SVP
SOCIETY OF VERTEBRATE PALEONTOLOGY
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Society of Vertebrate Paleontology

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Subject: Comments on the boundaries of Bears Ears and Grand Staircase-Escalante National Monuments from the Society of Vertebrate Paleontology

Overview

The Society of Vertebrate Paleontology (SVP, http://vertpaleo.org) is a major stakeholder in US National Monuments, especially the Bears Ears and Grand Staircase-Escalante National Monuments, because of their scientifically important paleontological resources—specifically prehistoric remains of backboned animals. SVP is a non-profit professional organization of more than 2,500 scientists, students, and amateurs whose mission is to advance the science of vertebrate paleontology and to encourage the protection of vertebrate fossils and fossil sites.

We strongly argue for (1) maintaining the existing boundaries of Grand Staircase-Escalante National Monument (GSENM) and (2) expanding the boundaries of Bears Ears National Monument to include the area that currently separates the western-most area from the main part of the monument, because of the scientific importance of the fossil material and associated contextual data coming out of them. The Antiquities Act of 1906 allows for designation of public land as a national monument in order to protect objects of scientific interest. Both Bears Ears and GSENM were established with the express purpose of protecting the exceptional paleontological resources within their boundaries. Thus, from a scientific perspective, it is unquestionable that both monuments are appropriately classified under the Act.

In these comments we present: (1) our views on the consultation process for declaring national monuments; (2) our views on the benefits of public lands in the science of paleontology; (3) specific details on the paleontological resources at Bears Ears and GSENM that justify our conclusion that the boundaries of the former should be expanded and the latter should be maintained; (4) information on the benefit of paleontological science and education at these monuments to the general public; and (5) comments on why mining operations are incompatible with discovery and scientific study of paleontological resources.

1. The role of consultation in establishing National Monuments

It is incorrect to say that Bears Ears and GSENM were designated without coordination with relevant stakeholders. The Department of the Interior and other stakeholders sought SVP's input on paleontological resources in the lead-up to the proclamation of both monuments. Because these areas contain one of the world's richest records of vertebrate life in the Mesozoic and late Paleozoic eras, our organization and the scientists we represent are very important stakeholders indeed. Overall, we were satisfied that our input was considered carefully and that the description of the paleontological resources in the two proclamations was appropriate.

That said, we recognize that the consultation process on National Monuments is much less formalized than consultation on regulations. In our opinion, regularizing consultation when national monuments are designated would be a great benefit from a scientific standpoint. We were seriously concerned at moments in the lead up to the Bears Ears proclamation that the important paleontological resources there would not be mentioned, an omission that could have made it difficult to obtain permits for paleontological research. A formal consultation process would ensure that scientific resources are properly identified and included in proclamation documents, as well as would create a venue for discussion whether those resources are best protected using monument status or some other designation.

We are dissatisfied with the current consultation process on existing Monuments established since 1996 under the Antiquities Act. The short notice for Bears Ears and GSENM especially has made it a challenge for us to compile comprehensive comments. As a major stakeholder, it would be inappropriate for SVP not to be able to comment and the deadline of only four weeks has left us less time than we had when the monuments were originally proclaimed.

2. On the role of public lands in the science of vertebrate paleontology

The science of paleontology benefits considerably from US public lands and the regulations that protect them. Our science requires wide reconnaissance to find appropriate fossil localities and to establish their geologic and stratigraphic contexts, often involving prospecting and mapping of hundreds of square kilometers. This task is much easier on public lands because of the ease with which permission can be obtained for researchers. Furthermore, the regulations that protect vertebrate fossils on public lands, especially the Paleontological Resources Preservation Act of 2009 (PRPA), prevent serious damage to and poaching of fossils that are still in the ground. As described below, important localities in the area that is now Bears Ears were destroyed prior to the area being designated as a National Monument. Please note that we are anxiously looking forward to the final publication of the Department of the Interior's regulations under PRPA, which have still not been published eight years after the Act was signed.

