

Classic Geologic Outcrops: Preservation and Future Accessibility

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INTRODUCTION

Geologists are privileged to work in some of the most remarkable, beautiful, and remote areas on the Earth. As professionals, we must care for important outcrops so they can continue to enlighten and educate earth scientists well into the future. Rock archives of valuable information, and access to these outcrops, can be destroyed by a few thoughtless actions. Accessible, exemplary geologic sites are visited by numerous individuals and field-trip groups each year. The consequences of unauthorized access, and the impact of rock hammers, painted section numbers, drill plug holes, and other evidence of increasing visits to these classic sites has serious consequences. In order to protect continued access for students and researchers, we, as a geologic community, must act responsibly by getting proper permits where required, conserving and protecting classic localities, and respecting land-use rules. In the following, we discuss a few examples of the preservation and accessibility of classic outcrops we have studied for years, recognizing that similar issues are prevalent globally.

GEOCONSERVATION, ETHICAL ISSUES, AND CHALLENGES

Geoconservation focuses on recognizing and preserving unique sites and landscapes that have important scientific value and add to our quality of life. Some efforts have resulted in global designations for UNESCO Geoparks and World Heritage sites (e.g., O'Halloran et al., 1994; Burek and Prosser, 2008). The U.S. National Park Service protects many beloved landscapes, but other public-owned lands with remote sites are difficult to manage with limited resources. Vandalism of outcrops on public land has occurred on classic sites, such as the exposure of the Moab fault in Bartlett Wash near Moab, Utah, USA (B. Trudgill, 2017, pers. comm.). In this instance, people without required permits from the U.S. Bureau of Land Management (BLM) cut a chunk of rock with deformation bands from a pristine outcrop exposure adjacent to the fault, leaving a gaping hole (Fig. 1).

At another highly visited locality (Tuscher Canyon) in the Book Cliffs, numerous drill holes were cut into world-class exposures of hummocky cross-stratified sandstone of the Cretaceous

Blackhawk Formation (Fig. 2). The scarring is permanent, despite later efforts to fill the drill holes.

Sadly, these are not isolated incidents. Great outcrops deserve respect. We must protect Earth's library of information; a photo is never the same as seeing a geologic feature in outcrop. While modest and discreet sampling of some outcrops is critical to advancing our science, there is no legitimate reason to deface a classic outcrop.

Numerous classic outcrops on private land have been accessed by geology groups for decades, and are important for teaching basic concepts and skills to the geologic community (Mogk, 2004). A prime example is the Cretaceous of the northern Book Cliffs, near Helper, Utah, USA. Numerous field trips routinely stop at Gentile Wash (Fig. 3) to observe classic fluvial-dominated delta front and shelf turbidites in the Panther Tongue (Newman and Chan, 1991; Van Wagoner et al., 1990; Olariu et al., 2010), or to see classic wave-dominated parasequences of the Blackhawk Formation (Van Wagoner et al., 1990; Kamola and Van Wagoner, 1995). The number of groups at times makes it seem like you



Figure 1. A well-visited exposure of a splay off the Moab fault near Moab, Utah, USA. (A) The eolian Jurassic Slickrock Member of the Entrada Sandstone (Je) is juxtaposed against the Cretaceous Cedar Mountain Formation (Kcm). Credit: M. Chan. (B) A ~60 cm chunk of slickrock sandstone was cut and removed in 2011 without proper permission and BLM permits. Credit: B. Trudgill.



Figure 2. Unsightly drill holes mar a classic exposure of hummocky cross-stratified sandstone in the Cretaceous Blackhawk Formation of Tuscher Canyon, near Green River, Utah. Credit: D. Stolz.



Figure 3. Many students enjoy the Cretaceous outcrop exposures at the mouth of Gentile Wash, near Helper, Utah, USA. The current property owner has procedures to accommodate field trips with advance written permission.

have to take a number and wait your turn to see these outcrops!

These Cretaceous outcrops are on private property; access now requires a request submitted 30 days in advance and subsequent written permission. Recently, a group with students parked unauthorized vehicles on the property. When asked by an agent of the owner if they had permission to be on the property, the group said that they were associated with a local state university (an unverifiable claim that later put some local universities under scrutiny) and falsely claimed permission to access the outcrops. Although many visitors are well-intended educational groups, continued unauthorized access could jeopardize access for all of us in the future.

LOOKING FORWARD

As GSA continues to look at issues of both geoh heritage and ethics, it is important that our society helps educate the membership on field conduct that is in the best interest of our whole community. We make three specific recommendations:

1. Act responsibly, remediate sites, and whenever possible leave no trace. Teach outcrop etiquette to students, assistants, or volunteers who participate in fieldwork. Ethical behavior is paramount, because field-trip leaders, faculty, and professional scientists are role models. Unethical behavior could have serious repercussions, such as limiting private land access and, in severe cases, even criminal prosecution (Foss and Liggett, 2016).

2. Understand and follow land-use rules and policies; obtain permission to access outcrops on private land. Specialized details of land ownership can be hard to find. Ways to ascertain property access include (a) contact local or published experts who have previously worked in the area; (b) query state geological surveys; (c) check land ownership plat maps; and (d) consult with government land managers or local law enforcement groups. If in doubt, always ask for permission, because government and private land owners frequently welcome the communication.
3. Uphold high ethical standards for yourself, and encourage your colleagues to do the same. As a community, our good field conduct helps ensure safety, communication, and continued access to classic outcrops. There are many rich localities that we want future generations to be able to visit for an enjoyable learning experience.

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