RESERVOIR ANALYSIS FOR THE CASCADE RIVER BASIN

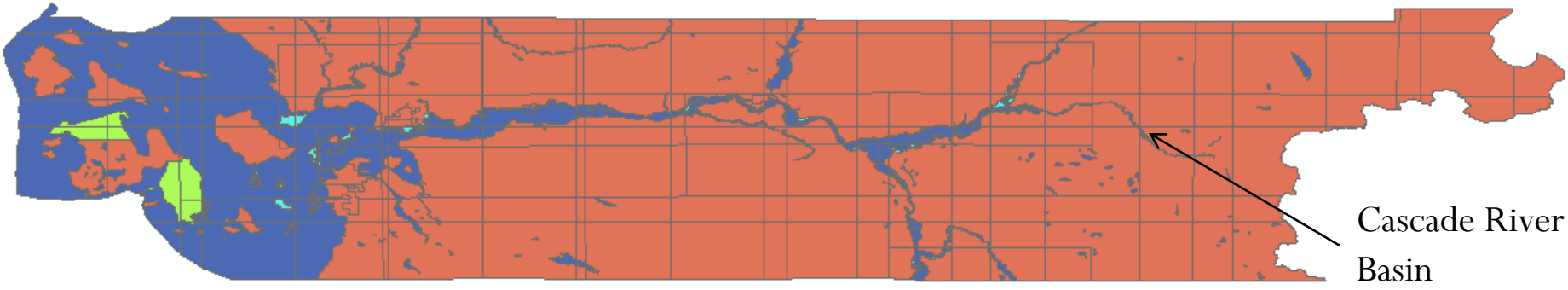
Joe Hamman

CE 424 – Fall 2010

Final Project

The Task

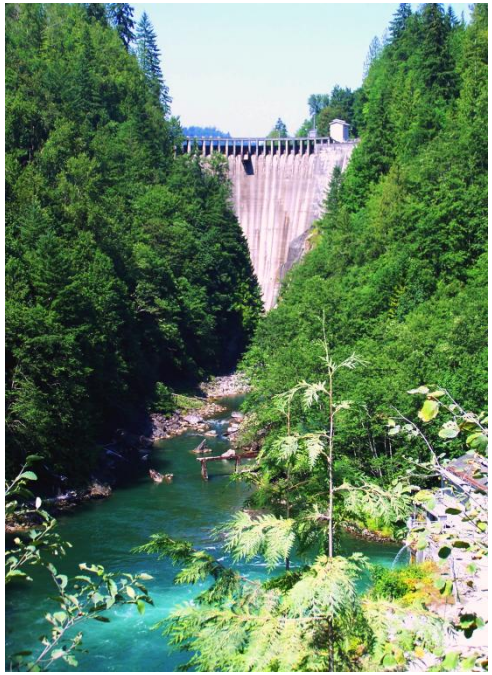
Due to the November 2006 flood, Skagit County is considering building a dam on the Cascade River for the purpose of flood control. The objective of this project is to determine where viable locations for the dam may be and provide recommendations to the County on the best alternative.

