

**ASSESSMENT OF FOSSIL  
MANAGEMENT  
ON FEDERAL AND INDIAN  
LANDS**

**OCTOBER 25, 1999**

# **TABLE OF CONTENTS**

**Executive Summary**

**I. Introduction**

**II. Value of Fossils**

**III. Management of Fossils on Indian Lands**

**IV. Management of Fossils on Federal Lands**

**V. Recommendations**

**Glossary**

**Appendix A: Summary of Management by Bureaus**

**Appendix B: Summary of Comments**

## EXECUTIVE SUMMARY

This report was prepared in response to Congress's request for an assessment of the need for a unified federal policy on the collection, storage, and preservation of fossils and for standards that would maximize the availability of fossils for scientific study. Eight "consulting agencies"-- the Bureau of Indian Affairs, the Bureau of Land Management, the Bureau of Reclamation, the Fish and Wildlife Service, the Forest Service, the National Park Service, the Smithsonian Institution, and the U.S. Geological Survey-- contributed to the report. The views of the public and several organizations, obtained via a public meeting and written comments, were considered in the preparation of the report.

Fossils are non-renewable and relatively rare resources, with significant scientific, educational, commercial, and recreational values. Fossils on Indian lands with commercial value are managed as trust resources, for the economic benefit of the Indian landowner. Fossils on federal lands, on the other hand, are managed for their scientific, educational, and recreational values. The consulting agencies' collection requirements reflect the agencies' varying statutory mandates, but also an attempt to balance the competing values of fossils. The differences among the agencies in inventory and monitoring efforts are due largely to varying amounts of acreage, staff, and funding. Other components of fossil management - storage, preservation, and information dissemination - are generally consistent across agency lines.

As a result of preparing this report, the consulting agencies have concluded that administrative actions and future legislation pertaining to fossils should be governed by seven basic principles.

### **Principle 1: Fossils on Federal Land are a Part of America's Heritage**

- ! Fossils are unique resources. Without fossils, human beings would have no understanding of the development of ancient life on earth.
- ! Of all the organisms that have ever lived, only a tiny proportion have been preserved, exposed to view, discovered, and appropriately collected.
- ! The condition, availability, and scientific significance of the fossils on federal lands are among the best in the world.
- ! Federal agencies' current management practices further the paramount scientific and educational values of fossils.

Recommendation: Future legislation should reaffirm the current use of federal fossils for their scientific, educational, and, where appropriate, recreational values.

### **Principle 2: Most Vertebrate Fossils are Rare**

- ! Relatively few sites worldwide contain dense accumulations of vertebrate fossils, and only a fraction of these sites are located on federal lands in the United States. Advocates for

increased collection of vertebrate fossils on federal lands often overestimate these fossils' abundance.

- ! Federal agencies therefore uniformly limit the collection of vertebrate fossils to qualified scientific and/or educational personnel.

Recommendation: Future legislation should reaffirm the restriction of vertebrate fossil collection to qualified personnel, with the fossils remaining in federal ownership in perpetuity.

### **Principle 3: Some Invertebrate and Plant Fossils are Rare**

- ! Although invertebrate and plant fossils generally are more abundant than vertebrate fossils, some are nonetheless extremely rare.
- ! The agencies' varying collection policies for invertebrate and plant fossils reflect the agencies' missions and satisfy the wide range of public interest in these fossils.
- ! The agencies will work to reduce the potential public confusion about the varying collection policies.

Recommendation: Future legislation should reaffirm mission-specific agency approaches to the management of plant and invertebrate fossils.

### **Principle 4: Penalties for Fossil Theft Should be Strengthened**

- ! Hundreds of fossils are stolen from federal lands every year. Such thefts reduce access by scientists and the general public to scientifically significant and/or appealing fossils, and destroy the contextual information critical for interpreting the fossils.
- ! The difficulties of establishing the commercial value of a stolen or damaged fossil hamper effective prosecutions of fossil theft and damage. Commercial value also does not necessarily reflect the scientific and educational values of fossils.
- ! Agency efforts to enhance awareness on the part of the public, scientists, and law enforcement personnel about the various values of fossils and the damage caused by fossil theft would eventually facilitate effective prosecutions. This, in turn, would more effectively deter future theft and damage.
- ! Notwithstanding public education campaigns and increased penalty provisions, fossils will continue to be stolen from federal lands unless agencies can place more trained personnel in the field.

Recommendation: Future legislation should include provisions for penalizing thefts of fossils from federal lands in a manner that will assist agencies more effectively to prosecute such thefts and deter future thefts. Penalties should reflect not only the loss of the fossil, but any damage resulting from its removal. Future funding strategies should emphasize education of federal managers, prosecutors, law enforcement personnel and the judiciary regarding techniques for the adequate protection of fossil resources.

### **Principle 5: Effective Stewardship Requires Accurate Information**

- ! Inventories and monitoring of fossils on federal lands are critical for sound fossil management. Thorough inventory data results in informed decision making and enhances interagency collaboration.
- ! New technologies, the help of amateurs and volunteers, and partnerships can improve the cost effectiveness of information gathering and analysis. However, on-the-ground inventories by professionals will remain important in assessing agency fossil resources.

Recommendation: Future legislation should contain provisions that acknowledge the critical role of inventories in the effective management of fossil resources. Increased emphasis on funding fossil inventories should take into consideration, where possible, regional approaches across agency lines, using modern technology such as GIS. Such funding could also address specific issues, such as the impact of erosion on the loss of resources. Future legislation should assure, as needed, the confidentiality of information about fossil resources.

### **Principle 6: Federal Fossil Collections Should be Preserved and Available for Research and Public Education**

- ! Fossils must be collected in context by trained personnel and remain in public ownership in perpetuity in order to be adequately preserved and available over the years for science and public education.
- ! Federal agencies currently strive to meet the needs of scientists and the general public by housing fossils in both large research institutions and small community-based institutions, as well as federal repositories.
- ! Increased financial resources and enhanced use of online databases, images, and other information would maximize the availability of existing and future museum fossil collections to scientists and the public.

Recommendation: Future legislation should affirm the importance of curating scientifically valuable fossils as federal property, but managed in partnership with non-federal repositories. Future funding approaches should emphasize the use of modern technology to improve curation and access, as well as the sharing of information between and among government agencies and other institutions.

### **Principle 7: Federal Fossil Management Should Emphasize Opportunities for Public Involvement**

- ! The public, including properly-trained amateurs and volunteers, have been and should continue to be a critical part of the management of fossils on federal lands.
- ! Public education is critical in the management of fossils on federal lands.

Recommendation: Future legislation should include an emphasis on public education and participation in the stewardship of fossil resources. Future funding approaches should emphasize the use of technology to increase public education and awareness of the importance and benefit of fossil resources.

