1972

Cass County, Weeping Water

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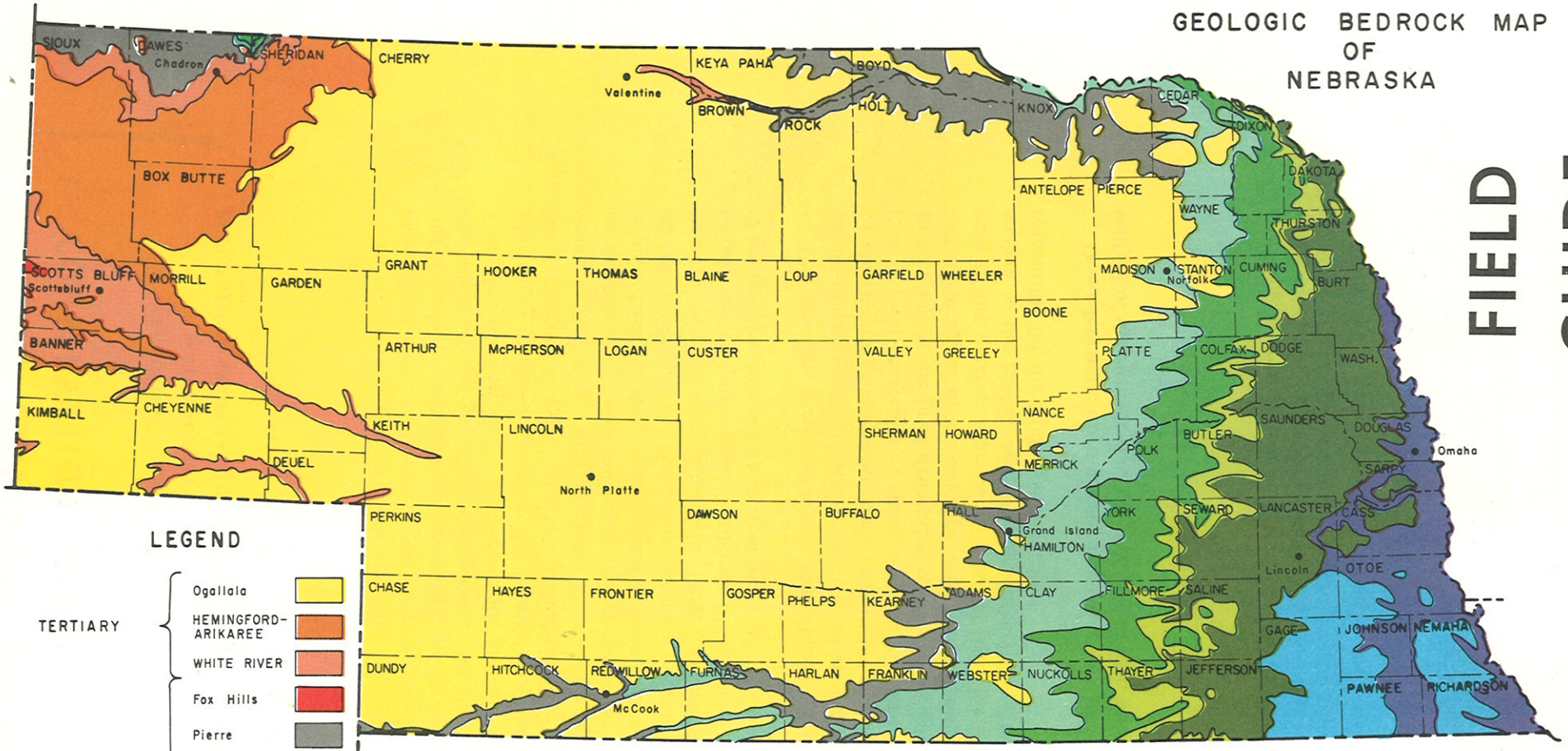
CASS COUNTY - WEEPING WATER

