CLAYTON LAKE DINOSAUR TRACKSITE - SURFACE HYDROLOGY ANALYSIS: ESTABLISHING A BASELINE FOR STUDIES OF SURFACE EROSION

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At Clayton Lake in Union County, northeastern New Mexico, an extensive dinosaur tracksite is exposed in the dam spillway. Tracks are present at four stratigraphic levels across the contact of the Lower Cretaceous (upper Albian) Mesa Rica and Pajarito formations. Exemplary tracks in the top sandstone bedding surface of the Mesa Rica Formation are exposed and vulnerable to the elements. Rain is infrequent but can be intense, while runoff from snowmelt can also cause impacts. Photogrammetric data gathered at Clayton Lake have been used to establish a baseline characterization of site surface hydrology in order to assess potential threats that flooding, weathering and erosion may present to ongoing preservation of tracks and traces.

Digital survey data collected in May 2019 at sub-centimeter spatial resolution were used to conduct a hydrological analysis of the site topography. UAS imagery collected from a height of 24 m provided a ground sample distance (GSD) of 0.62 cm, superseding the spatial resolution of 10 m DEMs previously available for this site. Pix4DMapper was used to generate an orthomosaic, Digital Surface Model (DSM) and Digital Terrain Model (DTM). ESRI ArcMap 10.6 Modelbuilder and QGIS 3.x were used to conduct a hydrological analysis of the site topography based on the DTM.

This process generated high accuracy feature classes for basins, contours and ephemeral microstream features, all of which permitted a highly detailed characterization of surficial geomorphology across the site. Tracks intersected by surface flow features are potentially the most impacted by runoff because the velocity of runoff is higher in the relatively narrow channels. The analysis determined that about half of the exemplary trackways are intersected by ephemeral microstreams. Many of these are simply grazed by the microstreams, but about 3-4 of them are squarely intersected by drainages that accumulate from significant upstream areas within the watershed. This characterization should assist in the prioritization of tracks for protection against flooding, weathering and erosion. Additionally, the findings of this study provide a baseline for future geologic studies and engineering interventions.

References


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