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Designing an L-THIA Model for ArcGIS 10.2 using Python 2.7



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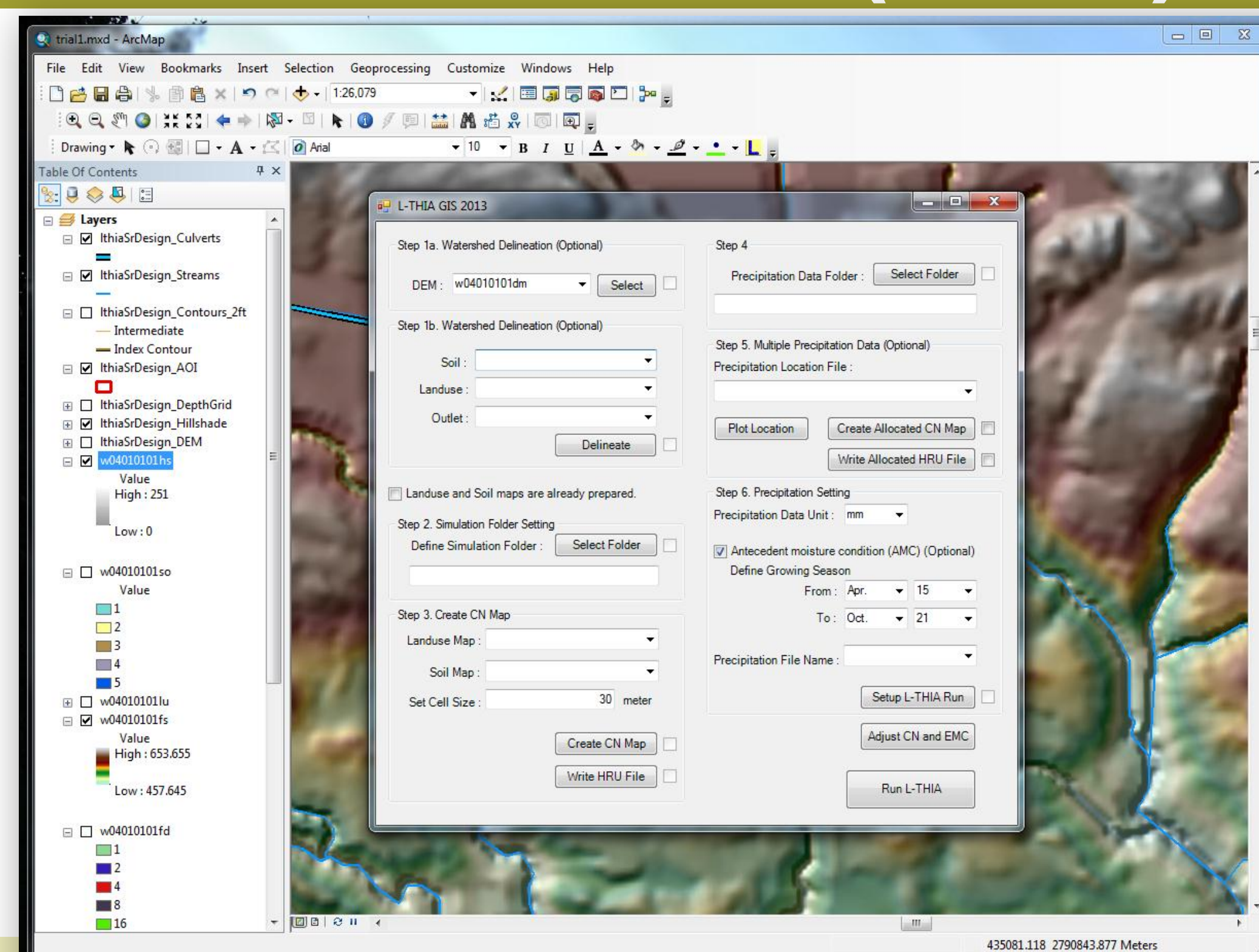
Problem Statement

- The L-THIA model for ArcGIS 10.1 was created as a Visual Basic “add-in” or plug-in by Youn Shik Park.
- The next version of ArcGIS, now released, is 10.2 and the software firm is removing VB support.
- The VB version has some limitations:
 - Very specific set-up of input files
 - Frequent crashes or errors
 - Limited or inflexible access to control parameters
 - Limited to tabular output (GIS users prefer spatial output)
 - Some operations are redundant to other tool packages.

