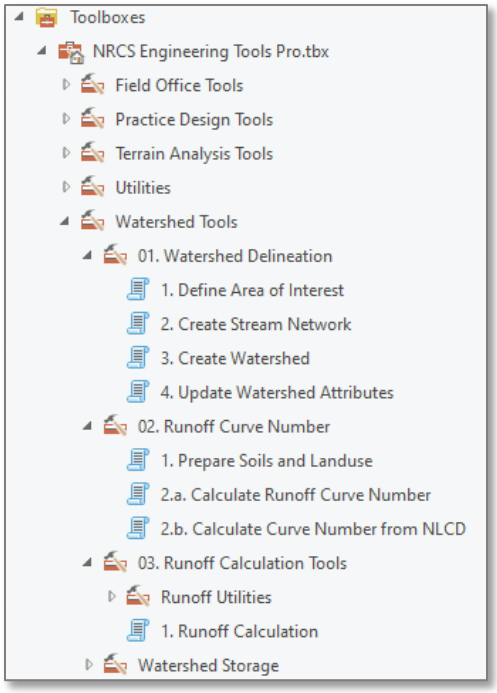
Running a Toolbox Tool

This section describes how to run a tool in a toolbox within ArcGIS Pro. The Engineering Tool is a custom toolbox, with groups of tools. The individual tools contain required parameters users must complete, optional parameters for users to complete, and auto filled or pre-filled parameters that users should not change.

Opening a Tool

To open a tool from the *NRCS Engineering Tools Pro* toolbox –

- Open the *Catalog Pane* (from the *View* tab of the *Ribbon*)
- Make sure the contents of the *Project* are displayed in the *Catalog Pane* by clicking *Project* at the top of the window.
- Expand *Toolboxes*.
- Expand the *NRCS Engineering Tools Pro* toolbox.
- Expand the tool group(s).
- Double-click the desired tool.
- The tool will open in the *Geoprocessing* pane or window. The *Geoprocessing* pane or window may be floating, docked, or hidden. Adjust the geoprocessing window to view and enter the required parameters and run the tool.



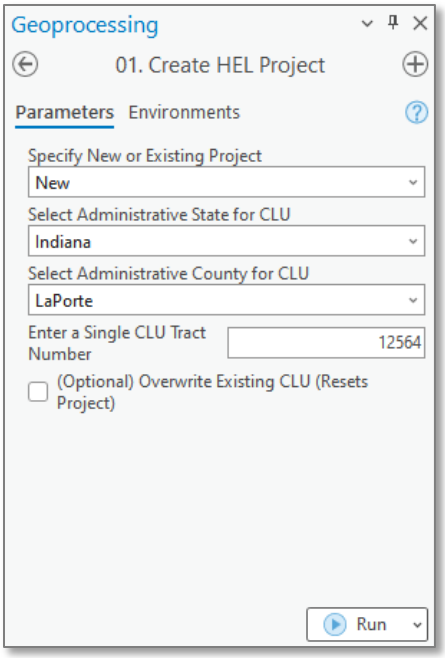
Completing Tool Parameters

Tools from the Engineering Tool could have required parameters, optional parameters, or auto-filled parameters. All required parameters must be filled out before a tool can be run. Specific methods for populating the parameters are covered in more detail in their respective lessons. The following general tips are provided when filling out tool parameters:

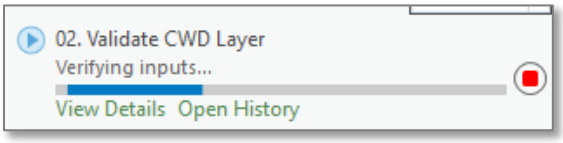
- Required parameters will usually have a red asterisk in front of them if they are not yet completed. They must be filled out before a tool can be run.
- Optional parameters will usually be labeled as (Optional) or won't have a red asterisk in front of them.
- Several parameters have picklists. Click the dropdown arrows to review and select choices.
- If a parameter instructs you to select a layer from the provided dropdown, then do so. Do not try to add a layer from the file system using the browse folder when *from dropdown* is present unless specifically directed to do so by this user guide or the help tip for that parameter.
- Sometimes Optional parameters will be available when you expand the carat/arrow at the heading of a group of parameters. Tool lessons will call this out where needed.
- Anything marked (Auto-populated) or (Do not change) should not be altered manually be users.
- When parameters are populated, wait for the blue progress bar at the top of the geoprocessing window to finish cycling before updating the next parameter or running the tool.
- Some parameter selections will hide or show new parameter options.
- Review all parameters before clicking *Run* in any tool.
- If a parameter has a red "x" or yellow triangle, hover over the icon for a descriptive message.
- Parameters have help tips available which will be displayed if you hover over the "i" icon in front of the parameter when interacting with that parameter.

Running a Tool

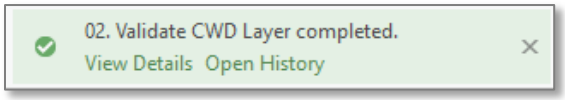
After completing entries for tool parameters, click the *Run* button at the bottom of the form for the tool.



While the tool is running, a status message will appear at the bottom of the *Geoprocessing* tool window. The progress bar will cycle while the tool runs. The red-square button acts as a stop or cancel function and will end the operation of the tool. The *View Details* text is a link to open another window that will show more detailed status messages of the tool as it runs.

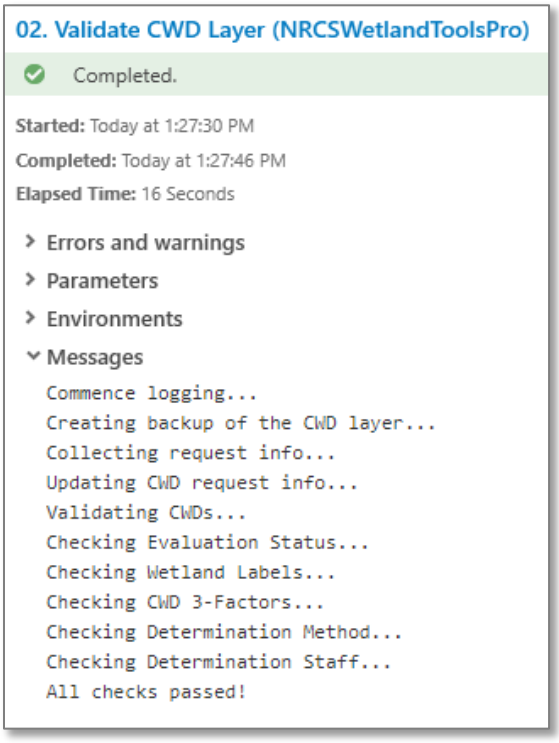


When a tool is finished running, it will show a status color and a message. Green indicates the tool ran successfully with no errors or warnings. Yellow indicates the tool ran but had warnings that you may want to review. Red indicates the tool failed. When a tool fails, read the error messages and review the tool instructions. This may help you to re-run the tool successfully.



Reviewing Tool Error Messages

After running a tool, you can click the *View Details* link in the status message at the bottom of the tool window for more information. This is useful if there are warnings (yellow status message) or errors (red status message).



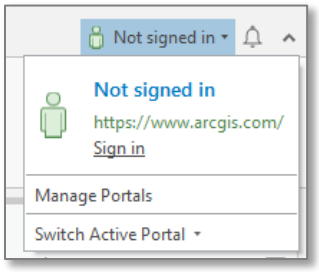
After clicking *View Details*, another window will open that contains sections for *Errors and warnings*, *Parameters*, *Environments*, and *Messages*. By default, *Parameters* will be expanded and displayed, but you can collapse that section and expand the *Messages* section for useful tips or hints. For example, a tool may have a red error message that a required parameter is incorrect, or input data is missing. You should go back and complete any instructions provided in the *Messages* before rerunning a tool or continuing the determination workflow.

Lesson 6 – Changing Portals in ArcGIS Pro

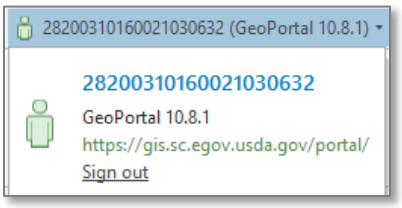
The CLU Download Tool relies on the GeoPortal to obtain current CLU data for the workflow. When opening a template, or during the CLU Download Tool workflow, you may be directed to sign-in or switch your Portal connection before running certain tools. This lesson is an overview of how to switch between Portals.

In an active ArcGIS Pro project, the *Portal Status* information and menu appear in the top-right corner of ArcGIS Pro. If you click the dropdown arrow next to your current sign-in status, a menu appears which shows the current Portal connection and your sign-in status for it. Also available are options to *Manage Portals* or to *Switch* your active Portal.

