

**PROJECT TITLE:** A CRITICAL EVALUATION OF THE PALEONTOLOGICAL RESOURCES OF THE TRIASSIC/JURASSIC TRANSITION FOR PURPOSES OF PROTECTION, INVENTORY, AND SALVAGE WITHIN BEARS EARS NATIONAL MONUMENT

**A. PROJECT ABSTRACT:** Sedimentary rocks from the Triassic/Jurassic transition in Bears Ears National Monument preserve one of the only complete geological records of this transition in the world and provide a nationally significant look into this time when dinosaurs went from a minor ecosystem component to the dominant form of terrestrial life. Although the region has only been sparsely studied, ongoing work from the Museums of Western Colorado and its partners have documented new fossil sites and specimens previously unknown to science. This preliminary work has just scratched the surface of the available rock, meaning that the BLM's job of protecting, interpreting, conserving, and salvaging these resources is not able to be fulfilled with full knowledge of the resources present. A preliminary, systematic inventory of the available rock outcrops from the Triassic/Jurassic transition is critical for understanding the fossil resources present within the monument, how best to protect those resources, and studying their significance to the prehistoric history of Utah and America in general. This inventory will provide significant value to the public because the fossils discovered by it are the foundation for internationally-recognized scientific research. Additionally, these fossils will reach tens of thousands of people in the state of Colorado, nationwide, and internationally through our museum exhibits, public programs, school programs, and the resultant popular media exposure.

**B. KEYWORDS:** Paleontology; Resource Management; Fossil; Triassic; Jurassic; Outreach

**C. RESEARCH THEMES:** (A) *Research Identified in Unit Science Plans* and (C) *Standardized Inventory and Monitoring*

**D. NLCS LANDS:** Bears Ears National Monument

## **E. INTRODUCTION**

When President Barack Obama proclaimed the Bears Ears National Monument (BENM) on December 28<sup>th</sup>, 2016, he specifically singled out the paleontological resources of the Bears Ears region. "The paleontological resources in the Bears Ears area are among the richest and most significant in the United States, and protection of this area will provide important opportunities for further archaeological and paleontological study," and that, "The Chinle Formation and the Wingate, Kayenta, and Navajo Formations above it provide one of the best continuous rock records of the Triassic-Jurassic transition in the world, crucial to understanding how dinosaurs dominated terrestrial ecosystems and how our 7:37 PM mammalian ancestors evolved" (Obama, 2016). The proclamation recognizes the importance of this crucial time period for research and preservation. Without a detailed inventory of the fossil resources of the BENM, however, it is difficult to impossible for the land management agencies to effectively fulfil their duties to the resource under the Paleontological Resources Protection Act (PRPA).

Since there currently exists no Monument Management Plan, like those that at Grand Staircase-Escalante National Monument (which direct that critical fossil resources deserve inventory and protection (collection)), this inventory is especially critical. While systematic work on the fossil resources of the BENM has only begun in recent years, several teams have already discovered over 100 significant paleontological sites, mainly from the Indian Creek and Comb Ridge sections of the monument. Still, vast areas of Triassic and Jurassic rocks within BENM have yet to be fully explored and formally inventoried.

The proposed paleontological survey and associated research will also allow for a greater public and citizen scientist understanding of non-anthropological science at BENM and on BLM-managed lands in general. We consider this point to be particularly important as many people from across the region and country do not currently understand that significant paleontological resources exist within the BENM. Furthermore, paleontology is often seen as accessible and therefore is useful as a foundation for better public appreciation of scientific resources on public lands. Results from this collaboration will reach

hundreds of thousands of people regionally, nationally, and internationally, through local visitor center lectures and displays, MWC museum visitation of exhibits with BENM specimens, statewide MWC outreach and education including lectures, classroom visits, and educational kits, and national and international media coverage of the scientific research resulting from this collaboration.

## **F. RESEARCH QUESTIONS/HYPOTHESES**

A systematic paleontological inventory of the significant and unexplored Late Triassic and Early Jurassic bedrock exposures at BENM is needed to identify and protect the fossil resources for which the monument was founded. Additionally, this work will also explore the diversity of life present just prior to and across the Triassic/Jurassic boundary, a time in Earth's history critical to understanding the next 200 million years of evolutionary time. Already our work over the past 4 years has discovered nearly five hundred fossil specimens of species of prehistoric reptile teeth from just one locality within BENM, the richest such deposit found in the state of Utah (Gay, Jenkins, St. Aude, & Azouggagh, 2016), as well as mass-death assemblages and unique cultural associations with fossil remains (Smith, et al., 2016; Gay, et al., 2017), in some cases organisms that are only found within the boundaries of BENM. These paleoecosystems represent the height of pre-dinosaur diversity, just prior to many crocodile-like archosaurs becoming extinct.

