4.11. PALEONTOLOGY

The BLM has identified four objectives for the management of fossil resources on lands it administers. They are: 1) locating, evaluating, managing, and protecting fossil resources; 2) facilitating appropriate scientific, educational, and recreational uses of fossils; 3) ensuring that proposed land uses do not inadvertently damage or destroy important fossil resources; and 4) fostering public awareness of the nation's rich paleontological heritage (BLM 1998:01).

Actions proposed in the Proposed RMP and each of the alternatives for other resources are analyzed here and the possible effects of these actions on paleontological resources are discussed. Because the total number of acres affected by other resource management decisions is not known, qualitative analysis is used to determine which alternative best meets the four goals and objectives identified in the BLM Manual and Handbook H-8270-1 (1998).

In situations where qualitative analyses are used to determine which alternative best meets the BLM's four goals and objectives identified above, a reasonably foreseeable action (RFA) may be used to help predict impacts. The RFAs are potential future actions, such as oil and gas well placement or any other surface-disturbing activity, where specific decisions (e.g., actual location of oil and gas wells) cannot be determined at the programmatic level of this RMP/EIS. The RFAs are not specified allocations or decisions, but a best estimate or a guideline for what actions might be taken in the future. Predictions of potential projects are based on professional judgment regarding approximate project locations, general locality conditions, and design features commonly applied to such projects. These predictions do not definitively determine the outcome of site-specific analysis required prior to implementation of any project.

For the purpose of this RMP, all vertebrate and vertebrate trace fossil (tracks, trails, or other indicators of vertebrate activity) localities were identified as to section, township, and range. The total area included in sections containing one or more vertebrate or vertebrate trace fossil localities within the VPA is approximately 147,062 acres (Class 4 and 5 areas).

Outcrops of geologic units such as the Morrison, Mesaverde, Mancos, Moenkopi, Green River, Uinta, Wasatch, Chinle, Cedar Mountain, and Navajo/Nugget Formations should be considered as Class 3 areas in the VPA. All of these units contain vertebrate fossils in other locations and may require further assessment where they are exposed in the VPA. Areas where these units are covered or obscured are not Class 3 areas. The total area in which vertebrate or other scientifically significant fossils would be expected to occur is approximately 1,173,741 acres. Class 1 and 2 areas make up approximately 446,946 acres of the VPA.[12]

Within the VPA, paleontological resources are most often found where there are outcrops of the Morrison, Mesaverde, Mancos, Moenkopi, Green River, Uinta, Wasatch, Chinle, and Navajo/Nugget Formations. Impacts to paleontological resources result from natural weathering and erosion and from surface disturbance caused by people or animals. Adverse impacts to the resource would be mitigated or avoided through the careful application of mitigation measures prior to surface disturbance. Where mitigation is necessary, fossils are collected and taken to

[12] Calculations for PFYC Class acreages do not include state, tribal, or private lands.

secure repositories, along with contextual data, which preserves the paleontological record. The beneficial impacts of mitigation include the potential for advances in scientific understanding and regional perspectives that would not be known otherwise. Other beneficial impacts result from public education about the resource and involvement in its protection, from partnerships and from the efforts of permitted researchers.

4.11.1. IMPACTS COMMON TO THE PROPOSED RMP AND ALL ALTERNATIVES

Management decisions related to air quality, cultural resources, human health and safety, soils and watersheds, riparian, special status species, special designations, vegetation, wild horses, and wildlife and fisheries would have negligible impacts on paleontological resources, and therefore these decisions will not be further analyzed. The impacts of these actions would be negligible because protecting air quality, protecting cultural resources under section 106, maintaining safety around AML sites and reducing the risks of hazardous materials spills, protecting sensitive soils and water resources, protecting federally listed species and their habitat, restoring and maintaining native vegetation communities, and protecting non-listed wildlife and fish habitats would neither inhibit nor enhance opportunities for the scientific study of important fossil resources nor the opportunities for recreational collection of fossils.

4.11.1.1. FIRE MANAGEMENT AND WOODLAND/FOREST

Actions related to fire management and woodland/forest management could have long-term direct adverse impacts on paleontological resources due to surface-disturbing activities such as creating fire lines and road building.

4.11.1.2. LIVESTOCK AND GRAZING

Livestock can have dispersed long-term direct adverse impacts on paleontological resources. Trampling damages and destroys fossils where animals range across outcrops of fossiliferous formations. Livestock could adversely affect paleontological resources in areas of concentration around stock ponds, salt blocks, bedding areas, and along animal trails. Where livestock are eliminated from certain areas, adverse impacts to paleontological resources could occur due to changes in movement patterns.

4.11.1.3. MINERALS

Exploration for and development of mineral resources can have short-term and long-term adverse effects on paleontological resources. Surface disturbance that results from mineral exploration (including seismic surveys) and development can affect paleontological resources by damaging or destroying them. Adverse effects include physical damage to or destruction of fossils, as well as increased vandalism and theft that result from improved access to fossil localities. However, following the procedures for assessment and mitigation found in the BLM Manual H-8270-1, Chapter III (1998) would reduce or remove the potential for most of these adverse impacts. Public education and, where necessary, law-enforcement actions would reduce unauthorized fossil collecting.

Exploration for and development of mineral resources would also have a potentially beneficial impact on paleontological resources by alerting paleontologist to discoveries in areas that are not currently being researched, potentially resulting in the collection of specimens and data that would not otherwise be recovered.

4.11.1.4. PALEONTOLOGY

The Proposed RMP and the range of alternatives proposed for managing paleontological resources would have both long- and short-term beneficial effects. The Proposed RMP and all of the alternatives propose appropriate assessment to facilitate scientific research, to encourage partnerships, to manage access to significant fossils, to reduce unauthorized collection of paleontological resources, and to mitigate potential adverse impacts, where necessary, to protect the resources. They also beneficially propose management for recreational collection and use of common invertebrate and plant fossils, with public education on and interpretation of paleontological resources.

4.11.1.5. RANGELAND IMPROVEMENTS

Management decisions that allow the concentration of livestock in areas where there are significant fossils would cause long-term adverse impacts to paleontological resources. Fences and water sources where animals congregate, if they are placed on or near areas where there are significant fossils, would result in damage or destruction of fossils. However, through required assessment of rangeland improvement projects, paleontological resources would be identified and improvements would be mitigated where the potential for resource damage exists.