Sign-in to a Portal



- Click the *Not signed in* dropdown.
- Click *Switch Active Portal*.
- From the list of available Portals, select GeoPortal (https://gis.sc.egov.usda.gov/portal).
- If prompted, complete the sign-in process. USDA Portals require PIV/CAC sign-in or E-authentication to complete sign-in. In some cases, Single-Sign On (SSO) may sign you in automatically. If you've signed-in to the selected Portal recently, your token may still exist, and you will be automatically signed in without needing to authenticate.
- After sign-in, you can click the Portal status dropdown again to see your status as well as the *Sign out* option (usually not needed).



Switch Active Portal

The process to switch Portals is the same as the sign-in process, above, except you would click your existing sign-in status dropdown and proceed straight to the *Switch Active Portal* choice. Then select your desired Portal and complete sign-in for that portal. If you are already signed into multiple Portals, you may not be prompted to sign-in again and your active Portal status will be updated.

Starting a Project

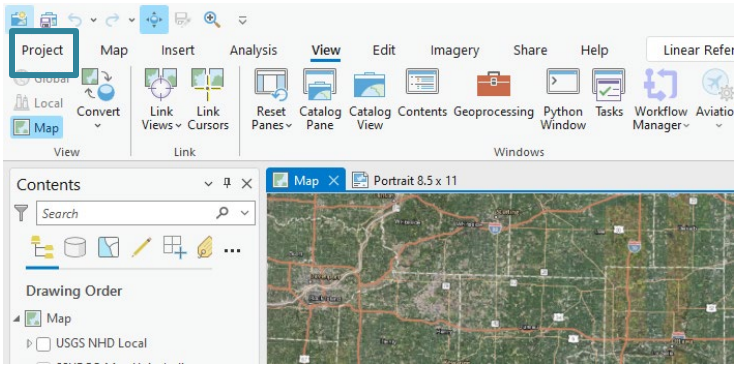
Open Custom Template

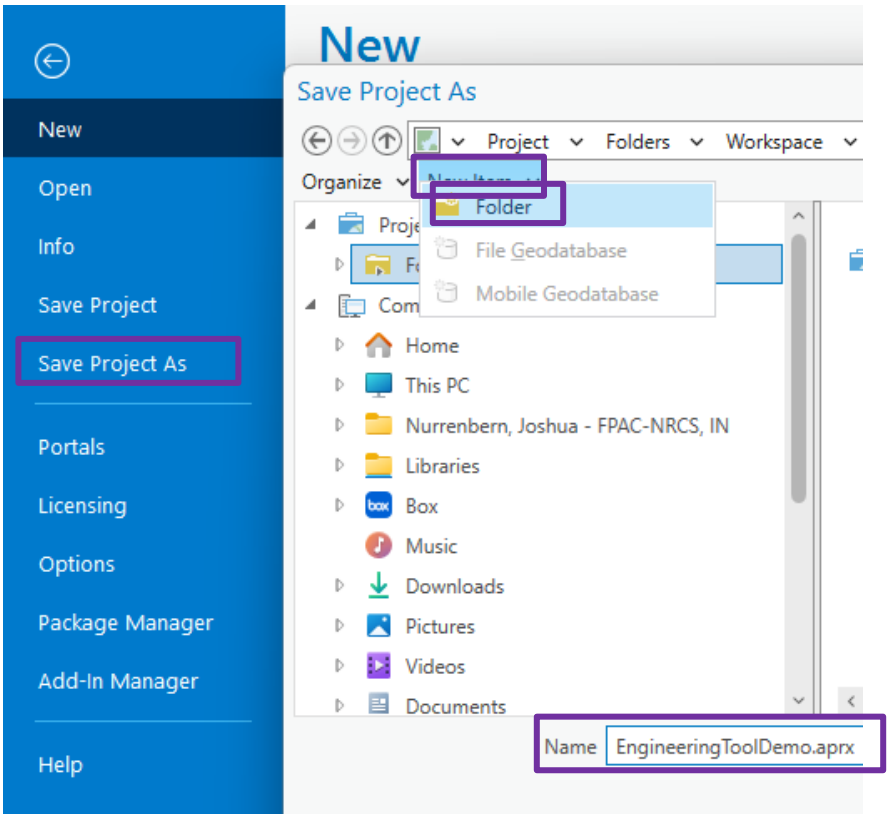
To start a project, either open the state template or a custom template that was created back in Lesson 4. These templates will be located in *C:\GIS_Tools\Engineering_Tools_Pro\State Templates* OR *C:\GIS_Tools\Engineering_Tools_Pro\My Templates.*

Saving New Project

Once the template project is open, do a *Save Project As* to save the project in a new workspace folder.

- Click *Project* on the left side of the ribbon.
- Hit *Save Project As* in the left menu
- Navigate to *C:\Workspace*
- Click *New Item* at the top of the File Explorer
- Click *Folder* to create a new folder
- Rename the newly created folder and open the folder.
- Create a Name for the folder at the bottom of the file explorer
- Hit *Save*

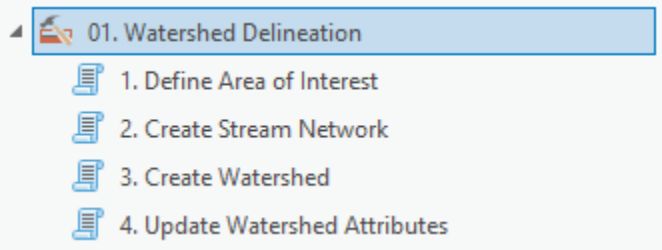




Note: Make sure to periodically save your project so you don't lose your progress

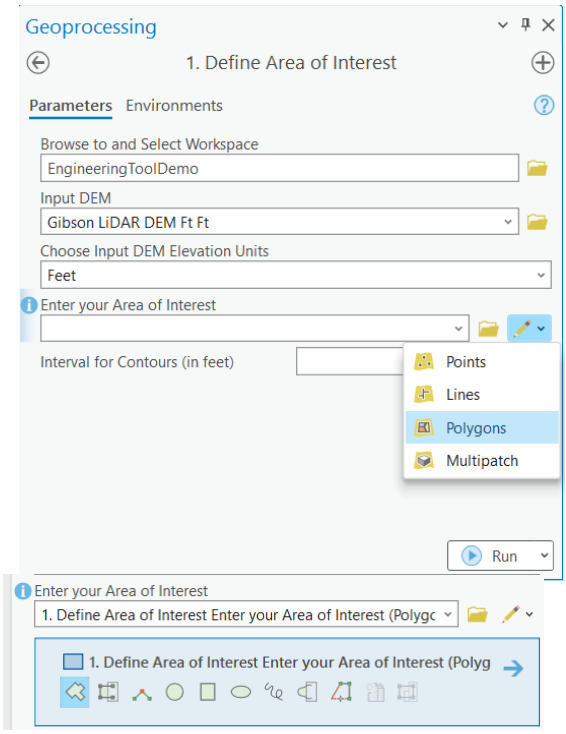
Watershed Tools

01.Watershed Delineation



Define Area of Interest

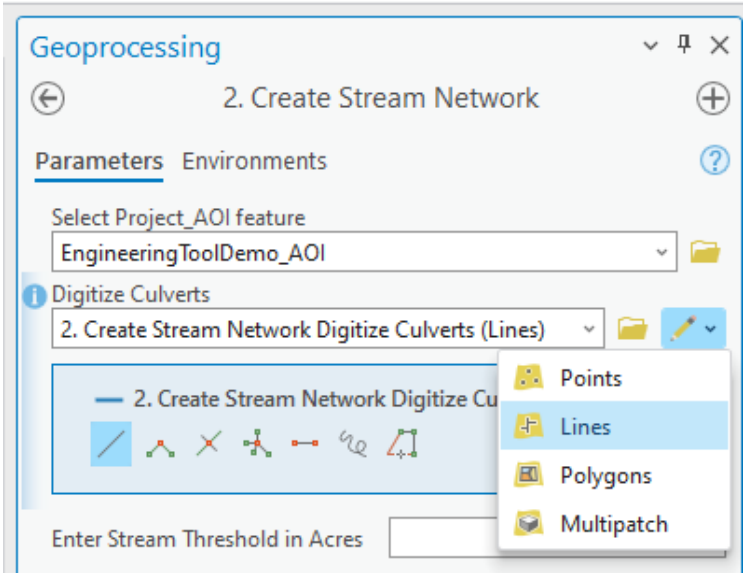
- Open the Define Area of Interest tool by double clicking the tool name in the toolbox in the Catalog pane.
- In *Browse to and Select Workspace*, select the folder in which the data will be saved to. This will probably be the folder created earlier in C:\Workspace.
- Select the County DEM for the county the delineation is occurring in.
- If using a County DEM, choose *Feet* for the *Elevation Units*
- To the right of the *Enter your Area of Interest* box, click the pencil icon then select *Polygons.*
- Once *Polygons* is clicked, a polygon is able to be drawn on the map by clicking for the vertices. Once the desired shape has been created, double click the last vertex to complete the polygon.