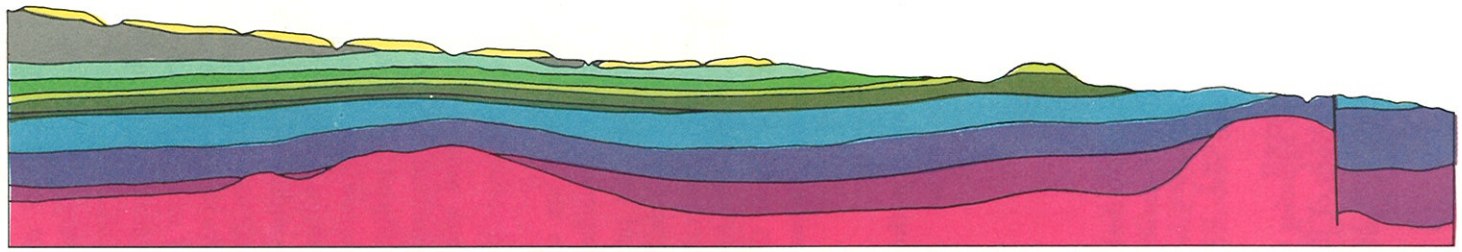
GEOLOGIC BEDROCK MAP OF NEBRASKA

FIELD GUIDE



LEGEND

- TERTIARY
  - Ogallala
  - HEMINGFORD-ARIKAREE
  - WHITE RIVER
- CRETACEOUS
  - Fox Hills
  - Pierre
  - Niobrara
  - Carlile
  - Greenhorn-Graneros
  - DAKOTA
- JURASSIC
- PERMIAN
- PENNSYLVANIAN
- MISSISSIPPIAN
- DEVONIAN
- SILURIAN
- ORDOVICIAN
- CAMBRIAN
- PRECAMBRIAN



Cross Section Along Southern Nebraska Border

20 0 20 40 60

Scale in Miles

NOTE: Unconsolidated sediments of Pleistocene age cover the bedrock throughout much of the State and are not shown.

THE UNIVERSITY OF NEBRASKA
CONSERVATION AND SURVEY DIVISION

GEOLOGICAL SURVEY
WATER SURVEY
SOIL SURVEY
INFORMATION SURVEY

PUBLISHED IN COOPERATION WITH:
NEBRASKA GEOLOGICAL SOCIETY
LINCOLN GEM & MINERAL CLUB

PREFACE

In recent years the earth sciences have become an important part of the curricula of many school systems. In the past, pupils were given only a smattering of geology, paleontology, mineralogy, etc. to help them better understand the world around them. Recent emphasis on the earth sciences has created a demand from teachers and students for geologic information in the area in which they live. In response to this demand in Nebraska, Educational Circular No. 1, "Record in Rock," and Educational Circular No. 2, "Minerals and Gemstones of Nebraska," were prepared. In addition to the educational emphasis on earth sciences, rock collecting has grown to be one of the nation's most popular hobbies. Many students and hobbyists are now requesting information on how to identify the various stratigraphic horizons (rock layers) and geologic features they encounter in the field. Thus, these field guides have been prepared to help the nonprofessional familiarize himself with the stratigraphy and some of the geologic phenomena of Nebraska.