On the whole, National Monument status allows protection of many sensitive paleontological sites and makes it easier for vertebrate paleontologists to conduct scientific research. Obtaining research permits is easier than in landscapes that are a mosaic of public and private lands, or even ones that are subdivided among different federal agencies. The pace of research at GSENM since it was established in 1996 illustrates the value of monument designation to research, with more

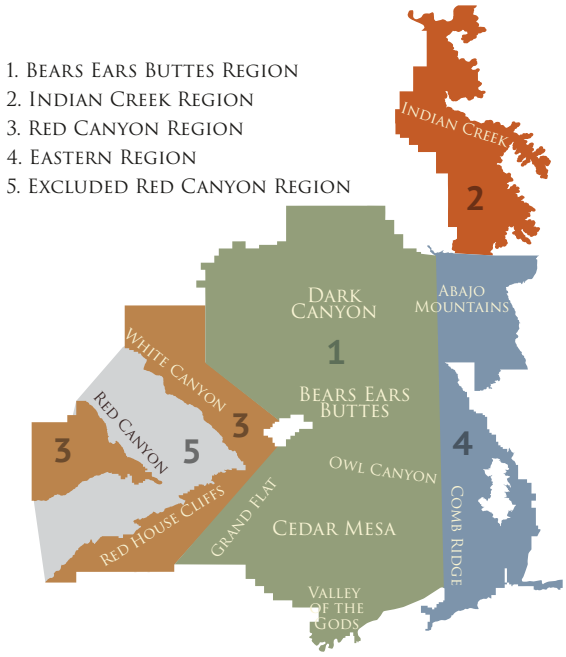
than 2,000 new vertebrate localities and 20 vertebrate species new to science documented since that time.

3A. Bears Ears National Monument

The Bears Ears proclamation of 2016 accurately describes its paleontological resources when it says that they "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." Vertebrate paleontologists have only started seriously studying the fossil record preserved there in the last few years, but already it promises to be as important as GSENM for the data it yields about life in Earth's past, including the history before and after our planet's most massive extinction 252 million years ago (the Permian-Triassic extinction).

The Natural History Museum of Utah in Salt Lake City alone has discovered 149 paleontological localities at Bears Ears since 2013—work that strongly justified the Monument's proclamation. This material includes 339 fossil specimens collected from the Lower Permian Cutler Group and Upper Triassic Chinle Formation). These discoveries were made in field seasons that lasted 1-2 weeks a year here, so the surface is only just being scratched.

All of the areas of Bears Ears contain scientifically invaluable paleontological resources, and thus justify the existing boundaries. Furthermore, the area at the western end that is currently excluded also contains significant scientific resources and deserves to be added to the monument. To justify this point, we have divided the monument into five regions (**Map 1**), each with a broadly similar geology, and describe the resources in each area.



Map 1. Five regions with scientifically important paleontological resources in Bears Ears National Monument.

1. Bears Ears Buttes Region

The central Bears Ears Buttes, Dark Canyon, and Cedar Mesa region contain scientifically invaluable Pennsylvanian and Permian communities that document the history of terrestrial vertebrate life prior to the Permian-Triassic extinction. The area includes spectacular synapsid remains and strange burrows from these early mammal relatives that are still poorly understood. The Valley of the Gods area includes some of the earliest vertebrates to walk on land in America, as well as exquisitely preserved leaf fossils and petrified wood. Fossils exposed along the Honaker Trail provide evidence that this arid landscape was once part of a thriving coral reef during the Pennsylvanian Period.

Byers, B.A., Ash, S.R., Chaney, D. and DeSoto, L., 2014. First known fire scar on a fossil tree trunk provides evidence of Late Triassic wildfire. *Palaeogeography, Palaeoclimatology, Palaeoecology*, *411:* 180-187.

Scott, K., 2013. Carboniferous–Permian boundary in the Halgaito Formation, Cutler Group, Valley of the Gods and surrounding area, southeastern Utah. *The Carboniferous–Permian Transition. New Mexico Museum of Natural History and Science Bulletin*, *60*: 398-409.

Morales, M., 1987. Terrestrial fauna and flora from the Triassic Moenkopi Formation of the southwestern United States. *Journal of the Arizona-Nevada Academy of Science*, 1987: 1-19.