- Choose a Contour interval
- Click *Run* at the bottom of the Geoprocessing pane.

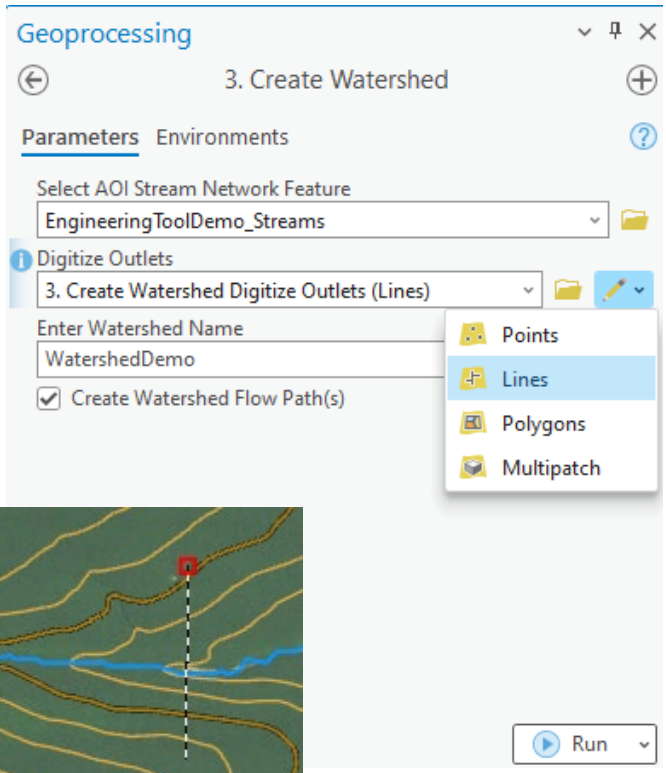
2.Create Stream Network

- Open the Create Stream Network tool by double clicking the tool name in the Toolbox in the Catalog pane
- Select the Project AOI in the first box. This will be named *<workspace_name>_AOI*
- In the digitize culverts section, select the pencil icon the select *Lines*
- On the map, a culvert can now be drawn by clicking on one side of the culvert then double clicking on the opposite end to complete the line.
- In the Stream Threshold section, enter a stream threshold value in Acres. The default is set to 5 acres.
- Click *Run* to run the tool.



3.Create Watershed

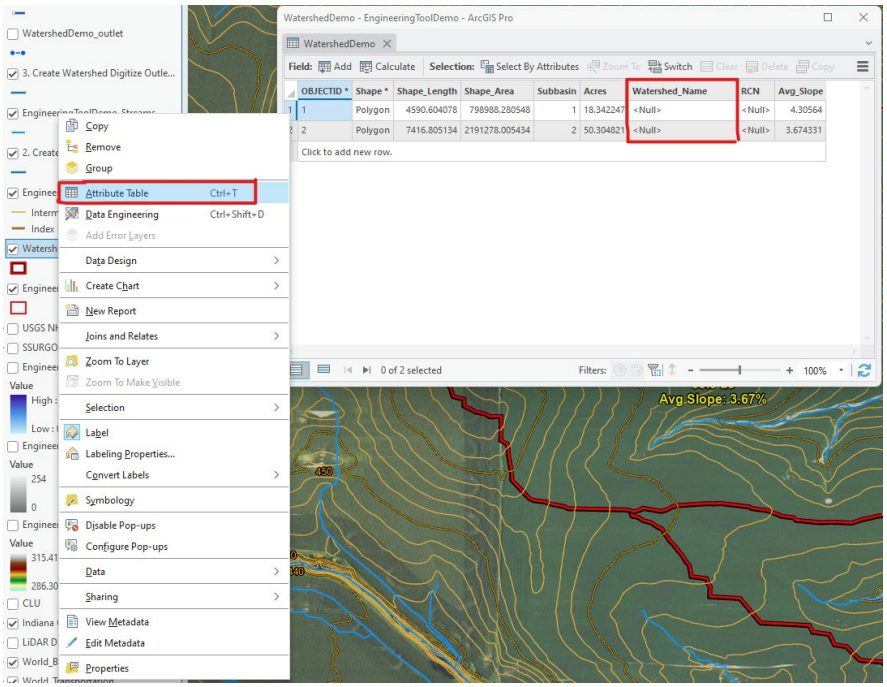
- Open the Create Watershed tool by double clicking the tool name in the Toolbox in the Catalog pane
- Select the Stream Network in the first empty box
- Digitize the watershed outlet by selecting the pencil then selecting *Lines*
- Once *Lines* has been selected, watershed outlets can be drawn on the map by first selecting one side of the outlet the double clicking at the opposite end of the outlet as shown in the image to the right
- Enter a watershed name. This can be any name, just don't include special characters
- Check the flowpath box to generate a longest flowpath line in each sub-basin. The checkbox is required if you want to run the Runoff Calculation later.



Editing Watersheds (optional)

If a watershed doesn't look correct, the watershed can be edited to match what is happening in the field. This could be useful if the ground condition in the field has changed since the last elevation collection. Please review Appendix A for information on how to use the editing tools in ArcGIS Pro.

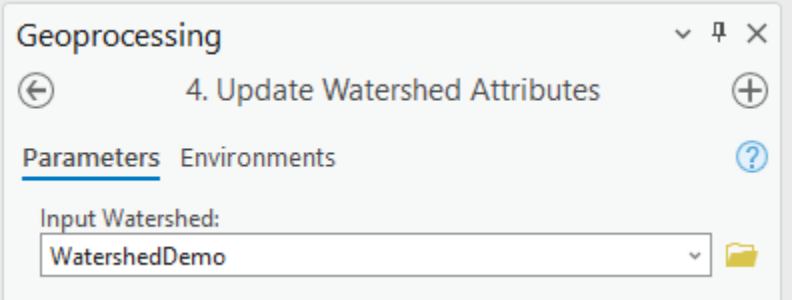
Subbasins can be given custom names with the ArcGIS Pro tool. To do this, open the attribute table for the newly created watershed and change the *Watershed_Name* field to the desired watershed name. If the watershed name is changed, the labels on the watershed will automatically update to the newly entered name. Save your edits on the left side of the edit tab on the ribbon.



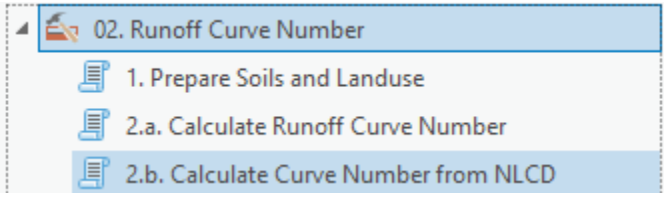
4.Update Watershed Attributes

If edits were made to the geometry of the attribute table, run the Update Watershed Attributes tool to update the geometry attributes in the attribute table.

- Open the Update Watershed Attributes tool by double clicking the tool name in the Toolbox in the Catalog pane
- Select the desired Watershed in the box.
- *Run* the tool