Perhaps even more important is the recognition that, at least in surrounding regions like Arizona and New Mexico, the transition between the Triassic and Jurassic ecosystems left many remnant populations and represented an incomplete takeover. We do not know yet if this is due to a gradual faunal change or a sudden one, with relict populations filling voids left by a disaster, only to be outcompeted by dinosaurs. In Arizona and elsewhere in Utah, Early Jurassic deposits show that burrowing near-mammals made up a large portion of the population in the Kayenta and Navajo Formations, though their ancestors have thus far been absent from older Chinle and Moenave deposits. Were these animals in fact present, showing that faunal turnover 200 million years ago was a gradual process, or was there a sudden crisis that is not yet recognized in the rock record?

## **G. RESEARCH METHODS**

**Fieldwork** - We propose to conduct our inventory, monitoring, and scientific collection of Late Triassic and Early Jurassic exposures in BENM, specifically targeting areas that have received little scientific interest in the last four decades. These areas will include the Church Rock Member of the Chinle Formation at Comb Ridge, Fry Canyon, White Canyon, and the Red House Cliffs. These areas have received little attention due to the difficult nature of access to these exposures, though preliminary work has shown that significant vertebrate trace and body fossils are present (Parrish, 1999; Gay, Jenkins, & Lepore, 2016). Work at the head of Comb Wash in the Moenkopi and lower Chinle Formations is also desperately needed as no formal surveying has ever been conducted above Trail Canyon. Initial reconnaissance in the summer of 2015 showed geological features (such as a large, coarse sandstone) that, if confirmed, would definitely tie the Chinle Formation at Comb Ridge into the larger geological picture within the southwestern United States. The Kayenta Formation at Comb Ridge within BENM is essentially unprospected, though numerous productive sites are known from the stretch of the ridge on the Navajo Nation to the south of the San Juan River. Thoroughly exploring this bedrock unit will demonstrate whether the large synapsids known from younger rocks near Moab had ancestors in the region or whether they were descended from a population that migrated into the area in the Early Jurassic. We will not be focusing on the rich Chinle Formation exposures in Indian Creek and Beef Basin as teams from the Natural History Museum of Utah and the St. George Dinosaur Discovery Site are actively working these areas. In general, the paleontological resources of BENM are imperfectly known; we will focus on exploring these unsurveyed areas; given our success within the last four years of work in the region, we expect that important new fossil localities will be discovered during our inventory.

During summer fieldwork, our crews will walk in teams of two to three across exposed bedrock, recording locality data, via GPS, notebooks, standard field locality forms, and photographs, for all significant fossil resource encountered. Late summer into early autumn would be utilized for additional

inventory work as well as and collection/stabilization of significant specimens that can be legally removed from the field, either under existing or newly issued permits. Collection techniques consist of photo documenting the site and re-acquiring GPS data prior to collection, along with the recording of the rock context and associated fossils. Sites yielding more than one element are mapped using meter grids. Site maps are subsequently digitized for archival purposes. Small one meter by one meter test pits may be used to explore the extent of any *in situ* fossil remains (as per a standard surface collection permit); exposed elements will be removed from the field using standard paleontological field methods and equipment including brushes, dental picks, awls, large picks, chisels, plaster, and burlap.

**Research** – Beyond just beginning scientific research on fossils discovered during the course of this inventory, the MWC team will continue to pursue scientific research and publication efforts on several paleontological topics from BENM. Specific projects include the description of a new taxon of Triassic archosauromorph, led by Gay and former students Xavier Jenkins which is currently in review at PLoS ONE. Also currently in review is a reassessment of the Triassic dinosaur fossil record from Utah which includes a discussion of purported and confirmed dinosaur body fossils from BENM. This project is headed by Jenkins and includes Gay and Museum of Moab director Dr. John R. Foster. We are also in the midst of a detailed description of the most prolific and diverse microvertebrate fossil locality from the Triassic of Utah lead by PI Rob Gay, along with Jenkins, MWC field assistants Taormina Lepore and Diana Azougagh and former student Isabella St. Aude. Gay, Jenkins, and Lepore have also completed a preprint on trace fossils from BENM and it is expected to go out for formal peer review in March of 2017. A new, large vertebrate bone bed from the Bears Ears region is being presented at the Western Association of Vertebrate Paleontologists in February of 2017 by a team lead by Gay, and joined by Jenkins, Lepore, former MWC summer student Dylan DeWitt, and UTPB alum Nathan Van Vranken; this group will be further enhanced by former students Michelle Bowen and Faron Nock, along with MWC Curator of Paleontology Dr. Julia McHugh for the final publication on this project, estimated to be in 2018. A biostratigraphic study of the Chinle Formation at Comb Ridge should also be ready to go out for formal review by late 2018 as well, in a project headed by Gay, Lepore, and Azougagh.

