

## INTRODUCTION

Paleontological resources, plant and animals fossils, are the remains and traces of once-living organisms, now preserved in rocks of the Earth's crust. They convey the story of origins and endings of extraordinary varieties of ocean-dwelling, fresh-water, and terrestrial creatures that have lived on the Earth.

## LEGAL AND ADMINISTRATIVE FRAMEWORK

Paleontological (fossil) resources are natural resources that occur on public lands; therefore, they are managed in accordance with the requirements of several Federal laws, primarily the Federal Land Policy Management Act (FLPMA) of 1976 and the National Environmental Policy Act of 1969 (see below). Additional requirements for the use, management, and protection of paleontological resources on public lands are addressed in a series of Federal Regulations and Secretarial Orders, as well as in specific BLM manual guidance. Other guidance has resulted from key court decisions and Solicitor's Opinions.

## LAWS

- ***The Common Varieties of Mineral Materials Act of 1947***: This act allows the protection of petrified wood on public lands.
- ***The National Environmental Policy Act of 1969***: This act covers the policy for documentation of effects (impacts) of Federal actions on natural resources on public lands.
- ***The Federal Land Policy and Management Act of 1976***: This act substantially amends the Forest and Rangeland Renewable Resources Planning Act of 1974. This act strengthens the references pertaining to suitability and compatibility of land areas, stresses the maintenance of productivity, and seeks to avoid the permanent impairment of the productive capability of the land.
- ***The Federal Cave Resources Protection Act of 1988***: This act serves to secure, protect, and preserve significant caves on Federal lands for the perpetual use, enjoyment, and benefit of all people; and to foster increased cooperation and exchange of information between governmental authorities and those who utilize caves located on Federal lands for scientific, education, or recreational purposes.

## REGULATIONS AND POLICIES

- ***Title 43 CFR 3620, Subpart 3622***: This sets agency policy for recreational collecting of common invertebrates and petrified wood on public lands.
- ***Title 43 CFR, Subpart 37***: This addresses the protection of significant caves and cave resources, including paleontological resources.
- ***Title 43 CFR, Subpart 8365***: This addresses the collection of invertebrate fossils and, by administrative extension, fossil plants.
- ***Title 43 CFR, Subpart 3622***: This addresses the free-use collection of petrified wood as a mineral material for non-commercial purposes.

- **Title 43 CFR, Subpart 3621:** This addresses the collection of petrified wood for specimens exceeding 250 pounds in weight.
- **Title 43 CFR, Subpart 3610:** This addresses the sale of petrified wood as a mineral material for commercial purposes.
- **Title 43 CFR, Subparts 3802 and 3809:** These address the protection of paleontological resources from operations authorized under the mining laws.
- **Title 43 CFR, Subpart 8200:** This addresses procedures and practices for the management of lands that have outstanding natural history values, including fossils, which are of scientific interest.
- **Title 43 CFR, Subpart 8365.1-5:** This addresses the willful disturbance, removal, and/or destruction of scientific resources or natural objects and Subpart 8360.0-7 identifies the penalties for such violations.
- **Secretarial of the Interior Order 3104:** This grants the BLM the authority to issue paleontological resource use permits for lands under its jurisdiction.
- **BLM Manual 8270:** This outlines policy for the management of paleontological resources.

USFS and BLM policy is intended to manage paleontological resources for scientific, educational, and recreational values, and to protect or mitigate these resources from adverse impacts. To accomplish this goal, paleontological resources must be professionally identified and evaluated, and paleontological data must be considered as early as possible in the decision-making process.

The USFS is developing manual direction for the management of paleontological resources on USFS-administered lands. Currently, the BLM direction is in use for USFS lands. Fossil collection on USFS-administered lands is regulated under 36 CFR 261.9(i), which prohibits “excavating, damaging, or removing any vertebrate fossil or removing any paleontological resource for commercial purposes without a special use authorization.”

A classification system called the Probable Fossil Yield Classification (PFYC) was developed by the USFS Paleontology Center of Excellence and the Region 2 Paleo Initiative in 1996 in order to promote consistency throughout, and between, agencies (USFS 1996 ). The PFYC system provides baseline guidance for assessing the relative occurrence of important paleontological resources, and the need for mitigation. Geologic units are classified at the formation or member level, according to the probability of yielding paleontological resources of concern to land managers. Classifications range from Class 1 to Class 5, and are based on the relative abundance of vertebrate fossils, or uncommon invertebrate or plant fossils, and their sensitivity to adverse impacts. A higher classification number indicates a higher fossil yield potential and a greater sensitivity to adverse impacts. (See Appendix Y, Volume 3, for a description of the 5 PFYC classes and the suggested management direction indicated for each class.)