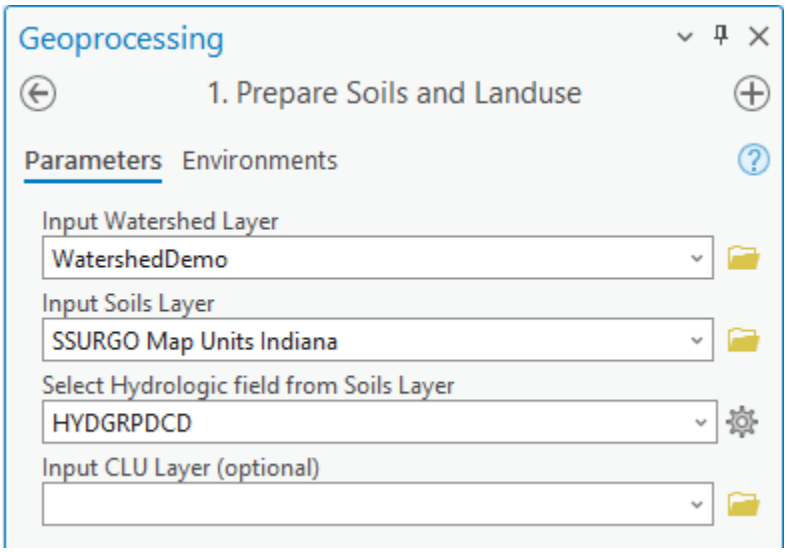


02.Runoff Curve Number



1.Prepare Soils and Landuse

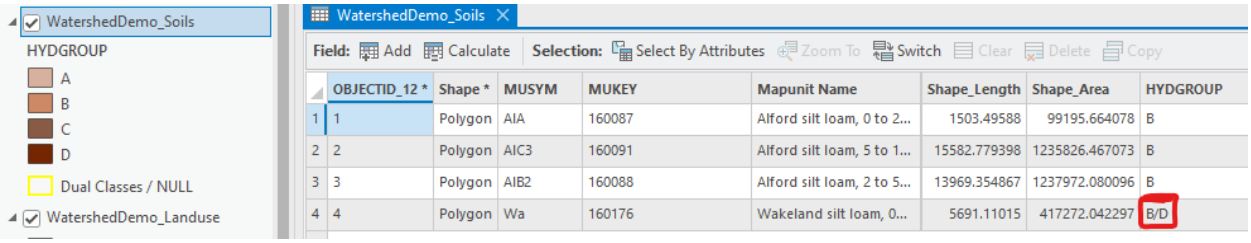
- Open the Prepare Soils and Landuse tool by double clicking the tool name in the Toolbox in the Catalog pane
- Select the Watershed in the first box
- Select the Soils layer in the second box
- Select *HYDGRPCD* in the third box.
- The CLU layer is optional. The national layer does not work for this field. The individual county layers can be used instead.
- *Run* the tool



Editing the Soils Layer and Hydrologic Values

The soils layers must be edited before the next tool can be run. Hydrologic Values need to be converted to single class values. i.e. “B/D” to “D”. Landuse values also need to be selected.

- Edit the *<Watershed Name>_Soils* layer by opening the attribute table (right click on layer)
- Change the *HYDGROUP* field to single class values
- *Save* edits on the edit tab in the ribbon

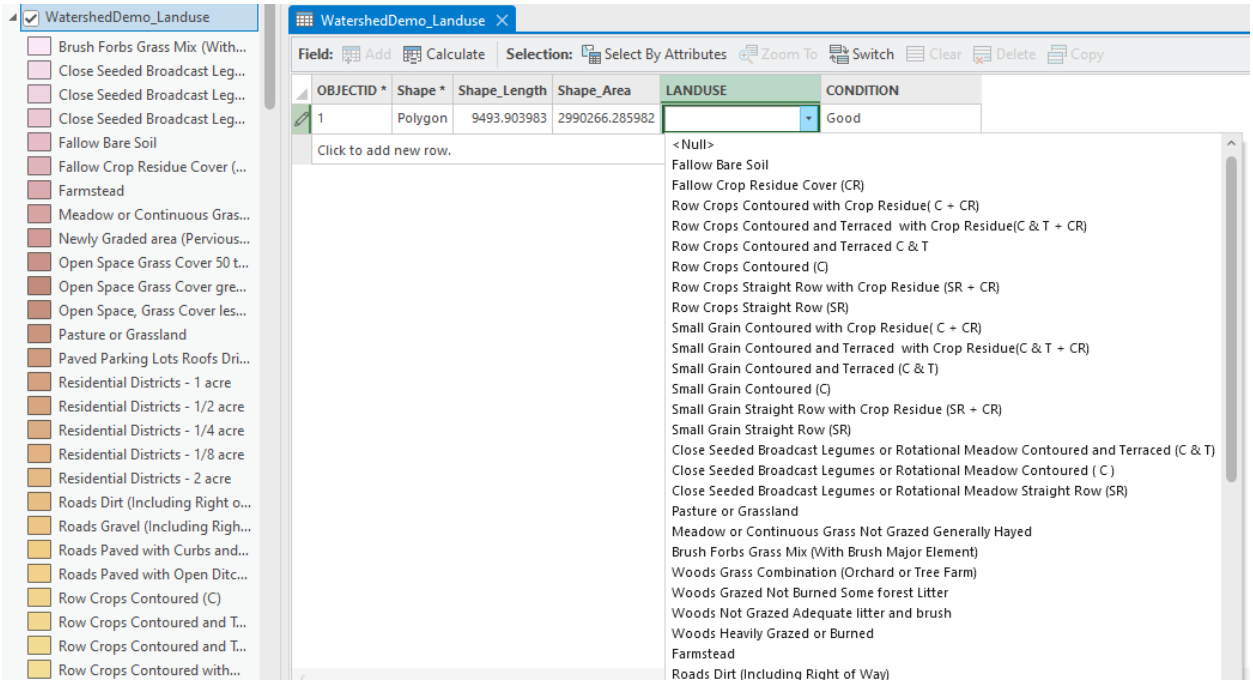


Edit the Land Use Layer

The land use layer must be edited by selecting a land use and condition in the attribute table. By default, the land use layer has one polygon in it. If there are multiple land uses in the watershed, edit the land use layer by following the layer edit instructions within Appendix 1.

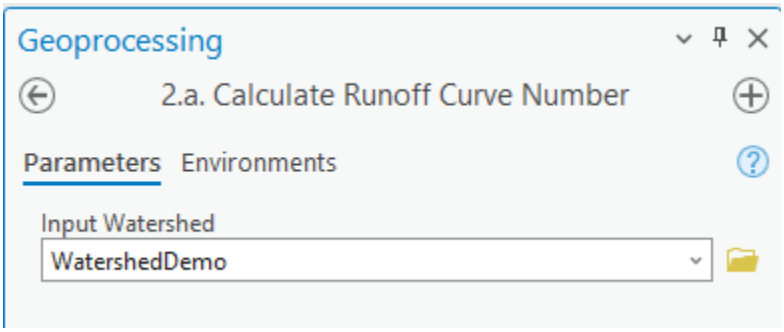
Once the land use layer has been edited

- Open the attribute table for the *<Watershed Name>_Landuse* layer.
- Change the *LANDUSE* and *CONDITION* fields to match the landuse and condition of the respective polygon
- *Save* the edits on the edit tab in the ribbon

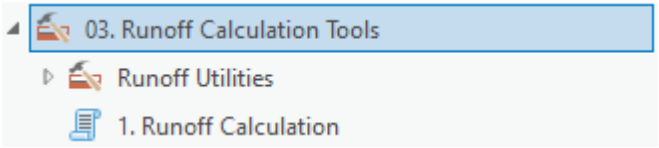


2.a.Calculate Runoff Curve Number

- Open the Calculate Runoff Curve number tool by double clicking the tool name in the Toolbox in the Catalog pane
- Select the watershed in the Input Watershed box.
- *Run* the tool

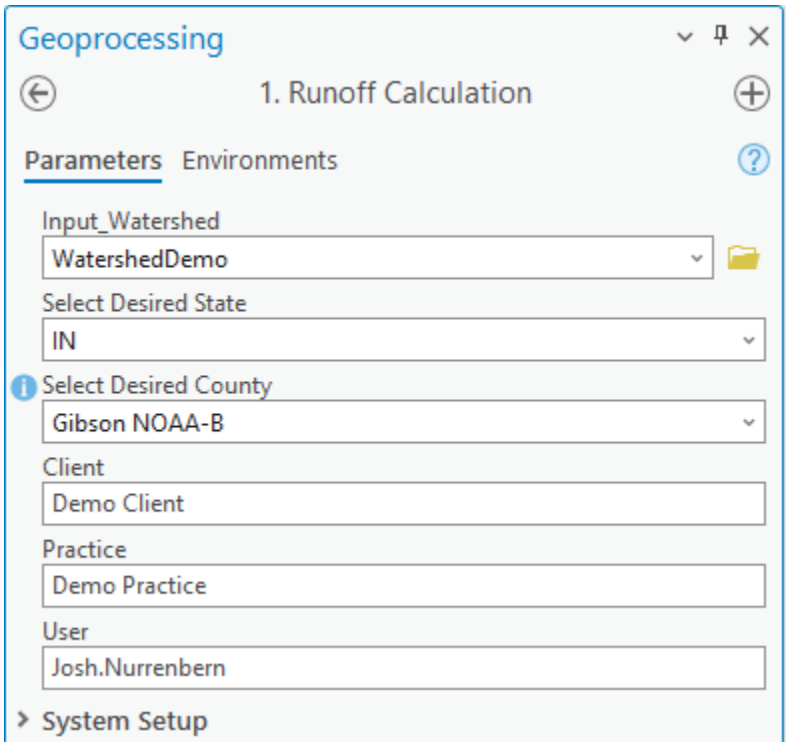


03.Runoff Calculation Tools



1.Runoff Calculation

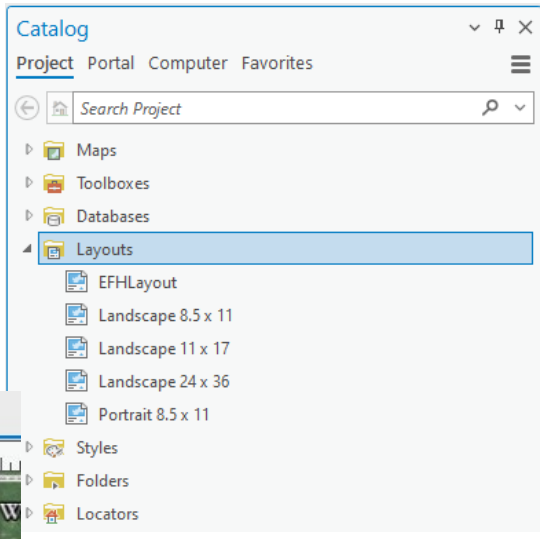
- Open the Calculate Runoff Curve number tool by double clicking the tool name in the Toolbox in the Catalog pane
- In the Input_Watershed column, select the watershed,
- Select the correct state
- Select the correct county
- Enter a Client name
- Enter a Practice name
- *Run* the tool