Background

- L-THIA (Long-Term Hydrologic Impact Analysis) is a mature model available as a spreadsheet, a web-based spatial model and as an add-in to the popular geographic information system (GIS) software system ArcGIS 10.
- The model generally has a method to determine an area of analysis such as a watershed, and then populates the watershed with data on soil and landuse.
- The model generally requires precipitation data for a long term and uses assumptions about the relationship between landuse, soil, and the chemistry of surface runoff passing across the various landscapes.
- Input data are landuse and soil map layers and long-term precipitation

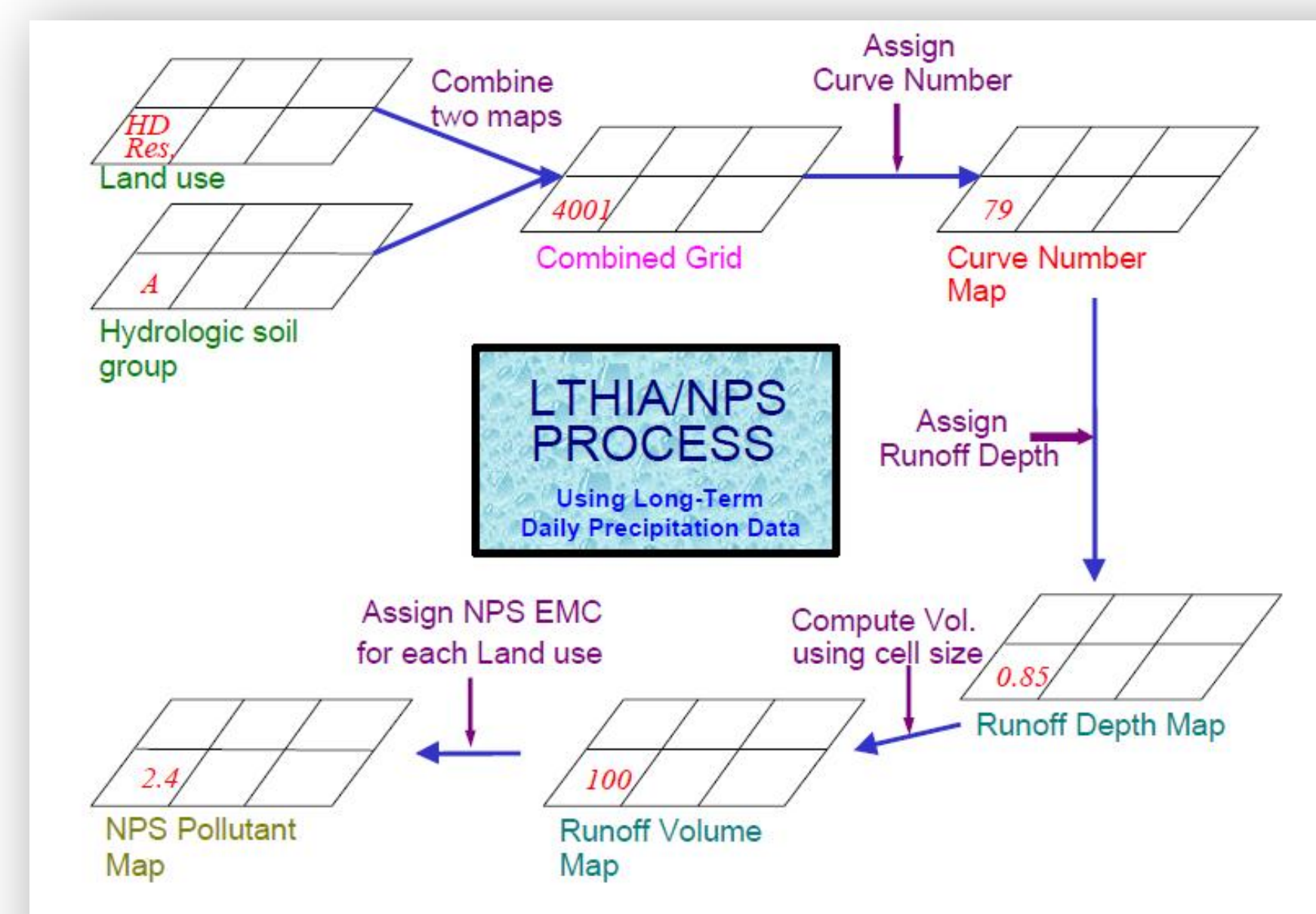
Previous Version (10.1)



