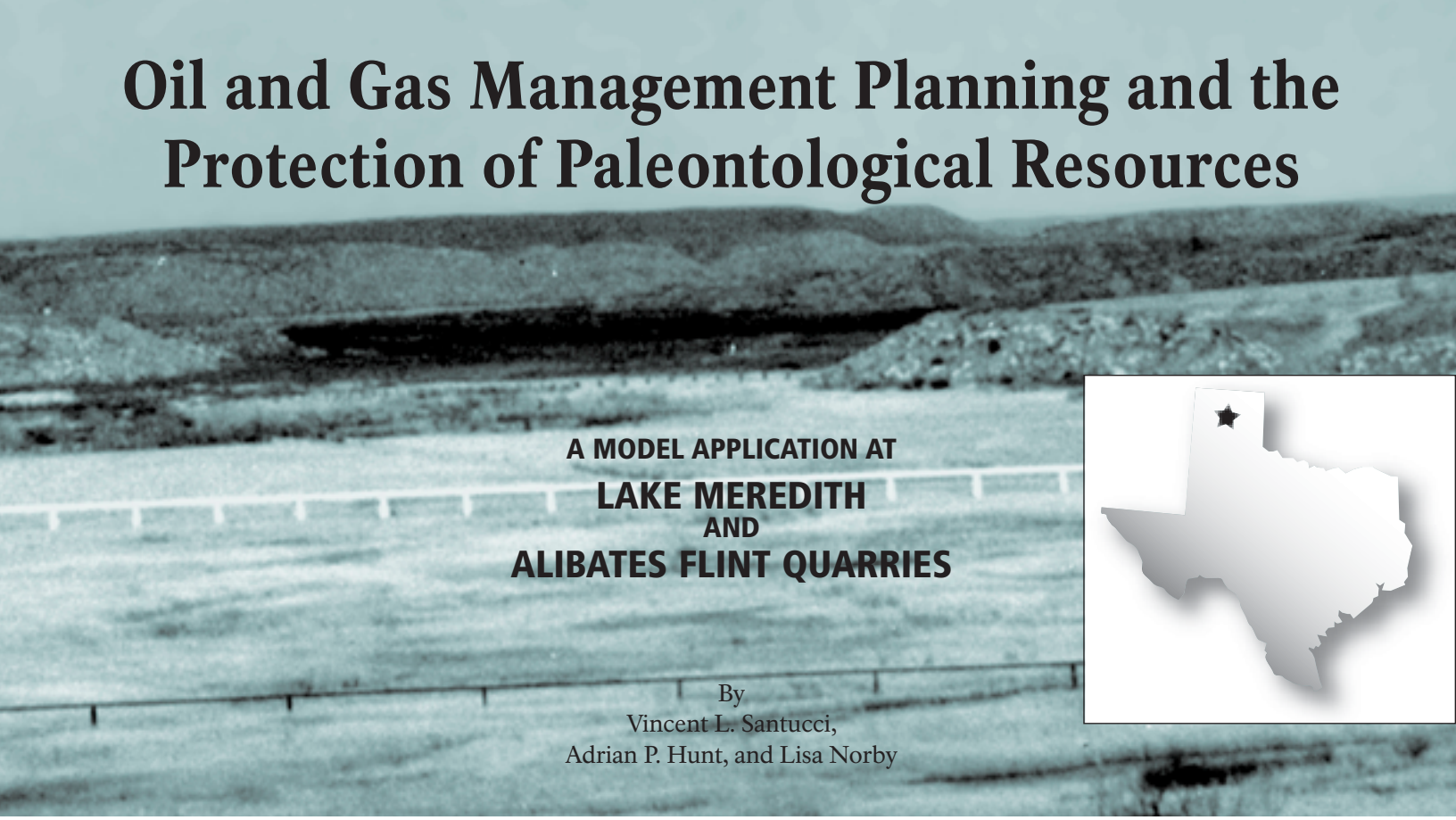
Oil and Gas Management Planning and the Protection of Paleontological Resources



A MODEL APPLICATION AT
LAKE MEREDITH AND ALIBATES FLINT QUARRIES

By
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For the first time the National Park Service has addressed the protection of paleontological resources in a park as part of oil and gas management planning. The milestone came during the development of an Oil and Gas Management Plan / Environmental Impact Statement (EIS) for Lake Meredith National Recreation Area and Alibates Flint Quarries National Monument. Still in draft form, the plan defines a long-term management direction for existing and anticipated oil and gas operations in the parks. Specifically it addresses the issues associated with the development of nonfederal oil and gas rights underlying these northwest Texas parks (fig. 1).