## DESIGN CRITERIA

Management guidelines and design criteria describe the environmental protection measures that would be applied to all of the alternatives at the project level in order to protect, enhance, and, where appropriate, improve paleontological resources. Guidelines and design criteria are presented in Part 3 of Volume II of the DLMP/DEIS.

## AFFECTED ENVIRONMENT

### Existing Conditions and Trends

Paleontological resources are integrally associated with the geologic rock units (e.g., formations) in which they are located. If extensive excavation on a certain formation in one geographic area leads to discovery of significant paleontological resources, there is a potential that excavations throughout the extent of the formation may also produce fossil material. Within the planning area, formations have differing potentials to contain significant fossils. Other areas may also contain fossils, but have not been examined and evaluated. The potential for paleontological resources is currently noted through the use of the PFYC System. No comprehensive study or evaluation of paleontological resources has been conducted in the planning area. (See Appendix Y, Volume 3, for a description of formations known to have potential for the occurrence of paleontological resources.)

In 1899, Walter Granger of the American Museum conducted the first paleontological work in the area. Since that time, scientific investigation has been sporadic, and no comprehensive paleontological investigation of the area has been conducted. A great deal of the area is remote; therefore, paleontologists have relied upon reports of fossil localities by ranchers, rock-hounds, and/or by the public. Unfortunately, by the time some localities are reported to the SJPLC, many have already been looted.

### Potential Paleontological Resources

Fossils found within the planning area are Jurassic and Cretaceous in age. They include various plants (mostly as petrified wood), invertebrates, and vertebrates (mostly dinosaurs). Within the planning area, formations are classified into categories that indicate the likelihood of significant fossil occurrence. The geological formations that are known to contain significant vertebrate, invertebrate, and plant fossils include, but are not limited to, the following in the planning area (BLM 1991):

- San Jose (vertebrate/dinosaurs);
- Mancos Shale (invertebrates, skate or ray teeth, ammonites, pelecypods, scaphites, oysters, gastropods, baculites, and stromatolites);
- Dolores (flowering plants);
- Morrison (vertebrates and invertebrates);
- Chinle (vertebrate/fish, and plants);
- Mesa Verde (invertebrates); and
- Navajo Sandstone (diverse ichnofauna (e.g., protomammal, dinosaur, pterosaur, crocodile, lizard, and invertebrate traces); petrified wood; remains of prosauropod and theropod dinosaurs; aetosaur; and therapsid vertebrate fossils).

The BLM identified the Morrison Formation as having the potential for fossil occurrences within the planning area (O'Neal 1989). The Morrison Formation is also the focus of the vanadium and uranium mining that has occurred historically on public lands and Department of Energy (DOE) leases. Vanadium and uranium mining is expected to increase during the planning horizon. Most of the planning area has not been surveyed for paleontological resources; therefore, the extent of occurrences of most paleontological resources is not known. The San Juan/San Miguel RMP (BLM 1985) provided for limited recognition of vertebrate paleontological resources in the identification of the Horse Range Mesa site (Morrison Formation), which was evaluated by Brigham Young University (BYU) (Stadtman and Miller 1989).

Visitors to public lands are welcome to collect reasonable amounts of many kinds of fossils without a permit. These materials, however, must be for personal collections and cannot be sold or traded. No permit is needed for plant fossils (including leaves, stems, and cones), or for common invertebrate fossils (including ammonites and trilobites). Petrified wood may be collected, up to 25 pounds each day (but no more than 250 pounds in any calendar year) for each individual. A permit is needed for the collection of vertebrate fossils, which are any remains or traces of animals with backbones (including dinosaur bones, fish, teeth of any kind, turtle shells, and trace fossils). Trace fossils include coprolites, which are fossilized waste (feces), tracks, and trackways. Generally, permits are only issued to professional paleontologists, who must agree to preserve their finds in a public museum, a college, or a university due to their relative rarity and scientific importance.

Within the planning area, the “demand” for paleontological resources is considered low to moderate. The principal legal use of the paleontological resource is for research, or for the viewing fossils in their natural surroundings. Collection in the name of scientific research is conducted under permits issued by the SJPLC. (Recreational use of fossils may include their viewing and noting their differences from other rocks while on outings.) No collection of vertebrate fossils is allowed without a Colorado BLM Paleontological Resource Use Permit or a USFS Special Use Permit. Illegal collection of fossils has occurred on both a commercial and casual basis.

