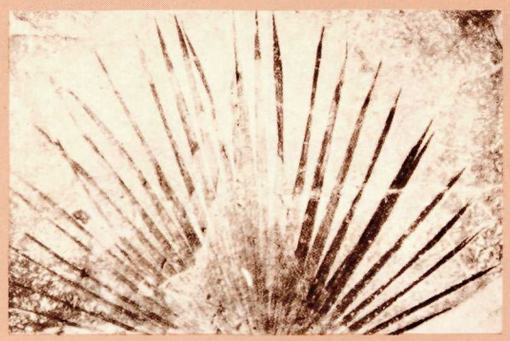


. . . No other fossil-bearing formation in North America has produced so many and such characteristic fossils as this great series of lake beds.

—Curtis Julian Hesse

In southwestern Wyoming a ruggedly impressive topographic feature rises sharply above Twin Creek Valley to an elevation of over 7,500 feet (2286. meters). Within its calcareous shale layers, some 60 million years old, are preserved one of the most extensive concentrations of fossilized fresh-water fish in the United States and one of few such repositories in the world.

The base of Fossil Butte consists of brightly colored red, purple, yellow, and gray beds of the Wasatch formation. Eroded portions of these horizontal beds slope gradually upward from the valley floor and then become abruptly steeper. Overlaying them and extending to the top of the Butte are buff-to-white beds of the Green River formation in which the fossils are located.

The vast majority of fossil finds for over 100 years have come from a unit of laminated shale averaging 18-inches thick (46 centimeters) which can be found from 30 to 300 feet (9 to 91 meters) below the varying surfaces of Fossil Butte. However, fossilized organisms can also be found throughout many of the other layers that compose the Butte.

The fossil fish represent several varieties of perch as well as other fresh water genera and several kinds of herring whose descendants now live in the sea. Other types of fishes include the paddlefish, garfish, stingray, and sturgeon. Well-preserved insect fossils, snails, clams, fragments of a few birds and bats, and many plant remains are also found in the rock layers.

Here, too, are outstanding examples of lake, shoreline, and tributary river floodplain deposits. These layers consist primarily of muddy limestone, calcareous siltstone, very fine sandstone, mudstone, oil shale, and volcanic tuff.

The underlying Wasatch formation also contains abundant fossilized animal remnants. Fragments of primitive horses, tortoise shells, ancestral monkeys, snakes, birds, and crocodiles have been among the discoveries.

Fossil Butte, proclaimed a national monument on October 23, 1972, preserves for the appreciation and education of all the people another chapter in the geologic history of life.