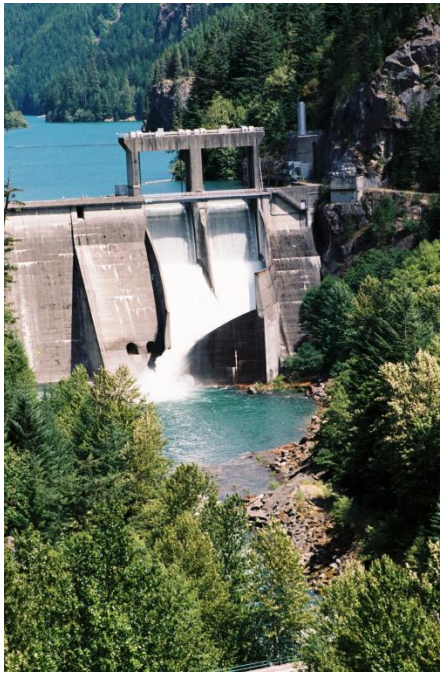


Skagit County FEMA Floodplain Map

The Criteria

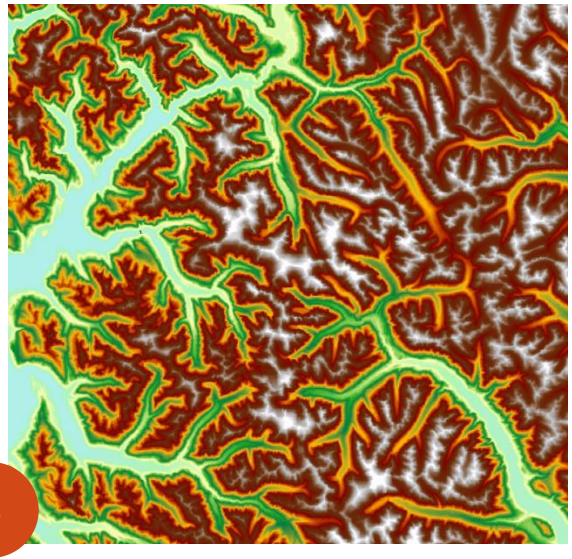
- Maximum width of 1000 meters.
- Adjacent slopes greater than or equal to 45 degrees.
- Base of dam between 250 and 500 meters elevation.
- Storage capacity of 250,000 ac. ft. (0.31 cu. km.)

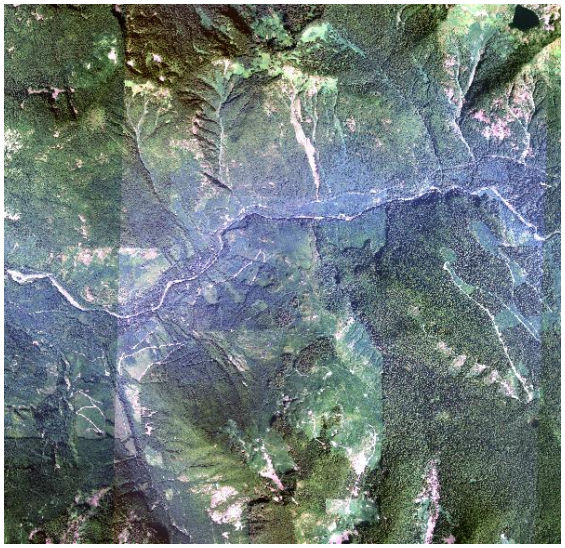


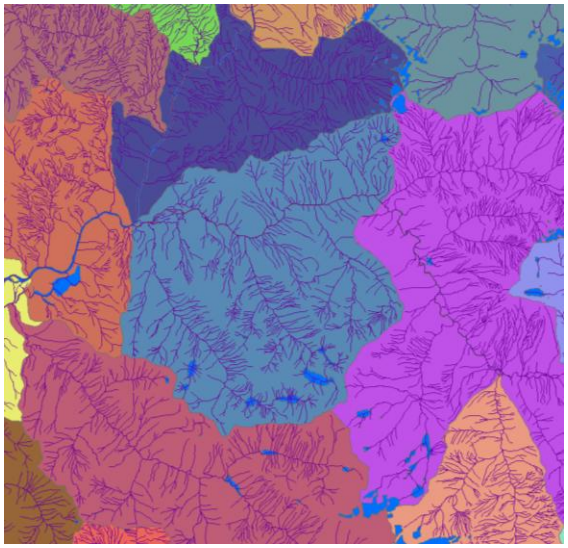


Data

- DEMs, Hydrography, and Imagery
  - Sources
    - USGS and Washington Department of Ecology.
- Data Processing
  - Combine DEM tiles to single DEM encompassing study area.
  - Project Combined DEMs (Decimal degrees to meters).