Safeguards against incompatible land and resource uses may be imposed through withdrawals, stipulations on leases and permits, design requirements, and similar measures developed and recommended by an appropriately staffed interdisciplinary team.

The natural processes of weathering and erosion impact paleontological resources by continually exposing fossilized material. Lower rates of erosion expose fossils, but delay their destruction; higher rates expose fossils, but more quickly destroy them. This varying rate of erosion allows a window of time in which a fossil might be discovered, properly identified, and studied.

Due to recreational activity, minimal localized degradation of geologic features, with their inherent fossil deposits, is expected to continue. Exposed fragile fossils may be degraded by casual OHV and mountain bike use that occurs off of existing or established routes.

The condition of paleontological resources may improve through the availability of educational information to the public regarding the nature of paleontological resources. Allowing appropriate scientific collecting by permit may help build the knowledge base of the scientific aspects of fossils, formations, and geology.

## ENVIRONMENTAL CONSEQUENCES

### DIRECT AND INDIRECT IMPACTS

Federal undertakings and unauthorized uses have the potential to result in irreversible disturbance and damage to non-renewable paleontological resources. The SJPLC would continue to mitigate impacts to paleontological resources resulting from authorized uses through project abandonment, redesign, and specimen recovery. Geologic formations with exposures containing vertebrate and non-vertebrate fossils may continue to be impacted as the result of natural agents, unauthorized public use, mining, and vandalism.

The casual use and collection of non-vertebrate fossils by “rock-hounds” and fossil collectors is expected to increase. Scientific interest in vertebrate fossils by the academic community is expected to remain at current levels.

Proposed management of the following resources/resource uses/programs may have no anticipated impacts to paleontological resources: Air, Cultural Resources, Fisheries, Geology, Soils, Invasive Species, Vegetation, Riparian Areas, Visual Resources, Water, Wildlife Habitat, Renewable Energy, Environmental Justice, Health and Safety, Native American Trust Resources, and Social Considerations.

Management measures common to all alternatives may preserve and protect paleontological resources for present and future generations. Adverse impacts may be mitigated through specimen recovery and analysis by professional paleontologists.

Under all of the alternatives, the greatest risk of damage or destruction of paleontological resources may result from casual, unauthorized activities (including dispersed recreational activity, OHV-use, and vandalism), mining of vanadium/uranium, and natural processes (including natural decay, deterioration, or erosion). Under all of the alternatives, unquantifiable indirect impacts may occur. Wilderness Areas, WSAs, and other Special Designation Area management may reduce the access to potential paleontological resources, as would the management of rivers for the outstanding remarkable values (ORVs) identified for suitable Wild and Scenic River (WSR) designation.

Impacts to paleontological resources within the planning area may result from actions proposed under the following resource management programs that have the potential to disturb fossil bearing geologic formations: Minerals Development, Vegetation and Fire and Fuels, Recreation, Lands and Realty, Trails and Travel Management; and Special Designation Areas.

**DLMP/DEIS Alternatives:** Under Alternative D, fewer limits would be placed on mineral development activities (including for roads, oil and gas exploration, and vanadium and uranium mining), when compared to Alternatives B and C. This may increase the potential for impacts to paleontological resources. Management of the Dolores Canyon Special Management Area may continue to provide protection to paleontological resources under all of the alternatives. Direct and indirect impacts may be minor under all of the alternatives.

## Impacts Related to Minerals Development Management

**Oil and Gas Development** - Oil and gas development may disturb the surface exposure of geologic formations bearing fossils. Formations with potential for paleontological resources also tend to be within areas with high potential for oil and gas discovery. This disturbance may result from direct impacts from a drill pad excavation or from the increased accessibility of a fossil locality by the construction of an access road. In some rare cases, the surface exposure of a formation is the last remnant of that formation. In these cases, it would be desirable to protect significant fossils within this remnant formation from disturbance. In other cases, the fossils may be distributed throughout a massive formation; however, the significance of the fossils would require protection of the entire formation. In most cases, preservation of individual outcrops is unimportant, either due to the lack of significance, wide distribution, or absence of fossils.

