

**KANSAS GEOLOGICAL SURVEY
OPEN-FILE REPORT 1989-5**

Paleontological Collecting in Kansas:
A Review of State Regulations and Recommendations
for Future Action in Kansas

by

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KANSAS GEOLOGICAL SURVEY
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PALEONTOLOGICAL COLLECTING IN KANSAS

Rex Buchanan and Chris Maples

Kansas Geological Survey

Open-file report 89-5

For the past few years, commercial fossil collecting has been a subject of growing interest and concern, both nationally and locally. In 1987, the National Academy of Sciences (NAS) produced a major report recommending policies for paleontological collecting. Several of the findings of that report, and its recommendations, are attached (Appendix 1). In general, the report recommends that uniform policies be developed toward fossil collecting on state and federal lands, and that commercial collecting on public lands be regulated.

In Kansas, concern has been focused primarily in the western part of the state, where large vertebrate fossils--such as fish, mosasaurs, and plesiosaurs--are regularly removed from a Cretaceous chalk bed known as the Niobrara formation. Fossils have been removed from the Niobrara for more than 100 years; many have gone to museums throughout Kansas and the world. However, prices for fossils have apparently begun escalating, bringing more commercial fossil collectors (some from Kansas, some from out-of-state) to western Kansas. According to some reports, an increasing number of those fossils now go into private collections.

With increasing interest in commercial fossil collecting came a concomitant increase in concern among local landowners and Kansas residents about commercial collecting, the prices being paid for fossils, and the ultimate disposition of the fossils. During the summer of 1988, the situation gained greater visibility through press coverage, primarily through a series of articles by reporter Mike Corn from the *Hays Daily News*. It should be made clear that none of the concern expressed about collecting was related to casual collectors, such as rockhounds and students, or professional paleontologists.

SURVEY OF EXISTING STATUTES

In anticipation of legislative concern, the Kansas Geological Survey began collecting information about paleontological collection. In July, 1988, we sent query letters to directors of state geological surveys across the country, asking for information about existing

statutory regulation of fossil collecting, recent attempts at legislation, and the workability of such arrangements. The responses to that letter, summarized in an attachment (Appendix 2) show a range of regulatory approaches. Most states have no existing statutes. Of the states that have existing statutes, most have tried (unsuccessfully) to link paleontological statutes with archeological statutes, such as an antiquities act. Nearly all state statutes are aimed solely at state-owned lands, and have had varying degrees of success. Many responses indicated that the primary problem lies with removal of fossils from private property, a problem that has not apparently been satisfactorily addressed.

OTHER STATE AGENCIES

Subsequently, we met with Ramon Powers, director of the Kansas State Historical Society, and Tom Witty, state archeologist, to discuss the Kansas antiquities act and possible inclusion of paleontological collection under the purview of the Historical Society. After discussion with Mr. Powers, we concluded that, because of the existing confusion in the public mind about archeology and paleontology, it was not advisable to combine the regulation of historical and paleontological artifacts. That position is in agreement with NAS recommendations.

Following that meeting, the subject of regulating paleontological collection was placed on the agenda of the Natural and Scientific Areas board, a group that meets under the purview of the Kansas Biological Survey and is made up of representatives of various natural resource agencies in Kansas. That board has the power to designate private and public land as a state natural and scientific area, and has done so for a few sites in the state, primarily those with specific biological characteristics and thus far only on public land. No geologic sites and no privately owned land have been so designated; thus the subject of paleontological collection was eventually removed from the board's agenda.

MEETING WITH KANSAS PALEONTOLOGISTS

Because of continuing interest, we then helped organize two meetings this winter (for press coverage, see Appendix 3). The first, held at Kansas State University on December 9, 1988, involved primarily paleontologists and educators from around Kansas. Attendees were Rex Buchanan, Kansas Geological Survey; Larry Enochs, Center for Science Education, Kansas State University; Ron West, Geology Department, Kansas State University; John Pojeta, U.S. Geological Survey, president-elect of the Paleontological Society, and

one of the authors of the NAS report; Al Kamb, Geology Department, University of Kansas; Larry Martin, Museum of Natural History, University of Kansas; Hans-Peter Schultze, Museum of Natural History, University of Kansas; Mike Corn, Hays Daily News; Lois Bartley, Kansas 4-H clubs; George Clark, Department of Geology, Kansas State University; Jed Day, Geology Department, Kansas State University; Mike Nelson, Geology Department, Fort Hays State University; and Chris Maples, Kansas Geological Survey. Over the course of three hours, the participants discussed a variety of issues concerning fossil collecting, its problems, and its regulation.

The meeting began with a discussion of the recommendations made in the NAS report. Participants expressed unanimous support for all of the recommendations except for #5, which recommends regulation of commercial collecting from public lands. This recommendation led to extended discussion (for commentary from professional paleontological journals, see Appendix 4).

Most concerns focused around commercial collecting of large vertebrate fossils. Participants agreed that casual collecting of vertebrate or invertebrate fossils was not a problem; its regulation was not necessary and therefore not an issue. Problems with commercial collecting centered around the unauthorized collecting of large vertebrate fossils from private property; appropriate compensation for landowners with fossils on their property; the exportation of Kansas fossils outside of the country; and the alteration of fossils for use as art objects.

Larry Martin argued that regulation of commercial collecting was neither desirable nor effective. He pointed out that the Badlands of South Dakota, one of the country's most heavily regulated locations, has not been successfully protected from collectors. Additional regulations would be difficult to enforce and probably not necessary, in that the trespassing and theft involved in fossil collecting were already illegal. Martin was not concerned about the loss of fossils to commercial collectors. Close regulation of vertebrate fossil collecting would, Martin suggested, drive up prices so that scientific collecting would be far more difficult (although Ron West suggested that the size of the market and prices for fossils might have been embellished by sellers). It would also disrupt communication that currently exists between collectors and scientists.

Mike Nelson expressed concern that heavy regulation of vertebrate fossil collecting would probably not be efficacious, and would probably drive the business underground. However, he pointed out that many western states have considered laws related to fossil collecting. Because of recent publicity concerning fossil collecting, he

noted that western Kansas landowners were now watching their land more closely.

In short, the consensus developed that regulation on private land would be difficult and perhaps counterproductive. However, participants felt that commercial collectors (not casual or scientific collectors) should be licensed by the appropriate state agency, and that there should be appropriate fees for the license and appropriate penalties for unlicensed collectors. Such a licensing procedure might be helpful in discouraging unauthorized collecting on private land, and would provide additional penalties for unlicensed collectors. Pojeta suggested that the state's paleontologists work with commercial collectors through the American Association of Paleontological Suppliers. Such a step would, he said, involve collectors in the process.

Nearly all participants also agreed that efforts should be made to keep regulations concerning paleontological collecting separate from archeological collecting. They were concerned about the existing confusion in the public mind between paleontology and archeology; in addition, there was concern about archeologists in governmental agencies being asked to rule on questions of paleontological collecting. Participants noted the existence of large archeological surveys (or inspections for archeological artifacts) that help fund archeological research; they noted the lack of such paleontological surveys, but felt they were not necessarily desirable in paleontology.

The participants also discussed the development of a policy for fossil collecting on state-owned land. While the amount of state-owned parkland in Kansas is relatively small, right-of-ways on state highways constitute a considerable amount of land, and are also common collecting locations, particularly along roadcuts. Again, the participants were not concerned with casual or scientific collecting, but with large-scale commercial collecting. The consensus developed that quarrying (as defined by the NAS report as the movement of 2 cubic meters of earth) for fossils on state-owned land by commercial collectors should require a permit, to be made available from the appropriate state agency. The agency decision about whether or not to issue such a permit should be made in consultation with the Kansas Geological Survey.

Finally, there was discussion of the level of funding for paleontological research within the state. The participants agreed that every effort should be made to take advantage of the educational and historical value of Kansas fossils, and that efforts should be made to keep Kansas fossils at state museums or universities. At the same time, they noted that increased funding was necessary to support the collecting and curating of those specimens, that without more funding

it was impossible to do additional field work or to add extensive numbers of specimens.

The following recommendations were then made: 1) the recommendations made in the NAS report should be made state policy; 2) quarrying for fossils on state-owned land by commercial collectors should require a permit from the appropriate state agency. The decision on awarding such a permit should be made in consultation with the Kansas Geological Survey; 3) commercial fossil collectors should be licensed by an appropriate state agency, with fees for the license and penalties for unlicensed collectors; and 4) efforts should be made to take advantage of the educational and historical value of Kansas fossils. Efforts should be made to keep important Kansas fossils in state museums or universities, with the appropriate funding support developed for collection and curation of those specimens.

PUBLIC MEETING IN HAYS

Because of continuing public interest in the topic, we scheduled a public meeting, mostly aimed at commercial collectors and landowners, for the Fort Hays Experiment Station on January 5, 1989. The meeting was attended by 12 to 15 people, including two commercial collectors, several landowners, the news media, two paleontologists, and a couple of other interested people.

The people attending agreed with the recommendations of the NAS report, although several landowners felt the recommendations did not go far enough in terms of protecting private property. Landowner concerns fell into two areas. First, they were concerned about trespass, about commercial collectors entering without permission. They seemed to feel that trespass laws needed to be beefed up in the case of fossil collecting. They agreed that a licensing process for commercial collectors, as proposed in the December meeting of paleontologists at Manhattan, would help.

Second, landowners were especially concerned about learning fair market value of fossils removed from their lands. They are concerned about some way of learning the value of those fossils, other than simply relying on the word of commercial collectors. "We don't know what they're worth, or how to find out," said one landowner. Several landowners pointed out that collecting has increased dramatically over the past five years, yet very few collectors ask for permission. At least one landowner felt that paying landowners a percentage of the return on the fossils--with a formula similar to royalties paid on oil--was an equitable solution to the problem.

The commercial collectors suggested that self-regulation of collectors was the best place to start, that many of the collectors could be educated by working through the American Association of Paleontological Suppliers. The collectors said that a substantial overseas market exists for the fossils--though they pointed out the historic nature of that market--and they said that prices had increased dramatically in the past few years. One collector suggested that people who donate fossils to museums be given appropriate tax breaks.

Both the landowners and the collectors agreed upon the need for cooperation and improved communication between themselves and professional paleontologists. Both groups were also fairly adamant that the state establish a single liaison person who could take calls from collectors and landowners, and then refer them to the appropriate expert for additional information. There was widespread concern about the difficulty of obtaining information from state museums and universities; both groups thought the situation would be helped by creating a single, responsible source of information, preferably in an existing state institution. They also felt that such a person could serve as a liaison between paleontologists and commercial collectors.

RECOMMENDATIONS

From this process of information gathering, we have drawn the following conclusion. First, there is a problem with commercial paleontological collection in Kansas. Fossils are apparently removed without landowner knowledge, and sold with little or no recompense to landowners. Apparently, much of the problem is from out-of-state commercial collectors. Second, there is no problem with casual fossil collecting by students or rockhounds, or with research collecting by professional paleontologists and institutions. Third, the guidelines developed in the National Academy of Sciences report and in the meeting of Kansas paleontologists are generally useful and should be instituted. Fourth, as best we can determine, fossils currently have no special protection under the law. To help stem their unauthorized removal from private or public property, it might be advisable to develop statutory protection, and make their theft a felony or misdemeanor. Fifth, the Kansas Geological Survey is not a regulatory agency and has no desire to be directly involved in any regulation of paleontological collection. However, the Survey is obviously willing to lead in collecting and providing information about the problem. To that end, the Kansas Geological Survey would act as a liaison between collectors and amateurs and professional paleontologists.

APPENDIX I

Selected Portions of the National Academy of Sciences
Report on Paleontological Collecting

As of 1-17-89, bound copies of the NAS report were no longer available. However, unbound copies could be ordered from the following address:

Committee on Guidelines for
Paleontological Collecting
Board on Earth Sciences
2101 Constitution Avenue
Washington, D.C. 20418

Paleontological Collecting

Committee on Guidelines for Paleontological Collecting
Board on Earth Sciences
Commission on Physical Sciences, Mathematics, and Resources
National Research Council

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EXECUTIVE SUMMARY

The Committee on Guidelines for Paleontological Collecting, by its charge, was concerned mainly with the extent to which federal land managers should control or restrict fossil collecting on public lands.

The charge of the Committee seemed simple at first. It reduced to this apparently straightforward question:

How should government protect and preserve fossils of extinct plants and animals while at the same time allowing other legitimate uses of the land and encouraging the scientific study of fossils?

The implication was that the destruction of fossils should be prevented whenever and wherever possible. It would seem, therefore, that the task of the Committee should have been to develop a set of guidelines for a system of regulation to "protect and preserve" fossils. The task should have been made easier by the fact that a large number of federal agencies with land management responsibilities already have regulatory systems in place.

The Committee found, however, that the problem is much more complex. Some of the salient difficulties are:

(1) Fossils are so numerous in some of the rocks of the Earth's crust that blanket statements such as "all fossils must be protected" are meaningless. If such statements were applied literally, the entire coal industry and major parts of the building-stone industry would cease to exist because their raw materials consist largely of fossils.

(2) Almost all fossil collecting produces new and interesting specimens because the study of ancient life is still in an exploratory phase. Therefore, to say that a fossil is "new to science" is not helpful in deciding which fossils require special protection.

(3) It is virtually impossible to determine, a priori, the scientific significance of a deposit of fossils. With a few special exceptions, a fossil's scientific value can be assessed only after it has been collected, prepared in a laboratory, and studied. Even after study, the scientific importance of a fossil is difficult to codify because so much depends on the changing context of evolving knowledge.

(4) A fossil left in the field, either embedded in rock or resting on a weathered surface, will eventually be destroyed by the natural processes of weathering and erosion.

In the foregoing aspects, fossils are very different from human artifacts, but past attempts at regulation have tended to confuse the two. This has led to uncritical and often unfortunate transfers of standards and procedures from archeology to paleontology.

In its further investigations, the Committee was dismayed to learn of the number of instances of disruption of collecting by what seem to be overzealous regulatory activities of federal agencies. Cases range from a Harvard biology professor who was apprehended in Montana for collecting fossils after inadvertently crossing an unmarked boundary of BLM land to an elderly hobbyist who was arrested in South Dakota for collecting seven rather undistinguished fossils in a National Forest. The government pressed charges in both cases: that of the Harvard professor was dismissed by a U. S. District Court on the grounds that the statute used in the case (Antiquities Act of 1906) was unconstitutional; and that of the South Dakota hobbyist was settled following a plea of nolo contendere and payment of a fine.

In a potentially far-reaching action, the Forest Service has taken steps to require permits for all collecting of sedimentary rocks on Forest Service land on the grounds that these rocks might contain fossils. This is disturbing because of the impact it could have on the teaching of basic field geology in colleges and universities and on the science of paleontology. Fortunately, the Forest Service has announced its intention to limit the permit requirement to vertebrate fossils and to commercial activities (36 CFR Part 261, August 26, 1986). However, the Forest Service is just one of more than 60 federal agencies that have--or assume--regulatory responsibility for fossil collecting.

After much discussion and soul-searching, the Committee adopted the following statement of principle as a basis for its detailed recommendations:

In general, the science of paleontology* is best served by unimpeded access to fossils and fossil-bearing rocks in the field. Paleontology's need for unimpeded access is in sharp contrast to the prevailing situation in archeology. In this report, 'access' is defined to include all collecting and removal of fossiliferous material for study and preservation. Generally, no scientific purpose is served by special systems of notification before collecting and reporting after collecting because these functions are performed well by existing mechanisms of scientific communication. From a scientific viewpoint, the role of the land manager should be to facilitate exploration for, and collection of, paleontological materials.

*Fossils have a broad geologic significance and their study is important to other subdisciplines of geology as well as to paleontology, e.g., stratigraphy, sedimentology, sedimentary geochemistry. Therefore, when this report speaks of the needs of paleontology and the best interests of paleontologists, the intent is to include all the disciplines and scientists who need and use fossils in their research.

In line with this principle, the Committee's specific recommendations are designed to reduce rather than promote regulation. If taken out of context, these recommendations carry the unfortunate implication that the Committee members do not think fossils are important enough to "protect and preserve." Nothing could be further from the truth. We all recognize and appreciate the great importance of fossils both to science and to society, but we also realize that an uncollected and unstudied fossil is of no value. We feel strongly that only with unimpeded access can our knowledge of ancient life move ahead with vigor.

It should be emphasized also that the Committee recognizes that some fossils and fossil deposits are sufficiently unusual or important to require special regulation, and we have proposed a system for this that uses an existing program for designation of natural landmarks on public lands. Even in these cases, however, we are recommending that continued collecting and study for scientific purposes be allowed because, even in these special situations, it makes no sense to inhibit the scientific study of fossils.

The Committee also recognizes that the legislation used to establish national parks and monuments obliges the National Park Service to protect fossils in park areas used heavily by the general public (see Appendix R for further discussion).

The Committee's recommendations are likely to be controversial because several of them are in direct conflict with the existing philosophies and practices of a number of federal agencies. These agencies have important and valid land management responsibilities but in some cases they have interpreted existing laws as requiring them to "protect and preserve" fossils in a manner similar to the conventional treatment of human artifacts. In these cases, the agencies have established programs of inventory and salvage similar to those in archeology. We challenge the archeology-paleontology link and urge a different approach to the problem of fossil collecting, an approach that would both benefit the science and reduce the burden on the land managers.

At its final meeting, held in Los Angeles on September 14, 1986, the Committee voted unanimously to approve the 10 recommendations given below. All 13 Committee members were present and voting. Unanimous approval was also given to explanatory and qualifying statements appended to Recommendations 3, 5, 7, and 9. These are included with the full list of recommendations in Part 5 of this report.

Recommendation #1. A uniform national policy on paleontological collecting should be adopted by all federal agencies. Existing statutory authority is adequate for implementation of such a policy.

Recommendation #2. Each state should adopt a uniform paleontological policy for state-owned lands.

Recommendation #3. All public lands should be open to fossil collecting for scientific purposes. Except in cases involving quarrying or commercial collecting, collecting fossils on public

land should not be subject to permit requirements or other regulation.* [see Part 5 for elaboration]

Recommendation #4. Fossils of scientific significance should be deposited in institutions where there are established research and educational programs in paleontology. These repositories will ensure that specimens are accessioned, maintained, and remain available for study and education. There is no justification for requiring that fossils be deposited in an institution in the same state in which they were found; such requirements discourage paleontological research.

Recommendation #5. Commercial collecting of fossils from public lands should be regulated to minimize the risk of losing fossils and data of importance to paleontology. Permit applications must be subject to review by paleontologists qualified to assess the projects' potential impact on related research programs. Applications must receive the endorsement of a paleontologist who is willing to supply guidance to the commercial operation. Specimens deemed to be of special scientific interest must be deposited in a public institution, such as a museum, college, or university. [see Part 5 for elaboration]

Recommendation #6. Private landowners should follow the guideline that commercial collecting of fossils be undertaken with thorough scientific oversight to ensure that the scientific usefulness of specimens is not impaired.

Recommendation #7. Blanket paleontological inventories, mitigation, or salvage activities should not be undertaken, funded or required by government agencies as a routine part of environmental assessment, impact analysis, permitting, land management, or similar programs. [see Part 5 for elaboration]

Recommendation #8. Land managers or developers who require scientific guidance on perceived paleontological problems should initially seek advice from the U. S. Geological Survey, or appropriate state geological surveys, which in turn may wish to contact appropriate paleontological organizations.

Recommendation #9. The Department of the Interior, in cooperation with the professional paleontological community, should identify and evaluate potential paleontological localities of national significance (both on public and private lands) for designation as National Natural Landmarks (NNLs), pursuant to the existing National Natural Landmark Program administered by the National Park Service (36 CFR 62). [see Part 5 for elaboration]

Recommendation #10. The paleontological societies of the nation should develop permanent and broadly based educational programs to inform landowners and commercial and amateur collectors of the research needs of professional paleontologists.

*As noted above, this recommendation would not apply to National Parks, where permits would still be required for all collecting.

Several of these recommendations refer to commercial collecting, and this is one of the most sensitive and difficult aspects of the overall problem. Many paleontologists find the sale of fossils repugnant on esthetic and moral grounds and because the increasing use of spectacular fossils as art objects encourages over-collecting of rare species. In keeping with this view, the Society of Vertebrate Paleontology (SVP) has made a number of statements protesting commercial activities. In 1973, for example, the Society adopted the following resolution:

The SVP goes on record as opposing the sale to the public of fossil specimens of any sort and that this resolution should be sent to the Secretary of the Interior and the Secretary of Agriculture of the United States.

The general feeling against the sale of fossils has led recently to an agreement among the major natural history museums to stop selling fossils in museum shops. It has also led to a number of attempts to limit or prohibit all fossil collecting for commercial purposes.

As the Committee learned, however, prohibition of all commercial fossil collecting and trafficking would create other problems. For example, most schools and colleges lack resident collections of fossils and must purchase study specimens for classroom use. Also, it is not uncommon for research museums to contract with collectors to obtain fossils of special scientific or display interest, just as zoos often employ professional collectors.

The Committee found it extremely difficult to resolve the legitimate but competing arguments concerning commercial collecting, and the Committee was itself a source of widely divergent views. We have arrived at a compromise position, embodied in Recommendations 4, 5, and 6, which we hope is a reasonable position between the extremes of complete prohibition and total deregulation.

Recommendation 7 also contains controversial elements. At first glance, it would seem that the land manager cannot do his or her job properly without first inventorying all resources on a tract of land. Although this principle is probably valid for certain conventional, easy-to-assess resources, such as some surface mineral deposits, wildlife, and vegetation, the Committee recommends that such automatic and blanket inventory work for fossils is not in the best interests of furthering scientific knowledge. This is partly due to the high cost and virtual impossibility of even reasonably complete paleontological inventories and partly because the real scientific significance* of a fossil deposit can rarely be determined until after collecting and thorough laboratory study. Although a minority of the scientific community favor inventory programs, the Committee's stance on this question conforms to the opinion of most paleontologists (see second quote below).

*This significance can include sedimentary processes, basin processes, paleoecology, and sedimentary chemistry, as well as paleontology sensu strictu.

Indeed, despite the fact that some aspects of the fossil collecting problem remain controversial, it is encouraging to note that the Committee's recommendations are identical in spirit, and very similar in detail, to those adopted by the Paleontological Society in a Position Paper issued on November 5, 1979. The writers of this statement concluded (in part) that:

"Any proposed law or regulation restricting fossil collection must recognize the fossiliferous nature of rocks and the need for law and regulation only for unusual, rare, specific categories of fossils."

and ...

"The Federal Government should provide little in the way of funds to support evaluation and collection of fossils under 'collection' and 'protection' programs."

