KANSAS GEOLOGICAL SURVEY
OPEN-FILE REPORT 2000-56

Kansas Academy of Science
Guidebook
13th Annual Multidisciplinary Field Trip

Greenwood, Coffey, and Osage Counties, Southeast Kansas

compiled by

Michael Morales
Field Trip Leader

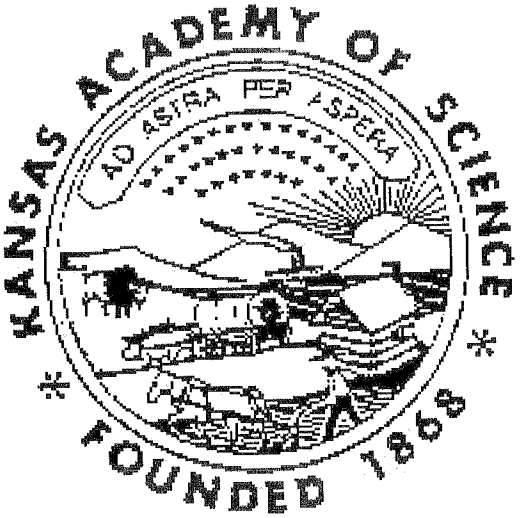
Disclaimer

The Kansas Geological Survey does not guarantee this document to be free from errors or inaccuracies and disclaims any responsibility or liability for interpretations based on data used in the production of this document or decisions based thereon. This report is intended to make results of research available at the earliest possible date, but is not intended to constitute final or formal publications.

Kansas Geological Survey
1930 Constant Avenue
University of Kansas
Lawrence, KS 66047-3726

