

The Modern Arc Hydro

Dean Djokic

UC



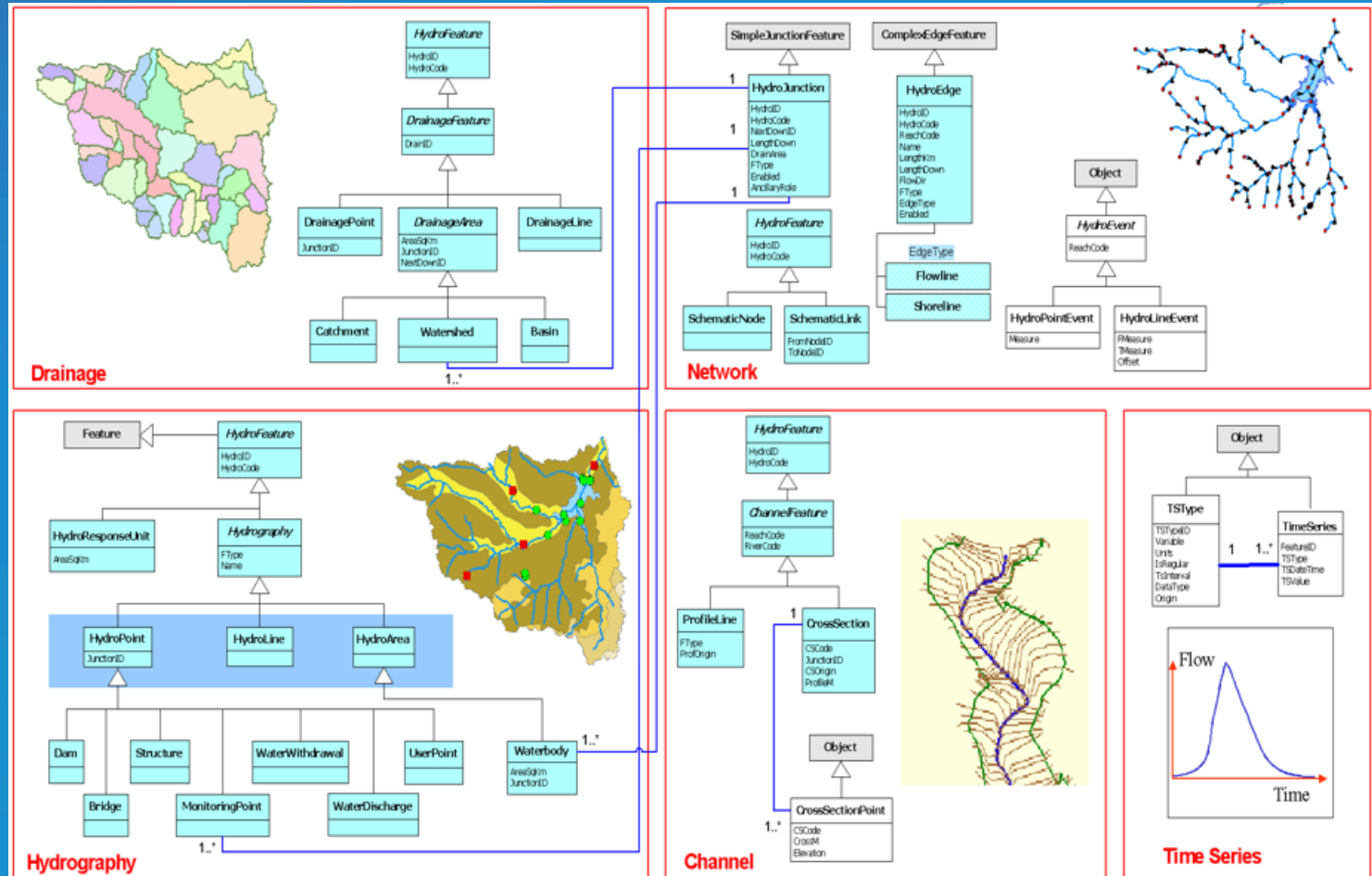
esri

What is Arc Hydro

- **Implementation of ArcGIS platform in water resources domain with focus on analytical capabilities**
- **Components:**
 - **Data model**
 - **Data**
 - **Tools**
 - **Services**
 - **Workflows**
 - **Best practices – building analytical systems**
- **Distribution – free (except premium services)**
- **Maintenance – 10.3.1, 10.4.1, ArcGIS Pro**
 - **Legacy – from 8.3 on**