The complete text of the 1979 Position Paper is given in Appendix L.

By urging a simplification of routine regulatory procedures, the Committee hopes and expects that its recommendations will be an important step toward helping those charged with management of public lands. With the implementation of our recommendations, the land manager will be able to devote more time to those relatively few cases where regulation is both necessary and desirable. And the science of paleontology will be advanced by eliminating much of the unnecessary complexity of the present (and proposed) regulation of fossil collecting on public lands.

2. PALEONTOLOGY AND FOSSIL COLLECTING

Paleontology is the study of fossils, the recognizable remains and traces of once-living, nonhuman organisms that are incorporated into the Earth's rocks. Shells, bones, leaves, tracks, trails, and a variety of other remains constitute a record of the history of life on the planet. Fossils are the focus of interdisciplinary study by geologists and biologists because fossils provide the basic data for evolutionary studies, measurement of time in Earth history, and the understanding of ancient environments and geographies. The research activities of paleontologists span the spectrum of effort from paleobiology to the application of data from fossils to the solving of geological problems.

Paleontology and Society

Fossils and fossil collecting serve a number of overlapping uses in our society. Fossils provide the only direct means of documenting the history of life on the Earth. Countless millions of species of plants and animals have evolved and become extinct in the known 3.5 billion years of the history of life on our planet. Paleontology is dedicated to exploring and studying this record. Knowledge of past life has a profound impact on many aspects of human inquiry, religion, and philosophy; only with this knowledge, can we attempt to place our own existence in a perspective of time and space in relation to our planet and the universe.

Of more day-to-day consequence to society is the use of fossils to establish a relative time scale of the physical history of the Earth. Fossils are found in a definite succession in sedimentary and slightly metamorphosed rocks, and fossils form the basis for the extremely detailed geologic time scale developed over the past 190 years (Appendix F). This geologic time scale is used on a daily basis by scientists studying the Earth and by the petroleum and mineral industries for prospecting, exploration, and mapping the distribution of rocks. Isotopic dating techniques calibrate the paleontologically determined geologic time scale in terms of years.

However, fossils remain basic to the description and measurement of the physical history of the Earth. Although the petroleum industry does not ordinarily use isotopic dating, it cannot function without paleontological dating.

At the federal level, paleontological expertise is housed primarily in the U.S. Geological Survey of the Department of the Interior. Because the Geological Survey does not manage land, it could act as the coordinator for all geological and paleontological advice to the diverse interests in the federal land-managing agencies. Additionally, all states have geological surveys, and most of these have established working relationships with universities, the U.S. Geological Survey, and other federal agencies.

Most professional paleontologists in the United States are organized into various societies (Appendix G). Membership in these societies is open and crosses all employer organization boundaries. The societies publish a variety of scientific papers in their journals, hold annual meetings, and function as the major media for exchange of information among paleontologists.

Fossils have educational value. Students at all levels are interested in dinosaurs and other extinct creatures. However, the significance of fossils in education extends well beyond an occasional trip to a museum or watching an educational television film. In the classroom, or on a field trip to collect fossils, handling and examining fossils are vital parts of both a general education in natural history and specialized training in paleontology, geology, and biology.

Thousands of ardent amateur collectors of fossils derive enjoyment from collecting trips, such as described in Appendix I, and these collectors have elaborate worldwide networks for trading and selling fossils. Many clubs and societies of amateur and hobby paleontologists exist in the United States (Appendix H), and some professional societies have large numbers of amateurs as members (Appendix G). There are many rockhound dealers and gem and mineral clubs worldwide, and many of these cater to amateur or hobby paleontologists. Shows at which fossils are sold or traded are held in Australia, Belgium, Canada, France, Italy, Holland, Spain, Switzerland, the Federal Republic of Germany, the United States, and many other countries.

Significant contributions to paleontology have been made by amateur fossil collectors who were curious and interested enough to share chance discoveries with professional paleontologists. Even in richly fossiliferous rocks that are well known to researchers, amateurs have found new species or exceptional specimens that have led to important scientific advances. A number of rock formations are so sparsely fossiliferous as to seem of little potential scientific value were it not for amateur collectors diligently searching for new material. One example is the Mazon Creek biota of Pennsylvanian age in Illinois (Appendix I). The fossils from Mazon Creek provide a unique view of life in the coal swamps that occupied Illinois 300,000,000 years ago. However, the more important Mazon Creek fossils are so rare that few, if any, professional

paleontologists can justify the time and expense required to collect them. The cumulative efforts of amateurs collecting over many years have made important paleontological analyses of Mazon Creek possible. Paleontologists at the Field Museum of Natural History in Chicago have fostered amateur-professional cooperation in the study of Mazon Creek fossils. Many other examples of amateur-professional cooperation could be cited.

To many people, the purely esthetic quality of fossils is important, and they use fossils for decorative purposes as objects of art. Periodically, fossils come into vogue in interior decorating. The esthetically pleasing patterns of fossils that dominate many polished marbles are widely used by architects for interior and exterior facing stone.

Fossil Collecting

Most fossils are relatively small (less than three inches long) and are collected either by picking up loose specimens on weathered rock surfaces or by using simple hand tools such as hammers, chisels, pry bars, and rakes. In poorly consolidated rocks, sieving of sediment is a common method of obtaining fossils. Quarrying to obtain fossils is generally limited to special situations where a locality is known to be fossiliferous and where the fossils are of special scientific or economic interest. Most such sites involve fossil vertebrates, and quarrying generally follows surface discoveries. Quarrying is expensive and ordinarily requires weeks or months to complete.

During field work, a paleontologist makes judgments as to which specimens to study. Once these judgments are made, selected specimens are removed for preparation and study in the laboratory. Collecting is obligatory if a fossil is to be of scientific or educational value. After specimens have been moved to the laboratory, their informational and predictive values are enhanced by various mechanical and chemical preparation techniques. The fossils are retained for future study and reference. In view of what must be done to make specimens of fossils scientifically useful, leaving specimens unprotected in their natural setting is not sensible. Fossils left behind are eventually destroyed by weathering and erosion.

Paleontology and Archeology

Attempts have been made by various federal agencies to regulate the collecting of fossils under statutes, or derived regulations, intended for archeological objects. This development is attributable to the misconception that paleontology is closely allied to archeology in its methods, objects of study, and goals.

Paleontology is the study of prehistoric, nonhuman life and is most closely allied with geology and biology. Archeology is a subdiscipline of anthropology and is often confused with paleontology. Archeology deals with the remains of past human

populations; it is the systematic study of antiquities and is limited to the materials produced by mankind. Paleontology has developed techniques and procedures different from those of archeology, and the nature of paleontological collecting and the uses of collections are very different from those of archeology.

Archeology focuses on the cultural history of Homo sapiens. This history is usually measured in thousands of years, whereas paleontology deals with the history of life dating back 3.5 billion years. In the Old World, paleontological and archeological scales sometimes overlap because the history of the humans there dates back several million years.

Archeology deals with the products of human activity and includes a broad spectrum of materials that range from arrowheads to pyramids, to ruined cities, and human bones. Because these remains are continuously exposed to weathering and erosion, and because until the industrial revolution comparatively few human beings lived on the Earth at any one time, archeological materials are comparatively rare. Justifiably, all the remains and works of ancient peoples are regarded as having special value, and specific rules for their collecting and/or preservation are appropriate. However, paleontologists do not consider all fossils extremely valuable because the Earth's outer crust contains trillions of them. This very abundance permits the use of fossils to establish a chronology of Earth history through the last 600,000,000 years by using the methods of biostratigraphy. As noted elsewhere in this report, the process of assigning special scientific significance to some fossils, and not to others, is based on knowledge, experience, and judgment. Therefore, paleontological specimens must be treated differently from archeological materials.

Removal of archeological materials, be they tools, pottery, or dwellings, can diminish, or even destroy, the value of the site for future study. Often, sites are best preserved intact and in situ. Archeology is highly site specific, and inventories of varying scale are appropriate to the science. Paleontology is rock-formation specific, and large-scale inventories are generally not practicable. Proper scientific collection of fossils insures their preservation for future generations of scientists and for educational purposes. With some important exceptions, collecting does not foreclose use of the rock formation for future study or as a source of additional fossils.

The archeological excavation method using a system of grid units is seldom used in paleontology and then only in special situations that require a record of the placement of the individual bones or shells.

Commercial Collecting

An industry of commercial fossil dealers has been a part of American paleontology for more than 100 years. Among primary dealers, the estimated 1985 gross income was \$3,000,000. Dealers do primary collecting and also buy from and trade fossils with other

dealers and hobby collectors in the United States and elsewhere. Dealers sell to private individuals, schools, colleges, and museums. Many fossils now on display in museums were obtained this way. The dealers have formed the American Association of Paleontological Suppliers, which has a stringent code of ethics and acts as an oversight group for the business (Appendix J).

The trading, buying, or selling of common fossils often fulfills an educational need. In fact, many museums have funds set aside to purchase unique, unusual, or rare fossils. However, an antagonistic relationship has developed between research paleontologists and the commercial dealers. Almost every professional macropaleontologist has had the experience of seeing an exceptionally well-preserved and/or rare specimen serving as an ornament or priced so high that it could not be purchased for research or educational purposes, even though it may have been offered first to the professional community.

Paleontological field work is commonly seasonal and often requires several years to complete. Furthermore, a paleontologist may not be able to obtain funding for field work on a successive annual basis. Because localities may not be continuously collected and because they are difficult to police, some accumulations of scientifically valuable fossils are quarried away by dealers who later sell them before a paleontologist can finish gathering the basic data. This problem seems most acute in the field of vertebrate paleontology on western public lands. Most vertebrate paleontologists who spoke to the Committee felt strongly that fossils from public lands should remain public property. A written poll submitted to the members of the Society of Vertebrate Paleontology upheld this viewpoint. The antipathy toward commercial collectors is most strongly held by members of this Society.

The problem is not limited to vertebrate fossils on western public lands. For example, some years ago, a graduate student studying Ordovician trilobites in southwestern Ohio discovered a mass accumulation of these fossils. They were present in an unusual growth series, and the student planned to collect sufficient specimens to conduct statistical studies for his thesis. However, the location of the site became known, and local collectors quarried away the trilobites and sold them to a supplier who was not aware of the student's interest. The student was not able to complete his research, and important scientific information was lost.

Are Fossils Rare?

Fossils are not rare. The rocks of the Earth contain trillions of fossils. However, this statement needs qualification. To a large extent, the environment in which organisms lived determines whether the rocks formed in that environment will contain abundant fossils. Fossils are generally most common in rocks formed in relatively shallow marine waters. In this environment, storm waves can pile up shelled bottom-dwelling organisms by the millions. After a storm, the shells are covered by sediment, the animals commonly die, and shell beds several feet thick may form. The fossil record is highly

biased toward shelled organisms that lived in shallow marine environments. However, no matter what the environment, any extinct species that are represented by only a small number of individuals when alive will not be abundant in the fossil record.

In freshwater environments, fossils of animals are usually most abundant in rocks formed in lakes; such rocks may also be rich in the leaves, spores, and pollen of plants. Fossils found in rocks formed in streams and rivers tend to have patchy distributions. However, when found, such deposits of fossils may have large accumulations of bones, plant parts, and shells.

Fossils tend to be least abundant in rocks that formed on dry land because dead plants and animals ordinarily are exposed to the air for long periods of time. The flesh is eaten by scavengers, or it decays, and the bones are disarticulated and broken up. In East Africa, for example, unprotected long bones of modern animals are no longer recognizable after 10 to 15 years because of weathering and erosion.

Microfossils, such as diatoms, pollen, radiolarians, conodonts, many foraminifers, etc., can be so numerous that they often constitute nearly 100 percent of the rock containing them. Despite the foregoing generalizations, the abundance of fossils varies greatly both geographically and geologically, and no categorical statements can be made about their availability and potential importance to science. Vertebrate fossils tend to be the least common. They often occur only as isolated bones and teeth. Skulls, whole skeletons, and concentrations of bones are found only occasionally. Plant fossils also are generally rare and fragmentary although they are present in localized concentrations more often than bones. Most commonly, the plant concentrations preserve particular parts of plants, such as petrified logs or leaf impressions. Shallow marine invertebrates that secrete external shells are the most common macrofossils. In many places, they are a major constituent of the rocks in which they are found and are frequently preserved as complete specimens.

Organisms lacking hard parts are represented by very few fossil specimens, and most of these are regarded as scientific treasures. The animal groups having hard parts that have many terrestrial species generally have the poorest fossil records; these include reptiles, mammals, birds, insects, and spiders. Animal groups having hard parts that have many shallow-water marine species usually have the best fossil records; these include sponges, corals, brachiopods, bryozoans, echinoderms, snails, clams, crustaceans, and fishes. Animal groups having many freshwater species that have hard parts have a fossil record intermediate between terrestrial and marine groups; these include snails, clams, and fishes. However, well-preserved freshwater fish fossils, represented by partial or complete specimens, are known from relatively few localities.

Some fossil species may be known from one or a very few specimens from a small geographic region. A classic example is Archaeopteryx lithographica, thought to be the oldest bird. Only six specimens have been found, and all were collected by amateurs within a few

miles of each other in Jurassic rocks of southern Germany. The predatory dinosaur Tyrannosaurus rex is known from many more specimens over a much larger area of the American and Canadian west. However, most of the specimens are isolated teeth and bones; only three fairly complete skeletons are known.

The rarity of a particular kind of fossil depends very much on what one means by the words 'particular kind.' For example, dinosaur bone fragments are a common constituent of many stream deposits of Mesozoic age; they are found on all continents and occur in rocks spanning more than 100 million years of geologic time. In many collecting areas, finding dinosaur bone fragments or even complete bones is not unusual or especially noteworthy. However, certain species of dinosaurs are known from only one or two localities.

Any reasonable and workable set of guidelines for paleontological collecting must accommodate the tremendous variation in quantity, quality, and areal extent of rocks containing fossils. Statements such as "Dinosaur collecting sites must be protected" are not scientifically defensible, although some dinosaur sites are truly important and deserve special recognition and protection. Differentiating between more significant and less significant localities takes considerable knowledge, judgment, and experience.

Do Fossils Constitute a Nonrenewable Resource?

In the sense that fossil specimens are the remains of long-dead organisms, they are not renewable. However, any single specimen is a representative of a species, and usually other specimens of that species can be found; in this sense, fossils are renewable. Because fossils are part of the rock in which they occur, they may be exposed to view by the natural processes of weathering and erosion. As a result, erosional landscapes such as coastlines, stream valley walls, cliff faces, and arid badlands are most likely to have exposed fossils and to offer the best possibilities for collecting.

Geologists classify rocks into formations depending on the rock type. Formations commonly occupy many square miles of the Earth's crust, vary in thickness, may or may not be exposed at the surface, and represent deposition under a particular set of environmental conditions. Because the distribution of organisms is controlled by environment, one can return to a formation again and again and usually find other specimens of a particular fossil species, providing that the species was not very rare originally.

Some kinds of formations yield new specimens more rapidly than others. Climate and rock type determine the rate at which new specimens become available from a formation. For example, in the wet eastern United States, limestone formations weather and erode rapidly and generally form the low regions in the landscape. In the dry western United States, limestones weather and erode slowly and form the high spots in the landscape.

An outcrop of rock can be temporarily depleted of fossils by collecting, but more specimens may be exposed by heavy rains, tides and waves, or a winter of freezing and thawing. Even in the desert

badlands of the West, erosion rates are very high during infrequent rains and new specimens are exposed with each storm. Furthermore, if one outcrop of a formation is depleted of fossils, paleontologists can usually examine other outcrops.

If a rock is well consolidated and resistant, and if weathering and erosion processes are minimal, new specimens may be exposed very slowly. In such situations, the first collector to discover an outcrop may reap the rewards of centuries of weathering and erosion. Subsequent collectors will find surface collecting less rewarding. However, even in this case, fragments of fossils will usually be present, and they indicate to the trained eye the location of subsurface specimens. Most of the collecting of larger vertebrates is done this way. A whole dinosaur skeleton exposed to view in the field is extremely rare. In a modern paleontological laboratory, the rock matrix surrounding specimens can be removed chemically or mechanically.

An irony of the natural renewal process is that once specimens of fossils are exposed at the surface of the Earth, they do not remain collectible for very long in most environments. If a collector does not remove them, nature will destroy the exposed fossils through weathering and erosion. In especially hard and resistant rocks, on the other hand, a fossil exposure may remain essentially intact for many years.

Fossil specimens cannot be called a "resource" in the usual sense of the word. Unlike some mineral resources, the supply of specimens of most fossil species is effectively inexhaustible. New specimens of most species are continuously being exposed by erosion and by man-made excavations, such as road cuts, building excavations, mining, and quarrying. For most species, the only process that can completely remove all specimens is the removal of the entire formation by erosion or by large-scale mining and quarrying.

There are, of course, exceptions to this general statement. Although the supply of most species is plentiful on a regional or global scale, individual localities can be and are destroyed or made inaccessible by urban development, flood control dams, construction of highways and airports, surface mining, and even over zealous collecting. This is a problem especially when the distribution of important fossils is naturally patchy, as in deposits of ancient streams and rivers.

Also, rocks from certain environments, such as deep sea sediments, are seldom preserved in the geological record; but when they are found, their fossils give us a rare glimpse of a previously unknown diversity of life. Occasionally, as in the case of the Cambrian Burgess Shale, very special conditions of preservation occur, yielding rare fossils of soft-bodied organisms.

Except for teeth and bone fragments, fossils of most terrestrial vertebrates are not common, and generally they have a patchy distribution in stream and river sediments. Such unusual fossils deserve special recognition by society and the scientific community.

4. AN ASSESSMENT OF PALEONTOLOGICAL REGULATIONS

A number of federal and state agencies have tried to develop regulations that recognize the importance of fossil collecting on public lands (Appendices M-O). These attempts have been hampered by the extremely complex and subjective aspects of the problem. Also, agencies rarely have had the benefit of paleontological expertise. Special difficulties have arisen where regulations originally written for archeology have been applied to paleontology.

The Bureau of Land Management has proposed a scheme for classifying lands on the basis of their potential to yield fossils of scientific value (Appendix M). The basis for this classification is "the degree to which a particular geologic formation is known to contain fossils." The Committee finds this criterion unacceptable.

Locality, not geologic formation is the proper basis upon which to determine the paleontological value of land. Much of the Morrison Formation, for example, is paleontologically uninteresting even though some Morrison localities, such as Dinosaur National Monument and the Cleveland-Lloyd Quarry (Appendix K), are paleontologically spectacular. The land is innocent of paleontological significance until a paleontologist demonstrates otherwise.

Additional problems are associated with the complex legal history of the regulation of fossil collecting in the United States. The Committee has not attempted to resolve the basic conflicts that exist in the varying interpretations of statutes, but we have provided, in Appendix R, a general summary of the problem.

Most land-management policies and regulations relating to fossil collecting appear to share a number of basic assumptions. Some of the more important of these are:

- (1) fossils constitute a valuable, nonrenewable resource;
- (2) assessing the importance of the fossils existing on a tract of land is possible and desirable;
- (3) the land manager has an obligation to inventory fossils;
- (4) the land manager has an obligation to preserve and protect fossils in rocks wherever possible;
- (5) collecting of fossils should be limited and controlled, with the general objective of minimizing the amount of collecting; and

(6) collectors should provide detailed plans before collecting and report their findings afterward.

The Committee has serious reservations about these general assumptions. However, the situation is by no means clear-cut. Some or all of the six assumptions are entirely reasonable when applied to specific fossiliferous localities. Few, if any, paleontologists would challenge the need to control collecting at an unusual deposit like the La Brea Tar Pits. And any experienced paleontologist could easily make up a list of a dozen or more such localities in other parts of the United States. In the case of national parks and monuments, the Park Service is obliged by statute to use special measures to protect and preserve fossils.

Problems arise, however, when the six assumptions are applied to the general case. In this broader context, the six principles take on quite a different cast, as follows:

1) Renewability of fossils. Fossil-collecting sites are typically "renewed" by the normal forces of erosion and weathering and by preparation of entombed specimens in the laboratory. To call fossils "nonrenewable" may be technically true, but in a practical sense, it is false for most species.

2) Assessment of importance. In a very real sense, the importance of a fossil is in the eye of the beholder. The scientific importance of fossils depends entirely on how they fit into the broader context of prior knowledge; this is virtually impossible to codify. Therefore, whereas valuations of importance may be desirable, they are extremely difficult, if not impossible, to implement.

3) Inventory. General inventorying of the fossil content of a large area of land is rarely practical or desirable. However, limited-scope inventories and surface predevelopment salvage can be scientifically useful under certain circumstances.

4) Preservation and protection. Most collectable fossils are on the surface and are subject to erosion and weathering. To leave these fossils in a natural state usually ensures their eventual loss. Most fossils have more scientific and educational value after they are removed from the rock, prepared, interpreted, and preserved by museums, universities, geological surveys, companies, and private citizens.

5) Minimizing collecting. Because the supply of fossils is rarely finite and because fossils are for all practical purposes renewable, there is no general justification for minimizing scientific collecting. The act of collecting fossils has value throughout the range of scientific and societal uses. However, it is the view of the Committee that commercial collecting on the public lands should be controlled by a permit procedure and carried out with thorough scientific oversight.

6) Planning and reporting by collectors to land managers. Some of the most scientifically and educationally important collecting results from reconnaissance exploration. Although many paleontological discoveries in the field are made by chance, paleontologists do not prospect randomly. Specific geological formations and general

geographic areas are selected on the basis of available stratigraphical and paleontological data, with the expectation of fulfilling particular research goals. Despite this planning, anticipating a specific locality where the work will be performed or the kinds and numbers of fossils that may be found is seldom possible. Reporting fossil finds is scientifically important because only through such reporting is our knowledge of the history of life, and of the Earth, meaningfully increased. The well established medium of scientific publication accomplishes this function, leaving only special instances where separate reporting to a land manager is justified. Thus, the only use of permits is to limit access to land.

5. CONCLUSIONS AND RECOMMENDATIONS

The Committee was faced with some difficult and controversial issues. Nevertheless, the ten recommendations given below (with annotations) constitute a strong consensus and they were approved unanimously by the full Committee on September 14, 1986.

Recommendation #1. A uniform national policy on paleontological collecting should be adopted by all federal agencies. Existing statutory authority is adequate for implementation of such a policy.

Recommendation #2. Each state should adopt a uniform paleontological policy for state-owned lands.

Recommendation #3. All public lands should be open to fossil collecting for scientific purposes. Except in cases involving quarrying or commercial collecting, collecting fossils on public lands* should not be subject to permit requirements or other regulation.