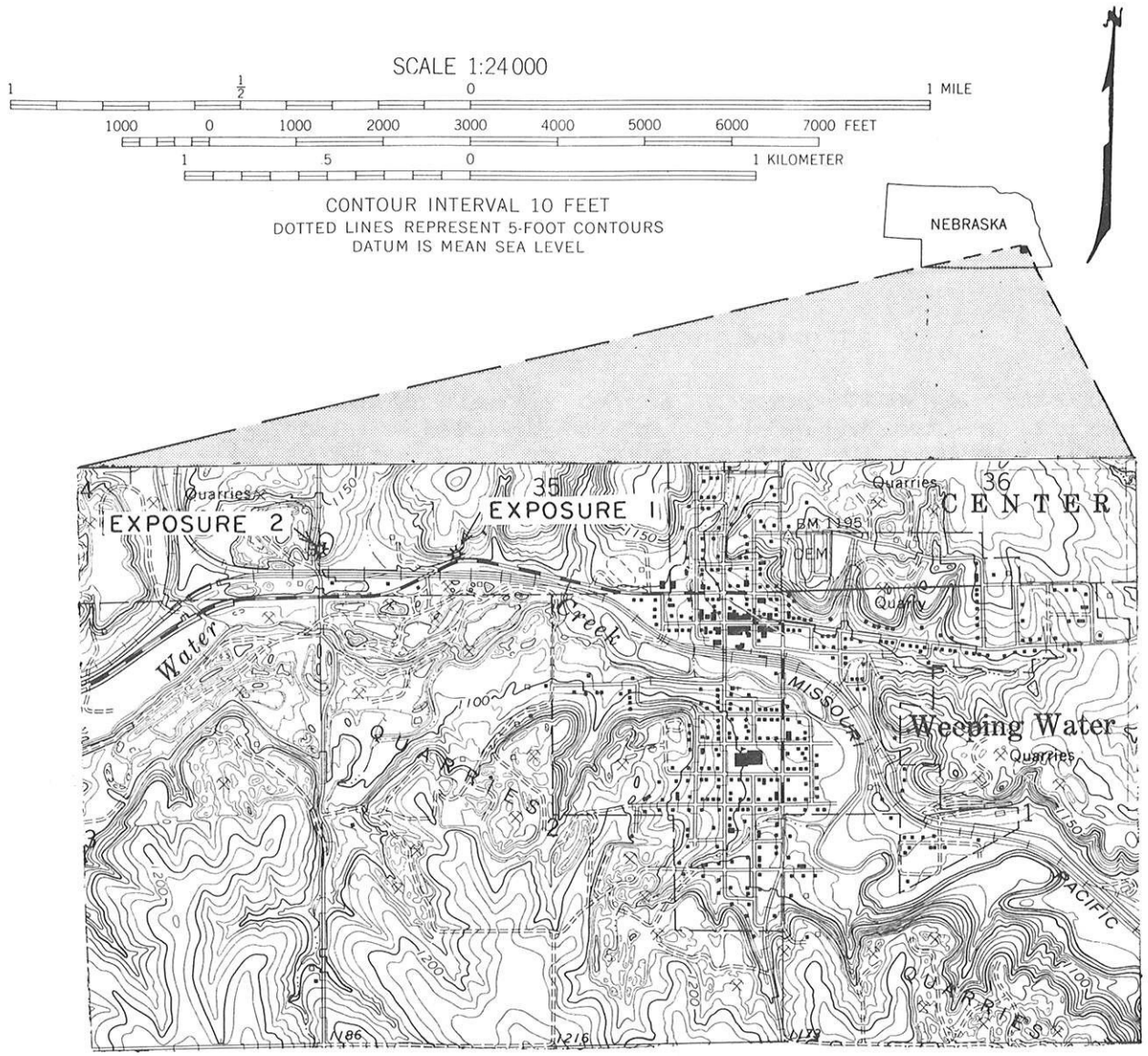
The locations presented herein were chosen for several reasons. All are on public property so that viewing them is always possible. All are easily reached by car and are generally accessible even to the elderly or handicapped. All provide "typical" examples of either common Nebraska rocks, minerals, or fossils. In addition to the brief description of the stratigraphy and the rocks, minerals, and fossils found in the outcrops, a brief description of the land forms within view of the outcrop is given. It is hoped that this information will orient the student to the geology of Nebraska and help him to understand the processes responsible for the landscape about him.

One safety note: when visiting these outcrops, be sure that your car is parked well off of the road—if your car is equipped with safety blinkers, use them.

The Conservation and Survey Division of the University is the agency designated by statute to investigate and interpret the geologically related natural resources of the state, to make available to the public the results of these investigations, and to assist in the development and conservation of these resources.

The Division is authorized to enter into agreements with federal agencies to engage in cooperative surveys and investigations in the state. Publications of the Division and the cooperating agencies are available from the Conservation and Survey Division, University of Nebraska, Lincoln 68508.

Publication and price lists are furnished upon request.



(WEEPING WATER QUADRANGLE)

LOCATIONS AND ELEVATIONS OF EXPOSURES
Figure 1

Exposure 1 is situated in the SW 1/4, SE 1/4, SW 1/4, sec. 35, T.-11N., R.-11-E., Cass County, Nebraska. The elevation at the adjacent road grade is 1100 feet above sea level.

Exposure 2 is situated in the SW 1/4, SW 1/4, SW 1/4, sec. 35, T.-11-N., R.-11-E., Cass County, Nebraska. The elevation ranges from about 1130 to over 1160 feet above sea level.

