The Automated Geospatial Watershed Assessment Tool
Introduction to AGWA for BAER scenarios

What is AGWA

The Automated Geospatial Watershed Assessment (AGWA, https://www.tucson.ars.ag.gov/agwa) tool is designed to support comprehensive watershed hydrological modeling with a suite of management tools. **AGWA for ArcGIS pro** is developed in 2024 using Python 3 within the ArcGIS Pro environment.

Summary of this Tutorial

Introduction	In this exercise you will assess the impact of a wildfire on runoff and erosion in a burned watershed.
Goal	To familiarize yourself with AGWA and its application for post-fire BAER scenarios.
Assignment	Run the KINEROS2 model to analyze the effects of the 2013 Mountain Fire on a watershed in the San Jacinto Mountains of California. Compare and view the pre- and post-fire simulation results.

Background

Mitigating the impacts of wildfires on watershed responses to precipitation is a primary objective of Burned Area Emergency Response (BAER) teams. Due to weather and climatic conditions, these teams often need to conduct rapid post-fire assessments to create a plan documenting and recommending the prioritization of remediation measures. Building and running distributed hydrological models to predict the potential impacts of fire on runoff and erosion can be time-consuming and laborious. To facilitate this process, the USDA-ARS Southwest Watershed Research Center, in cooperation with the U.S. EPA Office of Research and Development and the University of Arizona, developed AGWA, a geographic information system (GIS)-based tool. A GIS provides the framework for collecting spatially-distributed data, preparing model input files, and evaluating model results in a spatially explicit context.

The Study Area

The Mountain Fire began on July 15, 2013 on private land in Riverside County, CA, and burned a total of 27,531 acres before being declared contained on July 30. Over 50% of the burned area was within the San Bernardino National Forest, while approximately 30% was within land under the jurisdiction of the Department of the Interior (DOI). The burned DOI lands included 2,443 acres of Bureau of Land Management lands, and 5,783 acres of Bureau of Indian Affairs, the Agua Caliente Band of Cahuilla Indians (ACBCI) lands. A national DOI BAER team was assigned to assess the DOI lands. This exercise will focus on the Andreas Canyon watershed of 5,628 acres, with the upper watershed in the San Bernardino National Forest, and the lower watershed in ACBCI lands.

From the BAER perspective, Andreas Canyon was of particular interest because about two-thirds of the watershed burned and several values at risk (VARs) were located within the watershed (**Figure 1**) downstream of the burned area. These VARs included a road culvert at the outlet of the watershed, a United States Geological Survey (USGS) stream gage located within the Andreas Day Use Area, and the boundary between the National Forest and the ACBCI lands. The Day Use Area receives many visitors and has infrastructure at risk of flooding.

AGWA will be used to apply a burn severity map created by the BAER Team to the National Land Cover Data 2011 (NLCD 2011) to produce a modified land cover representing the burned condition of the watershed. The original pre-fire NLCD 2011 dataset and the modified post-fire NLCD 2011 dataset will be used to parameterize the KINematic Runoff and EROsion Model (KINEROS2; Goodrich et al. 2012; www.tucson.ars.ag.gov/kineros). A discussion on the selection of parameter values used to parameterize the models for simulating post-fire runoff and sediment transport is presented by Canfield et al. (2005)[1] and Goodrich et al. (2005)[1].

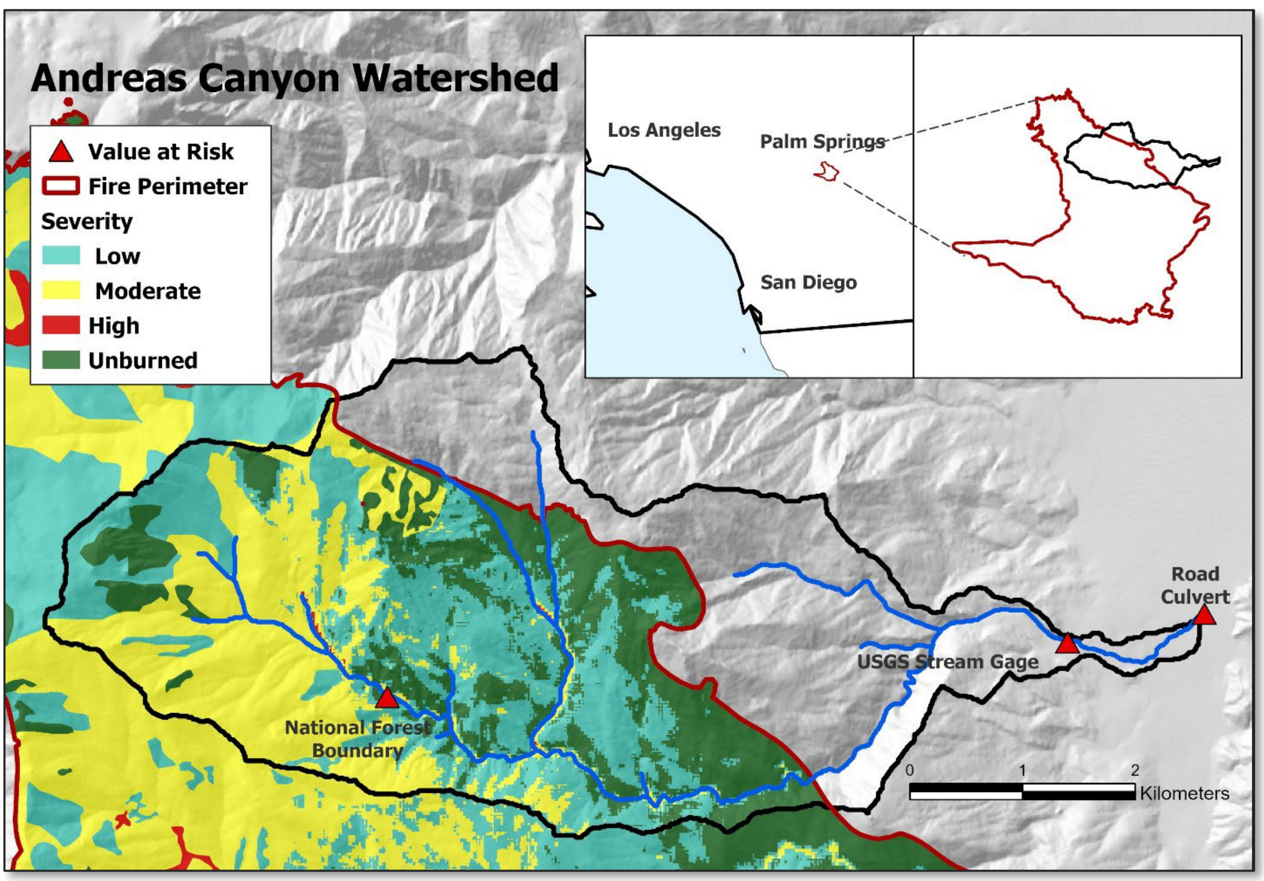


Figure 1. The Andreas Canyon watershed location, with Mountain Fire burn severity and VARs. The watershed is outlined in black.

This exercise examines the effects of fire on the hydrology of the Andreas Canyon watershed. The results disclose immediate changes to the hydrologic regime that are attributable to fire. Changes include the impairment of water resources due to increases in sediment yield and increase of flood risk due to higher runoff peaks.

Part 1: Download AGWApro toolbox, AGWA Directory, GIS Data, and Soil geodatabase

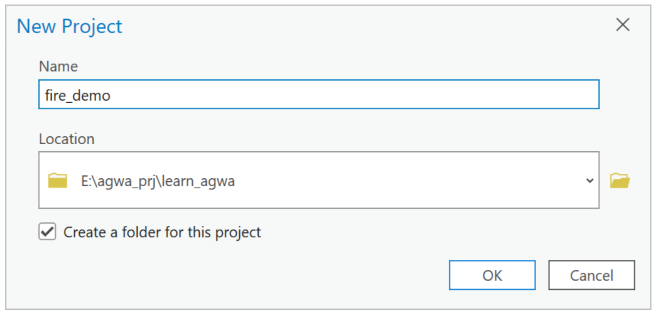
For this tutorial, the Python toolbox of AGWA for ArcGIS Pro, the AGWA directory, the GIS input data for this tutorial, and the gSSURGO_CA geodatabase are required.

1. **Download AGWA Toolbox for ArcGIS Pro**: The AGWA Python toolboxes for ArcGIS Pro is maintained on the SWRC GitHub repository. Visit https://github.com/ARS-SWRC/agwa, click the green **Code** button, and select **Download ZIP**.
2. **Download AGWA Directory**: Go to the Download Page of the AGWA website at https://www.tucson.ars.ag.gov/agwa/downloads/, in the **AGWA Directory** section, find **AGWApro v0.5 Directory** and click to download. This package contains the latest version of the AGWA lookup tables and model executables.
3. **Dowload the GIS Data for this tutorial**: At the Download Page of the AGWA website: https://www.tucson.ars.ag.gov/agwa/downloads/, under **AGWA Pro Tutorials**, click on **GIS Data for BAER process tutorial in Palm Springs** and download the GIS input data required for this tutorial.
4. **Download gSSURGO_CA Soil Geodatabase**: Visit the USDA Natural Resources Conservation Service's Gridded Soil Survey Geographic (gSSURGO) Database page at https://www.nrcs.usda.gov/resources/data-and-reports/gridded-soil-survey-geographic-gssurgo-database, click the **State Databases** link under the **Download gSSURGO Databases** section. On the next page, find **gSSURGO_CA.zip**, right-click on it, and select **Download**. A message indicating "Your Download is in Progress" will appear. Note that installation of Box is not required for downloading gSSURGO data.
5. **Unzip AGWA Pro Toolbox**: Extract the AGWA Pro toolbox to your preferred location. For this tutorial, it is extracted to **E:\agwa_prj\ agwa-pro-toolbox_v0.5_beta**.
6. **Unzip AGWA Directory**: Extract the AGWA package to your preferred location. For this tutorial, it is extracted to **E:\agwa_prj\AGWApro_v0.5_directory**.
7. **Upzip GIS Data**: Extract the data to your preferred location. For this tutorial, it is extracted to **E:\agwa_prj\tutorial_gis_data\tutorial_MountainFire**.
8. **Unzip gSSURGO_CA Soil Geodatabase**: Extract the gSSURGO_CA soil geodatabase. For this tutorial, the soil data is extracted to **E:\agwa_prj\gSSURGO_CA\ gSSURGO_CA.gdb**.

Part 2: Getting Started

If you are not familiar with ArcGIS Pro, please take a few minutes to review the Introduction to ArcGIS Pro documentation (https://pro.arcgis.com/en/pro-app/latest/get-started/get-started.htm) as the terminology, user-interface, and navigation covered there will be very helpful as you follow the steps in this tutorial.

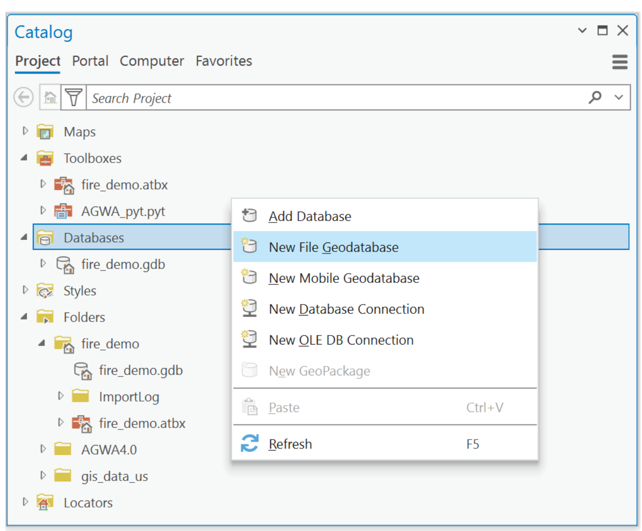
9. **Create an ArcGIS pro project**. Open ArcGIS Pro and select **Map** from the default templates shown below **New Project**. In the **New Project** dialog, enter **fire_demo** for **Name** and brose to select a preferred directory for **Location**, then click **OK**. For this tutorial, project **fire_demo** is created at **E:\agwa_prj\learn_agwa**. If you selected the Map template in the previous step, once Pro loads the empty Map view will be open. Note that Map is both the name of this particular view and the type of this view. Other views include scenes, layouts, tables, charts, and the catalog. Except for the Catalog view, names of views can be changed to help organize your project. Multiple views of all types may also be created and contain their own content independently.



10. **Set up a dedicated AGWA file geodatabase**. AGWA requires a file geodatabase to store metadata tables created during its operations. By default, each ArcGIS Pro project includes a geodatabase created simultaneously with the project. For instance, the **fire_demo.gdb** created in a previous step, is located at **E:\agwa_prj\learn_agwa\fire_demo**. This geodatabase can be used for AGWA. However, as a best practice, it is recommended to create a dedicated geodatabase specifically for the AGWA project to keep your data organized and separate. To do this,

    10.1. In the ribbon at the top of ArcGIS Pro, select the **View** tab and click the **Catalog Pane**.

    10.2. Right-click on **Databases** in the **Catalog** pane and select **New File Geodatabase**, In the popup window, navigate to the folder **fire_demo** if it is not already the default, then name the new file geodatabase **agwa_fire_meta** and click **Save**. Once completed, you will see **agwa_fire_meta.gdb** listed under **Databases**, below **fire_demo.gdb**. Alternatively, this can be achieved by right-clicking on the **fire_demo** folder under **Folders**, selecting **New**, then choosing **File Geodatabase**, and naming it **agwa_fire_meta**.



NOTE: Effective data organization is crucial for managing workflows efficiently. Since the AGWA package will be utilized across AGWA projects, it is advisable to store it in a location that is easily accessible. The directory tree illustrated below demonstrates how the **AGWApro_v0.5_directory**, **agwa-pro-toolbox_v0.5_beta**, **gSSURGO_CA**, **fire_demo.gdb** and **agwa_fire_meta.gdb** are organized within **E:\agwa_prj**. This example also provides a review of the contents included in the AGWA directory. Additionally, notice **gSSURGO_CA** can be used for other watersheds in the state of California. It is also recommended to store this folder in a location that is easily accessible.

Administrator: Command Prompt

```
E:\agwa_prj>tree
Folder PATH listing for volume mainDrive
Volume serial number is B20A-ACCE
E:.
├───agwa-pro-toolbox_v0.5_beta
│   ├───agwa_logo
│   ├───code
│   │   └───src
│   └───tutorials
├───AGWApro_v0.5_directory
│   ├───example_precipitation_files
│   ├───lookup_tables.gdb
│   ├───models
│   └───renderers
├───gSSURGO_CA
│   └───gSSURGO_CA.gdb
├───learn_agwa
│   └───fire_demo
│       ├───.backups
│       ├───fire_demo.gdb
│       ├───fire_meta.gdb
│       │   └───input_rasters
│       ├───GpMessages
│       ├───ImportLog
│       └───Index
│           └───fire_demo_index
│               ├───Connections
│               ├───fire_demo
│               └───Thumbnail
└───tutorial_gis_data
    └───tutorial_MountainFire
        └───InputData.gdb

E:\agwa_prj>
```

11. **Add folder connections.**

    11.1. In the **Catalog** Pane, right-click on **Folders**, select **Add Folder Connection**. In the next window, navigate to **E:\agwa_prj**, if it is not already the default, select **AGWApro_v0.5_directory** and click **OK** to add it to the project.