Sumida, S.S., Lombard, R.E., Berman, D.S. and Henrici, A.C., 1999. Late Paleozoic Amniotes and Their Near Relatives from Utah and Northeastern Arizona, With Comments on the Permian-Pennsylvanian Boundary in Utah and Northern Arizona in Gilette. *Vertebrate Paleontology in Utah. Utah Geological Survey, Miscellaneous Publication*, *9*(1): 31-43.

2. Indian Creek Region

This region, along with Red Canyon, hosts one of the best records of the Late Triassic and Early Jurassic periods in the world, a time when the early phase of recovering from the massive Permian-Triassic extinction was ending and a new phase of Mesozoic life was beginning. Early Permian sites in this region have produced well-preserved fossils of the giant amphibian Eryops, and many individuals of the sail-backed early mammal relative *Sphenacodon*. The Indian Creek Region documents the ecology of large carnivorous temnospondyl amphibians in the Moenkopi Formation, and the geologically younger Chinle Formation has produced abundant fossil plants, crayfish and burrows, as well as extinct amphibians and reptiles, such as metoposaurs, phytosaurs, crocodylomorphs, and dinosaurs. Fossil sites in this area were looted before the Monument was established.

Sprinkel, D.A., Chidsey Jr, T.C. and Anderson, P.B., 1995. A Survey of the Paleontological Resources from the National Parks and Monuments in Utah.

Sumida, S.S., Albright, G.M. and Rega, E.A., 1999. Late Paleozoic fishes of Utah. *Vertebrate paleontology of Utah. Geological Survey of Utah Miscellaneous Publication*, *99*(1): 13-20.

3. Red Canyon Region

Along with Indian Creek regions, the Red Canyon Region preserves one of the best records of the Triassic-Jurassic transition anywhere in the world, providing crucial information for paleontologists seeking to understand how dinosaurs came to dominate terrestrial ecosystems during the Mesozoic Era. This area has only just begun to be prospected and it has already produced an incredible range of vertebrate diversity, including enigmatic animals like the armored *Doswellia*.

Chamberlain, C.K. and Baer, J.L., 1973. Ophiomorpha and a new thalassinid burrow from the Permian of Utah. *Brigham Young University Geology Studies*, *20*(1): 79-94.

Dubiel, R.F., 1987. Sedimentology and new fossil occurrences of the Upper Triassic Chinle Formation, southeastern Utah.

Parrish, J.M., 1999. Small fossil vertebrates from the Chinle Formation (Upper Triassic) of southern Utah. *Vertebrate Paleontology in Utah*, 99(1), p.45.

Tanner, L.H. and Lucas, S.G., 2016. Stratigraphic distribution and significance of a 15million-year record of fusain in the Upper Triassic Chinle Group, southwestern USA. *Palaeogeography, Palaeoclimatology, Palaeoecology*, *461*, pp.261-271.

4. Eastern Region

The Eastern Region of the Monument has a unique record of Jurassic and Cretaceous vertebrate life. Examples include many new dinosaur taxa like the prosauropod *Seitaad*, whose remains are unique to this area. This region has also produced important vertebrate and plant fossils from the Quaternary that help us understand the climatic and environmental processes that have shaped the history of life in western North America over the last 2.5 million years of Earth's history.

Agenbroad, L.D. and Mead, J.I., 1989. Quaternary geochronology and distribution of *Mammuthus* on the Colorado Plateau. *Geology*, *17*(9), pp.861-864.

Betancourt, J.L., 1984. Late Quaternary plant zonation and climate in southeastern Utah. *The Great Basin Naturalist*, pp.1-35.

Fraser, N.C., Irmis, R.B. and Elliott, D.K., 2005. A procolophonid (Parareptilia) from the Owl Rock Member, Chinle Formation of Utah, USA. *Palaeontologia Electronica*, *8*(1), p.13A.

Gay, R.J., Jenkins, X.A. and Lepore, T., 2017. *The oldest vertebrate trace fossils from Comb Ridge (Bears Ears Region, southeastern Utah)* (No. e2662v2). PeerJ Preprints.

Lockley, M.G. and Mickelson, D., 1997. Dinosaur and pterosaur tracks in the Summerville and Bluff (Jurassic) beds of eastern Utah and northeastern Arizona. *Mesozoic Geology and Paleontology of the Four Corners Region*, *48*: 133-138.