4.11.1.6. RECREATION

The management goals and objectives for recreation would have both adverse and beneficial long-term impacts on paleontological resources. For example, allowing motorized vehicles up to 300 feet from a designated route increases the likelihood that important or major fossil localities in Classes 4 and 5 or Class 3 areas would be inadvertently damaged or vandalized, if discovered. The management goals and objectives for recreation also have the potential to benefit paleontological resources. By implementing public education and environmental awareness programs, such as the BLM's Tread Lightly and Leave No Trace programs, added recreational activities in the VPA would reduce illegal fossil collection, vandalism, or accidental destruction of the resource. Developed recreation sites are closed to recreational fossil collection (see 43 CFR 8365.1-5[b]), and closing developed recreation sites to surface-disturbing activities would reduce the adverse impacts to paleontological resources.

4.11.2. PROPOSED RMP AND ALTERNATIVES IMPACTS

This section summarizes the effects of the management actions (Proposed RMP and all alternatives) proposed in Chapter 2 for paleontological resources. Because the analyses of the management decisions presented in this chapter do not reflect specific projects or actions, some effects can only be expressed qualitatively. Quantitative analysis has been included when possible, based on specific decisions proposed in Chapter 2, as well as estimates of RFAs

described below. In most cases, site-specific analyses would be required to implement resource management decisions affecting paleontological resources. More detailed or locality-specific studies and appropriate environmental documents would be prepared in compliance with NEPA and its implementing regulations, as needed.

Effects analyzed in this chapter include direct, indirect, and cumulative effects of the proposed management decisions to the extent that they were identifiable for analysis. Where applicable, the short-term or long-term nature of these effects is described. Direct effects result from activities planned or authorized by the BLM and occur at the same time and place. Indirect effects are caused by these decisions and occur later in time or farther removed in distance, but are still reasonably foreseeable.

Cumulative effects occur when there are multiple effects on the same resources. They are incremental effects of proposed activities or projects when combined with past, present, and future actions. As stated in 40 CFR 1508.7 (1997), a "'cumulative impact' is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." The cumulative effects discussed in this chapter address resources for which direct and indirect impacts have been described earlier.

Where surface disturbance occurs within the VPA, the effects on paleontological resources can be beneficial or adverse. Beneficial impacts to paleontological resources would be due to advances in scientific understanding and knowledge of the spatial distribution of significant fossil resources. Adverse impacts would be due to disturbances that are uncontrolled or that increase public access to areas containing important or valuable fossils. Subsurface disturbance would also be detrimental to paleontological resources.

4.11.2.1. Impacts of Fire Management Decisions on Paleontological Resources

4.11.2.1.1. Proposed RMP and Alternatives A, B, C, and E

Under the Proposed RMP and all of the action alternatives prescribed, fire would be allowed on approximately 156,425 acres per decade. Because a far greater number of acres are proposed for prescribed fire under the Proposed RMP and the action alternatives relative to Alternative D (No Action), the Proposed RMP and all of the action alternatives are likely to have greater adverse direct impact on paleontological resources relative to the current management situation.

4.11.2.1.2. Alternative D (No Action)

Under the current management situation, Alternative D (No Action); 27,950 acres in the Book Cliffs RMP; and 22,950 acres in the Diamond Mountain RMP would be treated with prescribed fire and related activities for a total of 50,900 acres. This alternative is likely to have less adverse direct impact on paleontological resources as compared to the Proposed RMP and the action

alternatives, because fewer acres are proposed for treatment that could surface disturbances to the resource.

4.11.2.2. Impacts of Lands and Realty Decisions on Paleontological Resources

4.11.2.2.1. Proposed RMP

Under the Proposed RMP, the BLM would pursue assess to the White River at Cowboy Canyon, Bonanza Bridge, and Wagon Hound Road. It would also pursue the acquisition of Indian Trust Lands near the confluence of South and Sweetwater Canyons and in the Bitter Creek and Willow Creek areas. These actions would have potential direct, long- and short-term beneficial effects on paleontological resources as compared to Alternative D (No Action), if resources were present and significant paleontological resources were thus brought under BLM management. Easements such as that proposed at the mouth of Cowboy Canyon would affect paleontological resources by increasing public access to areas that contain geological units that are very rich in fossil localities. Public access to these areas could result in increased unauthorized use or vandalism, which would have more adverse impacts than Alternative D (No Action).

Land withdrawal decisions would preclude mineral entry on 22,814 acres under the Proposed RMP. This would provide some resource protection from minerals-related surface disturbances, but less than Alternative D (No Action) because Alternative D (No Action) would withdraw more acreage (35,900 acres).

Under the Proposed RMP, 106,178 acres of non-WSA lands with wilderness characteristics would be closed to oil and gas leasing and designated as avoidance areas for ROWs. This would have more long-term, beneficial impacts on paleontological resources by reducing surface disturbance-related impacts to the resource as compared to Alternative D (No Action).

4.11.2.2.2. Alternative A

The impacts to paleontological resources would be the same as discussed under the Proposed RMP because the management decisions would be the same.

4.11.2.2.3. Alternative B

Under this alternative, the BLM would pursue only administrative access across Indian trust lands in Bitter Creek, and near the confluence of South and Sweetwater Canyon. Land withdrawal decisions would be the same as under the Proposed RMP.

Under Alternative B, there would be no direct, long- or short-term impacts to paleontological resources within Indian trust lands because public access to potential paleontological resources would not be allowed. Mineral entry land withdrawal decisions would have the same impacts as the Proposed RMP because the decisions are the same. This would provide some resource protection, but less than Alternative D (No Action) because Alternative D (No Action) would withdraw more acreage.

4.11.2.2.4. ALTERNATIVE C

Lands and realty decisions under Alternative C would be the same as under the Proposed RMP, except that the BLM would also pursue an easement for the old Uintah Railroad bed from the Utah/Colorado line to Watson in Evacuation Wash. Potential long- and short-term direct impacts to paleontological resources from land acquisition decisions under Alternative C would be similar to those described under the Proposed RMP, but with additional beneficial and adverse impacts discussed under the Proposed RMP that includes the railroad bed easement.