**Data Management** – Data generated by this inventory will be archived digitally as well as, when appropriate, in physical form at the MWC. Specimen and site records will be included in our collections database using the PastPerfect software platform. PastPerfect allows associated records (maps, condition reports, field notes, sketches, photographs, preparation records, etc.) to be associated with localities and specimens. This system also allows for both custom report generation and selective information access via our web portal (which will be fully developed by fall 2017). Site and specimen information will be provided to land managers in spreadsheet (Excel or CSV), .gpx, and MS Word form.

**Public Dissemination, Education, and Outreach** – Fieldwork at BENM will be carried out partially through public high school field camps with local students acting as citizen scientists. PI Gay has conducted such camps in the past, and will bring students from across the region and the nation into contact with the resources of BENM. New discoveries and research are present in all aspects of MWC's public, exhibit, and school programs. Fossils, fossil casts and new research will be added to our on-site docented programs through the MWC Dinosaur Journey exhibit hall and education kits. MWC Dinosaur Journey also has a 'fishbowl' style preparation lab, allowing visitors to see work on BENM specimens as it progresses in real time. Collections work is also featured in our social media outreach efforts along with our annual 'Museum Education Class' which serves as both public education and volunteer training. Our curator of paleontology has expressed a desire to display specimens from the Fry Canyon poposaur, once it is cast, in our permanent exhibit hall. Our local BLM partnership website, westernslopeheritage.org, has a web-based public portal so that the public can search some of our collections and see photos of specimens not on display (all sensitive data such as site coordinates are not included in the search results) through our collections management program PastPerfect. Finally, the research team is active in publishing scientific results in a variety of technical journals (with a preference for Open Access). At the time of publication we will issue press releases and media packets that accurately summarize the new discoveries and research that will come from the BENM-MWC partnership.

**Mitigation of Resource Degradation** - To prevent the degradation or destruction of both previously discovered and newly uncovered fossil resources, MWC teams will prioritize collection and conservation of significant fossil specimens that are deemed to be at risk. This work will be done in consultation with BLM Canyon Country district paleontologist ReBecca Hunt-Foster. All newly located paleontological sites shall be evaluated for risks to the resource. These management recommendations will be forwarded to BENM and the BLM Canyon Country district paleontologist as part of our annual report. Any localities that are at risk to vandalism or degradation from visitor traffic will be brought to the BLM Canyon Country district paleontologist's attention sooner than the annual report. We shall also continually re-visit previously-located sites to monitor the condition of known paleontological resources.

**Project Evaluation** - The project will be fully successful if MWC & BENM jointly monitor 25 sites and inventory 1,000 acres. Also, fieldwork at the five to ten sites estimated to need collection will be finished by November 2016. In addition, the submittal of the two manuscripts and final report with GIS data must be made by March of 2018. A moderately successful outcome would be if only 75-80% of the targets for monitoring, collection, and inventory were met and only one exhibit and one paper finished, however this is at full funding levels (\$25K). If the project were not successful, we would see 60% or less of each target accomplished and neither a paper nor exhibit submitted.

MWC work will be monitored by the BLM Canyon Country district paleontologist, pending the hiring of a permanent BENM paleontologist. This person will monitor fieldwork progress and ensure that we are meeting our goals with respect to the timeline and objectives outlined above. Prior to the proclamation of BENM, we have been in contact with the BLM Canyon Country district paleontologist on a weekly to monthly basis.

