
Digital Image Contour Extraction
Extracting elevation contours for the May 18, 1980 Mount St. Helens Eruption
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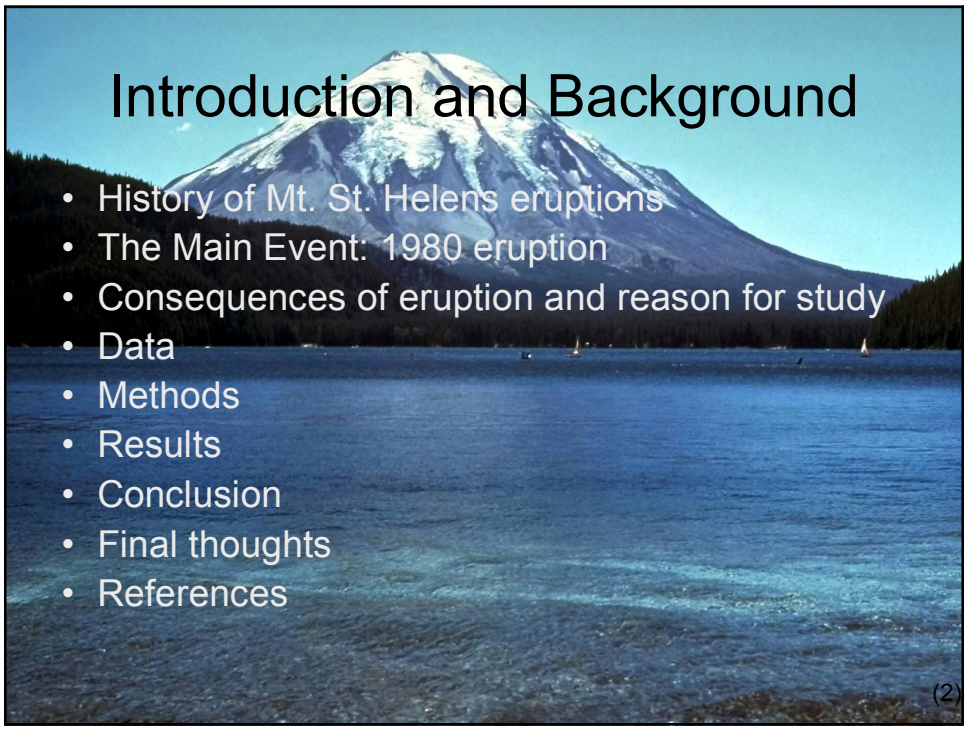
USGS
(1)


Introduction and Background
• History of Mt. St. Helens eruptions
• The Main Event: 1980 eruption
• Consequences of eruption and reason for study
• Data
• Methods
• Results
• Conclusion
• Final thoughts
• References
(2)

History of Mt. St. Helens Eruptions

- Mt. St. Helens is a Stratovolcano or composite volcano made of alternating layers of sediment, debris, lava, and ash
- Youngest Volcano in the Cascade Range
- First began forming 40,000 years ago
- Main Dome formed mostly during the last 2200 years
- Last previous eruption in 1857
- Painting by Paul Kane in 1847

(3)

May 18th, 1980 eruption and consequences

- Magnitude 5.1 earthquake 1 mile beneath the dome caused bulging north face of mountain to break off.
- Triggered massive landslide
- Pyroclastic eruptions
- Lahars
- Ash Plume that fell in 11 states
- Total volume of eruption estimated at 5.5 billion cubic yards