Sertich, J.J. and Loewen, M.A., 2010. A new basal sauropodomorph dinosaur from the Lower Jurassic Navajo Sandstone of southern Utah. *PLoS One*, *5*(3), p.e9789.

5. Excluded Red Canyon Region

Only parts of the Red Canyon Region are currently protected within the boundaries of Bears Ears National Monument. Area 5 is literally central to the important record of the Triassic-Jurassic transition described above. To protect this area, the boundaries of the Monument should be expanded to include the area between the western "island" and the rest.

3B. Grand Staircase-Escalante National Monument (GSENM)

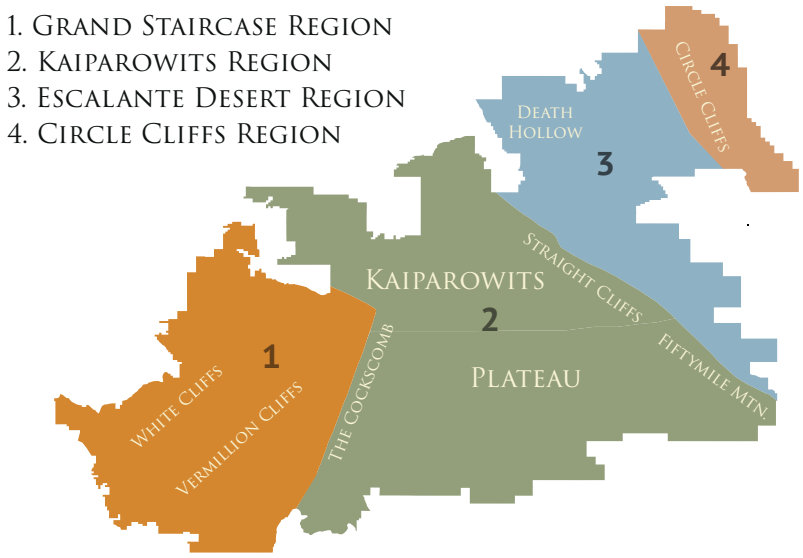
The boundaries of GSENM enclose literally thousands of fossil vertebrate localities, making it one of the most densely fossiliferous Mesozoic ("Age of Dinosaurs") areas in the world that require full protection. The Kaiparowits Plateau in particular produces an incredible yield of scientifically important vertebrate fossils from the floodplain facies of the Cretaceous strata. As stated in the Monument proclamation, GSENM is "one of the best and most continuous records of Late Cretaceous terrestrial life in the world". Five new types of horned dinosaur (relatives of the famous *Triceratops*) have come from GSENM, as have new duck-billed dinosaurs, tyrannosaurs, ankylosaurs, caimans, plesiosaurs, crocodylians, lizards, snakes, turtles, and mammals.

GSENM is one of the great success stories for science. Its designation as a National Monument and the appointment of a monument paleontologist (Dr. Alan Titus) have greatly facilitated research there, making it one of the most scientifically prolific areas in the US in terms of vertebrate paleontology. One indication of the success is the 634 page volume on GSENM paleontology published by Indiana University Press, which contains 28 peer-reviewed papers by more than 40 authors from around the world:

Titus, A. L. and M. A. Loewen. 2013. *At the Top of the Grand Staircase: the Late Cretaceous of Southern Utah*. Indiana University Press: Bloomington, Indiana.

New finds from GSENM are so important that they were highlighted by displays at the Society of Vertebrate Paleontology annual meeting in Salt Lake City last years, as explained in this short video (https://www.youtube.com/watch?v=5Av0PNt3ZaI). Research at GSENM by the Natural History Museum of Utah alone has registered 964 paleontological localities and over 2,000 fossil specimens saved for scientific research, including about 100 associated skeletons of extinct vertebrates. These yields were based on about 950 days of fieldwork over a 16-year span. Other groups (e.g., BLM and Denver Museum of Nature & Science) have discovered numerous vertebrate sites not included in this count, and yet other researchers (e.g., from Denver Museum of Nature & Science and Idaho State University) have focused on the paleobotanical and invertebrate sites from the non-marine Late Cretaceous strata of the Colorado Plateau. This is nothing to say of the very rich invertebrate and vertebrate fossil assemblages from the marine Tropic Shale, which has been worked by the Museum of Northern Arizona and the BLM.