Land withdrawal decisions would be similar to the Proposed RMP, except that additional acres in the Lower Green River ACEC and along the White River would also be precluded from mineral entry. Compared to Alternative D (No Action), the short-term and long-term indirect impacts of Alternative C would be more beneficial by providing greater resource protection than Alternative D (No Action) because more acreage would be withdrawn from mineral entry (a total of 36,265 acres).

4.11.2.2.5. ALTERNATIVE D (NO ACTION)

Lands and realty decisions under Alternative D (No Action) are unspecified in the current management plan. Any proposal to acquire or dispose of land would be reviewed to determine its potential to effect paleontological resources.

Land withdrawal decisions would preclude mineral entry on 35,900 acres. This would provide the paleontological resource protection from minerals-related surface disturbances.

4.11.2.2.6. ALTERNATIVE E

Proposed lands and realty decisions under Alternative E would be similar to Alternative C, with potential long- and short-term direct impacts to paleontological resources from land acquisition decisions similar to those described under the Proposed RMP, except that approximately 277,596 acres of non-WSA lands with wilderness characteristics within the VPA would be designated as ROW exclusion areas to protect the wilderness characteristics values in these areas. This would have more long-term, beneficial impacts on paleontological resources by reducing surface disturbance-related impacts to the resource as compared to Alternative D (No Action).

Land withdrawal decisions and impacts on paleontology under Alternative E would be the same as discussed under Alternative C. The short-term and long-term indirect impacts of Alternative E would be beneficial by providing greater resource protection than Alternative D (No Action).

4.11.2.3. IMPACTS OF MINERAL DECISIONS ON PALEONTOLOGICAL RESOURCES

Minerals decisions under the Proposed RMP and each of the alternatives have the potential to have both beneficial and adverse impacts on paleontological resources within the VPA, as all decisions would involve surface-disturbing activities. The difference between the Proposed RMP and alternatives is in the numbers of acres open to minerals development. For the Proposed RMP and each alternative the number of acres open to surface-disturbing activities is less important than the total size of Class 4 and 5 and Class 3 areas actually disturbed. All proposed actions and

projects related to minerals development would be subject to site-specific NEPA analysis and documentation, as well as agency guidance (i.e., BLM Handbook H-8270-1). Assessment of possible impacts to paleontological resources and recommendations for any necessary mitigation would be required. Because paleontological resources must be assessed and any required mitigation performed by a permitted paleontologist, specimens and data could be collected in areas of mineral development that would otherwise have gone unnoticed, which would be a beneficial impact of minerals development.

4.11.2.3.1. PROPOSED RMP

In general, the direct effects to paleontological resources resulting from minerals decisions would be related to the level of surface disturbances in Class 4 and 5 or Class 3 areas that occur under the decisions. The greater the level of permitted surface disturbance, the greater would be the potential for encountering paleontological resources in these areas. Under the Proposed RMP, 1,640,569 acres of BLM administered land would be open for oil and gas development and surface disturbances within the VPA under Standard and Timing and Controlled Surface Use leasing stipulations. Potential indirect adverse effects on paleontological resources under the Proposed RMP would include vandalism and unauthorized fossil collection that result from increased human activity within areas of mineral development in Class 4 and 5 and Class 3 areas. Compared to the other alternatives, the Proposed RMP has the third highest number of acres open to surface disturbance related to oil and gas development and the third lowest number of acres closed to surface occupancy or development (273,706). As such, the Proposed RMP has a greater potential for impacts to paleontological resources within the VPA than Alternative D (No Action) and Alternatives C and E, but lower than Alternatives A and B, but only if this disturbance takes place in Class 4 and 5 or Class 3 areas.

4.11.2.3.2. ALTERNATIVE A

The types of direct and indirect impacts of minerals leasing within the VPA on paleontological resources would be the same as discussed above under the Proposed RMP, but to a greater degree. This is because Alternative A would permit 1,776,782 acres under Standard and Timing and Controlled Surface Use leasing stipulations for oil and gas development. Compared to the other alternatives, Alternative A has the second highest number of acres open to surface disturbances related to minerals oil and gas development and the fifth lowest number of acres closed to surface occupancy or development. So, Alternative A has a greater potential for impacts to paleontological resources within the VPA than Alternative D (No Action), the Proposed RMP alternative, and Alternatives C and E; it would have a lower potential impact than Alternative B, but only if this disturbance takes place in Class 4 and 5 or Class 3 areas.

4.11.2.3.3. ALTERNATIVE B

The types of long- and short-term direct effects under Alternative B would be the same as those described under the Proposed RMP but of greater magnitude, because management decisions under this alternative would open the largest area for oil and gas minerals leasing (1,819,435 acres). This alternative would manage for the smallest area that would be closed to surface occupancy or any form of minerals development (94,603 acres), as compared to the other action

alternatives and to Alternative D (No Action). So, Alternative B would have a greater potential for adverse impacts to paleontological resources than Alternative D (No Action) and the other action alternatives.

4.11.2.3.4. ALTERNATIVE C

Direct effects to paleontological resources resulting from mineral decisions under Alternative C are related to the level of surface disturbance in Class 4 and 5 and Class 3 areas that is permitted under the decisions. The greater the level of permitted surface disturbance in these areas, the greater the potential for impact to paleontological resources. Under Alternative C, 1,627,197 acres of BLM administered lands would be open to minerals development. Compared to the Proposed RMP and the other action alternatives, Alternative C would have the third smallest area open to surface disturbance related to oil and gas development and the second highest number of acres closed to surface occupancy or development (286,916). The types of long term and short term direct and indirect impacts to paleontological resources would be the same as discussed above under the Proposed RMP, but to a lesser degree, because a smaller area would potentially be affected. However, the impacts would be greater than Alternative D (No Action). The impacts to the resource, either adverse or beneficial, would depend on the number of Class 4 and 5 and Class 3 acres that would be developed under this alternative.

4.11.2.3.5. ALTERNATIVE D (NO ACTION)

The direct impacts to paleontological resources resulting from mineral decisions under Alternative D (No Action) are related to the level of surface disturbances in Class 4 and 5 and Class 3 areas that are permitted by minerals decisions. Under Alternative D (No Action), 1,535,974 acres within the VPA would be open to oil and gas development. Alternative D (No Action) would have the second lowest number of acres open to surface disturbance related to oil and gas development and the fourth lowest number of acres closed to surface occupancy or development (189,470).

