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GEOG 3050
Final Project Report
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Risk Assessment: Hazardous Water Resource Area in Hawaii county, from Kilauea Volcano Eruption using 30-meter resolution LiDAR DEM's Goal:

Kilauea is one five active volcanoes on the island of Hawaii. it has been erupting continuously since 1983. On April 30,2018, the sign of eruption became more significant, the Kilauea volcano collapsed, and lava lake continues to sink down. according to TIME magazine, on May 8, 2018 President Donald Trump declared the volcanic explosion a major disaster in state of Hawaii. Fortunately, the collapse events end on August 2, 2018.

The purpose of this project is providing an introduction study to predict the impact of volcanic ashes on water stream sources in Hawaii. The most common aspect historically studied is turbidity, but there are many more to consider for example, the physical particles of ashes can clot intake devices, or it can erode metallic pipe connection. Acidification and Fluoride contamination are a few to be mentioned. The overall water demand will be substantially high due to clean-up procedure following the eruption. (Stewart,2006)

SPECIFIC OBJECTIVES AND QUESTIONS:

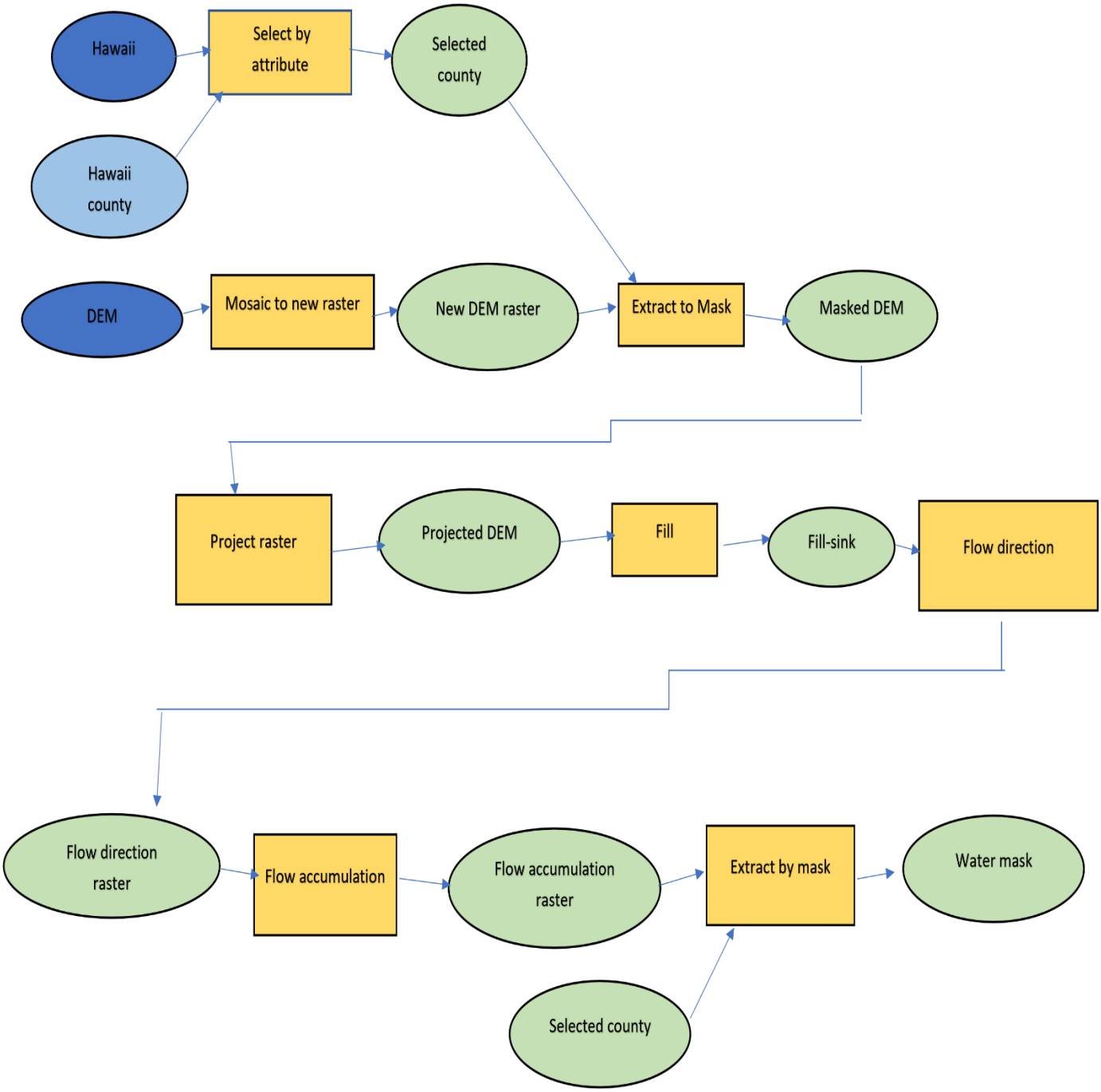
1- where there might be a water pollution caused by ashes?
2- how many people will be affected who are living in the ashes zone?

