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# Arc Hydro: Support for Hydrologic Modeling

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## 1.0 Introduction

Arc Hydro consists of a data model, toolset, and collection of workflows developed over the years to support geographic information system (GIS) implementations specific to water resources. The initial implementation of Arc Hydro was in 2002 with the data model, Arc Hydro book published by Esri Press, and an initial set of about 30 tools. Since then, Arc Hydro has expanded in terms of both tools and workflows as a result of many project applications. There are now more than 300 Arc Hydro tools, and they continue to be expanded based on work in specific implementations.

This document provides an overview of Arc Hydro tools that support hydrologic modeling and describes basic workflows using these tools. We demonstrate a typical approach to preparing GIS data for integration with the Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS). Integration of Arc Hydro with HEC-HMS was first implemented using HEC-GeoHMS tools and has since evolved for use within ArcGIS Pro. Although this document illustrates Arc Hydro capabilities for export to a specific hydrologic modeling system, the tools are intended to be flexible enough to prepare data for a range of applications. The documentation of and seamless integration with additional hydrologic modeling systems is an active area of Arc Hydro development.

## 1.1 Document History

Table 1. Document Revision History

Version	Description	Date
1	First version (GLO)	7/2020
2	Minor changes to Preparing Data for HEC HMS Export documentation (GLO)	9/2020
3	Switch order of centroid creation and Hydro Network creation (GLO)	9/2020

## 1.2 Recommended Reading

This is one of several instructional Arc Hydro documents. The following are the other suggested reading, in order of importance:

1. [Arc Hydro - Project Development Best Practices](#)
2. [Arc Hydro - ArcGIS Pro Project Startup Best Practices](#)
3. [Arc Hydro - Overview of Terrain Preprocessing Workflows](#) (key tools referenced are available for both 10.X and Pro)
4. [HEC-HMS Documentation](#) (relevant for the specific use case shown)

## 2.0 Solution Overview

The tools discussed in this document are in the Arc Hydro Tools Pro toolbox supporting ArcGIS Pro 2.4 and later. For most of the tools, there are no differences in behavior or functionality Pro and 10.x. However, the model integration tools, Preparing Data for HMS Export and Create HEC-HMS Basin File, are designed specifically for use within Pro 2.4 and later. This document focuses on the ArcGIS Pro version of the tools.

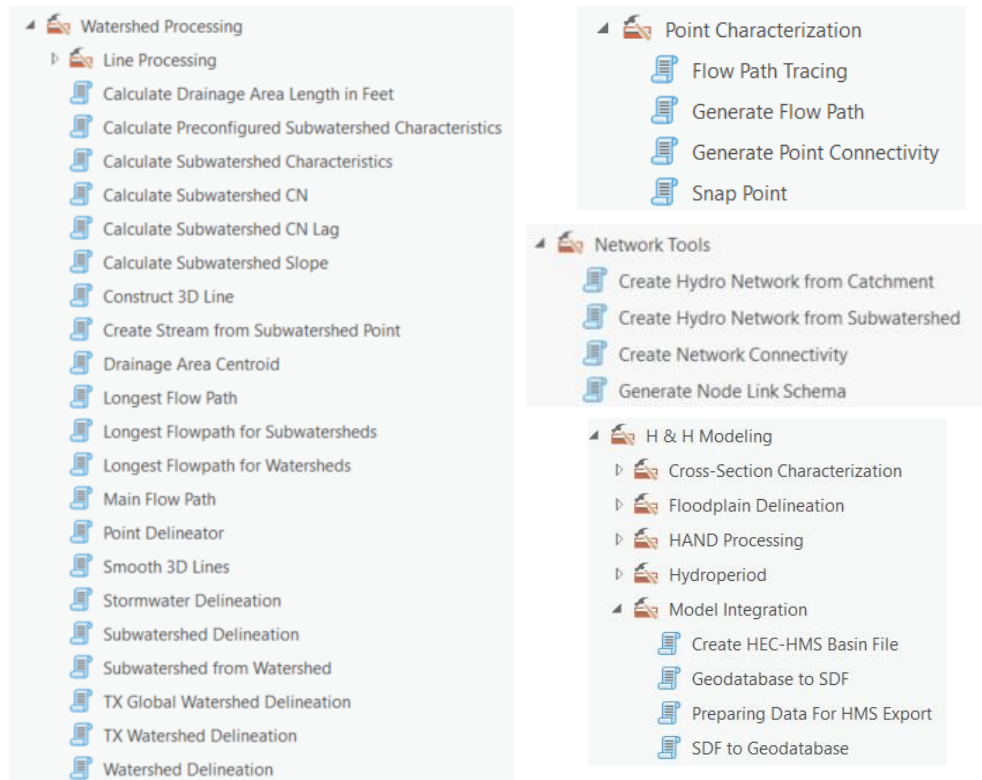


Figure 1. Arc Hydro hydrology-related tools.

## 2.1 Overview of Arc Hydro Tools that Support Hydrologic Modeling

Arc Hydro tools relevant to hydrologic modeling workflows are described in greater detail below. Note that the tools are not presented in the order in which they are used. In addition, not all the tools are used for all workflows.

Toolset	Step	Tool	Description
Watershed Processing	Watershed Delineation	Watershed Delineation (Interactive)	Delineate local watershed.
		Watershed Delineation (Batch)	
	Subwatershed delineation	Subwatershed from Watershed	Creates Arc Hydro subwatershed polygon and subwatershed point feature classes from Arc Hydro watershed polygon and watershed point feature classes. The input watershed polygon and point feature classes must be attributed according to Arc Hydro standards.
		Batch Subwatershed Delineation	Creates Arc Hydro subwatershed polygon and subwatershed point feature classes from Arc Hydro batch point feature class. The input batch point feature class must be attributed according to Arc Hydro standards.
	Basic watershed and Subwatershed characterization	Drainage Area Centroid	Creates a point feature class that represents the centroid of an input drainage area. The centroid can be calculated using one of three methods: center of gravity, halfway distance along the longest flowpath, or where 50% of the drainage area flows to along the given flowpath.
		Longest Flowpath	Generates longest flow path features associated to input drainage areas.

		Longest Flowpath for Subwatersheds	Generates longest flow paths for a subwatershed using preprocessed data, (e.g., "Longest Flow Path Adjoint Catchment"), to speed up processing.
		Longest Flowpath for Watersheds	Generates longest flow paths for a watershed using preprocessed data, (e.g., "Longest Flow Path Adjoint Catchment"), to speed up processing.
		Calculate Subwatershed Characteristics	Calculates user specified attribute(s) by applying zonal statistics on user provided characteristics raster(s). One or multiple characteristics can be computed in a single run.
		Calculate Preconfigured Subwatershed Characteristics	Calculates attribute(s) by applying zonal statistics. One or multiple characteristics can be computed in a single run. Input is specified via a configuration file.
		Calculate Subwatershed CN Lag	Calculates subwatershed lag using NRCS CN basin lag method. Lag is in hours. The following fields need to exist and be populated in the subwatershed feature class: "LongestFLFt", "BasinCN", and "BasinSlope". Output field is "BasinLag".
		Calculate Drainage Area Length in Feet	Calculates drainage area length in feet based on the length of area's longest flowpath. Flow path feature class must have field "DrainID" populated with "HydroID" of the matching basin. Output field is "LongestFLFt".

		Calculate Subwatershed CN	Calculates average subwatershed CN based on input CN raster. Output field is “BasinCN”.
		Calculated Subwatershed Slope	Calculates average subwatershed slope based on input slope raster. Output field is “BasinSlope”.
Point Characterization	Generate Point Connectivity	Generate Point Connectivity	Generates connectivity in watersheds associated to input point features. Using input points and the Flow Direction raster, this tool generates: drainage line features, catchment features associated to the drainage lines, adjoint catchment features, watershed point features, watershed features associated to each point, and stream link raster.
Network Tools	Create Network Connectivity	Create Network Connectivity	Creates network connectivity associated to input stream, pipe, inlet, outlet and catchment features using Node/Link features and connectivity.
	Create Node-Link Representation from Centroids and Subwatershed Outlets (nodes) and Drainage lines (links)	Create Stream from Subwatershed Point	Generates a hydro network (hydro edges and hydro junctions) from drainage lines, catchments, and drainage points.
		Create Hydro Network from Catchment	Generates a hydro network (hydro edges and hydro junctions) from drainage lines, catchments, and drainage points
		Create Hydro Network from Subwatershed	Generates a hydro network (hydro edges and hydro junctions) from drainage lines, catchments, and drainage points.
		Generate Node/Link Schema	Generates a node-link schema, where nodes are defined by

			the centers of basin polygons and by points that represent locations of interest in the model. These points may include basin outlets, river junctions, water intakes and other facilities.
H & H Modeling, Model Integration	Exporting hydrologic system data to be integrated with hydrologic modeling software	Preparing Data for HMS Export	Prepares basin system data to be exported to a HEC-HMS Basin model file. This tool organizes the data necessary for export into five tables, which are intended to be used as inputs to Create HEC-HMS Basin File.
		Create HEC-HMS Basin File	Pulls data from the HMS schema tables created using Preparing Data for HMS Export into a basin model file.

## 2.2 Generic Approach

Hydrologic modeling takes many forms. Arc Hydro tools do not directly perform hydrologic modeling but support it by identifying drainage areas and key landscape characteristics that are the foundation for hydrologic models. Watershed delineation and characterization were part of the first Arc Hydro Tools release in 2002. Simple models, like rational method, can be easily performed within GIS once the watershed and characteristics needed to support the method are derived.

This document explores more complex hydrologic modeling scenarios where simple empirical models are insufficient. For complex models, Arc Hydro prepares the input data to the extent possible and exports the data into the hydrologic model. The hydrologic modeling is performed outside of the GIS. Data requirements in this process will vary with the complexity of the implemented hydrologic techniques. There are a few generic steps that are common to most complex hydrologic models:

1. Partition the landscape into hydrologic modeling units based on morphologic and hydrologic requirements.
2. Establish connectivity (i.e., node-link) between hydrologic units.
3. Characterize hydrologic modeling units.
4. Prepare model inputs in a model specific format (i.e., model input files).



Steps 1-3 are common for all models. Step 4 will vary from model to model, but the actual content derived in steps 1-3 is the same. This document presents methods for data preparation for Hydrologic Engineering Center's HEC-HMS hydrologic model. Many other hydrologic models can be supported with minimal change to tools in step 4.

The following sections explore specific hydrologic modeling workflows and which tools are used for them. The workflows are documented using build 2.0.191 for ArcGIS Pro.

### 3.0 Overview of an Arc Hydro Hydrology Workflow

We demonstrate an approach for creating a hydrologic data model for HEC-HMS consumption. The approach branches into two common use cases for generating hydrologic units (i.e., catchments or subwatersheds) with varying levels of customization. Although the processes generate a final result specifically targeted to the HEC-HMS modeling system, the approach features standard components:

- standard dendritic terrain preprocessing,
- landscape tessellation and connectivity generation,
- node-link schema generation,
- landscape and basin element attribution,
- export to a modeling compliant format.

