

Remote Aerial Photogrammetry to Map, Model and Document Rock Outcrops

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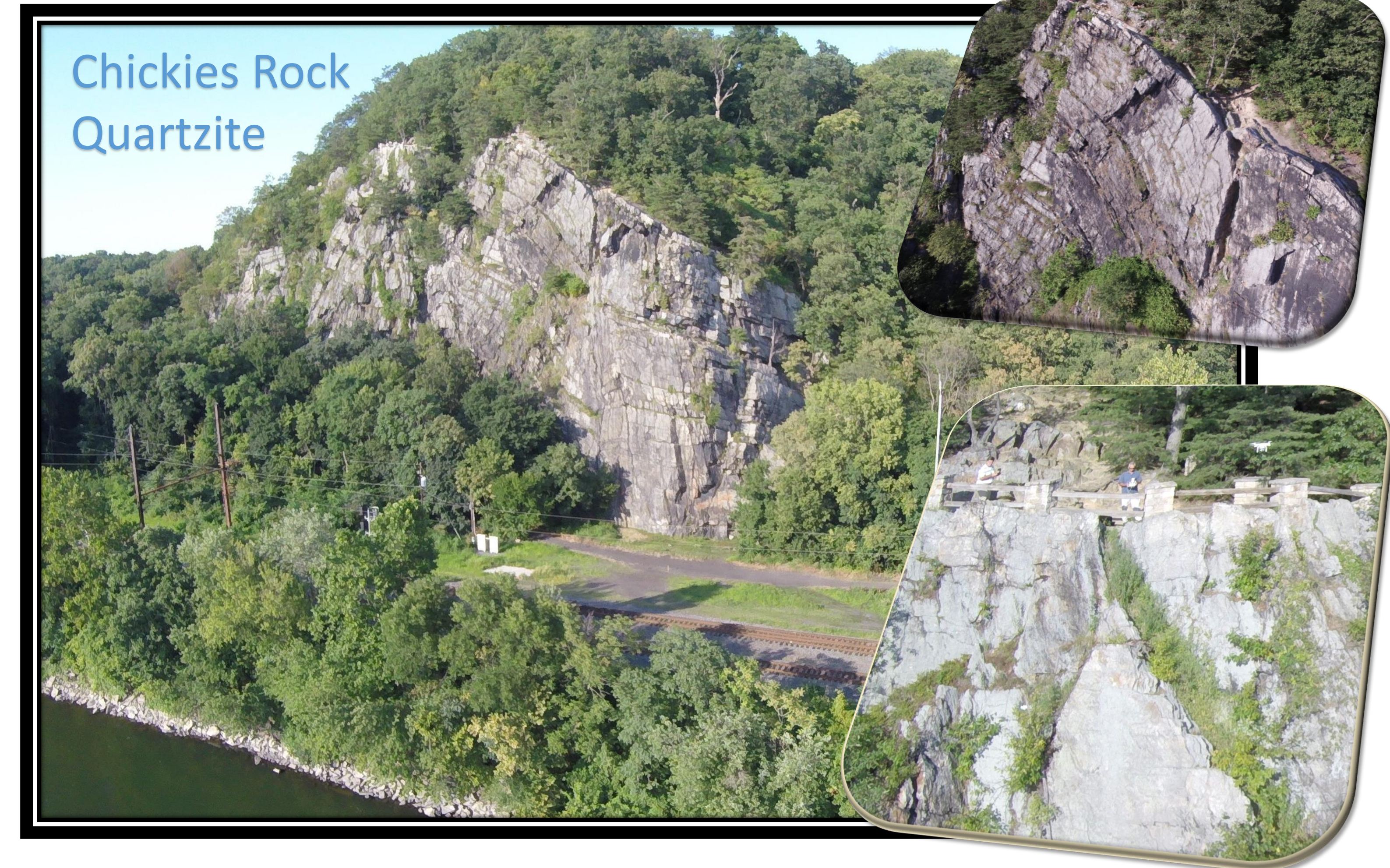