The types of long- and short-term direct and indirect impacts from minerals surface disturbances under Alternative D (No Action) would be the same as those described under the Proposed RMP.

Indirect impacts to paleontological resources based upon minerals decisions under Alternative D (No Action) are similar to those described for Alternative A but would be of smaller magnitude owing to the lower number of acres available for use and the higher number of acres closed to surface occupancy for oil and gas development (except for Alternative C).

4.11.2.3.6. ALTERNATIVE E

Under Alternative E, 1,385,454 acres of BLM administered lands would be open to oil and gas minerals development under Standard and Timing and Controlled Surface Use leasing stipulations. The types of impacts would be the same as discussed under the Proposed RMP above, but would be of lesser magnitude than the other alternatives because this alternative would allow the development of the smallest area for minerals development and the largest area

as closed to surface occupancy or any form of minerals development and subsequent surface disturbances.

Compared to the Proposed RMP and the other action alternatives, Alternative E minerals decisions would manage for the smallest area as open to surface disturbance related to oil and gas development and the largest area closed to surface occupancy or minerals surface occupancy or development (414,666 acres).The impacts to the resource, either adverse or beneficial, would depend on the number of Class 4 and 5 and Class 3 acres that would be developed under this alternative.

In summary, the highest adverse impacts to paleontological resources would occur under Alternative B, due to the greatest number of acres open to surface disturbance. Alternative A would have the second highest degree of adverse impacts, followed by Alternatives C and the Proposed RMP. Alternatives D and E would have the lowest levels of adverse impacts to paleontological resources.

4.11.2.4. Impacts of Non-WSA Lands with Wilderness Characteristics Decisions on Paleontological Resources

4.11.2.4.1. Proposed RMP

Under the Proposed RMP, 106,178 acres of non-WSA lands with wilderness characteristics would be managed under VRM II class objectives, closed to oil and gas leasing and mineral materials disposal, closed to woodland harvesting, and OHV use would be limited to designated routes. All of these decisions would either prohibit or restrict surface disturbances to paleontological resources, which would have long-term, beneficial impacts on the resource. The Proposed RMP would have more beneficial impacts on the resource than Alternative D (No Action) because these non-WSA areas would not be managed to protect their wilderness values under Alternative D (No Action). However, the reduction in potential surface disturbances from other resource uses may also reduce the likelihood that fossils would be discovered and collected, adversely affecting paleontological resources.

4.11.2.4.2. Alternatives A, B, C, and D

There are no proposed management decisions and no acres would be managed as non-WSA areas with wilderness characteristics under any of these alternatives, so there would be no impacts to paleontological resources from these decisions.

4.11.2.4.3. Alternative E

Under Alternative E, non-WSA lands with wilderness characteristics would be managed under VRM I class objectives, closed to OHV use, closed to oil and gas leasing and mineral materials disposal, closed to woodland harvesting, and excluded from ROWs designation. All of these decisions would either prohibit or restrict surface disturbances to paleontological resources, which would have long-term, preservation-related, beneficial impacts on the resource. This alternative would have more beneficial impacts on the resource than Alternative D (No Action)

because approximately 277,596 acres of non-WSA lands with wilderness characteristics would be managed to protect their wilderness values within the VPA, which would also preserve paleontological resources. However, the reduction in potential surface disturbances would also reduce the likelihood that fossils would be discovered and collected, adversely affecting paleontological resources.

4.11.2.5. Impacts of Paleontological Decisions on Paleontological Resources

4.11.2.5.1. Proposed RMP, and Alternatives A, B, C, D (No Action), and E

Paleontological resource decisions for each of the alternatives would have direct, beneficial impacts on paleontological resources within the VPA. Alternatives C and E would provide the greatest protection for paleontological resources through predictive modeling and broad-scale sampling, also requiring assessment (and where needed, mitigation) in all Class 4 and 5 areas, and in Class 3 areas as needed. Under the Proposed RMP and Alternative A, the use of predictive modeling and broad-scale sampling would streamline the process of assessment and the mitigation of potentially adverse impacts caused by surface disturbance and would make it more effective. The Proposed RMP and Alternative A would provide the second highest degree of protection to paleontological resources. The management decisions under Alternatives B and D are similar, with mitigation of impacts as fossils are found. These alternatives would provide the least protection for paleontological resources.

Paleontological Resource Use Permits administered by the BLM Utah State Office for scientific study would provide important information to the VPA about the location and kinds of significant paleontological resources. Providing websites, local interpretive sites, and written information to the public about fossils and hobby collection has the potential to directly increase the public knowledge of the earth sciences and encourage good stewardship, reduce illegal collection, and increase the likelihood that important discoveries would be reported to the BLM.

4.11.2.6. Impacts of Rangelands Improvement Decisions on Paleontological Resources

Paleontological resources would be affected by rangeland improvements if they were placed in areas with fossiliferous units. Generally, the areas proposed for rangeland improvements would be evaluated for significant fossils if they were in areas likely to contain fossils (those areas designated as Class 4 and 5 and Class 3). Those areas containing significant paleontological resources would be protected from damage by placing rangeland fences and other proposed improvements away from fossil localities. In those areas with known fossiliferous units, rangeland improvements structures or projects that would not or could not be moved, such as reservoirs, would be assessed and the potential impacts mitigated, which could beneficially lead to new discoveries and increase scientific knowledge.

4.11.2.6.1. Proposed RMP

Under the Proposed RMP, 34,640 acres of vegetation treatment, 69 miles of fencing, 38 miles of water pipeline, 51 spring developments, and 812 guzzler or reservoir projects would be

completed. These proposed improvements would cause surface disturbances, therefore beneficially increasing the probability of new discoveries. These acreages, miles and numbers of facilities are roughly comparable to those proposed under Alternative D (No Action). It is anticipated that the primary indirect impact would be to increase the potential for adverse, concentrated trampling of paleontological localities located in areas adjacent to fencing or reservoirs on barren bedrock. Where cattle, sheep, or other grazers gather, they could damage or destroy fossils in Class 4 and 5 or Class 3 areas.

4.11.2.6.2. ALTERNATIVE A

The impacts of rangeland improvements on paleontological resources would be the same as discussed under the Proposed RMP because the management decisions are the same.