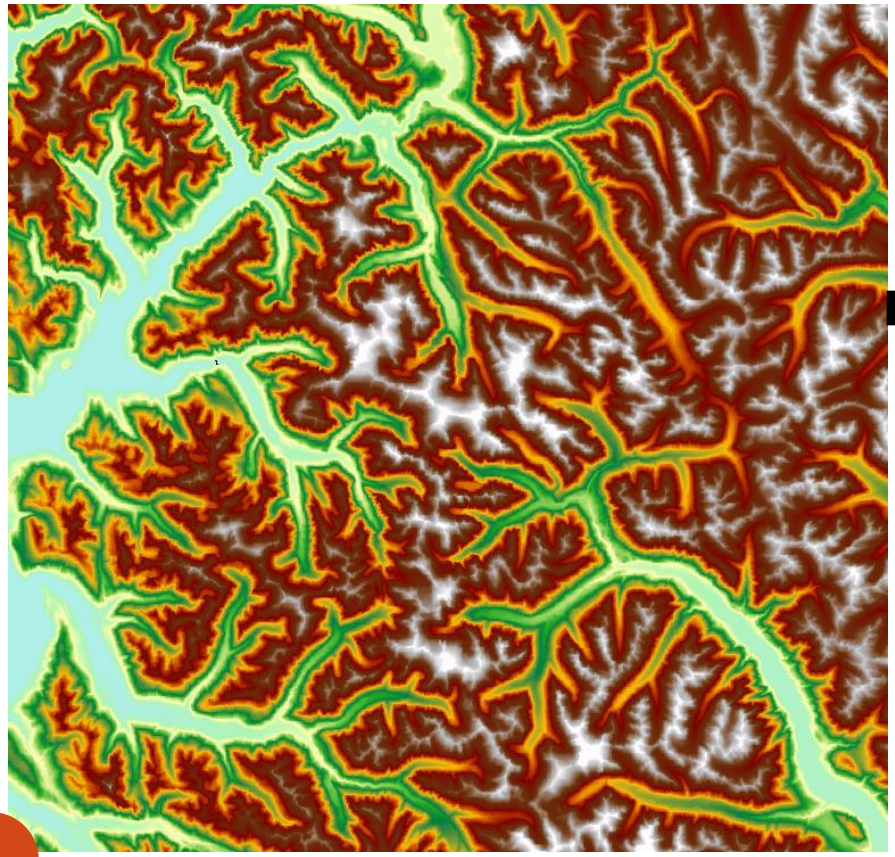


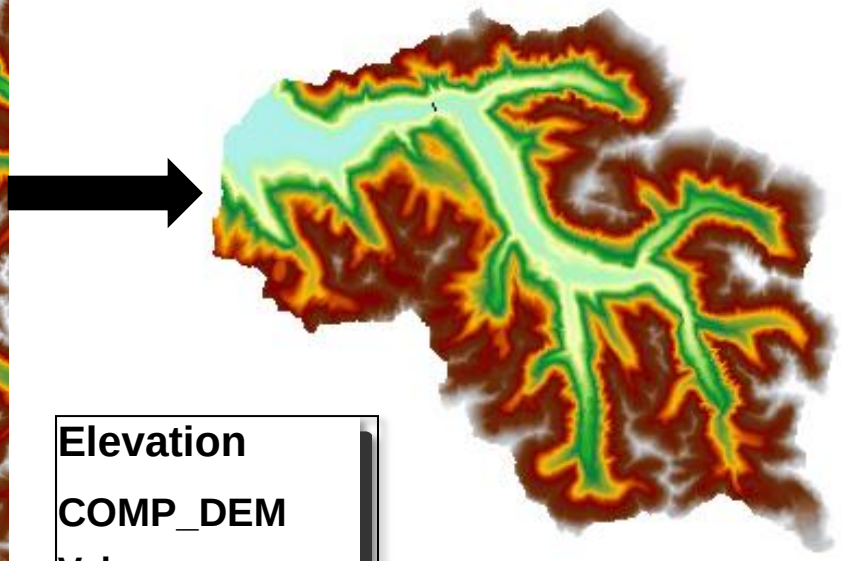




Digital Elevation Model

- Used 4 - 0.3 NED tiles
  - Approximately 10 foot resolution

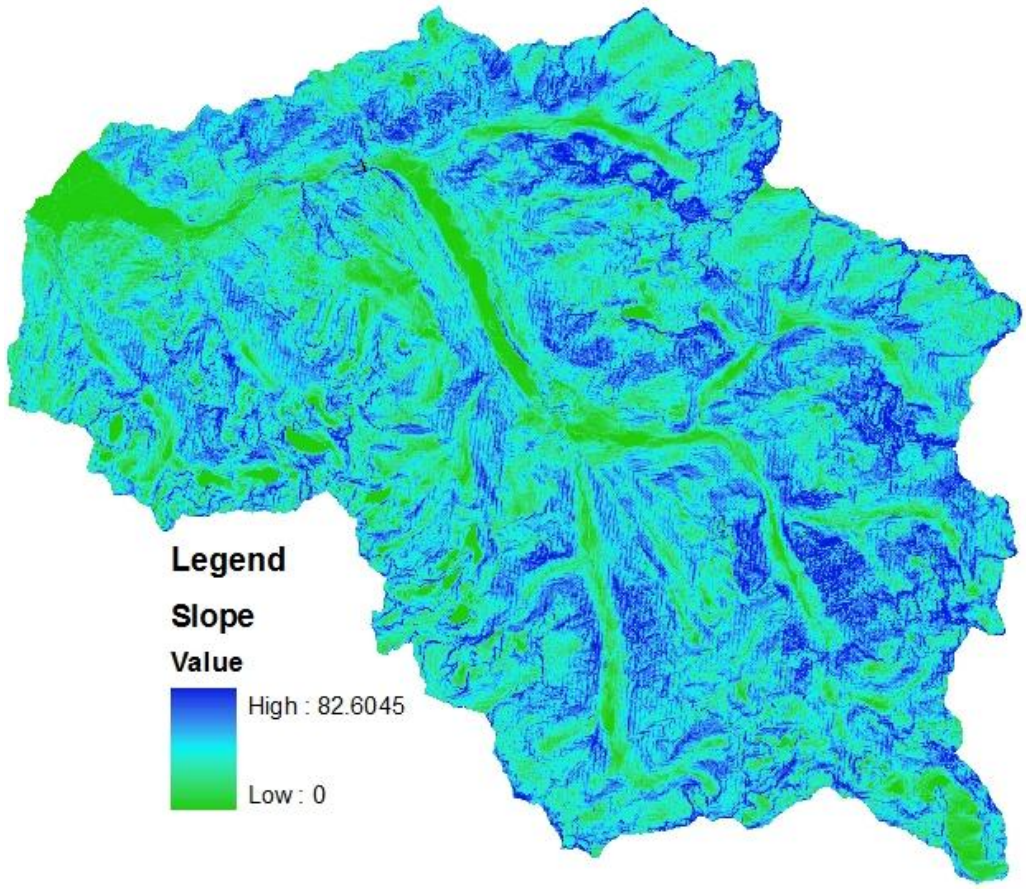