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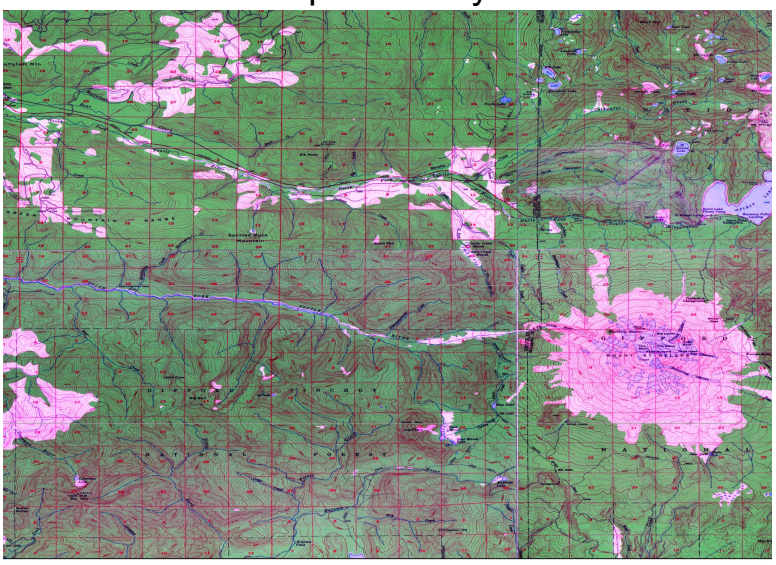
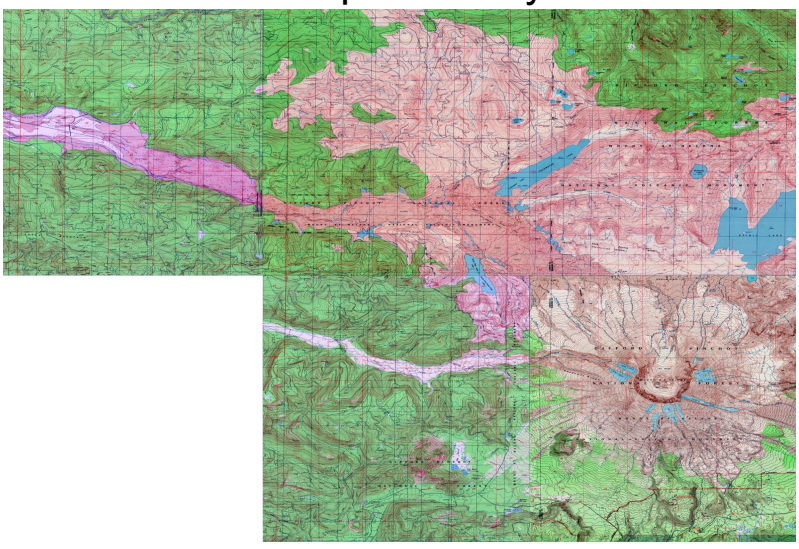
Data

Pre-eruption study area



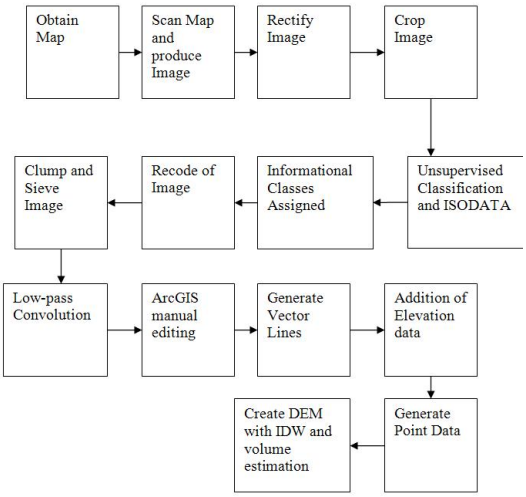
Data continued..

Post eruption study area



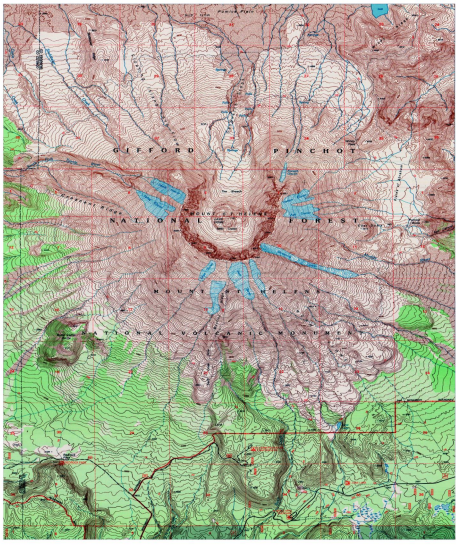
Methods

Digital Image Contour Extraction (DICE)



