Abstract

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Digital Terrain Analysis, Portland State University, Fall 2019.

Since Johnson Creek was channelized in the 1930's, it has had seasonal flooding and pollution problems. During this time there has been a lot of urbanization in the City of Portland. With this urbanization the city has started using sewer and water collection pipes changing the way the watersheds work, since it is no longer following the natural elevation of the land. For this project we used three different methods to try to determine which one would be the best fit in determining a new watershed for the area using the collection pipes.

The three methods were unenhanced, stream burning and AGREE. The unenhanced method does not consider any of the city's collection pipes. Stream burning considers the pipes but doesn't change the DEM for different elevations. AGREE reconditions the DEM so that the pipes are considered and the elevation around the pipes are made uniform, so elevation is not a problem.

Johnson Creek was the main study area, but we did not clip our watershed the study area. The pipes which help develop the new watershed are located mainly in the upper watershed, which we believe would be important to know. The idea is that watersheds change with urbanization and change from their natural elevation watershed. The addition of collection pipes in the Johnson Creek area are important factors in knowing where the source watersheds are.

Keywords: Johnson Creek, watershed, watershed delineation, unenhanced, stream burning, AGREE, collection pipes

Comparing Different Watershed Delineation Methods (Stream Burning and AGREE)

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Why

Recreating Haley Morris' Final Project

- Morris used unenhanced and stream burn method for Johnson Creek
- Morris suggest using the AGREE method as future studies

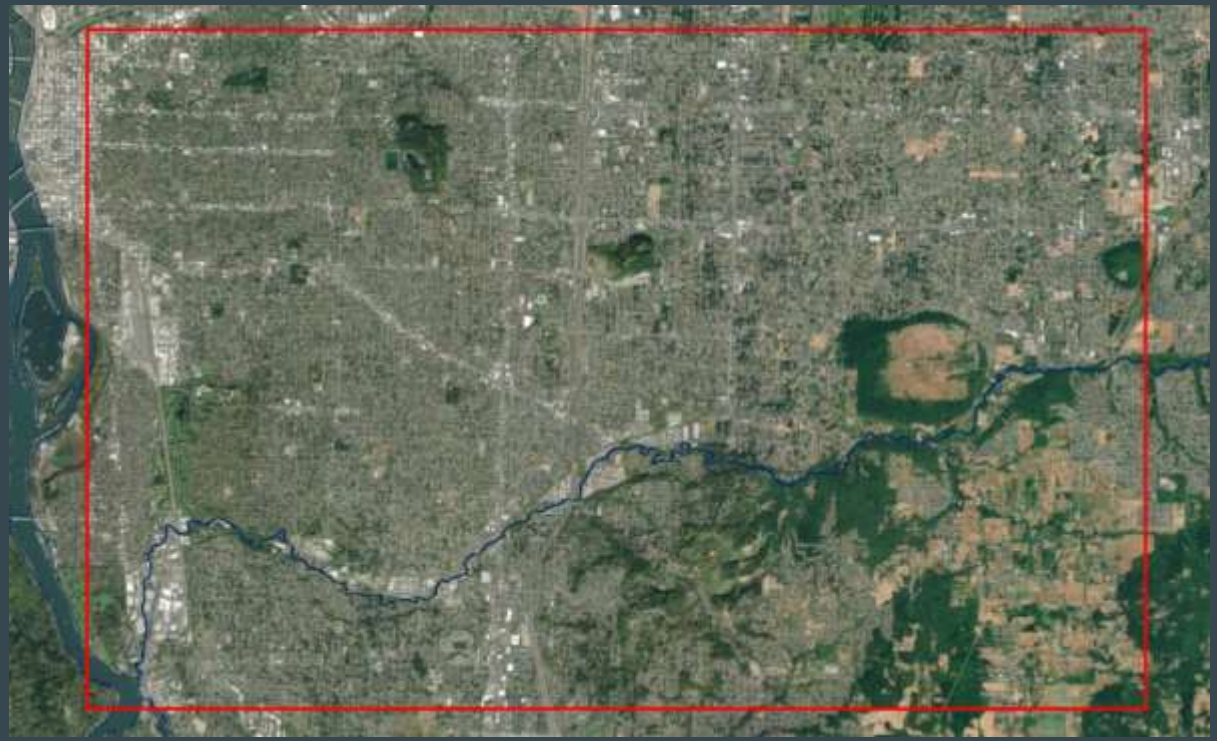
Expanding:

Using the AGREE method to see what watershed delineation Method works the best

Area Of Study

Johnson Creek

- Located in the south of the Portland Metro Area



Background

Johnson Creek

- History of seasonal flooding and pollution
- 1930s was the start of channelization by the Works Progress Administration (WPA)

Unenhanced Method

Data:

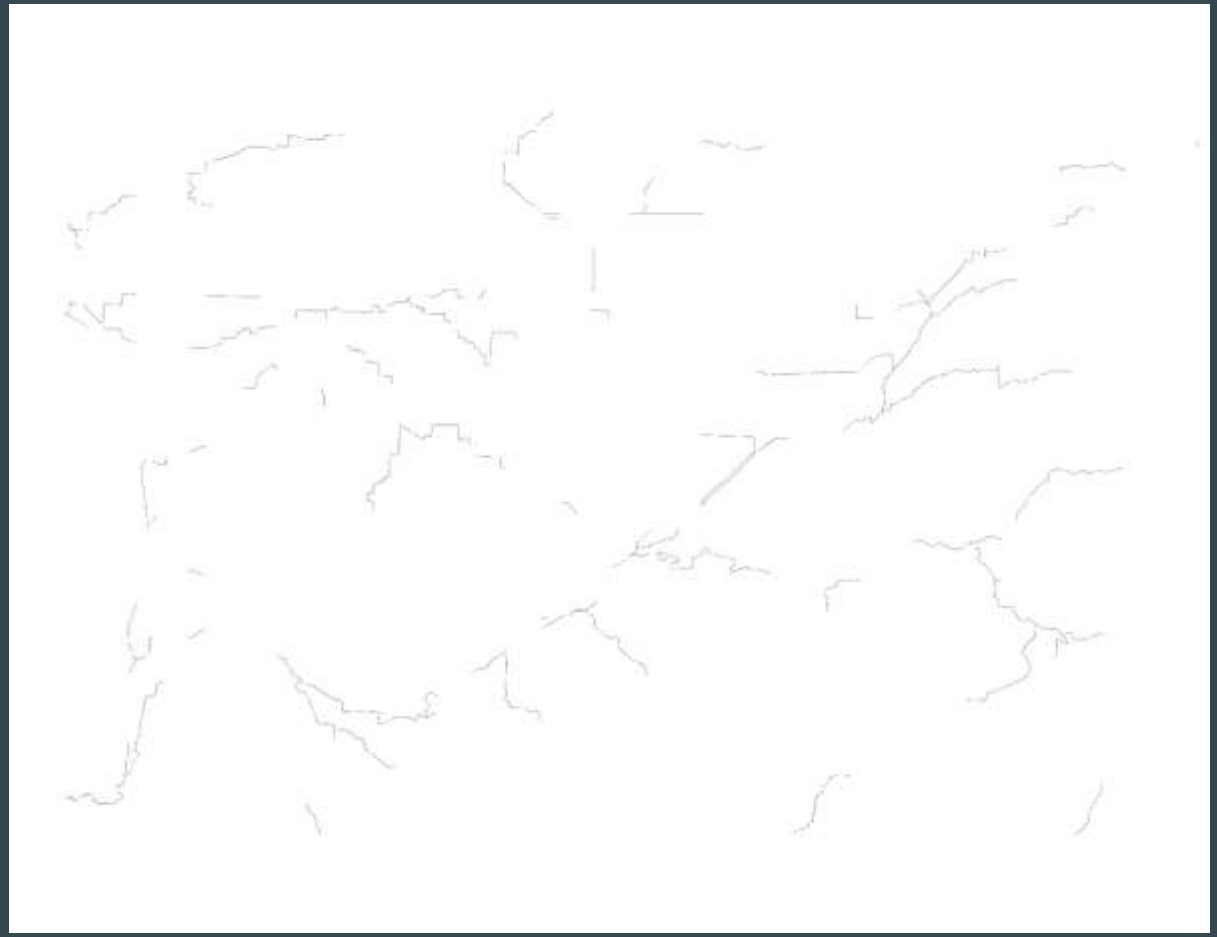
- LiDAR DEM

Same procedure as Lab 5

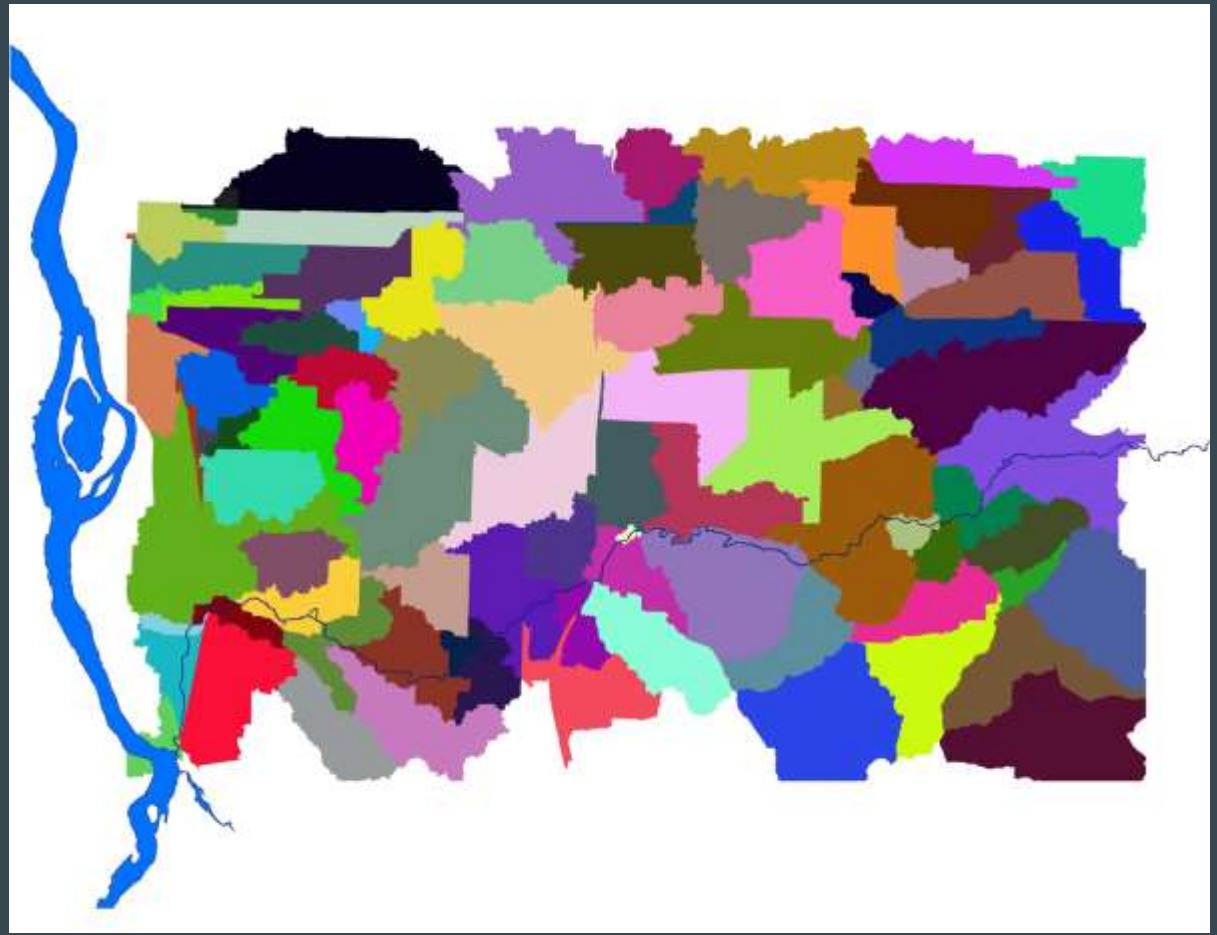
Tools:

- Flow direction
- Fill- as well as sink to figure-out if the DEM has any sinks to fill
- Flow Accumulation
- Con Statement- threshold 1,200,000