4.11.2.6.3. ALTERNATIVE B

The overall direct adverse impacts from rangeland improvement decisions on paleontological resources under Alternative B would be greater than those described for the Proposed RMP. Under Alternative B, 50,900 acres of would be subject to vegetation treatment, 369 miles of fencing would be installed, 51 miles of water pipeline would be installed, 78 well/spring developments would be undertaken, and 1,165 guzzler or reservoir projects would be completed. These improvements would likely impact more surface area than D (No Action), therefore creating a greater probability that paleontological resources would be beneficially discovered and studied, if improvements are in Class 4 and 5 and Class 3 localities. Long- and short-term direct and indirect impacts to paleontological resources from rangeland improvement decisions would be similar to those described for direct impacts under the Proposed RMP, but would be greater under Alternative B if the increased surface disturbance takes place in Class 4 and 5 or Class 3 areas.

4.11.2.6.4. ALTERNATIVE C

Under Alternative C a total of 45,860 acres would be subject to vegetation treatment, 129 miles of fencing would be installed, 30 miles of water pipeline would be installed, 87 well/spring developments would be undertaken, and 811 guzzler or reservoir projects would be completed. The direct and indirect, short term and long term impacts of rangeland improvement decisions on paleontological resources under Alternative C would be similar to that described for the Proposed RMP, but would be increased slightly in magnitude under Alternative C owing to the overall greater potential for impacts to the resource from range improvement surface disturbances. As Alternative C would affect more area, it also would beneficially increase the probability of new discoveries, when compared to Alternative D (No Action).

4.11.2.6.5. ALTERNATIVE D (NO ACTION)

The impacts of rangeland improvement decisions on paleontological resources under Alternative D (No Action) would be similar to that described for the Proposed RMP and the other alternatives. Under Alternative D (No Action) a total of 40,390 acres of would be subject to vegetation treatment, 65 miles of fencing would be installed, 35 miles of water pipeline would be

installed, 74 well/spring developments would be undertaken and 775 guzzler or reservoir projects would be completed.

The types of long- and short-term direct and indirect impacts to paleontological resources from rangeland improvement decisions would be the same as to those described under the Proposed RMP, but would be slightly greater under Alternative D (No Action), because more area would be disturbed from vegetation treatments, if Class 4 and 5 and Class 3 areas are affected.

4.11.2.6.6. ALTERNATIVE E

The impacts would be the same as Alternative C because the proposed rangeland improvements would be the same.

In summary, the greatest short-term direct, adverse impacts to paleontological resources due to surface disturbance from rangeland improvements and indirect adverse impacts from livestock trampling would be from Alternative B because the largest area would potentially be disturbed by rangeland improvements. The next greatest adverse impacts would be from Alternatives C and E, followed by Alternative D (No Action). The Proposed RMP and Alternative A would have the least impact on paleontological resources because these alternatives proposed the smallest area for vegetation treatments, the shortest miles of rangeland fencing, and the fewest wells/springs for development.

4.11.2.7. IMPACTS OF RECREATION DECISIONS ON PALEONTOLOGICAL RESOURCES

Recreation management decisions under the Proposed RMP and each of the alternatives would affect paleontological resources by either increasing visitor use or changing development. Increasing visitor use would affect resources by creating a greater level of surface disturbance, therefore increasing the probability that fossils would be discovered. Conversely, the greater the level of human activity, the greater would be the potential for paleontological resources within a recreational area to be adversely impacted by the number of individuals walking over or visiting paleontological localities. Increased human activity in areas where paleontological resources are present also tends to correspond with increased levels of vandalism, unauthorized collection, and inadvertent damage or destruction of the resource. The beneficial impacts of increased recreational use would be that people might find and report discoveries of important and valuable fossils.

The differing use levels of BLM land designated as SRMAs would affect the paleontological resources in areas known to have these resources. The designation of SRMAs generally increases recreational activity in given areas, but the only areas known to have important fossil localities at present are Blue Mountain, Red Mountain-Dry Fork, Browns Park, and the White River Corridor. Activity plans created for SRMA management would include stipulations to protect unique paleontological resources, which would minimize impacts to the resource.

Direct effects on paleontological resources resulting from recreation decisions under the Proposed RMP and all alternatives would be related to the level of surface disturbance associated with recreational development and with the degree of increased human activity in Class 4 and 5

and Class 3 areas. Potential short- and long-term direct impacts would include increases in levels of unauthorized use and associated vandalism that would accompany increased human activity. It should be noted and it is assumed, however, that regulated recreational use would likely provide better protection to paleontological resources than unregulated use. Collecting common invertebrate and plant fossils for personal, noncommercial use is an accepted, low-impact use of public lands, and could foster a greater appreciation for paleontological resources.

Indirect effects of recreation decisions on paleontological resources would include benefits such as increased public enjoyment of hobby collecting, increased interest in the science of paleontology, and generally more public awareness of these resources and how to preserve them. Potential adverse impacts would be the increased unauthorized collection, inadvertent damage, or vandalism in Class 4 and 5 and Class 3 areas adjacent to developed recreation areas.

4.11.2.7.1. PROPOSED RMP

Under the Proposed RMP, seven SRMAs would be managed within the VPA, totaling 133,560 acres: 2,831 acres along the White River Corridor, 44,168 acres in Nine Mile Canyon, 18,490 acres in Browns Park, 1,014 acres in Pelican Lake, 24,259 acres on Red Mountain-Dry Fork, 69 acres in Fantasy Canyon, and 42,729 acres on Blue Mountain. Additionally, 400 miles of non-motorized trails would be improved and/or developed, and restrictions would be placed on the use of OHVs for retrieval of big game off of designated routes. A total of 800 miles of motorized OHV trails would be developed or improved under this alternative. New cabin construction for permitted/administrative use would be allowed within the VPA but an attempt would be made to consolidate construction in specific areas at or near existing cabins. Also, under the Proposed RMP 106,178 acres of non-WSA lands with wilderness characteristics would be protected from cross-country OHV travel and closed to oil and gas mineral leasing and woodland harvesting. These decisions would have long term, beneficial impacts on the resource by protecting them from surface disturbances, unmanaged collection, and vandalism. However, the likelihood for discovery of significant paleontological resources would be reduced. Compared to Alternative D (No Action), the Proposed RMP would likely have fewer adverse impacts to paleontological resources and a reduced potential for damage of paleontological resources because more area would be beneficially protected under SRMA management from surface disturbances through SRMA integrated activity plans.