Assessing Risks to Fossils

As part of the plan, the National Park Service developed a *reasonably foreseeable development scenario* (RFD) to project future oil and gas development in the parks and to provide a basis to measure potential environmental impacts. The RFD estimated that over the next 15 to 20 years, in areas of the parks where drilling and production could be permitted, up to 85 new wells could be drilled. Ground-disturbing activities associated with oil and gas development can potentially damage or destroy nonrenewable paleontological (and other) resources.

GROUND-DISTURBING ACTIVITIES ASSOCIATED WITH OIL AND GAS DEVELOPMENT CAN POTENTIALLY DAMAGE OR DESTROY NONRENEWABLE PALEONTOLOGICAL RESOURCES.

Lake Meredith and Alibates Flint Quarries are located between two major structural basins in the Texas Panhandle. Paleontologists have obtained important collections of fossils from Triassic, Miocene, Pliocene, Pleistocene, and Holocene sediments in and around these two units of the national park system. However, the lack of adequate baseline paleontological resource data has limited the staff's ability to determine whether the oil and gas operations have adversely impacted the paleontological resources at the parks.

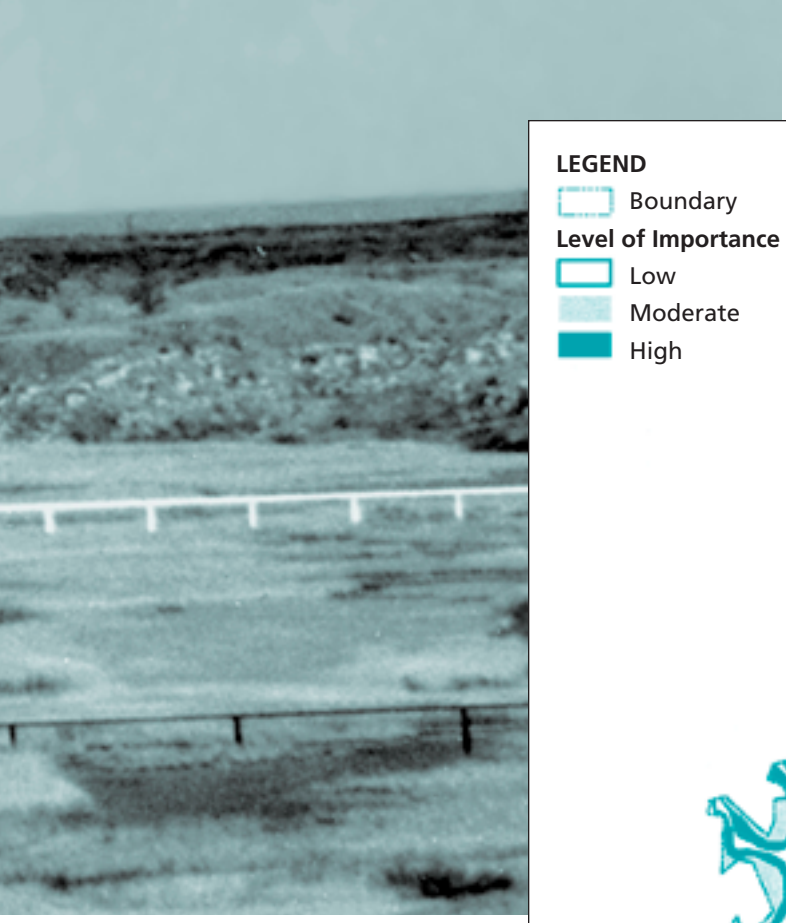

Figure 1. Oil and gas pipelines traverse the two Texas parks along with rights-of-way granting operator access. The recent park planning identified fossil-rich areas requiring protection from oil and gas activities.