The Committee recommends the following procedures and definitions:

Reconnaissance Collecting: Requires no advance notice to any public land manager; no permit is required. Such collecting is a day or less at any one locality and involves surface collecting by hand tools.

Extended Stay Collecting: Requires written advance notice to the land manager so that applicable rules can be known and followed;** no permit is required. Consists of surface collecting for more than one day by using hand tools.

* Other than National Parks

**This procedure should be kept simple and fast to allow a collector to explore more fully a newly discovered exposure or an unexpectedly productive site.

Quarrying for Fossils: For this report, a paleontological quarry is defined as an excavation of greater than two (2) cubic yards initiated for the extraction of fossils. Collecting fossils by quarrying should be controlled by a permit procedure. Permit forms should be simple.

Recommendation #4. Fossils of scientific significance should be deposited in institutions where there are established research and educational programs in paleontology. These repositories will ensure that specimens are accessioned, maintained, and remain available for study and education. There is no justification for requiring that fossils be deposited in an institution in the same state in which they were found; such requirements discourage paleontological research.

Recommendation #5. Commercial collecting of fossils from public lands should be regulated to minimize the risk of losing fossils and data of importance to paleontology. Permit applications must be subject to review by paleontologists qualified to assess the projects' potential impact on related research programs. Applications must receive the endorsement of a paleontologist who is willing to supply guidance to the commercial operation. Specimens deemed to be of special scientific interest must be deposited in a public institution, such as a museum, college, or university.

Past experience has clearly shown that commercial collecting has both benefited and hurt paleontological research. Many unique and scientifically important fossils have been discovered and made available to science by commercial collectors. Conversely, there are documented instances of important fossils disappearing into private hands with no opportunity for scientific study. The Committee believes that a permitting procedure for commercial collecting that would ensure access to specimens by scientists would meet the needs of both the scientific community and commercial interests.

Recommendation #6. Private landowners should follow the guideline that commercial collecting of fossils be undertaken with thorough scientific oversight to ensure that the scientific usefulness of specimens is not impaired.

Recommendation #7. Blanket paleontological inventories, mitigation, or salvage activities should not be undertaken, funded, or required by government agencies as a routine part of environmental assessment, impact analysis, permitting, land management, or similar programs.

By facilitating the work of scientists, land managers and other agencies can take advantage of the most effective means of accomplishing inventory objectives, i.e., increasing knowledge of fossil distributions on public lands. Thus, surface paleontological collecting should be encouraged on all public lands, including Areas of Critical Environmental Concern, Research

Natural Areas, Wilderness Study Areas, and Designated Wilderness Areas. There is no need to conduct general paleontological inventories on all public lands. Land managing agencies should contact the U. S. Geological Survey and appropriate state geological surveys to determine the need for a reconnaissance survey or limited-scope paleontological inventory where land development is contemplated. Development includes among other things urbanization, surface mining, dams, airport, and highway construction. In order to avoid unnecessary conflict and work, agencies should make these contacts in the early stages of land use planning and decision making. The Committee sees no need for land managing agencies to produce "Paleontological Resource Sensitivity" maps such as that produced for the Province of Alberta (Appendix P).

Recommendation #8. Land managers or developers who require scientific guidance on perceived paleontological problems should initially seek advice from the U. S. Geological Survey, or appropriate state geological surveys, which in turn may wish to contact appropriate paleontological organizations.

Recommendation #9. The Department of the Interior, in cooperation with the professional paleontological community, should identify and evaluate potential paleontological localities of national significance (on both public and private lands) for designation as National Natural Landmarks (NNLs), pursuant to the existing National Natural Landmark Program administered by the National Park Service (36 CFR 62). [See Appendix Q.]

Designation of a paleontological NNL should be made by the Secretary of the Interior with the advice of a National Paleontological Advisory Committee, which should include representatives of the subdisciplines of paleontology, recommended by the Paleontological Society.

All such localities should remain open for collection of fossils by the scientific community and by collectors commissioned by recognized educational and scientific institutions.

All such NNLs should be limited to the smallest area necessary to achieve their intended purpose.

Any individual or group may propose a fossil locality for designation as an NNL.

Type sections of rock formations and type localities of species are working tools for field stratigraphers, sedimentologists, paleontologists, and other scientists. Type sections and type localities should not for that reason alone ordinarily be designated National Natural Landmarks.

Recommendation #10. The paleontological societies of the nation should develop permanent and broadly based educational programs to inform landowners and commercial and amateur collectors of the research needs of professional paleontologists.

GLOSSARY OF TECHNICAL TERMS

Unless otherwise indicated, definitions are quoted or modified slightly from Bates, R.L., and Jackson, J.A. (eds.), 1980, Glossary of Geology, 2nd Edition, American Geological Institute.

Amateur Paleontologist - The term "amateur" is used to designate those who do not make their full-time living from paleontology. (Journal of Paleontology, 1984, p. 278.)

Archeology - 1) The scientific study of the material remains of past human life and activities, such as fossil relics, artifacts, monuments, etc. 2) The materials of this science; the remains of the culture of a people; as the archeology of the Incas. (Webster's New Collegiate Dictionary, 1956, p.46, G. & C., Merriam Co. Springfield, Massachusetts.)

Biology - The study of all organisms, especially living ones; includes neontology and paleontology but most often is used to imply neontology alone. Neontology is the study of living organisms.

Biostratigraphy - Stratigraphy based on the paleontologic aspects of rocks, or stratigraphy with paleontologic methods; specifically the separation and differentiation of rock units on the basis of the description and study of the fossils they contain. See Stratigraphy.

Formation - A body of rock strata, ...which is unified with respect to adjacent strata by consisting dominantly of a certain lithologic (rock) type or combination of types or by possessing other unifying lithologic (rock) features...

Fossil - The recognizable remains and traces of prehistoric, nonhuman organisms that are incorporated into the earth's rocks. (Defined in this report)

Geology - The study of the planet earth -- the materials of which it is made, the processes that act on these materials, the products formed, and the history of the planet and its life forms since its origin.

Isotopic dating - The application of the study of radioactive and stable isotopes, especially their abundances, to geology. It includes the calculation of geologic time.

Macropaleontology - The study of fossils (macrofossils) large enough to be seen with the naked eye. (Defined in this report)

Metamorphic rock - Any rock derived from pre-existing rocks by mineralogical, chemical, and/or structural changes, essentially in the

solid state, in response to marked changes in temperature, pressure, shearing stress, and chemical environment, generally at depth in the earth's crust.

Micropaleontology - The study of fossils (microfossils) that require magnifying equipment in order to be seen. (Defined in this report)

Outcrop - That part of a geological formation...that appears at the surface of the earth.

Paleontology - As used in this report, paleontology is the study of prehistoric, nonhuman life.

Sedimentary rock - A rock resulting from the consolidation of loose sediment that has accumulated in layers consisting of mechanically formed fragments of older rock transported from its source and deposited in water or from air or ice; a chemical rock formed by precipitation; or a rock consisting of the remains or secretions of plants and animals.

Stratigraphy - The science of rock strata. It is concerned not only with the original succession and age relations of rock strata but also with their form, distribution, composition, fossil content, geophysical and geochemical properties.

Type locality - The place from which the first specimens of a new fossil species are described. (Defined in this report)

Type section - The originally described sequence of strata that constitutes a stratigraphic unit or formation.

LEGAL HISTORY AND INTERPRETATIONS

LAWS AND REGULATIONS PERTAINING TO FOSSILS

I. INTRODUCTION

There is no federal legislation designed specifically for protection of fossils on federal public lands,¹ as there is for archaeological resources. Nevertheless, ample statutory authority exists for the various federal land management agencies to protect, manage and dispose of fossils on public lands. However, with few exceptions, existing statutes do not impose a duty on federal agencies to manage or preserve fossils on public lands. Among the exceptions to this general statement are specific federal statutes establishing national monuments for purposes of preserving fossil remains.² Thus the issue of whether federal agencies should regulate scientific or amateur fossil collecting by means of a permit system is largely a policy question, rather than a legal question. Fossil collecting for commercial purposes, however, probably requires some kind of permit system under existing law to ensure payment of adequate compensation.³

With few exceptions, neither archaeological nor paleontological resources located on private lands are regulated or protected by federal or state legislation. The exceptions include voluntary designation of private sites as national or state landmarks, certain prohibitions against federal actions or undertakings (e.g., federal construction projects or federally funded or licensed projects) that might destroy certain materials, and unsuitability designation for surface mining. Ownership of paleontological and archaeological resources located on private lands rests with the private landowner.

Sections II and III of this appendix summarize both general and agency-specific statutes that may apply to fossils on federal public lands. Brief summaries of laws designed primarily to protect archaeological or historic resources are included both for comparative purposes and because there may be some uncertainty about their applicability to fossils. Section IV summarizes state laws that pertain to fossils. Section V discusses ownership of fossils on "split estate" lands where the surface estate and mineral estate are in separate ownership.

II. FEDERAL STATUTES - GENERAL

A. Antiquities Act

The Antiquities Act of 1906⁴ requires a permit for excavation or removal of "any historic or prehistoric ruin or monument, or any object of antiquity" located on federal public lands.⁵ Unauthorized appropriation, excavation, injury, or destruction of such objects is punishable by a fine of up to \$500 or ninety days imprisonment, or both.⁶ Permits "for the examination of ruins, the excavation of ruins, the excavation of archaeological sites, and the gathering of objects of antiquity" may be issued by the secretary of the department with jurisdiction over the land. Permits may be issued only to "qualified" institutions for the benefit of "reputable museums, universities, colleges, or other recognized scientific or educational institutions, with a view to increasing the knowledge of such objects."⁷ Specimens collected must be permanently preserved in public museums.⁸ Regulations implementing the permit provisions of the Antiquities Act include reporting, curation, and land restoration requirements.⁹

A separate section of the Antiquities Act authorizes the President to establish national monuments to preserve regional "historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest" located on federal public lands.¹⁰ Dinosaur National Monument, for example, was established by presidential proclamation pursuant to this section of the Antiquities Act.¹¹

Although the Antiquities Act does not mention fossils or paleontology, fossils clearly fall within "objects of scientific interest" under the section of the Act authorizing national monuments. It is less clear that fossils were intended to be covered by the permitting provisions of the Act, as "objects of antiquity."

While no reported cases have considered the application of the Act's permit provisions to fossils, the legislative history of the Antiquities Act indicates that Congress was primarily concerned with cultural and archaeological resources.¹² Early administrative interpretation of the Act, however, included fossils within the meaning of the phrase "objects of antiquity," thereby subjecting them to the permitting provisions of the Act, whether or not they were found in an archaeological context.¹³ In practice, only vertebrate fossils and certain types of invertebrate fossils, determined on a case-by-case basis to be of significant scientific interest, were subject to the Antiquities Act permit procedures. In 1977, the Solicitor's Office of the Department of the Interior reconsidered this interpretation, advising that "it would be...more appropriate to adopt a legal strategy which excludes paleontological objects from the Antiquities Act and provides protection for these specimens under the other authorities available to the Department."¹⁴ Despite this advice, some Interior agencies have continued to rely on the Antiquities Act to require permits for vertebrate fossils.

The Solicitor's advice was based in part on the strict construction of the Antiquities Act by the Ninth Circuit Court of Appeals in United States v. Ben Diaz,¹⁵ In Diaz, the court considered the conviction of an individual charged under the Antiquities Act with unauthorized taking from reservation lands of Indian face masks which had been made in 1969 or 1970. The government asserted that "object of antiquity" could include "something that was made just yesterday if related to religious or social traditions of long standing."¹⁶ The court, however, found the terms "ruin," "monument," and "object of antiquity," to be undefined and vague, stating:

One must be able to know, with reasonable certainty, when he has happened on an area forbidden to his pick and shovel and what objects he must leave as he has found them.¹⁷

The court applied the "void for vagueness" doctrine and held that "the statute, by use of undefined terms of uncommon usage, is fatally vague in violation of the due process clause of the Constitution."¹⁸ The only known prosecution for fossil collecting under the Antiquities Act was dismissed on the basis to the Ninth Circuit's decision in Diaz.¹⁹

In a subsequent case, the Tenth Circuit Court of Appeals disagreed with the Ninth Circuit and upheld the constitutionality of the Antiquities Act against a similar claim of statutory vagueness (though on clearly distinguishable facts). In United States v. Smyer,²⁰ the defendant was convicted of taking 800-900 year old Mimbres artifacts for commercial purposes from National Forest lands in New Mexico. The court held that "the Antiquities Act gives a person of ordinary intelligence a reasonable opportunity to know that excavating prehistoric Indian burial grounds and appropriating 800-900 year old artifacts is prohibited."²¹

Even in Ninth Circuit jurisdictions, the Diaz decision has not foreclosed criminal prosecution under the more general theft and malicious mischief statutes²² for conduct that is also covered by the Antiquities Act. In United States v. Jones,²³ the court upheld convictions under these statutes for theft of Indian artifacts from federal lands, applying the rule that "where an act violates more than one statute, the Government may elect to prosecute under either unless the congressional history indicates that Congress intended to disallow the use of the more general statute."²⁴

As recently as 1984, the Interior Department apparently considered fossils to be subject to the Antiquities Act. Secretarial Order No. 3104 re delegated "authority for issuance of archaeological and paleontological permits" under the Antiquities Act and the Archaeological Resources Protection Act from the National Park Service to the various assistant secretaries, for re delegation to the land management agencies.²⁵ Much of the current confusion over paleontological permitting concerns the authority of these agencies under the Antiquities Act or other statutes.

B. Archaeological Resources Protection Act of 1979

The Archaeological Resources Protection Act of 1979 (ARPA),²⁶ protects archaeological resources and sites which are located on federal public lands and Indian lands. ARPA establishes a permit system for excavation or removal of these resources and provides for both civil and criminal penalties. Removal of arrowheads located on the surface of the ground are exempt from both criminal and civil penalties. The Act is directed primarily at commercial exploitation of archaeological resources on public lands.

Most paleontological resources are expressly excluded from coverage by ARPA. The Act's definition of "archaeological resource" excludes nonfossilized and fossilized paleontological specimens, unless found in an archaeological context.²⁷

C. Historic Preservation Statutes

The Historic Sites Act of 1935 provides for preservation of "historic sites, buildings, and objects of national significance for the inspiration and benefit of the people of the United States."²⁸ It authorizes the Secretary of the Interior to survey, investigate, acquire and preserve historical and archaeological sites of national significance.²⁹ The National Historic Preservation Act of 1966 (NHPA)³⁰ greatly expanded protection of historic and archaeological sites and established the National Register of Historic Places. The term "historic preservation" under NHPA includes "protection ... of districts, sites, buildings, structures and objects significant in American history, architecture, archaeology, or culture."

The National Natural Landmarks (NNL) program³¹ is administered by the National Park Service pursuant to the Historic Sites Act.³² The stated purpose of the NNL program is to "identify and encourage the preservation of nationally significant examples of the full range of ecological and geological features that constitute the nation's natural heritage."³³ The regulations define "National Natural Landmark" as "an area of national significance...that contains an outstanding representative example(s) of the nation's natural heritage, including ...geological features,...or fossil evidence of the development of life on earth." "National significance" is defined as "a recognition given to those examples of the full range of ecological and geological features, the usual as well as the unique, which best represent the nation's heritage, the knowledge and appreciation of which are important for the perpetuation of their inherent natural values and for associated scientific, educational, recreational or inspirational benefit."³⁴ Identification, designation, and monitoring of NNLs are done by the National Park Service. Private landowners are encouraged to enter into voluntary cooperative agreements to protect significant values of the landmark.³⁵ NNLs designated on public lands remain under the jurisdiction of the land managing agency.

The Reservoir Salvage Act of 1960 requires preservation of "historical and archaeological data" and specimens that might be destroyed as a result of dam construction projects by federal agencies

or private entities holding a federal license.³⁶ This act represents an alternative to the site preservation approach of the Historic Sites Act; namely, study, salvage, and preservation of site records while allowing development to proceed. The Archaeological and Historic Preservation Act of 1974 amended the Reservoir Salvage Act and extended its coverage from dams to all federal, federally funded, or federally licensed construction projects.³⁷ The present law includes detailed procedures for investigation and salvage of "scientific, prehistorical, historical, or archaeological data" threatened with destruction. It also provides for funding of such investigations, and compensation for loss due to delays in construction or temporary loss of the use of nonfederal land.³⁸ Although this legislation makes no reference to fossils or paleontological data, they could conceivably fall within the "scientific data" category. The stated purpose of the statute is to further the policy set forth in the Historic Sites Act, which appears to be directed primarily at historic and archaeological preservation.

D. National Environmental Policy Act

The National Environmental Policy Act of 1969 (NEPA)³⁹ imposes primarily procedural, rather than substantive, requirements on the decisionmaking process of federal agencies. NEPA requires federal agencies to prepare an environmental impact statement (EIS) on any proposal for a "major federal action significantly affecting the quality of the human environment."⁴⁰ Federal regulations interpret "human environment" broadly to include the "natural and physical environment."⁴¹ In determining whether the environment is "significantly" affected, federal agencies are directed to consider the degree to which the action may "cause loss or destruction of significant scientific, cultural, or historical resources."⁴²

An EIS must include a detailed statement on the following:

- (i) The environmental impact of the proposed action,
- (ii) Any adverse environmental effects which cannot be avoided should the proposal be implemented,
- (iii) Alternatives to the proposed action,
- (iv) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
- (v) Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.⁴³

Preparation of an EIS can be a lengthy process, in part because of the extensive requirements for public participation. Agencies generally prepare an environmental assessment (EA) on proposed actions to determine whether an EIS is necessary, i.e., to determine whether the action is "major" or will have a "significant effect on the quality of the human environment." Once an agency has complied with NEPA's procedural requirements,⁴⁴ however, the Act does not require that the agency's decision be the environmentally "correct" one, or even the

one with the least environmental impact (which is usually the "no action" alternative). As construed by the Supreme Court, NEPA does not require agencies to elevate environmental considerations over other appropriate considerations in selecting a course of action.⁴⁵ NEPA merely requires that the agency give adequate consideration to environmental consequences in its decisionmaking process.⁴⁶

In the process of complying with NEPA, an agency may be required to evaluate the impact of a proposed action on scientifically significant fossils, if any, and to develop alternatives or mitigation measures. However, NEPA does not mandate any particular approach to inventory or management of fossils.⁴⁷

E. 1872 Mining Law

The 1872 Mining Law provides for the location and patent of certain valuable mineral deposits that are not otherwise subject to disposal under the 1920 Mineral Leasing Act⁴⁸ or the 1947 Materials Act.⁴⁹ Minerals subject to location of mining claims under the 1872 Mining Law are generally "hardrock" minerals such as gold, silver, lead, zinc, etc. Neither petrified wood nor the fossil remains of animals may be claimed under the 1872 Mining Law.

In 1913, one Earl Douglas attempted to appropriate the fossil remains of dinosaurs and other prehistoric animals near Vernal, Utah, by location of placer mining claims for the Carnegie Museum. In an administrative appeal, the Interior Department upheld cancellation of the claim, holding that such remains "are not mineral within the meaning of the United States mining laws, and lands containing such remains are not subject to entry under such laws."⁵⁰

A 1962 amendment to the mining laws defined petrified wood and provided that no deposit of petrified wood shall be deemed a valuable mineral deposit within the meaning of the 1872 Mining Law.⁵¹ The amendment also directed the Secretary of the Interior to "provide by regulation that limited quantities of petrified wood may be removed without charge from those public lands which he shall specify."⁵²

Both the Bureau of Land Management⁵³ and the Forest Service⁵⁴ regulate the surface effects of exploration and development activities under the 1872 Mining Law.⁵⁵ BLM regulations require all operations, including casual use, to prevent unnecessary or undue degradation of the public lands and to protect environmental values, including cultural resources and paleontological materials. BLM regulations are quite specific on mining operators' duties to protect fossils:

- (1) Operators shall not knowingly disturb, alter, injure, or destroy any scientifically important paleontological remains or any historical or archaeological site, structure, building or object on Federal lands.
- (2) Operators shall immediately bring to the attention of the authorized officer any cultural and/or paleontological resources that might be altered or destroyed on Federal lands by his/her operations, and shall leave such discovery

intact until told to proceed by the authorized officer. The authorized officer shall evaluate the discoveries brought to his/her attention, take action to protect or remove the resource, and allow operations to proceed within 10 working days after notification to the authorized officer of such discovery.

- (3) The Federal Government shall have the responsibility and bear the cost of investigations and salvage of cultural and paleontology values discovered after a plan of operations has been approved, or where a plan is not involved.⁵⁶

It is not clear how the operator is to determine whether a particular fossil is "scientifically important."

The comparable Forest Service regulations require that all operations be conducted, where feasible, so as to minimize adverse effects on surface resources, without mentioning fossils.⁵⁷

F. Petrified Wood

As noted above, Congress in 1962 directed the Secretary of the Interior "to provide by regulation that limited quantities of petrified wood may be removed without charge from those public lands which he shall specify."⁵⁸ Interior regulations allow collection of limited quantities of petrified wood for noncommercial purposes without a permit, except for specimens over 250 pounds in weight.⁵⁹ The maximum quantity of petrified wood that any one person may remove without charge per day is 25 pounds plus one piece, provided that the total amount removed per person per year may not exceed 250 pounds.⁶⁰ Except as authorized by a permit to remove museum pieces, the use of explosives or power equipment is not permitted in the removal of petrified wood under the free use provisions.⁶¹ Collection is to be done in a manner that prevents unnecessary and undue degradation of lands.⁶² The head of an agency having jurisdiction over a free use area may adopt supplemental rules for collection.⁶³

Specimens removed under the free use provisions may not be sold or bartered to commercial dealers.⁶⁴ Collection of petrified wood for commercial purposes is governed by the 1947 Materials Act and the regulations pertaining to mineral material sales.⁶⁵

G. Materials Act of 1947

The Materials Act of 1947⁶⁶ authorizes the Secretaries of Interior and Agriculture to dispose of mineral and vegetative materials that are not expressly covered by other laws. The Act does not apply to national parks, national monuments, or Indian lands.⁶⁷ Mineral materials are defined to include, without limitation, common varieties of sand, stone, gravel, pumice, pumicite, cinders, and clay. The Act requires payment of "adequate compensation" for such materials and generally requires competitive bidding, although negotiated contracts are permitted in certain circumstances. Federal or state agencies or subdivisions, and nonprofit organizations, may be granted free use

permits for noncommercial purposes.⁶⁸ The Materials Act appears to be the only statutory authority for disposal of fossils from public lands for commercial purposes.