Figure 2 presents this workflow. Only the last component is HEC-HMS specific as it generates a HEC-HMS input file. All other steps would be common to any other node-link based hydrologic model. In the following sections, each step is described in terms of user input, example outputs, and further details. Our example implements the curve number loss method for model setup. Other loss methods supported by HMS and other models can be implemented as well using a combination of standard and Arc Hydro tools. Processing times for executing tools from this approach is documented in [Appendix 4.1](#).

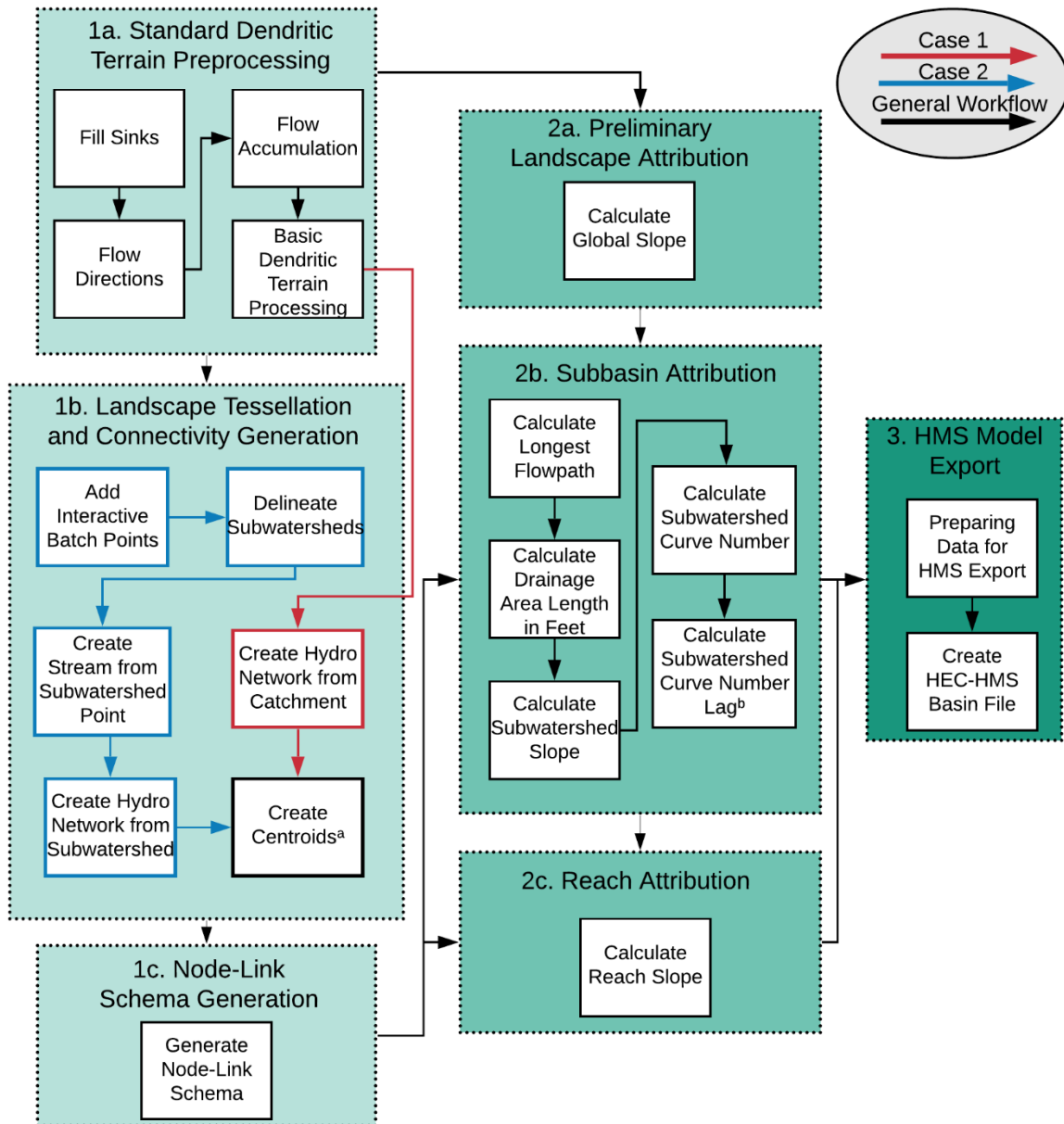


Figure 2. Arc Hydro workflows for hydrologic modeling. After completing the generic processes in part 1a, two use cases for creating the hydrologic network are shown (1b), as well as further schema creation (1c). These case-specific processes produce prerequisite data for attribution of the hydrologic network (2b and 2c) past the standard attribution (2a). Finally, a generic model export is performed, shown here for the HEC-HMS system (part 3).

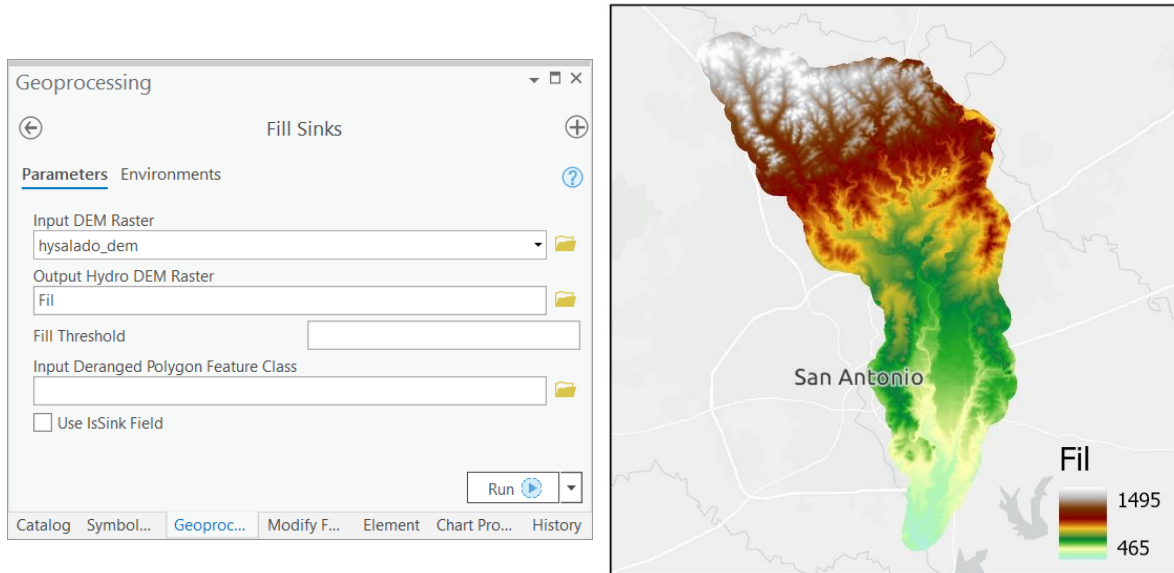
<sup>a</sup>When following Use Case 1, Arc Hydro catchments, created from Basic Dendritic Terrain Processing, are used directly as the input for Create Centroids. Through Use Case 2, subwatersheds are derived through additional processing.

<sup>b</sup>At this point, additional subbasin attributes can be derived that are not shown here.

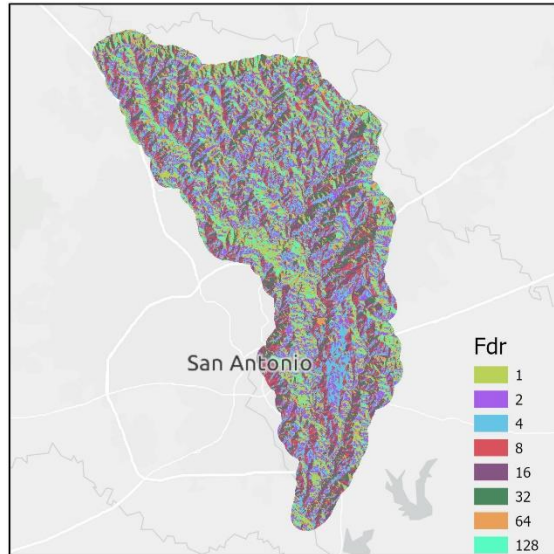
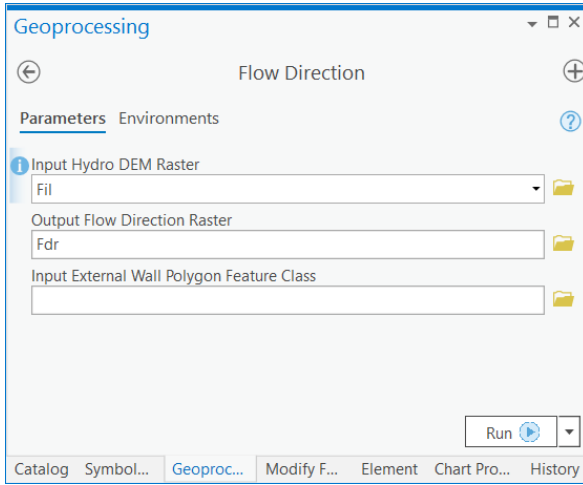
### 3.1 Standard Dendritic Terrain Preprocessing

While standard dendritic terrain preprocessing is presented here, other morphologies are supported, and their results can be used as input for later steps. Review document “Arc Hydro - Overview of Terrain Preprocessing Workflows” for discussion on other possible terrain processing workflows and select one that matches your conditions the best.