4.11.2.7.2. ALTERNATIVE A

Under Alternative A, 499,588 acres of the VPA would be managed within SRMAs: 24,183 acres along the White River Corridor, 52,720 acres in Browns Park, 24,259 acres on Red Mountain-Dry Fork, 1014 acres around Pelican Lake, 273,486 acres in the Book Cliffs, 81,168 acres in Nine Mile Canyon, and 42,758 acres on Blue Mountain would be managed as SRMAs. Additionally, 400 miles of non-motorized trails would be improved and/or developed, and restrictions would be placed on the use of OHVs for retrieval of big game off of designated routes. A total of 800 miles of motorized OHV trails would be developed or improved under this alternative. New cabin construction for permitted/administrative use would be allowed within the VPA but an attempt would be made to consolidate construction in specific areas at or near existing cabins. The types of direct and indirect beneficial impacts of recreation management

decisions under this alternative to paleontological resources would be the same as discussed under the Proposed RMP, but to a greater degree because more area would be protected from surface disturbances under increased SRMA management.

Compared to Alternative D (No Action), this alternative would provide fewer adverse impacts to paleontological resources and more beneficial impacts because more area would be protected from surface disturbances.

4.11.2.7.3. ALTERNATIVE B

Direct effects to paleontological resources resulting from recreation decisions under Alternative B are related to the lack of designation and protection of resources associated with recreational development and use. Under this alternative SRMA management decisions would be the same as Alternative D (No Action): no SRMAs would be designated in the White River Corridor or on Blue Mountain, but Brown's Park (17,000 acres), Pelican Lake (1,014 acres), Nine Mile Canyon (44,181 acres) and Red Mountain-Dry Fork (24,259 acres) would continue to be managed as SRMAs. A total of 86,454 acres would be managed within SRMAs. Additionally, under Alternative B, 800 miles of motorized trails would be improved or developed, and OHV use off of designated trails would be allowed for big game retrieval. Under Alternative B, recreational use in the White River Canyon with minimal supervision would continue; unrestricted and unconfined recreational use of the Book Cliffs would also continue as currently managed and new cabin construction would be allowed within the VPA, but an attempt would be made to consolidate construction in specific areas. Alternative B generally allows and would manage for unrestricted and unconfined use of BLM lands for recreation.

Potential long- and short-term direct and indirect impacts on paleontological resources under Alternative B are similar to those described for the Proposed RMP with the exception that the increased acreage available for unrestricted and unconfined recreational use under Alternative B would result in the increased potential for damage of paleontological resources.

4.11.2.7.4. ALTERNATIVE C

Alternative C would designate a total of 522,604 acres within SRMAs: 47,130 acres in the White River Corridor, 273,486 acres in the Book Cliffs, 69 acres in Fantasy Canyon, and 42,758 acres on Blue Mountain as new SRMAs. It would maintain 52,720 acres in Browns Park, 81,168 in Nine Mile Canyon, 1,014 acres at Pelican Lake and 24,259 acres on Red Mountain-Dry Fork as existing SRMAs. Additionally, under Alternative C, 400 miles of non-motorized trails would be improved and/or developed, and restrictions would be placed on the use of OHVs for retrieval of big game off of designated routes. No motorized OHV trails would be developed or improved under this alternative. Alternative C would have similar direct adverse effects as discussed under the Proposed RMP, except that the lack of OHV trail development or improvement would reduce the probability of new discoveries of paleontological resources.

Long- and short-term direct and indirect adverse effects on paleontological resources under Alternative C are less than those described for Alternative D (No Action) because more area

would be protected from surface disturbances within SRMAs than under Alternative D (No Action).

4.11.2.7.5. ALTERNATIVE D (NO ACTION)

As discussed above under Alternative B, Alternative D (No Action) would manage the same number and acreages of SRMAs as that alternative, with the same impacts to paleontological resources. Minimal oversight or lack of designation of new SRMAs would lead to resource degradation due to limited management of these areas. Additionally, 55 miles of non-motorized trails would be improved or developed and the Red Mountain trail would be managed as a motorized OHV trail. No management decisions are specified for OHV use off designated trails for the retrieval of big game. In general, Alternative D (No Action) would manage for unrestricted and unconfined recreational use of most areas within the VPA, which would have adverse impacts on the resource because of the increased likelihood of surface disturbances from OHV use, and from minimal management of front country and back country recreational activities. The potential long- and short-term direct and indirect effects on paleontological resources under Alternative D (No Action) are comparable to those described for Alternative B.

4.11.2.7.6. ALTERNATIVE E

The impacts would be the same as discussed under Alternative C, except that 157,018 acres of non-WSA lands with wilderness characteristics within the proposed SRMAs would be managed for primitive, non-mechanized recreational opportunities rather than developed recreation. This would result in somewhat less surface disturbance and less adverse, direct impacts on paleontological resources.

4.11.2.7.7. SUMMARY

In relative terms, Alternatives C and E would manage more areas as SRMAs with fewer trail development miles than Alternative A and the Proposed RMP. Alternatives B and D do not designate new areas as SRMAs and generally allow for unrestricted and unconfined use of BLM lands for recreation. The greatest protection of paleontological resources would be provided by Alternatives C and E, followed by Alternative A and the Proposed RMP, based on the total area protected and managed for resource preservation within SRMAs. Alternatives B and D would provide the least protection for paleontological resources.

4.11.2.8. IMPACTS OF TRAVEL DECISIONS ON PALEONTOLOGICAL RESOURCES

4.11.2.8.1. PROPOSED RMP

Direct impacts on paleontological resources within the VPA resulting from travel decisions under the Proposed RMP would be expected to be long-term and beneficial as compared to Alternative D (No Action). Travel decisions under the Proposed RMP provide for the opening, closing, or restricting of areas for OHV travel and for the repair, maintenance, upgrade, or realignment of roads causing resource damage. The Proposed RMP also provides for the closure of roads if repair, maintenance, upgrade, or realignment is not possible or feasible to reduce

damage to resources. All of these management decisions would have a potentially direct, beneficial impact on paleontological resources in Class 4 and 5 and Class 3 areas by reducing and/or controlling surface-disturbing, travel-related activities. Under the Proposed RMP, 6,202 acres would be open to unrestricted OHV travel; OHV travel on 1,643,475 acres would be to limited to designated routes, and 75,845 acres would be closed to OHV travel.