H. Surface Mining Control and Reclamation Act

The Surface Mining Control and Reclamation Act of 1977 (SMCRA)⁶⁹ regulates the environmental effects of coal mining on both federal and private lands. The federal agency primarily responsible for implementing SMCRA is the Office of Surface Mining (OSM). States with approved programs may assume primary responsibility for administering SMCRA within the state. SMCRA does not mention fossils or paleontological data, although it does refer to archaeological sites. The Act provides that permit applications must contain a map that includes "all manmade features and significant known archaeological sites existing on the date of application."⁷⁰ As originally proposed, OSM regulations would have also required identification of paleontological features as part of the mine permit application. This requirement was dropped in the final regulations, apparently on the basis of a legal conclusion that SMCRA and the National Historic Preservation Act require only that manmade cultural, historical, and archaeological features be protected in the mining permit process.⁷¹

Under OSM's final regulations, the only protection for fossils provided by SMCRA is the designation of lands as unsuitable for surface coal mining. Lands may be so designated if, *inter alia*, such mining would "affect fragile or historic lands in which such operations could result in significant damage to important cultural, scientific, and esthetic values and natural systems...."⁷² Apparently only one petition has been filed (in New Mexico) seeking unsuitability designation based on paleontologic values. The petition was rejected in that case since the company had proposed a plan for surveying the permit area for fossils prior to mining and had committed to stop mining and ask the regulatory authority for a significance determination if a potentially significant fossil were found during mining.

III. FEDERAL LAND MANAGEMENT AGENCIES

A. Department of Agriculture - Forest Service

The Secretary of Agriculture has broad authority under its organic act to regulate the occupancy and use of national forests.⁷³ Any violation of the statute or regulations promulgated thereunder by the Forest Service is punishable by a fine of not more than \$500 or imprisonment of not more than six months, or both.⁷⁴

Until recently, Forest Service regulations prohibited excavation or collection of any paleontological resources without a special use permit.⁷⁵ The regulations define paleontological resources as "any evidence of fossilized remains of multicellular plants, including imprints thereof" excluding organic remains primarily collected for use

as fuel such as coal and oil.⁷⁶ There has been at least one recent conviction under these regulations for fossil collecting without a permit on Forest Service lands.⁷⁷

In August, 1986, the Forest Service published an interim final rulemaking that limits this permit requirement to collecting of any vertebrate fossil and to commercial collecting of any paleontological resources.⁷⁸ Two primary reasons were stated for the rule change. First, the distinction between "archaeological" and "paleontological" resources in the Archaeological Resources Protection Act of 1979 (ARPA) implies that federal land management agencies are not mandated to exercise the same degree of protection for the two resources. Second, the collection of paleontological objects on National Forest lands is "a legitimate scientific and educational pursuit and there is no evidence of widespread conflicts or problems that would require a blanket prohibition" on such activities. Vertebrate fossils, however, "have traditionally been accorded special significance and will remain subject to regulation."⁷⁹ Even with this rule change, Forest Service land managers may still issue special closure orders to protect fossils. Such closures are authorized for the protection of, inter alia, "objects or areas of historical, archaeological, geological, or paleontological interest" or for "scientific experiments or investigations."⁸⁰ Entry into special closure areas may be authorized by special use permits.⁸¹ Fossils found in an archaeological context are subject to separate regulations and permits pursuant to ARPA.⁸²

B. Department of the Interior

1. Bureau of Land Management

The 1976 Federal Land Management and Policy Act (FLPMA)⁸³ provides broad general authority for the Bureau of Land Management (BLM) to regulate the use and occupancy of public lands under its jurisdiction "through permits, leases, licenses, published rules, or other instruments as the Secretary deems appropriate."⁸⁴ FLPMA also directs the Secretary to, by regulation or otherwise, take any action necessary to prevent "unnecessary or undue degradation" of the public lands under BLM jurisdiction.⁸⁵ Thus BLM has authority to regulate collection of fossils by means of a permit system, if it chooses to do so. BLM also has a duty to prevent any unnecessary or undue degradation of the public lands that might be caused by fossil collecting. However, FLPMA does not require BLM to regulate all types of fossil collecting by means of permits.

Unlike archaeological resources, fossils are not specifically mentioned in FLPMA. However, FLPMA does contain several references to "scientific values" of the public lands, which would presumably include fossils (at least those that are of scientific value). For example, FLPMA directs BLM to manage the public lands under principles of "multiple use and sustained yield" in accordance with land use plans.⁸⁶ The term "multiple use" is defined in part to mean "a combination of balanced and diverse resource uses that takes into

account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values."⁸⁷

Also, among FLPMA's declarations of policy is a statement that the public lands are to be "managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values...and that will provide for outdoor recreation and human occupancy and use."⁸⁸ Another policy declaration provides that the United States should "receive fair market value of the use of the public lands and their resources unless otherwise provided for by statute."⁸⁹ However, the policy declarations of FLPMA become effective only with specific statutory authority for their implementation as provided by FLPMA or other legislation.⁹⁰

Fossils, as a component or "value" of the public lands, are arguably subject to FLPMA's inventory provisions. FLPMA directs the Secretary to "prepare and maintain on a continuing basis an inventory of all public lands and their resource and other values (including, but not limited to, outdoor recreation and scenic values), giving priority to areas of critical environmental concern."⁹¹ "Areas of critical environmental concern" (ACEC's) are defined as "areas within the public lands where special management attention is required...to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards."⁹² Scientifically significant fossil localities would presumably fall within the category of "natural systems or processes." BLM has used ACEC designation extensively to protect fossil localities.⁹³

BLM has also used "Research Natural Area" (RNA) designation⁹⁴ (under the general authority of FLPMA) to manage and protect fossil localities. RNAs are defined in the regulations as "an area that is established and maintained for the primary purpose of research and education because the land has one or more of the following characteristics:... (4) a typical representation of common geologic, soil, or water features; or (5) outstanding or unusual geologic, soil or water features."⁹⁵ It is not clear from the regulations whether a permit is required to use such areas.

The BLM manages the "Fossil Forest" in New Mexico as a research natural area under special regulations promulgated in 1985.⁹⁶ This area was withdrawn from the mining and mineral leasing laws by the San Juan Basin Wilderness Protection Act of 1984,⁹⁷ which directed the Secretary to manage the area to prevent impairment of its existing natural, educational, and scientific research values, including paleontological study, excavation, and interpretation. Fossils may be collected only with a special use permit issued by the BLM state office.⁹⁸ Permits may be issued only to institutions and individuals engaged in research, museum, or educational projects that provide for detailed recordation, reporting, care of specimens, and

availability of specimens to other scientists and museums.⁹⁹ BLM also manages a number of National Natural Landmarks designated for paleontological values.¹⁰⁰

Noncommercial collecting of fossils other than petrified wood or vertebrate fossils on BLM-managed lands is currently covered only by general "conduct" regulations.¹⁰¹ These regulations allow collecting of "reasonable amounts" of nonrenewable resources such as rocks, mineral specimens, common invertebrate fossils, and semiprecious gemstones, except where otherwise prohibited. BLM proposed consolidated regulations for geologic and hobby mineral collecting in 1982.¹⁰² These regulations, however, were never adopted.

BLM also administers the mineral leasing laws for leasing of oil, gas, coal, and other minerals on federal lands. Such leases contain terms and stipulations to protect surface resources and other values that might be affected by mineral development. For example, the current oil and gas lease form provides:

Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessee may be required to complete minor inventories or short term special studies under guidelines provided by lessor. If in the conduct of operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipated environmental effects are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in the destruction of such species or objects.¹⁰³

Thus BLM may require paleontological inventories or studies in some cases and, in theory, prevent destruction of fossils of scientific interest encountered during oil and gas development.

In a related development, the New Mexico Energy and Minerals Department has entered into a Memorandum of Understanding (MOU) with the New Mexico State Office of the BLM for "Paleontological Mitigation Procedures on BLM Managed Mining Leases in New Mexico."¹⁰⁴ The two agencies agreed to cooperate, in consultation with the professional community, in determining the scope and intensity of a pre-mining paleontological inventory, determining the significance of paleontological occurrences, and developing mitigation procedures. In addition, BLM agreed to determine the disposition of materials collected, to be the permitting agency for inventory and collection activities, and to incorporate appropriate paleontological stipulations into leases.¹⁰⁵ The MOU procedures are to remain in effect "until modified according to the National Academy of Sciences' study recommendations, or until amended to conform with nationwide interim BLM paleontology guidelines, if necessary."¹⁰⁶

2. National Park Service

The National Park Service (NPS) has broad authority to manage and regulate uses of lands under its jurisdiction pursuant to its organic act.¹⁰⁷ National parks and monuments are to be managed "to conserve

the scenery and the natural and historic objects and the wildlife therein...in such manner...as will leave them unimpaired for the enjoyment of future generations."¹⁰⁸ The statute also provides that "no natural curiosities, wonders, or objects of interest shall be leased, rented, or granted to anyone on such terms as to interfere with free access to them by the public."¹⁰⁹

National Park Service regulations provide that "nonfossilized and fossilized paleontological specimens,...or the parts thereof" may not be disturbed, injured, removed, etc., without a permit.¹¹⁰ A specimen collection permit may be issued to reputable scientific or educational institutions or a state or federal agency under certain conditions, including a determination "that the collection is necessary to the stated scientific or resource management goals of the institution or agency."¹¹¹ Other activity permits may be issued based upon "a determination that public health and safety, environmental or scenic values, natural or cultural resources, scientific research, implementation of management responsibilities, proper allocation and use of facilities, or the avoidance of conflict among visitor use activities will not be adversely impacted."¹¹²

Legislation establishing certain national parks or national monuments may impose a duty on the NPS to preserve certain resources, including fossils. For example, several fossil bed national monuments have been established "to preserve [the site] for the benefit and enjoyment of present and future generations" and "to provide for the display and interpretation of scientific specimens" from the sites.¹¹³

The National Park Service also administers the National Natural Landmarks Program pursuant to the Historic Sites Act of 1935.¹¹⁴

IV. STATE LAWS

A. General

State regulation of fossils is typically included in legislation designed primarily for historic preservation or for protection of archaeological and other cultural resources. For some states, it is not clear whether a particular statute is intended to apply to fossils, as well as to archaeological resources (e.g., where the statute refers to objects of antiquity, or objects of historic or scientific significance). However, at least 20 states have adopted legislation that expressly regulates fossils or paleontological sites on state lands. State regulation may include permit requirements, qualifications for permit applicants, reporting requirements, and penalties for noncompliance. Some state laws appear to be modeled after the federal Antiquities Act of 1906.

Several states (including Idaho, Nevada, Utah, and Wyoming) purport to apply state permitting requirements to federal public lands as well as state public lands. A state permit requirement for federal public lands may be invalid, absent consent of the land managing agency, but there are no reported cases challenging the constitutionality

of these statutes. Nor does it appear that the states are attempting to enforce state permit requirements for federal lands.

At least three states (Idaho, Wyoming, and Utah) prohibit the export or removal of certain fossil specimens from the state without consent of the authorized state agency. Such export restrictions on specimens collected from federal public lands are probably invalid, unless incorporated into a permit issued by the federal land management agency.

B. Arizona

The Arizona statute requires a permit from the director of the Arizona state museum for excavation of any vertebrate paleontological site or any other paleontological feature located on lands owned or controlled by the state or any agency thereof.¹¹⁵ Permits may only be granted to institutions, organizations, or corporations organized for scientific, research, or land use planning purposes.¹¹⁶

C. California

California prohibits excavation or removal of any "vertebrate paleontological site, ... or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over such lands."¹¹⁷ Public lands are defined to include lands "owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof."¹¹⁸ Any violation of this provision is a misdemeanor.¹¹⁹

D. Colorado

Colorado requires a permit from the state historical society for investigation, excavation, gathering, or removal of historical, prehistorical, and archaeological resources on state-owned lands.¹²⁰ For public or private lands not owned by the state, the society may undertake to issue permits and perform other functions authorized by the statute when requested by the owner of the land.¹²¹ Permits may only be issued to duly qualified applicants and "only for the benefit of reputable museums, universities, colleges, or other recognized scientific or educational institutions, with a view to increasing the knowledge of such resources."¹²²

E. Florida

Florida enacted legislation to protect vertebrate paleontological sites in 1984.¹²³ Vertebrate fossils found on state-owned lands, including submerged lands and uplands, are declared to be property of the state.¹²⁴ Private lands may be designated as "state vertebrate paleontological sites" with the written consent of the owner.¹²⁵ Vertebrate fossil collecting on state lands or designated state vertebrate paleontological sites may be done only with a permit from

the Florida State Museum.¹²⁶ Collecting on such lands without a permit is punishable by a fine of up to \$500 or imprisonment for up to six months, or both, and forfeiture of all materials collected.¹²⁷

Although the statute does not purport to apply to nonstate-owned lands other than those voluntarily designated, it declares the legislative intent to protect and preserve vertebrate paleontological sites and to "discourage" vertebrate paleontological field investigation activities except in accordance with the provisions and the spirit of the act.¹²⁸ However, the Florida statute provides that the legislative intent is not to impede mining or construction of canals, but rather to encourage mine and heavy equipment operators to cooperate with the state in preserving its vertebrate paleontological heritage by notifying the Florida State Museum whenever vertebrate fossils are discovered during operations and by allowing such fossils to be properly salvaged.¹²⁹ Persons having knowledge of vertebrate paleontological sites are similarly encouraged to communicate such information to the museum.¹³⁰

F. Idaho

Idaho's statute requires a permit from the board of trustees of the Idaho State Historical Society ("board") for excavation of any vertebrate paleontological deposit or site on "any public lands" in Idaho.¹³¹ The statute is apparently intended to cover federal public lands as well as state public lands. Permits may be issued only to applicants who are qualified by experience or professional training to conduct such excavations in an approved scientific manner.¹³² The board is authorized to promulgate regulations necessary to protect vertebrate paleontological sites and deposits on public lands.¹³³ Removal from the state of specimens collected from vertebrate paleontological sites is prohibited without the prior consent of the board.¹³⁴ As a condition to such consent, the board may require that the specimens become or remain the property of the state.¹³⁵ Any violation of the statute is a misdemeanor, and conviction requires forfeiture of all materials acquired or discovered.¹³⁶

G. Kentucky

It is unclear whether Kentucky's archaeological statute applies to fossils. Kentucky's 1962 legislation declares a public policy "to preserve archaeological sites and objects of antiquity for the public benefit and to limit exploration, excavation and collection of such matters [sic] to qualified persons and educational institutions possessing the requisite skills and purpose to add to the general store of knowledge concerning history, archaeology and anthropology."¹³⁷ "Object of antiquity" is defined to mean "a ruin, monument, relic, bone deposit, artifact or any product of human workmanship of Indians or any aboriginal race or pioneers."¹³⁸ It is not clear whether "bone deposit" is intended to refer to human remains or any vertebrate deposit. A permit from the Anthropology Department of the University of Kentucky is required to explore or excavate archaeological sites or

objects of antiquity on lands owned by the state or any political subdivisions.¹³⁹ Permits are to be regularly granted for work undertaken for the benefit of reputable museums, universities, colleges or other recognized scientific or educational institutions with a view to promoting the knowledge of archaeology or anthropology.¹⁴⁰ Any person who discovers an archaeological site or object of antiquity in the course of construction work or otherwise is to report such discovery to the department.¹⁴¹ The department may enter into contracts or cooperative agreements with private landowners relating to the preservation and proper exploration of any archaeological site or object of antiquity located on private land.¹⁴²

H. Louisiana

Louisiana's 1974 statute declares a public policy "to protect and preserve historic properties, artifacts, treasure troves, and objects of antiquity which have historical value or which are of interest to the public," including fossil deposits.¹⁴³ However, the statute seems to be primarily concerned with archaeology and sunken treasure. The Louisiana Archaeological Survey and Antiquities Commission is authorized to promulgate regulations concerning the salvage and study of state historic and prehistoric remains on state lands.¹⁴⁴ The statute "encourages" private landowners to notify the commission at least 90 days prior to knowingly excavating or destroying any remains or artifacts to allow professional supervision by the commission.¹⁴⁵

I. Maine

Although an earlier Maine statute regulated both archaeological artifacts and natural science specimens on state lands, this statute was repealed and replaced by a 1981 statute that only applies to archaeological objects.¹⁴⁶

J. Massachusetts

Massachusetts requires a permit from the state archaeologist for field investigations on lands owned by the state or its political subdivisions or on historic or archaeological landmarks.¹⁴⁷ Any discovery of any archaeological or paleontological site on any lands in the state is to be reported to the state archaeologist and all reasonable steps must be taken to secure its preservation.¹⁴⁸

K. Montana

Montana's statute requires an antiquities permit from the state historic preservation officer for excavation or removal of paleontological remains on state-owned lands.¹⁴⁹ "Paleontological remains" are defined as "fossilized plants and animals of a geological nature found upon or beneath the earth or under water which are rare or

critical to scientific research."¹⁵⁰ Thus it would appear that no permit is required for fossils that are not deemed "rare" or "critical" to science. Antiquities permits may only be granted for work to be undertaken by reputable scientific, educational or related institutions.¹⁵¹

L. Nevada

Nevada requires a permit to explore or excavate historic or prehistoric sites on federal or state lands.¹⁵² "Prehistoric site" is defined to include any paleontological site or deposit, fossilized footprint and other impressions.¹⁵³ For federal lands, the Nevada statute purports to require applicants to also obtain a permit under 16 U.S.C. §§ 431-433 (the federal Antiquities Act).¹⁵⁴ However, the state statute's permitting requirements for fossils are much broader than those of the federal act, as interpreted by the Department of the Interior. Permittees may be required to give up to 50 percent of all materials discovered to the state for deposit with the state museum.¹⁵⁵

M. New Mexico

The New Mexico Cultural Properties Act, NMSA 18-6-1 to 16-6-17 (1978) as amended, does not apply to fossils. "Cultural property" subject to the act is defined to include "a structure, place, site or object having historic, archaeological, scientific, architectural or other cultural significance."¹⁵⁶ The statute is interesting in that it requires a permit for excavations using mechanical earth moving equipment of archaeological sites located on private land.¹⁵⁷ However, a landowner is not required to obtain a permit for personal excavation on his own land.¹⁵⁸ Archaeological specimens collected under such permits remain the property of the landowner.¹⁵⁹

N. New York

New York requires a permit from the Commissioner of Education for collecting "any object of archaeological and paleontological interest" located on state lands.¹⁶⁰ Any violation of this provision is a misdemeanor.¹⁶¹ The discovery of such objects is to be reported to the commissioner by the state department or agency having jurisdiction over such lands.¹⁶²

O. North Dakota

North Dakota's statute requires a permit from the superintendent of the state historical board for excavations or investigations of cultural resources on lands owned by any instrumentality of the state.¹⁶³ The statute defines "cultural resources" to include paleontological sites and materials.¹⁶⁴ A permit is also required for evaluation or mitigation activities pursuant to the National Historic Preservation Act.¹⁶⁵ However, the statute is not intended

to restrict landowners in exploring or excavating cultural resources on their own land.¹⁶⁶

P. South Carolina

The South Carolina Heritage Trust Program¹⁶⁷ provides for the designation of "Heritage Preserves" and "Heritage Sites" to protect natural areas and natural features for various purposes, including paleontological research. In addition, the 1982 South Carolina Underwater Antiquities Act¹⁶⁸ requires a license from the South Carolina Institute of Archaeology and Anthropology for operations involving submerged archaeological or paleontological sites.¹⁶⁹

Q. South Dakota

South Dakota's archaeological resources statute¹⁷⁰ does not appear to apply to paleontology. However, the South Dakota historic preservation statute defines "historic property" to include any object, area or site that is significant in the paleontology of the state, its communities, or the nation.¹⁷¹

R. Tennessee

Tennessee regulates fossils on state lands by requiring a permit from the Tennessee Division of Archaeology for excavation of archaeological or paleontological sites on state lands.¹⁷² If paleontological or archaeological sites are discovered on state lands during construction work, state agencies are required to cooperate with the division of archaeology to obtain data or prevent destruction of the sites.¹⁷³

S. Utah

Utah's statute requires a permit from the Division of State History for exploration or excavation of paleontological deposits on any state or federal lands in Utah.¹⁷⁴ The statute prohibits removal from the state of any materials from such deposits without the consent of the Division.¹⁷⁵ As a condition to granting its consent, the Division may require that a portion of the relics, materials, or deposits remain the property of the state or county in which they were located.¹⁷⁶ The Division is authorized to promulgate rules to protect paleontological deposits of the state from vandalism or injury.¹⁷⁷ Any violation of the statute or the rules promulgated by the Division is a misdemeanor and convictions result in forfeiture to the state of all materials discovered.¹⁷⁸ As noted above, the applicability of the permit, penalty, and forfeiture provisions to federal public lands is questionable.

The statute requires that any discovery of paleontological specimens on state lands be promptly reported to the Division of State History. The statute also states: "It is the intention of the legislature that discovery on privately owned lands of sites or specimens should be immediately reported to the division of state

history and that field investigations should be discouraged except in accordance with this act."¹⁷⁹

Utah's statute also provides for the designation of "state paleontological landmarks." Private lands may be so designated only with the written consent of the owner.¹⁸⁰

T. Virginia

The Virginia Antiquities Act¹⁸¹ does not appear to apply to paleontology. However, the Virginia Cave Protection Act requires a permit from the Department of Conservation and Historic Resources for removal of any paleontological feature of any cave.¹⁸²

U. Wyoming

Wyoming's statute was enacted in 1935. It requires a permit from the state board of land commissioners for excavation of any paleontological deposits on any public lands, either state or federal.¹⁸³ The board is authorized to promulgate and enforce regulations necessary to protect paleontological deposits from vandalism or injury.¹⁸⁴ Removal of such deposits from the state is prohibited except with the consent of the board. As a condition to such consent, the board may require that the materials forever remain the property of the state of Wyoming.¹⁸⁵ Any violation of the statute is a misdemeanor, with a maximum fine of \$100 or six months imprisonment, or both, and forfeiture of all materials discovered.¹⁸⁶

V. OWNERSHIP OF FOSSILS IN SPLIT ESTATE SITUATIONS

The question of fossil ownership may arise where the mineral estate is severed, or owned separately, from the surface estate. This is a very common situation in the western states and is sometimes referred to as the "split estate" situation. The severed mineral estate may be owned privately or by the federal government. The extensive severed mineral estate held by the federal government in the western states resulted primarily from mineral reservations in homestead patents. Today the federal government manages over 100 million acres of severed mineral estate in which all minerals were reserved to the United States plus over 20 million acres in which specific leasable minerals such as coal, oil and gas, or phosphate were reserved.¹⁸⁷

The Solicitor's Office of the Department of the Interior has concluded that federal mineral reservations generally do not include fossils.¹⁸⁸ Thus fossils would belong to the private surface owner where the mineral estate is federally owned. While there are no reported cases dealing with fossils in federal mineral reservations, at least one case has construed a private mineral reservation to include petrified wood.¹⁸⁹

NOTES

¹Legislation to regulate vertebrate fossil collecting on federal and Indian lands was introduced in 1983 by Senator Pressler (S.D.), but died in the Senate Energy and Natural Resources Committee. See Paleontological Resources Conservation Act of 1983, S.1569, 98th Cong., 1st Sess., 129 Cong. Rec. 93 (1983).

