The Geomorphology of the Ten Mile Terrace, Boise, Idaho

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METHODS
This study uses five methods:
1. soil hand texture, using the USDA soil descriptions;
2. sand, silt, clay grain-size distribution using a laser-based soil-particle measuring instrument;
3. geochemistry (yet to be completed) was assessed and reviewed using a pXRF and XRD
4. gravel size distributions were measured using a gravimeter with graduated size openings, and cobbles are measured along three axes; and
5. developing 4-meter contour maps to identify paleo-stream channels and valley terraces.

BACKGROUND AND PRIOR STUDIES
The Ten Mile terrace is the oldest terrace in the Boise River valley, with an estimated age of 1.7 Ma. The terrace covers an area of about 83 km² along the southern edge of Boise, Idaho with an overall length of about 19 km and a maximum width of about 5 km.
The Ten Mile terrace was deposited over the Plio-Pleistocene Glens Ferry Formation. The upper surface exhibits obvious patterned ground, possibly related to permafrost conditions, and is mantled with loess 1-2 m thick in places (Othberg and Stanford, 1992).
The deposits of Ten Mile terrace include a range of clasts from silt, sand, and gravel, to pebbles and cobbles comprised of quartz, albite, calcium and orthoclase feldspars, and muscovite. Othberg and others (1990) describe the gravel clasts as dominated by granitic rocks and porphyritic felsites from the Cretaceous Idaho Batholith Atlanta Lobe.

Othberg (1992) describes the gravel deposits as imbricated fluvial sediments, with cut-and-fill channels, inclined bedding and cross bedding that are interbedded with sand lenses. Savage (1958) suggests they are the depositional products of high-magnitude discharges flowing from the Boise River catchment that originates in the Atlanta area in central Idaho.

OBSERVATIONS AND EARLY INTERPRETATIONS

Top image (A) shows the surface of the 30-meter exposure of the Ten Mile Terrace at the Pleasant Valley Gravel Company operations. The apparent elevation perspective was derived using centimeter-resolution surface-from-motion imagery collected using an unmanned aerial vehicle (UAV, or drone).

East (B) and West (C) stratigraphic columns are shown with both the original images of the UAV photographic annotations with boundaries between units (shades of brown), and interpretations of unit sedimentology and resistance (bright colors). The imagery shows six depositional units - each has a fining-upward sequence that initiates with cobbles, transitions to sand and gravel, and ends with sand. Such sequences are often associated with migration of a channel in a braided or meandering stream system. Thickness of the each horizon is thought to be the result of the duration of depositional processes and indicate rate of channel migration.

Initial observations of clast mineralogy found no basaltic material, suggesting that deposition either occurred prior to Pleistocene volcanic activity observed in the region, or the path of the channels did not intersect any existing volcanic bedrock. Initial observations of sands, gravels, and cobbles suggest they are recycled material, predominantly early Pleistocene deposits, from the Boise Front and the Atlanta Lobe of the Idaho Batholith underlying the upper Boise River catchment.

The 30-m exposure is capped by up to 1.5 m of loess - it has a weakly developed soil profile with CaCO₃ present throughout and a noticeable carbonate layer (presence of calcium carbonate indicates develop loess deposition for an extended time.

REFERENCES