When fossils are identified, existing law would protect significant fossils from adverse impacts related to oil and gas development. Under all of the alternatives, prior to the approval of a permit to drill (APD), identified sites must be proven to have no significant fossils, or appropriate mitigation measures must be taken. For areas of 40 acres or less, mitigation would usually mean avoidance of the site. If a site could not be avoided, and if the disturbed area was significant, it would have to be excavated or the resource otherwise protected. This protection would be provided for in the standard terms and conditions of all oil and gas leases. Leases in areas designed for protection would also carry a NSO stipulation. This stipulation would be used on all formally designated areas of more than 40 acres.

The small percentage of unavoidable loss may be an irreversible and irretrievable commitment of the resource. The unavoidable loss would be insignificant, in relation to the widespread distribution of the resource. Currently, the only identified site within the planning area is the Horse Range Mesa Paleontological site (40 acres), where there is a NSO Stipulation in place for the protection of vertebrate fossils, and an exception criterion (including funding of accredited paleontological excavation in order to recover all vertebrate fossils to the point of scientific insignificance). Through avoidance or required collection, impacts in this area may be minimal and short-term.

A scenario of deferring oil and gas leasing during the life of the approved LMP may result in moderate impacts to potential fossil resources with less than 25% change. This is because values can normally be protected by avoiding surface use of land.

### Uranium/Vanadium Mining

Surface-disturbing activities authorized by the mining programs (including mineral-exploration projects and extraction of mineral resources) may result in adverse direct and indirect impacts to paleontological resources. The impacts may be minor to moderate. Discretionary actions designed to limit mining are minimal, outside of a withdrawal of public lands from the mining laws.

**DLMP/DEIS Alternatives:** Alternatives A and D would continue recognition for the Horse Range Mesa paleontological site with a NSO stipulation for oil and gas leasing. Potential formations would not require site-specific inventories for fossil resources under Alternatives A and D. Under Alternatives B and C, site-specific paleontological surveys would provide for site avoidance of potential fossil-yielding formations with regard to most disturbance activities (other than locatable mineral development on less than 5 acres, where a plan of development would not be required).

### **Impacts Related to Vegetation and Fire and Fuels Management**

Under all of the alternatives, minimal vegetation treatment is proposed where the potential exists for paleontological resources. There may be few, if any, negligible impacts to paleontological resources from vegetation and fire and fuels management.

WFU and prescribed burns would continue, and may result in direct and indirect impacts to paleontological resources. Fire may result in the direct destruction of organic fossil remains (e.g., Quaternary packrat middens). The removal of vegetative cover by fire may accelerate erosion and aeolian processes, which may, in turn, result in short-term indirect impacts. However, these impacts may be negligible when compared with similar impacts that occur by natural processes. Fire suppression that involves the use of heavy equipment and the construction of firelines would create surface disturbances that may result in direct minor impacts to paleontological resources.

**DLMP/DEIS Alternatives:** Under all of the alternatives, the potential impacts related to fire and fuels management on paleontological resources may be similar. Under Alternatives B and C, site-specific paleontological surveys would provide for site avoidance of potential fossil-yielding formations related to most disturbance activities. Without the requirement for site surveys for fossil information outcrops, negligible impacts to potential fossil-bearing formations may occur under Alternatives A and D.

### **Impacts Related to Recreation**

Under all of the alternatives, recreation would maintain an emphasis on opportunities associated with motorized vehicle use (including exploring backcountry roads, vehicle camping, sightseeing, and picnicking). Management of the Dolores Canyon Special Management Area may would continue to provide protection to paleontological resources under all of the alternatives; therefore, direct and indirect impacts may be minor. Increased visitation under current management may increase surface disturbance and opportunities to directly and indirectly damage resources, to the extent that minor impacts may occur to the paleontological resources. DLMP/DEIS Alternatives: The potential impacts related to recreation on paleontological resources may be similar under all of the alternatives. Under Alternatives B and C, site-specific paleontological surveys would provide for site avoidance of potential fossil-yielding formations under developed recreation sites. Casual recreational collecting would continue under all of the alternatives.

### **Impacts Related to Lands and Realty Management**

Lands and realty actions may acquire surface and subsurface estate, which would bring the estate under Federal protection, and, thereby, benefit paleontological resources.

Land disposals have the potential to remove paleontological resources from Federal jurisdiction. Withdrawals restrict certain activities (including access), which, in turn, decreases visitation. This may indirectly benefit paleontological resources (because fewer visitors may result in less surface disturbance, as well as in fewer opportunities to impact resources). The impacts would be minor.