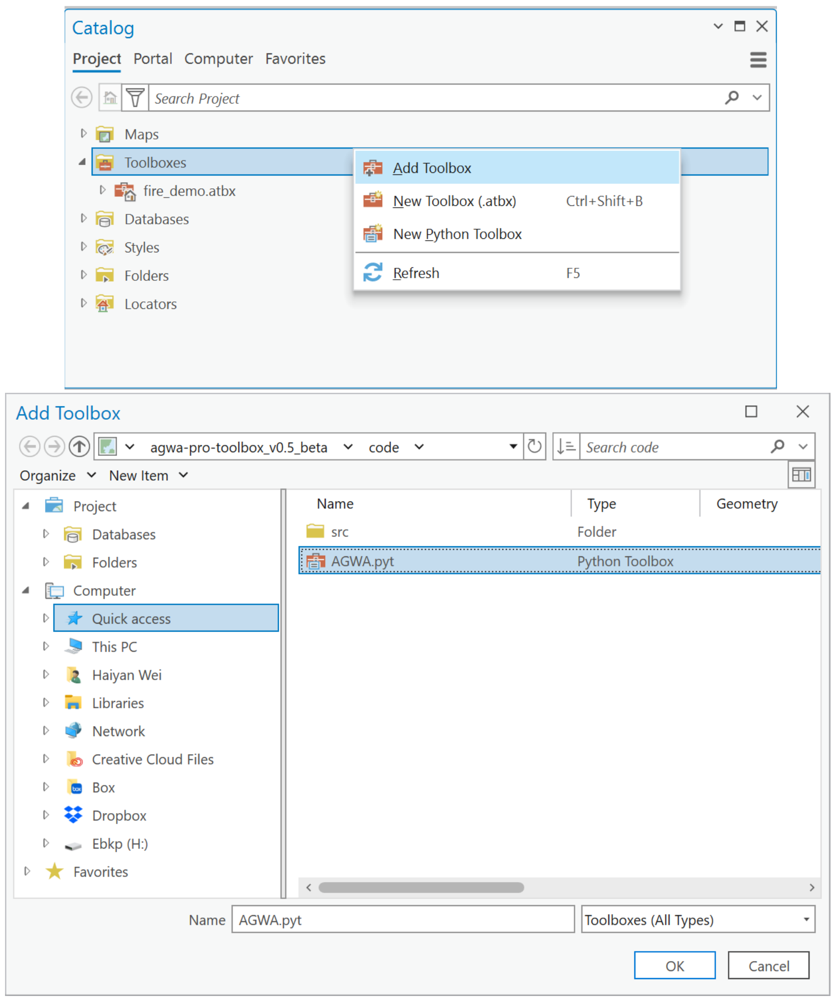
    11.2. In the **Catalog** Pane, right-click on **Folders**, select **Add Folder Connection**. Navigate to **E:\agwa_prj**, navigate to **tutorial_gis_data**, select **tutorial_MountainFire** and click **OK** to add it to the project.

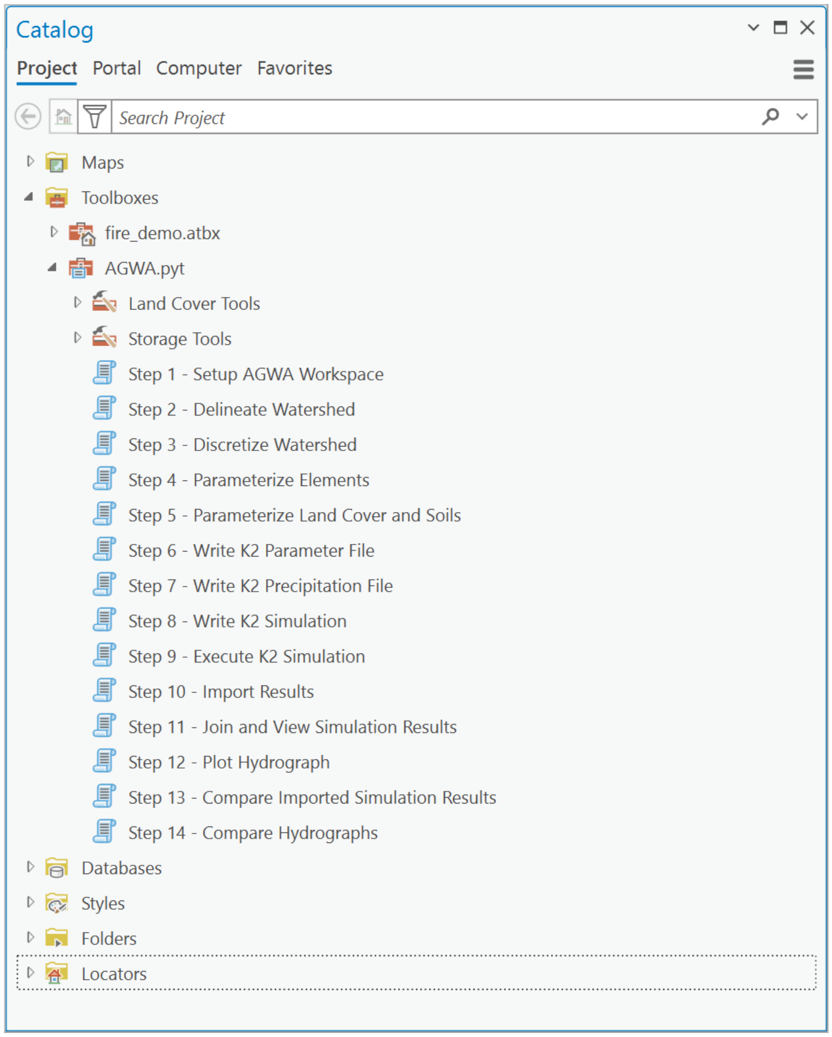
11.3. In the **Catalog** Pane, right-click on **Folders**, select **Add Folder Connection**. Navigate to **E:\agwa_prj** select **agwa-pro-toolbox_v0.5_beta** and click **OK** to add it to the project.

11.4. In the **Catalog** Pane, right-click on **Folders**, select **Add Folder Connection**. Navigate to **E:\agwa_prj**, select **gSSURGO_CA** and click **OK** to add it to the project.

12. **Add the AGWA toolbox and input data to the project**.

12.1. In the **Catalog** Pane, right-click on **Toolboxes** and select **Add Toolbox**, in the popup window, click **Folders** under **Project**, navigate to **agwa-pro-toolbox_v0.5_beta\code**, select **AGWA.pyt** then click **OK**. Once added, expand **Toolboxes** in the **Catalog** pane to view **AGWA.pyt**.





12.2. In the **Catalog** Pane, expand **Folders** and view the connections just added. Expand folder **tutorial_MountainFire**, then expand **inputData.gdb**, select all the datasets residing in the **inputData.gdb**, and right-click the selection and click **Add to Current Map** and to add all the datasets to the active map.

12.3. In the **Catalog** Pane, expand **Folders**, expand the folder **gSSURGO_CA**, then **gSSURGO_CA.gdb**, find the feature class **MUPOLYGON** and add it to the active map. After adding it, **MUPOLYGON** may appear in the **Contents** as **Map Unit Polygons - CA_202310**.

> NOTE: Folders like **gSSURGO_CA** can be added to the **Favorites** tab in the **Catalog** Pane for easy access in future AGWA projects. To do this, click on the **Favorites** tab, then select **Add Item** followed by **Add Folder**. Navigate to the **gSSURGO_CA** folder and click **OK** to view it in the **Favorites** tab. Right-click on the folder, and you will have the options to either add it to the current project or to future projects. Once a folder is added to Favorites, it will always be readily accessible under the Favorites section in all future ArcGIS Pro projects.

13. Save the ArcGIS Pro project before continue.

Section 1: Set up an AGWA Workspace

In ArcGIS Pro, AGWA is set up and structured differently than in previous versions for ArcMap. The AGWA-related metadata for a project is now more visible and editable. All AGWA-related metadata is stored within an AGWA workspace in standalone tables prefixed with meta (e.g. ***metaWorkspace***, ***metaDelineation***, ***metaDiscretization***, etc.) and saved in the file geodatabase created in step 2. In this section, you will follow the guide and create table ***metaWorkspace*** (content of the table see **Table 1**).

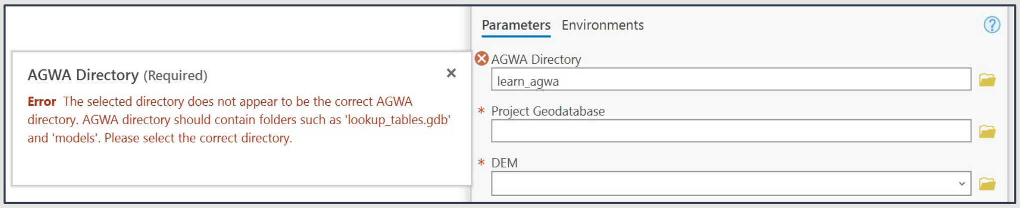
Table 1. Table *metaWorkspace* is used to store input data paths.

Field	Description
AGWADirectory	The path to the AGWA directory, which contains AGWA look-up tables and model executables
ProjectGeodatabase	The path to the ESRI file geodatabase that contains this table
FilledDEMPath	The path to the filled DEM that AGWA will utilize for this project
UnfilledDEMPath	The path to the unfilled DEM
FDPath	The path to the flow direction raster
FAPath	The path to the flow accumulation raster
FlUpPath	The path to the flow length (up) raster
SlopePath	The path to the slope raster
AspectFath	The path to the aspect raster
CreationDate	Date and Time of this table is created
AGWAVersionAtCreation	Version of AGWA
AGWAGDBVersionAtCreation	Version of AGWA lookup geodatabase
Status	Status or error message

14. Setup the AGWA workspace by expanding the AGWA toolbox, the **AGWA.pyt** below **Toolboxes** in the **Catalog** pane, double-clicking **Step 1 – Setup AGWA Workspace** to open a **Geoprocessing** window. Follow the steps and the screenshot below to select input data for this project.

    14.1. ***AGWA Directory***: Click the folder button next to the empty box below **AGWA Directory**, navigate to and select the **Folders\ AGWApro_v0.5_directory** that was added to the project in Part 2.

NOTE: If the selected directory is not recognized as a valid AGWA directory, an error icon will appear. Hovering over this icon will display an error message: "The selected directory does not appear to be the correct AGWA directory. It should contain folders such as 'lookup_tables.gdb' and 'models'. Please select the correct directory." This type of error reporting mechanism is implemented throughout AGWA 4.0 to provide prompt feedback and ensure accurate input.



14.2. ***Project Geodatabase***: Click the folder button next to box under **Project Geodatabase**, navigate to and select the **Project\Databases\ agwa_fire_meta.gdb**. Another shortcut it to navigate through **Project\Folders\fire_demo\agwa_fire_meta.gdb**. This File Geodatabase will be used to store all meta tables created by AGWA.

14.3. ***DEM***: Click the drop-down arrow and select the **fill_dem_mtnf** raster. If the **fill_dem_mtnf** raster is not in the list of items, you may have missed steps in Step 8, where the input data was added to the map.

14.4. ***Check if DEM is already filled***: **Check** the checkbox.

NOTE: If this parameter is unchecked, the DEM parameter is assumed to be an unfilled DEM. As a result, AGWA will create and store the filled DEM, flow direction, flow accumulation, flow length up, slope, and aspect rasters automatically.

14.5. ***Unfilled DEM***: Click the drop-down arrow and select the **dem_mtnfire** raster.

14.6. ***Flow Direction Raster***: Click the drop-down arrow and select the **fd_fdem** raster.

14.7. ***Flow Accumulation Raster***: Click the drop-down arrow and select the **fa_fdem** raster.

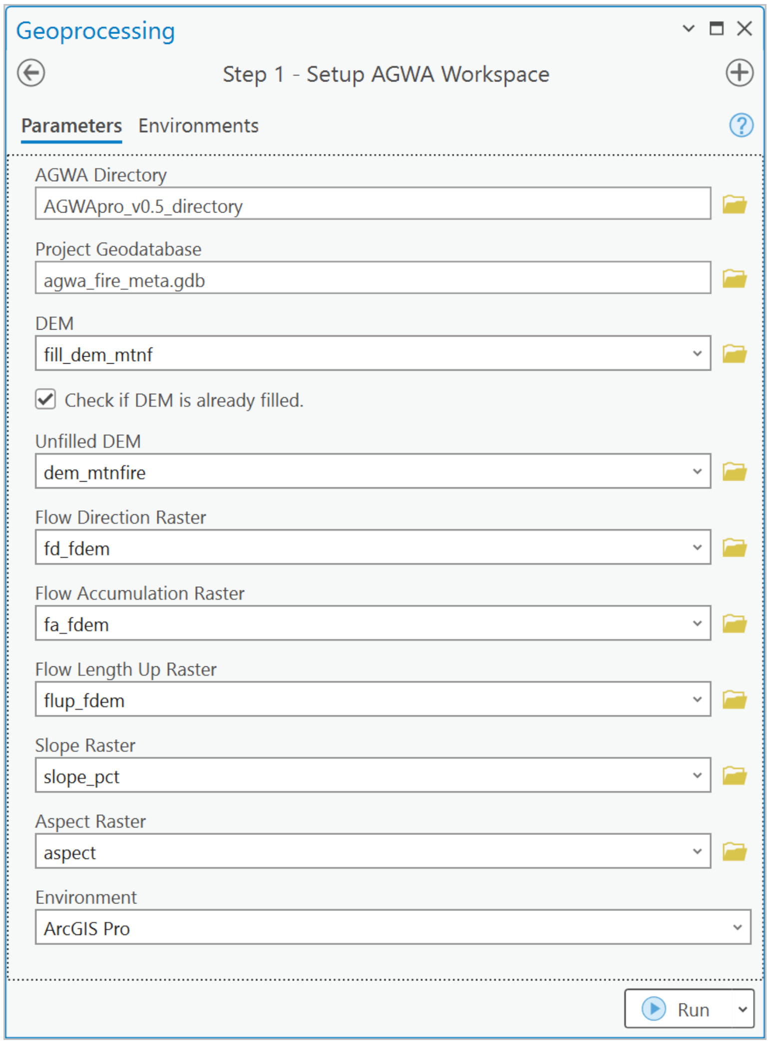
14.8. ***Flow Length Up Raster***: Click the drop-down arrow and select the **flup_fdem** raster.

14.9. ***Slope Raster***: Click the drop-down arrow and select the **slope_pct** raster.

NOTE: The slope raster is provided for this tutorial. If you need to create a slope raster for your study watershed, you will need to use "PERCENT RISE" as the unit. This is because the model in AGWA utilizes slope values expressed as percentages.

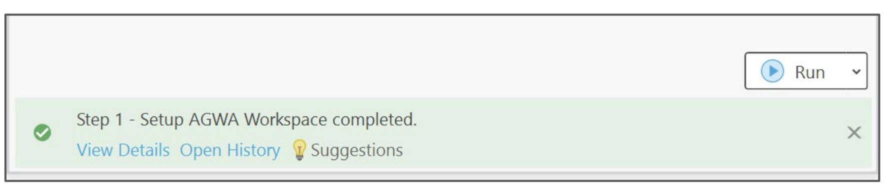
14.10. ***Aspect Raster***: Click the drop-down arrow and select the **aspect** raster.

14.11. ***Environment***: No change required, the default **ArcGIS Pro** value is fine. This parameter is reserved for future use.



14.12. Click ***Run***.

NOTE: Upon completing Step 1, a notification will appear at the bottom of the Geoprocessing window to indicate that the execution is complete. Click on **View Details** to open a pop-up window. Within this window, the **Messages** tab provides execution timestamps and additional AGWA-related information for review. If there were any issues during the process, error messages would be displayed here. You can also click on **Parameters** to review your input selections.