Both short-term and long-term indirect effects from travel decisions under the Proposed RMP are anticipated to be negligible. Long- and short-term direct impacts on paleontological resources from travel decisions would include increased protection of paleontological resources through the substantial reduction of surface-disturbing activities associated with general travel and open, cross-country OHV use. Paleontological resources in Class 4 and 5 and Class 3 areas that are closed to OHV use or where restrictions are placed on OHV use would receive the greatest benefit. Thus, with the specific controls and restrictions placed on travel activities under the Proposed RMP, the long-term net effect would be an overall decrease in the numbers of localities subject to adverse impacts, as compared to Alternative D (No Action).

4.11.2.8.2. ALTERNATIVE A

The impacts of travel decisions on paleontological resources would be the same as discussed under the Proposed RMP because the management decisions are the same.

4.11.2.8.3. ALTERNATIVE B

Under Alternative B, 5,434 acres would be open to unrestricted OHV travel; OHV travel on 1,659,901 acres would be limited to designated routes, and 60,187 acres would be closed to OHV travel.

Long- and short-term direct and indirect adverse impacts to paleontological resources from travel decisions under Alternative B are less than those described for Alternative D (No Action), due to the substantially lower acreage open to unrestricted, cross-country OHV use (and thus the reduced potential for surface disturbances to paleontological resources).

4.11.2.8.4. ALTERNATIVE C

Alternative C would provide the second greatest benefit to paleontological resources in Class 4 and 5 and Class 3 areas within the VPA by closing a substantially large area to OHV use, managing OHV travel, and improving roadways. Under Alternative C, 5,434 acres would be open to unrestricted, cross-country OHV travel; OHV use on 1,353,529 acres would be limited to designated routes, and 366,559 acres would be closed to OHV travel.

Long- and short-term direct and indirect impacts on paleontological resources from travel decisions under Alternative C are similar to those described under the Proposed RMP, but would be of greater magnitude owing to the increased numbers of acres under Alternative C that would be closed to OHV use. This alternative would have fewer adverse impacts to paleontological resources than Alternative D (No Action) because of the smaller area designated as open to OHV use.

4.11.2.8.5. ALTERNATIVE D (NO ACTION)

Current travel management decisions under Alternative D (No Action) are largely unspecified. No specific decisions are specified for the repair, maintenance, upgrade, or realignment of roadways causing damage to resources. Travel designations are specified, however, for OHV use within the VPA, and. these designations provide the least protection to paleontological resources from potential travel-related surface disturbances. Under Alternative D (No Action), 787,859 acres are designated as open to unrestricted, cross-country OHV use, largely in Class 4 and 5 and Class 3 areas. There are 887,275 acres that restrict OHV use to designated routes, and 50,388 acres are closed to OHV use.

The large area designated as open to unrestricted OHV use would likely contribute to greater numbers of paleontological localities being subjected to direct impacts resulting from OHV traffic and surface disturbances.

4.11.2.8.6. ALTERNATIVE E

Alternative E would provide the greatest benefit to paleontological resources in Class 4 and 5 and Class 3 areas within the VPA by closing a substantially large to OHV use (the most acreage of all the action alternatives and the Proposed RMP), managing OHV travel, and improving roadways. Under Alternative E, 5,434 acres would be open to unrestricted cross-country OHV travel, 1,326,024 acres would be designated to restrict OHV travel to designated routes, and 392,818 acres would be closed to OHV travel. Approximately 53 miles of OHV routes would be closed in non-WSA lands with wilderness characteristics to protect their wilderness values.

The beneficial long- and short-term direct and indirect impacts on paleontological resources from travel decisions under Alternative E would be similar to those described for the Proposed RMP but would be of greater magnitude owing to the increased acreage and miles of routes under Alternative E that would be closed to OHV use. This alternative would have fewer potentially adverse impacts to paleontological resources than Alternative D (No Action) because of the substantially reduced area open to OHV use and the increased area closed to OHV travel.

In summary, the greatest adverse impacts to paleontological resources would be due to Alternative D (No Action). The second highest degree of adverse impacts would come from Alternative B, followed by the Proposed RMP and Alternative A. Alternatives E and C would have the least adverse impacts to paleontological resources due to travel decisions, based on area open to cross-country OHV travel and areas where OHV travel is limited to designated routes.

4.11.2.9. IMPACTS OF VISUAL RESOURCE MANAGEMENT DECISIONS ON PALEONTOLOGICAL RESOURCES

Short- and long-term direct and indirect impacts on paleontological resources could result from visual resource management decisions if surface disturbance is controlled and limited, and collection of fossils is not allowed in some VRM class areas. If paleontological resources occur where visual resource management reduce, control, or eliminate surface-disturbing activities, beneficial direct impacts of management decisions would include a reduction in physical damage

to or destruction of fossils. Indirect beneficial impacts would include a reduction in vandalism and theft that result from improved access to fossil localities. Conversely, because increases in surface disturbance also increase the probability that fossils would be discovered, reduction in surface-disturbing activities could also adversely affect paleontological resources. Visual resource management decisions that reduce fossil collection would directly and adversely affect paleontological resources In all cases, these conclusions are based on the assumption that significant paleontological resources would occur in VRM Class I and Class II areas.

4.11.2.9.1. PROPOSED RMP

Under the Proposed RMP, 57,776 acres within the VPA would be designated as VRM Class I and managed under VRM objectives to preserve visual resources and scenic quality. This VRM class would impose the greatest limitations on surface-disturbing activities. Another 231,911 acres would be managed under VRM Class II objectives, 786,612 acres would be managed VRM Class III objectives, and 643,641 acres would be managed under VRM Class IV with the least restrictions on surface disturbances. The Proposed RMP would designate a total of 289,687 acres within VRM Class I and II, 122,915 more acres within the two highest VRM classifications than Alternative D (No Action) (see Table 4.19.3 Visual Resources).

Long- and short-term indirect impacts on paleontological resources from visual resource management decisions under the Proposed RMP would include beneficial impacts due to the overall reduction of allowed surface-disturbing activities within the areas managed under VRM Class I and II objectives, and an overall decrease in the numbers of localities subject to surface disturbance, as compared to Alternative D (No Action).