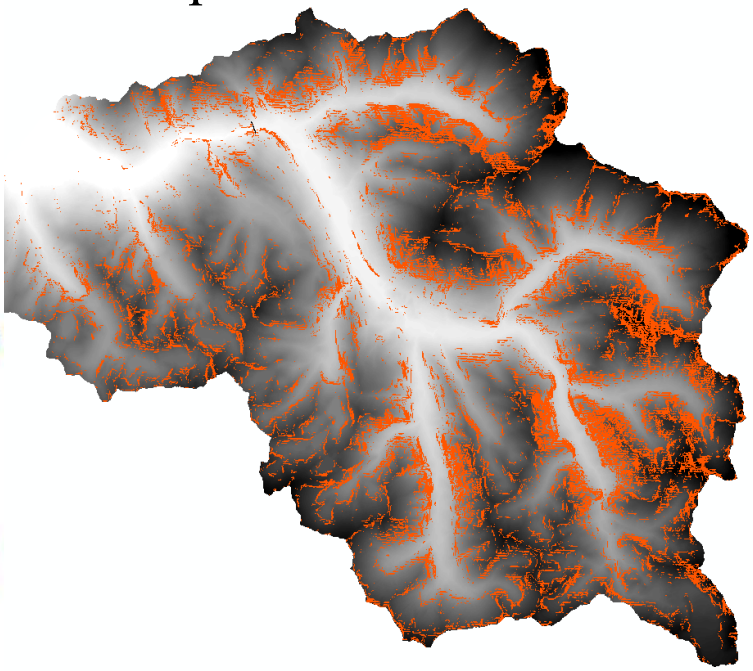
Clipped Basin DEM

Slopes

- Used 3D Analyst to determine basin slopes

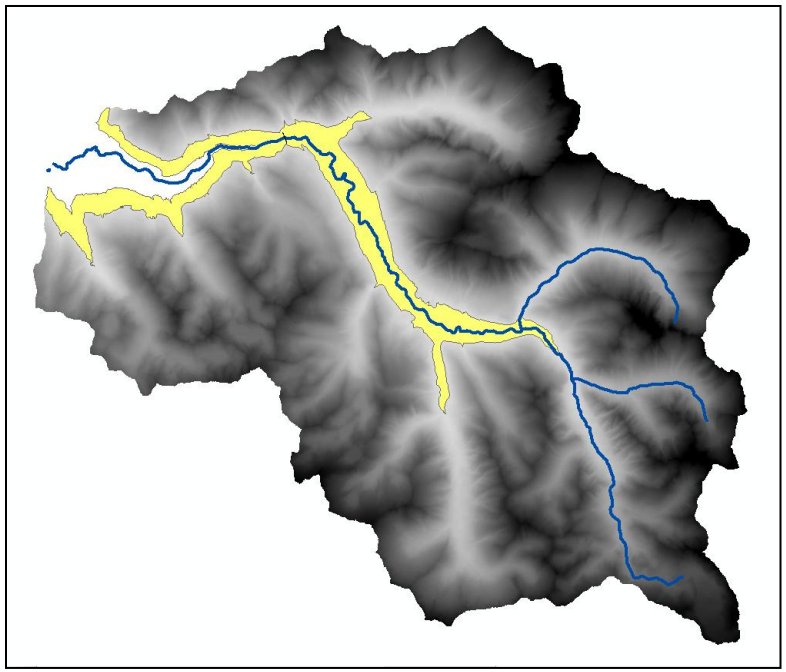


Basin Slopes in degrees.