- Stream Link
- Watershed

Unenhanced Stream Link



Unenhanced Watershed



Stream Burning Method

Data:

- LiDAR DEM of study area
- Pipes: collection_links

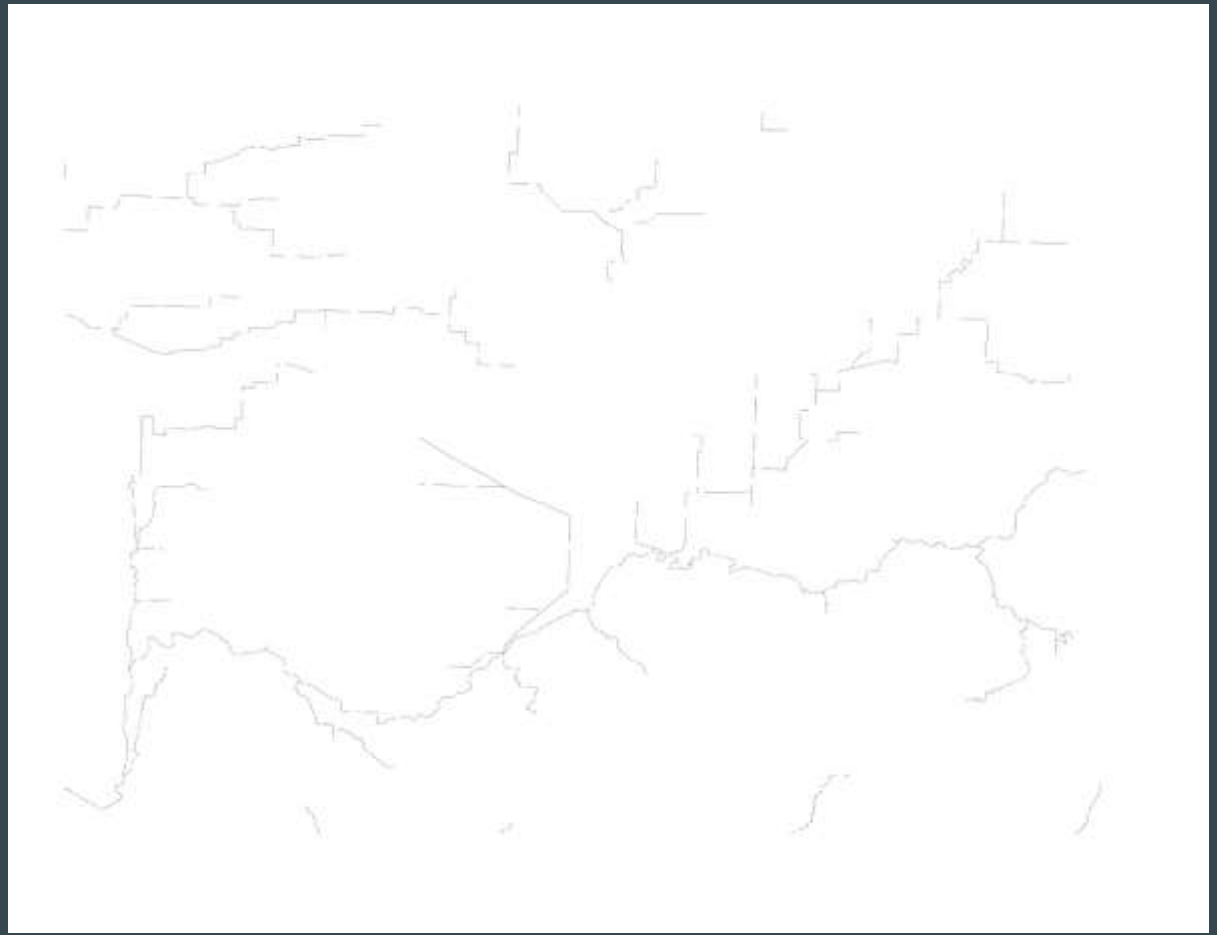
How to create the Stream Burn DEM:

Polygon to raster (pipe shapefile) → Is Null tool (making pipes = 0 and no data = 1) → con statement: con pipes = 0, dem - 10, dem (creating a DEM that has a lower elevation where the pipes are)

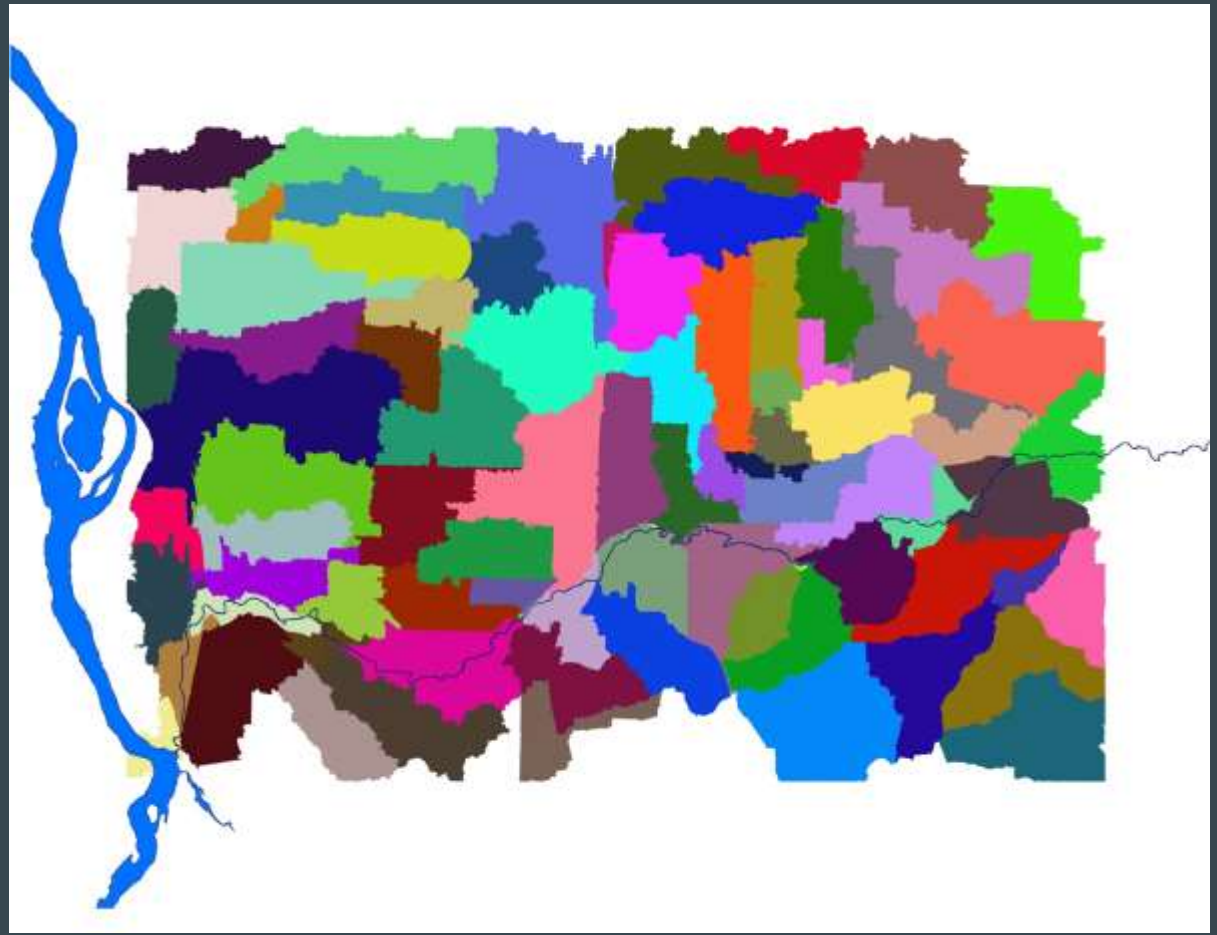
Tools:

- Stream Burn DEM
- Flow direction
- Fill → Sink tool
- Flow Accumulation
- Con Statement- threshold 1,200,000
- Stream Link
- Watershed