Dyer Quarry

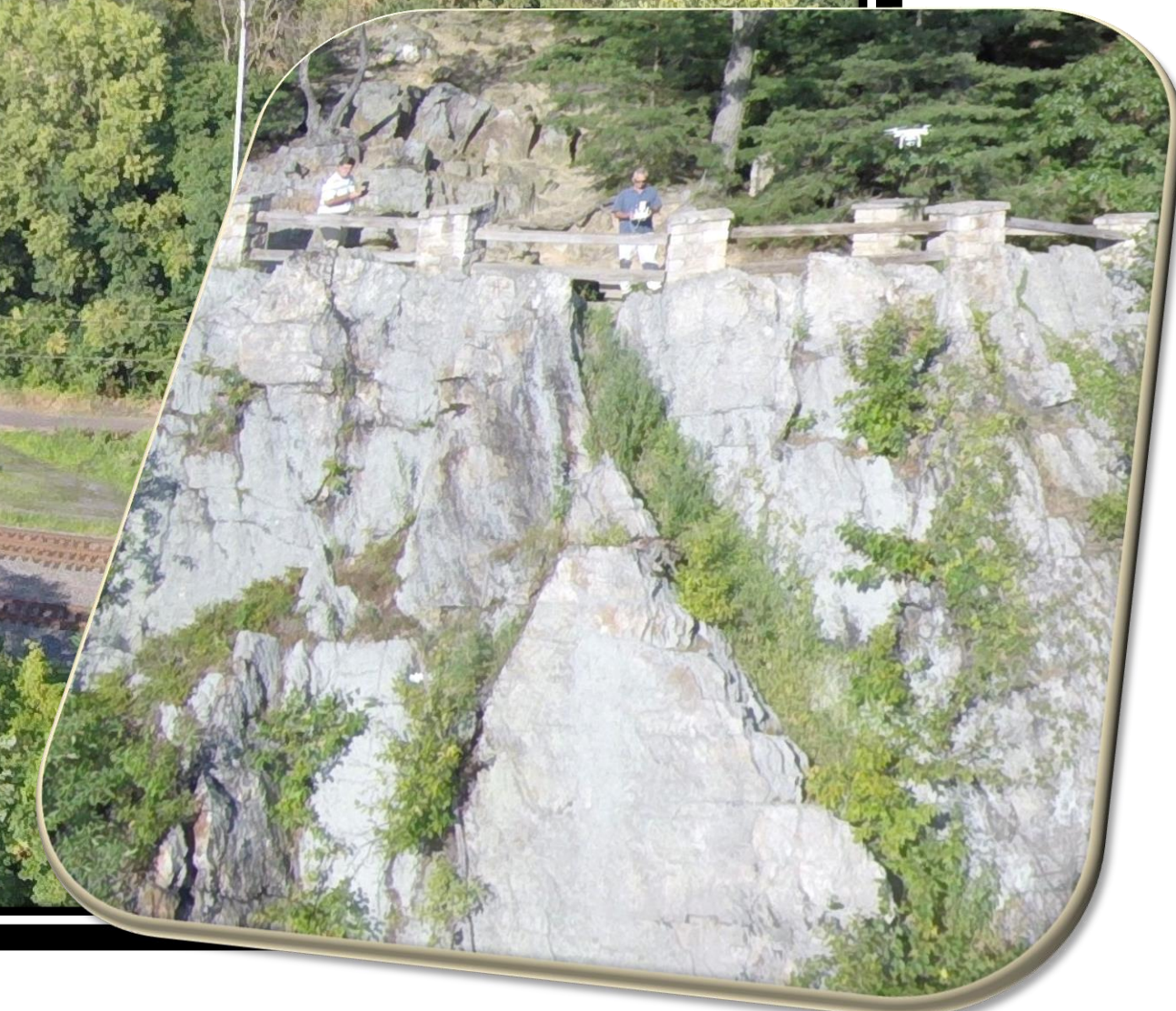


Hammer Creek Fm

Diabase



Chickies Rock
Quartzite



Lambertville Quarry

Photogrammetry and 3D Modelling can be used to analyze such things as structure (anticline above) or volume calculations (quarry below).



Model generated from photographs

Abstract:

Mapping rock outcrops has been the long standing privilege of the field geologist or aspiring geology student. From regional mapping projects to supplementing local site characterizations, valuable knowledge is garnered from observing the local road cut or quarry wall. However, there are times when outcrops are difficult to access and observe. Other times, they are large and require days to cover. Regardless of accessibility, in many cases, it is just helpful to photo-document the outcrop for further desktop analysis or inclusion in later presentations. The popularity of unmanned aircrafts (UAs) or drones has added a new tool for the field geologist. Aerial flights have long been used for ortho-photographs. Now, with the use of UAs, close range, low altitude aerial flights can be used to collect high resolution photographs and video of rock outcrops. Photogrammetry can then be applied to analyze outcrops directly or prepare 3D models. Deliverables can range from basic photo-documentation, to detailed mapping of lithology and structural features. This paper presents an overview of the use of UAs and photogrammetry to observe rock outcrops. Various photographic resolutions and post processing techniques are considered as possible means to measure basic field geology structures such as strike, dip, bed thickness, and joint patterns. Case studies and photographic examples of several outcrop sites are presented.