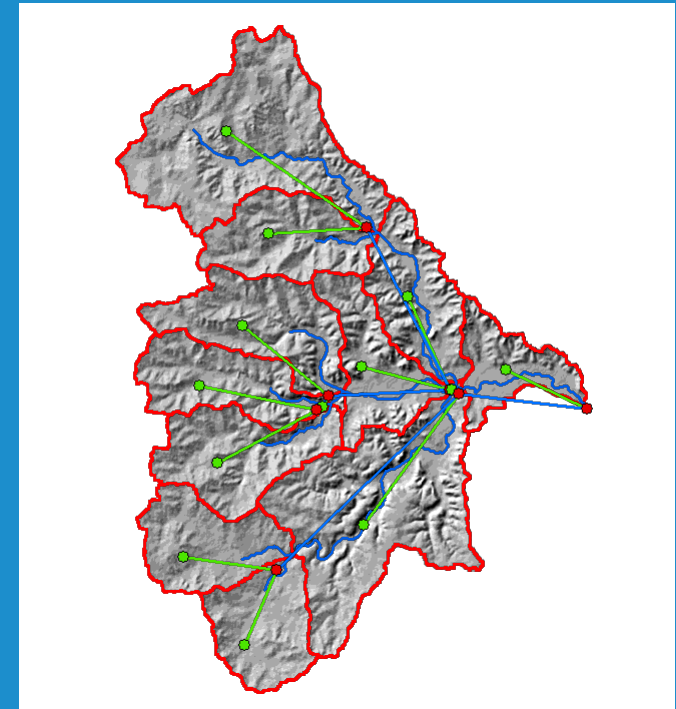
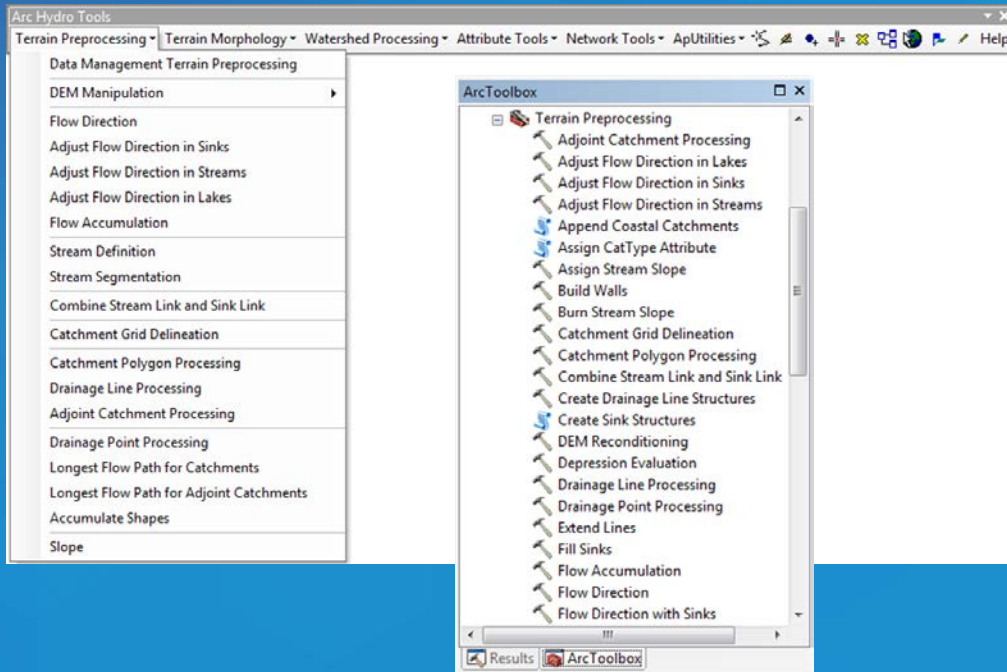
Data model

- **Simplicity**
 - Unique identifiers
 - Relationships
- **Stability**
- **Extensibility**
- **Needs driven**
 - Tools
 - User needs