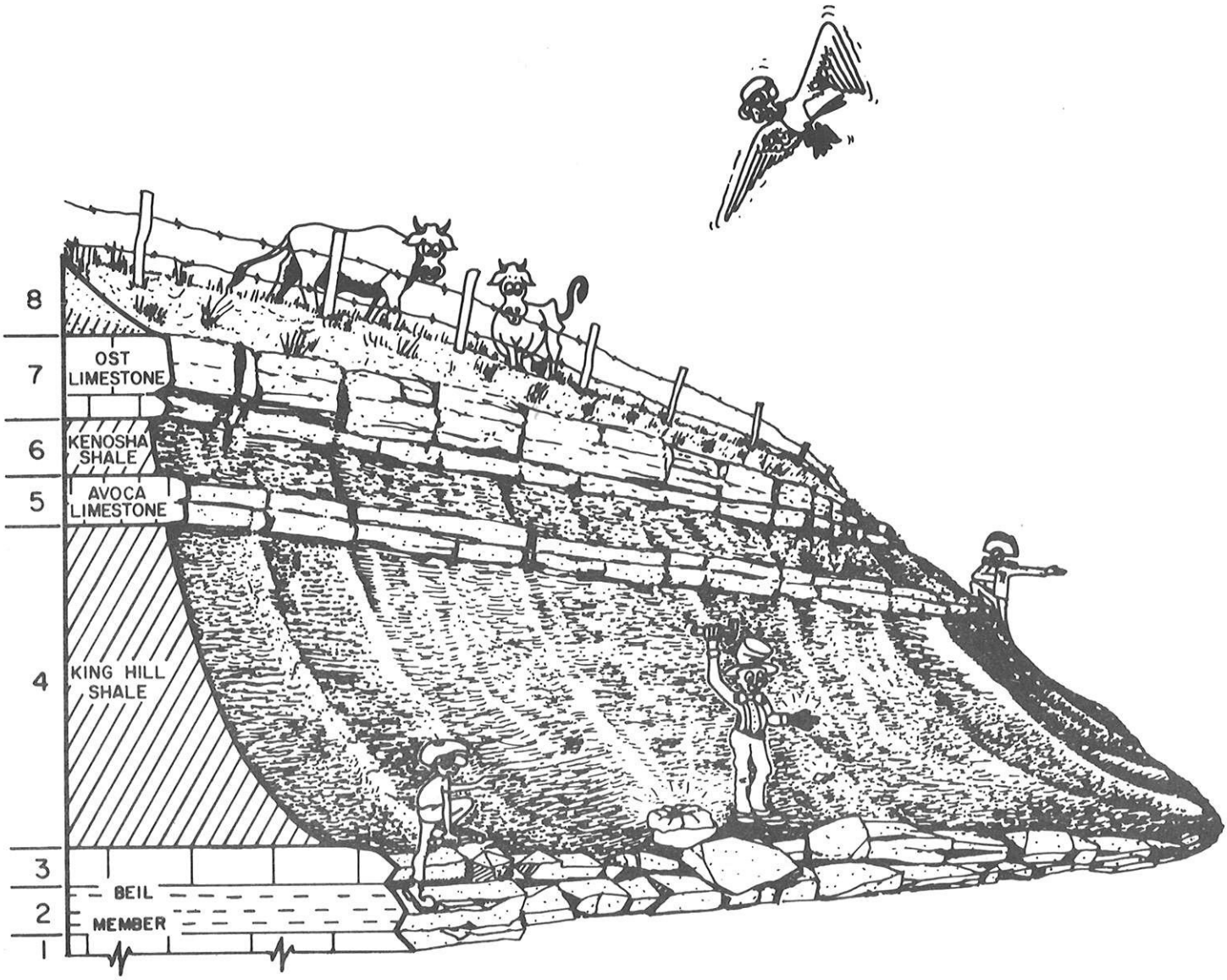


Figure 2

Idealized section at exposure 1. Note that slumping will often alter the appearance of the section.

EXPOSURES NEAR WEEPING WATER, NEBRASKA

Two outcrops near Weeping Water are of interest to both professional geologists and rock hobbyists. We can observe in this sequence of layered rocks changes from nonmarine to normal marine environments of deposition. These rock layers are a record of the advancing and retreating seas during a portion of Pennsylvanian time in this area of Nebraska. The abundant, well-preserved horn corals in the Beil Member of the Lecompton Formation are of interest to both professional paleontologists and amateur fossil collectors.

HOW TO FIND THE EXPOSURES

Use a Nebraska highway map to proceed from your starting point to Weeping Water, Nebraska. Locate the public library at the intersection of West "H" Street and North Randolph Street. Proceed westward along West "H" Street for about 0.65 miles--exposure one will be seen on the north (right) side of Highway 50. To locate exposure two, proceed westward about 0.3 mile to the intersection of the county road and Highway 50. Turn north (right) and proceed 0.12 mile. The outcrop is situated on the east (right) side of the road.