Design Requirements

- Accept the output file format of the NRCS Engineering Tools as an input for CN, watershed outline, soil and landuse layers.(In other words provide interoperability)
- Separate analysis processes into steps, which facilitates interoperability.
- Create an option to download precipitation data form our server, while within the program.
- Provide an option to allow multiple precipitation file formats.
- Provide an option to allow multiple raingage stations to be used
- Provide new output format, map-layer based outputs.
- Provide graphical outputs from the program.

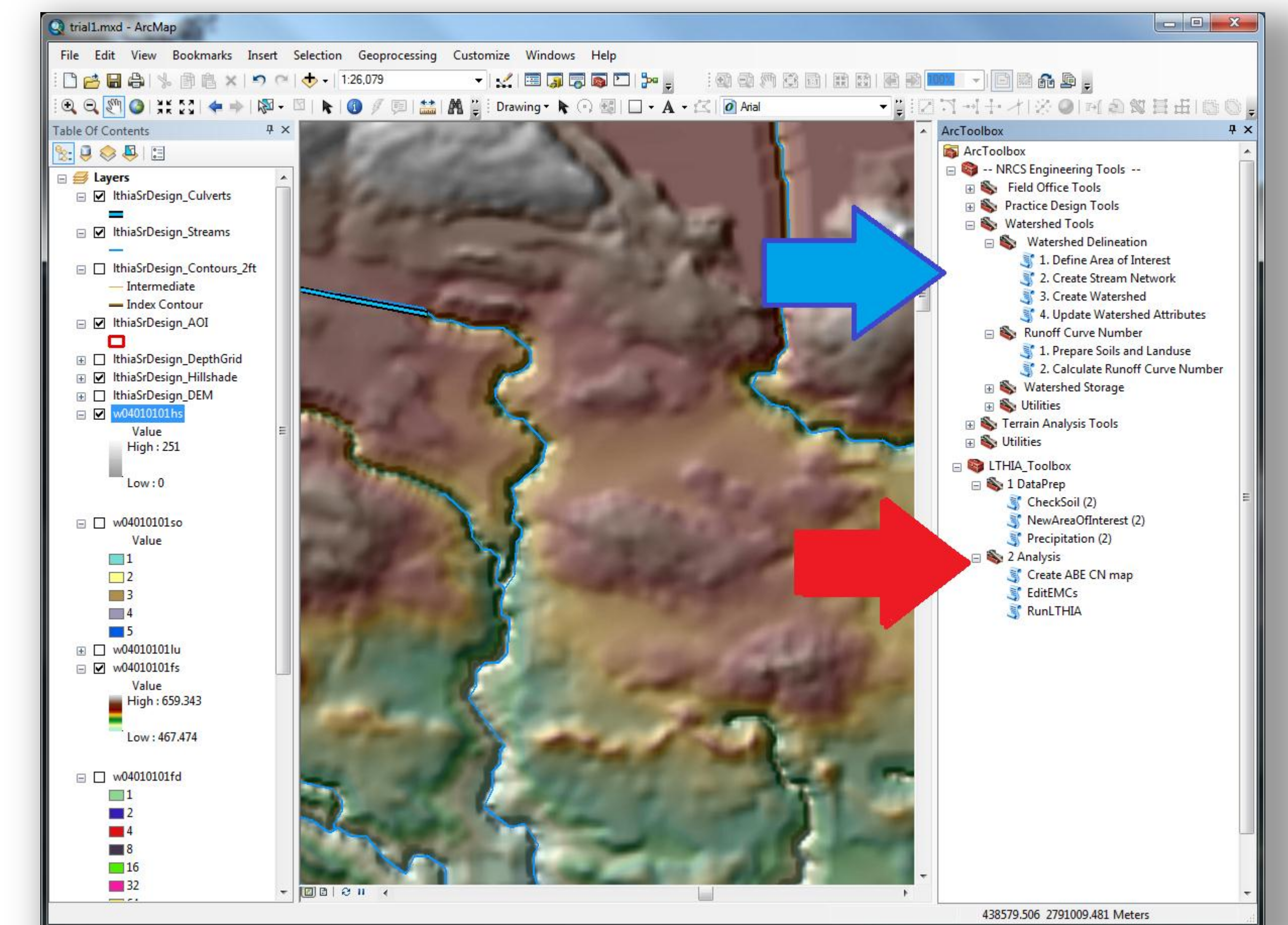
The diagram below illustrates the data processing flow for the model. The operations along the top can be performed in the NRCS Engineering toolbox or in a standard GIS software product