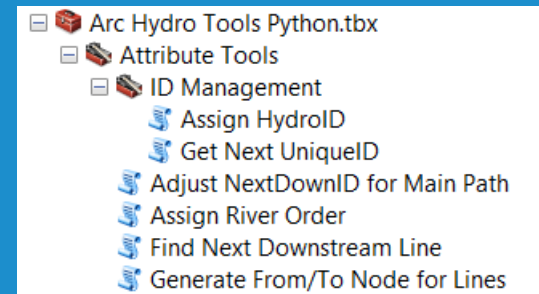
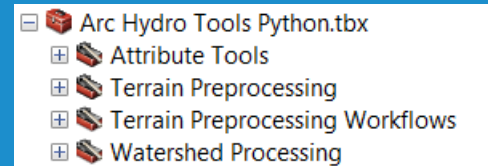
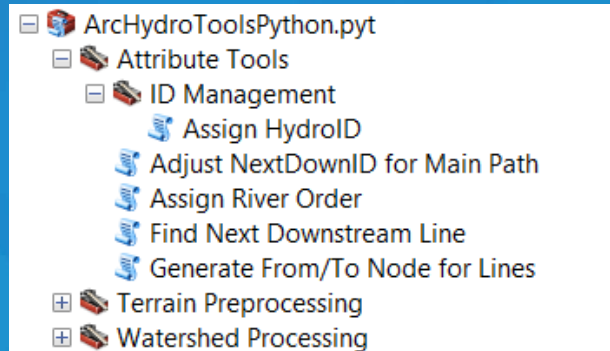
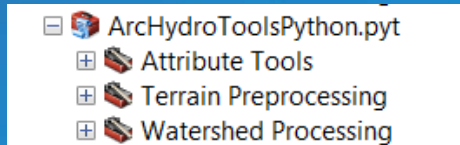
Tools

- 250+ tools developed over many years (>15)
 - Community driven development (projects)
 - Esri maintenance & support
- Build foundation for analytical capabilities



Tools

- Move to Python (.pyt, py + tbx)
 - Openness
 - Move forward (Pro)
 - Ease of dissemination (*)



Tools

- **Modularization – blocks of functionality grouped into single collection**
 - Terrain preprocessing for watershed delineation and characterization
 - Flood analyses and visualization
- **Automated testing**
 - Functionality/upgrades
 - Scalability


No	Tool	Execution	Comparison	CPU (s)
1	FlowDirection 1	Pass	Pass	67.6
2	FlowAccumulation 1	Pass	Pass	86.3
3	Stream definition	Pass	Fail	128.3
4	Stream segmentation	Pass	Pass	63.9
5	CatchmentGridDelineation	Pass	Pass	48.0
6	DrainageLineProcessing	Pass	Pass	105.3
7	CatchmentPolygonProcessing	Pass	Pass	63.7
8	AdjointCatchmentProcessing	Pass	Fail	224.1
9	DrainageLineProcessing	Pass	Pass	90.1
10	AppendCoastalCatchments	Pass	Fail	120.0

User interaction


- **User interaction – sharing experiences, techniques, best practices**
 - **GeoNet**
 - **User communication**
 - **Communication with users**
- **Tool/code/documentation dissemination**
 - **Transition from ftp to:**
 - **GitHUB**
 - **Scripts**

Services


- Base maps
- Data



World Hydro Reference Overlay
The World Hydro Reference Overlay Map service is designed to be used as a base map by scientists researchers in the fields of Hydrology, Geography, Climate, Soils, and other natural sciences.
Map Image Layer by HydroTeamRC

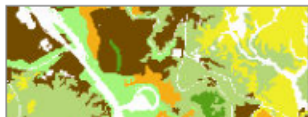


World Hydro Basemap
The World Hydro Basemap is comprised of the World Hydro Reference Overlay and the World Terr
Web Map by HydroTeamRC
Last Modified: April 5, 2016




US Hydro Blue Line for Ortho or Aerial Imagery - Sample
The blueline service is hydrography lines and labels to be overlaid on ortho- or aerial- imagery.
Map Image Layer by MappingCenterTeam
Last Modified: July 10, 2012
★★★★★ (0 ratings, 0 comments, 20,359 views)

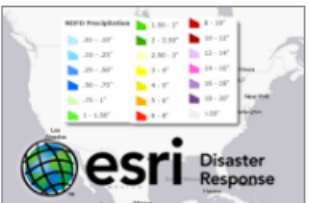
Open ▾ Details



USA Soil Survey
This map shows the Soil Survey Geographic (SSURGO) by the United States Department of Agricul Resources Conservation Service overlaid with a hydro reference layer.
Web Map by user_community
Last Modified: June 24, 2012



Total Annual Precipitation
Total Annual Precipitation, derived from WoldClim bioclimatic variable BIO12.