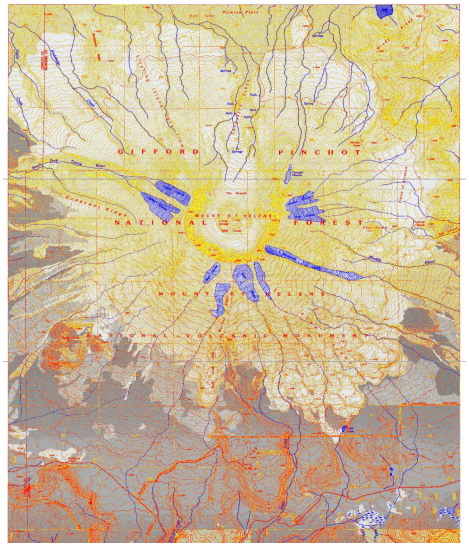
Methods

Cropping

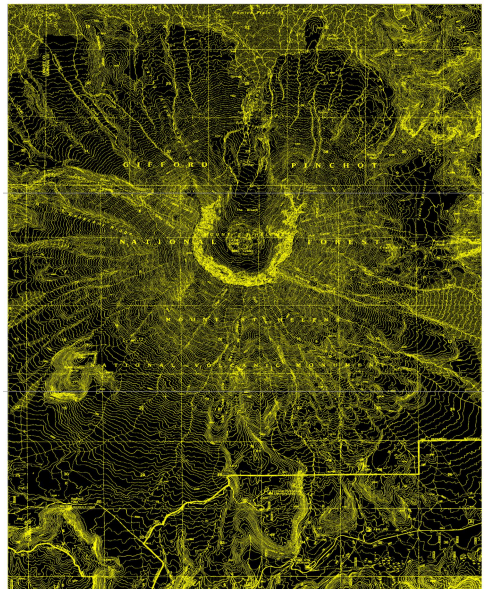


Methods

unsupervised classification and informational classes assigned

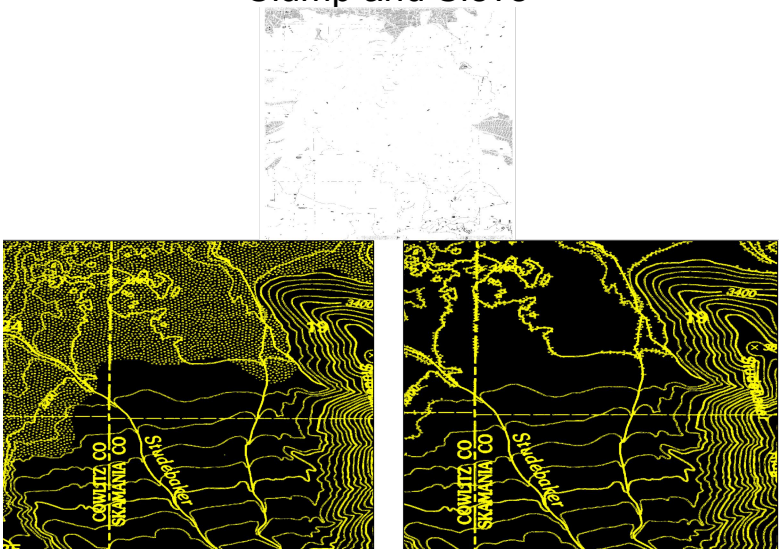


Methods-recode



Methods

Clump and Sieve



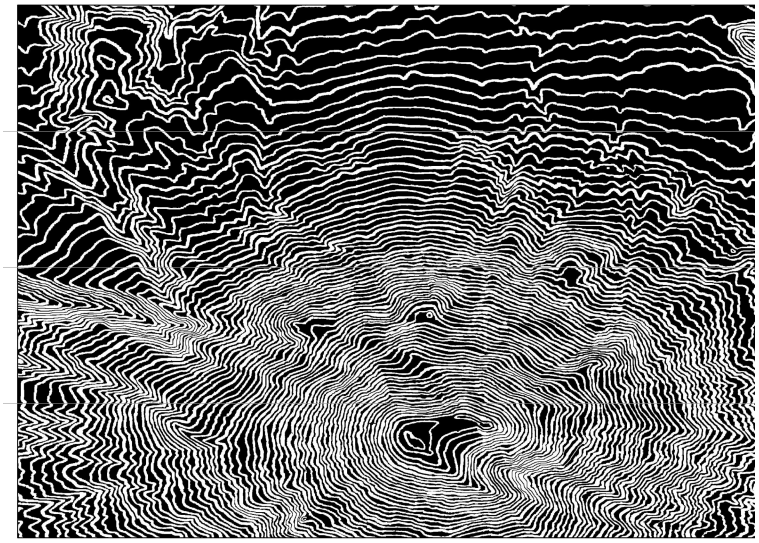
Methods

Convolution-low pass

1	1	1
1	0	1
1	1	1

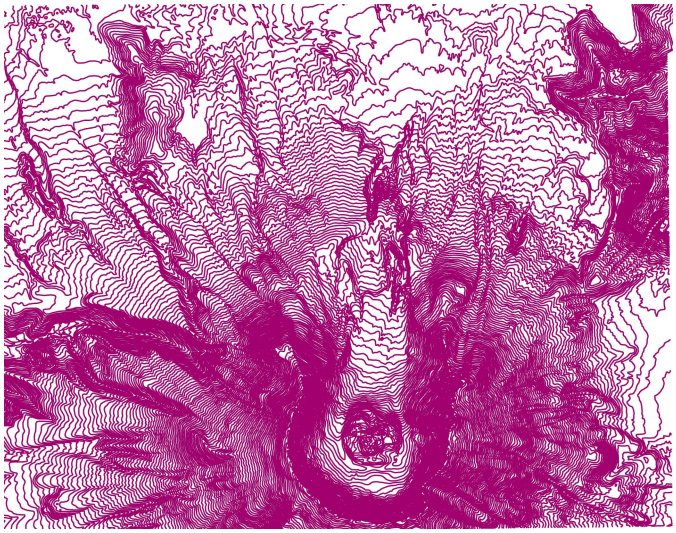
Methods

Raster image clean up



Results

Vectorization and addition of elevation data



Conclusion

- Unsupervised classification at 160 classes was necessary to differentiate between pixel colors
- Recode, Clump, Sieve, Reverse Recode, and Convolution vital tools
- Generation of Vector lines successful