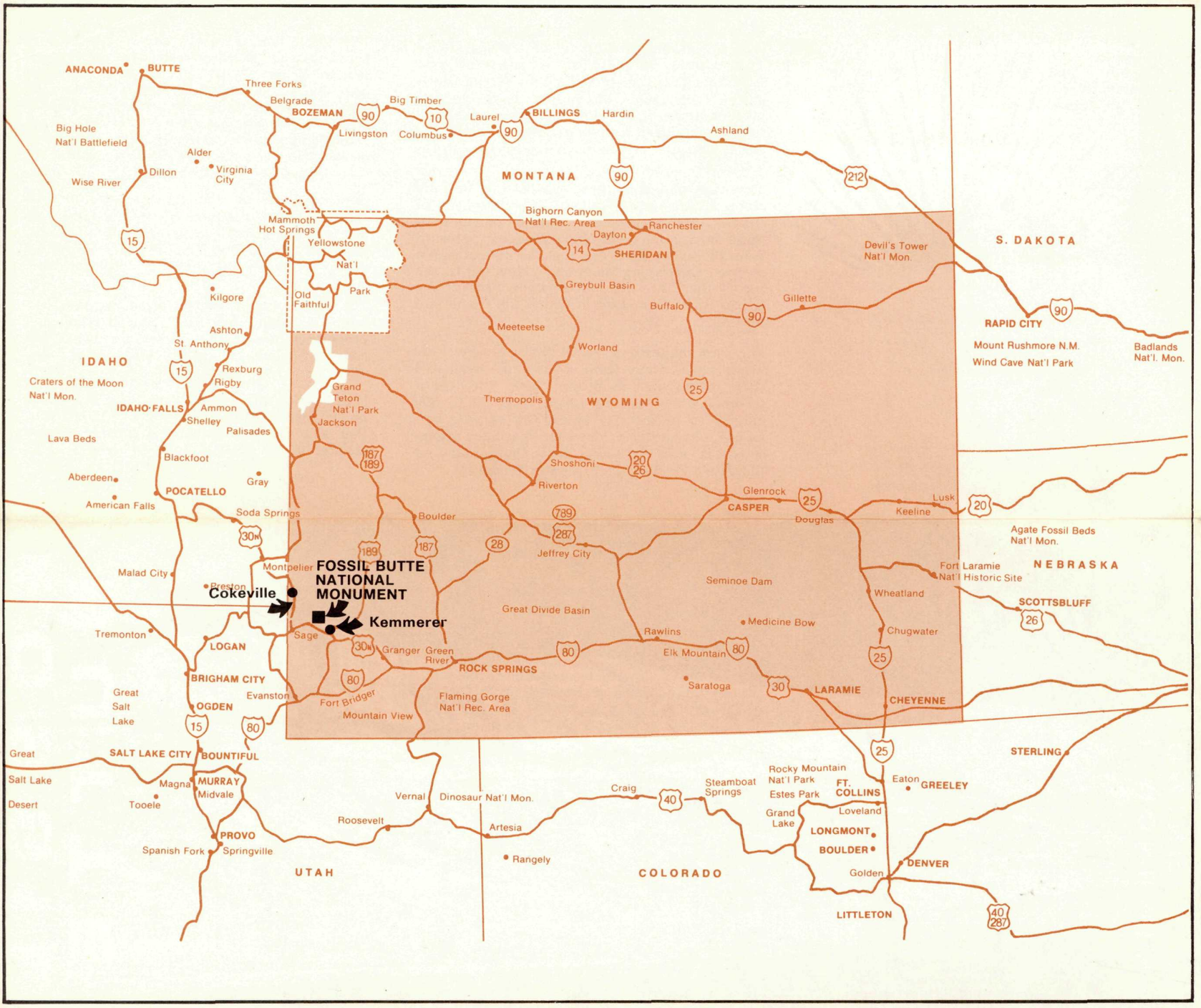
Why are so many fish preserved?

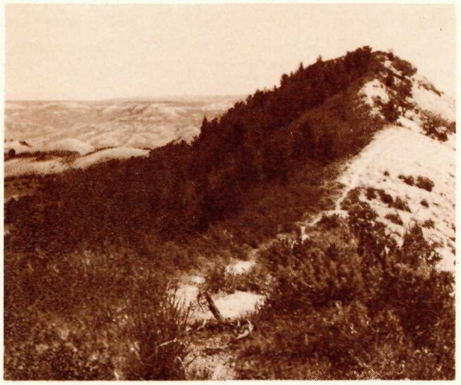
The waters of large lakes in warm temperate regions become stratified during certain times of each year, and surface layers become warmer, lighter, and less viscous than the deeper cooler waters. Winds blowing across the lakes are unable to circulate the deeper waters because of density differences, but create a circulation pattern in the upper well-oxygenated surface layer. This layer acts as a seal for the deeper, denser body of water that becomes foul and stagnant through the decay of organic matter which uses up the available dissolved oxygen and produces hydrogen sulphide and carbon dioxide. This causes a lake to be thermally and chemically stratified.

Fish thrived in the warm, well-oxygenated surface waters in which they swam. When they died, some sank to the lower stagnant, hydrogen sulphide-charged waters in which there was no life except anaerobic bacteria. Thus they escaped being torn apart by scavengers and bottom feeders or scattered by wave currents. Their delicate fin and tail rays, other bones, and even their scales were undisturbed. Stagnant, sulphide-rich organic mud, accumulated under these bottom conditions, account for the oil shales deposited in association with the fish.

The varied layers in which the fish occur may also be accounted for by the early cycle of thermal stratification. As temperatures of the surface layers rose, carbon dioxide was driven off and calcium carbonate was precipitated. But as the precipitate sank, it encountered bottom waters that were acid because of their carbon dioxide and hydrogen sulphide content; the carbonate was redissolved (that would enhance the stability of the stratification). Lakes generally undergo a breakdown of stratification and an intermixing of their waters twice a year, in the spring and fall, due to temperature changes or wind action. This phenomenon is called turnover. During the period of turnover in late autumn, the sulphide and carbon dioxide were dissipated, the waters became less acid, and a relatively thick lamina of calcium carbonate was precipitated. During the rest of the year, only small quantities of organic matter settled slowly to the bottom.