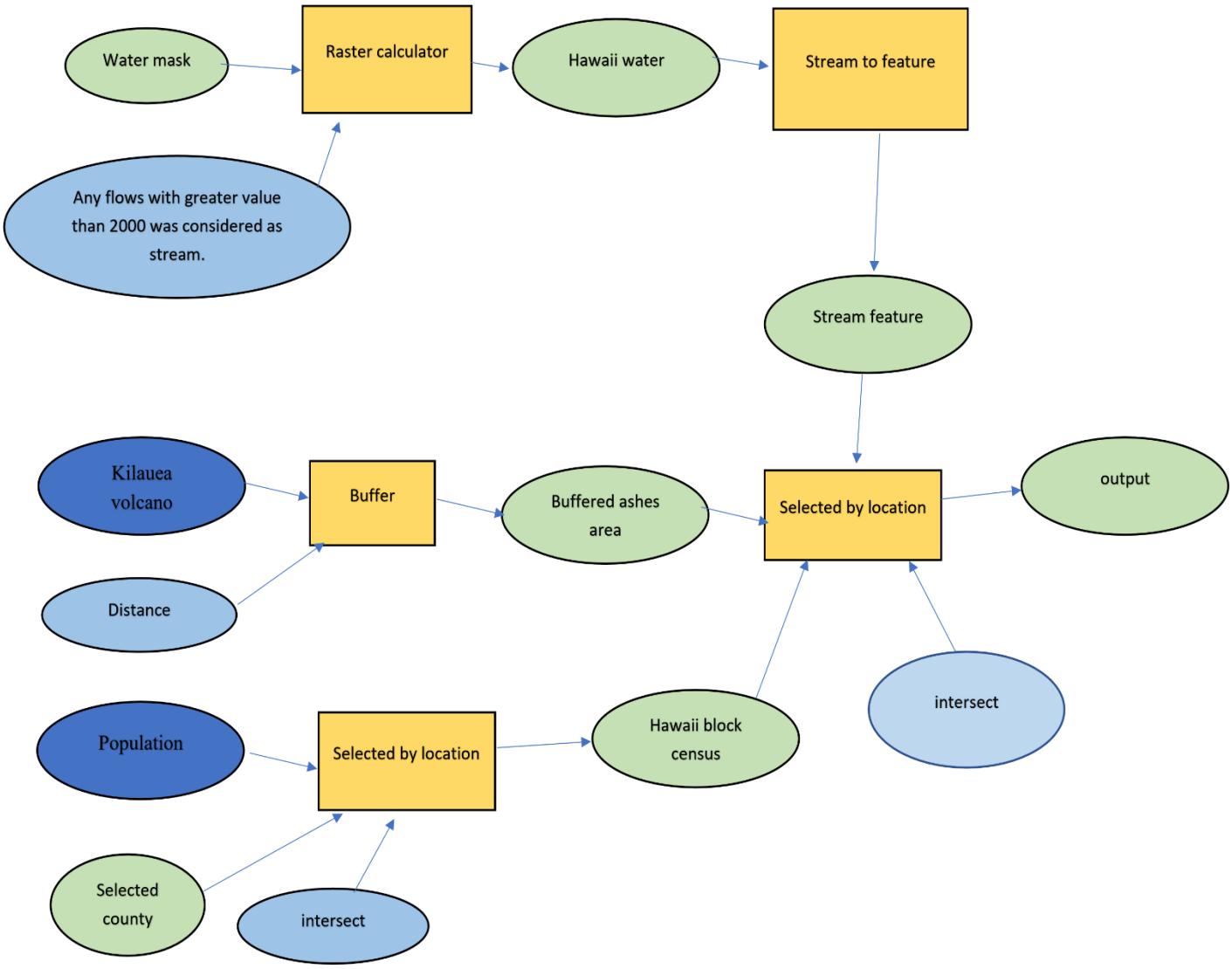
DATA COLLECTION AND DESCRIPTIVE STATISTICS:

Layer Name	Source	Description	File type
DEM	**Nasa**	The ASTER Global Digital Elevation Model (GDEM) Version 3 (ASTGTM) provides a global digital elevation model (DEM) of land areas on Earth at a spatial resolution of 1 arc second (approximately 30-meter horizontal posting at the equator). https://search.earthdata.nasa.gov/	**5 Raster images .TIF format**
Population	**GISL data**	2010 block census data for the Hawaii county. The total population was 185,079.	**Point shapefile**
Kilauea volcano	**Google earth**	Excel contain the name, longitude, and latitude.	**Excel file**
State of Hawaii boundary	**Hawaii Statewide GIS Program**	Coastlines for the main eight Hawaiian Islands. Source: USGS Digital Line Graphs, 1983 version. Extracted from USGS Digital Line Graphs by Office of Planning staff, 1988. http://geoportal.hawaii.gov/datasets/045b1d5147634e2380566668e04094c6_3?orderBy=isle	**Polygon shapefile**

Table 1 Information on collected data.