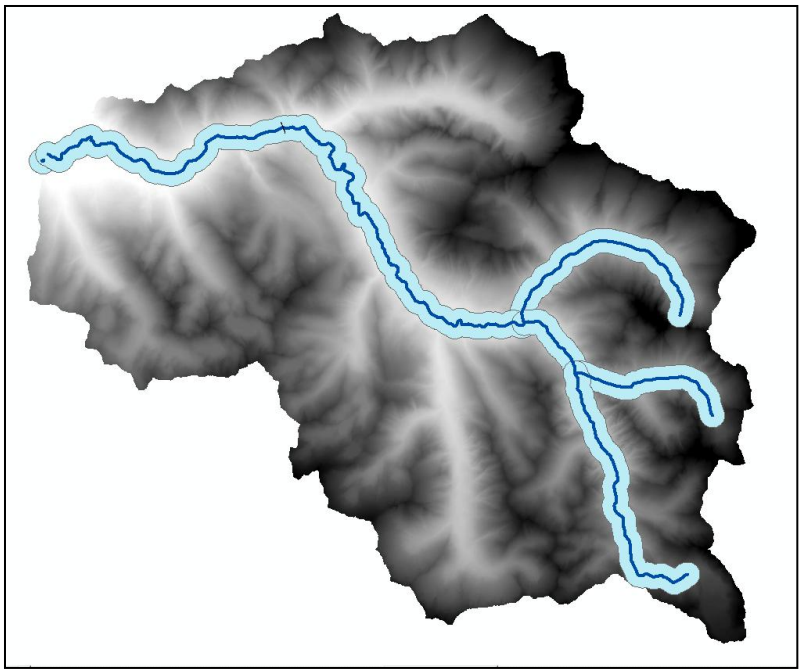


Basin Slopes steeper than 45 degrees.