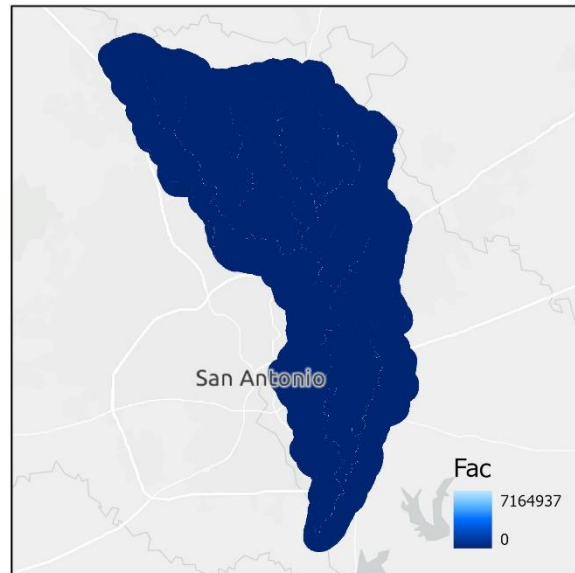
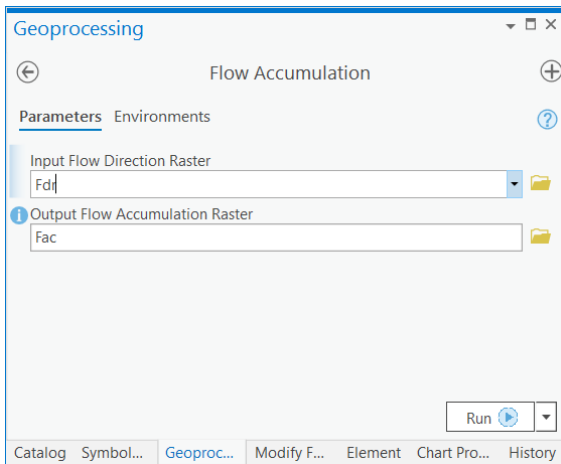
#### 1. Fill Sinks



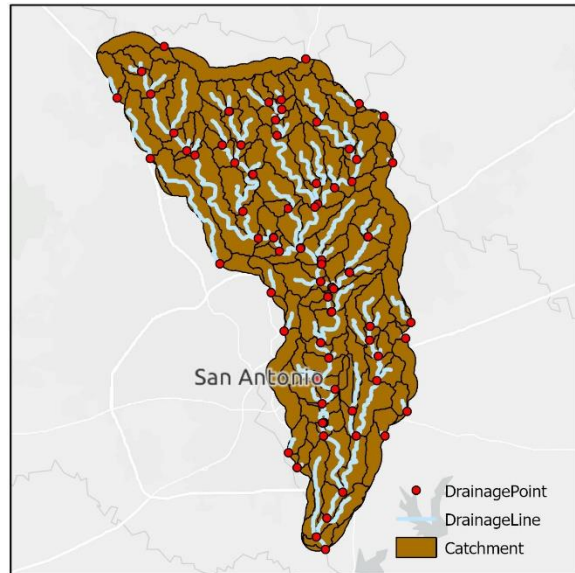
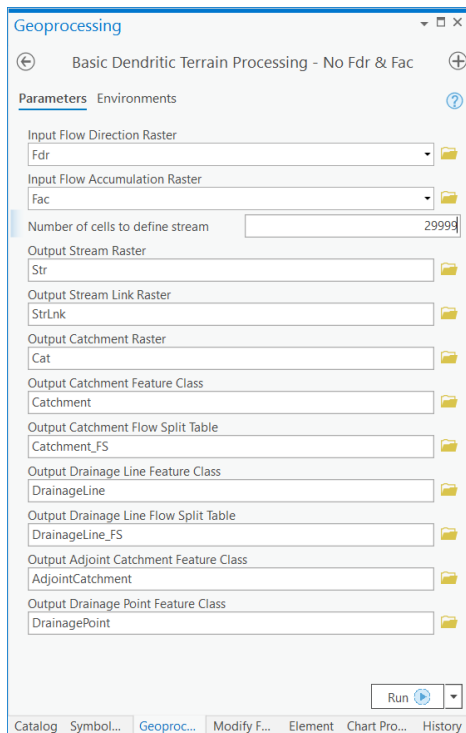
## 2. Flow Direction



## 3. Flow Accumulation



## 4. Basic Dendritic Terrain Processing



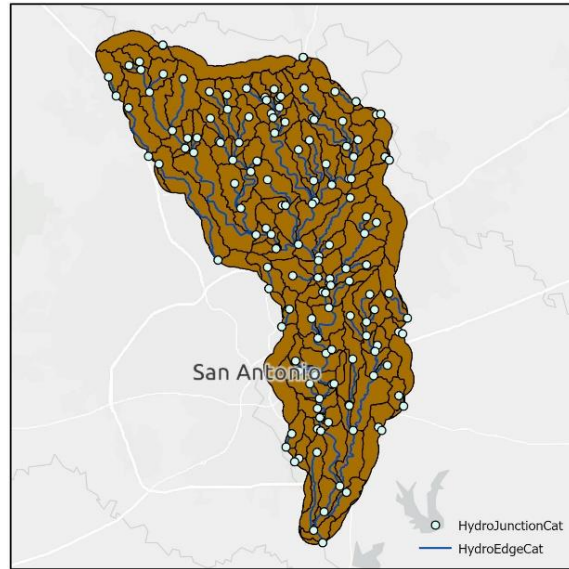
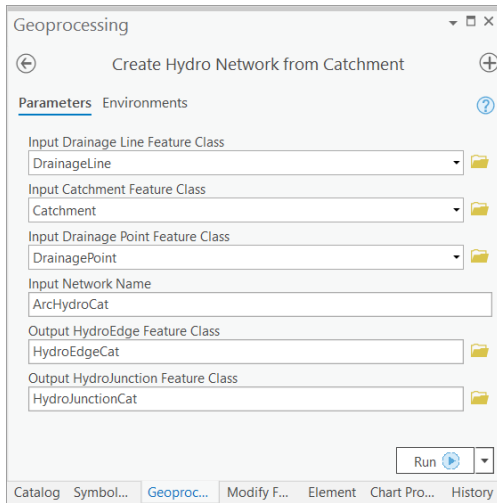
Not shown in output: Stream raster, stream link raster, catchment raster, catchment flow split table, and the drainage line flow split table.

## 3.2 Landscape Tessellation and Connectivity Generation

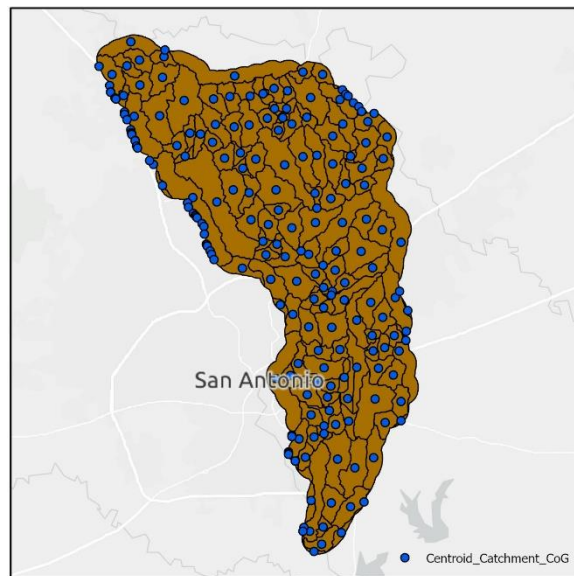
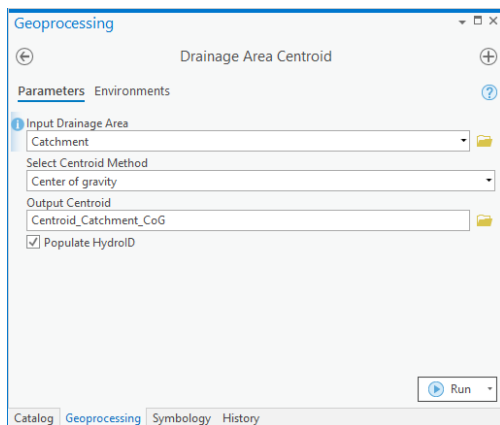
### 3.2.1 Use Case 1: Using Arc Hydro Catchments as HMS Subbasins

Use Case 1 describes the generic approach to the landscape tessellation and connectivity generation phase. The catchments and their related components created from Basic Dendritic Terrain Processing are used directly for subsequent schema generation and attribution. Thus, this approach assumes the outputs from Basic Dendritic Terrain Processing represent the complete set of basin elements of interest for hydrologic modeling.

## 1. Create Hydro Network from Catchment



## 2. Create centroids

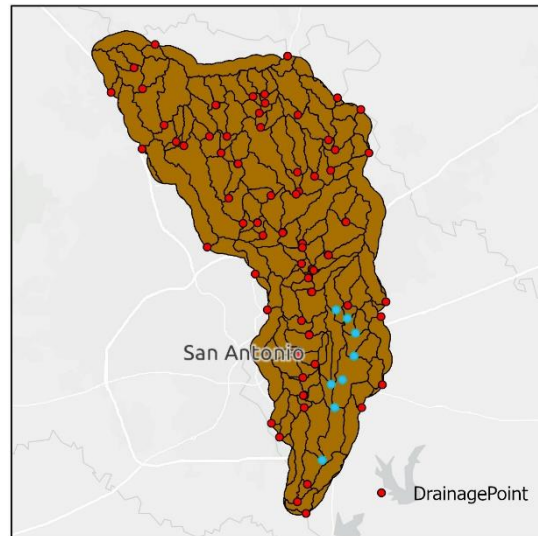
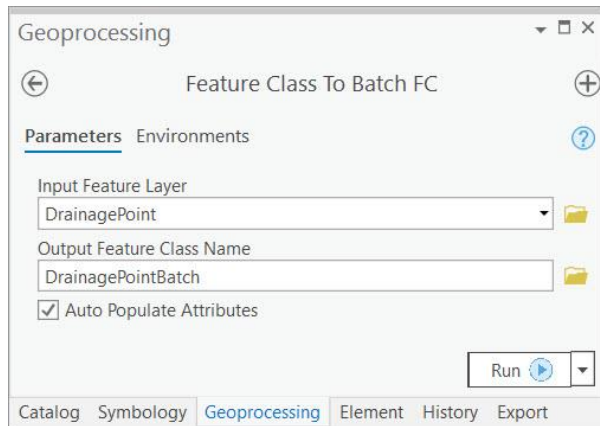


Note: Drainage Area Centroid will populate the JunctionID associated with each centroid *if* it is present in the Input Drainage Area. **For this reason, Drainage Area Centroid must be run *after* Create Hydro Network from Catchment as tools later in this workflow rely on JunctionIDs being present for centroid features.**

### 3.2.2 Use Case 2: Creating HMS Subbasins from User-Defined Batch Points

Use Case 2 describes an alternative workflow, where subbasins are created from a more specific set of drainage outlet points. This approach is useful when additional areas of interest exist (e.g., gauging stations) and users want to further customize the hydrologic data model.