STRATIGRAPHIC SECTION AT EXPOSURE ONE
Figure 2

PLEISTOCENE LOESS AND GLACIAL TILL AT TOP OF EXPOSURE

PENNSYLVANIAN SYSTEM: VIRGIL SERIES: SHAWNEE GROUP:

TECUMSEH SHALE FORMATION
- RAKES CREEK SHALE MEMBER
  - Horizon 8. Only the lower part of the Rakes Creek Shale is seen in Exposure 1. For a full description, see Exposure 2.
- OST LIMESTONE MEMBER
  - Horizon 7. Yellow-gray, massive limestone, about 2.8 feet.
- KENOSHA SHALE MEMBER
  - Horizon 6. Pale-red, silty and blocky shale, about 2.3 feet.

LECOMPTON LIMESTONE FORMATION
- AVOCA LIMESTONE MEMBER
  - Horizon 5. Two thin, light-gray, crystalline, fossiliferous limestones separated by thin shale. Contains fusulinids, ectoprocts, crinoids, brachiopods. About 1.4 feet.
- KING HILL SHALE MEMBER
  - Horizon 4. Dark-reddish-brown, silty shale with lime nodules. Greenish-gray at top and bottom. About 10 feet.
- BEIL LIMESTONE MEMBER
  - Horizon 3. Light-gray, finely crystalline, fossiliferous limestone. Contains crinoids and brachiopods. About 1 foot.
  - Horizon 2. Olive-gray, silty, fossiliferous shale. Contains horn corals. About 1.5 feet.
  - Horizon 1. Yellow-gray, massive, fossiliferous limestone. Contains horn corals. About 3 feet.