## H. RESULTS TO DATE

**Resource & Scientific Significance** - Teams led by PI R. Gay have logged a total of 41 days of fieldwork (around 3,500 person hours) of fieldwork within the boundaries of BENM within the last four years. During this time, the fossil localities at Comb Ridge have gone from two prior known localities to over two dozen. These localities include the oldest vertebrate trace fossils from Comb Ridge, the youngest phytosaur specimens from the southern Bears Ears, the richest microvertebrate site in the Triassic of Utah, and the only plant remains from BENM from the Triassic/Jurassic boundary at the Wingate Sandstone. Additionally, work conducted by Gay and others has begun to expand our knowledge of Late Triassic vertebrates in the Fry Canyon and White Canyon areas, regions previously left virtually untouched since the late 1980s when only preliminary survey work was undertaken.

**Public Value** - The results of the proposed collaboration between BENM and the MWC will easily reach tens of thousands (if not hundreds of thousands) of people across the region, country, and the world. Although research into the Triassic/Jurassic transition of BENM is in its infancy, we have already begun advancing many manuscripts towards publication from the region. These include work on the 'Hills Have Teeth' microvertebrate locality and its fauna (Gay & St. Aude, 2015; Lopez, et al., 2015; Gay, Jenkins, St. Aude, & Azouggagh, 2016; Gay & Jenkins, In review; Jenkins, Foster, & Gay, In Review), along with trace fossils (Gay, Jenkins, & Lepore, 2016), and a new bonebed of rare poposaur fossils (Gay et al., 2017). We have specifically targeted open-access journals where possible so that our results are made available to the public at large; the papers and preprints that have already been produced by our team on this area (Gay & St. Aude, 2015; Lopez, et al., 2015; Gay, Jenkins, & Lepore, 2016) that are currently available via OA have reached nearly 4,000 people, and news articles based on these discoveries and the unique collaboration between the research team and high school students have reached tens of thousands across Arizona, Utah, and Colorado. Social media coverage of our Bears Ears work over the last year and a half has resulted in us reaching nearly 20,000 people. This is especially significant as it exceeds the social media reach of many comparable and even larger museums across the region with similar content. In fact the MWC's most-viewed piece of social media content ever is a Facebook live video of Gay preparing a poposaur vertebra from the Bears Ears region, beating all other MWC social media content by an order of magnitude.

In addition to their research and scientific values, the fossil discoveries from BENM can be used to educate the public about science on federally-managed lands, the evolution of life on Earth, and our changing planet. These concepts are directly brought up in the MWC Dinosaur Journey exhibit gallery in Fruita, Colorado and plans exist to not only expand this facility but also to incorporate new discoveries from BENM into this exhibit space. Between 40,000 and 45,000 visitors tour our exhibit hall every year, with a large proportion of them being from outside the region (44% from outside the Western Slope, 30% from outside Utah and Colorado all together). This means we have an impact on the national understanding of the value of public lands paleontology disproportionate to our size.

## **I. BENEFITS FOR LAND MANAGEMENT**

**Resource Inventory** – This proposed cooperation is focused on creating a comprehensive fossil inventory of the southern portion of the BENM. Without such an inventory, effective management of the resource becomes difficult to impossible and may result in actions that inadvertently violate PRPA. As management of a resource requires a solid understanding of the resources present, their distribution, and risk to degradation and destruction, we propose that this partnership would help land managers accomplish their management goals. The existing work on the Triassic/Jurassic transition in southern BENM has surveyed less than 10% of the available exposure. Based on the success of the limited work thus far, it is likely that numerous significant localities remain undocumented. Considering the time to success ratio we have seen in the past, there are possibly tens of thousands of undocumented significant fossil sites from within the southern BENM pertaining to the Triassic/Jurassic transition alone. It is imperative to inventory as much of the un-examined exposure as possible.

**Resource Protection** – Fossils resources, by their nature, are fragile and irreplaceable. Erosion can cause the degradation of paleontological resources regardless of human impacts; however, some human activities can accelerate this resource destruction. Establishment of a paleontological resource inventory will help mitigate both sources of resource destruction. Fossils we identify as significant will be collected and housed in perpetuity at the MWC's Dinosaur Journey facility, the accredited and BLM-certified paleontological repository closest to BENM. There additional conservation can occur, including preparation, archival preservation via various adhesives, and eventual archival storage, display, and/or casting.

**Outreach and Education** – As Curator of Education, PI Gay is in a unique position to ensure that all research and specimens that end up in permanent collections will become part of the education and outreach work of the MWC. Not only will new outreach materials be produced for use in San Juan County schools covering the materials recovered from this inventory, but student and youth outreach is an important keystone of the paleontological inventory's fieldwork and research plan. Students working under Gay have already demonstrated the ability to conduct scientifically rigorous fieldwork as well as technically detailed, publishable research. Engaging the next generation of students in STEM fields in both classroom settings (with outreach kits), museum exhibits, and as an embedded part of fieldwork makes this proposed program and partnership unique.