The great abundance of fish preserved in some layers may be explained by the sudden chilling of the entire lake, as happens in tropical lakes. Waters may have overturned so rapidly that large numbers of fish of all ages were killed before the hydrogen sulphide could be oxidized.



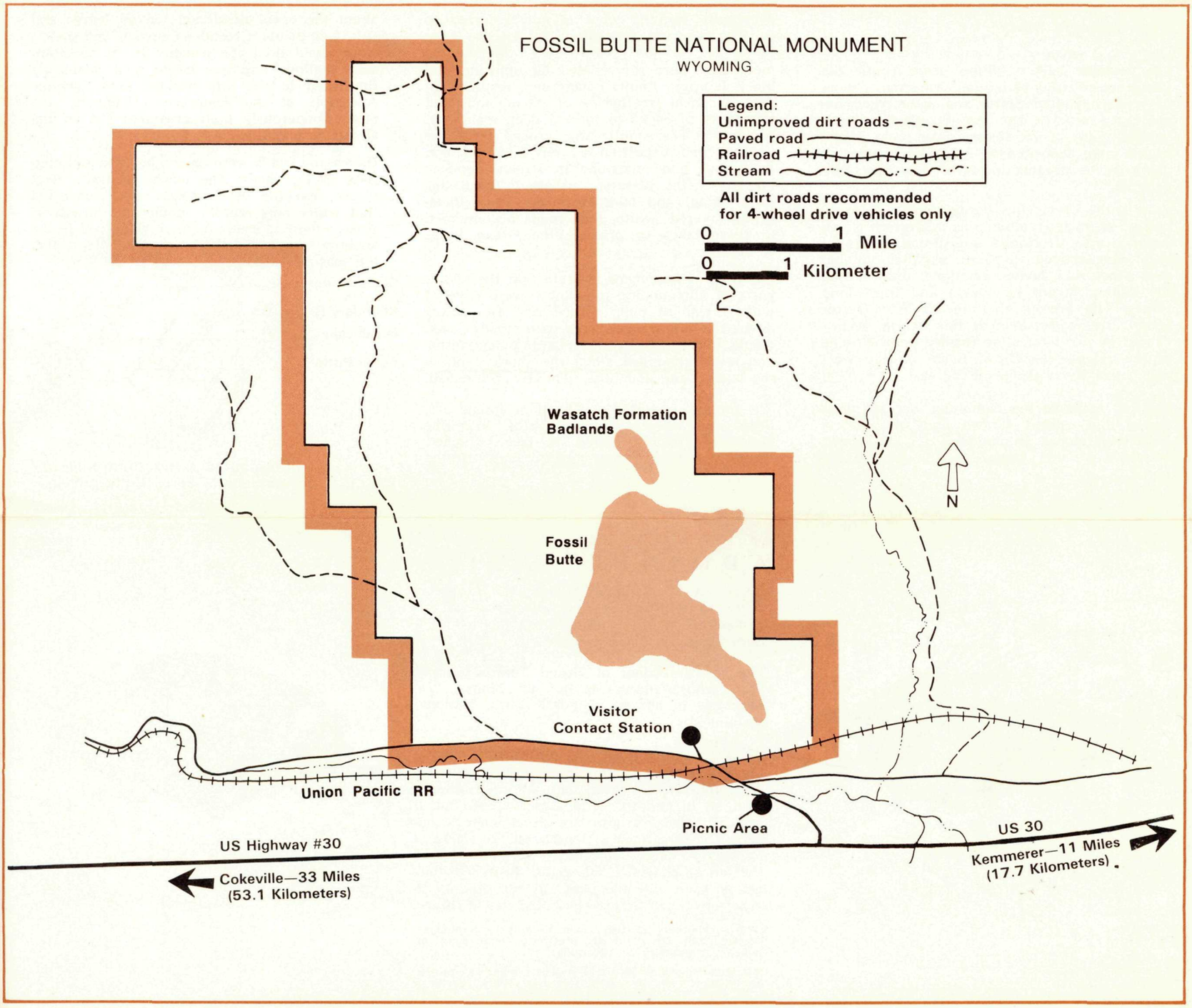


A myriad of plants and animals

The existing vegetative cover is predominantly a grass-brush type that normally grows under the semiarid to arid conditions of western Wyoming. Indian ricegrass, junegrass, and wildrye are the more common grasses. These are interspersed with shrubs such as big sagebrush, rabbitbrush, snowbush, greasewood, and serviceberry. The lower and upper flats are well carpeted with this type of vegetation, but the steeper slopes are sparsely covered to barren.