#### 1. Add Interactive Batch Points

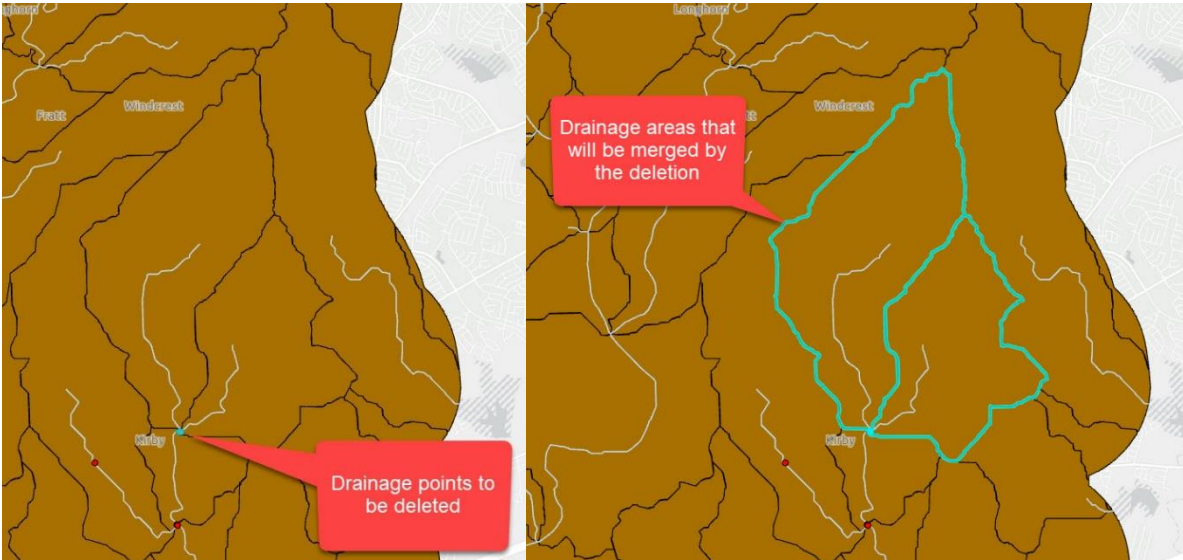


In this example, the user selects a subset of the drainage points feature class to represent the drainage outlets for their specific area of interest. The selected points are exported using the Feature Class to Batch Points tool.



The user then adds additional points along the drainage lines. These points define additional subbasin outlets of interest in the model and mimic the splitting capability available in GeoHMS.

[Hint: Enable snapping to improve performance of subsequent steps.](#)



Next, the user deletes two drainage points that correspond to adjacent catchments, leaving a single downstream point that will generalize these drainage areas along with the catchment directly downstream of both. This action mimics the merging capability available in GeoHMS.



After completing the interactive creation of drainage points, Hydro IDs are assigned to the new features.

Geoprocessing

Assign HydroID

Parameters Environments

Input Feature Class or Table  
DrainagePointBatch

Overwrite HydroID

Run

---

DrainagePointBatch X

Field: Add Calculate Selection: Zoom To Switch Clear Delete Copy

OBJECTID	Shape	pointid	GridID	DrainID	JunctionID	Name	Descript	BatchDone	SnapOn	SrcType	HydroID
6	Point	98	99	230	640	Batch_6	Autogenerated batch...	0	1	0	6
7	Point	105	101	232	647	Batch_7	Autogenerated batch...	0	1	0	7
8	Point	106	105	236	647	Batch_8	Autogenerated batch...	0	1	0	8
9	Point	111	120	246	654	Batch_9	Autogenerated batch...	0	1	0	9
10	Point	112				Batch_10	Autogenerated batch...	0	1	0	10
11	Point	118				Batch_11	Autogenerated batch...	0	1	0	11
12	Point	119				Batch_12	Autogenerated batch...	0	1	0	12
13	Point	125				Batch_13	Autogenerated batch...	0	1	0	13
14	Point	126	128	254	671	Batch_14	Autogenerated batch...	0	1	0	14
15	Point	<Null>	<Null>	<Null>	<Null>	Batch_15	Manually added batch...	0	1	0	15
16	Point	<Null>	<Null>	<Null>	<Null>	Batch_16	Manually added batch...	0	1	0	16

Note that these fields were manually populated

## 2. Delineate Subwatersheds

Geoprocessing

Subwatershed Delineation

Parameters Environments

Input Batch Point Feature Class  
DrainagePointBatch

Input Snap Distance  
0

Input Flow Direction Raster  
fdr

Input Stream Raster  
str

Output Subwatershed Feature Class  
Subbasin

Output Subwatershed Point Feature Class  
SubbasinPoint

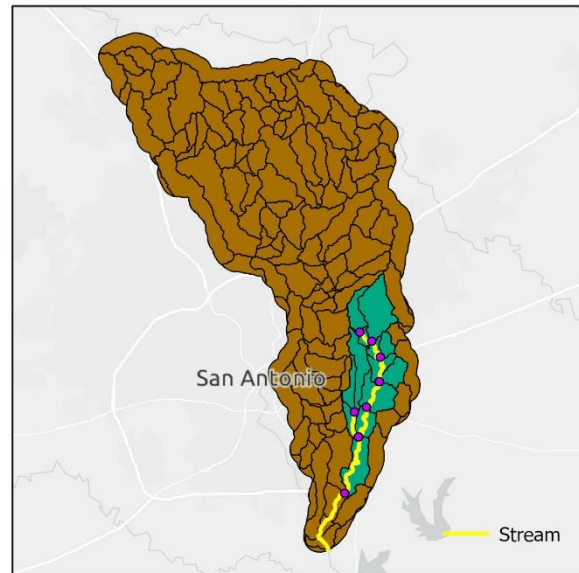
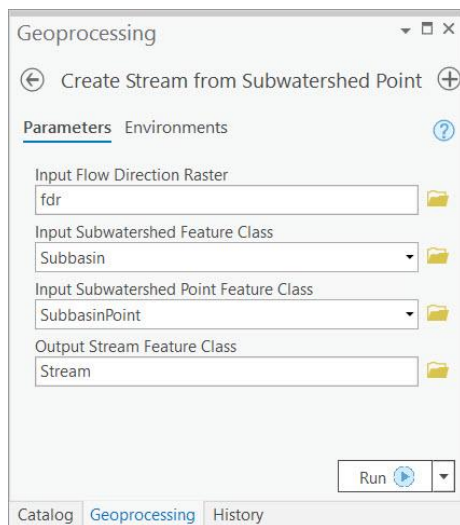
Run

Catalog Symbol... Geoproc... Create Fe... Element History Export

Windcrest  
Kirby  
SubbasinPoint  
Subbasin

The user can now delineate subwatersheds from the interactive batch points. On the right, the inset map highlights the merged drainage areas resulting from the [deletion of drainage points](#).

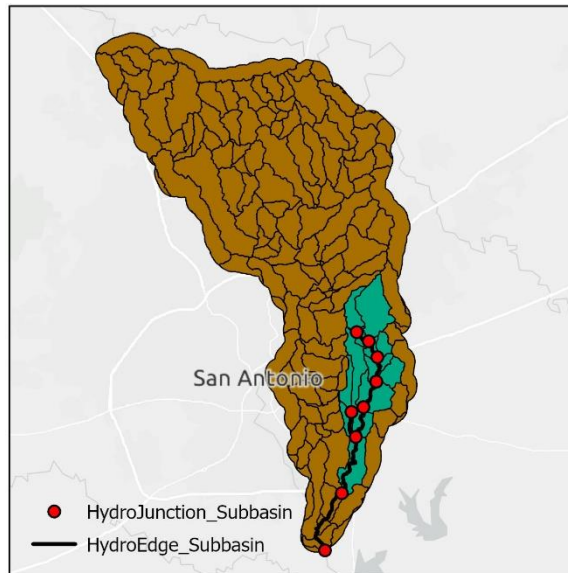
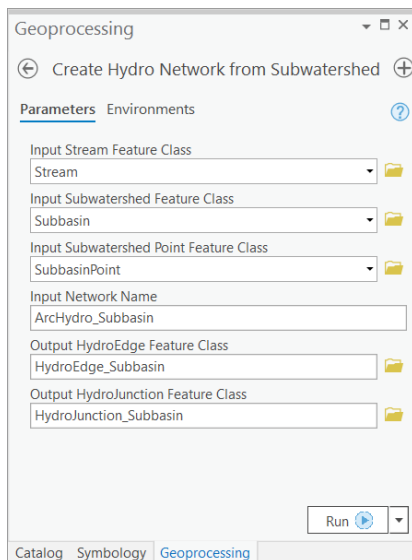
### 3. Create Stream from Subwatershed Point



Unlike Use Case 1, where the generic drainage lines created by Basic Dendritic Terrain Processing are applied, user-specific streams are derived for Use Case 2. These features are based on the interactively created batch points (“SubbasinPoint” feature class) and are derived from the Create Stream from Subwatershed Point tool. This tool ensures that flow connectivity between subwatersheds is determined, even if the governing batch points do not fall on a pre-defined drainage line. Note that in following steps, the output stream feature class would replace the drainage line feature class associated with Use Case 1.

---

#### 4. Create Hydro Network from Subwatershed



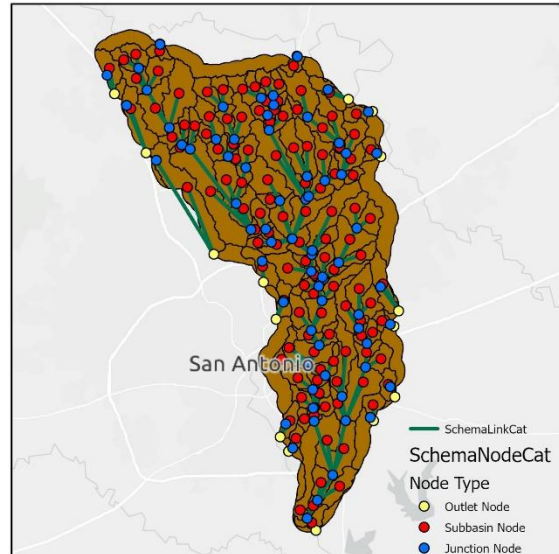
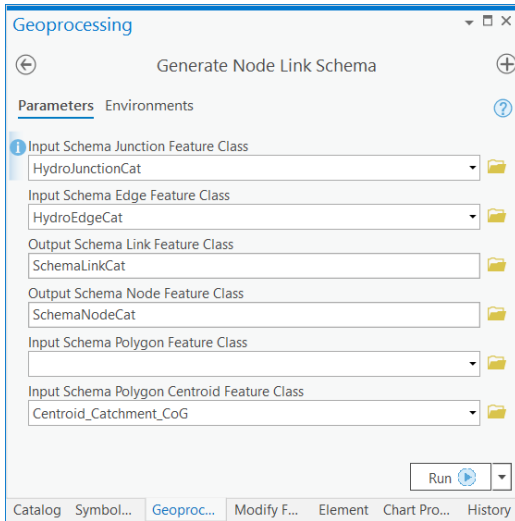
#### 5. Create centroids using the same process as shown in [Use Case 1](#)

Note: Drainage Area Centroid will populate the JunctionID associated with each centroid *if* it is present in the Input Subwatershed. **For this reason, Drainage Area Centroid must be run after Create Hydro Network from Subwatershed as tools later in this workflow rely on JunctionIDs being present for centroid features.**

### 3.3 Node-Link Schema Generation

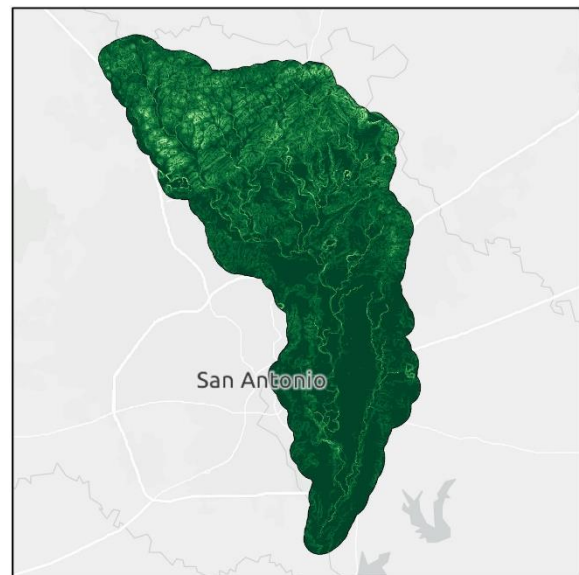
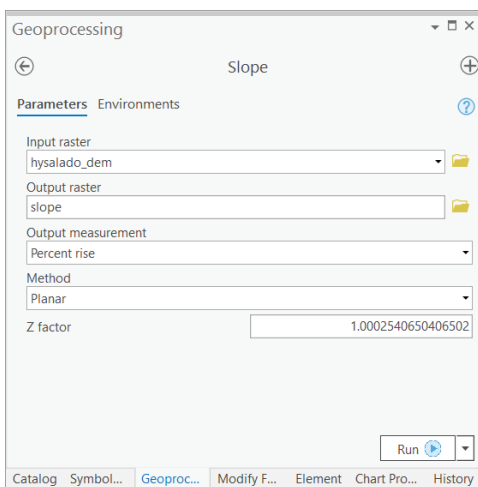
Input data corresponding to Use Case 1 are used until reaching Section 3.7.