Stream Burning Stream Link

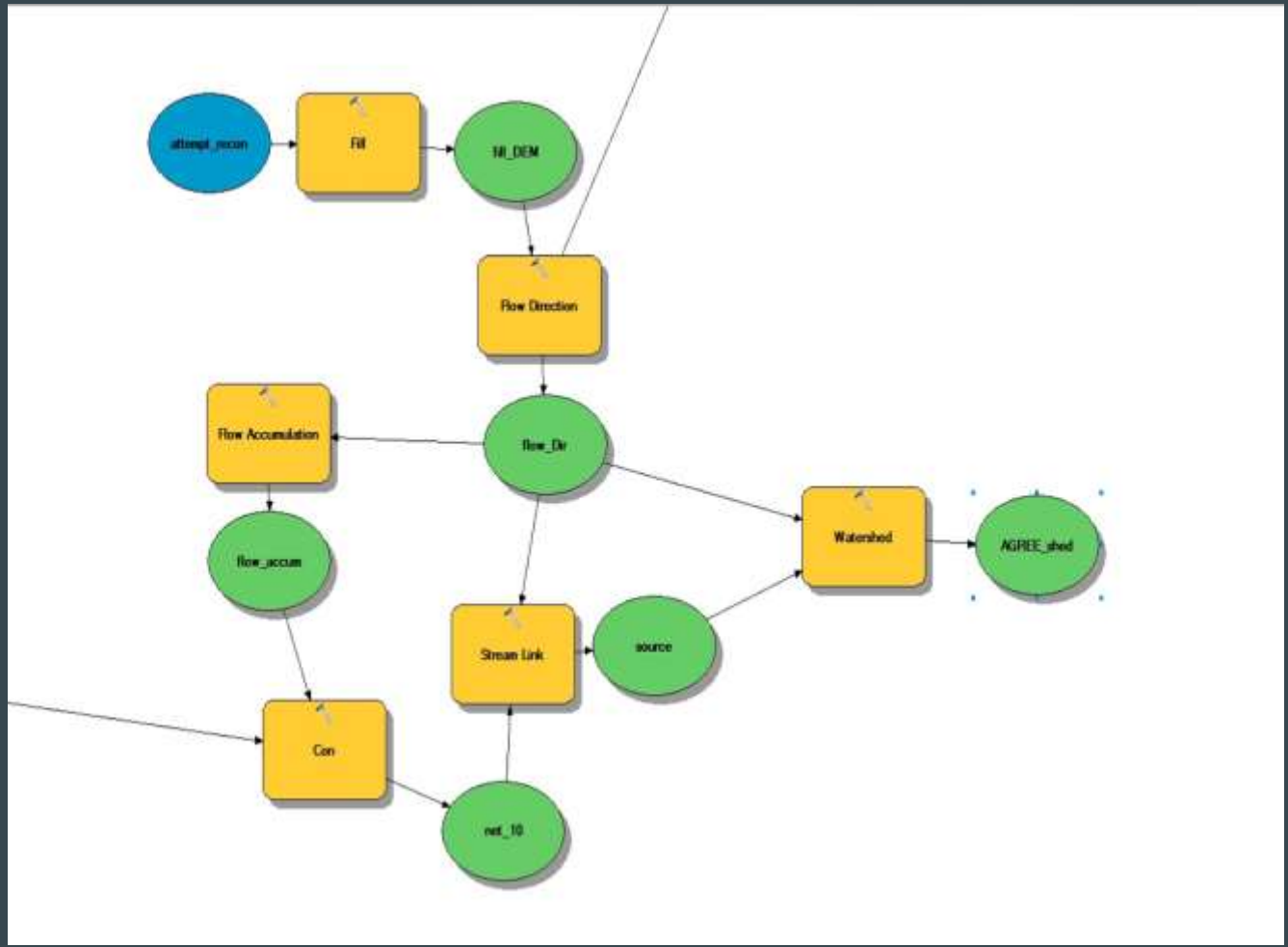


Stream Burning Watershed

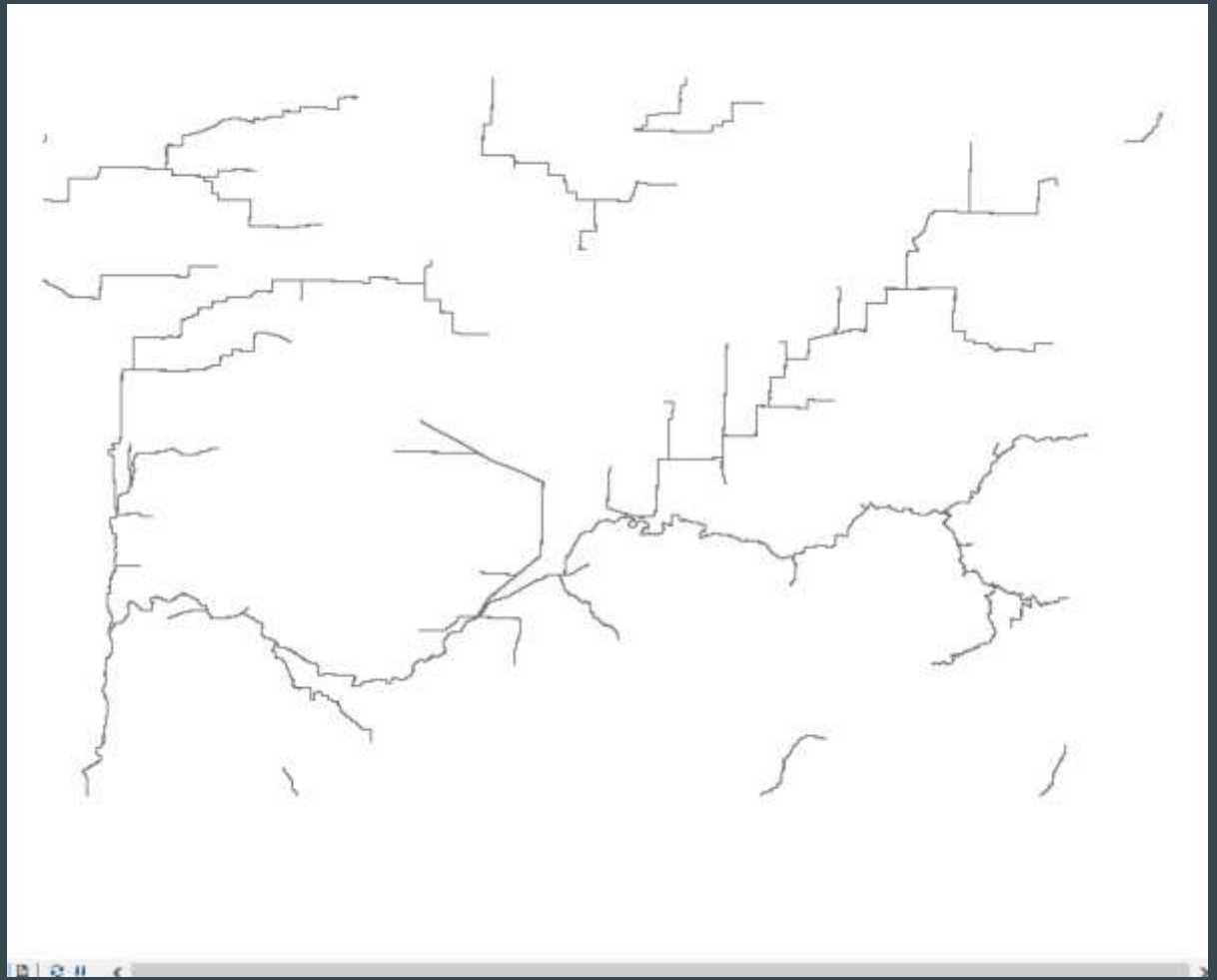


AGREE Method

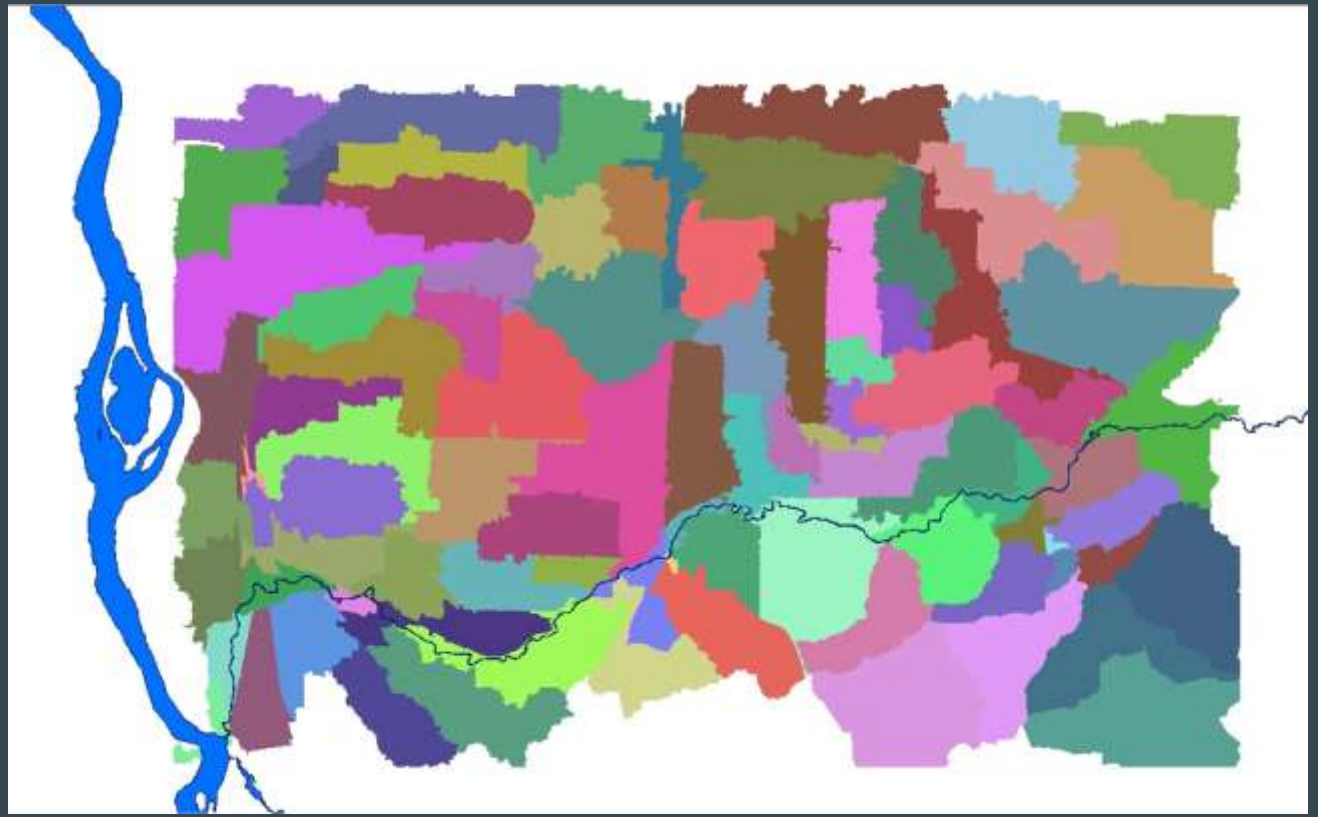
- Added steps
  - Downloading Hydro Tools
  - DEM Reconditioning
- Model Shows steps after DEM Reconditioning completed
  - Buffer =5
  - Smooth Z=10
  - Sharp Z=1000
- Used same data, con statements, and threshold as stream burning method to keep it uniform