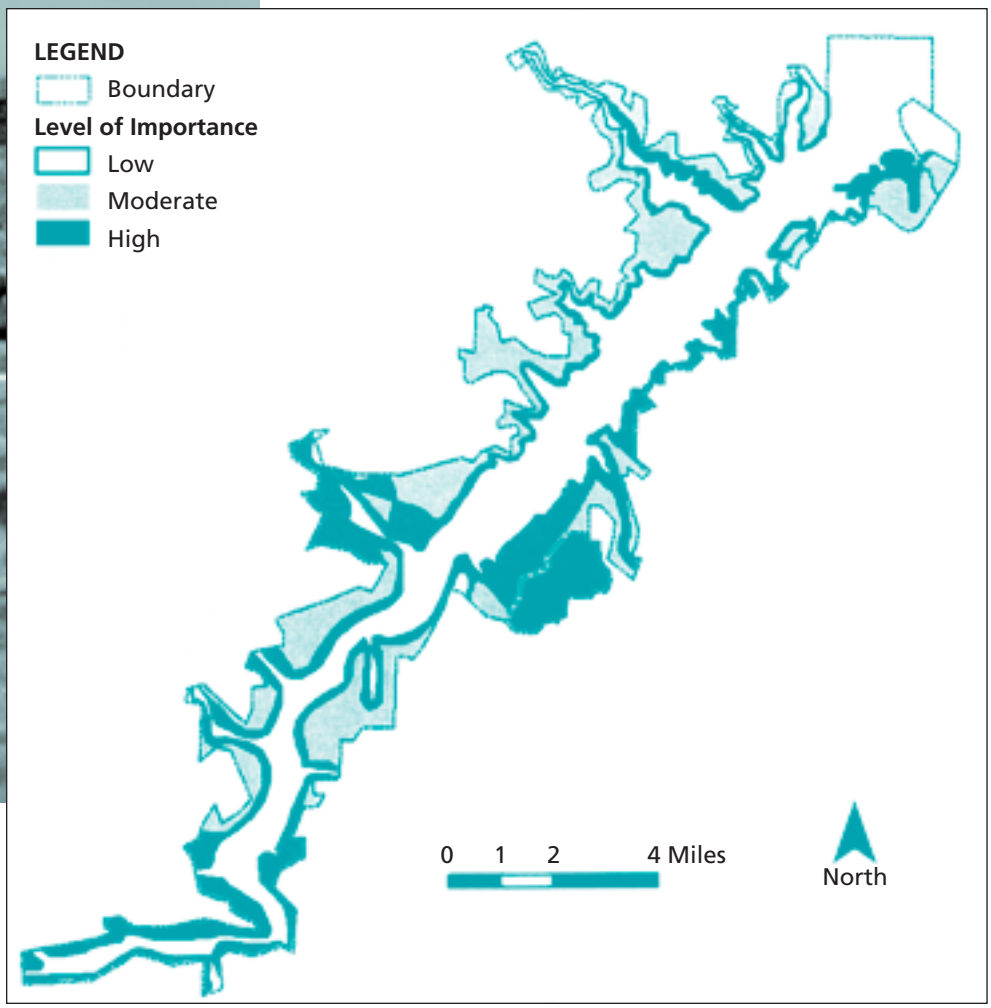

Figure 2 (above). A key tool in the oil and gas management planning process was the development of a paleontological resource sensitivity map, which identifies areas of high, moderate, and low probability for the occurrence of fossils. When preparing a plan of operation for oil and gas development in the parks, an operator must first hire a qualified paleontologist to survey the high-probability fossil areas.

Inventory Needed

Comprising park managers, staff of the Natural Resource Program Center, NPS paleontologists, and others, the oil and gas management planning team identified the need to consider the protection of paleontological resources in the planning process. Therefore, NPS paleontologists undertook a comprehensive paleontological resource inventory of the parks by reviewing literature, searching museum collections, and conducting field surveys. In the process the Park Service developed a "paleontological resource sensitivity map" identifying areas of high, moderate, and low probability for the occurrence of fossils (figure 2). First, NPS staff used geologic maps to determine surface exposures of fossil-bearing strata in the parks. They then correlated the predicted fossil areas with the actual occurrence of fossils in the field to fine-tune the sensitivity map.

During the inventory NPS paleontologists identified over a dozen paleontological localities consisting of diverse fossilized plants, invertebrates, vertebrates, and trace fossils. Significant paleontological resources were linked to the Upper Triassic (late Carnian) Dockum Group, including the remains of ancient amphibians (metoposaurs), reptiles (aetosaurs, phytosaurs, rauisuchians), and a great abundance of petrified wood (Murry 1989). The NPS staff documented six fossil localities from the Miocene-Pliocene Ogallala Group that contain root casts, silicified grasses, insect burrows, mammal bone beds, and a mastodon tooth (Hunt and Santucci in press; Wilson 1988). Additionally, within the national recreation area and national monument five Pleistocene paleontological localities are documented and include a site in which a nearly complete skull of the giant bison *Bison latifrons* (fig. 3, page 38) was collected (Anderson 1977; Dalquest and Schultz 1992; Hunt 2000). Resource management staff have entered the known paleontological resource localities into the parks' geographic information system database and plan to monitor these sites periodically in the future.