DRAFT

# I. INTRODUCTION

## Purpose and Scope of Report

This report responds to Senate Report 105-227 on the Fiscal Year 1999 Interior and Related Agencies Appropriations Act. The Senate Report states that the “*Secretary of the Interior, in consultation with appropriate scientific, educational and commercial entities, should develop a report assessing the need for a unified Federal policy on the collection, storage, and preservation of . . . fossils.*” The Senate Report further states that “*the report should evaluate the effectiveness of current methods for storing and preserving fossils collected on public lands . . .*” The Senate Report also encourages the Secretary of the Interior to assess the need for standards that would “*. . . maximize the availability of fossils for scientific study.*”

As a follow-up to Senate Report 105-227, Senators Tom Daschle and Tim Johnson sent a letter to the Secretary of the Interior. In their letter dated November 5, 1998, the Senators requested “*recommendations as to how to structure . . . a [unified Federal] policy*” including necessary “*legislative action.*” Furthermore, the Senators urged the Secretary to include “*recommendations to improve our ability to preserve and study fossils collected on public lands.*”

The agencies directed by the Senate to assist the Secretary of the Interior in preparing this report (consulting agencies) include the Bureau of Land Management (BLM), the Forest Service (FS), the National Park Service (NPS), the Fish and Wildlife Service (FWS), the Bureau of Reclamation (BOR), the Bureau of Indian Affairs (BIA), and the Smithsonian Institution (SI). The U.S. Geological Survey (USGS) also contributed to the report because of its special expertise in the earth sciences.

In this report, the consulting agencies assess the need for a unified federal policy for collecting, storing and preserving paleontological specimens. This report recommends that federal fossil management would be enhanced by a comprehensive legislative approach for protecting and managing these important resources. Such legislation, as well as future administrative actions, should be governed by the seven overarching principles outlined in this report.

## **Developing the Report to Congress**

The consulting agencies developed the following process for writing this report:

- ! Identification and discussion of the significant policy issues concerning collecting, storing and preserving paleontological specimens; preparation of a summary of these issues.
- ! Identification of relevant departmental manuals, regulations and agency handbooks to assist outside parties' review of the federal government's policies on collecting, storing and preserving paleontological specimens.
- ! Preparation of a background paper on the federal government's existing practices for managing collection, storage and preservation of paleontological materials; publication in the Federal Register of a notice of a public meeting on June 21, 1999 and the availability of the background paper; and distribution of the notice to key professional societies, organizations, and major scientific, educational and commercial entities concerned with collecting, storing and preserving paleontological specimens.
- ! Sponsorship of the public meeting to solicit the views of representatives from various interest groups and the general public; review of the relevant public input.
- ! Preparation of an outline, based on information secured above, of the topics to address in the report to Congress.
- ! Preparation of a draft report; publication in the Federal Register of the notice of the availability of the draft report; and distribution of the notice to attendees of the public meeting.
- ! Preparation of the final report, including a review of comments received, and submission to Congress.

## II. VALUE OF FOSSILS

**Do fossils have scientific value?** Yes. Fossils are the remains and traces of once-living organisms preserved in the earth's crust. The fossil record is our only evidence of more than 3.5 billion years that life has existed on earth. Fossils show us that:

- the first organisms on the planet were similar to living blue-green algae,
- there was a great diversification of multicellular animals in the oceans about 540 million years ago,
- the first plants lived on land about 400 million years ago,
- four-legged creatures first walked on land about 350 million years ago,
- dinosaurs evolved about 220 million years ago, and
- mammals and modern birds became very diverse about 65 million years ago.

Fossils show how the physical earth has changed over time. By studying them we can investigate the effects of climatic change over long periods of time. Fossils show us that:

- the climate has warmed and cooled,
- the positions of continents have changed, and
- mountains have been lifted up from ocean bottoms.

Fossils also document the way living things respond to changing conditions. Without them, we cannot understand the history of life on earth. The fossil record lets paleontologists test their ideas about how the world works. Fossils reveal and help us understand:

- mass extinctions of species at several times in the history of the planet,
- periods when many new forms appeared in a short time,
- genealogical relationships of living species to one another,
- rapid environmental changes in the past,
- effects of human-caused changes to the earth's environment, and
- effects of environmental changes on biological diversity and ecological structure.

**What role do fossils play in education?** Fossils play an important role in education. This is because paleontology, the study of fossils, is a science that combines geology, biology, chemistry and physics in an effort to understand the origin of our world and ourselves. Even the most reluctant student is fascinated by the past, especially when the lessons include dinosaurs in a way that stimulates his or her curiosity and imagination. Fossils are an ideal means for teaching how science works.

**Do fossils have commercial value?** Yes. Complete fossils have commercial value. Many fragments do as well. Many fossils, like objects of art or gemstones, are rare, beautiful or

awe-inspiring. Others are merely curiosities. There is a market for both the rare and exotic and the relatively mundane. Even before there was the science of paleontology, people collected fossils to sell them to museums or private collectors. One tension in the discussion of appropriate fossil management arises from the fact that fossils with high commercial value often have high scientific value.

Orlando

### **III. MANAGEMENT OF FOSSILS ON INDIAN LANDS**

#### **Bureau of Indian Affairs**

The authority of the Bureau of Indian Affairs (BIA) to manage fossil resources on Indian lands is limited and not mandated by statute. Indian lands are not public lands. The BIA's responsibilities are different from land managing agencies within the Department, such as the BLM or the NPS. Indian lands are lands that the United States holds in trust. These lands are subject to a restriction against alienation imposed by the United States because they are for the benefit of an Indian tribe or an individual Indian. The Government does not exercise the same rights of ownership or control over these lands as it does over its own public lands.

The government's role in managing Indian lands is that of a trustee. As a trustee, the BIA approves realty transactions or business arrangements with non-tribal parties that are initiated by an Indian landowner, and this approval is not discretionary. It is based on a determination that the transaction is to the benefit of the Indian landowner.

Fossils that have commercial value have been found to be trust resources, and the BIA must manage the fossils as a trust resource. In managing trust resources, the BIA is limited to approving either leases of Indian lands, or contractual agreements between Indian landowners and third parties for the extraction of such fossils. The criterion for these approvals is that the arrangements be of economic benefit to the Indian landowner. The arrangements are also subject to evaluation under the National Environmental Policy Act (42 U.S.C. 4321-4347) and the National Historic Preservation Act (16 U.S.C. 470 *et seq.*)

Since Indian lands are not public lands, the Indian tribe or individual Indian landowner may use fossil trust resources for their economic benefit. The BIA's role in these transactions is to ensure that the transaction benefits the Indian landowner. The BIA has no other authority to manage paleontological resources within its jurisdiction.

#### **Access**

If individuals or scientists are interested in access to fossils on Indian lands, they must get in touch with the tribe or individual landowner and request permission. The tribe or individual Indian landowner may deny access to their lands or may allow access with certain restrictions. It is up to the Indian landowner, not the BIA, to determine who has access to their lands and under what conditions that access will be permitted. Scientists are encouraged to work directly with the tribe or individual Indian to secure permission for research.

## **IV. MANAGEMENT OF FOSSILS ON FEDERAL LANDS**

Fossils are non-renewable resources. The consulting agencies' principal existing goals for the management of fossils from federal lands are to safeguard their intellectual and educational values and to promote their public benefits.

To explain to the public how the consulting agencies' management of fossils furthers these goals the agencies developed a background paper prior to the June 21, 1999, public meeting. The management components described in the background paper included:

- field inventory, monitoring and protection,
- collection requirements,
- storage and preservation, and
- information management.