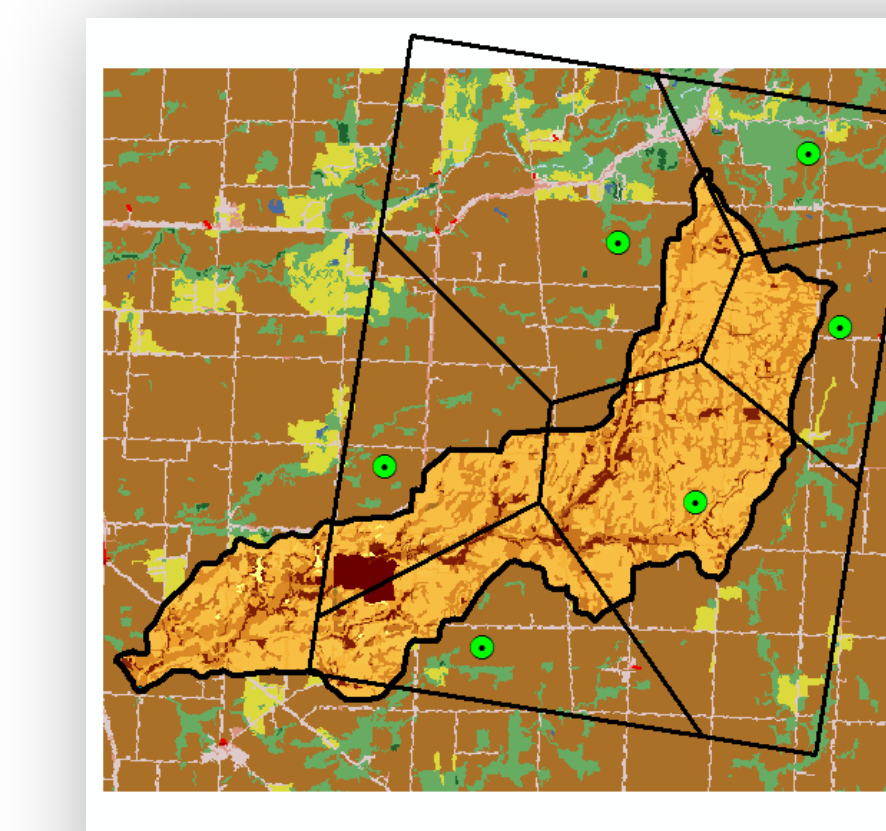
Multiple Precipitation Stations: In this situation there are multiple rainfall gages to use, and the watershed CN map is partitioned into areas where each area uses a particular rainfall gage to calculate the runoff. This requires a feature layer of the rainfall gage locations and runs a tool to generate the rainfall areas (uses Analysis.Proximity.CreateTheissen Polygons,) which result in a feature layer such as shown below.