To justify our opinion that the GSENM boundaries are appropriate with respect to paleontological science, we have divided the monument into four regions (**Map 2**) and describe the paleontological resources of each. We understand that BLM paleontologists have provided detailed maps of paleontological sites within GSENM for purposes of this consultation, many of which have been studied by members of our Society.



Map 2. Paleontologically significant regions in Grand Staircase-Escalante National Monument.

1. Grand Staircase Region

The Grand Staircase Region on the western side of the monument has yielded spectacular trackways, including unusual forms like *Brasilichnium*, which is likely to have been produced by Mesozoic synapsids. Extensive collections of fossils have been recovered from the Chinle, Moenave, Kayenta, and Navajo formations, many of them still under study, including fish and petrified forest.

Difley, R. and Ekdale, A.A., 2006. Trace fossils and paleoenvironments of the Early Jurassic Kayenta Formation, Washington County, Utah. *Making Tracks Across the Southwest.*

Lockley, M.G., Gierlinski, G.D., Titus, A.L. and Albright, B., 2006. An introduction to thunderbird footprints at the Flag Point pictograph–track site–preliminary observations on Lower Jurassic theropod tracks from the Vermillion Cliffs area, southwestern Utah. *New Mexico Museum of Natural History and Science Bulletin*, *37*: 310-314.

2. Kaiparowits Plateau Region

The Kaiparowits Plateau Region is the most impressive part of the Monument from the perspective of vertebrate paleontology. It provides one of the most complete records of the Late Cretaceous time anywhere in the world. More than 2,000 new vertebrate localities have been documented in this area alone since the monument was established, and only about 20% of it has been inventoried. Many new species have been described from this area, including mammals, dinosaurs, lizards and snakes, turtles, crocodyliforms, elasmobranchs, bony fish, invertebrates, and

plants. The spectacular dinosaur skulls that were on display at our Society's Salt Lake City meeting in 2016 were collected from the Kaiparowits Plateau Region, including *Kosmoceratops*, *Utahceratops*, *Diabloceratops*, *Nasutoceratops*, *Teratophoneus*, and *Lythronax*.

Paleontological research began in earnest on the Kaiparowits Plateau in 1983 when Jeffrey Eaton (then a Ph.D. candidate at the University of Colorado) and Dr. Richard Cifelli (then at the Museum of Northern Arizona) initiated research largely centered around the study of small, but extremely important, Cretaceous mammals. Interest in the Kaiparowits Plateau region was the result of its having a relatively continuous record of terrestrial evolution that was 20 million years long (about 95-75 million years ago) during the Cretaceous Period (see Eaton, 1991). It was quickly discovered that many of the units were fossiliferous, and in subsequent years has produced significant vertebrate fossils in every terrestrial unit in the sequence. This is the most continuous record of terrestrial evolution during this interval in the world.

From the Kaiparowits Plateau, the remains of mammals, frogs, salamanders, lizards, fish, turtles, crocodiles, and dinosaurs have all been recovered. Although the original work was focused on small vertebrates, other researchers (e.g., Dr. David Gillette, Museum of Northern Arizona; Dr. Scott Sampson with his students and other colleagues, Natural History Museum of Utah; Dr. Randall Irmis, Natural History Museum of Utah; Dr. Alan Titus, GSENM; Dr. Joseph Sertich, Denver Museum of Nature and Science; etc.) have subsequently focused on larger vertebrates such as dinosaurs. The results have been remarkable. The Kaiparowits region has produced an enormous number of taxa that are new to science and have significantly changed our understanding of terrestrial evolution during the Cretaceous. Even the only significant marine unit in the region, the Tropic Shale, has become well known for its remarkable plesiosaurs (large marine reptiles). There is no question that the Kaiparowits region contains a world-class assemblage of fossils, and that area will continue to produce new information about the geologic history of the Earth based on the rocks and fossils in the region.