The background paper is enclosed with this report, and summarized briefly below. In addition, Appendix A contains a summary of agency-specific policy and practice.

### **Field Inventory, Monitoring, and Protection**

The consulting agencies take somewhat different approaches to performing inventories and monitoring the condition of fossil resources on the lands they administer. Varying levels of acreage, staff, and funding, as well as different mandates, make this appropriate.

Currently, BLM and FS rarely have funding for inventory work prior to receiving project proposals. These agencies therefore conduct paleontological resource inventory and monitoring on a case-by-case basis. When notice of a proposed land use is received, a determination is made whether significant resources may be impacted, and whether a field survey is necessary to locate them. Fossils may be collected, documented, and sent to a repository before or during a project.

Similarly, the NPS has no Servicewide funding source for paleontological resource inventorying and monitoring. As a result, only a few national park units (of the 130 known to have significant paleontological resources) have completed comprehensive paleontological resource inventories. These inventories address land managers' day-to-day concerns such as fossil resource protection, interpretation, curation and research. Yet the fact that so few inventories have been completed means that the fossil resources in many park units are unknown and unprotected.

The Bureau of Reclamation conducts paleontological inventory as targeted by resource management plans.

The consulting agencies are developing cost-effective strategies, using new technology for identifying

areas that are most likely to contain significant fossils. After existing data have been compiled, reconnaissance fieldwork can be planned and implemented. In some cases, amateur paleontologists might be partners in paleontological inventories through participation in the supervised search for, excavation, preparation and curation of fossils from federal lands.

In order to maximize the scientific and educational value of fossils from federal lands, managers must also take into account the natural processes of erosion. Monitoring the condition of fossils and fossil localities provides a picture of how these resources change as they become exposed. However, no comprehensive study has been done to document the contribution of erosion to the loss of the fossil record, the variation in rates of loss, and the best methods of addressing such loss.

The public appetite for owning part of the fossil record, fueled in part by large commercial shows and sales on the Internet, shows no sign of decreasing. While there are laws that deal with theft and vandalism, these crimes increasingly affect fossils and have become a problem on federal lands. Land managing agencies, in addition to gathering baseline and follow-up data, investigate and prosecute incidents of resource theft and vandalism.

## **Collection Requirements**

The policies for collecting scientifically significant fossils on federal lands are premised on the paramount values of research and education. When such fossils are collected by inexperienced people, or when collectors fail to maintain precise information on the original location, rock type, or other conditions of a fossil occurrence, the fossils can be damaged or they can lose their context and much of their value as objects of study. Even when fossils are collected by qualified personnel, agencies must consider the potential impact of the collection process upon other significant resources, such as threatened and endangered species, and cultural resources. (See, for example, the discussion of Sacred Sites considerations at the end of this section.) These are the main reasons why federal agencies regulate fossil collecting on federal lands.

Tables 1 and 2 explain each agency's policies that govern fossil collecting. The variations in policy summarized in Tables 1 and 2 reflect the different mandates and missions of the consulting agencies. For example, the NPS is preservation-oriented. Its policies therefore keep all fossils in the public trust and only permit collection for scientific purposes. On the other hand, the BLM has a multiple use mission. Therefore, some fossils (vertebrates) are preserved for scientific study, while other fossils (plants and common invertebrates) are generally available for recreational and educational use. These collection policies are generally appropriate to the agency and bureau-specific missions, and make it possible for agencies to meet a variety of needs for research, public education, and recreation. These differences largely preclude a single federal fossil collection policy. The exception is the restriction of vertebrate fossil collection to qualified personnel.

**Table 1: Practices of the DOI for collecting fossils**

	<b>Invertebrates</b>	<b>Vertebrates</b>	<b>Petrified Wood</b>	<b>Other Fossil Plants</b>
<b>BLM</b>	Reasonable amounts for personal use, no permit required	Must have a permit	Up to 25 lbs/day/person + 1 piece; not to exceed 250 lbs/year for noncommercial use	Reasonable amounts for personal use, no permit required
<b>BOR</b>	Permit required; scientific purposes only	Permit required; scientific purposes only	Permit required; scientific purposes only	Permit required; scientific purposes only
<b>FWS</b>	Special Use permit required; scientific or educational purposes only	Special Use permit required; scientific or educational purposes only	Special Use permit required; scientific or educational purposes only	Special Use permit required; scientific or educational purposes only
<b>NPS</b>	Permit required; scientific purposes only	Permit required; scientific purposes only	Permit required; scientific purposes only	Permit required; scientific purposes only

Table 2 outlines the various requirements for obtaining a scientific collecting permit.

**Table 2: Requirements for Obtaining a Scientific Collecting Permit**

	<b>Qualifications</b>	<b>Permit Types</b>	<b>Other</b>	<b>Repository</b>
<b>BLM</b>	Graduate degree in paleontology or related topics; or equivalent experience with one who meets that standard	Survey/limited surface collection (<1 sq m disturbance; or excavation (1 sq m surface disturbance or more	Reports required annually and at the end of project. Work in Special Mgmt Areas requires additional reviews	Designated by permit applicant; must meet DOI/BLM standards
<b>BOR</b>	Similar to BLM	Scientific collecting permit	None	Designated by BOR or permit applicant; must have letter from repository showing intent to accept specimens
<b>FS</b>	Same as BLM	Varies with forest unit, from survey and inventory to excavation and collection	Reports required annually and at the end of project. Work in Wilderness Areas may be restricted	Designated in application for Special Use Permit; must meet FS standards. Standards added to permit
<b>FWS</b>	Related to nature of work	Special use permit required for survey or collection	Reports required at the end of the project	Similar to BLM
<b>NPS</b>	In revision; qualifications and experience to conduct scientific study or represents reputable scientific or educational institutions or state/federal agencies	Scientific Research and Collection	Reports required annually	At NPS units, or in an approved repository designated by permit applicant; must meet DOI/NPS standards

## Indian Sacred Sites

All federal agencies with jurisdiction over federal lands must also be in compliance with the President's Executive Order on Sacred Sites (E.O. 13007, May 24, 1996). The Executive Order states that each executive branch agency with statutory or administrative responsibility for the management of federal lands shall, to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions: (1) accommodate access to and ceremonial uses of Indian sacred sites by Indian religious practitioners, and (2) avoid adversely affecting the physical integrity of such sacred sites. Collecting fossils on public lands may impact Indian sacred sites. Therefore, collectors must comply with the Executive Order, agency policies, or procedures developed pursuant to this Executive Order. *See Departmental Manual, Part 512, Chapter 3: Departmental Responsibilities for Protecting/Accommodating Access to Indian Sites.*

## Storage and Preservation

Fossils collected by scientists from federal lands are placed in museums to:

- keep them safe,
- maintain their physical condition,
- keep fossils and information together, and
- make the fossils and their context available for scientific study and for active and current educational and interpretive programs.