NDFD Precipitation
This feed displays forecast precipitation for the next 72 hours.
Feature Layer by Esri_DisasterResponse_DM
Last Modified: December 29, 2015
★★★★★ (0 ratings, 0 comments, 46,068 views)

Open ▾ Details

Services/Apps

- Analytical services (global 90m, USA 30m):
 - Watershed delineation (<http://hydrology.esri.com/water>)
 - Downstream tracing
 - BYO – leverage existing or develop yours

Electric Hydro Flow Map
Electric Hydro Flow Map
Web Map by HydroTeamRC

Hydro Hierarchy
Fun web app for exploring the US Hydrologic Network.
Web Mapping Application by Richie@apl
Last Modified: February 9, 2015

Watershed Explorer
Delineate watersheds, drag and drop observation points and graph WaterML data feeds all in one and code sample attached.
Web Mapping Application by HydroTeamRC
Last Modified: August 7, 2014
★☆☆☆☆ (1 rating, 0 comments, 6,452 views)

Open ▾ Details

ArcGIS on hydro.esri.com_6080 (user)

- TxStats
- TxFlowsandDiametersUpdate
- TxGlobalWatershedDelineation

arcgis on hydro.arcgis.com (user)

- Tools
- Hydrology
 - TraceDownstream
 - Watershed

Calculated watershed and characteristics layers

Watershed Delineation

Watershed characteristics

Area (sq. miles) [14.67551] 4.537

Slope (ft per ft) [26.875] 0.150

Population (total) [26,875] 24,008

Shape (ft) [18,800.0] 0.008

Values in brackets are valid ranges

Calculated characteristics They can be edited.

Reverts parameter values to original GIS values

Design Flows (cfs)

0.1	697,865
0.2	1,526,765
0.5	2,167,852
1	3,188,509
2	4,093,057
5	5,148,004
10	6,269,298
25	6,326.1
50	8,203,755
100	
200	
500	
1000	

Recalculate Q parameters are enabled on the previous page.

Culvert Calculations

Culvert Characteristics	Culvert Dimensions (ft)	Calculated Dimensions
Slope (ft)	0.01	11.5
Flowing (ft)	0.045	15.4
Calculated Dimensions		17.6
		26.3
		22.3
		24.3
		26.3
		26.9
		28.9

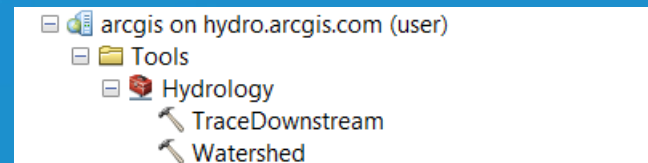
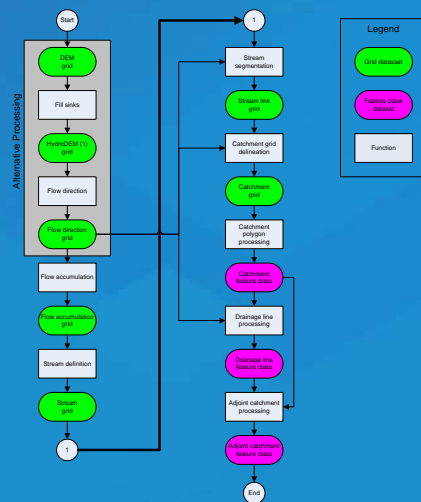
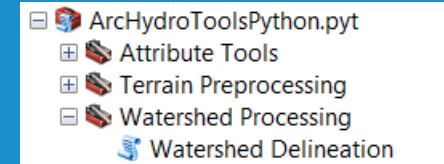
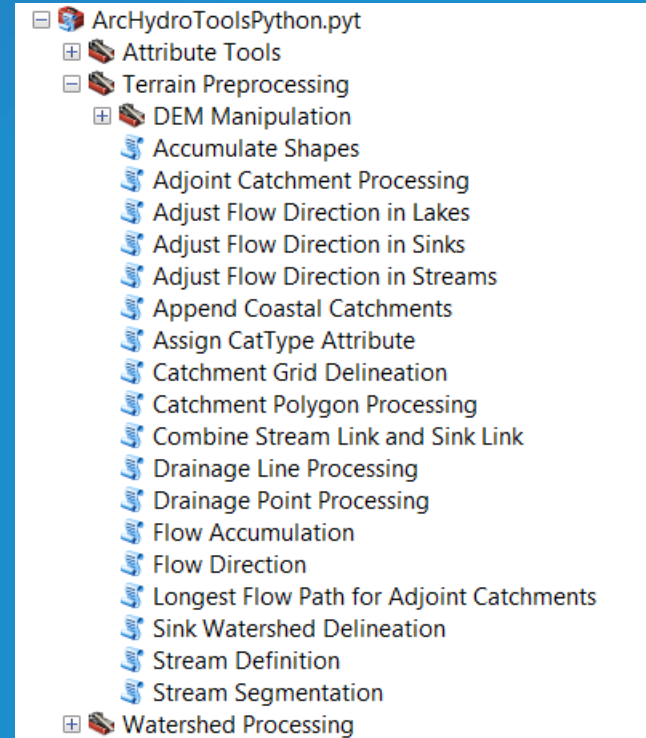
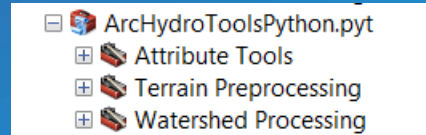
Click to download geodatabase with results.