Surface-disturbing activities authorized by the lands and realty programs (including ROWs and communication sites) may result in adverse direct and indirect impacts to paleontological resources. The impacts may be minor to moderate. Impacts from lands activities may be expected to be minor under all of the alternatives.

**DLMP/DEIS Alternatives:** The potential impacts related to lands actions on paleontological resources may be similar under all of the alternatives. Under Alternatives B and C, site-specific paleontological surveys would provide for site avoidance of potential fossil-yielding formations, thereby providing a means to identify and avoid disturbance to fossil sites. Without the requirement for site surveys for fossil formation outcrops, negligible impacts to potential fossil-bearing formations may occur under Alternatives A and D.

### **Impacts Related to Trails and Travel Management**

The most miles of roads would be open to motorized and mechanized travel under Alternative A. The Slick Rock mining district has no road or OHV restrictions under Alternative A. The greatest potential for impacts to paleontological resources associated with motorized and mechanized travel along roads may, therefore, occur under Alternative A. Overall impacts to paleontological resources may be long-term and minor.

Historically, mining, oil, and gas activity, as well as visitors, have all created roads. Their repeated use has made them permanent. These unapproved roads may be destructive to paleontological resources. Alternative A would propose little development of new permanent roads within the planning area, thereby protecting paleontological resources from further damage.

Under Alternative B, fewer miles of routes within the planning area would be open to motorized use (significantly less than the miles and area open to motorized use under current management). In addition, there would be no designation of open off-highway use.

Under Alternative C, significantly fewer miles of routes would remain open for motorized and mechanized use by the public than under current management. Alternative C may would be the most restrictive for motorized/mechanized access and, consequently, may be the most successful alternative at reducing visitor-caused surface disturbances to paleontological resources from motorized use. Impacts may be similar to those discussed under Alternative B, but less intense.

Under Alternative D, nearly as many miles of routes would remain open to motorized and mechanized use as would remain open under Alternative A. Overall, Alternative D would be the least restrictive alternative, in terms of OHV-use, and may, therefore, result in more localized impacts from such use than that which may occur under the other alternatives. In addition, opportunities for motorized and mechanized vehicle impacts may be greater, when compared to Alternatives B and C.

Overall, direct and indirect impacts to paleontological resources may be negligible to minor and long-term.

**DLMP/DEIS Alternatives:** Alternative B and C may result in the greatest potential benefits to paleontological resources. This would be due to protective special area designations. Under Alternatives B and C, site-specific paleontological surveys would provide for site avoidance of potential fossil yielding formations, thereby providing a means to identify and avoid disturbance to fossil sites. Without the requirement for site surveys for fossil formation outcrops, negligible impacts to potential fossil-bearing formations may occur under Alternatives A and D.

### **Impacts Related to Special Designation Area Management**

Current management of the Mud Springs/Remnant Anasazi ACEC, Weminuche Wilderness Area, and potential WSRs and WSAs provide a level of protection with regard to paleontological resources. The Horse Range paleontological site has provided for paleontology research and recovery of scientifically valuable specimens. Alternatives B and C would propose the designation of the Big Gypsum ACEC in order to protect critical resources, thereby providing protection to paleontological resources. These alternatives would require a plan of operations for mineral development and would not permit cross-country motorized travel. Impacts to paleontological resources may, therefore, be minor. Wilderness Area recommendations and WSR suitability management may also provide additional protection for paleontological resources.

Alternative D would propose no acreage for ACEC designation, thereby providing less protection to paleontological resources, when compared to the other alternatives. Impacts may be minor. Mining activities for uranium and vanadium on less than 5 acres would not require a plan of development in any areas with potential for vertebrate fossils, thereby increasing the risk of disturbance to unidentified sites.

***DLMP/DEIS Alternatives:*** Alternative C may result in the greatest potential benefits to paleontological resources (due to protective special area designations), followed by Alternatives B. Alternative A would continue protection of the Horse Range paleontological area. Without the requirement for site surveys for fossil formation outcrops, negligible impacts to potential fossil-bearing formations may occur under Alternatives A and D.

### **CUMULATIVE IMPACTS**

There may continue to be impacts to paleontological resources associated with unauthorized activities within the planning area (including OHV-use, dispersed recreation, grazing, and vandalism). Unauthorized activities, dispersed activities, and natural processes may also result in unmitigated impacts to paleontological resources. Increased uranium and vanadium mining may increase the potential to disturb vertebrate fossils in the Morrison Formation.