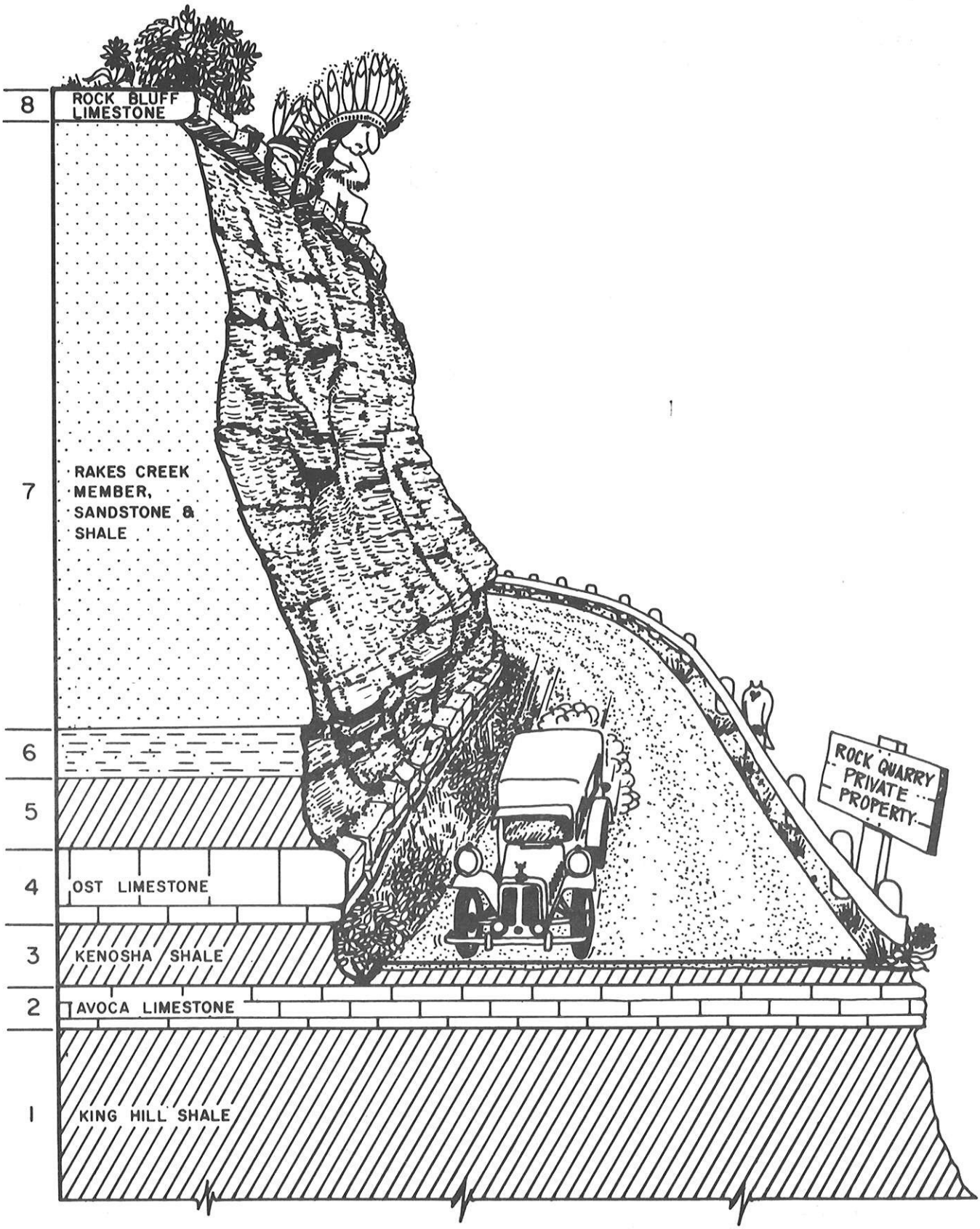


Figure 3
Idealized section at exposure 2. Note that slumping will often alter the appearance of the section.

STRATIGRAPHIC SECTION AT EXPOSURE TWO
Figure 3

PLEISTOCENE LOESS AND GLACIAL TILL AT TOP OF EXPOSURE

PENNSYLVANIAN SYSTEM: VIRGIL SERIES: SHAWNEE GROUP:

DEER CREEK LIMESTONE FORMATION
ROCK BLUFF LIMESTONE MEMBER
Horizon 8. Medium-bluish-gray, dense limestone with crinoids and pyrite. About 1.2 feet.

TECUMSEH SHALE FORMATION
RAKES CREEK SHALE MEMBER
Horizon 7. Grayish-yellow, very fine-grained, massive sandstone. About 27.0 feet.
Horizon 6. Light-grayish-green shale, sandy at top. About 2 feet.
Horizon 5. Dark-reddish-brown, blocky shale. About 2.5 feet.
OST LIMESTONE MEMBER
Horizon 4. Yellow-gray, massive limestone. About 2.8 feet.
KENOSHA SHALE MEMBER
Horizon 3. Pale-red, silty and blocky shale. About 2.3 feet.

This stratigraphic section continues downward at Exposure 1. Older rocks can be seen at the adjacent stone quarries, all of which are on private property. Identification of the older rock units can usually be accomplished with the aid of the Nebraska Geological Survey Bulletin 14A, "The Geologic Section of Nebraska."

CAUTION: You are driving and stopping on heavily traveled roads. Be certain that your car is pulled completely off of the road and be sure that your car is parked where it can easily be seen by drivers of oncoming traffic.

GEOLOGIC HISTORY

During the deposition of the Beil Limestone, normal marine conditions were present, as indicated by carbonate deposits and marine fossils. The environment of deposition changed drastically at the beginning of King Hill time, as indicated by rapidly deposited, largely nonmarine silts and clays. The return of the sea to the Weeping Water area allowed deposition of the Avoca Limestone under moderately turbulent water. The Kenosha Shale shows a return to nonmarine conditions similar to those of King Hill time. The Ost Limestone was deposited under disturbed marine conditions as shown by some fragmental fossils. The most radical change in environment of deposition took place at the beginning of deposition of Rakes Creek when red clays and silts were deposited in a broad delta which covered this area. Marine conditions returned during Rock Bluff time as shown by crinoid fossils. Generally, the outcrops near Weeping Water show environments of deposition alternating between marine and nonmarine conditions.

WHILE YOU ARE THERE---

Observe the thick limestones in the Weeping Water Creek valley. These upper Pennsylvanian marine deposits are the source material for a large road rock, building stone and agricultural lime industry.

The high bluffs overlooking Weeping Water Creek were favorite campsites for some tribes of American Indians. Many important Indian sites have been uncovered in this area by the Nebraska State Historical Society. In the more recent "prohibition era" many small stone quarries situated in the heavily vegetated hills provided locations for illegal distilleries.