Land managing agencies work through the permitting process to ensure that fossils collected by scientists from federal lands are available for exhibit, research, and public education. Fossils collected by scientists under permits issued by the various agencies remain the property of the federal government, and as such are the property of all Americans. Many comments received at the public meeting on June 21, 1999, and in written format, strongly supported the current practice of keeping collected fossils in the public trust. Many natural history museums are undergoing a surge of building and renovation, and are able to provide excellent levels of care for both specimens and data. However, the current levels of funding for both federal and non-federal repositories overall are insufficient to meet the increased demands for curation, display and education.

The Department of the Interior sets and maintains standards for the storage, preservation and care of collections under Departmental Manual 411. Other documents, such as NPS Museum Handbooks and the NPS's Natural Resources Management Reference Manual, add specific direction. The Smithsonian Institution, with decades of experience and extensive resources, is an excellent source of expertise on fossil storage and preservation.

## **Information Management**

Although all the consulting agencies have developed approaches to information management including Geographic Information Systems (GIS) and HyperText Markup Language (HTML), there is no current structure for a systematic approach to sharing information across agencies. Many databases are accessible on the Internet. Repositories that hold federal collections must meet certain standards for maintaining not only specimens, but also the contextual information that accompanies them. However, these institutions often lack sufficient resources to share information among themselves or with the broader public. Although many museums have put some of their catalogue information in digital databases, much more could be done with additional funding to maximize the usefulness of fossils to a wider audience, including the general public, students, land managers, and researchers. Despite funding limitations, many institutions have developed creative educational programs in which the public can learn about fossils collected from federal land.

## V. RECOMMENDATIONS FOR FURTHER ACTION

### **Tribal Land**

The consulting agencies have no recommendations concerning the management of fossils on Indian lands, since this should appropriately be addressed by tribal governments.

### **Federal Land**

As a result of this Congressionally mandated assessment of federal fossil management, the consulting agencies have concluded that a comprehensive legislative approach to the appropriate protection and management of fossil resources would greatly enhance federal stewardship of these resources. The Congress has enacted effective legislation for archaeological resources. While fossils are different from archaeological resources, they deserve similar and serious attention.

Toward that end, the agencies recommend that future legislation, as well as administrative actions, regarding fossils on federal land be governed by the following principles.

#### **Principle 1: Fossils on Federal Land are a Part of America's Heritage**

Americans share in a unique natural legacy. This country, alone in the world, is home to icons such as *Allosaurus*, *Deinonychus*, *Pentaceratops*, and *Stegosaurus*. Other fossils, less vivid in the public imagination than dinosaur skeletons, are no less wonderful and no less our own. Perfect leaves and flowers from Colorado and Utah, a delicate tracery of dinosaur tracks on a 165 million-year-old beach, schools of fish (perfectly filleted by scavengers and decay) that swam in what is now the desert landscape of Wyoming, forests of ancient redwoods in New Mexico, the oldest known parrots from tropical Montana - all these are preserved in the care of the nation. We are enriched by their collective ownership and impoverished in many ways by their loss.

We are particularly fortunate in receiving a legacy on federal lands that has not been squandered by earlier generations or scattered to the corners of the globe. Thomas Jefferson made clear to Lewis and Clark that some of their discoveries would have commercial value, but that some were to be brought back to the East and preserved for study. Part of their collection has survived for nearly 200 years. Jefferson himself studied a fossil ground sloth that he kept in the East Wing of the new White House.

Even this emphasis on preservation and study would have limited effect for the study of fossils if all of North America were covered by lush vegetation. The steep, arid, and deeply eroded terrains on federal lands in the West are the places where fossils are best preserved and most often found.

The earliest trappers and traders sent fossils East, and well before the Civil War, the predecessors of the U. S. Geological Survey had arrived to collect them in great numbers for safekeeping in the Smithsonian Institution. That synthesis of a national inclination to explore, a perfect landscape, a fascination with science, a desire to preserve, and the money and leisure to pursue these goals, brought 19th century Americans into the 20th century with this natural heritage largely intact.

Fossils are elements of the human environment. Although they are not crucial to existence, like water and air, they offer intangible gifts to imagination and curiosity in the same ways that art and music enrich our lives. They remind us who we are, and how we might have come to be. Unlike archaeology, which seems near and familiar because we are studying ourselves, paleontology offers a pilgrimage to deep time. It lets us study what natural systems were like before human influence.

The fossil record always begins with a finite number of organisms that have any chance of being preserved, only a few of which survive to the present. The odds against preserving any plant or animal as a fossil are tremendous. Many factors must act together in order to preserve a specimen millions of years after its death. These factors include:

- protecting the remains from scavengers and decay,
- rapid burial by soft sediments like volcanic ash or mud,
- presence of parts that can be preserved easily,
- limited movement of the remains, either by running water or trampling by animals, and
- limited chemical and physical changes after burial.

Preservation alone is not enough. In order to be discovered, the fossil must be:

- exposed to view,
- seen by a human being,
- recognized for what it is, and
- collected appropriately.

We know only a little about the fossil record, and the fossil record consists mostly of gaps that remain to be filled. Unique and significant assemblages of fossils need to be protected as a national treasure for the enjoyment of all.

Federal agencies' current management practices further the paramount scientific and educational values of fossils. Efforts to regulate the collection of significant fossils, foster partnerships with educational groups and inform the public about opportunities on federal lands are part of each agency's goals.

Periodically, and in the course of this report, there have been some proposals to expand the use of fossils on federal land to include commercial uses. The consulting agencies have concluded, however, that the broadest public benefit is derived from the use of fossils for their scientific, educational, and (where appropriate) recreational values.

**Recommendation: Future legislation should reaffirm the current use of federal fossils for their scientific, educational and (where appropriate) recreational values.**

DRAFT

## Principle 2: Most Vertebrate Fossils Are Rare

“Rare” and “common” are subjective terms. In order to give them objective meaning when discussing fossils, we might start by thinking of relative rarity and absolute rarity. One comment noted that there can be thousands of microscopic fossils - foraminifera and diatoms - in a single teaspoon. Such fossils might be seen as absolutely common worldwide, in certain rocks deposited on the ancient ocean floors. Invertebrate and plant fossils are also relatively more common than vertebrates.

But imagine the entire surface of the earth. Most of it is covered with water. Much of the land is covered by soil, trees, and thick vegetation, and even where bare rock is exposed, it is often basalt, granite, or some other rock that yields no fossils. Where sediments are exposed, they commonly contain no fossils at all, or only a few. Finding fossils is the exception, not the rule.

We often fail to take this into account because Americans, especially in the West, have become so accustomed to places like Dinosaur National Monument that we believe this is the norm. In these few fortunate spots, vertebrate fossils are indeed relatively common. But we celebrate them only because such places are the exception. Only a few kinds of vertebrate fossils - fish scales, conodonts - are relatively common.

At issue is the public perception that many vertebrate fossils are so common that they should be made available for unrestricted collection. Several comments described the fossil fishes of the Green River basin in southwest Wyoming in support of this argument.

Eocene (50 million year old) fish fossils from the Green River Formation do occur in large numbers, concentrated in a few layers of sediment and virtually absent from the rest. However, in a global context, such deposits are extremely rare. There are only two such accumulations of Eocene fossil fishes in the world: this one in Wyoming, which is about 50 miles in diameter, and a much smaller one in Italy. The majority of the productive layers are deeply buried, and the fossils can only be removed where the layers are eroded and accessible at the earth's surface. No doubt billions of fossil fishes exist in this area, but only a fraction is accessible without tremendous effort. Illegal collection on federal lands has damaged hundreds of acres in the Green River Formation.