²See Section II.B.2 infra on National Park Service.

³See Section II.G. infra on the Materials Act.

⁴Public Law 34-209, 16 U.S.C. §§ 431-433. For readers unfamiliar with legal citations, laws enacted by Congress (also referred to as public laws, statutes, or legislation) are codified in the United States Code (U.S.C.) and cited by title and section number. Regulations (or "rules") promulgated pursuant to these statutes are published in the Federal Register and later codified in the Code of Federal Regulations (C.F.R.), also cited by title and section number. Valid regulations adopted by an agency pursuant to a statute have the full force and effect of law.

⁵16 U.S.C. § 433.

⁶Id.

⁷16 U.S.C. § 432.

⁸Id.

⁹43 C.F.R. §§ 3.5, 3.10, 3.17 (1985).

¹⁰16 U.S.C. § 431.

¹¹Proclamation 1313, 39 Stat. 1752 (1915).

¹²H. R. Rep. No. 2224, 59th Cong., 1st Sess. (1906); S. Rep. No. 3937, 59th Cong., 1st Sess. (1906).

¹³Memorandum of October 12, 1956, from Assistant Solicitor, National Parks, to Chief Clerk. It is interesting to note that this opinion was apparently issued in response to a brief submitted by the American Geological Institute maintaining that fossils were not intended to be covered by the permitting provisions of the Antiquities Act. Thirty years later, paleontologists are raising the same problems with permitting, in spite of the fact that the Solicitor's Office has reversed itself on interpretation of the Antiquities Act.

¹⁴Memorandum of January 19, 1977, from Deputy Solicitor to Assistant Secretary for Fish, Wildlife & Parks, 6. [Emphasis added.] This advice was reiterated by the Solicitor in a more recent opinion, which advised "that the Antiquities Act not be relied on as authority for any fossil management program administered by BLM." Memorandum of January 17, 1986, from Associate Solicitor, Energy and Resources, to Director, Bureau of Land Management, 6.

¹⁵499 F.2d 113 (9th Cir. 1974).

¹⁶Id. at 114.

¹⁷Id. at 115.

¹⁸Id. at 115.

¹⁹United States v. Farisch [sic] Jenkins, No. CR-74-63-BLG, U.S. District Court, Montana District, Billings Division, January 13, 1975. As the later Smver case indicates, the outcome of this case might have been different in a Tenth Circuit state such as Wyoming.

²⁰596 F. 2d 939 (10th Cir. 1979).

²¹Id. at 941.

²²18 U.S.C. §§ 641, 1361.

²³607 F.2d 269 (9th Cir. 1979).

²⁴Id. at 271.

²⁵49 Federal Register, October 15, 1984.

²⁶U.S.C. §§ 470aa-47011.

²⁷16 U.S.C.. § 470bb(1).

²⁸Public Law 74-292, 16 U.S.C. §§ 461-467.

²⁹16 U.S.C. §§ 461-467.

³⁰Public Law 89-65, 516 U.S.C. §§ 470-470t.

³¹36 C.F.R., Part 62 (1985).

³²While the Historic Sites Act may not be the appropriate authority for natural landmarks that are unrelated to cultural or historic resources, ample authority exists under other statutes for such a program.

³³36 C.F.R. § 62.1 (1985).

³⁴36 C.F.R. § 62.2 (1985).

³⁵36 C.F.R. § 62.4 (1985).

³⁶Public Law 86-523, 16 U.S.C. §§ 469-469c, as amended.

³⁷Public Law 93-291, 16 U.S.C. §§ 469-469c.

³⁸Id.

³⁹Public Law 91-190, 42 U.S.C. §§ 4321-4347, as amended.

⁴⁰NEPA § 102(C), 42 U.S.C. § 4332(C).

⁴¹40 C.F.R. § 1508.14 (1985).

⁴²40 C.F.R. § 1508.27 (1985) [Emphasis added].

⁴³42 U.S.C. § 4332(C).

⁴⁴E.g., properly determined the need for an EIS and prepared an adequate EIS.

⁴⁵Strycker's Bay Neighborhood Council v. Karlin, 444 U.S. 223 (1980).

⁴⁶Id.

⁴⁷Archaeologists are often heavily involved in preparation of EISs, primarily as a result of Executive Order No. 11593, 3 C.F.R. § 154 (1985), which detailed federal agency responsibilities under NEPA and the National Historic Preservation Act of 1966. Since no comparable authority exists for paleontology, the agencies are left to their discretion in determining the scope of any paleontological inventory and impact analysis on fossil sites in any particular EIS.

⁴⁸Public land minerals subject to disposal under the leasing system include coal, oil, gas, oil shale, potassium, and phosphate.

⁴⁹Public land minerals subject to disposal under the Materials Act include common varieties of sand, stone, gravel, clay, etc. See Section II.G.

⁵⁰Earl Douglas, 44 L.D. 325, 326 (1915).

⁵¹Public Law 87-713, 30 U.S.C. § 611.

⁵²Public Law 87-713, § 2.

⁵³43 C.F.R. Subpart 3809 (1985).

⁵⁴36 C.F.R. §§ 228.1 - 228.15 (1985).

⁵⁵It is interesting to compare the permit requirements for mining activities under the 1872 Mining Law with those proposed for fossil collecting. The BLM mining regulations require no permit or notice for "casual use," defined as "activities ordinarily resulting in only negligible disturbance" of the lands and resources. 43 C.F.R. § 3809.0-5(b) (1985). A notice is required for operations that cause a cumulative disturbance (including access) of five acres or less per year. 43 C.F.R. § 3809.1-3. An approved plan of operations is only required for those operations that disturb more than five acres per year. C.F.R. § 3809.1-4. Comparable Forest Service regulations require a notice for any operations which "might" cause disturbance of surface resources, and an approved plan of operations for those that will likely cause "significant" disturbance of surface resources. 36 C.F.R. § 228.4 (1985).

⁵⁶43 C.F.R. § 3809.2-2 (1985). [Emphasis added.]

⁵⁷36 C.F.R. § 228.8 (1985).

⁵⁸Public Law 87-713, § 2.

⁵⁹43 C.F.R. § 3622 (1985).

⁶⁰43 C.F.R. § 3622.4 (1) (1985).

⁶¹43 C.F.R. § 3622.4 (2) (1985).

⁶²43 C.F.R. § 3622.4(a)(4) (1985).

⁶³43 C.F.R. § 3622.4(b) (1985).

⁶⁴43 C.F.R. § 3622.4 (3) (1985).

⁶⁵43 C.F.R., Part 3610 (1985).

⁶⁶30 U.S.C. §§ 601, 602.

⁶⁷30 U.S.C. § 601.

⁶⁸Id., See regulations at 43 C.F.R., Subpart 3621 (1985).

⁶⁹Public Law 95-87, 30 U.S.C. § 1201-1328.

⁷⁰SMCRA § 507(B)(13), 30 U.S.C. § 1257(b)(13).

⁷¹Preamble to final regulations, 44 Federal Register 15028 (March 13, 1979). See also Memorandum of July 29, 1981, from Regional Solicitor, Rocky Mountain Region to Regional Director, OSM, on "Paleontological Resources and Mine Plan Review."

⁷²SMCRA § 522(a)(3)(B), 30 U.S.C. § 522(a)(3)(B).

⁷³16 U.S.C. § 551.

⁷⁴Id.

⁷⁵36 C.F.R. §§ 261.1a, 261.9 (1985). Special use permit regulations are found at 36 C.F.R. 251.50 (1985).

⁷⁶36 C.F.R. § 261.2 (1985).

⁷⁷Frank Watson pleaded no contest in 1985 to a charge of violating these Forest Service regulations by collecting fossils on the Buffalo Gap National Grassland. He was fined \$100. Letter dated September 30, 1985, from Walter J. Bradskey (attorney for Watson) to Professor Farish A. Jenkins, Jr.

⁷⁸51 Federal Register 30355 (August 26, 1986). "Interim" rules, unlike proposed rules, are effective immediately. Comments submitted during the 30-day comment period will be considered in developing the final rule.

⁷⁹Id.

⁸⁰36 C.F.R. § 261.53(c),(d) (1985).

⁸¹36 C.F.R. § 261.1a (1985).

⁸²36 C.F.R. § 296.4 (1985).

⁸³Public Law 94-579, 43 U.S.C. §§ 1701-1782.

⁸⁴FLPMA § 302(b), 43 U.S.C. § 1732(b). BLM regulations implementing the general permit provisions of FLPMA are codified at 43 C.F.R. Part 2920 (1985). FLPMA authorizes the Secretary to issue regulations necessary to implement the provisions of the Act "with respect to the management, use, and protection of the public lands, including the property located thereon." 43 U.S.C. § 1733(a). Any person who "knowingly and willfully violates any such regulation which is lawfully issued" pursuant to FLPMA is subject to a fine of up to \$1,000 or imprisonment of up to 12 months, or both.

⁸⁵Id.

- ⁸⁶FLPMA § 302(a), 43 U.S.C. § 1732(a).
- ⁸⁷FLPMA § 103(C), 43 U.S.C. § 1702(c) [Emphasis added].
- ⁸⁸FLPMA § 102(a)(8), 43 U.S.C. § 1701(a)(8).
- ⁸⁹FLPMA § 1701(a)(9), 43 U.S.C. § 1701(a)(9).
- ⁹⁰FLPMA § 102(b) 43 U.S.C. § 1701(b). The only authority for disposal of fossils for commercial purposes appears to be the Materials Act, which requires payment of "adequate compensation." (See section II.G supra.)
- ⁹¹FLPMA § 201(a), 43 U.S.C. § 1711(a) [Emphasis added].
- ⁹²FLPMA §103(a) 43 U.S.C. § 1702(a).
- ⁹³Examples include Mountain Pass Dinosaur Trackway, 1,580 acres; Rainbow Basin-Owl Canyon, 2,426 acres; Marble Mountain Fossil Site, 500 acres; Coyote Mountain Fossil Site, 1,360 acres; North Panoche Hills, 18,000 acres; Webber Canyon, 160 acres. [List provided by Carl Barna of BLM on April 25, 1985.]
- ⁹⁴See 43 C.F.R., Subpart 8223 (1985).
- ⁹⁵43 C.F.R. § 8223.0-5 (1985).
- ⁹⁶50 Federal Register 42122 (October 17, 1985).
- ⁹⁷Public Law 98-603.
- ⁹⁸43 C.F.R. § 8224.1(a).
- ⁹⁹Id.
- ¹⁰⁰These include Cleveland-Lloyd Dinosaur Quarry in Utah, 80 acres; Bridger Fossil Area in Montana, 160 acres; Bug Creek Fossil Area in Montana, 800 acres; Garden Park Fossil Area in Colorado, 160 acres; and Hagerman Fauna Sites in Idaho, 3,875 acres. [List provided by Carl Barna of BLM.]
- ¹⁰¹43 C.F.R. § 8360 (1985).
- ¹⁰²47 Federal Register 35914 (August 17, 1982).
- ¹⁰³Offer to Lease and Lease for Oil and Gas, Form 3100-11 (March 1984), §6 [emphasis added].
- ¹⁰⁴MOU dated August 27, 1985.
- ¹⁰⁵BLM's only authority for conditioning leases with paleontological stipulations is the Federal Coal Leasing Amendments Act of 1975, one of the few authorities not cited in the MOU.

106 MOU, 2.

107 16 U.S.C. § 1,3.

108 16 U.S.C. § 1.

109 16 U.S.C. § 3.

110 36 C.F.R. § 2.1(a) (1985).

111 36 C.F.R. § 2.5(b) (1985).

112 36 C.F.R. § 1.6 (1985).

113 Public Law 91-60, 83 Stat. 101 (Florissant Fossil Beds National Monument); Public Law 92-537, 86 Stat. 1069 (Fossil Butte National Monument); Public Law 89-33, 79 Stat. 123 (Agate Fossil Beds National Monument).

114 16 U.S.C. §§ 461-467 and 36 C.F.R., Part 62. See Section II.C supra.

115 Ariz. Rev. Stat. Ann. § 41-841, 842.

116 Ariz. Rev. Stat. Ann. § 41-842.

117 Cal. Publ. Res. Code § 5097.5.

118 Id.

119 Id.

120 Colo. Rev. Stat. § 24-80-406.

121 Colo. Rev. Stat. § 4-80-408.

122 Colo. Rev. Stat. § 4-80-406.

123 Fla. Stat. Anno. 267.15-267.153.

124 Fla. Stat. Anno. 267.15(3).

125 Fla. Stat. Anno. 267.151.

126 Fla. Stat. Anno. 267.152(1).

127 Fla. Stat. Anno. 267.152(2).

128 Fla. Stat. Anno. 267.15(1).

129 Id.

130 Id.

- 131 Idaho Code § 67-4120.
- 132 Id.
- 133 Idaho Code § 67-4121.
- 134 Id.
- 135 Id.
- 136 Idaho Code § 67-4122.
- 137 Ky. Rev. Stat. Ann. § 164.705.
- 138 Ky. Rev. Stat. Ann. § 164.710.
- 139 Ky. Rev. Stat. Ann. § 164.720(1).
- 140 Ky. Rev. Stat. Ann. § 164.720(2).
- 141 Ky. Rev. Stat. Ann. § 164.730.
- 142 Ky. Rev. Stat. Ann. § 164.735.
- 143 La. Rev. Stat. Ann. § 41:1601.
- 144 La. Rev. Stat. Ann. § 41:1607.
- 145 La. Rev. Stat. Ann. § 41:1610.
- 146 Me. Rev. Stat. Ann. tit. 27, § 371-378.
- 147 Mass. Gen. Laws Ann. ch. 9, § 27C.
- 148 Id.
- 149 Mont. Code Ann. § 22-3-432.
- 150 Mont. Code Ann. § 22-3-421(5).
- 151 Mont. Code Ann. § 2-3-432.
- 152 Nev. Rev. Stat. § 381.197.
- 153 Nev. Rev. Stat. § 381.195.
- 154 Nev. Rev. Stat. § 381.199.
- 155 Nev. Rev. Stat. § 381.207.
- 156 N. M. Stat. Ann. § 18-6-3B.
- 157 N. M. Stat. Ann. § 18-6-11A.

- 158 N. M. Stat. Ann. § 18-6-11D.
- 159 N. M. Stat. Ann. § 18-6-11C.
- 160 N.Y. Educ. Law § 233.4 (McKinney 1969).
- 161 Id.
- 162 Id.
- 163 N. D. Cent. Code § 55-03-00.1
- 164 N. D. Cent. Code § 55-03-00.1.
- 165 N. D. Cent. Code § 55-03-01.
- 166 N. D. Cent. Code § 55-03-05.
- 167 S.C. Code Ann. § 51-17-10 - 52-17-140 (1985 Cum. Supp.).
- 168 S.C. Code Ann. § 54-7-400 to 54-7-540 (1985 Cum. Supp.).
- 169 S.C. Code Ann. § 54-7-440.
- 170 S.D. Codified Laws Ann. § 1-20-17 to 1-20-37 (1985).
- 171 S.D. Codified Laws Ann. § 1-19A-2 (1985).
- 172 Tenn. Code Ann. § 11-6-105 (1986 Supp.).
- 173 Tenn. Code Ann. § 11-6-107.
- 174 Utah Code Ann. § 63-18-25.1(1) (1986 Interim Supp.).
- 175 Utah Code Ann. § 63-18-25.1(3).
- 176 Id.
- 177 Utah Code Ann. § 63-18-25.1 (2).
- 178 Utah Code Ann. § 63-18-25.1 (4).
- 179 Utah Code Ann. § 63-18-27 (1977).
- 180 Utah Code Ann. § 63-18-26 (1985 Supp.).
- 181 Va. Code Ann. § 10-150.1 to 10.150.10. (1985 Repl. Vol.).
- 182 Va. Code Ann. § 10-150.16B (1985 Repl. Vol.).
- 183 Wyo. Stat. § 36-1-114 (1977).
- 184 Id.

185 Wyo. Stat. § 36-1-116 (1977).

186 Wyo. Stat. § 36-1-116 (1977).

187 Department of the Interior, PUBLIC LAND STATISTICS 1983, Tables 13, 20.

188 Memorandum of January 17, 1986, from Associate Solicitor, Energy and Resources, to Director, Bureau of Land Management, 3.

189 In Spurlock v. Santa Fe Pacific Railroad Co., 694 P.2d 299 (Ariz. App. 1984), the Arizona court of appeals held as a matter of law that helium, nitrogen, potash, industrial clay, and petrified wood are minerals, and were reserved by a general mineral reservation of "all oil, gas, coal and minerals whatsoever, already found or which may hereafter be found." The court noted that all are inorganic, commercially valuable substances which are distinct from the soil itself.

APPENDIX II

State Regulations on Collecting Paleontological Specimens

ALABAMA	No collecting in state parks.
ARIZONA	No paleontological excavating or collecting on state land without permit from the Director of the Arizona State Museum. Finds must be reported to the Arizona State Museum.
CALIFORNIA	Unauthorized excavation, etc., of paleontological or geological features on public lands is a misdemeanor. Permits required from director of the state park system.
DELAWARE	NO
FLORIDA	<p><u>Vertebrates</u> covered by: <i>F.S. 267.15 Vertebrate Paleontological Sites and Remains; Legislative Intent and State Policy.</i>- paleontological sites to be preserved but not to impede mining, etc. Miners encouraged to cooperate by notifying the state museum. The state will protect and preserve vertebrate fossils. All vertebrate fossils on state property belong to the state. <i>F.S. 267.152 Destruction, Purchase, and Sale of Vertebrate Fossils Prohibited, Exception; Field Investigation Permits Required; Penalty for Violation</i> - refers only to state property or state-designated sites. The program is administered by the Florida State Museum.</p> <p><u>Invertebrates</u> not covered but State Geologist has proposed it - not yet acted on by legislature.</p>
GEORGIA	NO
KENTUCKY	NO
ILLINOIS	Proposed amendment to protect paleontological resources is being considered. Some problems in the original wording of the new amendment had to be corrected (e.g., the highway department would violate the statute every time it removed fossiliferous rock without calling in a paleontologist to examine the site). Includes only state-owned or state-leased land. Permit required.
MAINE	Permit required for commercial use of state land. "Rockhounds," etc., don't need permission.

MARYLAND All regulations apply to caves only. No collecting in public or private caves without permission of state or owner. Permit required for collection of paleontological specimens in caves.

MASS. NO (may have archaeological laws - no info. sent)

MICHIGAN NO

MINNESOTA Damage or removal of "geological formations," prohibited. Commissioner of natural resources has power to erect Scientific and Natural Areas (SNAs).

Comments from John Splettoesser (Minnesota Geological Survey) include: 1) no limit on number of invertebrate fossils collected, but limit on vertebrate fossils, 2) academic institutions and museums should be allowed to collect without regulation, and 3) get the information on collecting out to geology departments, collectors, and others.

MISSISSIPPI NO

MISSOURI No general laws regulating fossil collecting. Collection of fossils on certain state-owned land is regulated by departmental policy (permit required).

MONTANA NO

NEBRASKA An old law that requires a permit for paleontological collecting, but unenforceable.

N. HAMPSHIRE NO

NEW JERSEY Indirectly covered by laws prohibiting removal of items (flowers, rocks, etc.) from state property.

NEW MEXICO "It is our [New Mexico Bureau of Mines and Mineral Resources] view that in almost all cases the best protection for fossils is collection."

N. CAROLINA NO? (the reply was "the N.C. Geol. Survey does not regulate fossil collecting in N.C.")

N. DAKOTA Title 55 - Any paleontological specimens found on state land must be returned to the state. Permit with permit fee required (issued by the North Dakota Geological Survey). No control over private land. Agreement with U.S. Forest Service and BLM to help manage resources on federal land. Part of agreement required deposit of representative specimens with the North Dakota Geological Survey for permanent curaticn. Natural Areas Registry Program used to identify and preserve natural areas.

OHIO No defacing, disturbing, removal, etc., of geological features on state land except with authorization.

OKLAHOMA Bill 2014 introduced attempting to regulate fossil collecting. Didn't pass but another version is being written.

Proposed bill would have erected an Advisory Board for the Preservation of Vertebrate Paleontological Remains (comprised of: 1) Director, Oklahoma Geological Survey, 2) Director, Oklahoma Museum of Natural History, and 3) the State Archeologist) to review applications and issue permits for collection of vertebrate fossils on all public and private lands.

OREGON Decision made by Dr. W.N. Orr (Curator, Condon Museum) and the Oregon Secretary of State to not have an "official" collecting permit because individuals not permitted would take the State to court. An informal system of written permits issued by Dr. Orr, acting as "State Paleontologist" has been in effect and working well for the past 8 years.

PENNSYLVANIA NO

PUERTO RICO NO

S. CAROLINA NO

S. DAKOTA Title 41, Art. 3, Ch. 1, Sec. 5 - Destruction, damage, or removal of natural features prohibited on State property without written permission from the secretary (Department of Fish, Game, and Parks) or his designated agent. Local governments permitted to preserve their "paleontological . . . history . . ." and to establish a district and commission. Paleontological excavations using hand-held tools exempted from Land Reclamation Act.

TENNESSEE NO

TEXAS

- 1) Natural resources code gives Texas Parks and Wildlife Commission authority over State parks and state historical and natural areas. Prohibits collecting.
- 2) Texas Department of Highways & Public Transportation - no definite policy against collecting along rights-of-way (only against right-of-way damage or creating traffic hazards).
- 3) Civil Stature 6081E - power given to cities and counties to create own policies. Some counties prohibit collection of rocks, minerals, and fossils along county roads.

UTAH New legislation proposed to erect Office of Antiquities (within Division of State History) to (1) supervise paleontological field work and research conducted on state or public lands, and (2) review and evaluate paleontological research done on public lands or with public funds. Unlawful for any person to collect anything from land owned or controlled by the state (and designated on a State Antiquities Landmark Office) without permission of the State Antiquities Landmark Office. Separate permission required to permanently remove specimens from the state. The state owns all paleontological specimens collected on state-owned or state-controlled land.