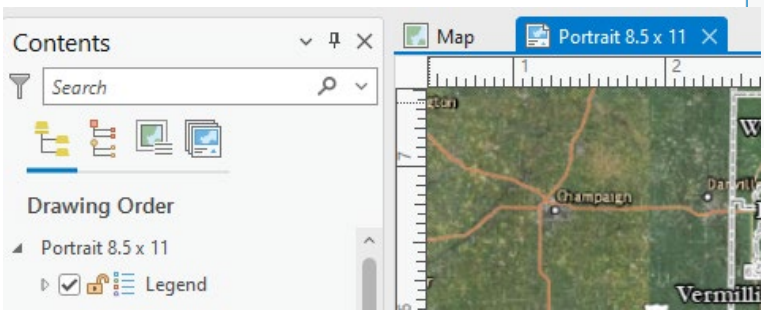
Layouts

Opening a Layout

Layouts can be opened from the Catalog pane in the *Layouts* section. Double click the desired layout to open it.



Once the layout is open, the map and layout can be switched between at the top of the frame. There should now be a *Map* tab and a layout tab as shown below

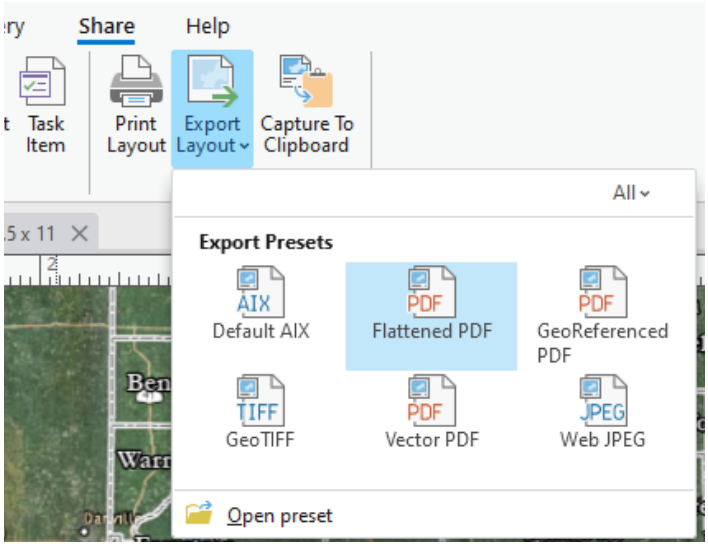


Editing the Map

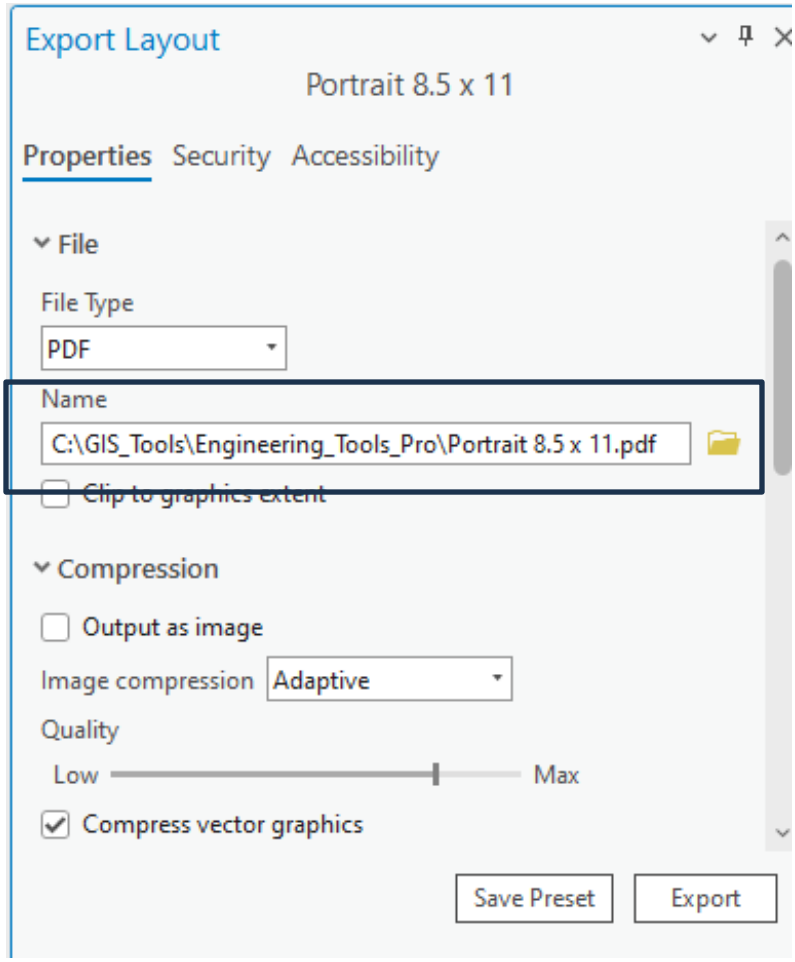
On the Insert tab on the ribbon, there are options to add a North Arrow, Scale bar, Legend, and Graphics and Text. Review the layout section above for more information on how to edit layouts.

Saving a layout

When the layout is open, open the *Share* tab on the ribbon. Click the *Export Layout* tool and select *Flattened PDF*.



Select the folder to the right of the name box and change the save destination to the desired save destination and change the save name to the desired save name.

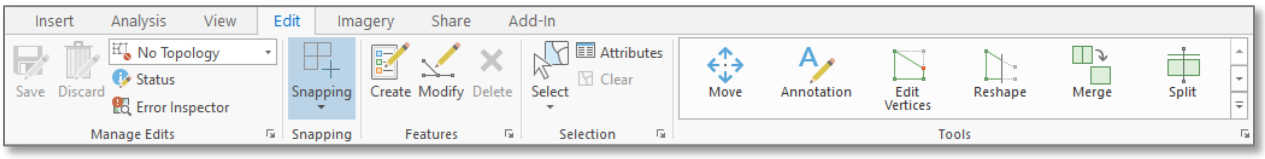


Appendix A – Basic Editing in ArcGIS Pro

This appendix provides basic details for how to edit in ArcGIS Pro. It is not comprehensive and if you need further assistance, you should request it from your State Tool Administrator and/or State GIS Specialist, as well as request options for possible ArcGIS Pro training courses from ESRI.

Edit Tab

Most functions and tools needed for editing will be found on the *Edit* tab of the ArcGIS Pro *Ribbon* when a map view is active. The buttons on the *Edit* tab will often be used to open additional panes with more tools and functions used for the actual edits. The *Edit* tab also has a *Tool Gallery* area (right-side of the below screenshot) that you can customize to show your favorite tools.

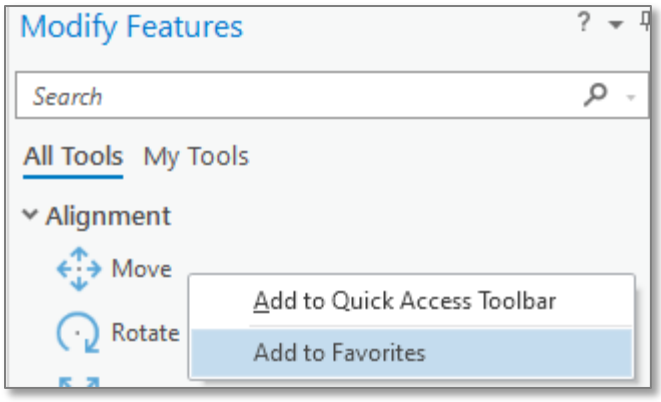


Create/Modify Features (General)

The edit tab contains a *Create* button and a *Modify* button. These buttons open additional panes that contain different tools for creating new features or modifying existing features, respectively.

