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Arc Hydro Project Development Best Practices

Arc Hydro Overview Document #2

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Arc Hydro Project Development Best Practices

Introduction

This document captures what works well when implementing Arc Hydro projects. It is based on many years of implementing ArcGIS and Arc Hydro projects across the world, support for Arc Hydro users, and specific feedback from some of our Arc Hydro users (always welcome). I am sure there are other recommendations that could/should be made, and we will expand this document to include them as they become apparent. This document is not focused on a specific version of ArcGIS or Arc Hydro – it is a set of generic recommendations that transcend specific versions. Most of these recommendations will work well for you in any ArcGIS project.

The Arc Hydro Mantra

- Arc Hydro is a “system” of tools and data structures that work in unison to provide rich and effective experience for GIS users in water resources community.

- If you are using Arc Hydro, you will most likely be doing ANALYSES – there are important considerations for GIS implementation when doing analyses that are different than using GIS just for mapping. Respect that.

- When using the tools, you are building a “system”, not just using a “bunch” of independent tools to produce a “bunch” of independent data.
  - Of course, there are plenty of Arc Hydro tools that can be used independently of the “system”. Use them as such and enjoy.

- When starting an Arc Hydro project, think ahead of the system you will be building. Plan ahead. Organize, then execute.

- Keep it simple – Ockham ’s razor is alive and well!

- Analytical system, analytical system, analytical system, …
Arc Hydro Tools installation

- The PS hydro team mft site has the latest versions of Arc Hydro (these are always development versions).

- Hydro resource center will have less frequent “official” versions.

- Arc Hydro tool setup can change often. That does not mean that you need to upgrade each time a new setup is released. Check “readme.doc” that goes with the newly released version to see what is new and upgrade only if the changes are relevant to you (a bug fix or a new functionality). “If it ain’t broke, don’t fix it”.

- Always uninstall before installing.

- When upgrading to new release of ArcGIS or service pack, always check if there is a new release of Arc Hydro tools. Do not assume that they are upward (or downward) compatible.
  - This is mostly between major core version updates, but sometimes SPs will need a separate version. Check the “readme.doc” for clarification of which Arc Hydro tools are compatible with which core version/sp combination.

Data organization

- Use file geodatabase or SDE.

- Keep rasters outside of the geodatabase.

- Do NOT use unprojected (geographic) data for analysis.

- Keep all the vector layers used in spatial operations and analytics in a single feature dataset. This has several corollaries (for analytical layers):
  - Do not use shape files.
  - Do not use data in different geodatabases.
  - Import data into a single feature dataset.

- Use the same spatial reference (projection) for raster and vector analytical data.

- Select appropriate projection based on the analysis being performed (usually equal area or equal distance – something that minimizes distortions relevant to the analysis).
• Layers used for mapping only can be in different feature datasets, but keep the same spatial reference as for analytical layers if possible.

• Organize all the data for a project into a single “parent” folder if possible.

• Do NOT use the data over a network drive if possible. Instead, copy the data to the local machine, perform the analysis locally, and then copy the data back to the central location.

• The exception is if you have a specialized network drive with specialized network connection hardware.

• If using default Arc Hydro geodatabase/feature dataset creation capabilities, make sure that the first function that will create the geodatabase/feature dataset is picking up the right input spatial reference (either from the input dataset or map data frame).

• To be super-safe, create the target dataset manually and specify it explicitly using “Set Target Location” Arc Hydro function.

• Once the initial project database is assembled, carefully manage HydroIDs if any of the input layers have them (they might have to be recalculated). Make sure you adjust the HydroID dispenser field (LASTID) in the APUNIQUEID table.

• Set vertical units for the DEM if not the same as horizontal.

Naming conventions

• Keep names of directories, geodatabases, layers, and attributes short.

• Do not use spaces or special characters in any of the names. “_” is the only exception.

• Start names always with a letter, never with a number.

• Do not use reserved keywords for names. This includes SQL commands and Arc commands.

• Develop a “standard” layer nomenclature and apply it consistently (e.g. start all flow direction rasters with “fdr” followed by descriptor of what flow direction is based on – e.g. “fil” for filled DEM, so “fdrfil” is a flow direction derived from a filled DEM).

• If using a specific threshold and there is more than one in the project, include the threshold in the name of the layer (e.g. str50k to indicate a stream grid based on a threshold of 50,000 cells). Not a bad idea even when a single threshold is used in the project.

• Raster names should be kept to less or equal to 13 characters (although this is not required for non Esri grid formats – e.g. tif)
General items

- Save your ArcMap project often.
- Save after each major subtask.
- Do not have multiple ArcMap projects (or ArcCatalog) pointing to the same data open at the same time.
- If you need to use ArcCatalog, use it from within ArcMap if possible instead of starting a separate instance of ArcCatalog.
- When starting a new Arc Hydro project always start from a newly opened ArcMap session (start a new instance of ArcMap).
- If functions that generate new feature classes have been executed (creating domains in particular), it is good to save and close the project (close all instances of ArcMap and ArcCatalog running), and then reopen the project.
- Do not change project names (e.g. save as …).
- If you are doing a lot of geoprocessing and do not need the logs, wipe them out often or turn logging off (suggested only when working on datasets that were previously tested).
- When starting a new project, add the largest (by extent) analytical layer to the map first and save the project. That will set the default location (directory and geodatabase) for the output layers created by the Arc Hydro tools. Then add other layers.
- To be super-safe, create the target dataset manually and specify it explicitly using “Set Target Location” Arc Hydro function.
- If you moved data in a different directory (or got a project from someone), the Arc Hydro tags in an existing ArcMap project will not be pointing to the right layer locations. Use “Reset Target Locations” Arc Hydro function to update the tags with new locations.
- Geoprocessing in general and Arc Hydro in particular generates a lot of temporary files that are stored in a %temp% system directory. It is good to wipe that directory clean from time to time (delete all the files in there that you can after closing all the apps).
- Do not use default ArcGIS geoprocessing target location to store your results – be explicit where results are directed (your project directory and geodatabase).
- Be aware that some of the Arc Hydro functions need higher versions of licensing.
Debugging and workarounds

- Things will go wrong.
- If you followed the suggestions so far, it will not be often.
- There are several types of problems you will face and each will require a different approach to identifying and fixing/or working around.
- Data problems – your data are bad – do not expect the tools to work. Fix the data.
- Data problems – your data are too big. Divide and conquer – split the dataset into smaller “chunks” and process in parts. This might also speed up the overall processing time as processing times are non-linear (especially in raster domain).
- Procedural problems – those will be minimized if you followed the best practices presented here (e.g. projection mishaps will be eliminated).
- Tool bugs – yes, there might be some, especially after new core software releases or major service packs. If you identify any, please let us know and we will fix them (often you will have to provide the data if we cannot reproduce the bug on our test datasets).
- “Gremlins”. Things that used to work in an existing project suddenly do not. This is usually related to file locking issues. Try to fix by applying fixes in the following order:
  1. Make sure there is only one instance of ArcMap open (this also includes ArcCatalog).
  2. Make sure the source and target locations, and layer tags are all properly set.
  3. Close ArcMap and reopen.
  4. Close ArcMap and all other apps, delete content of %temp% directory, reopen.
  5. Close all apps, reboot, reopen.
  6. Delete the mxd. Start the new map, add the data, and configure the layers using “Data Management”. Set target locations using “Set Target Locations”.