VERMONT NO - collecting not permitted in state parks without permission of Dept. of Forests, Parks, and Recreation (this doesn't appear to be official regulation).

WASHINGTON NO

W. VIRGINIA No collecting in federal or state parks. No laws protecting fossils. "Statutes are rather vague and difficult to enforce. 20-7A-6 *Liability of owners* - not liable for injuries sustained when prior consent given.

WISCONSIN Permission required for collecting on state park land.

WYOMING Allows commercial fossil collecting on State lands. Constitution sec. 36-1-114 through 116 - No excavation of paleontological deposits on public lands without a permit and no removal from state without consent (misdemeanors). All rare specimens must be reported to the Wyoming Geological Museum. Gives specifics on quarrying regulations for commercial collectors. Requires reclamation.

No responses to our inquiry were received from the following states:
 Alaska, Arkansas, Colorado, Connecticut, Hawaii, Idaho, Iowa,
 Indiana, Louisiana, Nevada, New York, Virginia

APPENDIX III

Paleontological Collecting in the News

Newspaper accounts of paleontological collecting across the country are voluminous. Therefore, we have selected relevant newspaper articles and editorials dealing with paleontological collecting in Kansas only. Articles and editorials are arranged in chronological order.

Collectors, paleontologists square off over sought-after fossils

By MIKE CORN

Treasures — some more than 100 million years old — are disappearing from northwest Kansas.

When they resurface, the fossils, preserved in what was once the bottom of an ancient sea covering Kansas, could turn up in California, Japan or Europe.

The fossils might serve as expensive decorations for private collectors who hang them over fireplace mantels, use them in walls of indoor swimming pools or incorporate them into facades on high-rise office buildings.

"They collect them kind of like stamps," said J.D. Stewart, a Kansas-trained paleontologist who now serves as assistant curator for fossil fish and reptiles at the Los Angeles

they're rare."

Professional fossil hunters have quietly invaded the thousands of acres of chalk beds in Trego, Gove, Logan and Wallace counties, collecting thousands of dollars worth of the fossils.

"I was amazed at the money they get for this stuff after I started checking," said Frank Offutt, a Gove County farmer whose land draws collectors like a magnet. "I had no idea it was worth thousands of dollars."

Scientific material is also lost, some contend.

"I personally think it's a tragedy this information is being lost," said a noted paleontologist who requested that his name not be used. "They (commercial collectors) will give you the argument that it will

from depredation."

The only protection Kansas offers is the law against trespassing, which commercial collectors argue is adequate. In at least two instances, farmers disagree.

"They'll pull in and if someone doesn't run them off they stay until you do," Offutt said. "They're hard to run out. They've always got an excuse."

Details of the plundering that some claim is taking place remain sketchy. The farmers, on whose land the search for valuable fossils occurs, say the professionals are shrewd and offer only a partial story; the hunters fail to mention that they collect for a profit.

Some farmers, who have dealt with the collectors, say deception

weather away."

Commercial collectors argue that fossils would be lost if left to the vagaries of nature. They also contend that they donate rare specimens to museums — specimens that otherwise would not have been collected.

The chalk beds — dubbed God's Cemetery by world-famous collector Charles H. Sternberg — are imposing structures, visible examples of the powerful forces of nature.

Hunting fossils for profit is a complex issue, one with differing viewpoints. It is a war with several sides and plenty of fighting within individual camps.

Recognized paleontological societies abhor commercial collectors and advocate laws to protect areas

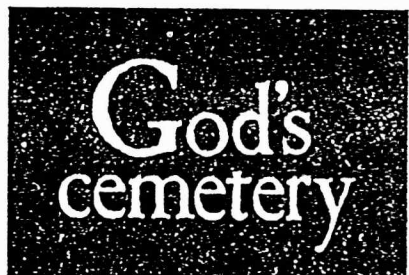
and outright illegal actions, such as trespassing, have occurred.

Teams of collectors, armed with gas-powered jackhammers, remove fossils from the chalk in which it is imbedded.

The potential profits make the work worthwhile.

The fossil remains of a rare shark hang on the wall at a fossil shop in Estes Park, Colo. The price tag for the squalicorax falcatus: \$28,000.

"That's what they were asking," Offutt said. The specimen came from Gove County, along the Smoky Hill River, but store personnel were not specific. Offutt fears the shark might have come from his land.



- Today: The controversy over collecting.
- Monday: Supplying the demand for fossils.
- Tuesday: The Sternberg legacy lives on.



County Museum of Natural History. "That's a real disservice when sold to people like that, especially if

FOSSILS IN DEMAND

Continued on page 2

Sunday morning
 August 14, 1988
 7 sections, 108 pages, 50¢
 Our 59th year - No. 237
 Hays, Kansas 67601

Fossils in demand, priced high ⁶⁵

Continued from page 1

Other specimens bring healthy prices. A complete pterodactyl can fetch \$50,000 to \$100,000, paleontologists say. A complete mosasaur, relatively common in the chalk beds of northwest Kansas, can be worth \$30,000 to \$50,000.

Even at those prices, there are willing buyers. The strongest market is in Japan, where money is more plentiful than fossils.

Northwest Kansas farmers receive little or nothing for the fossils. Often, they don't even know someone is on their land, or what will be done with the fossils that are collected.

Offutt has been paid \$200 for three fossils recovered on land he farms. One, a cimolichthyes, a fish from the Cretaceous period, measuring 4-feet long — the size of Offutt's kitchen table — put \$100 in his pocket. A Utah firm eventually sold it for \$2,500.

Despite the money, Offutt is bitter about his experience with commercial collectors. His dislike for the business is shared by Gove County landowner Charles Tuttle and numerous paleontologists throughout Kansas and the nation.

"I don't like it," Offutt said. "In part since I found out this stuff's worth something. I don't like someone coming in and taking something worth something. It's like stealing."

Commercial collecting of fossils is not new. Collectors have combed the area for more than 100 years. Today, however, most fossils are going to private collectors rather than museums and universities.

Offutt views the commercial collectors as a tight-knit group, feeding information to one another about fossil-rich locations. After running off one collector, he said, he found another on his land.

The first collector, Dave Tanking, Baldwin, denies that he invited the second collector.

Offutt doubts that most farmers care if people collect but he thinks they should be paid a fair price for items taken from their land.

"I think they could hunt if they would pay people what it's worth."

He would prefer, however, that the material stay in Kansas.

"I really think it needs to stay in the area," he said. "But it doesn't seem like anyone's inter-

ested."

Paleontologists across the state and the nation are interested but say they are hampered by inadequate funding and manpower.

One exploration project could start in 1989, according to Hans Peter Schultz, a vertebrate paleontologist at the University of Kansas.

But, Schultz said, museums cannot compete with private collectors in terms of the amount of money they are willing to pay.

"We have no money to buy fossils," he said. "We have to collect ourselves. Collecting is cheap, compared to buying it."

Schultz knows there is an active market for fossils.

"Especially in Japan, at the moment, because they have money available," he said. Fossils are purchased to build into indoor swimming pool walls and entries into buildings.

"In Japan, people have so much money that they take complete museum exhibits and take it to Japan and exhibit it there for two to three months and take it back," Schultz said.

Japan is the primary market, said Tom Lindgren, co-owner of Green River Geological Laboratories, a Green River, Utah, firm that has started collecting in Kansas.

Money and a fascination with ancient monsters, precipitated by cheap Godzilla films, are thought to be responsible.

"Apparently it's become kind of popular to have one of these things over the mantel," said Joe Thomasson, an FHSU botany professor now on leave of absence. "I just cringe at the

thought of one of those things being taken out of Gove County."

Thomasson fears the state is losing its treasures.

"I know there are these commercial outfits," he said. "Some try to put on a scientific facade, but the bottom line is the profit."

"The idea of hauling off stuff to sell really rankles me," said Chris Maples, a paleontologist at the Kansas Geological Survey.

He likens the situation to "fossil carpetbagging in a sense."

Maples would like to see the material remain in Kansas or, at the very least, in museums in the United States.

"This has been a pet peeve of mine," he said. "It's a personal one. I want to see the stuff in Kansas either remain in Kansas or be in a national place in the United States, like the Smithsonian."

"If people see a part of Kansas in the Smithsonian, they may want to come to Kansas."

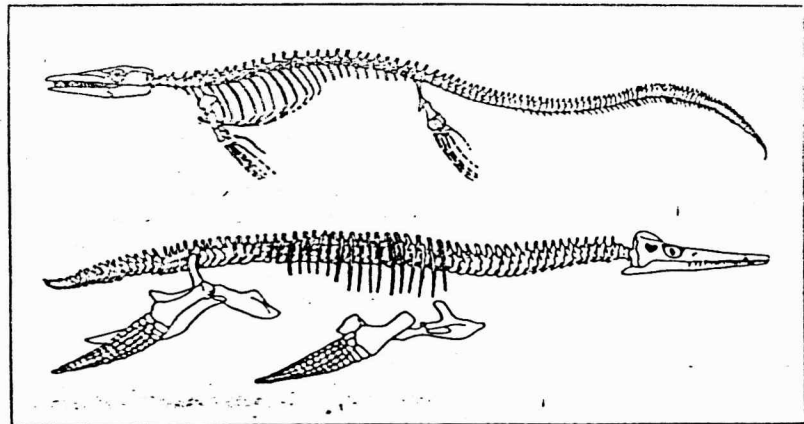
Maples said he would even go so far as to allow international museums to collect the fossils, as long as the collecting is regulated. He does not, however, want to see "some shyster getting rich at some landowner's expense."

Until recently, farmers were not paid for fossils gathered by commercial collectors.

That will change, according to Glenn Rockers, a Hays man who makes his living collecting, preparing and selling fossils.

"It hasn't been upfront for a hundred years," Rockers said.

"Now it has got to be upfront from here on. I know I have to change with the times and the times are changing."



Drawings courtesy Kansas Geological Survey

Fossils prevalent in the western Kansas chalk, from top, are mosasaurs, plesiosaurs and pteranodons.

Farmers, collectors clash over rights to fossils

By MIKE CORN

The fight over fossils, some 100 million years old, pits northwest Kansas landowners against commercial collectors.

And the war could escalate as farmers learn the value of the specimens taken from their land.

In at least two cases in Gove County, farmers and commercial collectors already have clashed. Both cases involve access to property, but one involves a farmer trying to get his fair share.

The line-up: Gove County landowners Frank Offutt and Charles Tuttle; on the collectors' side, Glenn Rockers of Hays, Dave Tanking of Baldwin and Tom Lindgren, representing Green River Geological Laboratories, Garden City, Utah.

In Tuttle's case, the collector was allowed to retrieve the remnants of a mosasaur on land the collector initially did not have permission to enter.

Rockers later was granted permission by Tuttle to hunt fossils, but only after he told Tuttle that he was looking for sharks teeth, according to Tuttle.

Tuttle soon found a mosasaur skull in a plaster cast, which Rockers admitted preparing during an earlier visit, one without permission.

"After I talked to him, I told him it was OK to go on the land," Tuttle said. "After we found the plaster, my wife and I were upset about it."

When they confronted Rockers, he admitted that he had been on the land earlier,

Tuttle said.

"He got away with a mosasaur," Tuttle said. "I told him he could take it since he found it."

Rockers did not get away with the complete fossil.

"He didn't ask for permission, so I took some bones myself," Tuttle said.

Rockers, who lives at 209 W. 17th in Hays, collects fossils for a living. In the past, he said he rarely has told farmers that he plans to sell the fossils. That will change, he said.

Rockers admits he entered Tuttle's land without permission on the first day, but said he obtained permission the second day.

"I'm sorry Mr. Tuttle is upset," Rockers said. "I really am."

Rockers did not offer Tuttle money for the fossil, and he doesn't think the specimen is worth anything.

"I don't know if it's got any monetary value," he said. "It's a pretty bad specimen."

Tuttle, irked by the chain of events, no longer allows fossil hunters on his land.

Rockers is just one of several collectors scouring the chalk beds of northwest Kansas. Fossil hunters from Utah also have been in the area, as has Dave Tanking, Baldwin.

Tanking blames the Utah firm for stirring up a hornet's nest in the chalk beds, specifically on land farmed by Offutt.

Offutt, however, sees it differently.

The problems started almost five years

ago, when two men from Salina started conducting guided fossil-hunting tours. One guide, Dave Tanking, now living in Baldwin, called Offutt and said he and a few friends would be out.

Offutt initially gave his blessings but became upset when he counted 14 vehicles in his pasture.

"That's what really aggravated me," Offutt said. "Here we are skimping to pay for the land and here they are making money off it."

"That's absolutely false," Tanking said in an interview. He contended the tours consisted of a few people who paid \$20 apiece, barely enough to cover expenses.

Regardless, Offutt soon told Tanking not to collect on his land anymore. Tanking said he complied with Offutt's wishes.

But then, Offutt said, the people from Green River showed up.

Tanking said he mentioned Offutt's land in a conversation with Green River representatives but added that Offutt did not want collectors on his land.

"They approached Frank after I told Frank that I would not be back," Tanking said. "To get an in, they made me look like I was making all this money. To get his confidence, they fed him a line of baloney."

Tom Lindgren, a partner in Green River, said the firm gave Tanking \$500 worth of trilobite fossils for information about a fish on Offutt's land. Unable to agree on a price, the fish is still buried on Offutt's land.

Offutt said he first stumbled across Green River when he found two of its people in his field. They did not have permission.

"At first they didn't know where they were at," Offutt said. "Then he had a fish that he found. He wanted to know if he could dig it out. That's when he agreed to pay me for it."

Offutt received \$100 for the fish. Tanking said he should have been paid as much as \$1,000. Lindgren said he sold the fish for \$2,500.

"This guy is so damned bitter that I don't know what the hell is going on," Lindgren said of Tanking. The bitterness, he thinks, is a result of Green River's move on Offutt's land.

"Supposedly this was his personal little deal there," he said. "Then Frank got mad at him and told him he couldn't collect there."

The controversy is giving Lindgren second thoughts about collecting in Kansas.

"I don't like what's happening down there," he said. "It's bothering me a heck of a lot. That's such a small portion of what we're involved in. I'd just as soon not be involved, period."

"What I've been getting is these guys think that's their private territory and no one outside of Kansas should be coming in."

Offutt doesn't dispute that.

"Nobody asked these guys out here and now they're mad at us," he said of the collectors.

Collectors turn to commerce

This is the second of a three-part series.

By MIKE CORN

Fossil collecting: a classic lesson in the law of supply and demand.

To meet the demand for fossils, several firms have cropped up throughout the nation.

Green River Geological Laboratories Inc., of Garden City, Utah, is one firm gaining a foothold in the worldwide fossil market.

Fossil merchants depend on the chalk beds of northwest Kansas for part of the supply needed to meet demand. Sales are made throughout the world, but most notably in the Orient.

Members of the Green River team spend about a month every year in the Kansas chalk beds; they also buy from Kansas residents.

Normally, the Green River team collects in Gove, Logan and Trego counties, according to partner Tom Lindgren. The Utah firm specializes in preparing fossils for display in museums, including the Field Museum of Chicago and the Brigham Young University museum in Provo, Utah.

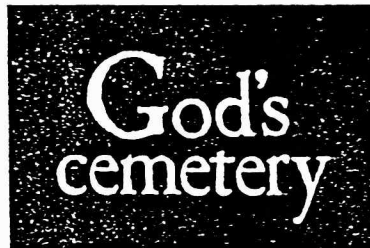
Although he could provide no definite formula on determining the value of a fossil in the ground, Lindgren did provide some general guidelines that can be used by farmers wanting compensation.

"The way we consider value on a fossil is an unprepared fossil delivered to us ... is worth one-third of the eventual sales value," he said. "The thing is, with Kansas material, there's such a variety of prices. But a lot of that depends on the actual quality of preparation once it's done.

"We consider ourselves one of the best in the country in preparation, and as such, we charge a little more for our items."

One such item came from a farm in Gove County, on land farmed by Frank Offutt. The specimen recovered was a Cimolichthyes, a Cretaceous-age fish.

"I believe that's probably the finest most complete specimen that's ever come out," Lindgren said. "That piece was 4 to 4½ feet



Sunday: The controversy over collecting.
• Today: Supplying the demand for fossils.
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long and we spent 90 to 100 hours in preparation on that."

Some restoration was required on the fins, he said, but very little.

"We sold that for \$2,500, which is actually not getting our preparation out of it," he said. "In the ground, as such, I paid Frank (Offutt) \$100."

The fossil went to a museum in southern California, he said. "But until it's on exhibit I'm not allowed to actually tell where it goes. It's a private museum in southern California."

Glenn Rockers, Hays, is also a full-time commercial fossil collector. He admits he makes a good living at it. He will not, however, say how good.

"I make a good living," he said. "That's the only way I can an-

swer that. I'm driving a 14-year-old truck with a worn out camper shell, so I'm not getting rich."

For Dave Tanking, a LaCrosse native now living in Baldwin, fossil collecting is a hobby — sometimes a money-making hobby.

"It's something I love to do, because I love to hunt fossils," Tanking said. "There is money involved. To what degree, it varies."

Both Tanking and Rockers are quick to point out that the world-famous Sternberg family also were commercial collectors.

"My wife thinks I'm Charles Sternberg reincarnate," Rockers said. "He's my mentor."

"I think the public should be aware that the Sternbergs ... were not only scientists. They were commercial collectors."

Both also mention collector Marion Bonner, Healy, whose finds are on display in local and national museums.

A native Kansan, Rockers started collecting fossils from the chalk beds of northwest Kansas two years ago when he was living in Estes Park, Colo. He moved to Hays on March 1 and lives at 209 W. 17th.

Rockers maintains a small workshop in Hays. The floor is littered with chalk debris scraped away from fossil remains he collected. Hundreds of hours of preparation are required between

the time a fossil is discovered until it is sold, usually 11 months later.

Rockers has hunted fossils 30 years. Four years ago, he and other business interests, formed a company called Paleosearch and started collecting full-time. He locates, excavates, prepares and markets his product.

He also serves on the board of directors for the American Association of Paleontological Suppliers, a trade group representing commercial collectors.

The association's purpose, Rockers said, is to educate and organize commercial collectors "with the idea that they have an obligation to the scientific community that if they find or collect something rare, something that has never been seen before, that they have an obligation to present it to an institution for scientific study."

Commercial collectors in 1981 had gross sales of \$3 million, according to a government report.

Tanking, who works full-time at a Lawrence foundry, has collected fossils in northwest Kansas since 1979. He collects under the name Niobrara Paleontology, a reference to the rock format that includes the chalk beds.

Other collectors also walk the chalk beds, which have been explored by hundreds of fossil hunters for more than a century. Some collect for a profit; others for museums and universities.

The markets for fossils taken from northwest Kansas chalk beds vary.

"I have a lot of private collectors in the United States that I sell pieces from me that they can't acquire anywhere else," Rockers said. "We're talking commercial specimens that I've found."

"I do have some business overseas. A good percentage of what I sell is overseas. I don't know what that's going to set. It's a sensitive area and to be honest I don't like it. I'm not happy with it. I would just as soon every piece that comes out stay right in Kansas."

"I do sell some stuff overseas," Rockers added. "Mainly because I've got to make a living."



Rockers uses common dental tools to clean teeth on a fossil.

JAPAN

Continued on page

Japan is largest market for fossils from Niobrara

Continued from page 1

they're willing to buy it."

Tanking said his market primarily is located in the western half of the United States.

Rockers said he also sells to museums, including the Smithsonian. His latest sale was to a children's museum being built south of St. Louis. He also has contributed specimens to the Smithsonian, the University of Kansas and the Schiele Museum in Gastonia, S.C., where he served as a volunteer field assistant.

According to Green River's Lindgren, "Right now, the largest market for stuff out of the Niobrara is the Orient — Japan," he said.

"The Japanese are real hot to trot for pteranodon (flying reptile) material, which comes specifically from Niobrara. We, unfortunately, have never had an opportunity to collect one.

"Mosasaur material mostly goes to the Orient and fish material, pretty much wherever you can find a buyer."

There are two reasons why Japan is an active buyer of fossils.

An abundance of money is the first reason. Old movies are another reason.

"If you look back at the cheap movies that they put out over the years, Godzilla and Rhodan, they're so interested in dinosaurs and monsters," he said. "They look at Kansas pieces as ancient monsters. They're interested in dinosaurs, but there's very, very few dinosaurs on the commercial market today."

As a result, the market for mosasaurs has increased. Mosasaurs were not true dinosaurs but instead were a large aquatic lizard that lived during the time of the dinosaur.

"But because of its size, it's just very impressive. And they like mosasaurs. Big teeth. Big skulls. They've got an interest in this. These are monsters that did live, not just stories."

Green River, Lindgren said, has only sold a few specimens to Japan.

"We've never sold a mosasaur," he said. "The mosasaur we collected is still here. It's only a skull anyway, with some vertebra behind it and some partial paddles."

Although commercial collectors agree their business is needed to meet the demand for fossils, they

differ about the proper ethics of collecting.

Tanking argues that collecting should not take place without permission. Rockers agrees, but said permission is not always possible.

"I ask when I can and when there's someone by. I believe in that. But it's not always practical."

Rockers considers it an unwritten law to ask permission before entering land to collect fossils.

"But if you can't, you go in if it's not posted," he said. "If it's posted, I don't go in."

Kansas law does not mandate that land be posted before trespassing charges can be filed. Tanking said

he understands that and would not wander across the countryside looking for fossils without permission.

Tanking uses soil survey and land ownership maps to determine ownership. If that fails, Tanking said, he drives around and talks to area farmers.

"If you get permission on a section of ground, that's the section that you've got permission for," he said. "I don't go anywhere unless I have permission because I can't do it comfortably. It bothers me."

Neither man, however, lets the farmer know that they will eventually sell the fruits of their labor.

Tanking said he tells them that he's collecting fossils, but not that he's going to sell them.

"I go out and I tell them I'm collecting fossils," he said. "I'm not going out there to try to screw anybody. I'm going out to enjoy myself, to collect and to pay for my trip out there."

"I don't ask them if they want me to pay. I go out and ask if I can collect. If they want to ask if I'm willing to pay, I'm going to say 'it depends.'"

"Commercial collectors don't go and say they're collectors and want to dig up \$1,000 worth of bones," Rockers said.

That will change, however.

"I plan to in the future because this thing's coming to a head," he said. "It's going to have to be all up front."

Paying farmers for fossils was virtually unheard of until several months ago.

"That arrangement spread like wildfire through western Kansas chalk beds," Rockers said. "It's something that's going to change commercial fossil collecting in western Kansas from here on out. When I first heard, I was appalled. But then I thought that was only right."

