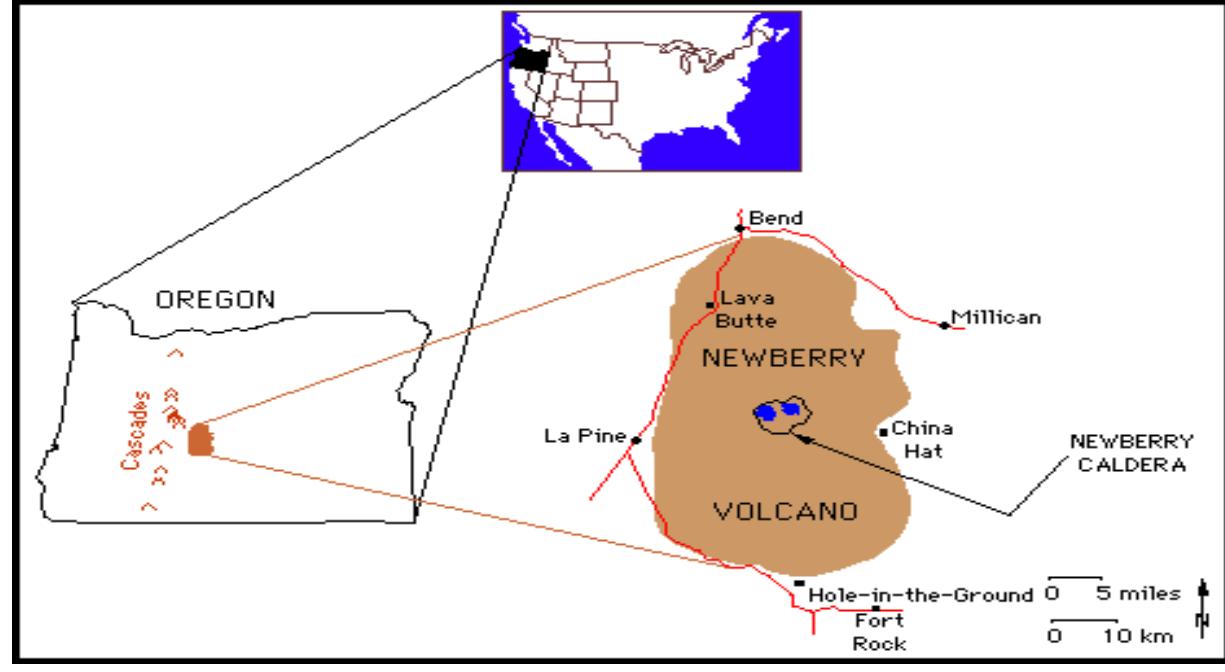


Creating a GIS Database for Newberry Volcano, Central Oregon A Tool for Geomorphic Analysis of Cinder Cone Morphology

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Project Goals and Objectives:

- Create a comprehensive GIS of geologic features at Newberry Volcano.
- Perform morphometric analyses on ~200 cinder cones including dimensions, relief parameters and volume.
- Elucidate spatial and temporal patterns associated with cinder cone distribution and eruptive process.



Newberry Volcano, Oregon
Location: 43.7N, 121.5W
Elevation: 7,986 feet (2,434 m)

Newberry volcano is a broad shield volcano located about 20 miles southeast of Bend in central Oregon. As one of the largest volcanoes in the Cascades, it has been built by thousands of eruptions, beginning about 600,000 years ago. At least 25 vents on the flanks and summit have been active during several eruptive episodes over the past 10,000 years. (<http://www.fs.fed.us>)

Project Summary:

This project provides students opportunities for practical application of GIS software skills combined with geologic problem solving skills.

TOOLS UTILIZED:

Software programs include ArcView GIS, Idrisi, Cartalinx and Surfer.

CREATING THE GEOLOGIC MAP:

The first step in this project involved creating a digital version of the USGS geologic map. With the help of 6 students, the map was digitized over a period of three terms. This labor intensive process involves vectorizing the map by tracing each line using a digitizing puck and tablet. Each polygon is then assigned attributes in the geospatial database.

The completed geologic map was edited by overlaying the cone polygons on the topographic base, to ensure proper alignment.

SELECTING CONES:

There are over 400 cinder cones in the vicinity of Newberry Volcano; however, only a select set were suitable for analysis.