After completion, notice that the ***metaWorkspace*** table has been added to the **Standalone Tables** in the **Contents** pane of ArcGIS Pro, appearing at the bottom of the Content list. Please do not remove it from the Contents, as AGWA uses these meta tables to track processes continuously. Additionally, it is recommended to keep the current map active when AGWA is running to avoid interruptions.

Part 3: Modeling Pre-Fire Runoff in the Study Area

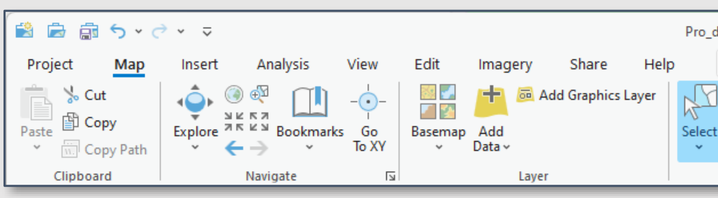
Section 2: Delineate the watershed

Delineation creates a feature class that represents the entire area draining to a user-specified outlet. To delineate a watershed, AGWA uses the filled DEM, flow direction, and flow accumulation rasters that were registered in the ***metaWorkspace*** table created in Section 1.

15. **Watershed Delineation**. Delineate the watershed by expanding the AGWA toolbox and double-clicking **Step 2 – Delineate Watershed**. Set the parameters as follows:

    15.1. ***Project Geodatabase***: Click the folder button next to the empty box below **Project Geodatabase** parameter to navigate to and select **Folders\fire_demo\agwa_fire_meta.gdb**, which was setup in Section 1.

    15.2. ***Outlet Selection***: Click the drop-down arrow and select **Vars**. Then select the feature "Road Culvert" (the point furthest to the right). The road culvert was chosen as the outlet because it is the furthest downstream of all the VARs in this watershed.

    > NOTE: If the selected feature class has a single feature in it so no feature selection is required. If instead the selected point feature class has multiple features, you must make a feature selection using the attribute table or the select tool.
    >
    > To use the select tool, select the map tab in the ribbon and activate the select tool (see screenshot below), then click, or click-and-drag, a box in the map to select the desired outlet feature. To verify the correct selection has been made, or alternatively to select the feature using the attribute table, right-click on the layer name in the contents pane and select attribute table.
    >
    > 
    >

    15.3. ***Snap Radius (m):*** Enter **0**.

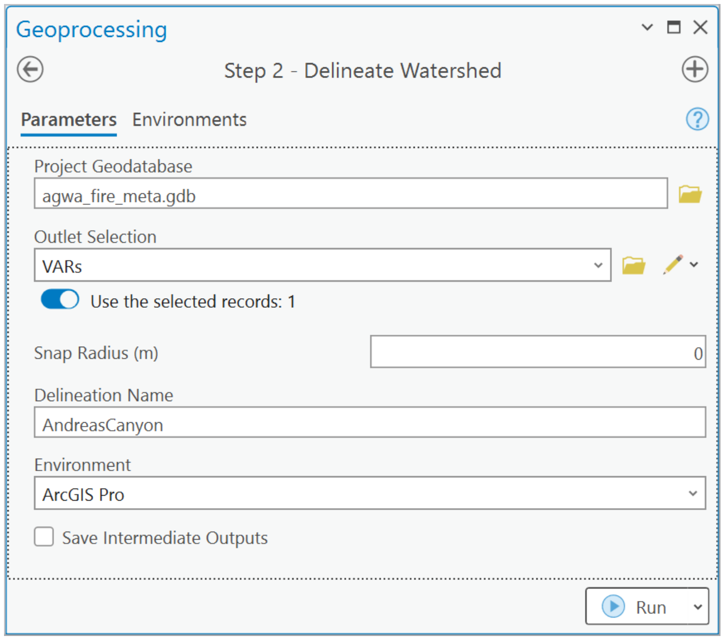
    > NOTE: the snap radius was set to 0 in this example because the outlet location fell on the DEM-based stream network. If you are not certain your outlet will fall on the DEM-based stream network, then set a snap radius that is at least the same as the DEM cell size, if not 2 or 3 times that (e.g. for a 10m DEM, a snap radius of 20 to 30 meters is reasonable, and could be higher).

    15.4. ***Delineation Name***: Enter **AndreasCanyon** for the Delineation Name parameter.

    15.5. ***Environment***: No change required.

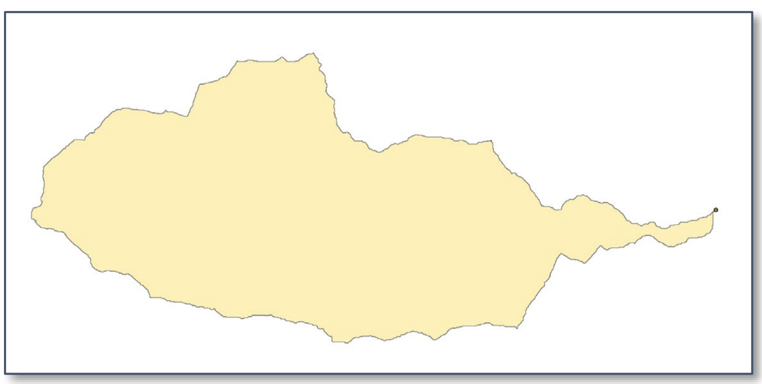
    15.6. ***Save Intermediate Outputs***: **Uncheck** the checkbox.

NOTE: if the **Save Intermediate Outputs** parameter is checked, any intermediate datasets that are created during this step will not be automatically deleted from the project's default geodatabase.



15.7.Click ***Run***.

After completing, notice that the polygon feature class **AndreasCanyon** has been added to the map, appearing as shown in the image below. Also, the table ***metaDelineation*** has been added to the **Contents**. AGWA allows for multiple delineations within the same project geodatabase, provided that the same set of raster files recorded in the **metWorkspace** table, created in Step 1, are used.



Additionally, a folder named after the Delineation Name used in Step 2 has been created. Within this folder, a file geodatabase named after the same delineation name has been generated. This geodatabase is used to store data relates to this delineation created in this step and subsequent steps. It also contains a table named **Delineation**, which was created in Step 2 to store the user's inputs.

Although this step is optional, you can expand the Folders section in the Catalog Pane, right-click on **fire_demo** and select **Refresh**. Then, expand the **fire_demo** folder and the **AndreasCanyon** folder to review the contents of **AndreasCanyon.gdb**. To add this geodatabase to your project for easy access, right-click on **AndreasCanyon.gdb** and select **Add To Project**. The geodatabase will then appear under **Databases** in the **Catalog** Pane.

16. Save the current project file and continue.

Section 3: Discretize (e.g. subdivide) the watershed

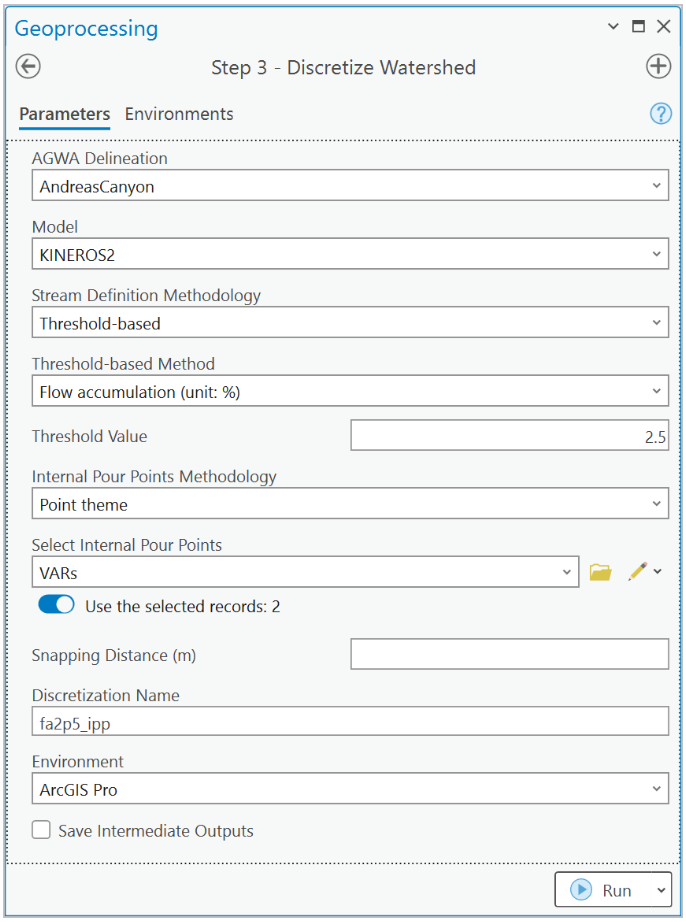
Discretizing breaks up the delineated watershed into model specific elements and creates a stream feature class that drains the elements. Discretization includes several parameters which are used to define the model, the complexity of the discretization, the name of the discretization, and whether additional pour points will be used to further control the subdivision of the watershed.

17. **Watershed Discretization**. Discretize the watershed by expanding the AGWA toolbox and double-clicking **Step 3 – Discretize Watershed**. Set the parameters as follows:

    17.1. ***AGWA Delineation***: select **AndreasCanyon**.
    17.2. ***Model***: select **KINEROS2**.
    17.3. ***Methodology***: select **Threshold-based**.
    17.4. ***Threshold-Based Method***: select **Flow accumulation (unit: %)**.
    17.5. ***Threshold Value***: Enter **2.5**.
    17.6. ***Internal Pour Points Methodology***: select **Point theme**.
    17.7. ***Select Internal Pour Points***: select **VARs**. Then click the **Select Feature button** and draw a rectangle around the **Stream Gage** and **Forest Service Boundary** points (the left-most two points).

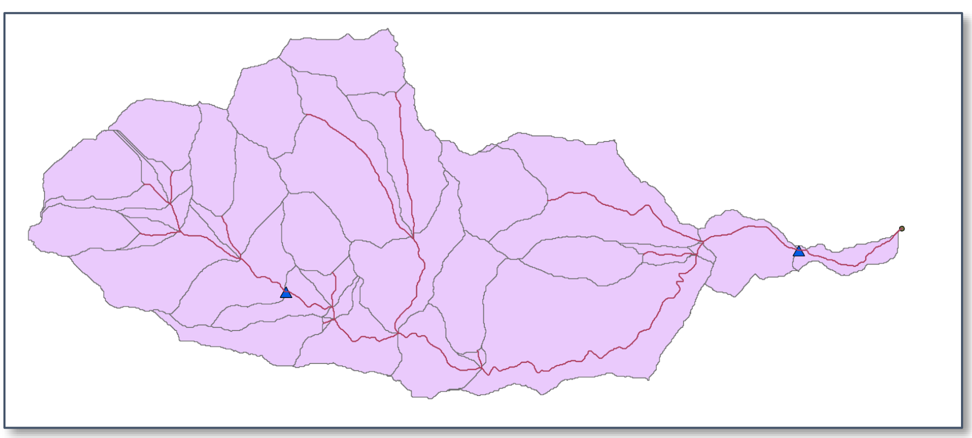
    > NOTE: Internal Pour points can be used to force the subdivision of watershed elements at user-supplied points. Since KINEROS2 is run for each individual element in a watershed, model outputs can be viewed at each element or pour point. This is useful for upstream VARs, so that BAER resource specialists can see model outputs at each VAR in the watershed and not just at the outlet.

    17.8. ***Snapping Distance(m):*** Enter **0**.
    17.9. ***Discretization Name***: Enter **fa2p5_ipp**.
    17.10. ***Environment***: No change required.
    17.11. ***Save Intermediate Outputs***: **Uncheck** the checkbox.



17.12. Click ***Run***.

Upon completion, the ***metaDiscretization*** table has been created and added to the map. Additionally, two feature classes: **fa2p5_ipp_hillslopes** and **fa2p5_ipp_channels,** representing the hillslope elements and channel elements respectively, are added to the map. Zoom in to view and save the project before continuing.



Section 4: Parameterize the watershed elements for KINEROS2

Parameterizing elements involves defining model input parameters based on topographic features, drainage networks, and hydraulic geometry properties. These parameters represent the physical properties of the watershed and are used to create the model input files.

18. Parameterize the elements of the watershed by expanding the AGWA toolbox and double-clicking **Step 4 – Parameterize Elements**. Set the parameters as follows:

    18.1. ***AGWA Delineation***: select **AndreasCanyon.**

    18.2. ***AGWA Discretization***: select **fa2p5_ipp**.

    18.3. ***Use Previous Element Parameterization***: Leave unchecked.

    18.4. ***Slope Type***: select **Uniform**.

    18.5. ***Flow Length Method***: select **Plane Average**.

    18.6. ***View Map of Hydraulic Geometry Types***: **Check**.

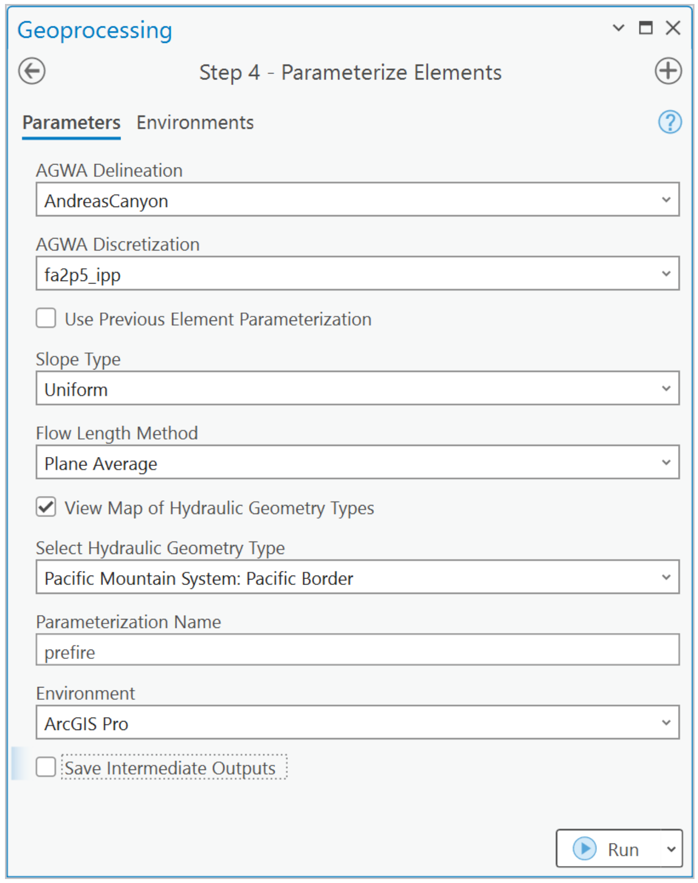
    18.7. Hydraulic ***Geometry Type***: click the drop-down arrow and select **Pacific Mountain System: Pacific Border**.

    > NOTE: Once **View Map of Hydraulic Geometry Types** is checked, a polygon feature class **HGR_physio** will be added to the map. Although this step is optional, you can right-click on the feature class and select **Attribute Table.** In the opened table, choose **Show Selected Records** to view the Name of the hydraulic Geometry types intersecting with the study watershed.
    >
    > Hydraulic geometry relationships define bankfull channel width and depth based on watershed size. Bankfull relationships are useful in that they define channel topography with minimal input and effort by the user; however, there are some drawbacks. The relationships are designed to be applied to very specific physiographic regions and outside of these regions the performance of the relationships in accurately depicting the channel geometries severely declines.