#### 1. Generate Node-Link Schema



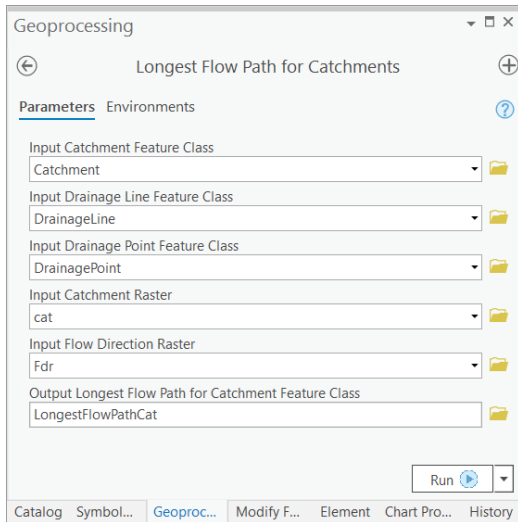
### 3.4 Preliminary Landscape Attribution

#### 1. Calculate Global Slope

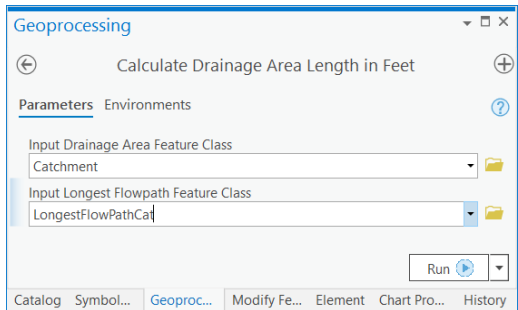


## 3.5 Subbasin Attribution

### 1. Calculate Longest Flow Path

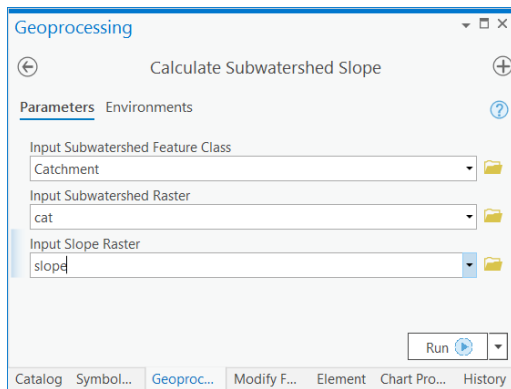


### 2. Calculate Drainage Area Length in Feet



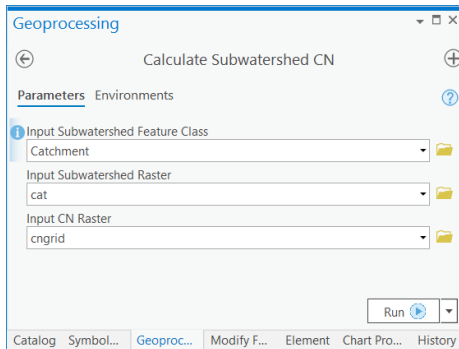
HydroID	NextDownID	CatType	JunctionID	LongestFLft	BasinSlope
240	254	<Null>	662	31916.303013	2.210784
221	229	<Null>	638	22753.145007	2.2321
226	228	<Null>	635	9493.782464	2.989023
214	221	<Null>	624	26561.744572	2.236976
230	232	<Null>	640	11110.432893	2.928805
251	249	<Null>	658	14522.819254	2.186607
227	-1	<Null>	634	10741.021638	2.203552
252	-1	<Null>	664	13490.758646	2.400477

### 3. Calculate Subwatershed Slope



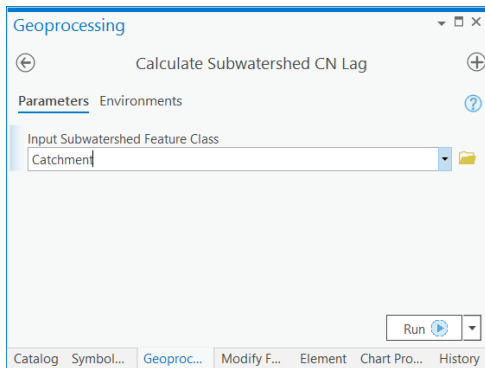
HydroID	NextDownID	CatType	JunctionID	LongestFLft	BasinSlope
240	254	<Null>	662	31916.303013	2.210784
221	229	<Null>	638	22753.145007	2.2321
226	228	<Null>	635	9493.782464	2.989023
214	221	<Null>	624	26561.744572	2.236976
230	232	<Null>	640	11110.432893	2.928805
251	249	<Null>	658	14522.819254	2.186607
227	-1	<Null>	634	10741.021638	2.203552
252	-1	<Null>	664	13490.758646	2.400477

### 4. Calculate Subwatershed Curve Number



HydroID	NextDownID	CatType	JunctionID	LongestFLft	BasinSlope	BasinCN
240	254	<Null>	662	31916.303013	2.210784	83.149134
221	229	<Null>	638	22753.145007	2.2321	82.419355
226	228	<Null>	635	9493.782464	2.989023	81.862472
214	221	<Null>	624	26561.744572	2.236976	81.747475
230	232	<Null>	640	11110.432893	2.928805	81.709873
251	249	<Null>	658	14522.819254	2.186607	81.055785
227	-1	<Null>	634	10741.021638	2.203552	81
252	-1	<Null>	664	13490.758646	2.400477	80.995833

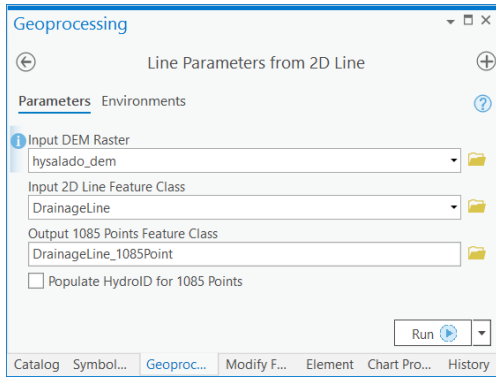
### 5. Calculate Subwatershed Curve Number Lag



HydroID	NextDownID	CatType	JunctionID	LongestFLft	BasinSlope	BasinCN	BasinLag
219	-1	<Null>	627	29412.110371	2.40077	75.327586	3.528354
240	254	<Null>	662	31916.303013	2.210784	83.149134	3.082124
220	226	<Null>	629	23979.946955	2.616886	74.309475	2.955142
214	221	<Null>	624	26561.744572	2.236976	81.747475	2.770292
231	233	<Null>	641	13236.900423	1.614065	71.238095	2.548364
221	229	<Null>	638	22753.145007	2.2321	82.419355	2.397188
255	259	<Null>	671	29909.349545	2.8845	91.570111	1.863209
223	226	<Null>	629	15004.768389	2.338816	79.207985	1.858859
251	249	<Null>	658	14522.819254	2.186607	81.055785	1.767534
244	-1	<Null>	657	12057.640687	1.818884	79.772727	1.738918
252	-1	<Null>	664	13490.758646	2.400477	80.995833	1.593395
228	232	<Null>	640	12358.555185	2.539562	79.130576	1.531052

### 3.6 Reach Attribution

#### 1. Calculate Reach Slope



### 3.7 HMS Model Export

We demonstrate a workflow for integrating Arc Hydro outputs with HEC-HMS. GIS data that follow the Arc Hydro standards can be exported to a format compatible with HMS (i.e., \*.BASIN file) using two tools: Preparing Data for HMS Export and Create HEC-HMS Basin File. These tools were developed and tested used HEC-HMS 4.2.1, but the resulting Basin file is compatible with HEC-HMS 4.4.1.

In the following sections, the workflow is demonstrated using a subset of the Use Case 1 data that has been processed through section 3.7, and then further attributed using external user knowledge of the study area (Figure 3).

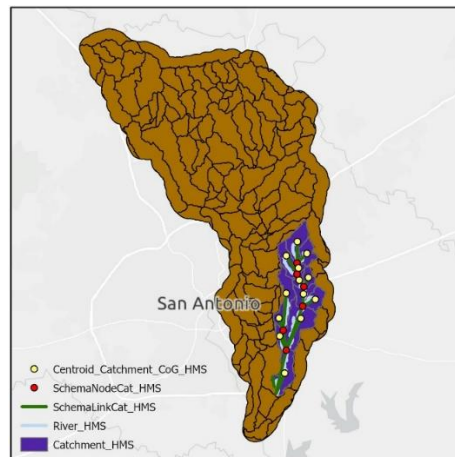
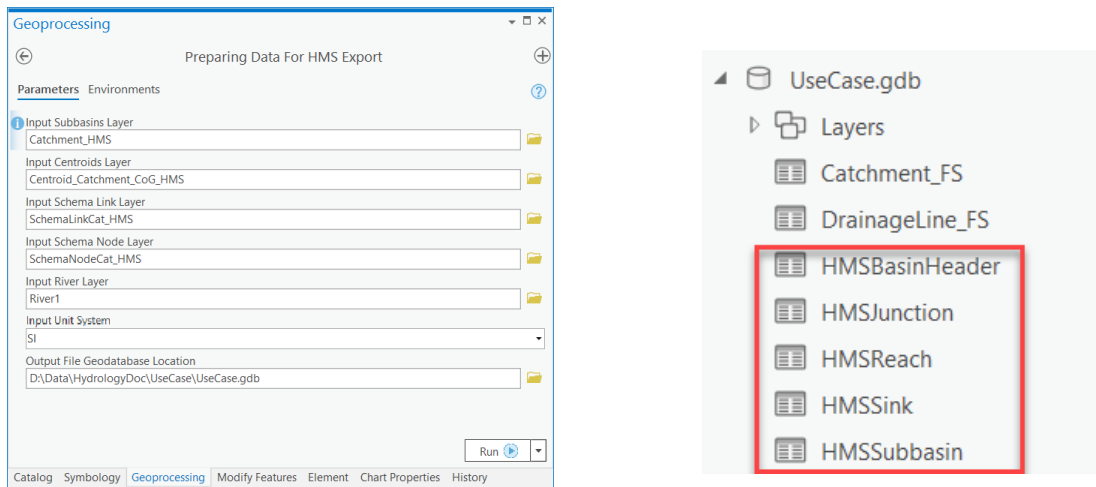


Figure 3. Case study area (“Catchment\_HMS”) used to demonstrate Arc Hydro’s integration with an external hydrologic modeling system, HEC-HMS.