Small but dense forests of Douglas fir and scattered stands of limber pine grow on some of the higher north-facing slopes and on other exposures where moister sub-surface conditions exist. Intermixed with these and in some instances farther downslope than the evergreens are stands of aspen. In autumn, the aspen appear as splashes of gold along the ravines on the southwestern face of Cundick Ridge. At lower elevations, willow thickets mark the courses of intermittent streams.

Several different species of wildlife live in or pass through this rugged area. Mule deer and moose are common inhabitants as well as a small band of wild horses. Pronghorn antelope are native. In autumn, elk drift into the vicinity from higher elevations. Coyotes and bobcats find ample food supply in an abundant rabbit population. On the west side of Fossil Butte is a small colony of prairie dogs. Birdlife is abundant, and many species nest here, including prairie falcons and golden eagles.



Development of Fossil Butte

Development and use of Fossil Butte National Monument is still in the planning stage. The National Park Service plans a major interpretive facility at a location where the fossil deposits are richest and most accessible. Here you will be able to watch scientists expose fossils and prepare them for in-place exhibition. Exploratory excavation will be an important part of the interpretive program. To complement the in-place exhibits in telling the story of life represented here, a series of museum exhibits will also be displayed in a visitor center where the varied stories of the area—its paleontology, geology, biology, human history, and the significance of the site to the Nation—will be told.

To help insure that your visit is a safe one, please be advised that: (1) elevations in the monument range from 6640′–8084′, so strenuous activity may be hazardous for those accustomed to lower elevations; (2) climbing on the steeper slopes and cliff faces is very dangerous due to the unstable soil and rock in these areas; and (3) grazing livestock and native wildlife such as moose can be dangerous and should not be approached by hikers.

About your visit

The monument is about 11 miles (17.7 kilometers) west of Kemmerer. The Butte is located just north of U.S. 30N and the Union Pacific Railroad, both of which traverse the valley.

There are no commercial or camping facilities at the monument. Restaurants and overnight accommodations are available in the nearby towns of Kemmerer and Cokeville.

The climate is semiarid and cool-temperate. Annual precipitation, most of which falls as snow, averages about 9 inches (22.9 centimeters). Winters are cold, but not of the severity of those on the more exposed plains of eastern Wyoming. Summer days are warm, but nights are cool.

HELP US PROTECT FOSSIL BUTTE

All objects in the monument—rocks, wildflowers, trees, and animals—must be left in place and undisturbed so that others, too, may enjoy them. This protection is not only a matter of law; it is also a matter of good citizenship and consideration for others.

The Geologic Story

Origin and History

For at least half a billion years (until the Cretaceous Period 80 million years ago), most of western United States was submerged beneath the sea. As the sea retreated and advanced, many of the diverse older rocks of the region were deposited on its floor; some were deposited by streams during brief marine withdrawals.

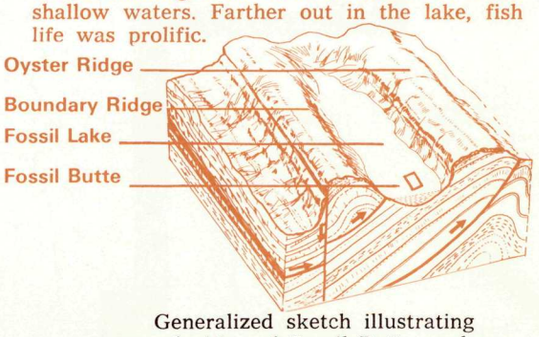
Late in the Cretaceous Period (some 80 to 70 million years ago), mountains in western North America rose from the sea. Broad sheets of rock were shoved eastward, skidding up and over other rock layers. Frictional drag caused the sliding layers to buckle and form long ridges. The present Commissary and Oyster Ridges are expressions of this action. Basins caused by down-buckling formed on each side of the ridges—the Fossil Basin on the west and Green River Basin on the east.