You can add tools from the *Create* or *Modify* features panes to your Favorites tools list, which will in turn update the *Tool Gallery* on the *Edit* tab of the ribbon. To do so:

- Find a tool that you want to add (e.g., the *Move* tool in the *Modify Features* pane, shown below).
- Right-click the desired tool.
- Click *Add to Favorites* from the pop-up menu.
  Note: if the tool is already in your *Favorites*, the option will be *Remove from Favorites* instead, which you should not click unless you want to actually remove it.



The *Create* and *Modify* features panes have a variety of features organized by thematic groupings for their functions. If you can't find a desired tool, use the *Search* bar at the top of the pane to find it. Once you find it, it's recommended that you add it to your *Favorites*, so that it's readily available.

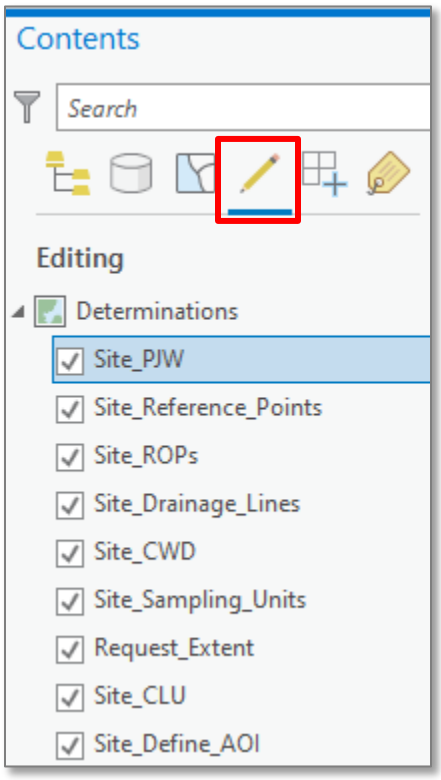
Another way to access *Favorites*, besides the *Tool Gallery* on the *Edit* tab, is to click the *My Tools* link at the top of the *Modify* features pane or the *Favorites* link at the top of the *Create* features pane. Remember to switch back to the *All Tools* or *Templates* links at the top of the *Modify* or *Create* panes, respectively, to find tools that aren't in your *Favorites*, as needed.

Select Features

Many editing tools in ArcGIS Pro involve the step of selecting features. Often a select tool will be included directly in a given tool's pane, if necessary. Otherwise, the standard select features tool from the *Edit* tab or *Map* tab can suffice.

Start/Stop/Save/Discard Edits

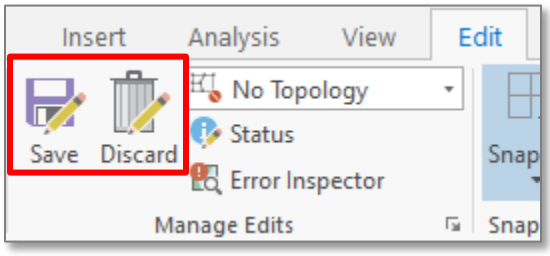
ArcGIS Pro does not use *Start Editing* or *Stop Editing* functions by default to open and close an edit session. However, ArcGIS Pro does include options to enable such settings. If your state has directed you to implement these optional settings in your projects, use them as directed. They will not interfere with the normal WC Tool workflow other than to start or stop editing, as needed. If these optional settings are not enabled, then any editable layer can be edited in a project at any time.



For normal ArcGIS Pro use, editing is possible on any editable layer in a map. You can control whether a layer is editable by clicking the *List By Editing* button at the top of the *Contents* pane for an active map. The checked layers will be editable. By default, the WC Tool sets the editable status as active for its operational or business layers when they are loaded. It is not recommended to disable the editable status of any of the business layers for the WC Tool, and instead to manage your edits by turning off the selectable or visible status of any given layer when it is not the focus of current edits.

If any layer has status problems regarding its ability to be edited, a warning or error icon will be displayed to the right of the layer in this list. The icon can be clicked or hovered for more details.

ArcGIS pro does include a *Save [Edits]* button on the ribbon of the *Edit* tab. It is the icon of the save diskette with a pencil over it. This icon is labeled *Save*, but this should not be confused with saving the project. To clarify this difference, this user guide and its lessons refer to this button as *Save [Edits]*.



The *Discard* button is next to the *Save [Edits]* button and can be used to discard all currently pending edits and return your edited data to the state it was in prior to beginning edits or the state it was in the last time you used *Save [Edits]*. This is an undo for all pending edits.

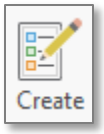
Undo/Redo

ArcGIS Pro has *Undo* and *Redo* buttons on the *Quick Access Toolbar*. These can be used to undo or redo recent edits, until you click the *Save [Edits]* or *Discard* button. Once edits are saved or lost, the only recourse for more corrections is to perform additional edits.

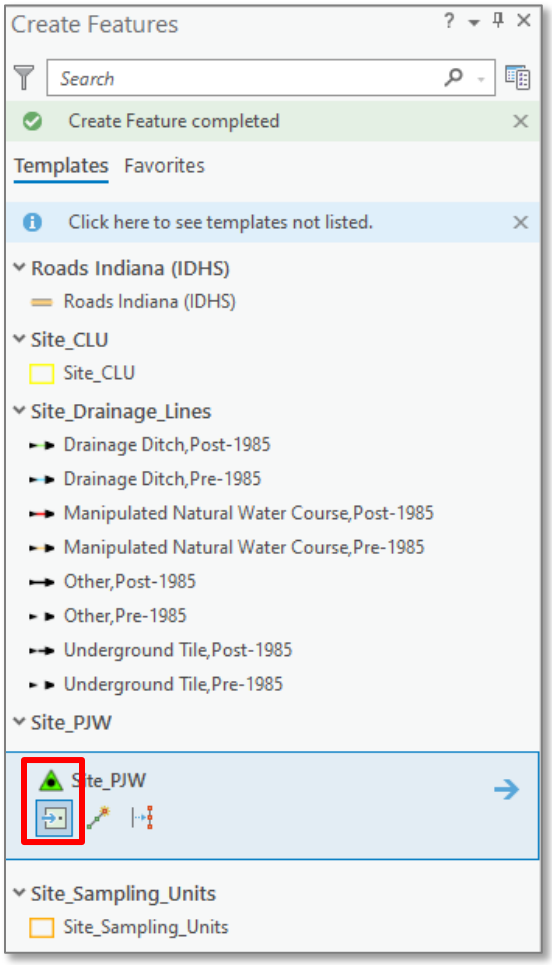
Create Features (Points/Lines)

In the WC Tool workflow, the *Create* features tools should only be used to create points (Representative Observation Points, Reference Points, Potential Jurisdictional Water points) and lines (Drainage Lines). The *Create* tools should never be used to create polygons in any of the WC Tool polygon business layers.

To access the *Create Features* pane click the *Edit* tab, and then click the *Create* button.



This will open the *Create Features* pane which will display a list of layers under the *Templates* tab for which you can create features. If a layer that you are expecting is not in the list of available layers, make sure the layer is set as visible in the *Contents* pane.



Warning: Even though operational polygon layers for the WC Tools are shown in this list, you should NOT create new features for those layers. You may also see incidental reference data that you added in this list. Do NOT create new features in your authoritative reference data layers.

Find the layer for which you want to create features and expand it to see its features (if not already expanded). Click a symbol of a feature to be created. For single symbol layers, it will be only that symbol. For unique (multiple) symbol layers, it will be a list of the available values used to symbolize that layer.

Next, click the *Point* or *Line* digitizing tool (typically the top-leftmost tool) beneath the selected symbol.

You can now digitize on the map with the active tool. The active symbology (and possibly related attributes to define that symbology) will be created for new features that you digitize.

When digitizing points, ***single-click*** at the desired location for a point. The point is immediately created and there is no need to press F2 or click the *Finish Sketch* button. Do *not* double-click, or else you risk creating two stacked points at the same location.

When digitizing lines, start and shape the line by using ***single-clicks*** to digitize. When finished, either double-click at the last point, right-click and choose *Finish*, press F2 on the keyboard, or click the *Finish Sketch* button from the editing toolbar that appeared over the map view. The latter options are useful if you cannot double-click at the last point for some reason. When digitizing drainage, start at the upstream end and digitize downstream in the direction of flow.

If needed, use *Undo* to undo a digitized point, or use *Cancel Sketch* to stop digitizing a line.

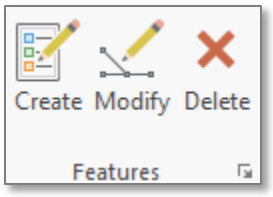
Delete Features (Points/Lines)

In the WC Tools workflow, the *Delete* features button should only be used to delete Site ROPs, Reference Points, Drainage Lines, or PJW points that are not needed for the current project, possibly as part of correcting or changing these features.