## 1. Preparing Data for HMS Export



This tool extracts information from input layers created following Arc Hydro standards. The information is organized into five intermediate output tables (right). These tables are created using pre-configured schemas from the Arc Hydro data model. The tool searches the input layers for each field name found in the corresponding Arc Hydro schema table. If a field name is not present in the input layer, default or Null values are used to populate these in the output tables and a warning message alerts the user which attributes fell into this category. Using the preparation steps shown in this document alone will not populate the entirety of the data elements that are ideal for HMS implementation. However, given additional information about one's dataset and area of interest, users can include these data by manually populating the intermediate output tables. Users should reference [Appendix 4.2](#) for the data elements the BASIN file can contain. This appendix also includes notes for how default values are determined and tips for populating HMS attributes where applicable. Users should also see the [HEC-HMS documentation](#) for further details regarding the utility of these data elements in the context of hydrologic modeling.

Note: In most cases, Arc Hydro will assign a default naming scheme to output basin elements (i.e., subbasins, reaches, junctions, sinks). **If users want to have control over the unique names assigned to each basin element, they must apply these names to the *input layers*. Users should not edit the “Name” fields in the intermediate output tables.**

Note: The appeneded version of the Use Case 1 dataset includes a River feature class. To repeat this process with the base dataset for Use Case 1, the drainage line feature class would be applied in place of the River feature class. Similarly, the stream feature class from Use Case 2 would replace the River feature class.

Note: Users should clear the created tables from the map view before re-running this tool.



## 2. Create HEC-HMS Basin File

The screenshot shows the Geoprocessing tool interface on the left and the resulting text output on the right. The tool is titled 'Create HEC-HMS Basin File' and has two main parameters: 'Input Prepared Data Location (GDB)' set to 'D:\Data\HydrologyDoc\UseCase\UseCase.gdb' and 'Output Basin Model File' set to 'D:\Data\HydrologyDoc\UseCase\usecase.basin'. A 'Run' button is visible at the bottom of the tool interface.

The output text is a list of basin and subbasin attributes, including:

- Basin: UseCase** (lines 1-28): Description, Last Modified Date (06/11/2020), Last Modified Time (15:32:18), Version (3.5.0), Unit System (English), Grid Cell File (TBD), Missing Flow To Zero (No), Enable Flow Ratio (No), Allow Blending (No), Compute Local Flow At Junctions (No).
- Subbasin: W160** (lines 29-47): Description, Canvas X (2166648.5455059707), Canvas Y (13728947.446146727), Label X (16.0), Label Y (16.0), Area (3.1677427654499817), Downstream (J810), LossRate (SCS), Percent Impervious Area (1.0), Curve Number (74.27688435041377), Initial Abstraction (None), Transform (SCS), Lag (7.427688435041377), Baseflow (None).
- Subbasin: W170** (lines 48-66): Description, Canvas X (2170738.0363327265), Canvas Y (13723959.010517567), Label X (16.0), Label Y (16.0), Area (2.050296996555059), Downstream (J810), LossRate (SCS), Percent Impervious Area (2.0), Curve Number (79.15908675799087), Initial Abstraction (None), Transform (SCS), Lag (7.915908675799087), Baseflow (None).
- Subbasin: W180** (lines 67-85): Description, Canvas X (2167254.7345723063), Canvas Y (13717827.637021556), Label X (16.0), Label Y (16.0), Area (0.6468556369616466), Downstream (J760), LossRate (SCS), Percent Impervious Area (3.0), Curve Number (82.36213005939013), Initial Abstraction (None), Transform (SCS), Lag (8.236213005939012), Baseflow (None).
- Reach: R850** (lines 86-104): Description, Canvas X (2166471.7699308842), Canvas Y (13715276.579787731), From Canvas X (2166561.769750893), From Canvas Y (13719896.579734057), Label X (16.0), Label Y (16.0), Downstream (J760), Route (Muskingum Cunge), Channel (Trapezoid), Length (5701.613874600136), Energy Slope (0.003508669557002393), Width (10.0), Side Slope (3.0), Mannings n (0.045).
- Reach: R860** (lines 105-123): Description, Canvas X (2169381.770016387), Canvas Y (13709906.579700577), From Canvas X (2166471.7699308842), From Canvas Y (13715276.579787731), Label X (16.0), Label Y (16.0), Downstream (J710), Route (Muskingum Cunge), Channel (Trapezoid), Length (9414.183942105014), Energy Slope (0.0020187439880766547), Width (10.0), Side Slope (3.0), Mannings n (0.045).
- Reach: R870** (lines 124-142): Description, Canvas X (2168871.770052135), Canvas Y (13701746.579544854), From Canvas X (2169381.770016387), From Canvas Y (13709906.579700577), Label X (16.0), Label Y (16.0), Downstream (J640), Route (Muskingum Cunge), Channel (Trapezoid), Length (10539.991792618965), Energy Slope (0.0025623226552235266), Width (10.0), Side Slope (3.0), Mannings n (0.045).
- Reach: R880** (lines 143-161): Description, Canvas X (2165601.7700304687), Canvas Y (13694096.579824984), From Canvas X (2168871.770052135), From Canvas Y (13701746.579544854), Label X (16.0), Label Y (16.0).

This tool accesses the intermediate HMS tables by searching the input file geodatabase for the default table names (i.e., those pictured in step 1). Data from these tables are organized into \*.BASIN file with the format required by HEC-HMS. Note that the example output shown above is populated with minimal Null or default values, as it was derived from a very complete input dataset.

In comparison, the example output below shows an output BASIN file for an incomplete dataset. This example was created using data from Use Case 2, with minimal basin attribution. Despite the default and Null values applied throughout, the BASIN file will successfully load in the HEC-HMS program. However, users would need to gather this missing information before any meaningful hydrologic modeling could be accomplished.

```

1 Basin: UseCase
2   Description: UseCase
3   Last Modified Date: 06/03/2020
4   Last Modified Time: 12:42:16
5   Version: 3.5.0
6   Unit System: SI
7   Grid Cell File: TBD
8   Missing Flow To Zero: No
9   Enable Flow Ratio: No
10  Allow Blending: No
11  Compute Local Flow At Junctions: No
12 End:
13
14 Subbasin: W450
15   Description: W450
16   Canvas X: 2168144.5553088486
17   Canvas Y: 13725993.903066188
18   Label X: 16.0
19   Label Y: 16.0
20   Area: 15.188565086805811
21   Downstream: 557
22   LossRate: None
23   Percent Impervious Area: None
24   Curve Number: None
25   Initial Abstraction: None
26   Transform: None
27   Lag: None
28   Baseflow: None
29 End:
30
31 Subbasin: W470
32   Description: W470
33   Canvas X: 2163607.5172124356
34   Canvas Y: 13716671.299329683
35   Label X: 16.0
36   Label Y: 16.0
37   Area: 1.945508923274375
38   Downstream: 557
39   LossRate: None
40   Percent Impervious Area: None
41   Curve Number: None
42   Initial Abstraction: None
43   Transform: None
44   Lag: None
45   Baseflow: None
46 End:
47
48 Subbasin: W490
49   Description: W490
50   Canvas X: 2167391.3041793853
51   Canvas Y: 13712639.654424146
52   Label X: 16.0

```

```

352 Route: None
353 Channel: Trapezoid
354 Length: 8.025125593532387
355 Energy Slope: None
356 Width: 10.0
357 Side Slope: 3.0
358 Mannings n: 0.045
359 End:
360
361 Reach: R5710
362   Description: R5710
363   Canvas X: None
364   Canvas Y: None
365   From Canvas X: None
366   From Canvas Y: None
367   Label X: 16.0
368   Label Y: 16.0
369   Downstream: J5720
370   Route: None
371   Channel: Trapezoid
372   Length: 7.974518135069503
373   Energy Slope: None
374   Width: 10.0
375   Side Slope: 3.0
376   Mannings n: 0.045
377 End:
378
379 Sink: J5720
380   Description: J5720
381   Canvas X: None
382   Canvas Y: None
383   Label X: 16.0
384   Label Y: 16.0
385 End:
386
387 Junction: J5570
388   Description: J5570
389   Canvas X: None
390   Canvas Y: None
391   Label X: 16.0
392   Label Y: 16.0
393   Downstream: R5580
394 End:
395
396 Junction: J5560
397   Description: J5560
398   Canvas X: None
399   Canvas Y: None
400   Label X: 16.0
401   Label Y: 16.0
402   Downstream: R5590
403 End:

```

[Appendix 4.3](#) gives steps for importing the resulting .BASIN files to the HEC-HMS program.

## 4.0 Appendix

### 4.1 Processing Times

The information in this appendix is provided for reference only. The actual performance will vary greatly depending on the size and complexity of the underlying DEM and function parameters. The numbers provided here are to be used as a relative measure of performance – which functions are “faster” and which are “slower”. Remember that raster processing tends to be non-linear for large rasters and that doubling the size of the raster will usually result in more than doubling the time it takes to process it.

The hardware used for processing will also have an impact on the performance. Fast hard-drive (HD) subsystem (preferably SSD) can double the improvement in performance compared to traditional HD. Make sure that both the scratch and permanent storage are pointing to the fast HD. For other processing suggestions, refer to “Arc Hydro - Project Development Best Practices” document.