Debate rages over need for regulation of fossil collecting

By MIKE CORN

In Gove County, a new sign of the times has appeared: "Private lease: No hunting, no fossil hunting or trespassing."

The hand-lettered prohibition against fossil hunting is a relatively new addition to the standard signs that adorn fences throughout Kansas.

Frank Offutt penciled in the additional warning after his land became the target of commercial fossil hunters.

Trespassing laws are the only protection afforded Kansas landowners who do not want fossil collectors on their land. No law specifically dealing with antiquities — something of a misnomer for fossils — exists in Kansas, or in most other states.

The need for laws that would regulate the fossil collecting on private land is a point of hot debate.

Another area of disagreement, further clouding the antiquities issue, is whether fossils are a renewable resource.

There also is confusion about how an antiquities law would be applied to paleontological and archeological remains.

Paleontology is the study of fossils, the remains of prehistoric, nonhuman life. Archeology deals with the remains of past human populations; its study is limited to materials produced by mankind.

Recently a committee of the National Academy of Sciences issued recommendations on guidelines for paleontological collecting on federal lands. The recommendations also addressed fossils on state and privately-owned land.

The recommendation concerning private land is terse but offers little guidance to landowners: "Private landowners should follow the guideline that commercial collecting of fossils be undertaken with thorough scientific oversight to ensure that the scientific usefulness of specimens is not impaired."

The report also recommends that specimens of special scientific interest must be deposited in a public institution.

The 242-page report did little to clarify the value of fossils or determine what specimens are of scientific importance.

"It's very difficult for any one person to say this is not scientifically important," said J.D. Stewart of the Los Angeles County Museum of Natural History. "If it's hard for a scientist to give an answer, it's hard for a bureaucrat."

The Los Angeles museum, according to Stewart, a Plainville native, never works with commercial firms.

Should Kansas attempt to implement a law regulating fossil collecting, it would not break new ground. At least three states —

Idaho, Wyoming and Utah — prohibit the export or removal of some fossil specimens without consent of a state agency. Seventeen other states regulate collecting on public lands.

Earlier this year, Oklahoma attempted to pass a vertebrate fossil protection act; the bill died in committee at the urging of the American Association of Paleontological Suppliers, a trade group representing commercial collectors.

Commercial collectors oppose such a law, contending they would no longer be allowed to collect fossils, which would then be lost to nature. Some paleontologists say bureaucratic red tape would make collecting difficult, while others say a law is needed.

"Part of the problem is we have no state regulation," said Chris Maples, a paleontologist at the Kansas Geological Survey.

"They can be protected," said Tom Lindgren, co-owner of Green River Geological Laboratories, a Garden City, Utah, firm. "There are laws against trespassing.

"I don't think there should be any federal or state regulations. There's already protection. Ranchers don't take advantage of it."

"Trespassing is enough to protect yourself," said commercial collector Dave Tanking, a former La-Crosse resident now living in Bald-

win. "If someone is on your land and doesn't have permission, that's trespassing."

Many farmers don't care if people collect fossils. Most, however, want to know who is on their land.

Antiquities laws work fine for archeological discoveries or for smaller, well-defined paleontological areas, said Orville Bonner, a paleontologist at the University of Kansas. For areas as large as the chalk beds of northwest Kansas — covering some 4,000 square miles —

COLLECTOR OPPOSES

Continued on page 6

Collector opposes regulation

Continued from page 1

the law would not work, he contended.

"It's better that someone collect than let the weather erode them out," Bonner said. "Probably more fossils erode away than are collected."

Hays-based commercial collector Glenn Rockers opposes an antiquities law, in part because the chalk beds of northwest Kansas provide nothing new to science.

"It's a tired area," Rockers said. "It has been collected so extensively. Thousands of volumes have been written up."

The issue also involves pure economics.

"It seems odd to me that people are coming in from out of state and making a bundle of money without compensating the landowners," Maples said.

"They are coming in and essentially raping the fossils. Something is not right in that. We sure wouldn't let a coal company come in and sell to the Japanese without compensating the landowners."

Fossils as a renewable resource is another stumbling block.

Even the National Academy of Sciences had trouble with the issue. Its committee answered the question with a qualified yes — and no.

"In the sense that fossil specimens are the remains of long-dead organisms, they are not renewable," the NAS report states. "However, any single specimen is a representative of a species and usually other specimens of that species can be found; in this sense, fossils are renewable."

"Everytime it rains it's a brand new collecting area," Rockers said, referring to the erosive action caused by rain, which washes out new fossils.

"It's not like we're using it up. We're doing what God put us here for, to find his ancient creatures that lived here 80 million years ago."

"Everything is finite," said Rick Zakrzewski, director of the Sternberg Museum on the Fort Hays State University campus. "I'm sure that on the presumption that everything stays the way they are, a thousand years from now people will still be collecting fossils out here."

Zakrzewski favors some type of regulation on collecting fossils, fearful that material could be lost forever.

"Something should be worked out so the stuff isn't lost," he said. "It should be accessible to everyone. And that isn't possible when it's sold. It's a thing that belongs to everybody. It's not yours, it's not mine. It's everybody's."

Sternberg family considered fossils a Kansas legacy

MIKE CORN

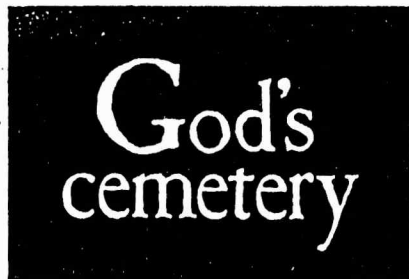
The name Sternberg is synonymous with fossil collecting.

And the museum that bears the Sternberg name, on the Fort Hays State University campus, is considered one of the best of its kind by Kansas-trained paleontologist J.D. Hart.

Many fossils in the Sternberg museum — representing life 100 million years ago, when Kansas was covered by a shallow sea — came from chalk beds in Trego, Gove and other counties. Many were collected by members of the Sternberg family.

The museum's quality should be as no surprise.

Kansas is practically unparalleled in the world in the number and quality of swimming reptiles that can be found, according to Chris Maples, a paleontologist at the Kansas Geological Survey. Swimming reptiles are ver-



Sunday: The controversy over collecting.
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tebrates, which means they have a backbone. And they can be gigantic. There is some speculation, Maples said, that the fabled Loch Ness monster might be a mosasaur or plesiosaur, the fossils of which have been found in northwest Kansas.

A collector says he also works in education. See page 2.

The Sternberg family helped make famous the chalk beds of northwest Kansas — “those old cemeteries of creation.”

Specimens collected by the Sternbergs are on display in at least 22 states and 15 foreign countries, according to Katherine Rogers, a Hays resident who is completing a full-length book about the Sternbergs.

The Sternberg family includes patriarch Charles H. and his three sons, George — of Sternberg Museum fame — Charlie and Levi.

“Charles H. is believed to be the only fossil hunter who totally supported his family” from the sale of fossils, Rogers said.

Rogers, a former professor of journalism at FHSU, is putting the finishing touches on her book and hopes to line up a publisher soon. The book covers 115 years of history. Rogers spent five years researching and writing it.

The elder Sternberg sold the fossils he collected, but unlike private collectors today, he sold them only to museums.

“I don't remember any sales to individuals,” Rogers said. “Individuals didn't collect. It went to museums and major universities.”

Rick Zakrzewski, Sternberg director, agreed.

“He (George Sternberg) didn't want to teach so his salary was low,” he said. “I know he contracted, collected stuff and arranged things with museums. As far as I know, he never sold to people off the street.”

The FHSU museum is comparable to the American Museum of Natural History in New York, the Museum

of Natural History at the University of Kansas, the Los Angeles County Museum of Natural History, the Smithsonian Institute, the South Dakota School of Mines and the University of Colorado, according to Stewart, a Plainville native who is assistant curator at the Los Angeles County Museum.

The Sternberg legacy started in 1867, when Charles H. Sternberg was 17 years old and sold a fossil to the Smithsonian.

“He worked under short-term contracts,” Rogers said. “Contracts with museums. This was a period when many of the great museums back East were being established. They were eager to buy these fossils.”

The Sternberg clan spent considerable time in Canada, collecting dinosaur bones. Charles H. and George eventually returned to the

BONNER FAMILY

Continued on page 2

Tuesday evening
August 16, 1988
Our 59th year-No. 239
Hays, Kansas 67601

Bonner family continues fossil work

Continued from page 1

states, but Charlie and Levi remained in Canada.

The elder Sternberg wrote two books and numerous scientific articles for the Kansas Academy of Sciences. The books, "Life of a Fossil Hunter" and "Hunting Dinosaurs in the Bad Lands of the Red Deer River," chronicled his life as well as those of his three sons.

In the first book, Charles H. Sternberg tackled the complex issue of selling fossils to individuals.

Had he sold to dealers, Sternberg wrote, the fossils would have been more expensive to museums and "I should never have been known as one of those who have devoted their lives to the advancement of paleontology."

Sternberg also noted his disappointment that Kansas fossils left the state.

"Moreover, the finding of each new and valuable specimen reduces the probability of finding more in the years to come. The writer has tried to bring to a successful issue several movements through which the results of his collecting expeditions in Kansas would remain within the boundaries of the state — within the district where the huge and strange forms lived their lives. To his regret, he has so far failed."

To a degree, he has not failed. More than 50,000 people visit the Sternberg museum each year. Some are scientists who examine the thousands of fossils stored there.

Last year, Zakrzewski said, eight to 10 researchers used the museum.

George Sternberg shared his father's desire to leave a legacy for future generations, as well as the elder Sternberg's early interest in fossils.

"I was only nine years old at the time and I shall never forget how elated my father was over the remains of a plesiosaur skeleton which I discovered one day while I was with him. ..."

After spending time in Canada, George Sternberg returned to Kansas in 1924, living in Oakley for three years. In 1927, he set up shop in Hays at the university's museum.

Discoveries by the Sternberg family were so impressive that 10 have been named in their

honor by scientists.

There are striking similarities between the Sternberg family and the Bonners of western Kansas.

As with the Sternbergs, fossil collecting is a family affair for the Bonners.

Marion Bonner, now living in Healy, is the patriarch. He has four sons, all of whom know what to look for in the chalk beds of northwest Kansas and how to collect the specimens.

"Orville's the only one that took it up seriously," Bonner said.

Orville is currently a paleontologist at the Museum of Natural History at the University of Kansas in Lawrence.

A second son, Chuck Bonner, lives near Scott City and is a painter. His work, which depicts life as it was 100 million years ago, adorns the Sternberg Museum on the Fort Hays State University campus.

Now 78 years old, Marion Bonner has been forced to delay his fossil-hunting ventures to the chalk beds of northwest Kansas because of the summer's extreme heat.

But for 65 years, Bonner has collected and sold fossils.

"I used to collect for George Sternberg," Bonner said. "I've known him since 1924."



Photo courtesy Sternberg Museum

In an early photo, George Sternberg poses with a Mastodon tusk and tusk

Bonner also has collected for the Los Angeles museum, and several of his discoveries are on display at Sternberg.

The elder Bonner started collecting fossils, at the urging of a science teacher in Leoti. He started small, collecting shark teeth.

Mostly, he searched along the Smoky Hill River in the rocks in Wallace, Logan and Gove counties.

His finds have been remarkable. They include mosasaurs and plesiosaurs.

One plesiosaur that Bonner and his son, Orville, found is on display in Sternberg. Collector Glenn Rockers, Hays, called it the finest in the world.

Bonner has been associated with the Los Angeles museum for some 20 years.

Five specimens found by the Bonner family are on display at Sternberg. The plesiosaur, donated to the museum, was found near Russell Springs in 1955.

Other of Bonner's finds are on display at museums in Chicago and Denver.

"I've got them all over the world," he said.

The elder Bonner has other honors. At least four species have been named for the man.

Bonner said he collects strictly "for the scientific part of it." He dislikes the idea of fossils being sold to private individuals.

"I take a dim view of that," he said. "Some people pick up a big vertebrate from a mosasaur and use it as a door stop. I take a dim view of that."

He has no fossils in his house, although he does have a replica of a plesiosaur paddle.

"They should go to the people that study them," he said. "I like to see them go to a museum."

His son Orville has a slightly different opinion. He would rather see fossils collected than destroyed by the forces of nature. And he doubts that many people try to collect for a profit.

"Oh, I think they're pretty rare," he said of for-profit collectors. "I think it would be difficult to make a living."

"I'd rather have anyone. I don't care who it is, go collecting as long as they do a good job," Orville Bonner said. "I'd rather have someone collect them than let the weather erode them out."

Collectors, museums both work in 'education'

By MIKE CORN

Commercial collectors and museums, in the opinion of one commercial collector, have a common goal: educating the public about life that once existed.

"The professional paleontologist and the commercial collector like myself, we could accumulate a tremendous amount of information ... if we would spend more time cooperating than fighting each other," commercial collector Glenn Rockers said.

Museums have been hamstrung by inadequate funding, he said, restricting their ability to search for fossils. In the two years Rockers has collected in western Kansas, he has never run across a professional paleontologist.

But he questions the need for museums to obtain additional fossils when most museums, including the Sternberg Museum in Hays, have thousands of specimens in storage. A small fraction of the fossils collected actually are displayed.

Literature published by Sternberg puts the size of its collection at

more than a million pieces. But Tom Herrin, Sternberg exhibit specialist, said half to two-thirds of the specimens are tiny invertebrate fossils such as snails.

Many items in storage are fragments, often nothing more than a single tooth. Several specimens are needed for scientific study, Herman said.

Material in storage might not be valuable as display material, said J.D. Stewart at the Los Angeles County Museum, but to the "specialist they are a gold mine of information."

Rockers said he doubts that museum employees are paid enough to go out in the field to do what a commercial collector does.

"If I was not making a living doing what I'm doing as a sole proprietor, no one could pay me enough to do it," he said. "It's very hard work."

Hot summers, cold winters, long hours and an abundance of rattlesnakes make the life of a fossil hunter difficult.

"Unfortunately, when God deposited the fossils in the chalk, he did an inhospitable job," Rockers said.

But if left in the field, nature eventually destroys the fossils.

"If it wasn't for the commercial collector, the majority would not be collected at all. Mother Nature would destroy all of it. A week doesn't go by where I find a specimen that I'm 20 years too late. You

have to be there at the instant it starts to erode out."

Rockers admits, however, that he and other commercial collectors have a responsibility to help preserve rare specimens.

"I've donated thousands and thousands of dollars of stuff to museums," he said.

Rockers currently has a mounted skull of a "tylosaur proriger" — a mosasaur — in his shop; it is destined for a new children's museum in Missouri that another commercial collector plans to establish. A portion of the price was donated, but he won't say what the final cost was.

Almost 250 hours of restoration work was required to assemble the skull, the remains of which were found scattered in an area the size of a large closet.

The Missouri museum offers the promise that the item will be on display.

"I have been coming to Fort Hays State University museum for 10

years and in the fossil department I have not seen one thing change in the 10 years. I may be wrong.

"If they've got a million specimens in the back, somebody ought to be doing something with them. The public, the taxpayers that are funding that museum, need to have a fresh approach."

Sternberg has changed, Herman said, noting the addition of a display showing steps in fossils collecting and an elaborate geologic time scale. Time and money are the limiting factors.

Stewart likened fossils in storage at museums to money in a bank: "It's for the future. If you don't get it now, you'll never get it."

In the Los Angeles area, 20 percent to 40 percent of the museum's collecting sites are lost, covered by urban sprawl.

"I'm doing the same thing the museums are doing but I'm doing it with museums that are willing to put these beautiful fossils on display," Rockers said.

Scientists favor fossil regulations

By MIKE CORN
Hays Daily News

12-11-88

MANHATTAN — State paleontologists on Friday called for the licensing of commercial fossil collectors and urged the adoption of recommendations contained in a national report on the issue.

The paleontologists, meeting at Kansas State University in Manhattan, also recommended that permits be required before commercial collectors quarry for fossils on state-owned lands, including land along state roads.

Hays-based commercial collector Glenn Rockers on Saturday expressed satisfaction with the recommendations, although he voiced concern over the licensing process.

No recommendations were made on licensing fees, who would be required to purchase a license or who would enforce the licensing requirement.

The Friday meeting was called by the Kansas Geological Survey in an attempt to determine where paleontologists from state universities stand on the issue of regulating fossil collecting.

KGS paleontologist Chris Maples said the meeting was called because of the likelihood that KGS director Lee Gerhard will be asked for an opinion on the need to regulate fossil collecting.

"As far as Chris and I are concerned, we would like to find out what you people think," said Rex Buchanan, assistant director for publications and public affairs at KGS.

Maples and Buchanan were among the 14 people attending the meeting. Paleontologists from the University of Kansas, KSU and Fort Hays State University attended the meeting.

Also attending was John Pojeta, a paleontologist with the U.S. Geological Survey in Reston, Va. Pojeta also is president-elect of the Paleontological Society and served on the panel that developed the fossil collecting guidelines for the National Academy of Sciences.

The NAS report was prepared in 1987 and was designed to offer advice on how the federal government should regulate the collection of fossils on federally owned land.

Currently no formal regulations govern fossil collecting on federal lands; Kansas lacks any regulations on fossil collecting.

The controversy over fossil collecting in Kansas arose when northwest Kansas farmers learned

FOSSILS: Level of regulations argued

Continued from page 1

the chalky remains were valuable, although they were paid nothing for what was found. Chalk formations in Trego, Gove and Logan counties are rich in the fossil remains of life that once existed in an ancient sea.

The Manhattan meeting did not include representatives from either the commercial collecting field or farmers, on whose land the fossils have been found. Maples, however, said he plans to meet with both in the future.

"Admittedly, this is not a very eclectic group," Maples said, referring to the lack of farmers and commercial collectors attending. "We will be getting input from collectors and farmers down the line."

Rockers said he would be happy to meet with Maples to discuss the possibility of regulations on fossil collecting.

The adoption of the NAS report pleased Rockers.

"I agree 100 percent with that," he said of the report.

Rockers said he would be willing to buy a permit, but noted that he was concerned about the licensing procedures. Rockers also agreed with the idea of requiring a permit to quarry on state-owned land, especially roadcuts.

"I'm impressed and enthusiastic," Rockers said of the meeting. "I'm very pleased."

The contents of the NAS report consumed most of the 4½ hour meeting, especially the recommendation that would open federal lands to commercial collectors through a permit process.

"If there's a market for vertebrate fossils, then it's difficult for Fort Hays or KU to go out and collect," said Mike Nelson, chairman of the earth sciences department at FHSU. "I think there ought to be a much greater emphasis on

supplying casts" of fossils. Casts are plaster reproductions of fossils.

Pojeta defended the recommendation, noting that commercial collecting would be supervised by a paleontologist.

"In my opinion, I don't want to see many laws passed," he said. "Then we get it in the hands of lawyers and out of the hands of scientists."

Nelson, however, said he thinks fossil-rich western states will be passing fairly stringent laws to regulate commercial collectors. Utah, for example, is currently struggling with the issue.

Larry Martin, a paleontologist from KU, said he and his co-worker Hans Peter Schultze discussed the issue and "agreed that if we are against anything, that is commercial collecting. And even if we wanted to regulate it, we couldn't."

Pojeta agreed that commercial collecting might be viewed as a problem, but added: "I think most people will agree commercial collecting will not go away."

"Why not court the commercial collectors and put them on the spot a little bit?" he asked, adding that

the state could require adherence to a code of ethics adopted by a trade group formed by commercial collectors.

"They can put pressure on unscrupulous collectors," said Ron West, a paleontologist at KSU.

No action was taken on adopting the ethics code.

Initially, Nelson was the lone holdout on recommending the adoption of the NAS report.

"I think the state needs its own policy for state-owned land," Nelson said. "I would like to see a permit (required) to collect on state land."

The licensing process likely would require some type of reporting requirement to ensure that scientifically important material is not lost.

After making the recommendations, the paleontologists briefly talked about the need for additional funding to conduct research.

"We should make an effort to take advantage of the tremendous availability of fossils in Kansas and collect and prepare as many of these in (Kansas universities and museums," said George Clark, a KSU professor of geobiology.

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Fossil licenses

Kansas' past lies buried beneath the prairies. It is a past rich in prehistoric animal life. In many areas fossils abound.

Unfortunately, that abundance of fossil material also makes Kansas a potential hunting ground for those who quarry and sell fossils to collectors of the unusual.

State paleontologists meeting in Manhattan last week recommended that the state institute licensing and regulating procedures for commercial fossil collectors.

That recommendation should be heeded.

The fossils buried in Kansas' chalk beds contain important scientific information about the geologic and natural history of the state. They should not be ripped out and sold by those untrained in interpreting their significance.

Regulations and licensing would help ensure that potentially significant scientific discoveries are not recklessly destroyed by those whose only motive is profit.

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EDITORIAL

Kansas fossils deserve state protection

Last week's decision by paleontologists in the state and the positive response it evoked from one local fossil collector bode well for one of Kansas' more exotic resources.

Paleontologists agreed to pursue regulation of commercial fossil collectors. Glenn Rockers, a Hays-based collector, said he was pleased with the group's recommendations.

The proposal is far from complete. More study is needed before final recommendations can be developed and presented to the proper authorities. But the first step has been taken.

At their meeting, the paleontologists agreed that commercial fossil collectors should be licensed, and that they should be required to buy permits to hunt fossils on state-owned land.

Although some regulation is

needed, Kansas needs to take care that it does not create an needlessly burdensome bureaucracy. Licensing and permit requirements should not discourage collecting, but ensure that the resource — or the state or landowner — is not exploited.

To be effective, the state must develop regulations that are acceptable to not only researchers, but also collectors and landowners.

And enforcement procedures, including penalties, must be made a part of the recommendations if the regulations are to carry any weight.

Considerable work awaits those attempting to protect the rich fossil history of Kansas. The paleontologists have taken the first step. Others, including landowners, collectors and lawmakers, must now join them.

NEWS



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Story by Will Dickinson
2310X
Dec. 28, 1988

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MEETING ON FOSSIL COLLECTING SCHEDULED

HAYS (KU) -- Landowners and individuals who sell fossils will discuss the collecting of fossils, including the commercial collecting of large vertebrates from western Kansas.

Paleontologists from the Kansas Geological Survey, based at the University of Kansas, and from Fort Hays State University will attend the meeting at 7:30 p.m. Jan. 5 in the auditorium of the Fort Hays Experiment Station.

The meeting will allow landowners and commercial collectors to discuss problems related to commercial collecting. Fossils of interest to collectors have been found in chalk in the Smoky Hill River Valley. The fossils are the remains of animals that died and settled to the bottom of an ocean that covered western Kansas in the Cretaceous Period -- the age of the dinosaurs.

