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Delineation of Watershed Regions Supplying Spirit Lake at Mount St. Helens, WA

Cameron Marshall
cmars637@uw.edu

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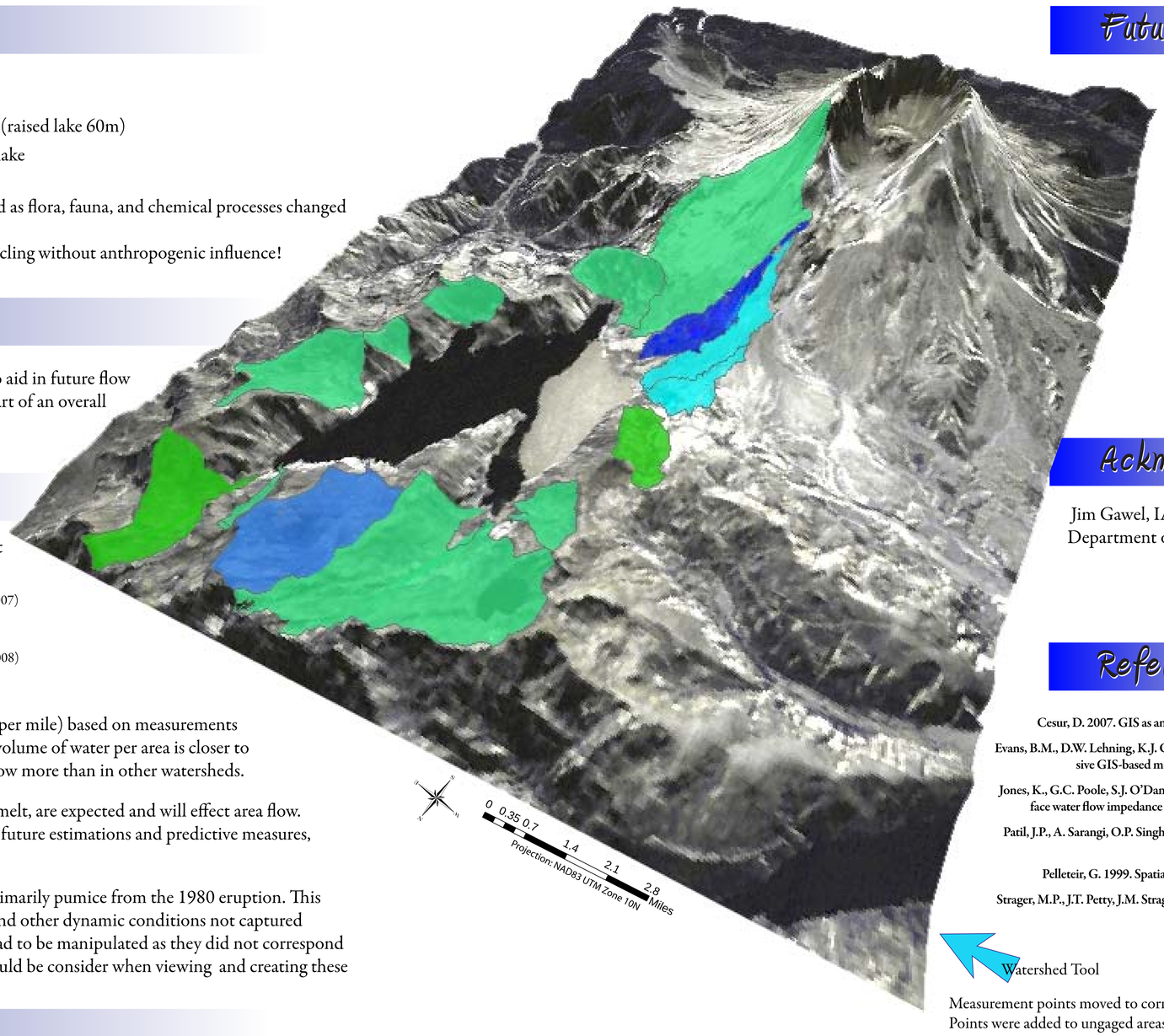
University of Washington, Tacoma Undergraduate
GIS Certificate Program



Background

SPIRIT LAKE

After 1980 eruption:

- Lake shallower and more surface area (raised lake 60m)
- Large amounts of nutrients added to lake
  - o Increased nearshore productivity
- Nutrient cycling in lake likely changed as flora, fauna, and chemical processes changed

A unique research opportunity to study nutrient cycling without anthropogenic influence!

Purpose

To develop watershed regions around Spirit Lake to aid in future flow and nutrient load calculations and estimations as part of an overall nutrient cycling model for the lake.

Discussion

GIS has been used in recent watershed development models to:

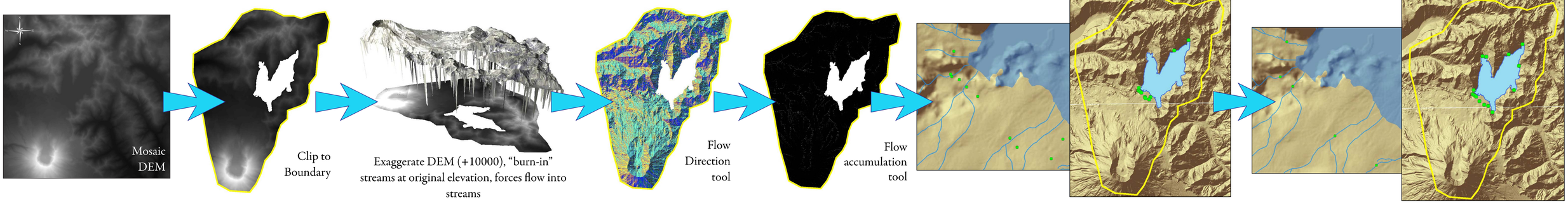
- develop dynamic floodplain mapping (Cesur 2007)
- aid in restoration efforts (Strager et al. 2008)
- predict nutrient loads in wetlands (Evans et al. 2008)
- estimate surface water flow (Patil et al. 2008)

This map represents a snapshot of the area flow (cfs per mile) based on measurements made on August 15, 2008. As expected, the largest volume of water per area is closer to the mountain, where deep snowmelt likely effects flow more than in other watersheds.

Seasonal differences, due to precipitation and snowmelt, are expected and will effect area flow. However, the watersheds developed can be used for future estimations and predictive measures, with the use of further integrated analysis.

The geologic makeup of the southern shoreline is primarily pumice from the 1980 eruption. This makes it highly susceptible to shifting streambeds and other dynamic conditions not captured through a GIS. For instance, measurement points had to be manipulated as they did not correspond to the stream layer available for download. This should be consider when viewing and creating these watershed maps.

Methods



Measurement points moved to correspond to nearest burned-in stream from stream layer for watershed development. Points were added to ungaged areas of stream system to develop watersheds in these regions for estimating area flow.

Future Work

As this project is part of an overall nutrient budget at Spirit Lake, nutrient concentrations will need to be applied to each watershed and integrated into the model.

Future work should also look at the following:

- Use of LiDAR (when available) for more detailed analysis (Jones 2008)
- Seasonal views of watersheds
- Ground-truthing — more stream measurements
- Development of more watersheds over area
- Average geology and precip of watersheds and snowmelt
- Application of process to other watershed areas

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