AGREE Stream Link



AGREE Watershed

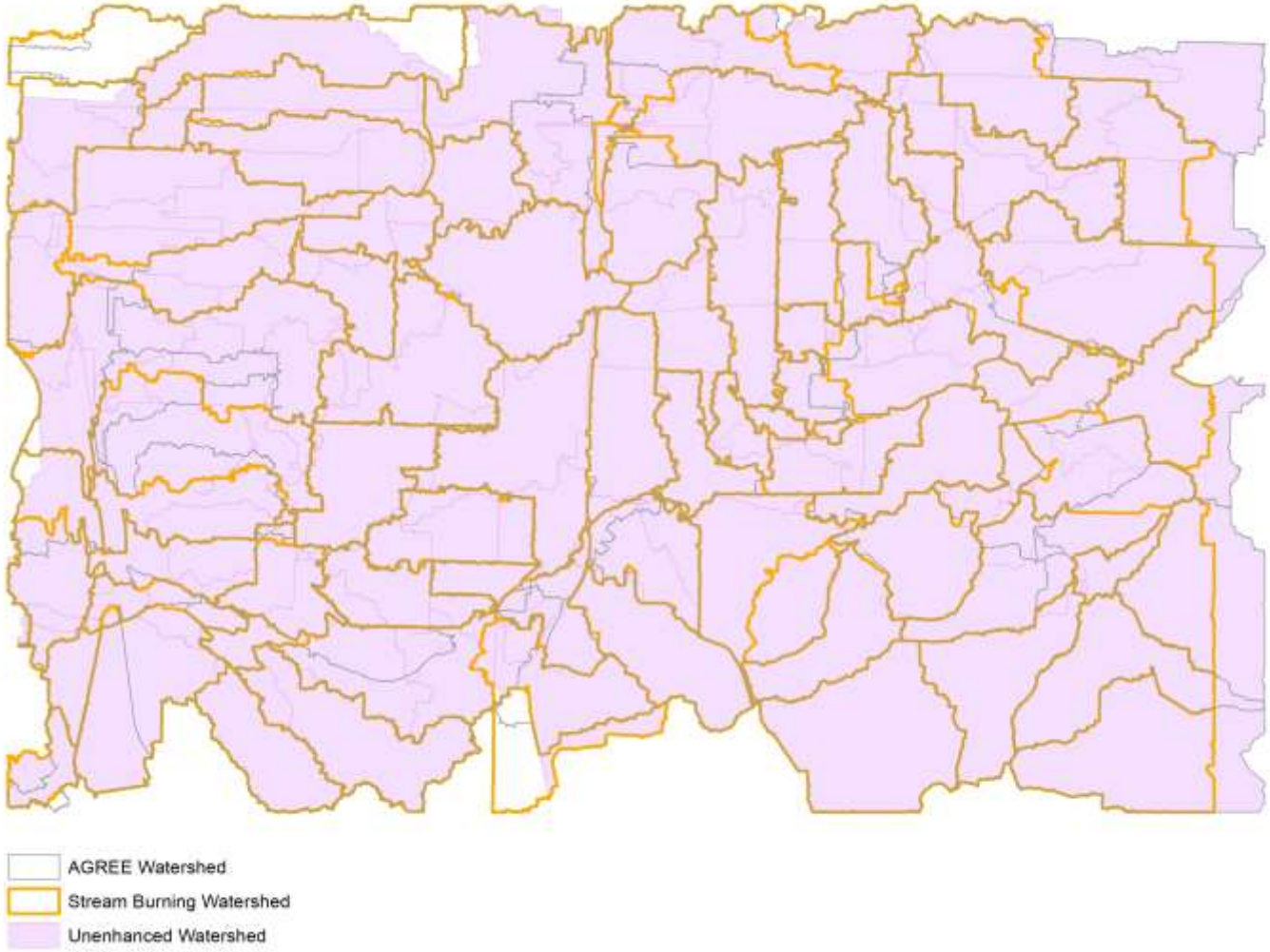


Results

Unenhanced: 99 watersheds

Burned Streams: 84 watersheds

AGREE: 92 watersheds


AGREE Watershed
Stream Burning Watershed
Unenhanced Watershed

Comparing the Two

Unenhanced vs. Stream Burned

The stream burning method is more accurate. This is because it is able to take pipes into account. This is important for industrial areas, like the Portland Metro Area, as pipes change the water flow. The stream burning method is able to take this into account unlike the unenhanced method.