Over the past year, landowners have expressed a growing concern about the removal of fossils such as those of fish and pterodactyls from private land in western Kansas.

At the meeting, the scientists from the Survey and Fort Hays State University will discuss paleontological collecting and summarize a 1987 report from the National Academy of Sciences on collecting. They will also listen to concerns of collectors and landowners.

"We simply want to learn what people in the area think about the situation," said Chris Maples, a paleontologist at the Survey. "Our goal is to gather information from as many viewpoints as possible in order to formulate a thoughtful opinion on the subject."

-KU-

Meeting about fossils provides few solutions

By MIKE CORN
Hays Daily News

Regulations alone won't stop commercial fossil collecting, one collector thinks, but farmers voiced concern that they might not receive their fair share for the fossils that are recovered.

Thursday's meeting between commercial fossil collectors and landowners was congenial enough, but few solutions to ease the friction between the two groups were suggested.

"We're not going to go away," said Glenn Rockers, a commercial fossil collector who operates out of Hays. "The amateur is still going to go out on weekends. ... And I am going to continue making a living as a commercial collector."

But landowners voiced concern over a way to ensure that they are paid a fair amount for fossils found

on their land.

"We won't say its a cash crop, but if they mine this from the land we should get paid," said Roma Tuttle, a Quinter resident and Gove County landowner.

Her husband, Charles, said he thinks landowners should be told what was found and what it's worth.

The meeting, the second of its kind in Kansas, was organized by the Kansas Geological Survey. The survey expects to be asked about the need for legislation to regulate commercial collecting.

At the first meeting in December, paleontologists from state universities recommended adopting a federal report on fossil collecting. The group also suggested a licensing program for collectors, designed to let farmers find out who might be collecting on their land.

The controversy involving com-

mercial fossil collectors and landowners surfaced last summer when farmers complained that their land was yielding valuable fossils, for which they received nothing.

The problem of compensating farmers was discussed, but no clear-cut answers were offered.

"I think it's something that has to be worked out between the collector and landowner," Rockers said.

Rockers has previously suggested that landowners are entitled to an eighth of the final value of a fossil, a suggestion that has received a favorable response.

"As landowners, we don't have any idea what the stuff is worth," said Frank Offutt, whose Gove County land has been a hotspot for fossils. "When we deal with Glenn (Rockers), he's going to go as cheap as he can. And I don't blame him."

"The percentage method sounds

to me the best solution yet," said Rex Buchanan, assistant director of publications at the Kansas Geological Survey.

"It's like history, the value of fossils are coming on fast," said Fred Nuss, a collector from Otis. "It's like art. Right now, they (fossils) are coming on big and hot."

At the meeting, Rockers also called for better communication between commercial collectors and paleontologists — groups that have typically been at odds with each other.

"There's been a tremendous distance, a gap, between these two entities," he said. "The scientific community does not have the time nor the money to spend time in the field like commercial collectors."

FOSSILS / see page 5

FOSSILS: Collectors to continue

Continued from page 3

Rockers said he thinks the commercial collectors could do a substantial amount of the legwork needed to recover fossils.

Noting its long history, Rockers said commercial fossil collecting would not go away.

"It's here to stay," he said. "It's not going to go away depending on what the Kansas Legislature does or does not do."

He went on to say that Kansas would be the main beneficiary if relations between the groups improved, primarily through donations of scientifically important material found by collectors.

Rockers also called for someone in the state to serve as a liaison between commercial collectors, farmers and paleontologists.

"If Kansas wants to protect its fossils, they're going to have to take one step farther," he said. "Regulation isn't going to do it."

"If the state of Kansas wants to regulate us, that's great. But do it in a way that is beneficial."

Offutt agreed that there is a need for a contact person with the state, something akin to a state paleontologist.

He also said a fossil collector has no more right to hunt fossils on his land than someone hunting for birds.

"I feel if we could get along, there would be plenty of places to hunt," Offutt said.

Legislator to push law on fossil collecting

By MIKE CORN 1-8-89
Hays Daily News

Legislation aimed at regulating fossil collecting in Kansas will be introduced this session, according to a Dighton legislator.

"I'll either introduce legislation myself or ask a committee to do it," said Rep. Max Moomaw, R-Dighton. "I will guarantee there will be legislation introduced."

Moomaw said he would like to get the measure introduced during the first two weeks of the session, which begins Monday.

"While things are a little slow, that's the time to do it," he said of introducing the legislation.

Moomaw said he plans to ask the Legislative Research Service, an arm of the Legislature, to research laws in other states. The Kansas Geological Survey has already done that, as well as conduct two meetings on the issue.

Moomaw's district encompasses portions of the fossil-rich areas of northwest Kansas.

Another legislator, whose district covers most of the fossil-bearing lands in Trego, Gove and Logan counties, said he has no plans to introduce legislation covering commercial fossil collecting, but would support it if it is introduced.

The issue of fossil collecting surfaced this summer after farmers complained that commercial collectors were digging fossils on their land without permission. Kansas landowners currently have no protection other than state trespassing laws.

The collecting was even harder to swallow once the farmers learned the value of the fossils once they are prepared and sold, primarily to private collectors.

The Geological Survey, anticipating the introduction of legislation concerning fossil collecting, has organized two meetings on the issue.

The first, in Manhattan in December, involved paleontologists from state universities. That group recommended the adoption of a federal report on fossil collecting as well as the licensing of commercial collectors.

Paleontologists also urged the state to require a permit system to quarry on state-owned land, primarily along roads.

Rep. Gayle Mollenkamp, a Republican from Russell Springs, said he could live with those recommendations.

"I wouldn't have any problem with that logic myself," he said.

At a meeting last week in Hays, commercial collectors and landowners offered their opinions on the issue.

Glenn Rockers, a commercial collector in Hays, suggested the need for a liaison officer — something of a state paleontologist — with the state. That way, he said, farmers and collectors alike would have someone to contact if they had questions.

FOSSILS / see page 9

See related legislative stories on pages 2, 3 and 8.

FOSSILS: Moomaw wants owners protected

Continued from page 1

Rockers also recommended an education program, as well as an effort to soothe the rift that has long existed between commercial collectors and paleontologists.

Farmers, however, said they would like some protection ensuring that they receive a fair share of the value of the fossils.

Concern has been voiced that because the fossils are now known to be valuable, the state might not receive as many specimens through donations. At the Hays meeting it was suggested that a tax deduction might work.

Moomaw said he is not yet certain what his legislation will entail, but said he wants some type of "reasonable" measure that will protect

landowners. He doubts that any legislation will adversely affect university and museum paleontologists.

"I don't think those are the people we are concerned about," he said, noting the already existing need to obtain permission to hunt fossils.

"Something to ensure that commercial collectors do not come in and take valuable fossils ... and make money off it either without landowners' permission or the landowner sharing in the value," Moomaw said. "I certainly feel landowners have every right to know what will be done with the fossils."

He said his first priority is writing legislation that will protect landowners' rights.

Once legislation is introduced,

Moomaw said, hearings will be conducted allowing both sides of the issue to present their case.

"We'll try to write something that's fair," he said.

Mollenkamp said he would not support legislation if it hampers universities and museums in their search for fossils.

"If it is written to affect people who do it as a business, I would support it," he said.

Mollenkamp, R-Russell Springs, said his Logan County ranch has yielded numerous fossils and has served as a home base for a number of college fossil-hunting expeditions.

"There's several colleges in the northern part of the United States that came here to my ranch for several years," he said. "I've had

no problem with it (commercial collecting) at all."

Although he has encountered problems, Mollenkamp said, "when you start interjecting high dollars into it, it starts raising problems."

"If we're going to start tying it in the hand of museums and colleges, wouldn't be in favor of it," Mollenkamp said. "I would support it other type of legislation" affecting commercial collectors.

Mollenkamp said he understands the concerns of farmers on whose lands the fossils have been found.

"I assure you I would be upset if I knew someone was out collecting and making money off it," he said.

But, he lamented, "I'd just soon not know about things like that."

APPENDIX IV

Paleontologists on Paleontological Collecting

Clearly, opinions are somewhat divided in the paleontological community on what, if anything, to do about collecting of fossils. The following articles are representative, but by no means exhaustive, viewpoints on paleontological collecting by the professional paleontological community.

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**ONLINE****Paleontology and Regulations:
The National Academy of Sciences**

Paleontologists are highly individualistic; in any discussion we have more opinions than participants. All agree, however, that paleontology is based on specimens. Consequently, the report of the National Academy of Sciences Committee on Guidelines for *Paleontological Collecting* touches the soul of paleontology, because it provides guidance to land managers who control access to public lands.

Because paleontologists are unaccustomed to working in large groups or to reaching consensus, the report is a first for United States paleontology; it is a policy document from a committee that included representatives of all factions—four vertebrate paleontologists, three invertebrate paleontologists, a paleobotanist, a geological administrator, two geological businessmen, and two lawyers—who work for museums, universities, state and federal geological surveys, a coal company, and a business that sells fossils. They were chosen because their backgrounds would provide different points-of-view; they did not represent organizations or societies.

The urgency of the NAS Committee's task was underscored by developments among land managers, including: 1) placing paleontology under regulations designed for archeology; 2) rules potentially restricting university field camps, paleontological collecting trips, stratigraphical studies, non-paleontological studies using data from fossils, and activities of extractive industries; and 3) protection for fossils, which resulted in the arrests of a university professor and an amateur.

A sample of the range of ideas presented to the NAS Committee included: 1) free access for everyone to all lands to collect fossils; 2) absolute protection for fossils, including "every mammal tooth on every ant hill;" 3) protection of all type sections and type localities; 4) stopping the collection of sedimentary rocks, as they might contain microfossils; 5) prohibition of fossil collecting because part of the wilderness experience includes the weathering of fossils; 6) requirement of 34 pages of rules and forms to obtain a collecting permit from one part of one of the 60+ federal land-managing agencies; 7) arrest of anyone without a collecting permit; 8) discontinuance of federal paleontological permits because there were only 24 applicants in fiscal year 1986; 9) objection to delegating paleontologists' right of access to land to bureaucrats who confuse paleontology with archeology; 10) "inventory, mitigation, and salvage of fossils" are good, as they provide contracts, employ students, and may turn up something interesting; 11) "inventory, mitigation, and salvage" of fossils are bad, because they are done with no scientific purpose in mind, and because contracts to do these are grants without peer review; and 12) that the only good commercial collector is dead or in jail.

The report contains 10 unanimous recommendations. On October 25, 1987, the Council of the Paleontological Society unanimously endorsed the NAS report. On October 23, 1987, the Business Meeting of the Society of Vertebrate Paleontology decisively rejected the report; however, an unknown number of persons abstained.

The committee addressed two major concerns of vertebrate paleontologists first in the report's unequivocal statement, "Commercial collecting of fossils from the public lands should be regulated . . ." (p. 25). Secondly, the committee opposed blanket inventories, stating that "The land is innocent of paleontological significance until a paleontologist demonstrates otherwise" (p. 21), because inventories need a scientific rationale beyond the mere hope for discovery. In a strong statement of principle (p. 2), the Committee asserted that land managers should facilitate scientists' access to fossils.

As a consensus document, the report creates a special dynamic, because it deals with the diversity of the profession of paleontology, and thus reflects what is possible in a universe of conflicting interests. The report will not solve every special need, nor will it prevent unscrupulous collectors from poaching fossils; these are proper jobs for land managers.

I thoroughly agree with Frank Whatmore, a vertebrate paleontologist and friend of 24 years, who said "This report is long overdue—we should have had it 20 years ago." The report is FREE from the Board of Earth Sciences, 2101 Constitution Ave., Washington, D.C., 20418. PLEASE READ IT!

—JOHN POJETA, JR.



John Pojeta is a paleontologist, specializing in Paleozoic molluscs, for the U.S. Geological Survey, Washington, D.C. He has traveled widely to obtain specimens that document early molluscan phylogeny in the United States, Australia, Antarctica, New Zealand, Europe, West Africa, and China. John was a member of the National Academy of Sciences Committee on Guidelines for Paleontological Collecting (1984–1987), President of the Paleontological Research Institution (1989–82), Secretary of the Paleontological Society (1982–88), and recently finished an invited lecture tour of China. He is the nominee for President-Elect of the Paleontological Society (1988–89).

For another opinion, see page 253.

Regulation and Fossil Collecting— An Alternative View

MICHAEL J. NOVACEK
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The National Research Council (NRC) report on fossil collecting has a daunting objective: it is expected to serve as a set of guidelines for the whole spectrum of paleontological interests—scientist, amateur, commercial collector, vertebrate paleontologist, paleobotanist, micropaleontologist, and so forth. In meeting this challenge the report has engendered some controversy, particularly in the area of vertebrate paleontology.

My remarks on this issue should not be taken as an official statement of any special interest group. Members of the Society of Vertebrate Paleontology, the international organization representing the great majority of professional vertebrate paleontologists (as well as many nonprofessionals) in this country, are currently being polled for their reaction to the NRC report. Nonetheless, as chairman of the Society's Government Liaison Committee (GLC) during 1986 and 1987, I have some familiarity with the problem. Moreover, my comments here accurately represent the majority position of GLC (it is noteworthy, however, that two members of that committee also participated in drafting the NRC report), as well as the opinions of many SVP members.

I emphasize from the outset that many aspects of the NRC report are hardly inimical to the special concerns of vertebrate paleontology. Most of the ten recommendations that form the core of the report are logically aimed at developing a more open, uniform, and less bureaucratic program for regulation of fossil collection. This is apparent in recommendation #3, where federal permits for scientific collecting are advocated only in the case of quarrying. Although some SVP members have

complained that this policy is too permissive and is likely to be exploited by irresponsible collectors, many vertebrate paleontologists (myself included) agree that the present regulatory procedure could be more efficient and more flexible.

Recommendation #3 does, however, contain a controversial statement. It lumps quarrying for scientific purposes with commercial collecting as those activities requiring permits. The issue of commercialism is further elaborated in recommendation #5, a part of which states, "Commercial collecting of fossils from public lands should be regulated to minimize the risk of losing fossils and data of importance to paleontology" (p. 5). A procedure is then outlined wherein commercial activities are assessed and monitored by professional paleontologists.

At first glance, recommendation #5 might seem an effective measure against exploitive commercialism. There is, however, widespread concern among vertebrate paleontologists that the provision for controlled regulation is simply too weak to deal with the problem. Burgeoning activities in commercial collecting impact perhaps most strongly on the field of vertebrate paleontology. Disturbing are the basic premises for the latitude provided by recommendation #5. In the NRC report it is stated (p. 13) that "fossils are not rare" and (p. 22) that "to call fossils 'non-renewable' may be technically true, but in a practical sense, is false for most species." Granted, these attributes may apply to bountiful assemblages of fossil macroinvertebrates and marine micro-organisms, but they certainly exclude a large category of scientifically important vertebrate fossils (the report acknowledges, in fact, the extreme rarity of whole dinosaur skeletons, p. 16). Unusual, well-preserved specimens of great scientific interest (e.g., *Archeopteryx*, the Green River fishes, and the Eocene mammals from Grube Messel) often have a strong ap-

peal in the commercial market. It is thus inappropriate to develop guidelines for the protection of vertebrate fossils based on the assumption that these remains are, by and large, abundant and effectively renewable.

For these reasons, the Society of Vertebrate Paleontology has maintained a hard line against commercial inroads. Cited in the NRC report (p. 3) is the 1973 resolution adopted by the Society "opposing the sale to the public of fossil specimens of any sort . . ." Many of us remain convinced that commercialism of fossils on public lands should be "regulated" by means of outright prohibition, not simply by means of a very difficult and tenuous monitoring program conducted by professional paleontologists. It is this aspect of the NRC report that is perhaps the most problematic for vertebrate paleontology.

A second area of disagreement concerns recommendation #7 of the NRC report which states that "blanket paleontological inventories, mitigation, or salvage activities should not be undertaken, funded or required by government agencies as a routine part of environmental assessment, impact analysis, permitting land management, or similar programs" (p. 4). I agree that such surveys should not be rampant, random, or poorly justified. Nonetheless, recommendation #7 seems unduly restrictive. The NRC committee argues that such surveys are usually warranted only as *post facto* operations that follow intensive scientific work. On the contrary, there may arise a need to assess the importance of a fossil discovery before the last page of the long awaited monograph is set in type. To exclude such surveys seems ill-advised in a current climate of interest in documentation of biotic diversity and abundance in the tropics and other regions of the world. Fossils, just like living organisms, are valuable resources, many of which, as noted above, are of limited abundance. Even the NRC report advocates regulation of some collecting activities (e.g., quarrying and commercialization), and land managers thus have a need to periodically evaluate and assess the resources they manage.

Related to this issue is recommendation #8, which identifies the USGS or

appropriate state geological surveys as the discretionary bodies for paleontological problems involving land management. In many cases, such a procedure would be effective. However, these agencies are staffed with only a few vertebrate paleontologists. Land management problems should also be brought to the attention of professional paleontologists working in the affected area, perhaps by way of notices disbursed to professional societies. Scientists most qualified to make an initial assessment of a particular problem

may, in many instances, be affiliated with universities or museums, and not with federal or state surveys.

Other aspects of the NRC report have elicited reaction from vertebrate paleontologists. The above issues, however, seem to loom most important in the development of a broad policy for fossil collecting. It is acknowledged that the NRC report must serve a diverse community and that some compromise is naturally expected. Moreover, paleontological subdisciplines should resist a parochial attitude toward earnest ef-

forts to forge a useful policy. Nonetheless, many of us view elements of the NRC report as presenting compromises that pose a substantial threat to effective scientific research in vertebrate paleontology. In the near future, a more thorough accounting of the reaction of this group to the suggested guidelines in the NRC report will be available. In the meantime I hope that these remarks have shed some light on a vertebrate paleontological perspective.



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The use and conservation of palaeontological sites. Geological Society, London, 1-2 October 1987. Jointly sponsored by the Geological Curators Group, the Geological Society and the Palaeontological Association. Organised by Dr. P.R. Crowther, Mr. M.F. Stanley and Dr. W.A. Wimbledon.

1987 was the European Year of the Environment (EYE) and an ideal opportunity to take stock of one of our most valuable natural resources: the history of life on earth as inscribed in the rocks. This two-day meeting with four chairmen and fifteen invited speakers drew some eighty workers from diverse backgrounds ranging from museums to mammalogy and places as far away as Stuttgart and California. Tristram Besterman (Plymouth) set the ball rolling by making the important distinction between conservation and preservation and presented the case for why we need to pursue the former. Bill Clemens and Rupert Wild then described state conservation in the USA and West Germany respectively, the two systems reflecting very different legal traditions. Bill updated us on the activities of the Committee for Guidelines for Paleontological Collecting. This body has been trying to unravel complex Federal/State legislature restraining the use of American palaeontological sites. With the successful Palaeontological Association excursion to West Germany only two days old, it took little imagination to visualise the Tertiary site at Messel, internationally renowned for its vertebrate, plant and insect fossils, becoming Europe's biggest rubbish dump. Delegates were urged by Rupert to sign yet another petition against such a fate and responded stoically.

Inevitably, conservation has to be costed and the first session of Thursday afternoon was devoted to the price of fossils by Ian Rolfe (Edinburgh) and Angela Milner (London) and of fossil collecting by Stan Wood (Livingston). Ian and Angela tested delegates' knowledge of the antique value of fossils via a questionnaire and traced the economic history of ichthyosaurs from Mary Anning to the present day. Stan gave a very personal account of his pioneering work as a 'fossil hunter' coupled with traditional Scottish financial commonsense. At times, it was almost too easy to forget that most people give up their time (and most of their finds) freely in the cause of conservation. Mike Taylor (Leicester) moved on to

explore the amenity value of palaeontological conservation, an attractive prospect if properly and sensitively applied. John Cope (Swansea) then reminded us, via biostratigraphy, of the need to see examples of extinct species in their natural context and of the problem of over-collecting. Hammered-out classical coastal sections were a poor legacy for the next generation. Formal discussion continued informally at the end of the first day as we moved from the lecture theatre to the library for wine and savouries and a buffet supper.

Day two commenced with Eric Robinson (London) presenting diverse examples of collaborative work between professional and amateur palaeontologists and geologists, a theme at the heart of the Geologists' Association's thinking. Some of the recent project work had been modestly grant-aided by societies including the G.A. and Pal. Ass. and, judging from demand, the G.A.'s fieldwork Code was a great success. Next a cancellation and change of programme: instead of Maggie Rowlands on the controversial issue of fossil fish sites, we heard Bill Wimbledon from our government's own conservation body, the Nature Conservancy Council. Past history had shown that biology and geology might be good friends in natural history but are liable to become sparring spouses when married by parliament in one nature conservation organisation. Instead, notification of geological (and palaeontological) Sites of Special Scientific Interest (triple S I's) needed speeding up because many of the sites selected by the Geological Conservation Review still lacked statutory protection: indeed, some had been lost. Perhaps the most interesting part of this talk was the proposal of a charter for the use of palaeontological sites because their needs are not the same as wildlife sites. I may also add that the N.C.C.'s 'Domesday Book' of UK geological conservation is anticipated with much interest. There then followed two contributions on the 'birds and butterflies' of palaeontology and their sites: fossil mammals by Kenneth Kermack (London) and reptiles by Michael Benton (Belfast) and, in similar vein, fossil macro-plant sites by Chris Cleal (Newbury). The session was interrupted to enable delegates to transfer to the Linnean Society for the public launch of a new, voluntary geological conservation organisation, The British Institute for Geological Conservation*. The afternoon continued with an additional contribution by Dr. Laing Ferguson on Carboniferous conservation in Nova Scotia, another contribution by Mike Taylor on the veritable spider's web of law surrounding UK nature conservation and a summing up by George Black, who in his own words, is now out of the wood but not so long as to forget what the trees look like! It was perhaps significant that discussion ended with an impromptu presentation on the problems of conserving mineral species, reminding us that nature conservation is essentially interdisciplinary.

For those who could not make it, the proceedings of the meeting and the ensuing discussion sessions will be published next year as a Special Paper in Palaeontology (40). At the end of the day, what was achieved apart from an airing of views during EYE? The answer must be the birth of a brand-new UK

initiative in the form of the British Institute for Geological Conservation. It is too early to say how it will grow and develop, but the head cannot function without the body and geological nature conservation is already burgeoning at county and urban level in such disparate places as Leicestershire and West London. However, I hope that we do not entirely lose the old alliance of natural history plus archaeology still conserved in many societies and museums. In the final analysis, nature conservation can only succeed if endorsed by the community at large, and a holistic approach to our environment is the only one which makes sense. Palaeontologists and geologists have a lot to do, seeing that they have, literally, inherited the earth.

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