Base of Dam and Max Width

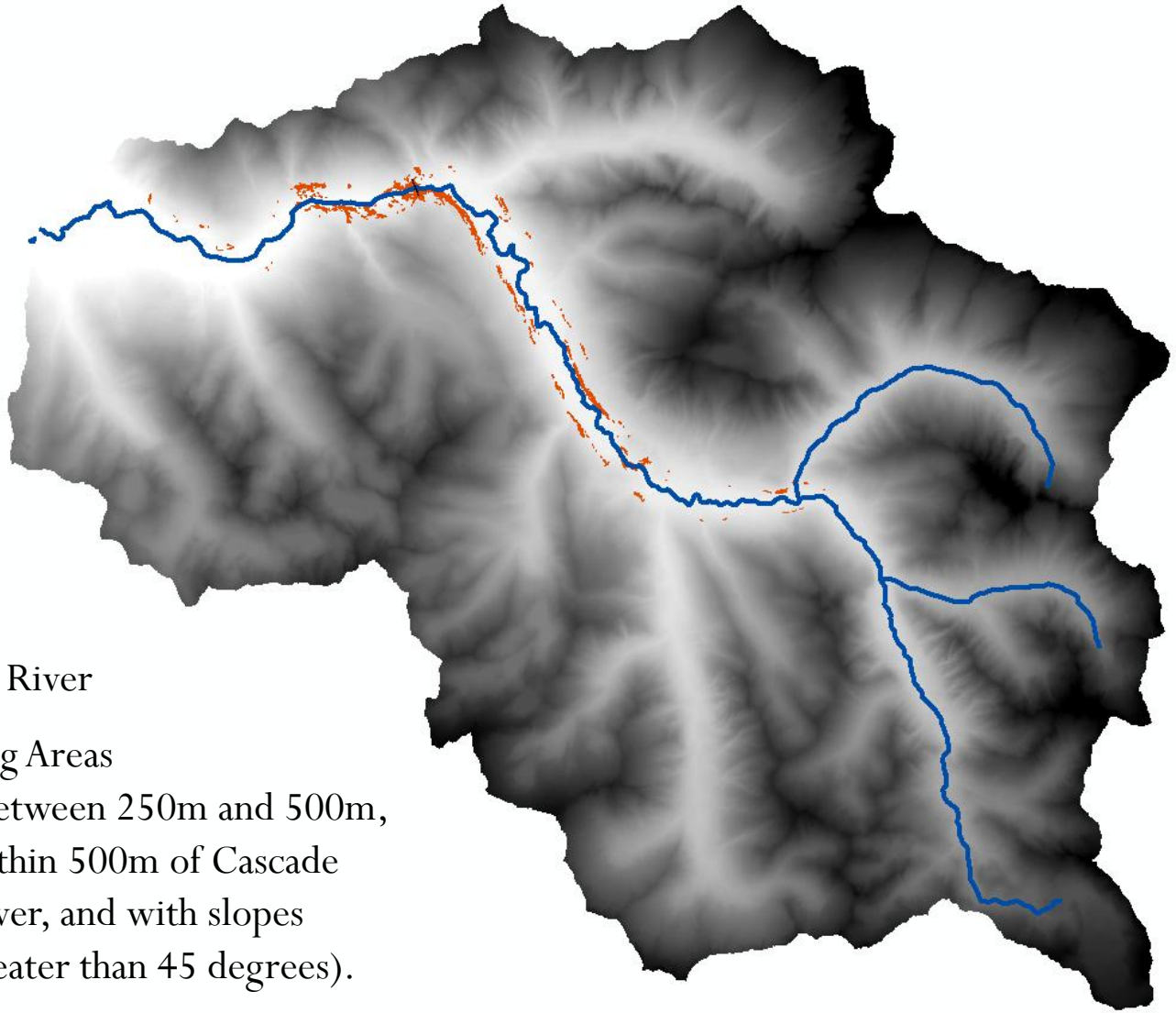


Elevations between 250 m and 500 m



500 m buffer along Cascade River

Final Result

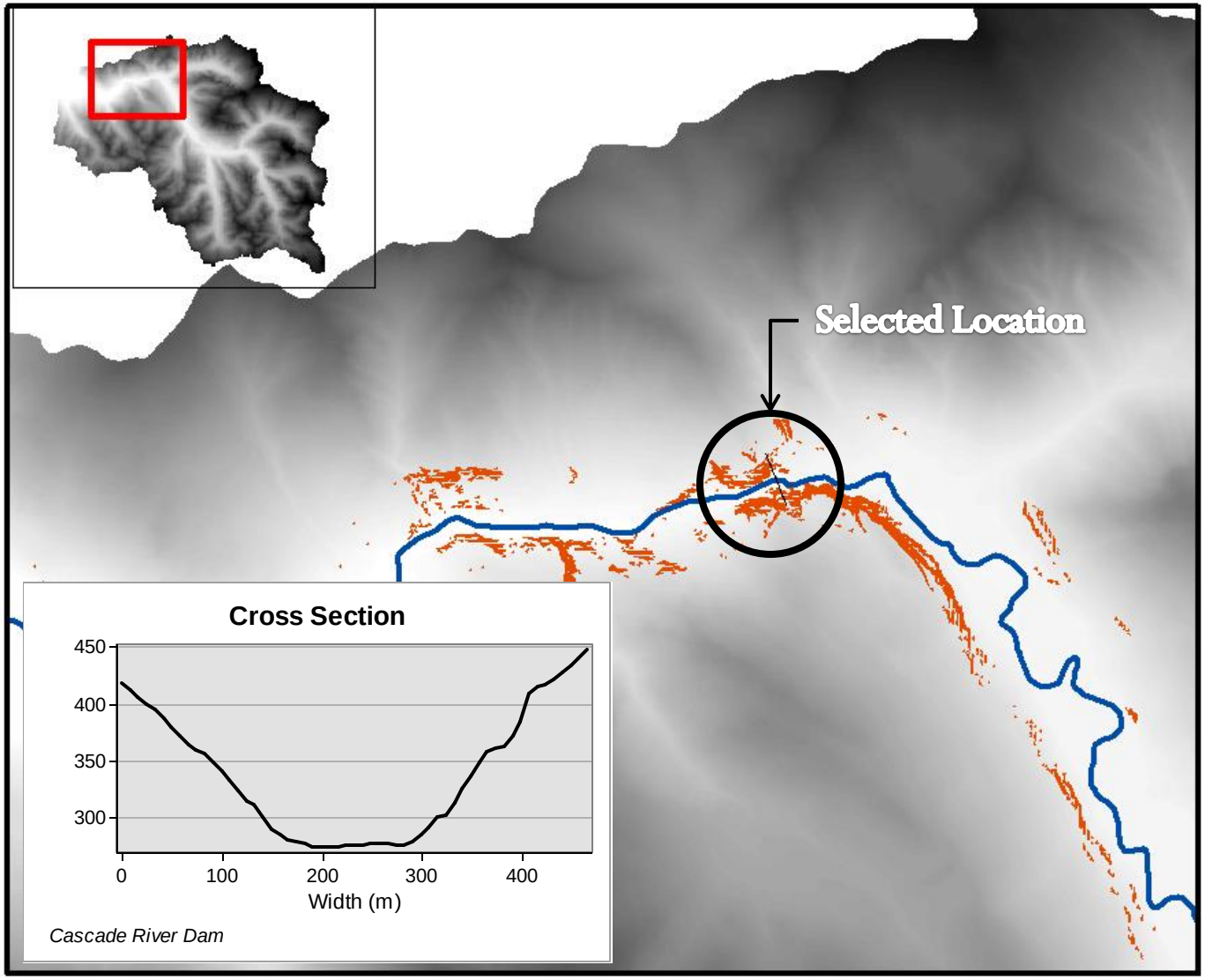