Warning: Never use delete to remove a polygon area from a WC Tool operational layer. Use the *Merge* tool under *Modify Features* instead.

To delete a feature:

- Click *Clear [selected features]* to clear any current selections.
- Use the *Select [Features]* tool to select the feature(s) to be deleted. Take extreme care through layer selectable status, editable status, or visible status to avoid inadvertently selecting unintended features from other layers, especially reference layers.
- Click the *Delete* button from the *Edit* tab.
- Review the results before clicking *Save [Edits]*. You do not want to save edits of deletions for critical data layers that cannot be easily recovered or recreated.

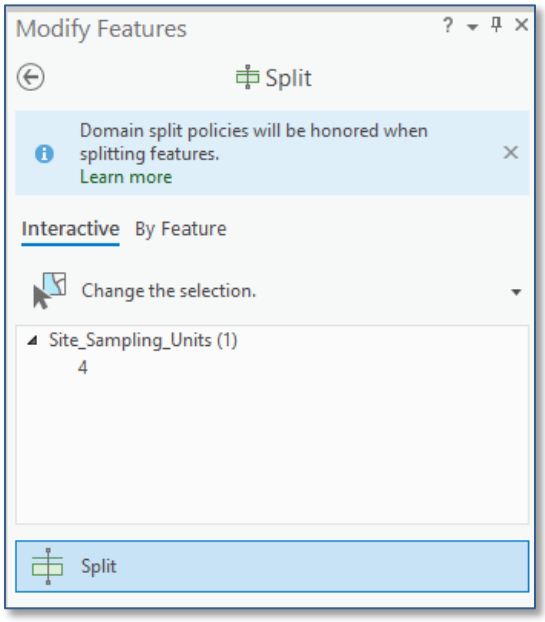


Split Features (Polygons)

The *Split* tool is the primary tool for delineating extents within the WC Tool's business layers to sub-divide areas into different sampling units or determination areas. *Create* features should *NOT* be used to delineate polygon features in the WC Tool.

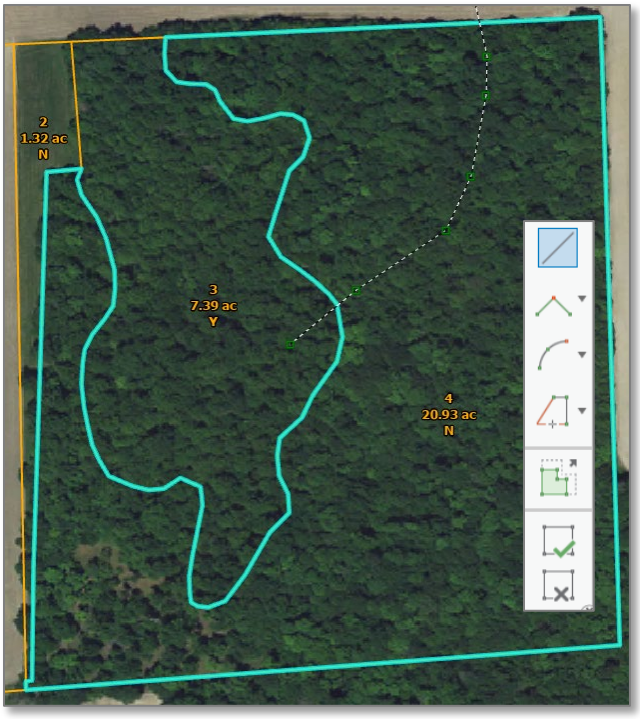
To split a feature:

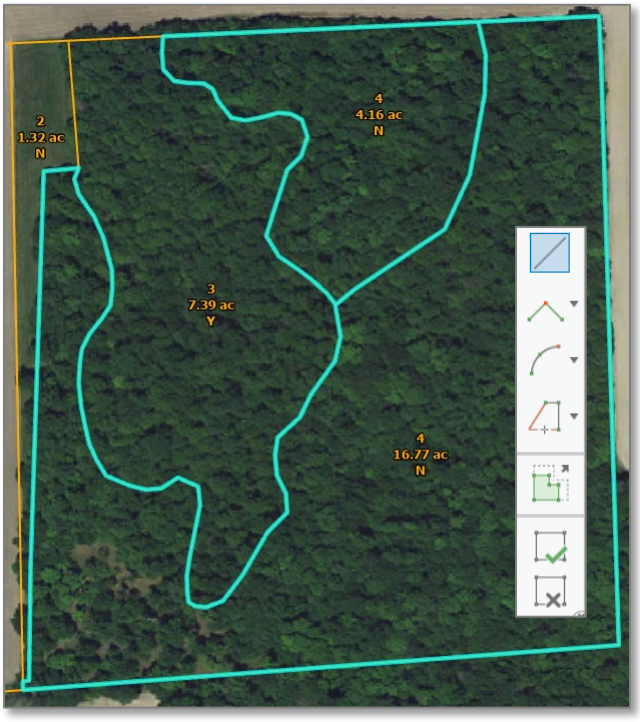
- Click *Clear [selected features]* to clear any current selections.
- Access the *Split* tool from the *Tool Gallery* or your *Favorites* list. If *Split* is not available in those places, click the *Modify* features button on the *Edit* tab of the ArcGIS Pro *Ribbon*. Expand the *Divide* section, and then click the *Split* tool.
- In the *Split* tool pane, use the *Change the selection* tool to select the feature(s) to be split. Take extreme care through layer selectable status, editable status, or visible status to avoid inadvertently selecting unintended features from other layers.
- Click the *Split* digitizing tool in the bottom half of the *Split* tool pane.
- Use the *Split* digitizing tool to digitize a split through a polygon.
    - Use single-clicks to start and shape the split.
    - If splitting from edge to edge, start outside of the selected polygon(s) and digitize across or around to an edge and then finish outside the starting edge.



- If splitting inside one polygon without touching the edges (create “island” polygon), start inside the polygon and cross back over the starting sketch (dotted line) extent.
- Double-click, press F2, click *Finish Sketch*, or right-click and select *Finish* to complete the split. Split features will appear and have duplicate attributes. Acres will update. All features from the split will be selected by default.

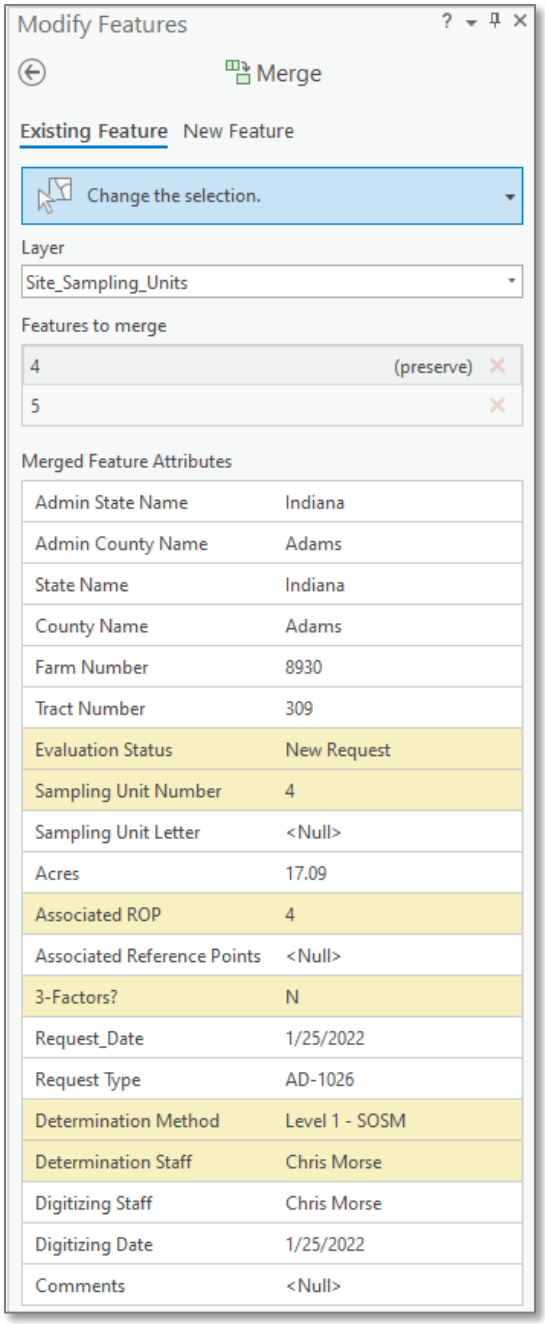
- Update attributes of the split features and save edits, as needed.