One comment received from a paleontologist also refuted the claim that fossil fishes from Southwest Wyoming are so common that they are not in need of protection. He referenced a single specimen and pointed out that even “After excavation of well more than a million ‘fishes’ over the last 140 years, this specimen is the first [pike] ever found in the [Green River] Formation (and the only complete [pike] skeleton known from the Eocene of North America)!”

A few other comments also attempted to make the case for a wealth of vertebrate fossils by describing great accumulations of bones. Regrettably, these are the exception and not the rule. Relatively few such accumulations, representing 500 million years of geologic time, are known in

the entire world. A fraction of them are on federal land in the United States. Rather than agree to their exploitation, we should be astonished by their existence and treat them with the respectful awe reserved for the very old.

The restriction of vertebrate fossil collection to qualified personnel is one example of a unified federal policy. Some commenters requested a reconsideration of this long standing federal approach. However, in the light of the scientific value of these resources outlined above, and the majority of comments we received from the public, the consulting agencies agree that the policy should remain in place.

**Recommendation: Future legislation should reaffirm the restriction of vertebrate fossil collection to qualified personnel, with the fossils remaining in federal ownership in perpetuity.**

### **Principle 3: Some Invertebrate and Plant Fossils are Rare**

In general, invertebrates and plants are relatively abundant in the fossil record, and are more likely to be preserved than vertebrates. However, there are some kinds of plants and invertebrates that lived in environments so limited, or that survived such enormous odds against preservation and discovery, that they are just as rare as the rarest vertebrates. In west central Nevada, 15 million year old lake beds preserve delicate wasps, lacewings, beetles and ants in shales so thin they are called “paper shales.” Leaves of the ironwood tree, which now lives only on the Channel Islands of California, occur in the same place.

The acknowledgment that some invertebrate and plant fossils are rare does not mean that the public cannot enjoy them. For example, the NPS tries to ensure that all visitors to parks and to fossil repositories are able to see the fossils for which park units were created by allowing the collection of fossils for scientific or research purposes, and by specifying that all collected specimens remain in federal ownership.

Those who enjoy paleontology as a hobby are welcome to collect a wide variety of plant and common invertebrate fossils on lands administered by the BLM. No permit is required, although there are some limitations (see Table 1 on page 12), and the fossils may not be bartered or sold. Recreational use of BLM lands is an increasingly important function, and limited casual collecting of petrified wood, invertebrates, and plant material is a low-impact hobby that can be enjoyed by almost anyone on lands designated for such a purpose.

The consulting agencies received some input to indicate that the differences in collection policies for plant and invertebrate fossils may be confusing to the public. However, the agencies believe that the policies are in conformance with agency missions, and do not jeopardize the protection of scientifically significant fossils. At the same time, agencies have concluded that they should improve public understanding of their goals in the management of plant and invertebrate fossils.

**Recommendation: Future legislation should reaffirm mission-specific agency approaches to the management of plant and invertebrate fossils.**

## **Principle 4: Penalties for Fossil Theft Should be Strengthened**

Even though fossils from federal lands cannot legally be bought and sold, fossils on the open market often have high monetary values. Those that play on our most basic impulses - appeal of the extraordinary, delight in beauty - may also play on our desires to own them and our willingness to pay dearly for the privilege. Thick catalogs and well-attended fossil shows make available a wealth of fossils that can be legally collected from private lands, and from state trust lands in a few Western states.

Escalating commercial values mean that increasingly, unauthorized collecting activity is spilling over onto federal lands. The loss of parts of the fossil record means the loss of important scientific and educational information about the history of life. These losses occur as a result of ignorance on the part of the public or deliberate theft. In a study commissioned by the Forest Service (FS), it was found that almost one-third of the paleontological sites surveyed in the Ogallala National Grassland showed evidence of unauthorized collecting. In 1999, NPS conducted a service wide survey identifying 675 documented incidents of paleontological resource theft or vandalism in the national parks between 1995 and 1998. NPS and BLM can issue citations under their regulations, but the fine imposed is usually no more than \$100.

Two federal laws currently target the illegal collection or destruction of fossils. The Archaeological Resources Protection Act, 16 U.S.C. §§ 470aa-470mm (1994) (ARPA) authorizes penalties for illegal collections of paleontological resources. However, ARPA applies only to paleontological resources that were found in an "*archaeological context*." The Federal Cave Resources Protection Act, 16 U.S.C. §§ 4301-4310 (1994) (FCRPA) authorizes misdemeanor-level penalties for illegal collections of paleontological resources from significant caves. Because these authorities address a limited subset of fossils, laws penalizing the theft or depredation of government property (18 U.S.C. § 641 and § 1361) now offer the primary protection for fossils on federal lands. However, establishing the monetary value of a fossil, or damage done to a fossil, can be difficult.

Relatively few people, even within the federal judiciary, know how costly fossils have become, or how these high prices may persuade an unscrupulous few to collect illegally from federal lands. For most people, the idea that a single skeleton could bring as much as \$7.6 million at an auction is incredible or absurd. Even scraps of dinosaur bone, sold in plastic bags, cost \$3 - a truckload of these seemingly worthless bits might bring thousands of dollars to the seller. Additionally, potential expert witnesses can be reluctant to testify on the government's behalf as to the value of a stolen fossil because they believe that their testimony would further escalate commercial fossil prices. As a result of these factors, the fines currently imposed on fossil thieves are usually low compared to the lost resources. At Badlands National Park, for example, a man who had stolen fossils from the park over a period of years was fined a total of \$50.

Even if a stolen fossil can be recovered, crude collecting techniques may reduce its value through a loss of data, or damage to other specimens. Often, the most pronounced damage is the loss of

the context and the historical record, which is difficult to value in monetary terms. In addition, theft and vandalism often cause other environmental impacts, including the loss of other significant resources. Although there is no way to recover such losses, penalties for inflicting the damage should at least be high enough to enhance the deterrent effect. The NPS is beginning to apply the Park System Resources Protection Act, 16 U.S.C. § 19jj, to fossil thefts for that very purpose. Although the agency has been successful in using innovative economic models to reach court-approved settlements under the Act, it remains to be seen whether these models adequately reflect the losses to science and education caused by fossil thefts.

To build more effective cases under the government property laws, managers, prosecutors, the public, and the judiciary need to be better informed about commercial values, about the relative rarity of fossils that drives prices up, and about the scientific and educational values of fossils. Furthermore, the public is being made aware of successful prosecutions and penalties commensurate with the gravity of the offense. Public awareness is essential because it deters potential violators and, it increases the public's sense of affiliation with the agencies that are protecting the public's resources.

The consulting agencies are beginning to cooperate on joint efforts, including interagency training, that will disseminate such information. These efforts, modeled after those used to protect archeological resources, bring together scientists and law-enforcement specialists from the federal land management agencies to facilitate coordination and consistency. However, the consulting agencies agree that, despite such efforts, fossils will continue to be lost unless more rangers, paleontologists, and other trained personnel are made available to land managers at the field level.