Legend

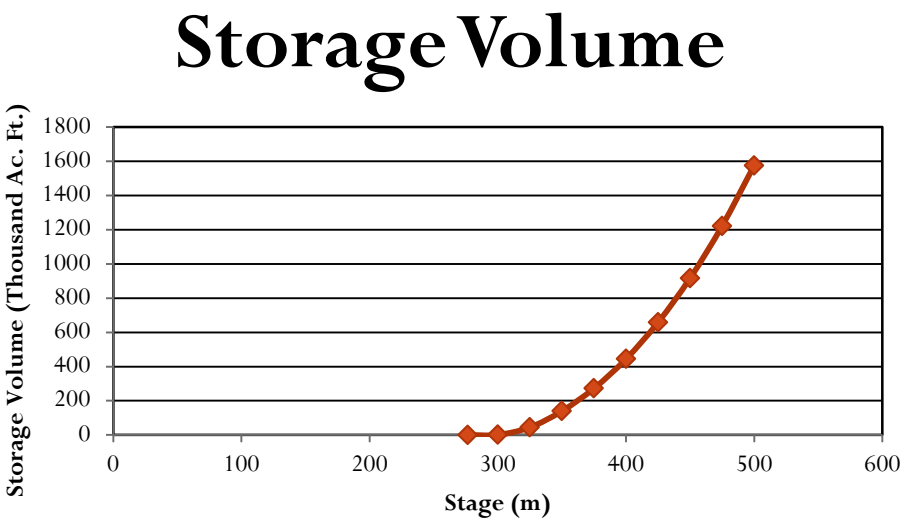
Cascade River

Resulting Areas
(Between 250m and 500m, within 500m of Cascade River, and with slopes greater than 45 degrees).