The following results were collected using a machine with 64 GB of RAM. The largest extent of the testing dataset, located in the Salado Creek watershed in San Antonio, TX, included:

- 10 m DEM with 3,500 columns and 6,000 rows
- 209 catchments
- 131 drainage lines

<b>Tool</b>	<b>Runtime</b>
Fill Sinks	20 seconds
Flow Direction	10 seconds
Flow Accumulation	20 seconds
Basic Dendritic Terrain Processing	2 minutes, 15 seconds
Slope	5 seconds
Subwatershed Delineation	4 minutes (13 drainage points)
Drainage Area Centroid (Center of Gravity method)	15 seconds
Longest Flowpath for Catchments	1 minute, 15 seconds
Calculate Subwatershed CN Lag	10 seconds
Calculate Drainage Area Length in Feet	10 seconds
Calculated Subwatershed Slope	10 seconds

Create Stream from Subwatershed Point	2 minutes, 30 seconds (13 subwatershed points)
Create Hydro Network from Catchment	45 seconds
Create Hydro Network from Subwatershed	3 minutes
Generate Node/Link Schema	30 seconds
Preparing Data for HMS Export	1 minute
Create HEC-HMS Basin File	5 seconds

## 4.2 Schema Designs for the HMS Export Tables

### 4.2.1 HMSBasinHeader

#### 4.2.1.1 Schema

<input checked="" type="checkbox"/> Visible	<input type="checkbox"/> Read Only	Field Name	Alias	Data Type	<input checked="" type="checkbox"/> Allow NULL	<input type="checkbox"/> Highlight	Number Format	Domain	Default	Length
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	OBJECTID	OBJECTID	Object ID	<input type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Name	Name	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				20
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Description	Description	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				255
<input checked="" type="checkbox"/>	<input type="checkbox"/>	LastDate	LastDate	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				20
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Version	Version	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				20
<input checked="" type="checkbox"/>	<input type="checkbox"/>	ProjUnit	ProjUnit	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>		UnitType		7
<input checked="" type="checkbox"/>	<input type="checkbox"/>	GridFPath	GridFPath	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				255
<input checked="" type="checkbox"/>	<input type="checkbox"/>	FlowRatio	FlowRatio	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>		BooleanYesNo	No	3
<input checked="" type="checkbox"/>	<input type="checkbox"/>	JuncFlow	JuncFlow	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>		BooleanYesNo	No	3
<input checked="" type="checkbox"/>	<input type="checkbox"/>	NoFlowTo0	NoFlowTo0	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>		BooleanYesNo	No	3
<input checked="" type="checkbox"/>	<input type="checkbox"/>	LastTime	LastTime	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				25
<input checked="" type="checkbox"/>	<input type="checkbox"/>	AllowBlending	AllowBlending	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>		BooleanYesNo	No	255

#### 4.2.1.2 Notes

Field	Details
<i>Name</i>	Default naming is name of the Pro project (watch for weird characters).
<i>Description</i>	Default is to copy the Name field.
<i>LastDate</i>	Date when the table is created.
<i>Version</i>	Hardcoded as the most current version of HMS that is supported for these tools.
<i>ProjUnit</i>	Keyword representing the user-selected unit system to apply.
<i>GridFpath</i>	N/A for the current implementation.
<i>FlowRatio</i>	N/A for the current implementation.
<i>JuncFlow</i>	N/A for the current implementation.

<i>NoFlowto0</i>	N/A for the current implementation.
<i>LastTime</i>	Time when the table is created.
<i>AllowBlending</i>	N/A for the current implementation.

## 4.2.2 HMSSubBasin

### 4.2.2.1 Schema

<input checked="" type="checkbox"/> Visible	<input type="checkbox"/> Read Only	Field Name	Alias	Data Type	<input checked="" type="checkbox"/> Allow NULL	<input type="checkbox"/> Highlight	Number Format	Domain	Default	Length
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	OBJECTID	OBJECTID	Object ID	<input type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Name	Name	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				20
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Description	Description	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				32
<input checked="" type="checkbox"/>	<input type="checkbox"/>	LossMet	LossMet	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>		LossRateType		30
<input checked="" type="checkbox"/>	<input type="checkbox"/>	TransMet	TransMet	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>		TransformType		30
<input checked="" type="checkbox"/>	<input type="checkbox"/>	BaseMet	BaseMet	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>		BaseflowType		30
<input checked="" type="checkbox"/>	<input type="checkbox"/>	PctImp	PctImp	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	InitAbst	InitAbst	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	BasinCN	BasinCN	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	BasinLag	BasinLag	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	InitLoss	InitLoss	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Area_HMS	Area_HMS	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CanvasX	CanvasX	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CanvasY	CanvasY	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	LabelX	LabelX	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric		16	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	LabelY	LabelY	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric		16	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Downstream	Downstream	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				32

### 4.2.2.2 Notes

The Subbasin layer is the primary source for this table. The centroid layer is a secondary source.

Field	Details
<i>Name</i>	Default naming is “W” + (HydroID * 10).
<i>Description</i>	Default is to copy the Name field.
<i>LossMet</i>	Will be populated using the <b>LossMet field in the Subbasin layer, if it exists</b> . Otherwise, Null.

	<p><i>User tip: Refer to the HMS documentation to understand the application of this field and the possible values, then use Calculate Fields to apply the desired value to all features in the subbasin feature class.</i></p>
<i>TransMet</i>	<p>Will be populated using the <b>TransMet field in the Subbasin layer, if it exists</b>. Otherwise, hardcoded as “SCS”.</p> <p><i>User tip: Refer to the HMS documentation to understand the application of this field and the possible values, then use Calculate Fields to apply the desired value to all features in the subbasin feature class.</i></p>
<i>BaseMet</i>	<p>Will be populated using the <b>BaseMet field in the Subbasin layer, if it exists</b>. Otherwise, Null.</p> <p><i>User tip: Refer to the HMS documentation to understand the application of this field and the possible values, then use Calculate Fields to apply the desired value to all features in the subbasin feature class.</i></p>
<i>PctImp</i>	<p>Will be populated using the <b>PctImp field in the Subbasin layer, if it exists</b>. Otherwise, Null.</p> <p><i>User tip: If a percent impervious raster is available for the study area (e.g., from the National Landcover Dataset in the US), use “Calculate Subwatershed Characteristics” in the “Watershed Processing” toolset.</i></p>
<i>InitAbst</i>	<p>Will be populated using the <b>InitAbst field in the Subbasin layer, if it exists</b>. Otherwise, Null.</p> <p><i>User tip: If a percent impervious raster is available for the study area (e.g., from the National Landcover Dataset in the US), use “Calculate Subwatershed Characteristics” in the “Watershed Processing” toolset.</i></p>
<i>BasinCN</i>	<p>Will be populated using the <b>BasinCN field in the Subbasin layer, if it exists</b>. Otherwise, Null. Note, the BasinCN field is calculated in the documented example.</p> <p><i>User tip: To calculate this field as shown here, a Curve Number grid must be created. This can be derived with knowledge of the landcover for the area of interest.</i></p>
<i>BasinLag</i>	<p>Will be populated using the <b>BasinLag field in the Subbasin layer, if it exists</b>. Otherwise, Null. Note, the BasinLag field is calculated in the documented example.</p>

<i>InitLoss</i>	<p>Will be populated using the <b>InitLoss field in the Subbasin layer, if it exists.</b></p> <p>Otherwise, Null. <i>User tip: If a percent impervious raster is available for the study area (e.g., from the National Landcover Dataset in the US), use “Calculate Subwatershed Characteristics” in the “Watershed Processing” toolset.</i></p>
<i>Area_HMS</i>	<p><b>New field</b> that is created in the Subbasin layer by the Preparing Data for HMS Export tool. This field stores the subbasin areas using the correct unit system.</p>
<i>CanvasX</i>	X coordinate of the centroid for each subbasin.
<i>CanvasY</i>	Y coordinate of the centroid for each subbasin.
<i>LabelX</i>	In the current implementation, this is hardcoded to 16.
<i>LabelY</i>	In the current implementation, this is hardcoded to 16.
<i>Downstream</i>	<p>Name of the junction the subbasin is connected to. Using the Arc Hydro schema, this is looked up by:</p> <ol style="list-style-type: none"> <li>1. Identifying the schema node (related to subbasin centroid - “NodeA”) where FeatureID of the node = HydroID of the subbasin.</li> <li>2. Identifying the schema node (related to junction - “NodeB”) where HydroID of the node = DownElemID of NodeA.</li> <li>3. Extracting the “Name” attribute of NodeB if it exists. Otherwise, apply the default naming for junctions: J + (10*HydroID of NodeB).</li> </ol>



## 4.2.3 HMSJunction

### 4.2.3.1 Schema

<input checked="" type="checkbox"/> Visible	<input checked="" type="checkbox"/> Read Only	Field Name	Alias	Data Type	<input checked="" type="checkbox"/> Allow NULL	<input type="checkbox"/> Highlight	Number Format	Domain	Default	Length
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	OBJECTID	OBJECTID	Object ID	<input type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CanvasX	CanvasX	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CanvasY	CanvasY	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Name	Name	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				20
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Description	Description	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				32
<input checked="" type="checkbox"/>	<input type="checkbox"/>	LabelX	LabelX	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric		16	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	LabelY	LabelY	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric		16	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Downstream	Downstream	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				32

### 4.2.3.2 Notes

The Schema Node layer is the primary source for this table. Specifically, the features where SrcType = 2.

Field	Details
<i>Name</i>	Default naming is “J” + (HydroID * 10).
<i>Description</i>	Default is to copy the Name field.
<i>CanvasX</i>	X coordinate for each schema node. If this field is not present, the geometry of the point is used.
<i>CanvasY</i>	Y coordinate for each schema node. If this field is not present, the geometry of the point is used.
<i>LabelX</i>	In the current implementation, this is hardcoded to 16.
<i>LabelY</i>	In the current implementation, this is hardcoded to 16.
<i>Downstream</i>	<p>The downstream element for each junction. This will always be a reach. Using the Arc Hydro schema, this is looked up by:</p> <ol style="list-style-type: none"> <li>1. Identifying the schema link (LinkA) where HydroID of the link = DownElemID of the node.</li> </ol>

	2. Extracting the “Name” attribute of LinkA if it exists. Otherwise, apply the default naming for reaches: “R” + (10 * HydroID of LinkA).
--	---

## 4.2.4 HMSReach

### 4.2.4.1 Schema

Visible	Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Domain	Default	Length
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	OBJECTID	OBJECTID	Object ID	<input type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CanvasX	CanvasX	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CanvasY	CanvasY	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	FromCanvasX	FromCanvasX	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	FromCanvasY	FromCanvasY	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Name	Name	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				20
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Description	Description	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				32
<input checked="" type="checkbox"/>	<input type="checkbox"/>	LabelX	LabelX	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric		16	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	LabelY	LabelY	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric		16	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Downstream	Downstream	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				32
<input checked="" type="checkbox"/>	<input type="checkbox"/>	RouteMet	RouteMet	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>		RouteType		25
<input checked="" type="checkbox"/>	<input type="checkbox"/>	ChnShapeKine	ChnShapeKine	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				11
<input checked="" type="checkbox"/>	<input type="checkbox"/>	RivLen_HMS	RivLen_HMS	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Slp	Slp	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	ChnWidth	ChnWidth	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	ChnSdSlp	ChnSdSlp	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	ChnManN	ChnManN	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			

### 4.2.4.2 Notes

The Schema Link layer is the primary source for this table, specifically the features where LinkType = 2. The Schema Node layer and the River layer are secondary sources.