SOME COMMON FOSSILS YOU MAY FIND DURING YOUR TRIP
(See Figure 4)

1, 2. - Echinoid (sea urchin) spine and plate. Archeocidaris. Three times natural size.

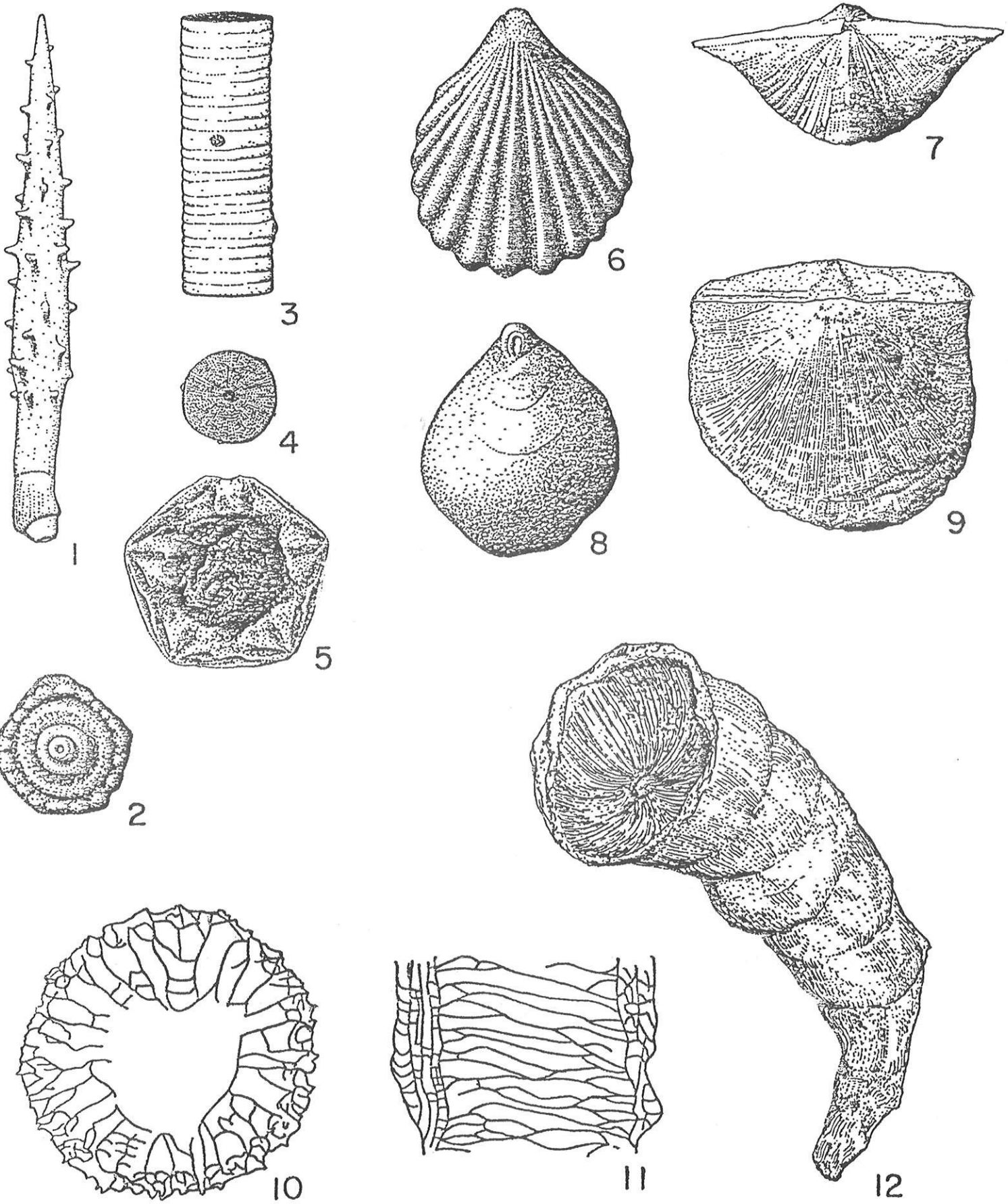
3-5. - Crinoids (sea lillies). 3-4. Stem and columnal, natural size. 5. Crinoid cup, Delocrinus, twice natural size.

6-9. - Brachiopods (lamp shells). 6. Hustedia, six times natural size. 7, 8, 9. Neospirifer, Composita, and Derbyia, all natural size.