Interoperability

- New design is “interoperable” with NRCS Engineering Toolkit*, a Python-based tool set with many features that overlap the tools included in the VB version.
- Wide distribution of NRCS tool supports promotion of L-THIA 10.2 Tool.

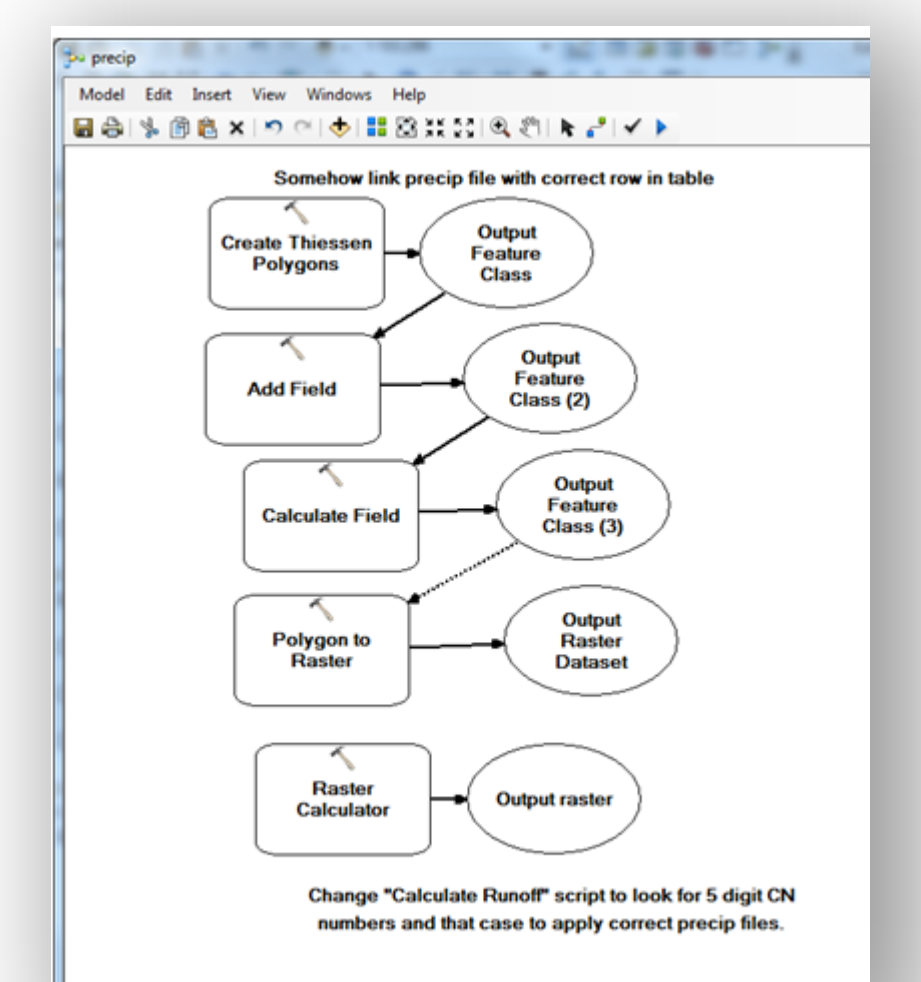


Design team needs to create a method to signal the model when the multiple precipitation case is in use.



Note this image shows (problematic) effect of not setting processing extent to the extent of the watershed

The user will provide a point feature class with an attribute that includes the name of the precip file for each gage. that can be done using a script, to associate each precip file with the appropriate feature in the map layer. We calculate these polygons below and give each one an integer tag that relates to the individual precipitation file to use



* NRCS is Natural Resource and Conservation Service, ·United States Department of Agriculture