Field	Details
<i>Name</i>	Default naming is “R” + (HydroID * 10).
<i>Description</i>	Default is to copy the Name field.
<i>RouteMet</i>	Will be populated using the <b>RouteMet</b> field in the <b>Subbasin</b> layer, <b>if it exists</b> . Otherwise, hardcoded as “Muskingum Cunge”.

	<p><i>User tip: Refer to the HMS documentation to understand the application of this field and the possible values, then use Calculate Fields to apply the desired value to all features in the subbasin feature class.</i></p>
<i>ChnShapeKine</i>	<p>Will be populated using the <b>ChnShapeKine field in the Subbasin layer, if it exists</b>. Otherwise, hardcoded as “Trapezoid”.</p> <p><i>User tip: Refer to the HMS documentation to understand the application of this field and the possible values, then use Calculate Fields to apply the desired value to all features in the subbasin feature class.</i></p>
<i>RivLen_HMS</i>	<p><b>New field</b> that is created in the Schema Link layer by the Preparing Data for HMS Export tool. This field stores the reach lengths using the correct unit system.</p>
<i>Slp</i>	<p>Will be populated using the <b>Slp field in the River layer, if it exists</b>. Otherwise, Null.</p> <p><i>User tip: This field should be populated after executing the step “Calculate Reach Slope” step.</i></p>
<i>ChnWidth</i>	<p>In the current implementation, this is hardcoded to 10.</p> <p><i>User tip: Refer to the HMS documentation to understand the application of this field and the possible values, then use Calculate Fields to apply the desired value to all features in the subbasin feature class.</i></p>
<i>ChnSdSlp</i>	<p>In the current implementation, this is hardcoded to 3.</p> <p><i>User tip: Refer to the HMS documentation to understand the application of this field and the possible values, then use Calculate Fields to apply the desired value to all features in the subbasin feature class.</i></p>
<i>ChnManN</i>	<p>In the current implementation, this is hardcoded to 0.045.</p> <p><i>User tip: Refer to the HMS documentation to understand the application of this field and the possible values, then use Calculate Fields to apply the desired value to all features in the subbasin feature class.</i></p>
<i>FromCanvasX</i>	<p>X coordinate of the reach FROM node. If this field is not present, the correct node is looked up using the Arc Hydro schema by:</p> <ol style="list-style-type: none"> <li>1. Identifying the upstream schema node (FromNode) where HydroID of the node = FromNodeID of the reach.</li> </ol>

	2. The X coordinate of FromNode is used.
<i>FromCanvasY</i>	<p>Y coordinate of the reach FROM node. If this field is not present, the correct node is looked up using the Arc Hydro schema by:</p> <ol style="list-style-type: none"> <li>1. Identifying the upstream schema node (FromNode) where HydroID of the node = FromNodeID of the reach.</li> <li>2. The Y coordinate of FromNode is used.</li> </ol>
<i>CanvasX</i>	<p>X coordinate of the reach TO node. If this field is not present, the correct node is looked up using the Arc Hydro schema by:</p> <ol style="list-style-type: none"> <li>1. Identifying the downstream schema node (ToNode) where HydroID of the node = ToNodeID of the reach.</li> <li>2. The X coordinate of ToNode is used.</li> </ol>
<i>CanvasY</i>	<p>Y coordinate of the reach TO node. If this field is not present, the correct node is looked up using the Arc Hydro schema by:</p> <ol style="list-style-type: none"> <li>1. Identifying the downstream schema node (ToNode) where HydroID of the node = ToNodeID of the reach.</li> <li>2. The Y coordinate of ToNode is used.</li> </ol>
<i>LabelX</i>	In the current implementation, this is hardcoded to 16.
<i>LabelY</i>	In the current implementation, this is hardcoded to 16.
<i>Downstream</i>	<p>The downstream element for each reach. This will always be a junction. Using the Arc Hydro schema, this is looked up by:</p> <ol style="list-style-type: none"> <li>1. Identifying the schema node (NodeA) where HydroID of the node = DownElemID of the reach.</li> <li>2. Extracting the “Name” attribute of NodeA if it exists. Otherwise, apply the default naming for junctions: “J” + (10 * HydroID of NodeA).</li> </ol>

## 4.2.5 HMSSink

### 4.2.5.1 Schema

<input checked="" type="checkbox"/> Visible	<input checked="" type="checkbox"/> Read Only	Field Name	Alias	Data Type	<input checked="" type="checkbox"/> Allow NULL	<input type="checkbox"/> Highlight	Number Format	Domain	Default	Length
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	OBJECTID	OBJECTID	Object ID	<input type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Name	Name	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				20
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Description	Description	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				32
<input checked="" type="checkbox"/>	<input type="checkbox"/>	LabelX	LabelX	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric		16	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	LabelY	LabelY	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric		16	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CanvasX	CanvasX	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CanvasY	CanvasY	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			

### 4.2.5.2 Notes

The Schema Node layer is the primary source for this table. Specifically, the features where DownElemID = -1.

Field	Details
<i>Name</i>	Default naming is “J” + (HydroID * 10)
<i>Description</i>	Default is to copy the Name field.
<i>CanvasX</i>	X coordinate for each schema node. If this field is not present, the geometry of the point is used.
<i>CanvasY</i>	Y coordinate for each schema node. If this field is not present, the geometry of the point is used.
<i>LabelX</i>	In the current implementation, this is hardcoded to 16.
<i>LabelY</i>	In the current implementation, this is hardcoded to 16.

## 4.3 Importing the Basin Model File to HEC-HMS

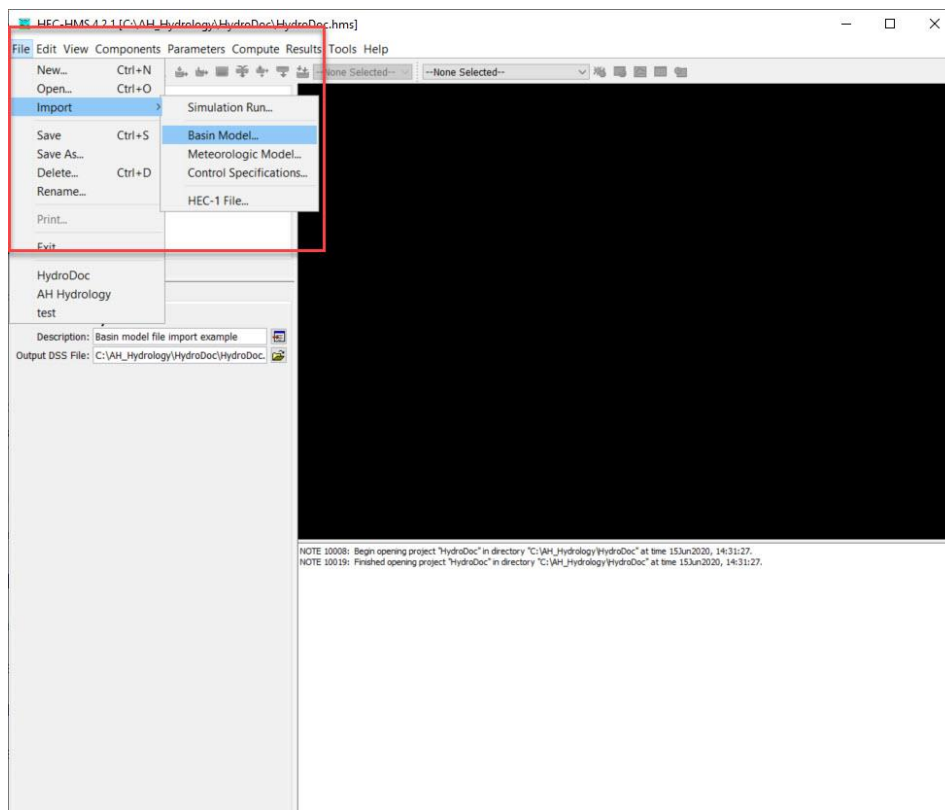
The approach below outlines the method for importing the basin model file created in section 3.7 into HEC-HMS.

1. Create a new project in HEC-HMS.

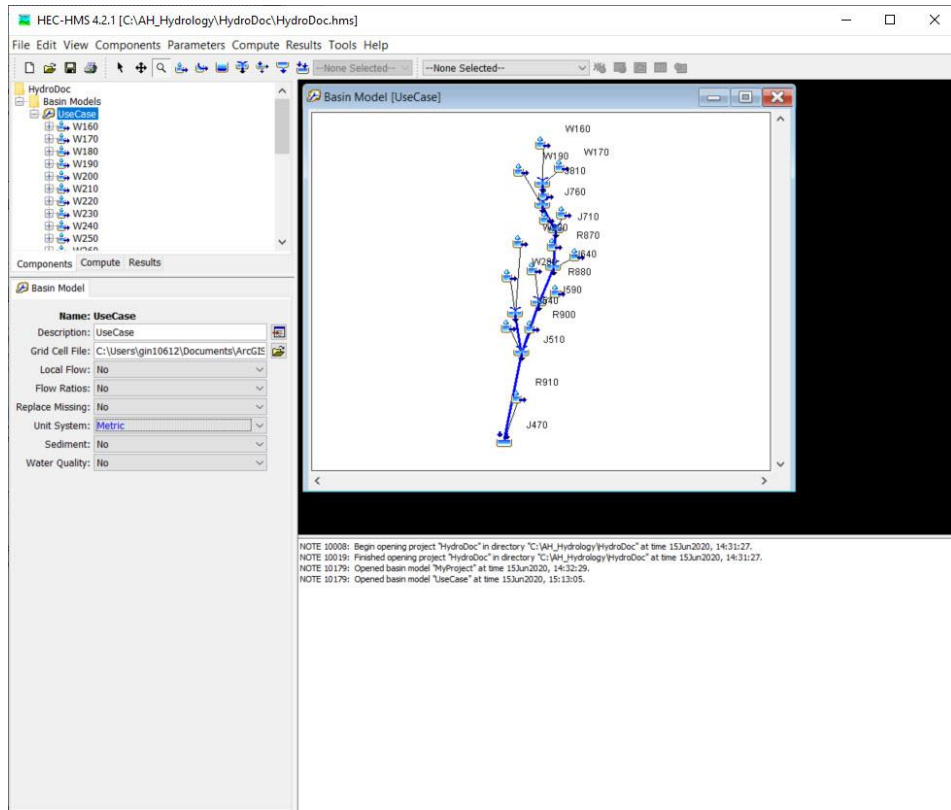


Note: The units chosen here should be consistent with those used in Preparing Data for HMS Export

2. File → Import → Basin Model and select your .BASIN file



3. The basin elements described in the .BASIN file should load as icons in the HMS schematic.



Attributes for each element will also be reflected in the Components interface. See the information extracted for basin W260 and its downstream element, junction J590, below.