    18.8. ***Parameterization Name***: Enter **prefire**. A descriptive name is recommended.

    18.9. ***Environment***: No change required.

    18.10. ***Save Intermediate Outputs***: **Uncheck** the checkbox.



18.11. Click ***Run***.

Upon completion, the ***metaParameterization*** table has been added to the map. It contains a record of the parameter values used in the parameterization.

Section 5: Parameterize the land cover and soils for KINEROS2

Parameterizing land cover and soils involves defining model input parameters based on land cover types and soil types. This includes using look-up tables to relate land cover types to various characteristics such as canopy cover, interception, hydraulic roughness, and imperviousness. Similarly, look-up tables relate soil textures to hydraulic conductivity, porosity, and the proportions of sand, silt, and clay, as well as to erosivity values, among other properties.

19. Parameterize the land cover and soils of the watershed by expanding the AGWA toolbox and double-clicking **Step 5 – Parameterize Land Cover and Soils**. Set the parameters as follows:

    19.1. ***AGWA Delineation***: select **AndreasCanyon.**
    19.2. ***AGWA Discretization***: select **fa2p5_ipp**.
    19.3. ***Land Cover Raster***: select **nlcd2011_mtnfire**.
    19.4. ***Land Cover Lookup Table***: select **mrlc2001_lut**. This a lookup table resides in **AGWA\lookuptables.gdb**.

19.5. ***Soils Layer***: click the drop-down arrow and select **Map Unit Polygons - CA_202310** or **MUPOLYGON**. It is the soil polygon feature class from **gSSURGO_CA.gdb** that was added to the Contents in Part 2.

19.6. ***Default Soils Database***: Leave it **Checked**.

> NOTE: When **Default Soils Database** is checked, AGWA will automatically use the file geodatabase that contains the soils layer selected in 17.5, which is typically the case if you are using a gSSURGO database downloaded directly. If this option is unchecked, an input box **Soils Database** will appear, allowing the user to select a customized geodatabase. To do so, in the **Catalog** Pane, navigate to the soil geodatabase, right-click on the geodatabase and select **Copy Path**, then paste this path into the **Soils Database** parameter box.

19.7. ***Maximum Number of Soil Horizons***: Enter **1**.

19.8. ***Maximum Soil Depth (cm):*** Enter **4**.

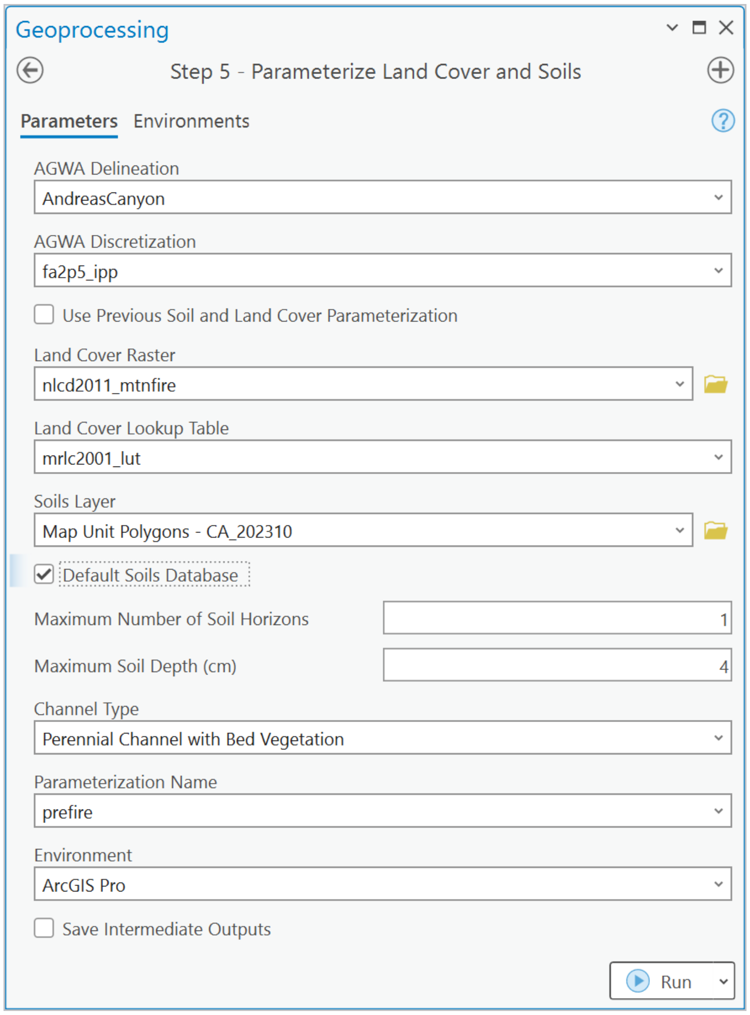
19.9. ***Channel Type***: Click the drop-down arrow and select **Perennial Channel with Bed Vegetation**.

19.10. ***Parameterization Name:*** Select **prefire** for the Parameterization Name parameter.

> NOTE: **Step 4 – parameterize elements** must be completed prior to **Step 5 – parameterize land cover and soils**. Completed element parameterizations will be available to use as the base for land cover and soils parameterizations. The Parameterization Names created from Step 4 are listed automatically in this step for selection.

19.11. ***Environment***: No change required.

19.12. ***Save Intermediate Outputs***: **Uncheck** the checkbox.



19.13. Click ***Run***.

Upon completion, two tables: ***parameters_hillslopes*** and ***parameters_channels*** are created within the delineation geodatabase at: **fire_demo\AndreasCanyon\AndreasCanyon.gdb**. These tables store the computed input model parameters for each element. Save the project before continuing.

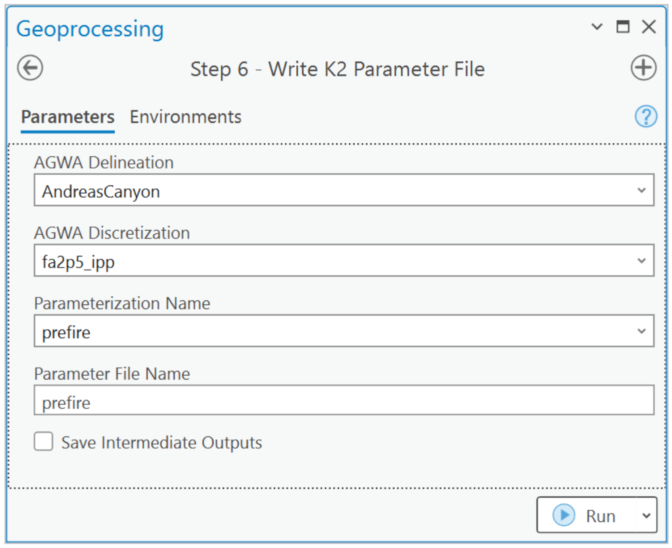
Section 6: Write a KINEROS2 parameter file

Writing the model input files creates a parameter file using a selected parameterization and other optional configuration inputs. When writing the input files, AGWA loops through features of the selected discretization and reads the model parameters from the parameterization look-up tables to write into the input files for the model. The parameter file is created in a **parameter_files** folder, which is nested within a directory created based on the user's choice of delineation name and discretization name, e.g. **fire_demo\AndreasCanyon\modeling_files\fa2p5_ipp\parameter_files**.

20. Write the KINEROS2 parameter file for the watershed by expanding the AGWA toolbox and double-clicking **Step 6 – Write K2 Parameter File**. Set the parameters as follows:

20.1. ***AGWA Delineation***: Select **AndreasCanyon**.
20.2. ***AGWA Discretization***: Select **fa2p5_ipp**.

20.3. ***Parameterization Name***: Select **prefire**.
20.4. ***Parameter File Name***: Enter **prefire**.
20.5. ***Save Intermediate Outputs:*** **Uncheck** the checkbox.



20.6. Click ***Run***.

Upon completion, a file named **prefire.par** is created and stored in **fire_demo\AndreasCanyon \modeling_files\fa2p5_ipp\parameter_files**. Save the project and continue.

Section 7: Write a KINEROS2 precipitation file

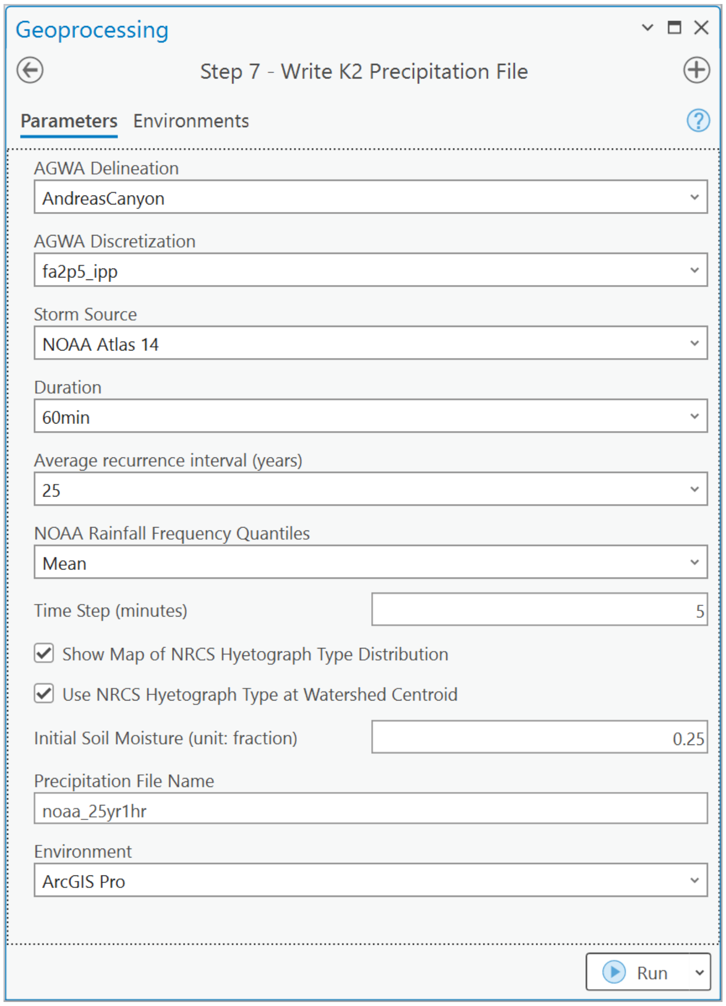
Writing KINEROS2 precipitation files creates the file that contains the rainfall hyetograph used to drive the model. The duration of the rainfall event determines the simulation period, and the rainfall depth, temporal distribution, and initial soil moisture affect the runoff-infiltration characteristics of the simulation. The precipitation file is save in a folder named **precipitation_files**, which is nested within a directory created based on the user's choice of delineation name and discretization name, e.g. **fire_demo\AndreasCanyon\modeling_files\fa2p5_ipp\precipitation_files**.

21. Write the KINEROS2 precipitation file for the watershed by expanding the AGWA toolbox and double-clicking **Step 7 – Write K2 Precipitation File**. Set the parameters as follows:

    21.1. ***AGWA Delineation***: **AndreasCanyon**.
    21.2. ***AGWA Discretization***: **fa2p5_ipp**.
    21.3. ***Storm Source***: Select **NOAA Atlas 14**.
    21.4. ***Duration***: Select **60min**.
    21.5. ***Average Recurrence Interval (years)***: Select **25**.
    21.6. ***NOAA Rainfall Frequency Quantiles***: Select **Mean**.
    21.7. ***Time Step Duration (minutes)***: Enter **5**.
    21.8. ***Show Map of NRCS Hyetograph Type Distribution***: **Check**.
    21.9. ***Use NRCS Hyetograph Type at Watershed Centroid***: **Check**.

> **NOTE**: When **NOAA Atlas 14** is selected, AGWA will connect to the NOAA Precipitation Frequency Data Server at https://hdsc.nws.noaa.gov/hdsc/pfds/ and scrapes rainfall depth data for the chosen duration, recurrence interval, and whether to use the mean or the lower 90% or upper 90% quantile values.
>
> When **Show Map of NRCS Hyetograph Type Distribution** is checked, a polygon feature class **nrcs_precipitation_distributions** will be added to the map. Right-click on the feature class and select Attribute Table, then select Show Selected Records to view the hyetograph type(s) intersecting with the study watershed.
>
> When **Use NRCS Hyetograph Type at Watershed Centroid** is checked, AGWA will automatically select the hyetograph type intersecting at the watershed centroid location. If unchecked, an input box **Hyetograph Shape** will appear, providing a list of all available types for users to select their choice.
>
> Based on the user's selections, a hyetograph will then be created by AGWA. Alternatively, AGWA provides options for users to input customized rainfall depth and duration, or to upload their own hyetograph from a CSV file, adhering to the provided example format.

21.10. ***Initial Soil Moisture***: Enter **0.25**.
21.11. ***Filename***: Enter **noaa_25yr1hr**.
21.12. ***Environment***: No change required.



21.13. Click ***Run***.

Upon completion, a file named **noaa_25yr1hr.pre** is created at **fire_demo\AndreasCanyon\modeling_files\fa2p5_ipp\precipitation_files**. Additionally, the rainfall depth fetched from the NOAA Precipitation Frequency Data Server and the hyetograph shape selected at the watershed centroid location can be viewed in the **View Details** section of the Geoprocessing window.

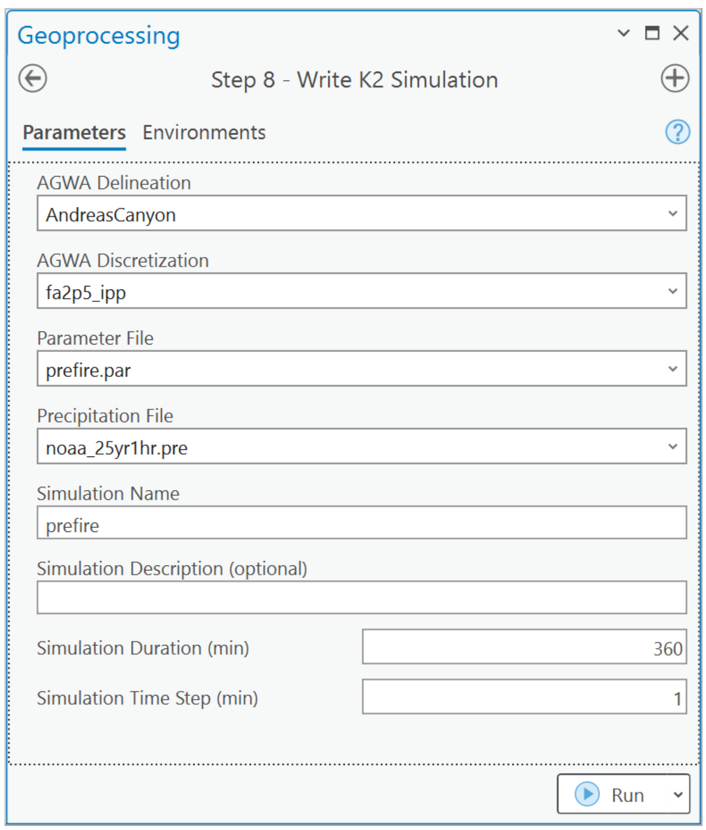
```
Hyetograph shape: CA_5

NOAA data fetched successfully from https://hdsc.nws.noaa.gov/pfds
   Results for 25 year 1.0 hours Mean rainfall: 44.0mm.
   Watershed Centroid Point:  Lat 33.7627, Lon -116.6007
   Region: Southwest
   Unit: metric
   Datatype: depth
   Volume: 6
   Version: 2
```

Save the project and continue.