The northern part of the Kaiparowits Plateau contains remarkable localities in all of the Cretaceous units (Naturita, Tropic Shale, Straight Cliffs, Wahweap, and Kaiparowits formations) whereas the southern portion of the plateau has excellent localities in the Naturita, Tropic Shale and Straight Cliffs formations (the stratigraphically higher formations, the Wahweap and Kaiparowits, have been largely removed by erosion). Over 45 new taxa and more than 300 taxa total have been reported from these areas (see Eaton and Cifelli, 2013; Titus et al., 2016). The collections are represented by tens of thousands of specimens housed in public repositories at the Natural History Museum of Utah, Oklahoma Museum of Natural History, Denver Museum of Nature and Science, Museum of Northern Arizona, and University of Colorado Museum to name a few.

Many of the larger fossils, such as turtles, crocodiles, and dinosaurs, are subject to poaching of fossils for non-scientific purposes and inadvertent destruction by all-terrain vehicle (ATV) activity. Important specimens were lost to unregulated collecting prior to designation of the monument (this is also true of archeological areas that were looted) and we are aware of many cases of destruction by off-road activities. The monument has greatly improved the protection of paleontological resources and has also helped to coordinate and regulate the large number of scientists working there, thus improving the quality of the science and education

A few representative publications on geological and paleontological studies from Kaiparowits Plateau include:

Boyd, C.A., Drumheller, S.K. and Gates, T.A., 2013. Crocodyliform feeding traces on juvenile ornithischian dinosaurs from the Upper Cretaceous (Campanian) Kaiparowits Formation, Utah. *PloS one*, *8*(2), p.e57605.

Eaton, J. G., 1991, Biostratigraphic framework for Upper Cretaceous rocks of the Kaiparowits Plateau, southern Utah: *in* Nations, J.D., and Eaton, J.G. eds., Stratigraphy, depositional environments, and sedimentary tectonics of the western margin, Cretaceous Western Interior Seaway: *Geological Society of America Special Paper* 260: 47-63.

Eaton, J.G., 2006. Santonian (Late Cretaceous) mammals from the John Henry Member of the Straight Cliffs Formation, Grand Staircase-Escalante National Monument, Utah. *Journal of Vertebrate Paleontology*, *26*(2): 446-460.

Eaton, J.G., and Cifelli, R.L., 2013, Review of Late Cretaceous Mammalian Faunas of the Kaiparowits and Paunsaugunt Plateaus, Southwestern Utah, Chapter 14 *in* Titus, A. L., and Loewen, M. A. eds. *At the Top of the Grand Staircase – the Late Cretaceous of Southern Utah*. Indiana University Press, Bloomington, pp. 319-328.

Loewen, M.A., Irmis, R.B., Sertich, J.J., Currie, P.J. and Sampson, S.D., 2013. Tyrant dinosaur evolution tracks the rise and fall of Late Cretaceous oceans. *PLoS One*, *8*(11): e79420.

Lund, E.K., O'Connor, P.M., Loewen, M.A. and Jinnah, Z.A., 2016. A New Centrosaurine Ceratopsid, *Machairoceratops cronusi* gen et sp. nov., from the Upper Sand Member of the Wahweap Formation (Middle Campanian), Southern Utah. *PloS one*, *11*(5), p.e0154403.

Sampson, S.D., Loewen, M.A., Farke, A.A., Roberts, E.M., Forster, C.A., Smith, J.A. and Titus, A.L., 2010. New horned dinosaurs from Utah provide evidence for intracontinental dinosaur endemism. *PLoS One*, *5*(9): e12292.

Sampson, S.D., Lund, E.K., Loewen, M.A., Farke, A.A. and Clayton, K.E. 2013. A remarkable short-snouted horned dinosaur from the Late Cretaceous (late Campanian) of southern Laramidia. *Proceedings of the Royal Society, B*, 280: 20131186.

Titus, A., Eaton, J. G., and Sertich, J., 2016, Late Cretaceous stratigraphy and faunas of the Markagunt, Paunsaugunt, and Kaiparowits plateaus, southern Utah. *Geology of the Intermountain West*, 3: 229-291.

Zanno, L.E., Varricchio, D.J., O'Connor, P.M., Titus, A.L. and Knell, M.J., 2011. A new troodontid theropod, *Talos sampsoni* gen. et sp. nov., from the Upper Cretaceous Western Interior Basin of North America. *PloS One*, *6*(9): e24487.