Cones were selected for analysis based on the following criteria:

- Single cones with one vent
- Intact cones that had not been breached
- Cones with sufficient exposure which have not been covered by subsequent eruptions
- Cones not related to fissure eruptions

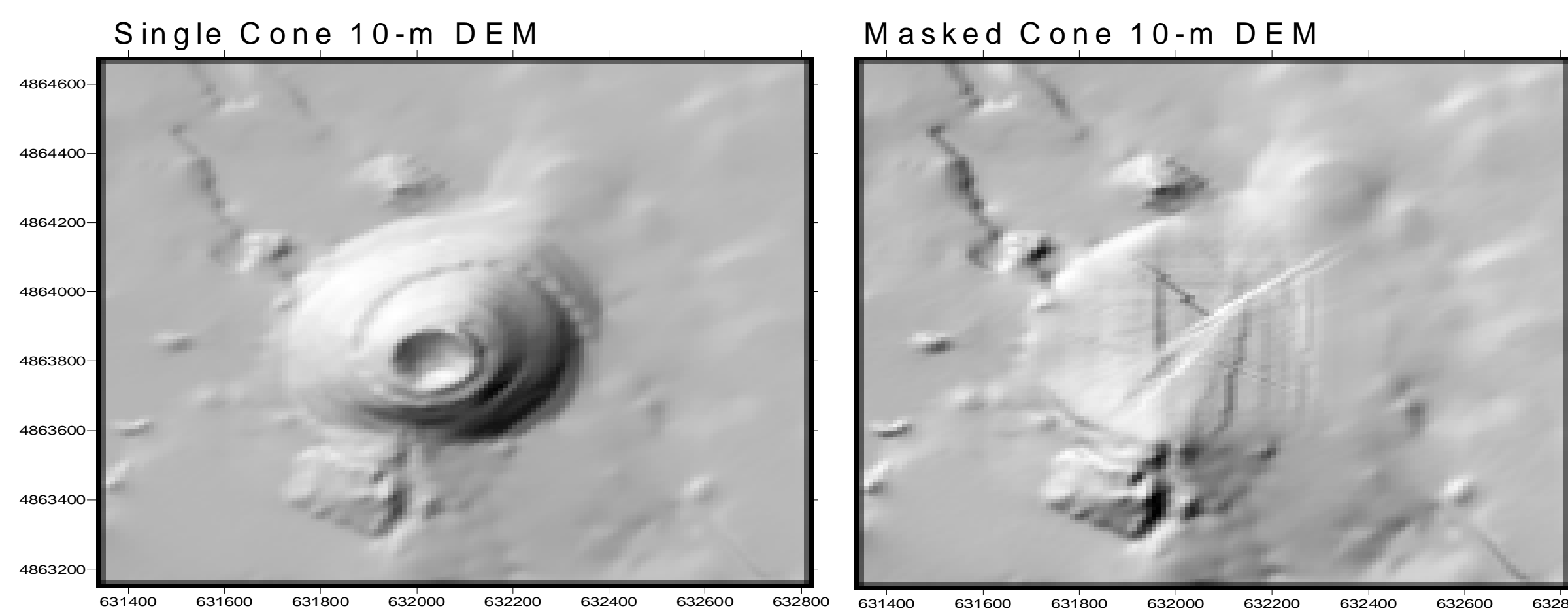
This selection criteria narrowed the number of applicable cones from 400 to 195.

VOLUME CALCULATIONS:

Cone Volume Calculations Involve:

- (1) Clipping a single cone from the USGS 10-meter resolution digital elevation models (DEM).
- (2) Masking the cone DEM to remove the cone surface.
- (3) Subtracting the masked DEM from the cone DEM to derive a volume in cubic meters.

Below is an example of a clipped and masked DEM of Lava Butte, near Bend, Oregon. This process must be repeated for each cone in the selected data set.



CONE MORPHOMETRY:

Morphometric Measurements Include:

- (1) Digitizing mutually perpendicular long and short axes for each of the selected cones.
- (2) Determination of total relief, dimensional ratio and slope as derived from the digital elevation model.

ANALYTICAL OBJECTIVES:

Once all volumes and morphometric parameters have been calculated, statistical analyses will be used to delineate both spatial and temporal trends. These results will be used to provide a morphometric basis for constraining the relative ages of numerous cinder cones at Newberry Volcano.