Section 8: Write a KINEROS2 simulation

Running a KINEROS2 simulation involves creating a simulation directory, which is based on the selected parameter file and precipitation file. This directory is established within a **simulations** subdirectory, which is located in the discretization folder, nested under the delineation folder.

22. Write a KINEROS2 simulation for the watershed by expanding the AGWA toolbox and double-clicking **Step 8 – Write K2 Simulation**. Set the parameters as follows:
    - 22.1. ***AGWA Delineation***: Select **AndreasCanyon**.
    - 22.2. ***AGWA Discretization***: Select **fa2p5_ipp**.
    - 22.3. ***Parameter File***: Select **prefire**.
    - 22.4. ***Precipitation File***: Select **noaa_25yr1hr.pre**.
    - 22.5. ***Simulation Name***: Enter **prefire** for the Simulation Name parameter.
    - 22.6. ***Simulation Description***: This is an optional parameter that writes a comment description into the KINEROS2 run file, which results in the KINEROS2 output file also containing the description.
    - 22.7. ***Simulation Duration (min):*** Leave the default value (**360**). This parameter is auto-populated with the duration of the precipitation event plus 300 minutes.
    - 22.8. ***Simulation Time Step (min):*** Leave the default value (**1**). This parameter is auto-populated with a one-minute time step, resulting in the output hyetographs also reporting at a one-minute interval.



    - 22.9. Click ***Run***.

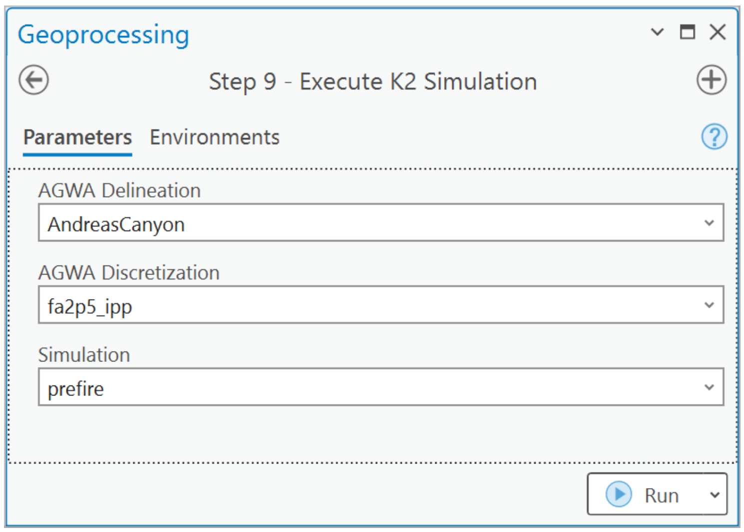
Upon completion, all files required for modeling are copied to the simulation subdirectory. Save the project and continue.

Section 9: Execute the KINEROS2 simulation

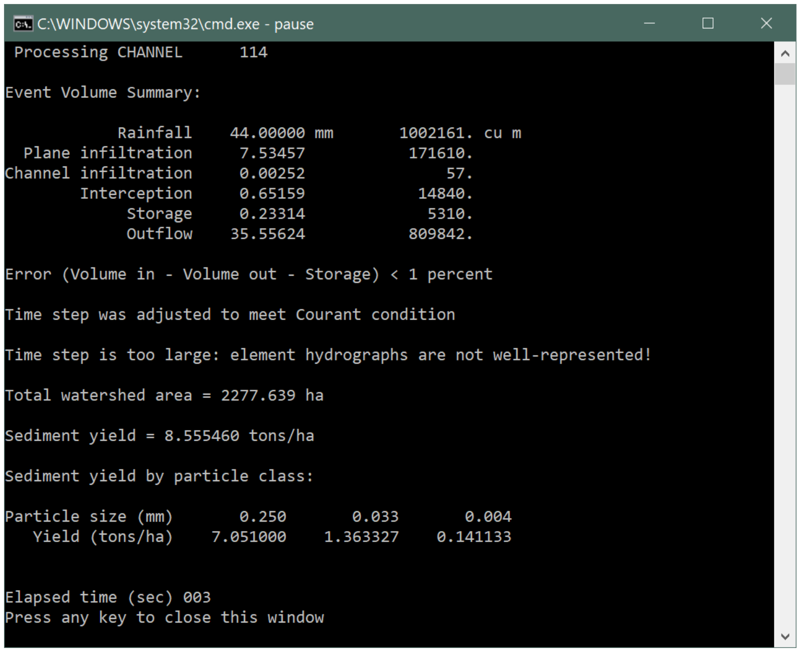
Executing the KINEROS2 simulation opens a command window in which the model executes.

23. Execute a KINEROS2 simulation for the watershed by expanding the AGWA toolbox and double-clicking **Step 9 – Execute K2 Simulation**. Set the parameters as follows:

    23.1. ***AGWA Delineation***: Select **AndreasCanyon**.
    23.2. ***AGWA Discretization***: Select **fa2p5_ipp**.
    23.3. ***Simulation***: click the drop-down arrow and select **prefire**.



    23.4. Click ***Run***. A command window will open and display simulation process. Press any key to close the window after verify the simulation.



By default, this command window remains open so that the results of the simulation can be observed. Before closing it, ensure you make note of any error messages that appear in the window.

Part 4: Create Post-Fire Land Cover

Section 10: Create Post-Fire Land Cover

In Part 4, you will use the Land Cover Change tool to create a post-fire land cover. This tool uses the pre-fire land cover and the burn severity raster to generate the post-fire land cover. This post-fire land cover will then be used in the next part to derive the post-fire soil properties.

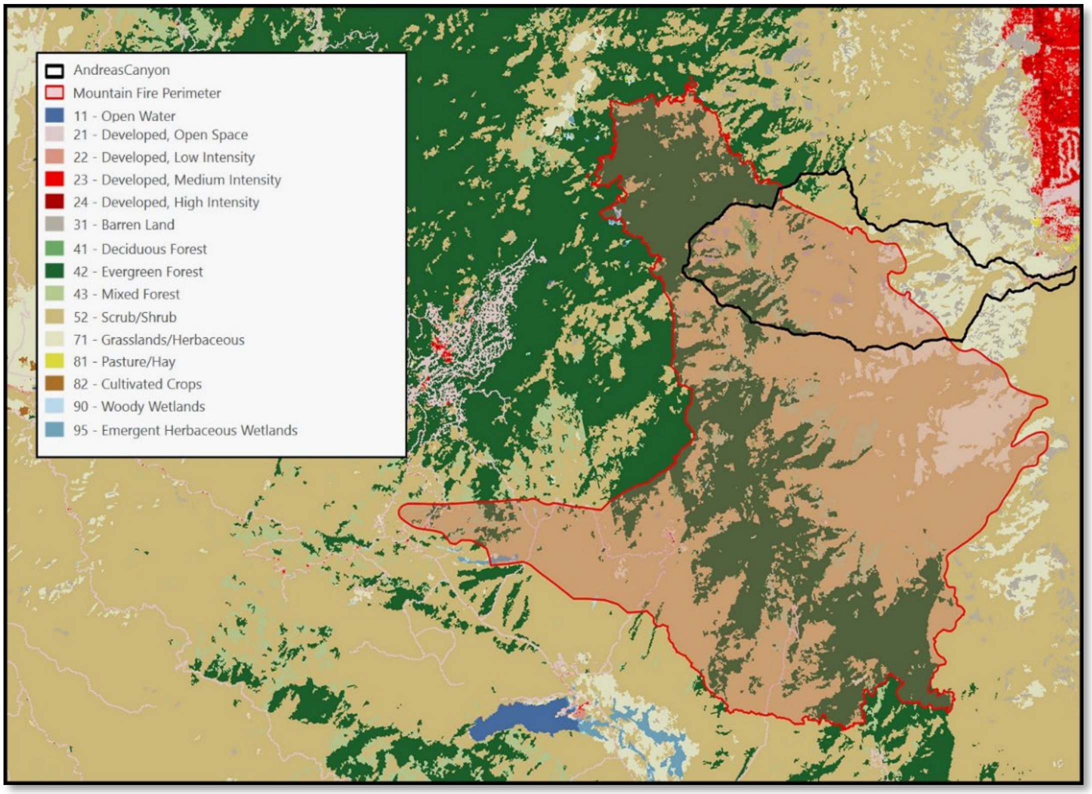


Figure 2. Pre-fire Land Cover.

In a BAER situation, a Burned Area Reflectance Classification (BARC) map is provided and then verified and modified by BAER experts. The final Burn Severity map can be imported directly into AGWA to modify the pre-fire land cover (NLCD 2011 in this case). Based on the pre-fire land cover classes along with the burn severity information, AGWA changes several input parameters for KINEROS2. These parameter changes are applied to the hillslope roughness coefficient, hydraulic conductivity, and percent cover.

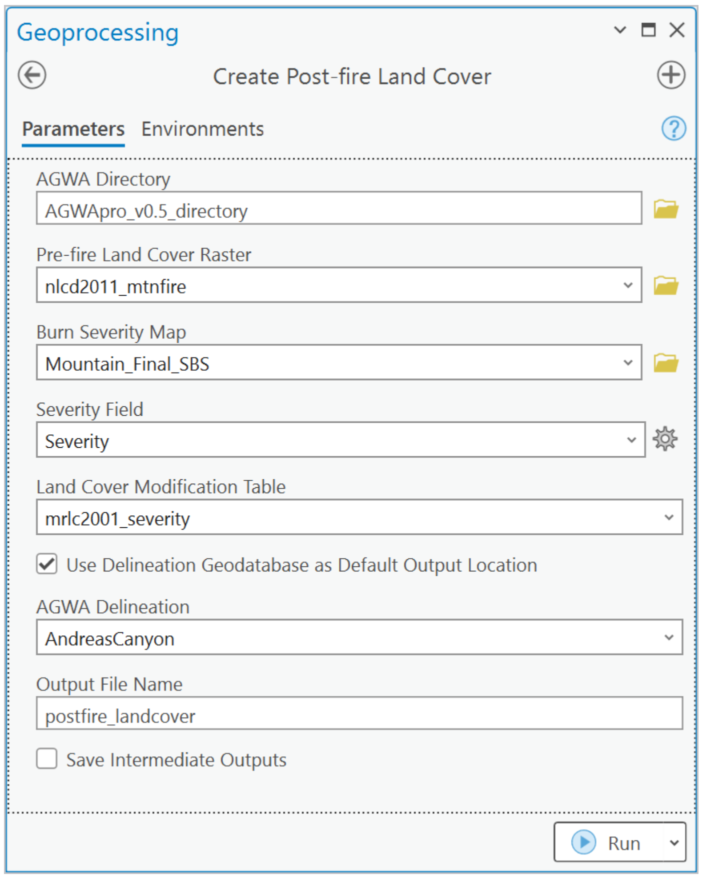
The **Create Post-fire Land Cover** tool will be used to create the post fire land cover raster. Note that it can operate independently of AGWA delineation; in other words, it can be used even if a watershed has not been delineated. In such cases, users will need to designate an output folder. However, if an AGWA delineation is available, there is an option to save the output raster directly in the delineation geodatabase.

24. Expand **Land Cover Tools** under **AGWA.pyt** and doule-click **Create Post-fire Land Cover**.
    24.1. ***AGWA Directory***: Nevagtive to **AGWA** and select it.
    24.2. ***Pre-fire Land Cover Raster***: Select **nlcd2011_mnfire**.
    24.3. ***Burn Severity Map***: Select **Mountain_Final_SBS**.
    24.4. ***Severity Field:*** Select **Severity**. This field in the Burn Severity Map, selected in the previous step, indicates the level of burn severity.

24.5. ***Land Cover Modification Table***: Choose **mrlc2001_severity**. This table, which resides in the AGWA lookup table geodatabase, will be used to modify land cover.
24.6. ***Use Delineation Geodatabase as Default Output Location***: **Check**.
24.7. ***AGWA Delineation***: Select **AndreasCanyon**.

NOTE: When ***Use Delineation Geodatabase as Default Output Location*** is checked, all AGWA delineations detected in the ***metaDelineation*** table will become available for selection here. When unchecked, the input for **Output Location** becomes available, allowing the user to select a designated folder to store resulting raster.

24.8. ***Post-fire Land Cover File Name:*** Enter **postfire_landcover**.
24.9. ***Save Intermediate Outputs***: **Uncheck**.

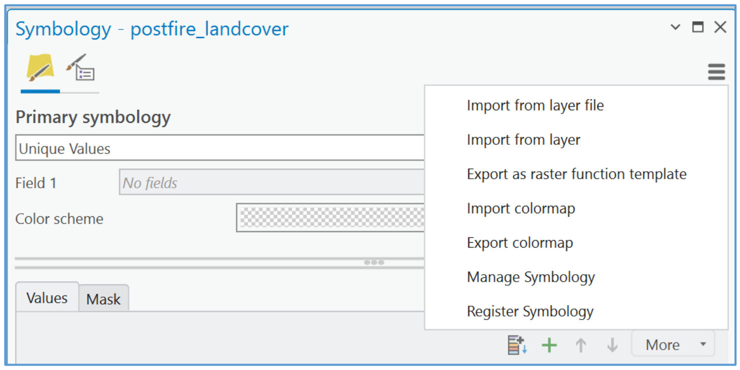


24.10. Click ***Run***.

At this point, the post-fire raster **postfire_landcover**, representing the post-fire land cover, has been created and added to the map. In this instance, since the option to use the Delineation Folder as the default output location was selected, the post-fire raster is saved in the delineation geodatabase: **AndreasCanyon.gdb\postfire_land_cover**. Intermediate results are save in folder **AndreasCanyon\postfire_land_cover** created in the process if **Save Intermediate Outputs** were checked.

25. To enhance visualization of the different land cover types and associate the pixels with their classification, load a legend into the **nlcd_mtnfire** and **postfire_landcover** datasets.

25.1. Select **nlcd_mtnfire** in the **Contents** in the Contents pane, then navigate to the **Raster Layer** tab available from the ribbon menu and click on **Symbology**. Click the ≡ button and choose **Import from layer file**. In the **Import symbology** window, navigate to **Folders\ AGWApro_v0.5_directory \renderers\nlcd2001.lyr** and click **OK** to apply the symbology.



25.2. Repeat the last step to apply the same symblolgy layer to **postfire_landcover** because it shares the same legend and clasificaition as **nlcd_mtnfire**.