## **J. DETAILED TIMELINE**

*Spring 2017:* Background research, planning, and coordination with BLM field offices and interim management of BENM.

*Summer 2017:* Fieldwork in BENM to inventory fossil resources. Tasks include systematic prospecting to identify new fossil sites, evaluation of these sites, and excavation of those sites under risk. This work will be undertaken by crews of trained staff and volunteers from the MWC and Utah Friends of Paleontology.

*Fall 2017:* Preparation and curation of collected specimens at the MWC.

*Winter 2016-2017:* Final preparation and submission of interim report to BLM.

*Spring/Summer 2018:* Second season of fieldwork to inventory complete inventory work as laid out in this proposal.

*Fall 2018:* Preparation and curation of collected specimens at the MWC.

*Winter 2018:* Final preparation and submission of final report to BLM

## K. BUDGET

The MWC will provide matching contributions through the salary of the PI, Field Assistant, and undergraduate interns, volunteer time in excavating, preparing, conserving, and curating fossil specimens, and the supplies and materials needed for fieldwork (inventory and excavation) and preparation.

**PI summer salary** – The Principal Investigator (PI) Gay from MWC will dedicate at least one month during 2017 and two during 2018 of his working time toward achieving the goals outlined herein.

**Field Assistant salary** – The field assistant will spend at least three months directing fieldwork during the summer of 2017 and 2018. This allows completion of the goals set forth in the proposal.

• PI summer salary + 40% fringe benefits	\$7,680
• Field assistant salary + 40% fringe benefits	\$4,608
<b>Total Salaries</b>	<b>\$12,288</b>

• excavation supplies	\$1,500
• mapping supplies	\$500
• camping supplies	\$1,500
• vehicle fuel	\$1,600
• food	\$2,000
• collections cabinets and curation supplies	\$1,600
<b>Total Fieldwork and Supplies Costs</b>	<b>\$8,700</b>

<b>SUBTOTAL</b>	<b>\$23,028</b>
-----------------	-----------------

Total Direct Costs:	<b>\$20,988</b>
Total Indirect Costs (8.8%):	<b>\$ 3,883</b>
Total Costs (this budget):	<b>\$24,871</b>

### Matching Contributions from MWC

*PI Salary:* The MWC contribution of salary + fringe benefits for 3 months of summer salary of the Principal Investigator is worth \$1,920.

*Field Assistant Salary:* The match of salary + fringe benefits for 3 months of the Field Manager's salary is worth \$3,192.

*Undergraduate Internships:* Two undergraduate interns from regional institutions will spend at least 8 weeks working on the project. These interns will be funded by the MWC, and represent a total of \$5,000 in matching funds (\$2,500/intern).

*Volunteer Time:* MWC and UFOP paleontology volunteers will spend at least 2,000 hours of work time in the field and lab dedicated to the proposed project. Calculated at an hourly rate of \$23.00 including benefits for the private sector, these volunteer hours are worth \$46,000 as matching funds.

*Field Supplies:* The MWC has the majority of the needed major equipment and supplies for conducting successful paleontological inventory and excavation. Equipment already owned by the MWC, including vehicles, would cost at least \$80,000 to purchase.

*Preparation Supplies:* All fossil specimens collected require proper preparation (removal of surrounding rock matrix) and conservation in the lab prior to accession into collections and long-term curation. The MWC has a large and well-equipped, and staffed paleontology preparation lab suitable for this task. Preparation requires specialized equipment and supplies, including picks, brushes, pneumatic tools, glues, stabilizers, etc. These equipment/supplies are worth \$5,900 as matching resources.

### Matching Contributions from other sources

*Field Assistant Salary:* A grant through Canyonlands Natural History Association has allowed one week of field assistant work in the field and benefits, valued at \$950.

*Field vehicle fuel:* A grant through Canyonlands Natural History Association has already allocated an additional \$150 of fuel expenses.

*Field supplies:* A grant through Canyonlands Natural History Association has already allocated an additional \$1,450 for expendable field supplies including camp food.

Based on our work in association with CNHA we anticipate increased support from them for the 2018 field season to the tune of approximately \$4,900.