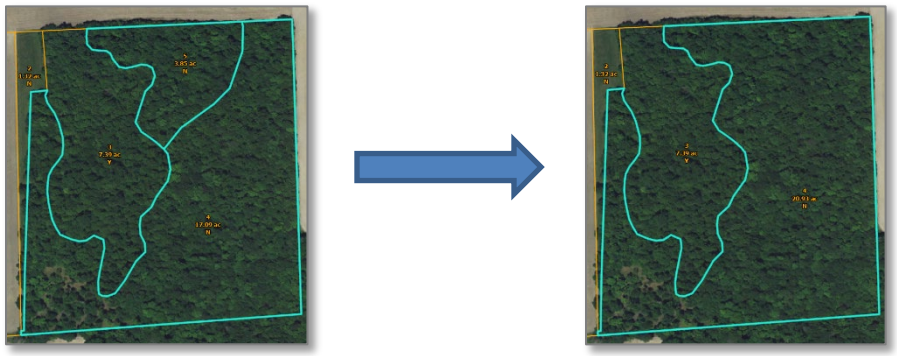
Merge Features (Polygons)

The *Merge* tool is used to combine adjacent extents of polygons into a single extent ("dissolves" or "erases" separating lines between adjacent features). It can also be used to create multi-part features by merging non-adjacent polygons. It is used to combine features within the same layer, not between separate layers. In the WC Tool, it is typically used to correct or adjust delineations of Sampling Units, in conjunction with the *Split* tool, or to combine adjacent CWD areas of matching labels and methods.



To merge features:

- Click *Clear [selected features]* to clear any current selections.
- Access the *Merge* tool from the *Tool Gallery* or your *Favorites* list. If *Merge* is not available in those places, click the *Modify* features button on the *Edit* tab of the ArcGIS Pro *Ribbon*. Expand the *Construct* section, and then click the *Merge* tool.
- In the *Merge* tool pane, use the *Change the selection* tool to select two or more features, typically adjacent features, that will be merged together.
- The layer dropdown can be used to specify the layer for the selections.
- Once selected, the features to be merged will be listed in a table in the pane. You can click either row to see its attributes, and the selected row will be marked "(preserve)".
- Choose and review one of the selected features for which the attributes will be preserved.
- Click ***Merge*** at the bottom-right of the pane.



Attributes

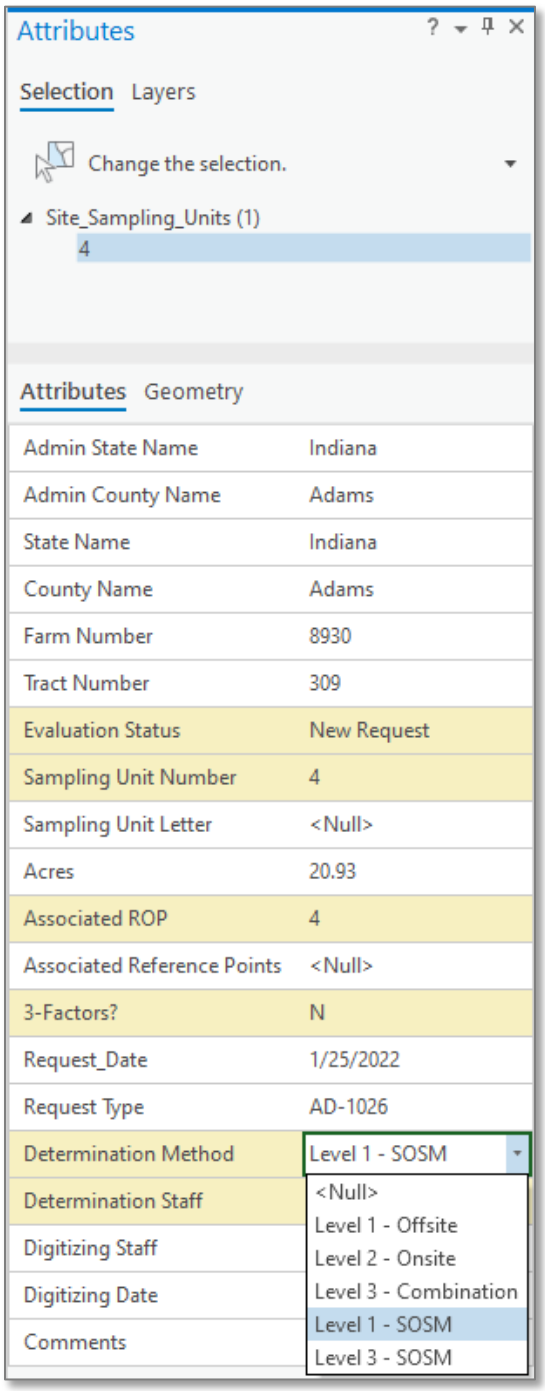
The *Attributes* tool opens the *Attributes* pane and is used to update attributes for selected features. In the WC Tool, the attributes of the business layers for the tool may include required fields, which are highlighted. Also, where choice lists are provided in dropdown menus, you must select a value from the list and cannot type in a custom value.

In the *Attributes* pane, you can use the *Change the selection* tool to select one or more features on the map. The selected features will appear beneath the layer name that contains the feature, along with a count of how many features are selected.

In the list of selected features in the *Attributes* pane, the attributes in the bottom half of the pane are associated with the highlighted feature in the top half of the pane.

If multiple features are selected in the layer, only the highlighted feature in the list of the top half of the pane has its attributes displayed in the bottom half.

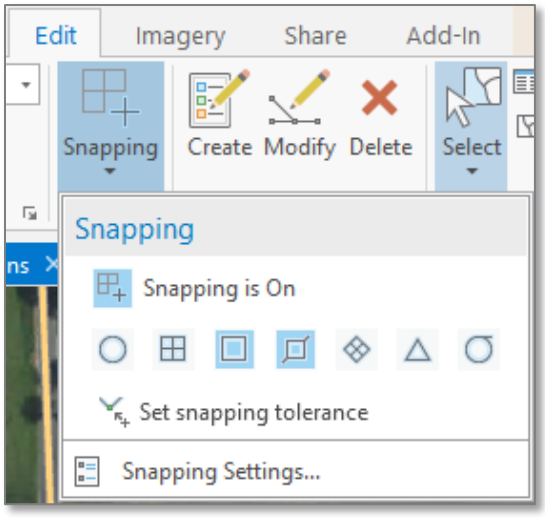
If multiple features are selected in the layer, you can change an attribute for all selected features at the same time (e.g., if all features use the same *Determination Method*), but selecting the layer name in the top half of the pane before updating a particular attribute.



Snapping

Snapping is a feature of ArcGIS Pro where new vertex edits can be matched exactly to existing geometry features in the map to connect geometry. ArcGIS Pro has snap settings active by default and they can be modified or disabled as needed. Also, while digitizing, you can hold spacebar to temporarily override and suspend any active snap settings.

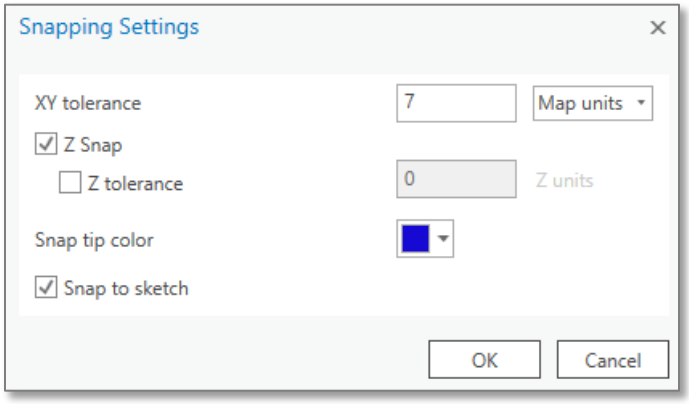
The *Snapping* tool and its settings is available on the *Edit* tab of the ArcGIS Pro *Ribbon*. When clicking this tool, you can enable or disable snapping by clicking the top left button in the snapping tool menu. The current status of snapping is always displayed when opening this tool.



Below the Snapping status button is a row of the types of features to which the edit cursor while currently snap. The most commonly used types are *vertex* and *edge* (shown highlighted in blue in the accompanying screenshot).

The next tool below the row of feature types for snapping will activate an interactive cursor on the map that you can use to draw a distance that will be used for snapping. It will be labeled with the map units used by the coordinate system of the current *Map* or *Map Frame* or by pixels, depending on your *Snapping Settings*.

Additional settings can be adjusted under the *Snapping Settings…* button. This will open the *Snapping Settings* window where you can manually adjust a snapping tolerance and specify whether it uses pixels or map unit distances.



Note: The *Snap to sketch* option needs to be enabled if you need to use the *Split* tool while editing to cut out an “island” polygon from within a single selected feature.

Issue Reporting

Please contact the State GIS Specialist if you have any issues.