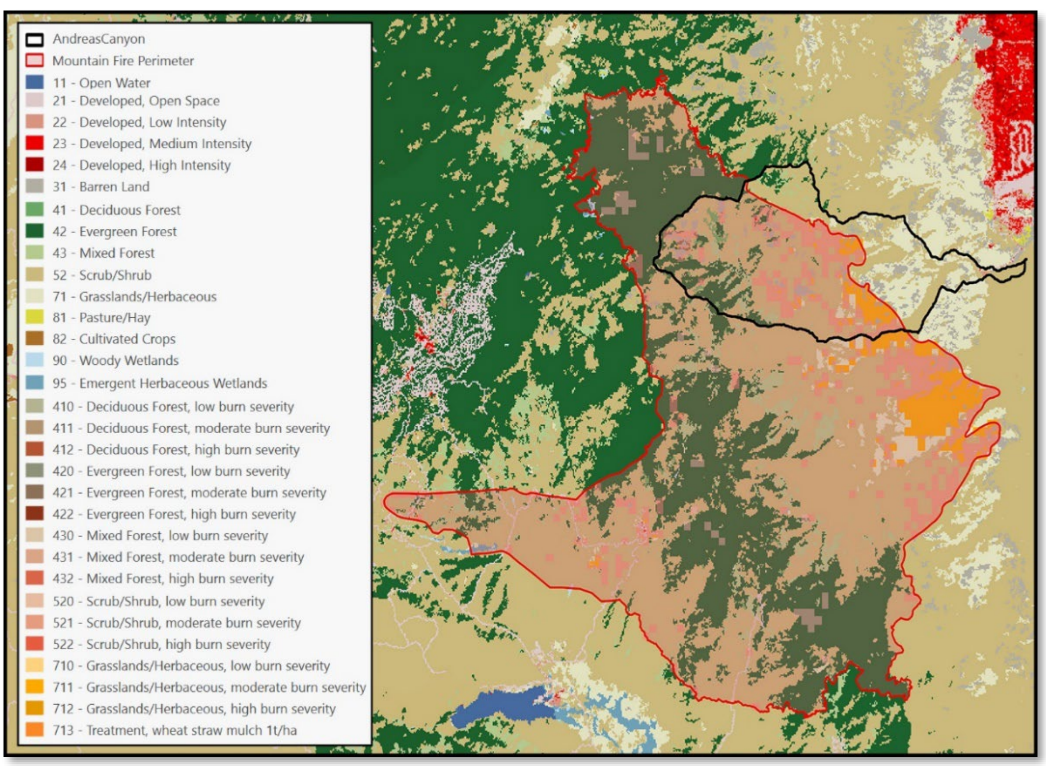


Figure 3. Post-fire Land Cover Map Created in AGWA.

Part 5: Modeling Runoff in Study Area Using Post-Fire Land Cover

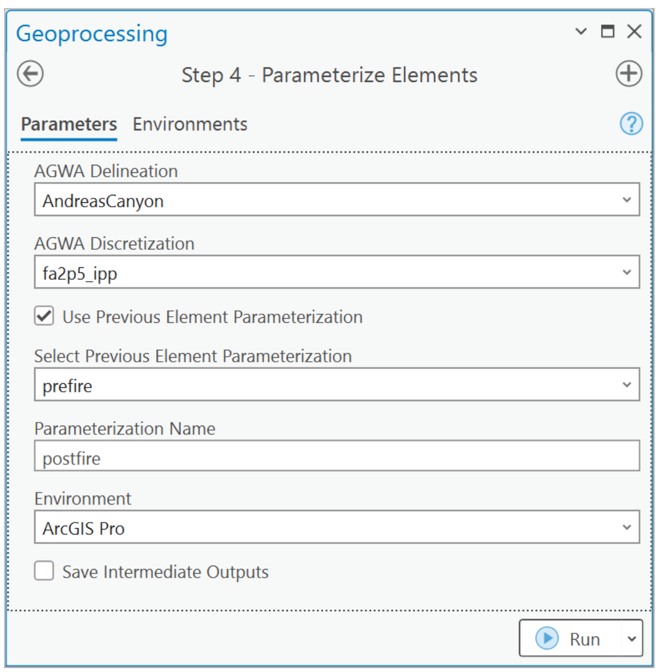
In Part 5, a new parameterization will be created using the post fire land cover dataset created in Part 4, and we will guide you to write a new set of model input files and execute the model.

Section 11: Parameterize the watershed elements for post-fire scenario

The Steps 4 and 5 of the AGWA toolbox allow for the reuse of a previous parameterization to expedite the process. This option should only be utilized when users are confident that the inputs are the same.

26. Click on **Step 4-Parameterize Elements** to create element parameters for post-fire scenario.

26.1. ***AGWA Delineation***: Select **AndreasCanyon**.
26.2. ***AGWA Discretization***: Select **fa2p5_ipp**.
26.3. ***Use Previous Element Parameterization***: **Check** the box.
26.4. ***Select Previous Element Parameterization***: Click the drop-down arrow and select **prefire**.
26.5. ***Parameterization Name***: Enter **postfire**.
26.6. ***Environment***: No action is required.
26.7. ***Save Intermediate Outputs***: No action is required.



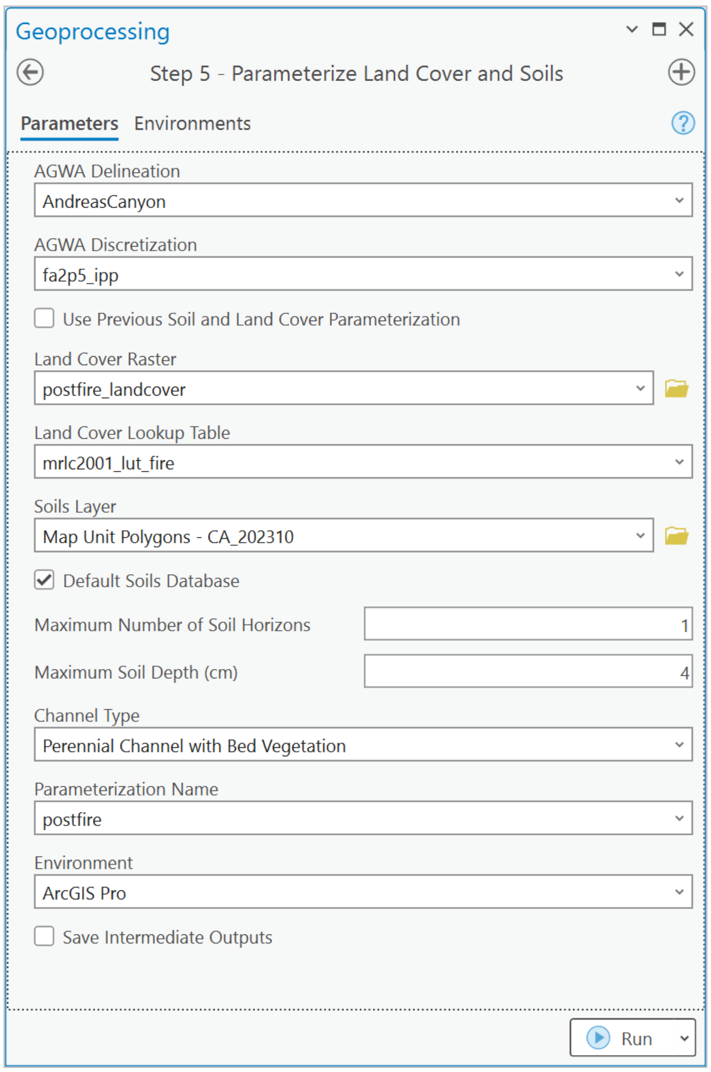
26.8. Click ***Run***.

Section 12: Parameterize the soil and land cover for post-fire scenario

27. Clicking **Step 5 – Parameterize Land Cover and Soils** and we will use post-fire land cover raster for this step.

27.1. ***AGWA Delineation***: Select **AndreasCanyon.**
27.2. ***AGWA Discretization***: Select **fa2p5_ipp**.
27.3. ***Land Cover Raster***: Select **postfire_landcover**.

27.4. ***Land Cover Lookup Table:*** Select **postfire_land_cover**.
27.5. ***Soils Layer***: Select **Map Unit Polygons - CA_202310**.
27.6. ***Default Soils Database***: **Check**.
27.7. ***Maximum Number of Soil Horizons***: Enter **1**.
27.8. ***Maximum Soil Depth (cm):*** Enter **4**.
27.9. ***Channel Type***: Click the drop-down arrow and select **Perennial Channel with Bed Vegetation**.
27.10. ***Parameterization Name***: Select **postfire** for the Parameterization Name.
27.11. ***Environment***: No change required.
27.12. ***Save Intermediate Outputs***: Uncheck the checkbox.



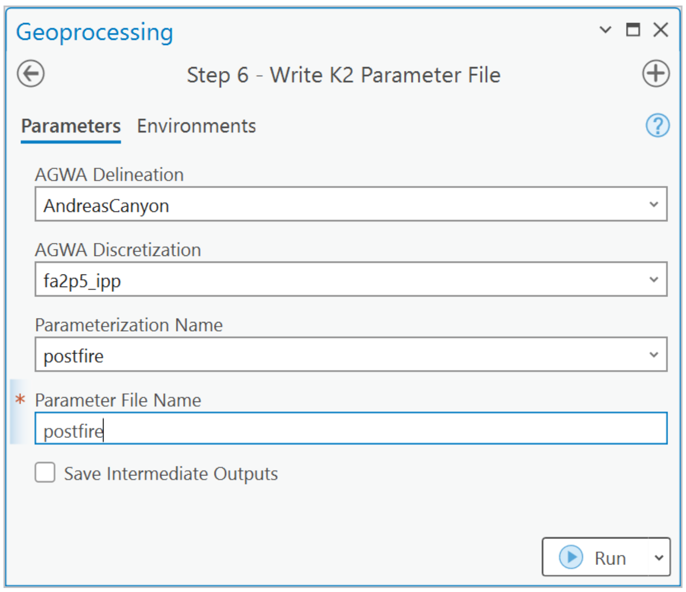
27.13. Click ***Run***.

Section 15 Writing K2 Parameter file

The same precipitation file used in the pre-fire simulation will also be used in the post-fire simulation, eliminating the need to rewrite the KINEROS2 precipitation file. In this section, we will focus on writing the K2 parameter file for the post-fire scenario.

28. Click **Step 7 – Write K2 Parameter File**.

    28.1. ***AGWA Delineation***: Select **AndreasCanyon**.
    28.2. ***AGWA Discretization***: Select **fa2p5_ipp**.
    28.3. ***Parameterization Name***: Select **postfire**.
    28.4. ***Parameter File Name***: Enter **postfire**.
    28.5. ***Save Intermediate Outputs***: Leave this checkbox unchecked.

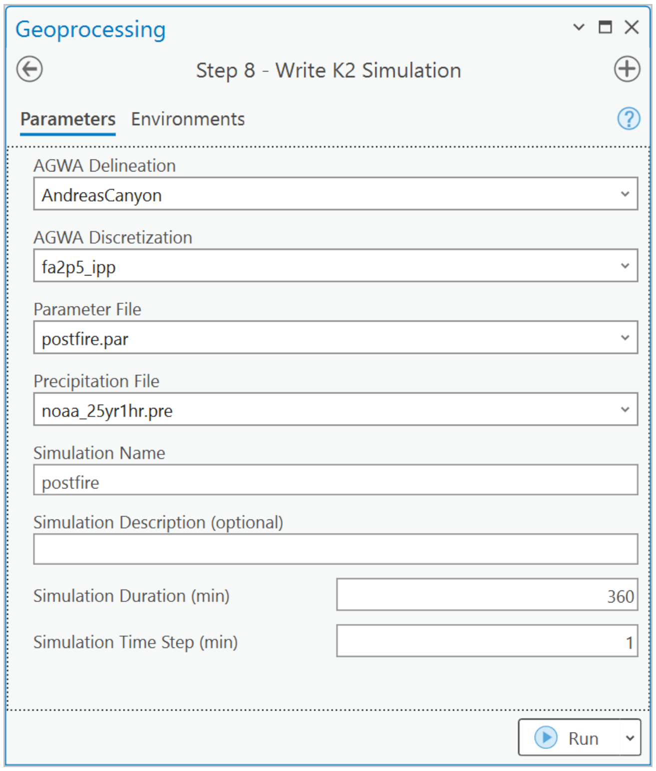


    28.6. Click ***Run***.

Section 13: Write K2 Simulation

29. Write the post-fire simulation by clicking **Step 8 – Write K2 Simulation**.

    29.1. ***AGWA Delineation***: Select **AndreasCanyon**.
    29.2. ***AGWA Discretization***: Select **fa2p5_ipp**.
    29.3. ***Parameter File***: Select **postfire.par**.
    29.4. ***Precipitation File***: Select **noaa_25yr1hr.pre**.
    29.5. ***Simulation Name***: Enter **postfire**.
    29.6. ***Simulation Description***: This is optional.
    29.7. ***Simulation Duration (min):*** Leave the default value (**360**).
    29.8. ***Simulation Time Step (min):*** Leave the default value (**1**).

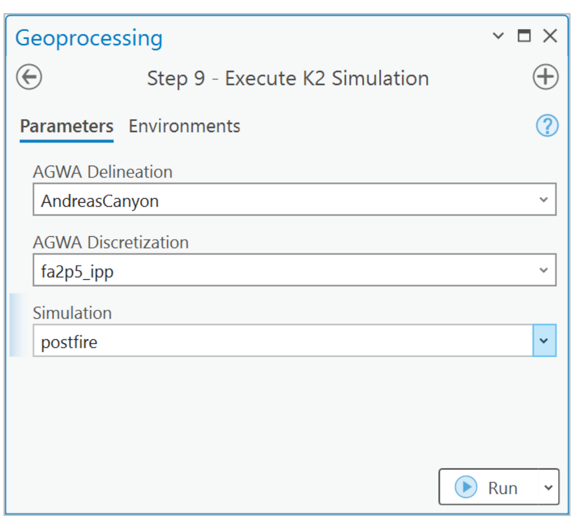


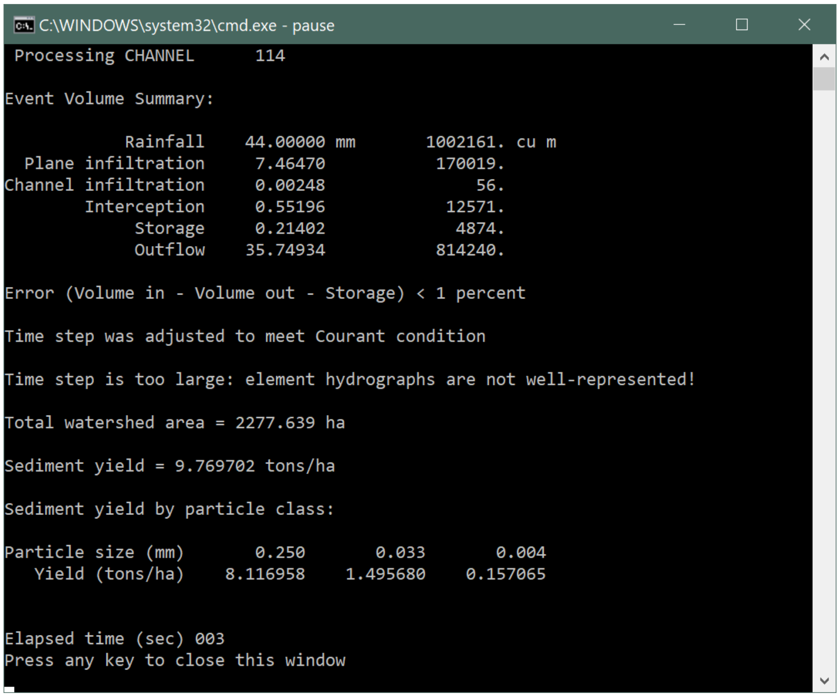
29.9. Click ***Run***.

Section 14: Execute K2 Simulation

30. Write a KINEROS2 simulation for the watershed by expanding the AGWA toolbox and double-clicking **Step 9 – Execute K2 Simulation**. Set the parameters as follows:

30.1. ***AGWA Delineation***: Select **AndreasCanyon**.
30.2. ***AGWA Discretization***: Select **fa2p5_ipp**.
30.3. ***Simulation***: Select **postfire**.





At this point, both the pre-fire and post-fire scenario have been simulated.

Part 5 Import and view simulation results

In Part 5, the results from the pre-fire and post-fire simulations will be imported into AGWA. These results will then be differenced to visually assess how the fire impacts the hydrology of the watershed.