Functional blocks

- **Focused:**
 - **Tools**
 - **Workflows**
 - **Services**
- **Areas:**
 - **Terrain processing for watershed delineation and characterization**
 - **Support for global services**
 - **Use for local higher resolution terrains**
 - **Flood analyses and visualization**
 - **Planning**
 - **Forecasting**

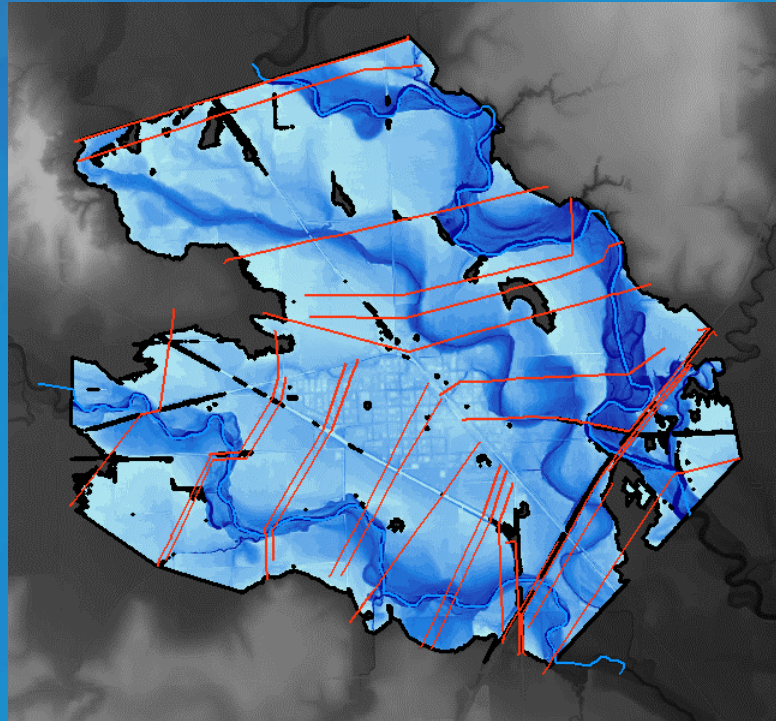
Terrain processing for watershed delineation and characterization

- Tools
- Workflows
- Services
- Areas:
 - Support for global services
 - Use for local higher resolution terrains



Flood analyses and visualization

- Tools
- Workflows
- Services
- Areas:
 - Planning
 - Forecasting



- [-] [Icon] Cross-Section Characterization
 - [+] [Icon] Assign Hydrology River Properties to Cross-section
 - [+] [Icon] Assign River Slope to Cross-section
 - [+] [Icon] Calculate 3D Cross-section Characteristics
 - [+] [Icon] Calculate Manning's N for Cross-section
 - [+] [Icon] Calculate Normal Depth
 - [+] [Icon] Calculate Potential Q
 - [+] [Icon] Define 3D Cross-section from 2D
- [-] [Icon] Floodplain Delineation
 - [+] [Icon] Calculate WSE for Selected Model
 - [+] [Icon] Create 3D Stream WSE Line
 - [+] [Icon] Create 3D WSE Stream Line Grid
 - [+] [Icon] Derive BFE - no smoothing
 - [+] [Icon] Derive BFE - with smoothing
 - [+] [Icon] Derive Extended BFE - No Smoothing
 - [+] [Icon] Find Intersect Points
 - [+] [Icon] Flood from Cross-Section
 - [+] [Icon] Flood from Stream WSE Py
 - [+] [Icon] Interpolate WSE at Cross-Sections
 - [+] [Icon] Merge Cross-Section Feature Classes
 - [+] [Icon] Select WSE To Process
- [-] [Icon] Map to Map
 - [+] [Icon] Export to DSS
 - [+] [Icon] Flood From Stream WSE
 - [+] [Icon] GeoRAS to Flood
 - [+] [Icon] HMS to GeoRAS
 - [+] [Icon] Import from DSS
 - [+] [Icon] Run HMS
 - [+] [Icon] Run RAS
 - [+] [Icon] SDF to XML
 - [+] [Icon] Stream WSE From Point WSE Measurements
 - [+] [Icon] Update RAS Flow

