

**GIS in Water Resources
Fall 2020
CUAHSI Virtual University**

David Tarboton

Utah State University

Phone: (435) 797-3172

Office Hours: Contact by email. See calendar

<https://calendar.google.com/calendar/embed?src=david.tarboton@usu.edu>

Email: david.tarboton@usu.edu

Course Description

Application of Geographic Information Systems (GIS) in Water Resources. Digital mapping of water resources information using content from publicly available sources such as the US national map, and other climate and hydrography datasets. Hydrologic terrain analysis using digital elevation models (DEMs) and DEM based delineation of channel networks and watersheds. Flood hydrology modeling and inundation mapping based on height above the nearest drainage derived from digital elevation models. There will be four detailed computer exercises that introduce (1) Building a watershed basemap using publicly available hydrography and watershed boundary data in the US; (2) Spatial analysis. Calculation of slope, land use and precipitation over subwatersheds; (3) Watershed delineation from digital elevation models; and (4) Basic GIS Programming using Python, using calculation of river hydraulic properties using height above the nearest drainage (HAND) as an example.

Prerequisite: This course will use ArcGIS Pro from ESRI. The prerequisite is basic knowledge of GIS through any prior GIS course or self-preparation through the free Getting Started with ArcGIS Pro lesson from ESRI at <https://learn.arcgis.com/en/projects/get-started-with-arcgis-pro/>. Arrangements will be made for students to use ArcGIS Pro through their university site license.

Course Objectives

The course exercises are intended to enable you to be able to:

- Prepare a base map of a hydrologic region including watersheds, streams, topography, land use measurement sites and data measured at those locations;
- Interpolate measured data at points to form raster surfaces over a region, and spatially average those surfaces over polygons of interest;
- Do hydrologic calculations using map algebra on raster grids;
- Analyze a digital elevation model of land surface terrain to derive watersheds and stream networks.
- Calculate hydraulic properties of stream channels from a digital elevation model using the height above nearest drainage (HAND) approach.
- Use programming to automate and extend GIS work.

Course Web Site

<https://cuahsi.instructure.com/courses/183>

Course Computer Environment

This course will use ArcGIS Pro version 2.6 from ESRI.

The ArcGIS Pro software is available for Windows computers. On a computer with a different operating system you may need to use a Windows virtual machine.

The universities participating in CUAHSI Virtual University all have ESRI site licenses and your local instructor needs to arrange for access. See “Instructions for Accessing and using ArcGIS Pro Software” document in course website.

<https://cuahsi.instructure.com/courses/183/pages/instructions-for-accessing-and-using-arcgis-pro-software>

A number of Toolboxes within ArcGIS Pro, such as The Spatial Analyst and 3D Analyst toolboxes will be used in the course.

Course Readings

Readings for this course will be given out as in-class handouts or links to resources on the web.

Method of Evaluation

Course grades will be based on assigned exercises.

Schedule

Class	Date	Subject
1	Thu Sep 3	Introduction to GIS in Water Resources. Data sources.
2	Tue Sep 8	Exercise 1: Building a base map.
3	Thu Sep 10	Spatial Analysis
4	Tue Sep 15	Exercise 2: Spatial analysis in Hydrology
5	Thu Sep 17	Digital Elevation Model Watershed and Stream Network Delineation
6	Tue Sep 22	Exercise 3. Watershed and Stream Network Delineation
7	Thu Sep 24	Basic GIS Programming using Python. Height above Nearest Drainage (HAND) Flood Inundation Mapping
8	Tue Sep 29	Exercise 4: Height above Nearest Drainage (HAND) Flood Inundation Mapping