In two recent cases, three individuals were convicted of theft of some \$10,000 worth of fossil fish from BLM administered lands in Wyoming. Two of these people were also convicted of aiding and abetting in the thefts. The successful prosecution of individuals for theft or damage to fossils, using theft of government property laws, dates back only a few years. So it is reasonable to expect there will be a long learning curve before all elements of the legal system work successfully in deterring and punishing these crimes.

**Recommendation: Future legislation should include provisions for penalizing thefts of fossils from federal lands in a manner that will assist agencies more effectively to prosecute such thefts and deter future thefts. Penalties should reflect not only the loss of the fossil, but any damage resulting from its removal. Future funding strategies should emphasize education of federal managers, prosecutors, law enforcement personnel and the judiciary regarding techniques for the adequate protection of fossil resources.**

## **Principle 5: Effective Stewardship Requires Accurate Information**

Without a clear understanding of the paleontological resources on federal lands, agencies cannot effectively manage and protect these resources for the benefit of the American people. The consulting agencies use a variety of methods for locating and evaluating areas where fossils occur, based on their mandates, the acreage involved, and their ability to use staff, technology and partners in the effort. Much of the initial work can be done by using new technology to search on-line databases and create computer models that integrate satellite images, vegetation and soil maps, and other spatial data in Geographic Information Systems (GIS). However, in many areas, on-the-ground inventories (“ground truthing”) must then be done to provide detailed information.

Information from the above efforts enables land managers to identify areas of scientific significance, assess natural or human-caused impacts, plan cyclic monitoring programs that prevent loss of important specimens to erosion, and evaluate requests for collecting permits. Such baseline information improves the ability of the agencies to make informed decisions about resource stewardship, lets agencies identify museums and other repositories with collections of fossils from federal lands, and enhances opportunities for public education. More detailed inventories within repositories can also provide information about particular collections of fossils from federal lands. Finally, all these activities produce important new discoveries and opportunities for collaborative management. Amateurs can be important partners in paleontological inventories through participation in the supervised search for, excavation, preparation and curation of fossils from federal lands.

For example, an inventory at Channel Islands National Park revealed a virtually complete pygmy mammoth skeleton in rapidly eroding sea cliffs. A team of scientists and students from Northern Arizona University collected the skeleton and the associated geologic data, and it was prepared and studied at the Mammoth Site, Hot Springs, South Dakota. Intense public interest has prompted a partnership between the National Park Service and the Santa Barbara Museum to develop an exhibit on the pygmy mammoth. Subsequent surveys found more than 100 additional mammoth sites on the Channel Islands, documenting the progressive dwarfing of the island mammoths prior to their extinction.

The NPS has tested some of its inventory methods in Yellowstone National Park, resulting in publications, maps, and increased staff awareness of paleontological resources. The increased staff awareness led to a fourfold increase in reports of paleontological resource theft or vandalism and to the identification of a number of new fossil sites.

Some cost-effective strategies for inventory and monitoring efforts would best be achieved across agency lines through the funding of partnership efforts. One current trend in paleontology is to assemble teams of experts from universities, museums, and government agencies and then focus the team’s energy on understanding a whole ancient ecosystem. A recent team study examined a 140-million-year-old ecosystem that stretched from Arizona to Montana, yielding new discoveries of dinosaurs and other animals, plants, climate and landscape. That work led to profound new

interpretations that are being assembled into interpretive products for the public at visitor facilities in national parks, forests and BLM areas, and on the Internet. Such integrated approaches to inventorying paleontological resources are the most powerful means of enhancing our understanding of the history of life on earth and demonstrating the importance of protecting paleontological sites.

The limited paleontological inventories on federal lands accomplished to date have yielded exciting discoveries. Further inventories are likely to provide new evidence about the history of life. However, despite the availability of new technological approaches, inventory efforts for fossil resources in all the agencies reflect a lack of emphasis and funding in relation to the inventory of other resources.

**Recommendation: Future legislation should contain provisions which acknowledge the need for gathering and analyzing information about where fossils occur, in particular the critical role of inventory in the effective management of fossil resources. Increased emphasis on funding fossil inventory should take into consideration, where possible, regional approaches across agency lines, using modern technology such as GIS. Such funding could also address specific issues, such as the impact of erosion on the loss of resources. Future legislation should assure, as needed, the confidentiality of information about fossil resources.**

## **Principle 6: Federal Fossil Collections Should be Preserved and Available for Research and Public Education**

To maximize the availability of fossils for scientific study and for the public, fossils collected under a permit from federal lands must remain in public ownership where they can be accounted for and made available for repeated research and educational projects. Paleontologists cannot “experiment” with their subjects in the way that chemists or physicists can, so instead they must observe, describe, and analyze what they see. Often, these observations are carried out repeatedly as the science advances, so the need for long-term care of fossils, whether in storage or on exhibit, is critical. For example, unlike 20 years ago, scientists now CAT-scan fossils. The long-term presence of fossils in exhibits and displays may be critical as well, especially to children who enjoy a story over and over, admiring its permanence in their lives and learning new things each time they revisit it.

Fossils and data together form the fabric of paleontology. But like a complex tapestry of fragile threads, the fabric cannot be rewoven once it has been separated. The sediments at a fossil locality cannot be put back in context once they have been dug into and moved. Trained permittees begin the process of collecting fossils and data in context, and it is the work of museums and other repositories to maintain that context. The Department of the Interior has established standards for its own repositories and for other institutions that house its collections and data.

Some public commenters were concerned about excessive handling of specimens by the public; others felt that specimens are locked up in museum basements and inaccessible to all except an elite few. Both these views need to be addressed by agencies that serve the public. Agencies must develop and disseminate information about what fossils are in the public trust and how people can feel a sense of ownership. At the same time, agencies try to ensure that these fossils are professionally preserved and managed.

Despite the balancing act required for effective preservation and access, it is clear that the public believes that scientifically important fossils are a part of their heritage. In the words of one commenter, “Why should my daughter care about the United States when it has become nothing but a commercial [fossil collectors’] center for profit? What kind of interest in science will her children have if the tools and subjects of scientific study are locked away in someone’s private collection?”

Agencies work with a wide range of repositories to house these collections, including federal repositories, large research institutions and small community-based institutions. This approach allows agencies to meet the needs both of researchers and the general public. The long-standing partnership between museums and federal agencies for the curation of scientifically valuable fossil resources works well. However, the steady increases in collections and demand for more effective access by researchers and the public strains the financial resources of the federal

government and the museum community. The use of modern technology could effectively address some of these concerns, but requires shared use of the tools in order to develop the most effective approaches. The consulting agencies, with specific input from the Smithsonian Institution, believe that four steps could be taken to enhance the value of existing museum fossil collections. The steps are as follows:

- complete the capture of information in digital format for existing collections, including those that are un cataloged,
- make full information from databases of specimen information available online over the Internet to qualified researchers and land managers,
- make general information about the collections available to the public via the Internet,
- capture digital images of specimens and link these images to specimen databases so that both researchers and interested amateurs can view their fossils over the Internet.