Uplifted rocks in the mountains became weathered and eroded. Gravel and rock debris from their slopes accumulated as vast aprons of sediment and began to fill the basins, eventually forming what is now referred to as the Evanston formation. By Eocene time (some 60 million years ago), the ancient mountains were rejuvenated by uplifting and block faulting. Rainfall increased, resulting in deep chemical weathering of the uplands and the decay of rocks to form a deep mantle of red earth. The mantle was eroded from the uplands and deposited as red conglomerate, sandstone, and mudstone in stream deposits now called the Wasatch formation. The basins sank again, and lakes formed within them. Thinly layered, white, limy muds accumulated in these lakes to produce the Green River formation.

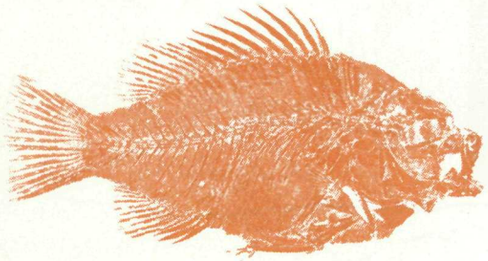
Fossil plant specimens indicate that the higher parts of surrounding mountains were covered with forests of pine, spruce, and fir. Lower down, the hills were covered with mimosa, oak, maple, hickory, and willow. Large palms, ferns, and reeds abounded along the shores, and in the lakes algae and other plankton flourished.

The forests supported an abundant animal life. Birds and insects were plentiful. Primitive monkeys probably swung on tree branches. Horses, no bigger than modern dogs, trotted about the open forest and fed on leaves and soft, lush plants. Crocodiles, turtles, and snakes were found along the streams. In the meadows and shallow swamps large land mammals flourished in the semi-tropical environments. Ancestors of the rhinoceros, elephants, and other ponderously built creatures fed on the abundant plantlife.

Clams and snails were on the beaches and mud flats of the lakes. The warm, shallow, clear water near the beaches was ideal for algae that built many reeflike mounds of limestone. Free-swimming small shellfish also lived in the shallow waters. Farther out in the lake, fish life was prolific.



Generalized sketch illustrating complexities of Fossil Butte geology.



ADMINISTRATION

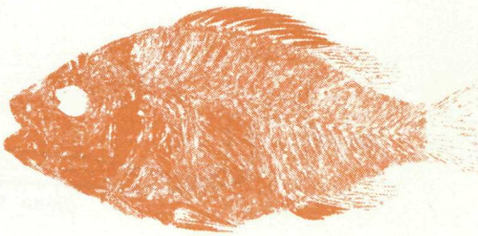
Fossil Butte National Monument, consisting of about 8,180 acres (3313 hectares), is administered by the National Park Service, U.S. Department of the Interior.

The superintendent of Grand Teton National Park, whose address is Box 67, Moose, WY 83012, is in charge of Fossil Butte National Monument.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources." The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

Credits: Photos: Courtesy, Don Kominsky, Kemmerer Gazette, and Dr. Paul O. McGrew, Department of Geology, University of Wyoming.

Correspondence and informal requests may be sent to the Management Assistant, National Park Service, P. O. Box 527, Kemmerer, WY 83101.



Man and Fossil Butte

The first fishes from the Green River formation were found along the present Green River by Dr. John Evans in 1856 and were described by Joseph Leidy. Several other localities were found to yield fishes, but it was not until the early 1870's that abundant fishes were found at Fossil Butte, referred to as the Twin Creek locality.

A. C. Peale examined the Butte in 1877 and described it in the Hayden Survey report of that same year. Material collected by Peale included specimens subsequently described by Edward D. Cope, Lesquereux, and Scudder.

Cope visited the area in connection with geological surveys. Othniel C. Marsh came here also in connection with his explorations of western United States which resulted in a large and unique collection of fossil vertebrates, later presented to Yale University and the United States National Museum.

A more comprehensive study of the area was made in 1905 by A. C. Veatch and described in a U. S. Geological Survey Professional Paper in 1907. Fossil Butte and nearby exposures were among many sites examined by W. H. Bradley in his regional studies of the Green River formation and described in various publications.

During the past decade, W. W. Rubey, J. I. Tracey, Jr., and S. S. Oriel have been conducting geological studies in areas that include the Butte. Several generations of local residents have quarried fossil fish on a small scale and supplied specimens to museums throughout the world.

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