#### **L. DELIVERABLES**

This partnership will produce: 1) Digital database of all sites in .gpx format; 2) Annual Technical Report summarizing the field season's work and any significant scientific or interpretative data obtained; 3) Two paleontological outreach kits made with casts of recently collected material from the Bears Ears region to be used as traveling exhibits in the local communities or wherever there is demand for such exhibits, two public presentations, and one site tour; 4) At least two technical papers submitted to peer-reviewed publications.

*Deliverables:* Final report including locality maps and photos, quarry excavation maps, GPS data for all inventoried localities, locality descriptions, detailed lists of specimens excavated and curated, and site-by-site management recommendations. Also included are presentations at scientific conferences, publications in scientific journals, and the dissemination of this information to the public through the Museums of Western Colorado in partnership with the BLM. Collected specimens will be repositated at the MWC's Dinosaur Journey.

#### **M. BLM CONTACT PERSON**

ReBecca Hunt-Foster  
BLM Canyon Country District Paleontologist  
Moab Field Office Youth, Education and Outreach Co-Coordinator  
82 East Dogwood  
Moab, UT 84532  
435-259-2179  
[rhuntfoster@blm.gov](mailto:rhuntfoster@blm.gov)

#### **N. PARTNER'S QUALIFICATIONS**

The project team consists of Robert Gay (Principal Investigator), Dr. Julia McHugh (Curator of Paleontology), Taormina Lepore (Field Assistant), and Xavier Jenkins (undergraduate intern, Arizona State University). The team has over 50 years of field paleontological experience, the majority of it in the Triassic Period. Within southeastern Utah the team has over 15 years' experience in the field and the PI is a recognized expert in the paleontological resources of BENM, having been consulted by the White House on the fossil resources of the area before the designation of BENM. MWC is regionally important natural history museum and a recognized federally-approved paleontological repository.

*Principal Investigator:* **Robert J. Gay**  
Curator of Museum Education  
Museums of Western Colorado  
550 Jurassic Ct.  
Fruita, Colorado, 81521  
Phone: (970) 361-0285  
E-mail: [robertg@westcomuseum.org](mailto:robertg@westcomuseum.org)

#### **O. REFERENCES CITED**

- Gay, R. J., & Jenkins, X. (In review). A reevaluation of *Crosbysaurus* from Utah and the description of a new genus of archosauriform. PLoS ONE.
- Gay, R. J., & St. Aude, I. (2015). The first occurrence of the enigmatic archosauriform *Crosbysaurus* Heckert 2004 from the Chinle Formation of southern Utah. *PeerJ*, 3(e905).
- Gay, R. J., Jenkins, X. A., & Lepore, T. (2016). The oldest vertebrate trace fossils from Comb Ridge (Bears Ears Region, southeastern Utah). *PeerJ Preprints*, 4:e2662v1.
- Gay, R. J., Jenkins, X., Milner, A. R., Van Vranken, N. E., Dewitt, D. E., & Lepore, T. (2017). A New Triassic Bonebed from the Bears Ears Region of Utah. *Western Association of Vertebrate Paleontologists Annual Meeting, Program and Abstracts*.
- Gay, R. J., Jenkins, X., St. Aude, I., & Azouggagh, D. (2016). A new, diverse microvertebrate locality from the Lower Chinle Formation of southeastern Utah (USA). *Journal of Vertebrate Paleontology Program and Abstracts*, 143.
- Jenkins, X., Foster, J., & Gay, R. J. (In Review). A Review of the Triassic dinosaur record from Utah (USA). *Acta Paleontologica Polonica*.
- Lopez, A., St. Aude, I., Alderete, D., Alvarez, D., Aultman, H., Busch, D., . . . Gay, R. J. (2015). An unusual archosauriform tooth increases known tetrapod diversity in the lower portion of the Chinle Formation (Late Triassic) of southeastern Utah, USA. *PeerJ PrePrints*, 3(e1828).
- Obama, B. (2016). *Presidential Proclamation -- Establishment of the Bears Ears National Monument*. Washington, D.C.: The White House.
- Parrish, J. (1999). Small fossil vertebrates from the Chinle Formation (Upper Triassic) of Southern Utah. *Vertebrate Paleontology in Utah*, 1(45), 1-6.
- Smith, J. A., Hunt-Foster, R., Gay, R., Conner, C., Miracle, Z., & Foster, J. R. (2016). The novel occurrence of a lintel stone containing vertebrate ichnofossils in a Pueblo III structure in Utah. *Geological Society of America Abstracts with Programs*, 147.