The following benefits could result from moving collections information and images online:

- Museum collections could become a tremendous educational resource for teachers at all levels across the entire country. For example, a teacher in Wyoming could use the Internet in his/her classroom to query a database of the Smithsonian Institution in Washington, D.C., about fossils collected in a Wyoming county, and be able to display pictures of those fossils to the class,
- Online images and databases could be a major source of information to amateurs and hobbyists. A collector in Iowa using a digital database and picture could identify a crinoid fossil found in his/her backyard,
- Enhanced online information would also give land managers some of the information they need about the resources under their jurisdiction. They could answer questions such as: what fossils in their area have been collected, which fossils are rare, and who should they turn to for more technical information about a particular fossil occurrence?
- Online databases would improve the efficiency of scientific investigations by allowing scientists to access records from multiple museums, and view specimens prior to or instead of traveling. The greater efficiency for scientists would result in an increase in the knowledge generated from federal collections.

**Recommendation: Future legislation should affirm the importance of curating scientifically valuable fossils as federal property, but managed in partnership with non-federal repositories. Future funding approaches should emphasize**

**the use of modern technology to improve curation and access, as well as the sharing of information between and among government agencies and other institutions.**

draft

## **Principle 7: Federal Fossil Management Should Emphasize Opportunities for Public Involvement**

None of the principles discussed above can be implemented without the endorsement and support of the American people. Agencies, no matter how much they wish to, cannot do the whole job of caring for this part of America's heritage. All the consulting agencies currently foster the involvement of the general public - amateurs, volunteers, and students - in a variety of opportunities in paleontology on federal lands, depending on that involvement to foster a sense of ownership so that each citizen can become a steward of the past. More opportunities should be identified by consulting agencies with this goal in mind. For some agencies, amateur and volunteer opportunities might include training, assisting an agency with fossil inventory for land use planning and resource management, and working alongside professional paleontologists as they do inventories, survey and collection of fossils for research and scientific projects, exhibitions, and protection and preservation. Continued recreational collecting of plants and common invertebrates on BLM-administered lands provides the kind of hands-on involvement that builds powerful attachments to the land and the resource. NPS lands offer visitors an equally valuable experience. Providing resource education tempered by a resource protection message.

An excellent example of a partnership between government and the public is the Dinosaur Depot in Garden Park, CO, the museum of the Garden Park Paleontology Society (GPPS.) The GPPS originated as a local volunteer interpretive group that conducted tours of the Garden Park Fossil Area, one of the earliest collecting sites of the "dinosaur hunters" of the late 1800's. The GPPS also helps the BLM with management and protection of the paleontological sites in the area. The museum is a result of local residents wanting to keep specimens collected from the Fossil Area in the community, and wanting to provide educational and recreational opportunities for the residents and tourists to enjoy. The museum now has a professional curator, and has achieved repository status with the BLM. Their amateur volunteers are certified through the Denver Museum of Natural History for collection, preparation and maintaining the collections, and the volunteers in turn teach BLM staff how to foster similar groups in other areas.

Information from fossils is also available in databases and in interpretive displays such as those in NPS units, BLM lands, and USFS special sites. The public may participate in paleontological investigations through the USFS Passports in Time projects, as NPS Volunteers in Parks, and as other public land agency volunteers. The public may also participate in activities on federal lands sponsored in partnership with other organizations. The USGS National Paleontological Database is currently under construction.

Failure to involve the public in the preservation of its heritage will certainly result in the loss of rare, beautiful, and significant resources, either through misuse or neglect. People who are well informed about what is at stake, and about their role in ensuring that their children will enjoy America's fossil heritage, can be counted on to protect this legacy.

**Recommendation: Future legislation should include an emphasis on public education and participation in the stewardship of fossil resources. Future funding approaches should emphasize the use of technology to increase public education and awareness of the importance and benefit of fossil resources.**

DRAFT

# GLOSSARY

The consulting agencies agree that the definitions below represent broadly the meaning of these terms for purposes of this report. Slightly different definitions may appear in the policy documents of each agency.

<i>Allosaurus:</i>	Meaning “different lizard,” was a large carnivorous dinosaur from the Late Jurassic Period, about 145 million years ago. It lived in what is now the western United States. It was about 10.5 m long and weighed about 1400 kg. The type species is <i>A. fragilis</i> .
Conodonts:	Teeth of very early fish-like creatures that lived about 515 million years to 210 million years ago.
Crinoid:	A large class of echinoderms usually having a somewhat cup-shaped body with five or more feathery arms.
Curation:	The management, preservation and use of museum objects/specimens, which includes acquisition and disposal, documentation and cataloging, preventive conservation, storage, access, interpretation and exhibition, and research and publication.
<i>Deinonychus:</i>	A carnivorous dinosaur from the Cretaceous Period, about 100 million years ago. This small, intelligent, biped was about 10 feet (3m) long, weighed up to 175 pounds (80 kg), and had a 5 inch (13 cm) long, sickle-shaped claw on each hind foot. Several skeletons have been found in Montana, Utah, and Wyoming, USA. It was named by paleontologist J. Ostrom in 1969. The type species is <i>D. artirrhopus</i> .
Eocene:	Relating to, or being an epoch of the Tertiary Period between Paleocene and the Oligocene or the corresponding system of rocks. About 55 to 35 million years before the present.
Fossil:	Fossils are the remains, traces or imprints of organisms preserved in the earth’s crust. Fossils have been found on every continent on Earth.
Invertebrate:	Animals lacking a backbone or spinal column.
Multicellular:	Having many cells.
Non-renewable:	Not capable of being replaced or replenished.

Organisms:	Living things.
Paleontology:	A science dealing with the life of past geological periods as known from fossil remains.
<i>Pentaceratops</i> :	Meaning “five-horned face,” this was a large ceratopsian dinosaur from the Late Cretaceous period, about 75-65 million years ago. This plant-eater had a very large, bony, scalloped, head frill, a snout horn, 2 larger, forwards facing horns above its eyes, and 2 pointed, horn-like cheek bones. Its enormous skull was up to 9.8 feet (3 m) long. <i>Pentaceratops</i> was up to 28 feet (8 m) long. Fossils have been found in New Mexico, USA. It was named by paleontologist Henry F. Osborn in 1923.
<i>Stegosaurus</i> :	Or ‘roof lizard’, was a plant-eating ornithischian dinosaur that had armored plates along its back and spines on the tail. It lived during the Late Jurassic Period, about 145 million years ago.
Vertebrate:	A vertebrate is an animal with a backbone. Dinosaurs were vertebrates. People are also vertebrates.

## **APPENDIX A. SUMMARY OF MANAGEMENT BY BUREAUS**

### Bureau of Land Management

The Bureau of Land Management (BLM) is charged with retaining the public lands in Federal ownership, planning for their future use through systematic inventory, protecting the quality of scientific and other values, and managing lands for multiple use and sustained yield. In carrying out this mission, BLM manages fossil resources for their scientific, educational, and recreational values in collaboration with museums and other groups. The great majority of the fossil record - invertebrates, plants, and petrified wood - is available for the enjoyment of hobbyists, school groups, and the general public. A permit is required for the collection of scientifically important fossils such as vertebrates, and such specimens and data must be placed in repositories where they remain the property of all Americans. BLM supports the development of exhibits featuring federally associated collections, and the display of exhibit-quality specimens in local museums.