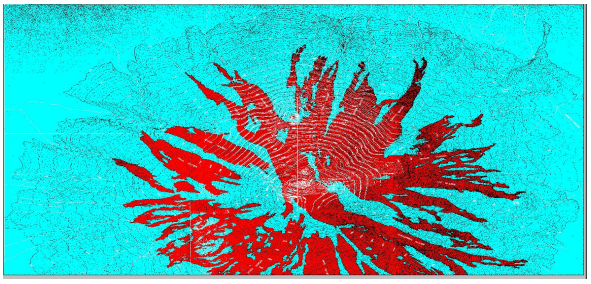
Limits of the DICE process

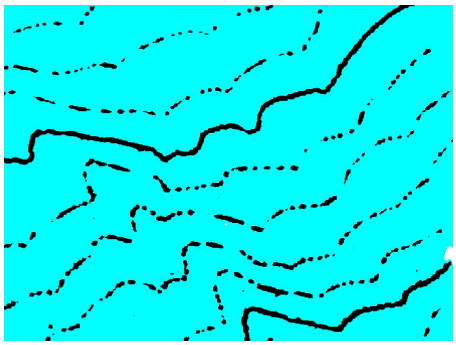
1:10,000 pre eruption map of Mt. St. Helens

Limits continued..

Zoomed in contour lines

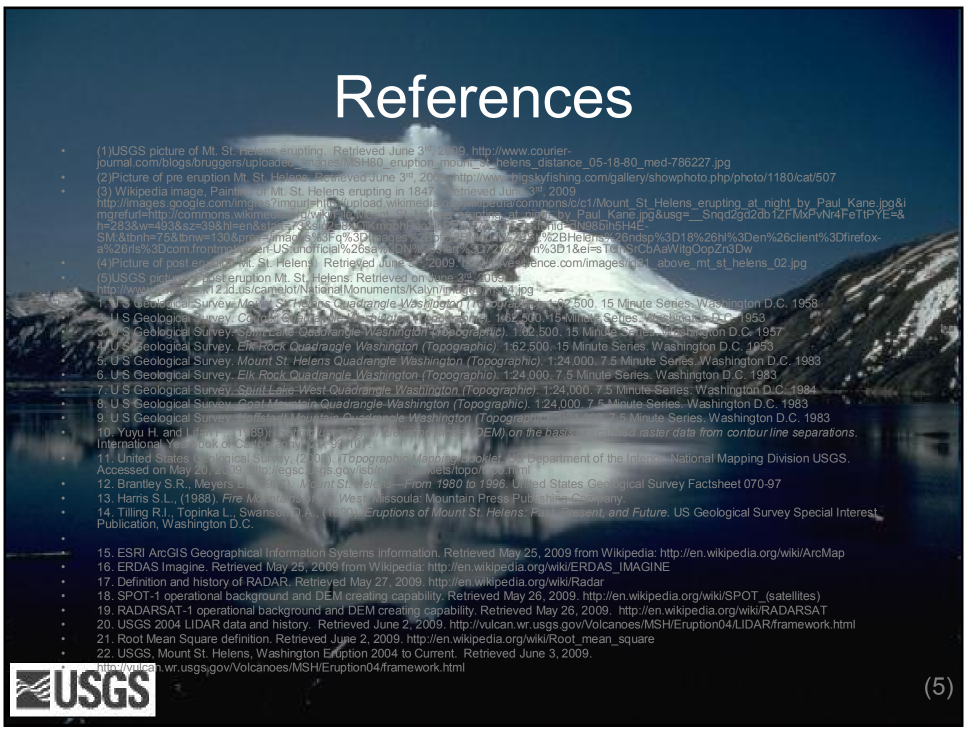
Attempts with Photoshop





Some final thoughts

- Adobe Photoshop was unsuccessful at correcting our most detailed map thanks to its dithering printing process
- Perhaps a more skilled technician could have made our map work
- This method of elevation contour generation is superior to heads up digitizing but process must be refined for it to also save time



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