Section 15: Import Results

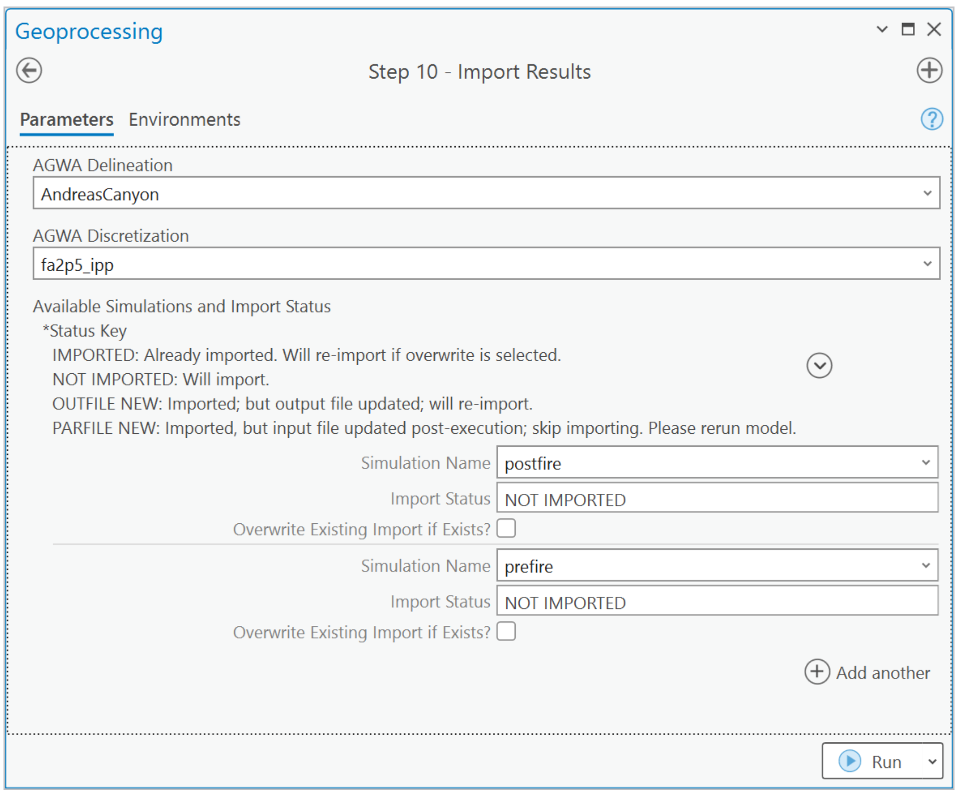
31. Import the results from the two simulations by selecting **Step 10 – Import Results**.

  31.1. ***AGWA Delineation***: Select **AndreasCanyon**.
  31.2. ***AGWA Discretization***: Choose **fa2p5_ipp**.
  31.3. ***Available Simulations and Import Status***: This section lists the simulations available for import along with their current status. Click on the drop-down arrow and select both **prefire** and **postfire**. Notice their status are populated automatically.

NOTE: There are four statuses, each with a brief description.

- **NOT IMPORTED**: Indicates that the results are pending import. AGWA will proceed with the import.
- **IMPORTED**: Means the results have already been imported; there is no need for re-import unless overwrite is selected.
- **OUTFILE NEW**: Suggests that although the simulation results have been imported, the output file has been updated post-import, re-importing is necessary and AGWA will proceed with the import.
- **PARFILE NEW**: Appears when the simulation results have been imported, but the input parameter file has been updated post-execution. A re-import will not occur automatically, and re-execution of the model is recommended.

If the **Overwrite Existing Import if Exists** option is checked, the import will proceed regardless of the current status of the simulation.



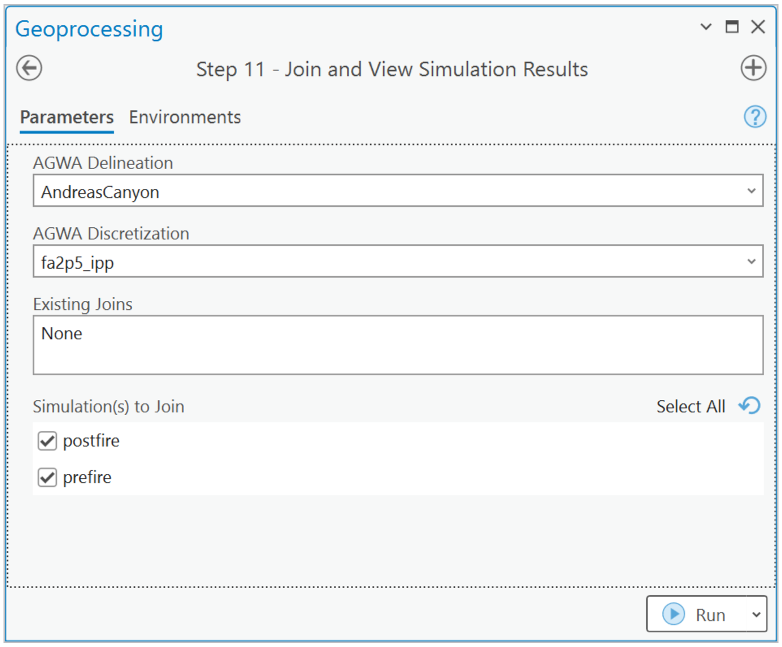
31.4. After setting all parameters, click the **Run** button to import the selected simulation results.

After completing this step, a table **k2_results** has been created in the delineation geodatabase to store the results of selected simulations.

Section 16: Join Simulation Results

32. Click **Step 11 – Join and View Simulation Results** and follow the steps to join the simulation results, which were imported in the previous step, to a set of feature classes. This will enable the results to be viewed using the **Symbology** tool in ArcGIS Pro.

32.1. ***AGWA Delineation***: Select **AndreasCanyon**.
32.2. ***AGWA Discretization***: Choose **fa2p5_ipp**.
32.3. ***Existing Joins***: This is the point at which AGWA automatically populates existing joins and informs users that existing joins will be replaced if they choose to join again. In this case, no existing joins exist for the current set of delineation and discretization.
32.4. ***Simulation(s) to Join***: select both **postfire** and **prefire**.



32.5. Click ***Run***.

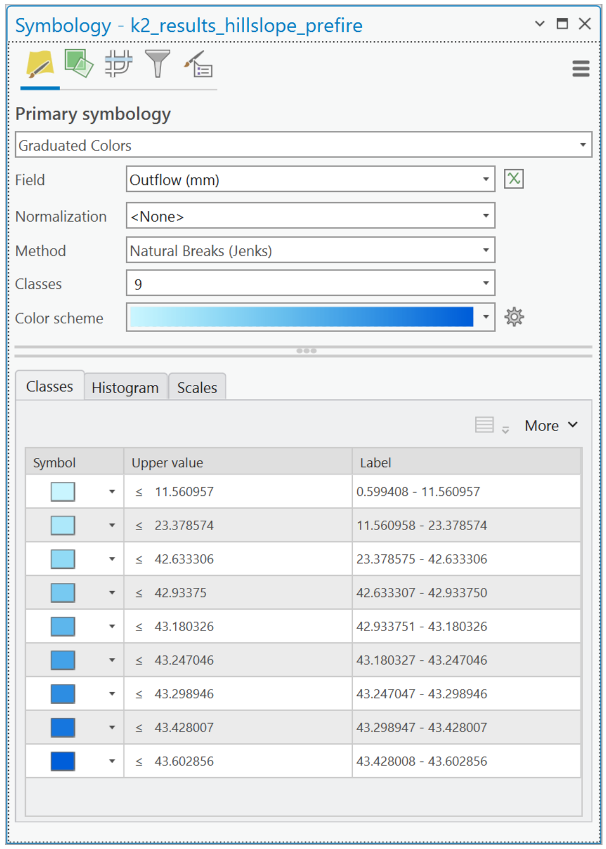
Upon completion, you will notice that details about the joins we just completed will appear in the **Existing Joins** box. Additionally, four feature classes have been added to the content of the map: **k2_results_channel_prefire** and **k2_results_hillslope_prefire** for the **prefire** simulation, **k2_results_channel_postfire** and **k2_results_hillslope_postfire** for the **postfire** simulation.

Section 17: View Simulation Results

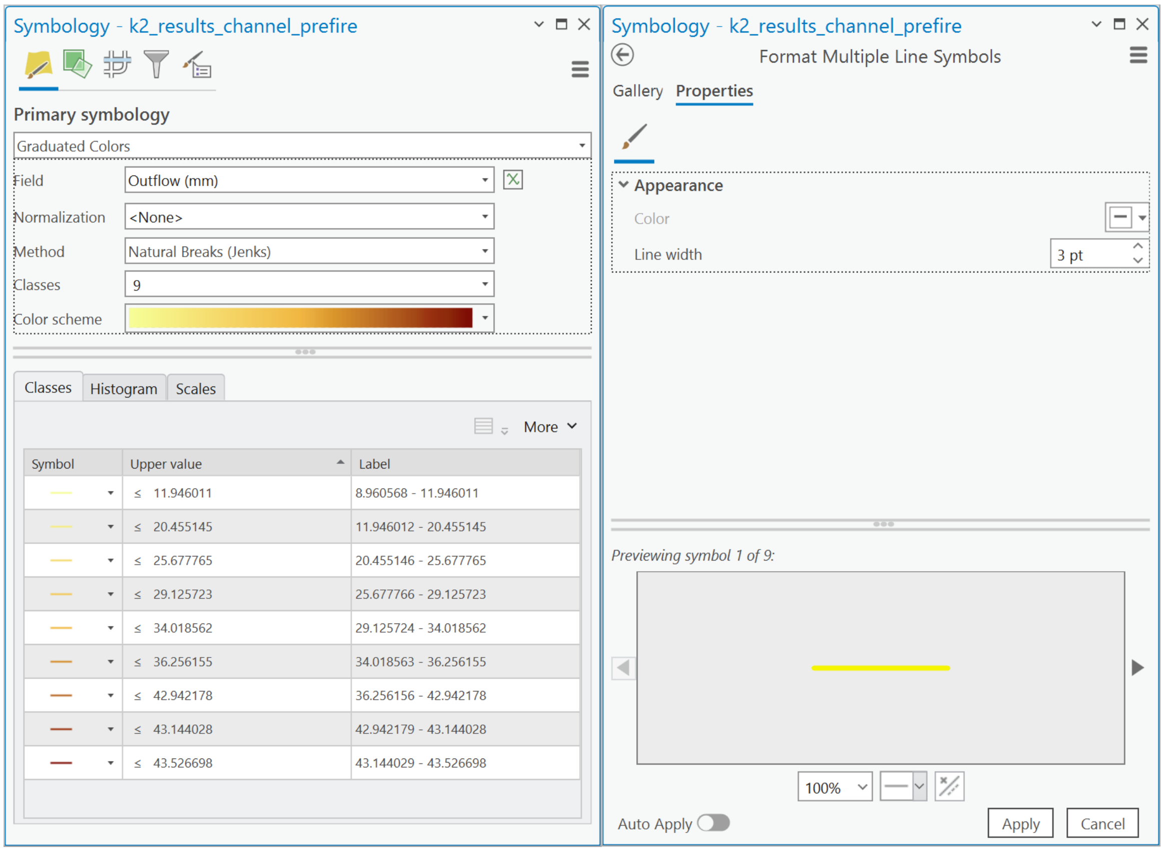
Users can visualize the simulation results with the **Symbology** tool. We will use the simulation **prefire** as an example for this section.

33. Select the **k2_results_hillslope_prefire** layer in the **Contents** of the Map. Then, open the **Symbology** tool from **Feature Layer** tab, which can be accessed from the ribbon menu when a feature class layer is selected.

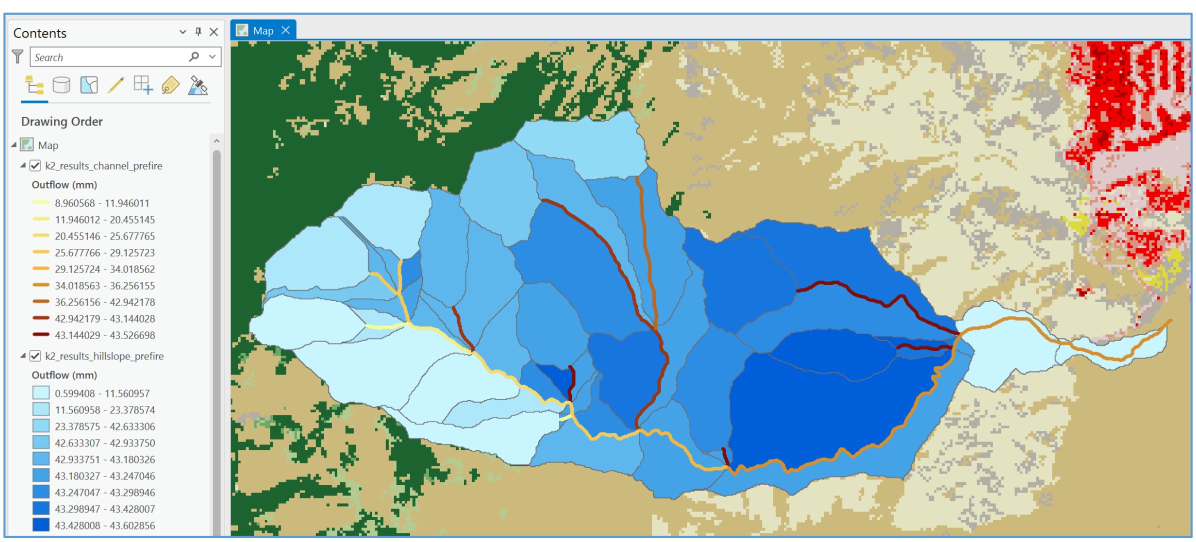
33.1. ***Primary symbology***: Click the drop-down arrow and select **Graduated Colors**.
33.2. ***Field***: Select **Outflow (mm)** or choose another unit of outflow that you are interested in from the drop-down list.
33.3. ***Method***: **Natural Breaks (Jenks)**.
33.4. ***Classes***: **9**.
33.5. ***Color scheme***: Select a color scheme.



34. Repeat the previous step for the **k2_results_channel_prefire** layer. Additionally, to improve visualization, you may want to increase the line width. Do this by clicking **More**, **Format all symbols**, and then click the **Properties** tab and adjust the **Line width** to **3** pt.



After completion, the map should resemble the following image. Simulated runoff is displayed for each hillslope and channel element, according to the selected color theme and classification. Areas associated with high runoff risk can be identified in this manner.