10-12. - Horn coral. 10, 11. Transverse and longitudinal sections, twice natural size. Complete specimen of Pseudozaphrentoides, natural size.

More information about these, and other fossils is available in the Conservation and Survey Division's Educational Circular No. 1, "Record in Rock."

Figure 4



NOTES

Some Additional Publications Available from the Conservation and Survey Division

RECORD IN ROCK, A Handbook of the Invertebrate Fossils of Nebraska: *Roger K. Pabian,* Educational Circular No. 1 (1970).

MINERALS AND GEMSTONES OF NEBRASKA, A Handbook for Students and Collectors: *Roger K. Pabian,* Educational Circular No. 2 (1971).

SOILS OF NEBRASKA: *J. A. Elder,* Resource Report No. 2 (1969).

DIRECTORY OF NEBRASKA QUARRIES, PITS, AND MINES: *R. R. Burchett,* Resource Report No. 5 (1971).

CENTENNIAL GUIDEBOOK TO THE GEOLOGY OF NEBRASKA: *R. R. Burchett and E. C. Reed* (1967).

GUIDEBOOK TO THE GEOLOGY ALONG THE MISSOURI RIVER BLUFFS OF SOUTHEASTERN NEBRASKA AND ADJACENT AREAS: *R. R. Burchett* (1970).

GUIDEBOOK TO THE GEOLOGY ALONG PORTIONS OF THE LOWER PLATTE RIVER VALLEY AND WEEPING WATER VALLEY OF EASTERN NEBRASKA: *R. R. Burchett* (1971).

THE GEOLOGICAL SECTION OF NEBRASKA: *G. E. Condra and E. C. Reed,* Nebraska Geological Survey Bulletin No. 14A (1943, revised 1959).

REVISION OF THE CLASSIFICATION OF THE PLEISTOCENE DEPOSITS OF NEBRASKA: *E. C. Reed and V. H. Dreeszen,* Nebraska Geological Survey Bulletin No. 23 (1965).

GEOLOGICAL MAP OF NEBRASKA: Compiled by *R. R. Burchett,* 1:1,000,000 Scale (1969).

TOPOGRAPHIC MAPS: Topographic Map Division, U.S. Geological Survey.

AGE	GEOLOGIC TIME UNITS		ROCK TYPES	MINERAL RESOURCES AND PRODUCTS	TYPICAL FOSSILS
MILLIONS OF YEARS AGO	CENOZOIC (RECENT LIFE)	PLEISTOCENE	Glacial till, silt, clay, sand, gravel, volcanic ash.	Agricultural soil, water, sand & gravel, volcanic ash.	MAMMALS: MAMMOTH
2		TERTIARY	Sandstone, siltstone, clay, gravel, marl, volcanic ash.	Agricultural soil, water, sand & gravel, volcanic ash, riprap.	
70	MESOZOIC (MIDDLE LIFE)	CRETACEOUS	Chalk, chalky shale, dark shale, varicolored clay, sandstone, conglomerate	Water, oil & gas, cement, brick, agricultural lime, & other construction materials.	REPTILES: DINOSAUR
135		JURASSIC	Subsurface only. Sandstones and shales		
180		TRIASSIC			PLESIOSAUR
225	PALEOZOIC (ANCIENT LIFE)	PERMIAN	Shale, limestone, dolomite, gypsum, anhydrite, sandstone, siltstone, chert.	Water, agricultural lime, oil, road rock, riprap.	AMPHIBIANS
280		PENNSYLVANIAN	Limestone, shale, sandstone, coal.	Oil, cement, brick, concrete aggregate, lightweight aggregate, road rock, agricultural lime, rip rap, water.	BRACHIOPOD
310		MISSISSIPPIAN	Subsurface only. Limestone, dolomite.	Oil, water.	
350		DEVONIAN	Subsurface only. Dolomite, gray shale.		FISH: CORALS
400		SILURIAN	Subsurface only. Dolomite.		
440		ORDOVICIAN	Subsurface only. Dolomite, sandstone, shale.		INVERTEBRATES: CRINOID
500		CAMBRIAN	Subsurface only. Dolomite, sandstone.		TRILOBITE
600	CRYPTOZOIC (HIDDEN LIFE)	PRECAMBRIAN	Subsurface only. Granite, other igneous rocks, and metamorphic rocks.		?
? 5,000					