Standard Operating Procedures Developed

The oil and gas management plan / EIS identifies standard operating procedures for locating and protecting paleontological resources (Santucci 2000). These procedures outline circumstances when a paleontological survey is necessary and how the survey should be implemented. The procedures also provide guidance when an unanticipated discovery of fossils occurs during approved operations or fossils are damaged within previously identified paleontological localities.

Three alternative actions are identified in the EIS for paleontological resources. Alternative A is the continuation of current management practices in which proposals for oil and gas development are evaluated case by case. Alternatives B and C designate special management areas throughout the parks for protection of the paleontological resources. Additionally, alternatives B and C prescribe the application of the standard operating procedures for locating and protecting paleontological resources. For example, in high-probability fossil areas, the operator of any oil-and-gas-related, ground-disturbing activity, would be required to survey for paleontological resources and describe ways of minimizing fossil disturbance; the survey of medium-priority areas would be recommended.

The EIS is now being finalized; public comments have been received and are being incorporated into the plan. The record of decision is anticipated in early 2002. The National Park Service prefers alternative B.

Conclusion

The Lake Meredith National Recreation Area and Alibates Flint Quarries National Monument Oil and Gas Management Plan and Environmental Impact Statement represents the first time that paleontological resources have been considered in this type of planning in the national park system. The benefits resulting from the consideration of fossil protection in the planning process are many. For example, the planning process focused NPS staff on the need for baseline paleontological resource inventories of the parks. It also prompted the development of new standard operating procedures for locating and protecting fossils, which may be a useful model for other parks addressing similar issues. Also, it has drawn national attention to the significance of fossils in these parks. Finally, it has strengthened the protection of nonrenewable paleontological resources at Lake Meredith and Alibates Flint Quarries. PS

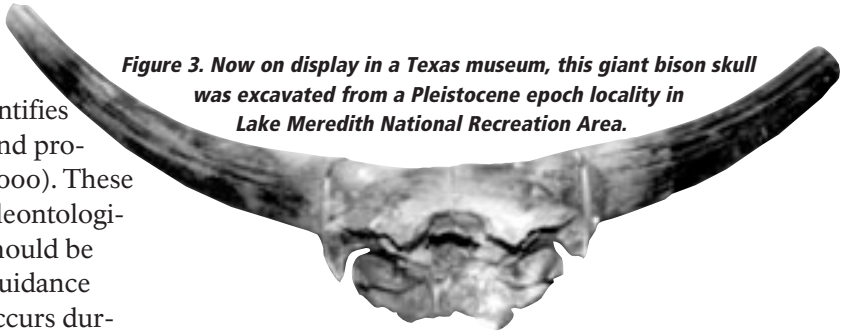

Figure 3. Now on display in a Texas museum, this giant bison skull was excavated from a Pleistocene epoch locality in Lake Meredith National Recreation Area.

Literature Cited

Anderson, B. A. 1977. Overview of bison remains from the Plum Creek area, Lake Meredith Recreation Area, Texas. Southwest Cultural Resources Center, Santa Fe. Unpublished report on file at Lake Meredith National Recreation Area. 10 pp.

Dalquest, W. W., and G. E. Schultz. 1992. Ice age mammals of northwestern Texas. Midwestern State University Press, Wichita Falls. 309 pp.

Hunt, A. P. 2000. Preliminary assessment of the paleontological resources of Lake Meredith National Recreation Area and Alibates Flint Quarries National Monument. Unpublished National Park Service Report. 17 pp.

Hunt, A. P., and V. L. Santucci. In press. Paleontological resources of Lake Meredith National Recreation Area and Alibates Flint Quarries National Monument, West Texas. New Mexico Geological Society Guidebook.

Murry, P. A. 1989. Geology and paleontology of the Dockum Formation (Upper Triassic), West Texas and eastern New Mexico. Pages 102–44 in S. G. Lucas and A. P. Hunt, editors. The Dawn of the Age of Dinosaurs in the American Southwest. New Mexico Museum of Natural History, Albuquerque.

Santucci, V. L. 2000. Standard operating procedures for locating and protecting paleontological resources (appendix F). Lake Meredith National Recreation Area and Alibates Flint Quarries National Monument Oil and Gas Management Plan / Environmental Impact Statement. National Park Service.

Wilson, G. A., 1988. The effects of subsurface dissolution of Permian salt deposition, stratigraphy and structure of the Ogallala Formation (Late Miocene age), northeast Potter County, Texas. Unpublished M.S. Thesis, West Texas State University.

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