Stream Burned vs. AGREE

The AGREE method is more accurate. This is because it is able to change the elevation of the DEM around the pipes as well as the elevation of the pipes themselves. While stream burning only does the pipes.

Things that Differ

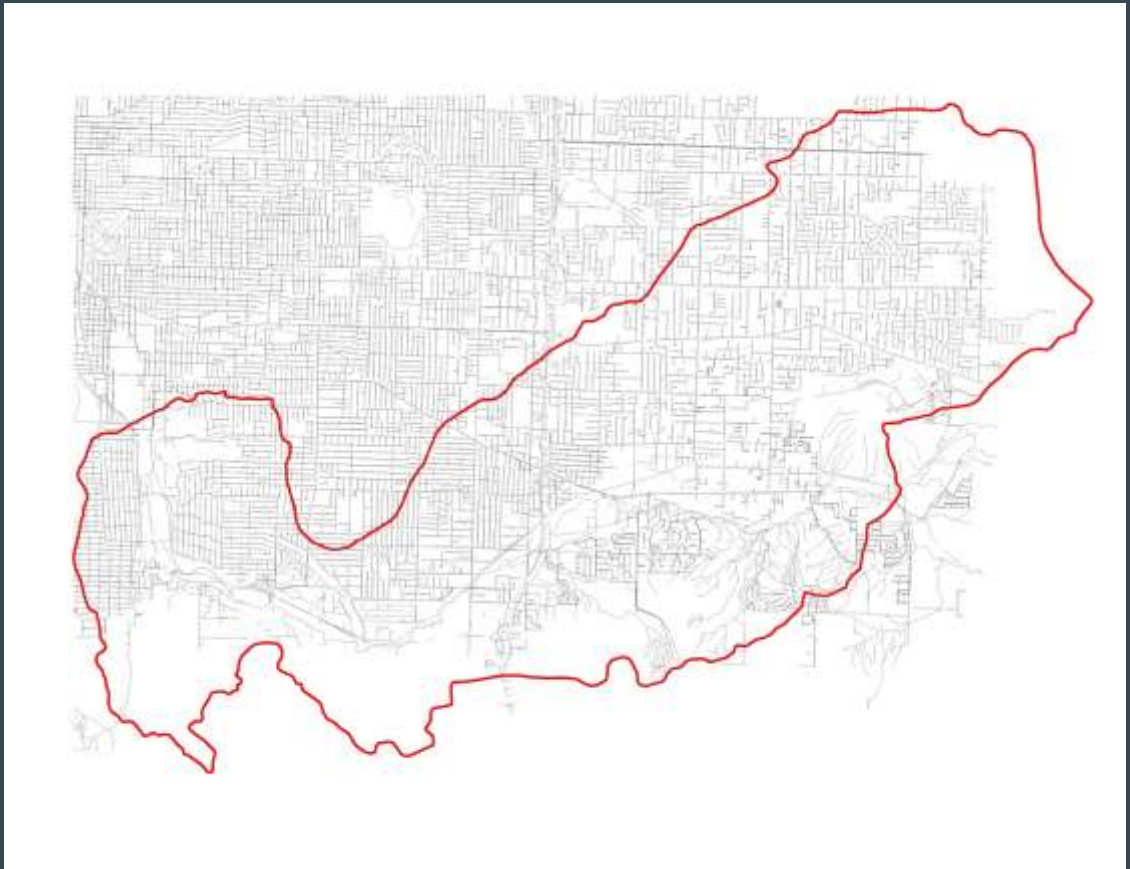
Ours:

- Kept the upper watershed because there are a lot more collection of pipes in the upper region. If we are looking at pollution sources we would want to look at areas above the study area for clues as to where the pollution is originating from. Not just the area of study.
- Counted the OBJECTID to figure-out how many watersheds are in each method

Morris:

- Clipped the stream links to the lower watershed only
- Counted the value column instead of OBJECTID column giving a different result to watershed count. 115 for unenhanced and 113 for stream burned

Pipes



What we would do Different

- Rerun unenhanced flow direction/accumulation
- Change the threshold value (1,200,000) and con statement on the stream burning method (DEM = 10)
- Interact with the AGREE method more

References

I Drive:
Pipes- I:\Research\Shares\gisdata\City\Portland\BofEnvironmentalServices\2019 Version\Standard_Sources_2019.gdb
DEM- I:\Research\Shares\gisdata\City\Portland\DEM\Lidar_3ft\MetroEast

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Johnson, Steve. “Johnson Creek.” *The Oregon Encyclopedia*, 2018, oregonencyclopedia.org/articles/johnson_creek/#.XfF6iuhKgdU.