METHODOLOGY AND WORKFLOW MODEL:





The process of the project:
Program: python 2.7.16 and ArcGIS desktop 10.7.1

1)Files preparation:
A- Convert the location Volcano csv file to the point shapefile.
B- Select by attribute the Hawaii county from Hawaii state polygon shape file
C- Select by location the Hawaii county population from Hawaii state population shape file.
D- Mosaic the 6 DEM Raster that covered the Hawaii county.
Note: All the out puts saved to the geodatabase.

2) model the flow of water across a surface:
A- Fills sinks in a surface raster to remove small imperfections in the data.
B- Creates a raster of flow direction from each cell.

C- Creates a raster of accumulated flow into each cell.
D- Raster calculator: Calculate the Hawaii county streams by considering any flows with greater value than 2000 as stream.
E- convert Hawaii streams to feature (polyline feature class)

3) Create 30 Km and 45 Km buffer circle ranges around the Volcano and calculate the length of streams and total of the population inside those ranges.
Results:

A) Streams:

1- The Total length of streams in Hawaii is 9942.29 Km.
2- The Total length of streams in range 30 Km is 2585.22 Km. which is 26.0% of the Total streams' length of the Hawaii county.
3- The Total length of streams in range 45 Km is 4433.27 Km. which is 44.59% of the Total streams' length of the Hawaii county.

B) Population:

1- The Total of population in Hawaii county in 2010 is 185058.
2- The Total population in range 30 Km is 14689. which is 7.94% of the Total population of the Hawaii county.
3- The Total population in range 45 Km is 91914. which is 49.67% of the Total population of the Hawaii county.

Maps:

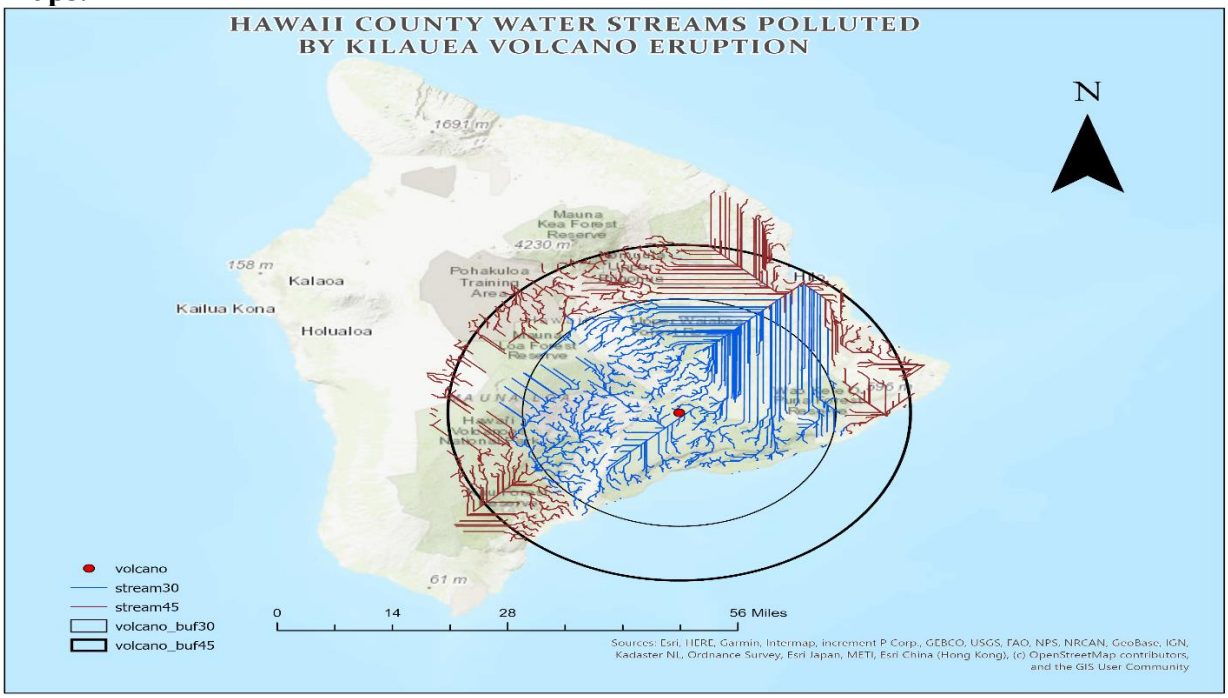


Figure 1Map of the streams in range 30 km and 45 km around the Volcano.