Visual resource management decisions under the Proposed RMP would have a direct beneficial impact to paleontological resources, as compared to Alternative D (No Action), because there would be less surface disturbance and therefore less physical damage to or destruction of fossils. Indirect beneficial impacts would include a reduction in vandalism and theft that result from improved access to fossil localities. However, the reduction in surface disturbance may also reduce the probability that fossils would be discovered and collected, adversely affecting paleontological resources. If fossil collection was not allowed in some areas in order to meet VRM Class I and Class II resource objectives, this would directly adversely affect paleontological resources as well because the likelihood for significant paleontological resource discoveries would be reduced.

4.11.2.9.2. ALTERNATIVE A

Under Alternative A, 63,136 acres within the VPA would be managed under VRM Class I objectives, 294,773 acres would be managed under VRM Class II objectives, 716,186 acres would be managed under VRM Class III, and 645,845 acres would be managed under VRM Class IV. Compared to the other alternatives, Alternative A would provide a high degree of direct, adverse impacts to paleontological resources because a total of 357,909 acres would be managed under the two highest VRM classifications where the likelihood of significant resource discovery would be reduced by restrictions on surface disturbances. Visual resource management decisions under Alternative A would have less short term and long term direct and indirect

beneficial impact to paleontological resources than do those under Alternative D (No Action) because more area would be protected under the higher VRM classes. However, the same specific controls and restrictions placed on surface-disturbing activities in areas managed as the two highest VRM classes would also result in an overall beneficial decrease in the numbers of localities subject to surface disturbances, as compared to Alternative D (No Action).

4.11.2.9.3. ALTERNATIVE B

The overall indirect effect of visual resource management decisions on paleontological resources under Alternative B would be roughly comparable to but slightly greater degree than that described for Alternative D. Under Alternative B, 52,764 acres would be managed under VRM Class I objectives, and 114,030 acres would be managed under VRM Class II objectives. Another 199,179 acres would be managed under VRM Class III objectives, and 1,353,967 acres would be managed under VRM Class IV objectives. The VRM designations under this alternative are similar to those currently designated under Alternative D (No Action), and this alternative would designate practically the same acreage under VRM Class I and II as Alternative D (No Action) (166,794 acres), with impacts on paleontological resources similar to those discussed under Alternative D (No Action).

4.11.2.9.4. ALTERNATIVE C

The direct and indirect, long- and short-term adverse effects of visual resource management decisions on paleontological resources under Alternative C would be greater than that described for any other alternative except Alternative E. Under this alternative, 145,781 acres would be managed under VRM Class I objectives, and 362,660 acres would be managed under VRM Class II objectives. VRM Class III would be designated on 580,846 acres, with VRM Class IV designation on 630,653 acres. Alternative C would manage a total of 508,441 acres under VRM Class I and II objectives, with impacts on paleontological resources as discussed under the Proposed RMP, but to a greater degree because more area would be protected from disturbances (a beneficial impact), but also closed to surface disturbances that could identify localities with significant resources (an adverse impact). Compared to Alternative D (No Action), this alternative would protect 341,669 more acres under VRM Class I and Class II designations, so there would be more adverse and beneficial impacts than Alternative D (No Action).

4.11.2.9.5. ALTERNATIVE D (NO ACTION)

Under Alternative D (No Action), 53,086 acres would be designated as VRM Class I and 113,686 acres as VRM Class II; 199,192 acres would be designated as VRM Class III and 1,353,976 acres would be designated as VRM Class IV. Under Alternative D (No Action), a total of 166,772 acres would be managed under VRM Class I and II objectives, the smallest area of all the alternatives.

Alternative D (No Action) would have the least beneficial impact to paleontological resources, when compared to the other alternatives, because there would potentially be more surface disturbance and therefore more physical damage to or destruction of fossils. Indirect adverse impacts would include the likelihood of increased vandalism and theft that result from improved

access to fossil localities. However, the increase in surface disturbance would also increase the likelihood that significant sources of fossils would be discovered and collected, beneficially affecting paleontological resources

4.11.2.9.6. ALTERNATIVE E

The direct and indirect, long- and short-term beneficial effects of visual resource management decisions on paleontological resources under Alternative E would be greater than for any other alternative. Under Alternative E, 334,516 acres would be designated as VRM Class I, and 259,694 acres would be designated as VRM Class II. Approximately 535,586 acres would be designated as VRM Class III, and 590,144 acres as VRM Class IV. With the highest number of acres designated as VRM I and II classes (approximately 594,210 acres) and managed under VRM objectives to restrict or minimize surface disturbances, Alternative E would manage 427,438 more acres within the two highest VRM classifications than Alternative D (No Action). However, if fossil collection was not allowed in some areas in order to maintain VRM I and II management goals, this would directly and adversely affect paleontological resources to a greater extent than the other alternatives.

4.11.3. UNAVOIDABLE ADVERSE IMPACTS

Loss due to non-recognition, lack of information and documentation, erosion, casual collection, and inadvertent destruction or use would cause resource losses. The rate, extent, intensity, and duration cannot be quantified at this time due to lack of data. As a part of natural environmental processes, paleontological localities will be exposed, remain for a time, and become lost to history if not recorded or studied. The management decisions caused by the action alternatives and Alternative D (No Action) would cause losses over and above the natural attrition rate but cannot be quantified at this time. However, the broad-scale sampling and classification of areas with a high likelihood of containing paleontological resources is expected to greatly reduce the probability of unavoidable adverse impacts to the resource.

4.11.4. SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

The short-term uses of BLM lands for activities involving surface-disturbance would have long-term impacts on paleontological resources. The surface-disturbing activities affecting paleontological resources would include mineral development, livestock trampling, and constructing fire lines and roads during wildland fire management. Travel decisions involving maintenance, upgrade, and realignment of roads and OHV use would also have long-term adverse impacts on these resources. Providing access for the public through Lands and Realty decisions and OHV use would also increase the potential for vandalism and the inadvertent destruction of paleontological resources.

4.11.5. IRREVERSIBLE AND IRRETRIEVABLE IMPACTS

Irreversible impacts to paleontological resources would occur where unavoidable adverse impacts destroy or disturb paleontological resources.