3. Escalante Desert Region

The Escalante Desert Region of the Monument contains mostly Jurassic rocks, including important fossil vertebrate trackways and Morrison Formation paleobotanical and dinosaurian sites.

Foster, J.R., Hamblin, A.H. and Lockley, M.G., 2000. The oldest evidence of a sauropod dinosaur in the western united states and other important vertebrate trackways from Grand Staircase-Escalante national monument, Utah. *Ichnos: An International Journal of Plant & Animal*, *7*(3): 169-181.

Stokes, W.L., 1978. Animal tracks in the Navajo-Nugget sandstone. *Rocky Mountain Geology*, *16*(2): 103-107.

4. Circle Cliffs Region

The Circle Cliffs Region at the northeastern end of the Monument contains Permian and Triassic rocks, which have yielded scientifically important fossils including the largest Triassic age petrified forest outside of Petrified Forest National Monument. This region has also produced the most complete skeleton of the bipedal stem-crocodilian *Poposaurus* ever found, an animal that is important for understanding the evolution of archosaurs and crocodilians.

Foster, J., Hamblin, A. and Lockley, M., 2003. *Apatopus* trackway and other footprints from the Chinle Group of southern Utah: an update. *Ichnos*, *10*(2-4), pp.165-167.

Gauthier, J.A., Nesbitt, S.J., Schachner, E.R., Bever, G.S. and Joyce, W.G., 2011. The bipedal stem crocodilian *Poposaurus gracilis*: inferring function in fossils and innovation in archosaur locomotion. *Bulletin of the Peabody Museum of Natural History*, 52(1), pp.107-126.

4. Educational benefits of the Monuments to the general public

Outreach efforts from collaborative research at GSENM and, more recently, Bears Ears have literally reached millions of people. Dozens to hundreds of peer-reviewed scientific articles, dozens of conference presentations, a 634-page multi-authored scientific volume (Titus and Loewen, 2013) [all references are cited in full above], a richly illustrated popular science book titled *Where Dinosaurs Roamed*" (Sadler, 2016), four professional society field trips have focused on paleontological advances from these monuments. Many of the sscientists working on monument material have committed to publishing in open-access venues so that all US citizens can read the results. For example, at least six open-access papers on material from GSENM (Sampson et al., 2010, 2013; Zanno et al., 2011; Boyd et al., 2013; Loewen et al., 2013; Lund et al., 2016), have been read by at least 140,000 people, and shared via social media by over 900 people. Monument fossils have garnered considerable media attention. A joint project between Utah Natural History Museum and GSENM was featured in a 2014 issue of National Geographic. More than 600

media outlets covered the discovery of a "pig-nosed" from GSENM, *Arvinachelys*, more than 100 covered the discovery of the new horned dinosaur *Machairioceratops*, and nearly 1100 covered the new tyrannosaur, *Lythronax*, as one might expect given the public fascination with these carnivorous dinosaurs.

5. Why modern mining techniques are incompatible with paleontological science

Finally, we note that if modern mining techniques are applied to an area like the Kaiparowits Plateau beds they destroy both the fossils themselves and their geological context. We are aware that calls have been made to reduce the size of GSE-NM to make way for strip mining of coal on the Kaiparowits Plateau (e.g., Utah HCR12). Such a move would be devastating to the fossil resources there, which as we describe above are producing the richest record of Late Cretaceous life anywhere in the world. The units that contain abundant vertebrate fossils are stratigraphically interleaved between the units that bear coal because of the pattern of rise and fall of sea level during Cretaceous deposition. Modern mechanized strip mining techniques remove the overburden from coal seams with heavy equipment, which in the Kaiparowits Plateau would consist of the units that are the most fossiliferous. The mining process would not only pulverize spectacular skeletons like *Kosmoceratops*, *Utahceratops*, and *Lythronax*, but it also destroys the stratigraphic context leaving the rubble mixed together. The scientific value of the deposits would be destroyed in the process. It is therefore critically important to protect these paleontological resources from destructive processes like strip mining. Indeed, this protection was a prime reason why GSE-NM was proclaimed.

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