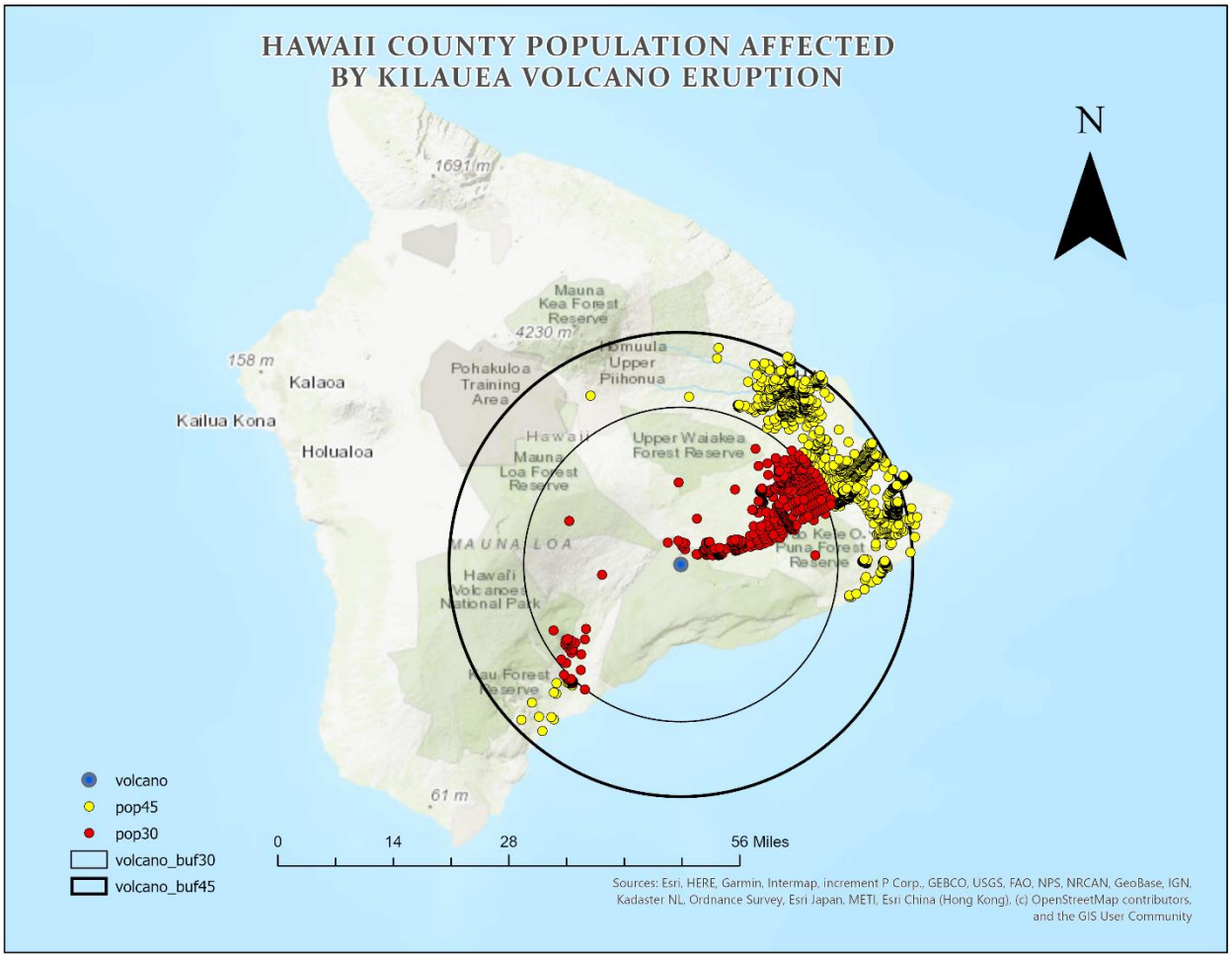


Figure 2:Map of the population around the Volcano in Range 30 Km & 45 Km.

Conclusion:

The code is originally structured to calculate the total length of the affected streams and how many lives are threatened by water contamination with ashes. After running the code we have discovered that 26% of Hawaii county streams will be polluted if the contamination range was 30 km and 46% if the range was higher up to 45 km. Additionally, almost 8% of the population in Hawaii lives in the first contamination risk zone and almost half of the population will be threatened if the ashes reach 45 km range. However, people in lower stream face higher risk of surface water contamination as the ashes accumulate across river streams. Further study can be done to compare upper stream to lower stream contamination ratio. Also, the impacts of Kilauea Volcano Eruption are not just on people or life on land, but It has bad impacts on the oceans and marine life should be studied in this area.

References:

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