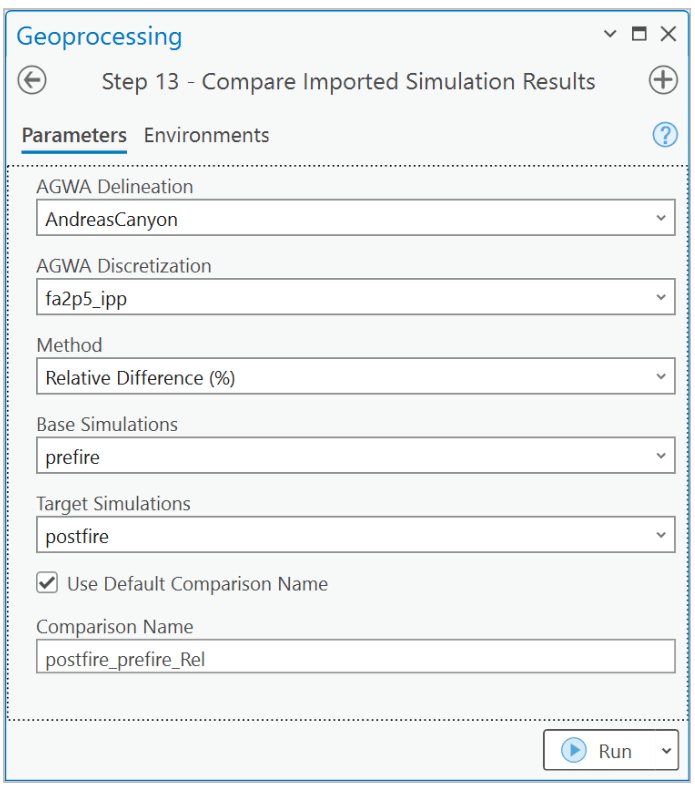
Part 6: Comparing Results from Pre-Fire and Post-Fire Scenarios

AGWA offers an easy way to compare and display the differences between two sets of simulations. In Part 6, we will guide you through comparing the previously imported pre- and post-fire simulation results.

Section 18: Compare Imported Simulation Results

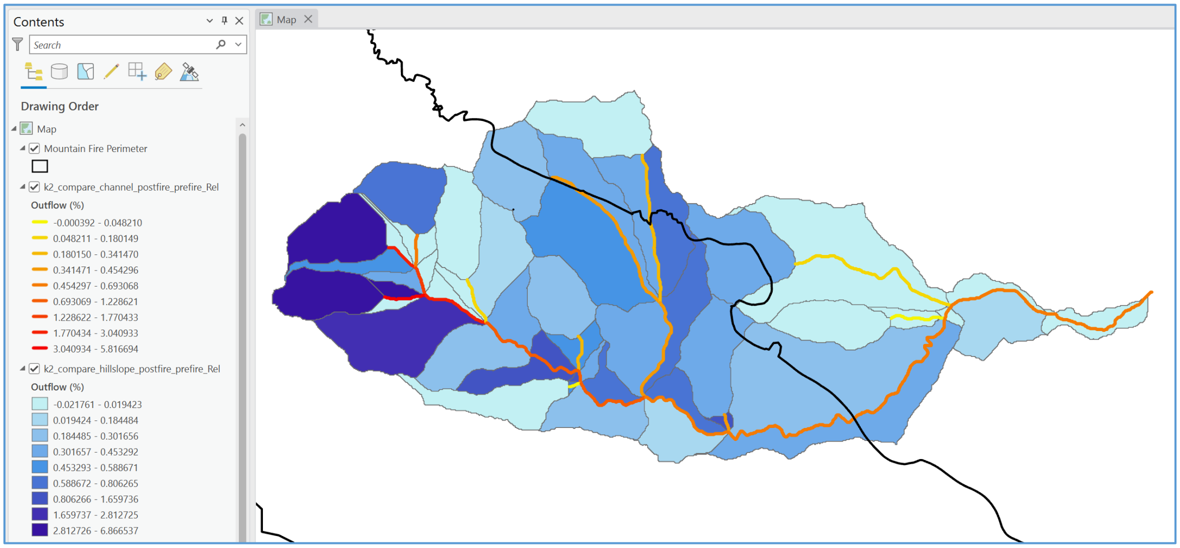
Comparisons can only be performed on imported simulations. There are two methods for comparison: **absolute** and **relative**. The absolute comparison method involves directly subtracting the target simulation results from the base simulation results. The relative difference, on the other hand, is calculated as the percentage of the absolute difference relative to the base simulation results.

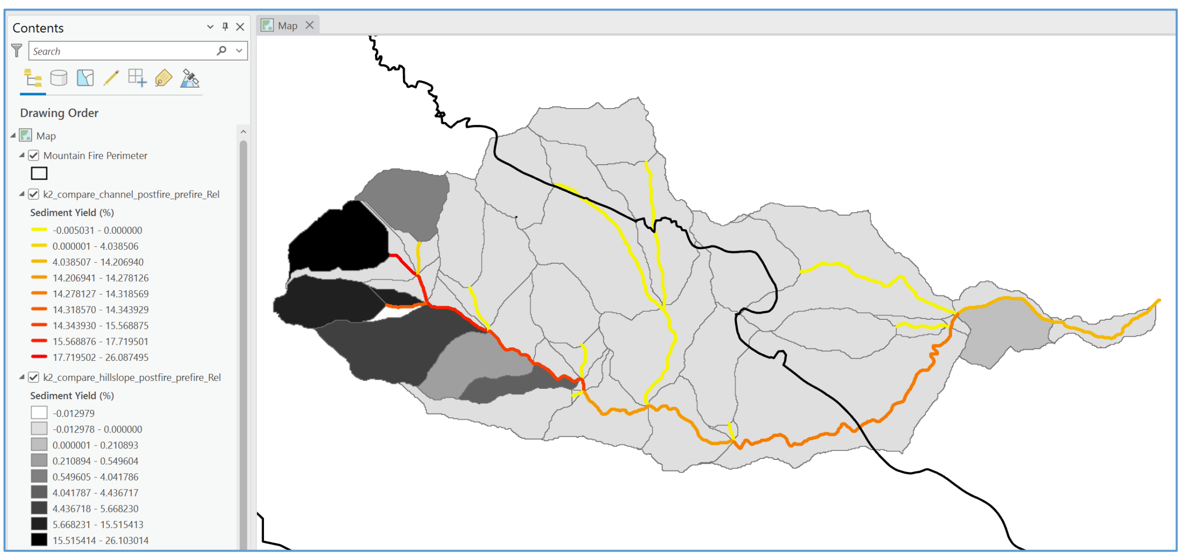
35. Open **Step 13 - Compare Simulation Results** and follow the steps below to calculate the differences between the two simulations: **prefire** and **postfire**.
    35.1. ***AGWA Delineation***: Select **AndreasCanyon**.
    35.2. ***AGWA Discretization***: Choose **fa2p5_ipp**.
    35.3. ***Method***: Select the comparison method, such as **Relative Difference (%)**.
    35.4. ***Base Simulations***: Choose **prefire**.
    35.5. ***Target Simulations***: Select **postfire**.
    35.6. ***Use Default Comparison Name***: **Check** this box.
    35.7. ***Comparison Name***: A name based on user's inputs will appear in this box if the ***Use Default Comparison Name*** is check. In this case, the comparison name is **postfire_prefire_Rel**. Enter a name manually if ***Use Default Comparison Name*** is unchecked.



35.8. Click ***Run***.

Once completed, two feature classes **k2_compare_channel_postfire_prefire_Rel** and **k2_compare_hillslope_postfire_prefire_Rel** will be added to the Contents of the Map. You can use the **Symbology** tool again to visualize the differences between the two simulations. The difference of Outflow and Sediment Yield should look like the images below:





Section 19: Compare hydrographs

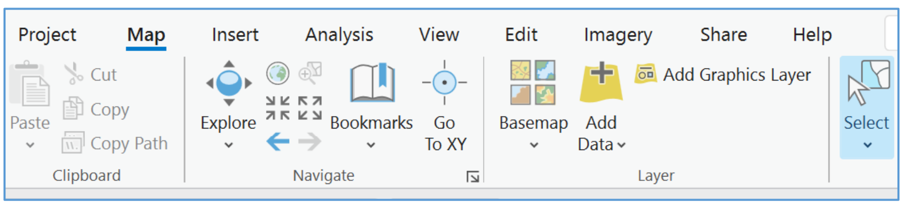
Comparing hydrographs of the same modeling elements from two simulations provides another visualization to examine the impact of wildfires on hydrology.

36. Open **Step 14 - Compare Hydrogprahs** and follow the steps below to plot and compare the hydrograph of two simulations at selected element IDs.

36.1. ***AGWA Delineation***: Select **AndreasCanyon**.
36.2. ***AGWA Discretization***: Choose **fa2p5_ipp**.
36.3. ***Simulation to Compare***: Select both **postfire** and **prefire**.
36.4. ***Compare Hillslope Element(s)***: **Check**.
36.5. ***Hillslope Element ID Selection Method***: Select **Input ID Manually**.
36.6. ***Input Hillslope IDs, separated by comma***: Enter **31,41**.
36.7. ***Compare Channel Element(s)***: **Check**.

> NOTE: If you are only interested in comparing hydrographs for hillslopes, you can leave this uncheck. Conversely, if your focus is solely on channels, then you may leave the option of **Compare Hillslope Element(s)** blank.

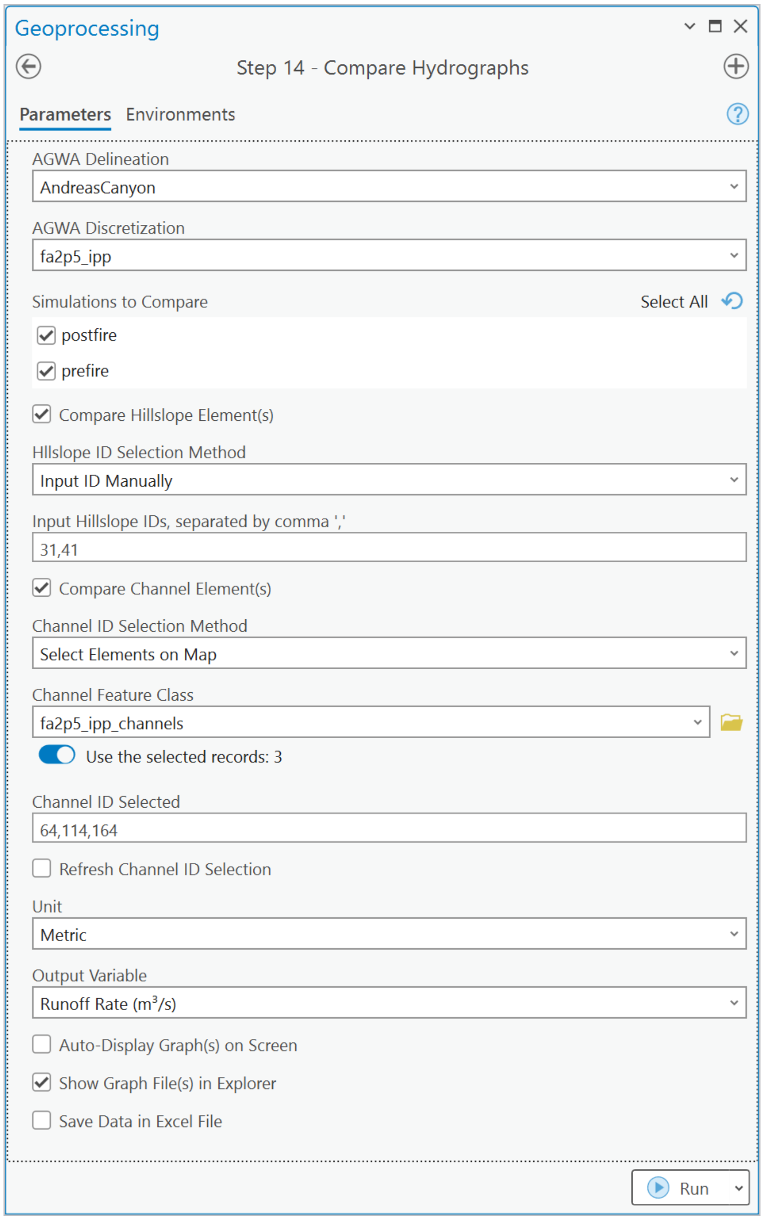
36.8. ***Channel Feature Class***: Select **fa2p5_ipp_channels**.
36.9. ***Channel ID List***: Note that channel features to be compared must be selected and will be automatically reflected here. One way to do is by right-clicking on **fa2p5_ipp_ channels** in the Content pane, selecting **Attribute Table** to open it, and then locating and selecting the record where channel ID is **64** and **114**. Alternatively, use the **Select** tool from the **Map** tab on the ribbon menu to select the same channels. Labeling the elements with ChannelID can aid in locating specific elements.



36.10. ***Refresh Channel ID Selection***: **Check** this option to update and reflect changes in channel ID selection. This box will automatically uncheck itself once the update is complete.
36.11. ***Unit***: Choose **Metric**.
36.12. ***Output Variable***: Select the output variable of interest: **Runoff Rate (m^3/S)**.
36.13. ***Auto-Display Graphs***: **Uncheck**.
36.14. ***Auto-Display Files in Explore***: **Check**.

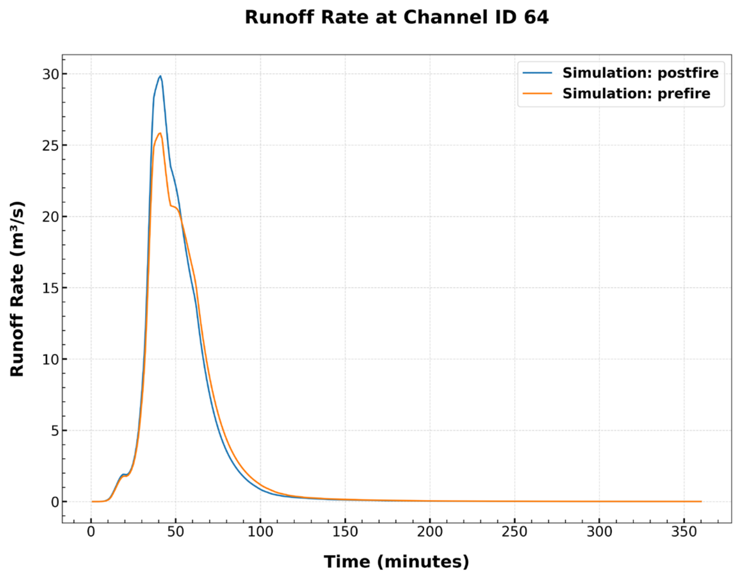
> NOTE: When **Auto-Display Graphs** is enabled, AGWA will automatically display the plotted graph on the screen. Please note that this process may take some time, and a black command window may appear briefly before the graph is displayed; it will close automatically. When **Auto-Display Files in Explorer** is checked, a file explorer window will open, showing the location where the graphs are stored. This option is checked by default.

36.15. ***Save Data in Excel File***: **Uncheck**. If checked, AGWA will save the data for comparison in an Excel file.



36.16. Click ***Run***.

In this section, we demonstrate the comparison of hydrographs using two methods to select hillslope and channel features to compare. Upon completion, an Explorer window will open, allowing users to view the graphs at **fire_demo\AndreasCanyon\modeling_files\fa2p5_ipp\simulations**.



The above is an example of the comparison at Channel ID 64. Channel 64 is located in the upper watershed, where the severity of the fire ranges from low to high. Hydrographs indicate a higher runoff peak from the post-fire simulation. Results showed less contrast at Channel 164, which is located in one of the VARs, but still exhibited a higher runoff peak after the fire. These hydrographs are useful to compare how the watershed response will change after fire at specific VARs. However, in a BAER rapid assessment situation such as after the Mountain Fire, proper calibration was not performed. Therefore, trusting the absolute values shown by these hydrographs is not recommended. Instead, focusing on the relative (percent) change is a better strategy when dealing with uncalibrated watersheds.

References

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Goodrich D.C., I.S. Burns, C.L. Unkrich, D.J. Semmens, D.P. Guertin, M. Hernandez, S. Yatheendradas, J. Kennedy, L.R. Levick, 2012. KINEROS2/AGWA: Model Use, Calibration, and Validation. *Transactions of the ASABE* 55(4), 1561-1574.