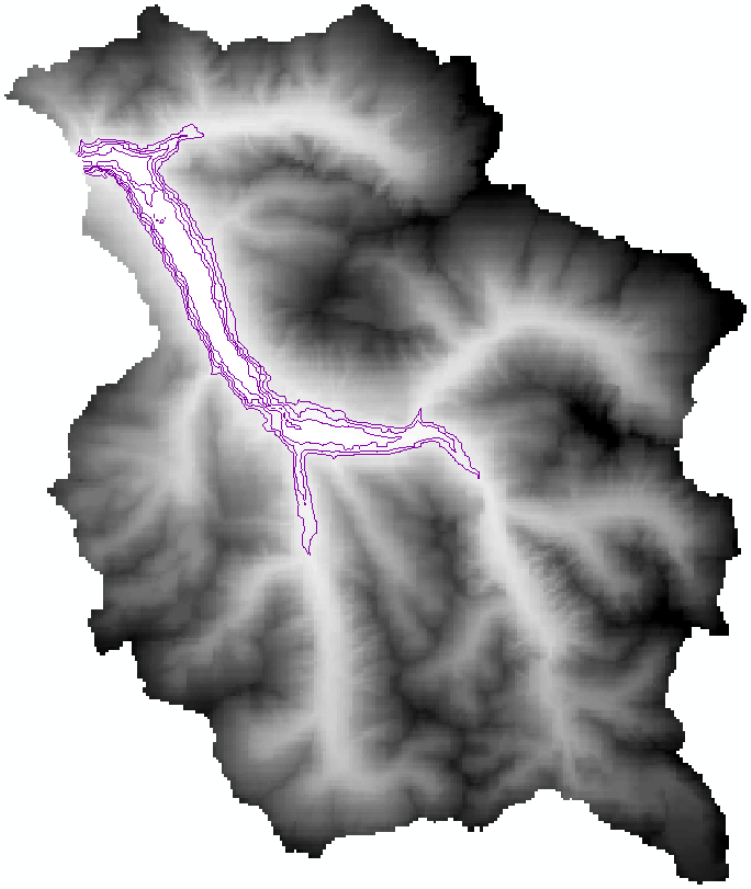
Selected Location



Storage Curve for Dam



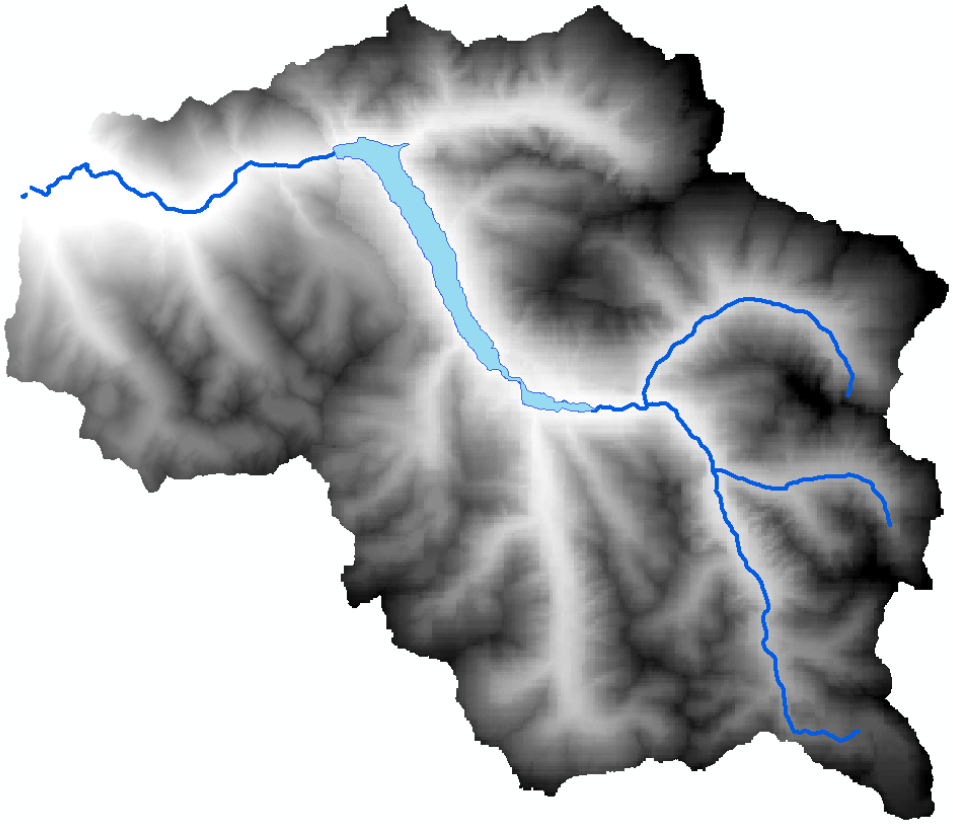
STAGE: (m)	VOLUME: m^3	3D_AREA: m^2	2D_AREA: m^2
276.51	0.02	9.73	9.72
300	1.12E+06	3.84E+05	3.81E+05
325	5.50E+07	3.69E+06	3.64E+06
350	1.72E+08	5.85E+06	5.70E+06
375	3.36E+08	7.94E+06	7.63E+06
400	5.48E+08	1.01E+07	9.54E+06
425	8.12E+08	1.25E+07	1.17E+07
450	1.13E+09	1.49E+07	1.39E+07
475	1.51E+09	1.75E+07	1.62E+07
500	1.94E+09	2.03E+07	1.88E+07



Extents of reservoir area up to 500 m.

Conclusions

- Dam Dimensions
  - Height: 98 meters
  - Width: 355 m
  - Storage Volume: 272,000 ac. ft.
- Reservoir Dimensions:
  - Surface Area: 7.63 km^2
  - Shoreline: 2.88 km



Cascade River Basin showing proposed reservoir

Thank you!

- Questions?

- Contact Information
  - Joe Hamman – jhamman1@uw.edu

    Graduate Student in Hydrology and Water Resources