Because the BLM administers some 264 million acres of federally-owned surface, detailed inventories to locate fossils are impractical except on a case by case basis. However, as part of the NEPA process, BLM considers the impact to fossil resources when evaluating surface-disturbing projects, such as pipelines or roads, and in the development of realty exchanges. BLM maintains a professional staff of paleontologists who work with those from other land managing agencies to develop and provide training and to coordinate other interagency functions. Law enforcement officers in critical areas are available to work with paleontologists in preventing damage and loss of this resource.

### Bureau of Reclamation

The mission of the Bureau of Reclamation (BOR) is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. The agency's program emphasis is on water conservation and reuse, environmental protection and restoration, and expansion of its customer base beyond agricultural interests to include rural and urban water users, Native American tribes, the environmental community, and recreational users.

Through leadership and the use of technical expertise, efficient operations, responsive customer service and the creativity of people, the Bureau of Reclamation seeks to protect and preserve natural resources. Fossils are among these natural resources, and the BOR protects them through a permit process. The Bureau of Reclamation has no law enforcement authority at this time, but has drafted and submitted legislative language to establish limited law enforcement capabilities. On BOR administered lands, a permit is required to collect any kind of fossils.

## Fish and Wildlife Service

The U.S. Fish and Wildlife Service's mission is, working with others, to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. As part of this mission, the FWS manages an extensive network of lands that are administered as part of the National Wildlife Refuge System.

In addition to sustaining important wildlife and their habitat, national wildlife refuges protect other important resources such as fossils. Fossils are protected under regulations published in 50 CFR Parts 26 and 27, which require that a permit be issued by FWS to search for and collect fossils on refuges. Permits are issued to reputable scientific and educational institutions that can demonstrate sound research objectives and ensure the long-term care of Federal collections for study and public appreciation.

## Forest Service

The USDA Forest Service is dedicated to caring for the land and serving the people, and to protecting and managing the paleontological (fossil) resources that are important to our natural resource inheritance. The Forest Service will meet its Natural Resource Agenda by providing leadership, technical assistance and support for all forests in the protection and management of our paleontological resources. The Forest Service recognizes multiple-use values for paleontological resources that include a legacy for present and future generations; scientific significance, education and interpretation; recognition of aesthetic qualities; and public participation.

The Forest Service will continue to enhance its resource protection mandates for the protection and preservation of its fossil resources; will continue to foster partnerships and collaborations with other land managing agencies, and educational and scientific institutions; and provide opportunities for public participation and enjoyment of its natural heritage.

## National Park Service

As required by its Organic Act, 16 U.S.C. §§ 1 et seq., the NPS strives to conserve paleontological resources in park units and provide for their enjoyment so that they are unimpaired for the enjoyment of future generations. The current draft of the *NPS Management Policies* (under revision) establishes the following mandates for NPS paleontological resource management:

“Paleontological resources, including both organic and mineralized remains in body or trace form, will be protected, preserved, and managed for public education, interpretation, and scientific research. The Service will study and manage paleontological resources in their paleoecological

context; that is, the geologic data associated with the fossil that provides information about the ancient environment. Parks will establish programs to inventory paleontological resources and systematically monitor for newly exposed fossils, especially in areas of rapid erosion. The Service will protect scientifically significant resources by collection, or by on-site protection and stabilization. The Service will encourage and help the academic community to conduct paleontological field research under terms of a research permit. Fossil localities and associated geologic data will be adequately documented when specimens are collected. Paleontological specimens that are permanently retained under 36 CFR § 2.5 are subject to the policies for museum objects. All specimens collected from park lands remain in Federal ownership. If needed to protect paleontological resources in national park system units from harm, theft, or destruction, the Service will ensure that the nature and specific location of these resources remain confidential. The Service will take all actions necessary to prevent damage and unauthorized collection of fossils. The sale of original paleontological specimens is prohibited in parks.

“Special Circumstances: A park may purchase fossil specimens collected on non-NPS lands only after making a written determination that addresses the following criteria:

The specimens are scientifically significant, and are accompanied by detailed locality data; and pertinent contextual data;

The specimens were legally removed from their site of origin, and all transfers of ownership have been legal;

The alternatives for making these specimens available to science and the public, such as the acquisition of the specimens by other public or educational institutions, are unlikely; and acquisition is consistent with the park's enabling legislation and Scope of Collection Statement, and will ensure the specimens' availability in perpetuity for public education and scientific research.

“Parks will exchange fossil specimens only with other museums and public institutions dedicated to the preservation and interpretation of natural heritage and qualified to manage museum collections. Fossils to be deaccessioned in an exchange must fall outside of the park's Scope of Collection Statement. Fossils in a park collection in compliance with 36 CFR 2.5 may not be exchanged. Exchanges must follow deaccession procedures in the Museum Handbook, Part II, Chapter 6.

“All National Park Service construction projects in areas with potential paleontological resources must be preceded by a pre-construction surface assessment prior to disturbance. For any occurrences noted, or when the site may yield paleontological resources, the site will be avoided, or the resources will, if necessary, be collected and properly cared for.”

### The Smithsonian Institution

The Smithsonian Institution is a trust instrumentality of the United States. Within the context of the Smithsonian's mandate to “increase and diffuse knowledge among men,” extant since 1846,

and the charge of the National Museum of Natural History (NMNH), for research, collection and exhibition of natural history objects, is its traditional stewardship of what are considered “national treasures.” This stewardship is intended to insure the protection and conservation of fossil evidence of past forms of life, and to make this evidence available for scientific studies, both now and in the future. The Department of Paleobiology is charged with being the national repository for one of the world’s largest fossil inventory of more than 40 million lots of fossils representing 480 separate collections. More than 50% of our present collections are from federal lands. According to the Organic Act of 1879 in the founding of the U. S. Geological Survey, after the preliminary studies of natural history objects collected by national expeditions, and by extension those collected on federal lands, are done, these objects are to be offered to the Smithsonian for their consideration, ultimate care, protection and study.

The identification of a fossil as a national treasure requires paleontological expertise, which is represented among the various specialities on the staff of the Department of Paleobiology, NMNH. In addition to recognition of the scientific importance of new fossil finds, this expertise also includes knowledge of their care and maintenance, a responsibility to the public, the scientific and educational community, and a respect for the future needs of particular fossils (type specimens) as unique standards of reference. A main purpose for research in NMNH is to understand the context of the collections under its care. It is also to inform the public of their importance by publications, exhibition and various means of education. In scope, whereas the NMNH occupies a place near the center of pride in the monumental city of Washington D.C., its role as a “national museum” reaches out to share its treasures as much as possible to those parts of the country from which they come.

## **APPENDIX B. SUMMARY OF COMMENTS**

NOTE: This draft report was developed taking into consideration the comments received at the June 21, 1999 meeting, as well as those received in writing during the public comment period of May 28 to July 28, 1999. The final report will take into consideration those comments, as well as comments received on this draft report. An appendix in the final report will summarize all comments received and explain the manner in which they were responded to in the development of the final report.

**Draft**