KANSAS ACADEMY OF SCIENCE GUIDEBOOK

13th ANNUAL MULTIDISCIPLINARY FIELD TRIP

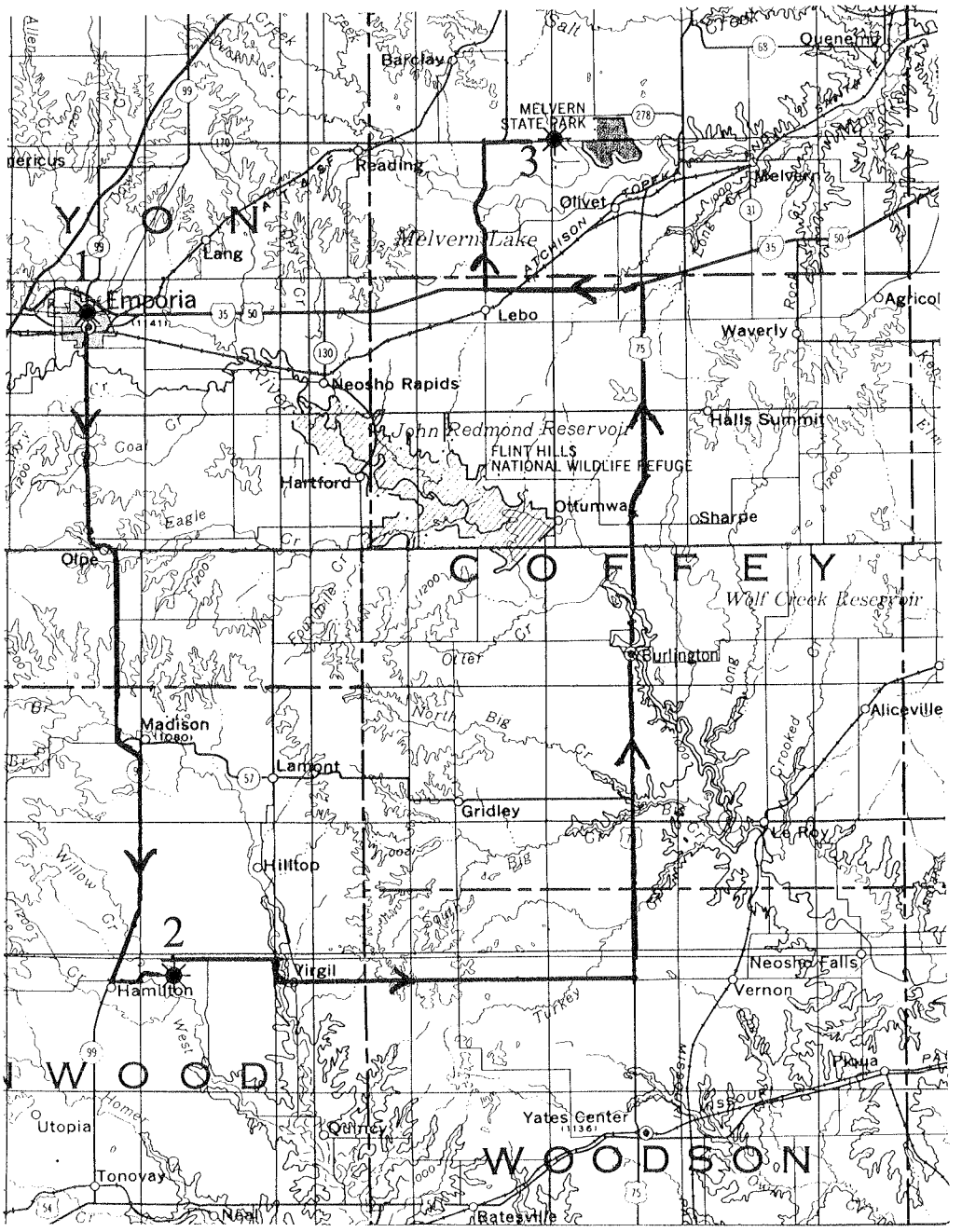


GREENWOOD, COFFEY, AND OSAGE COUNTIES SOUTH-EAST KANSAS

October 14, 2000
Kansas Geological Survey
Open-File Report 2000-56

Guidebook Compiled by:

Michael Morales
Field Trip Leader



The Scientific Importance of Hamilton Fossil Quarry, Greenwood County, Kansas

Michael Morales

Johnston Geology Museum
Emporia State University
1200 Commercial Street, Box 4030
Emporia, KS 66801
moralesm@emporia.edu

Introduction

During the past 35 years, an abandoned commercial rock quarry near the small town of Hamilton, Greenwood County, eastern Kansas, has become recognized as one of the world's truly significant localities for fossils of ancient animals and plants. It has yielded a varied fossil assemblage of well preserved plants, vertebrates and invertebrates which represent a sample of the terrestrial and marine flora and fauna that inhabited a coastal environment during the late part of the Pennsylvanian Period, about 300 million years ago. Since 1997, the quarry has been owned by Emporia State University (ESU), where it is administratively part of the university's Johnston Geology Museum.

History

The first unusual fossil from the quarry, an acanthodian fish, was discovered by Walter Lockard in 1964 (Bridge and Mapes, 1988). A few years later, Lockard brought the specimen to the attention of Dr. Thomas Bridge of Emporia State Teachers College, now Emporia State University (ESU). Bridge recognized the scientific importance of the little fossil fish; indeed, it turned out to be a species of fish previously unknown to paleontology (Zidek, 1988). Over the next 30 years, scientific researchers from ESU, the University of Kansas, Ohio University, the Denver Museum of Natural History and other institutions collected large quantities of fossils and associated geological data from several sites within the quarry property (Figure 1). Analysis of this material resulted not only in the identification of many species of known plants, vertebrate and invertebrate animals, and microfossils, but also in the determination that the assembled collections include several new species of ancient life.

Stratigraphy and Depositional Environments

The main fossil-bearing rocks of the quarry represent ancient river sediments, called the Hamilton channel deposits, that were laid down on the following late Pennsylvanian (Virgilian) age formations: (in descending order) the Topeka Limestone, Calhoun Shale, Deer Creek Limestone, and possibly the Tecumseh Shale (Figure 2). It is not clear whether the paleochannel itself actually cut down into these formations, or the channel simply deposited its sediments

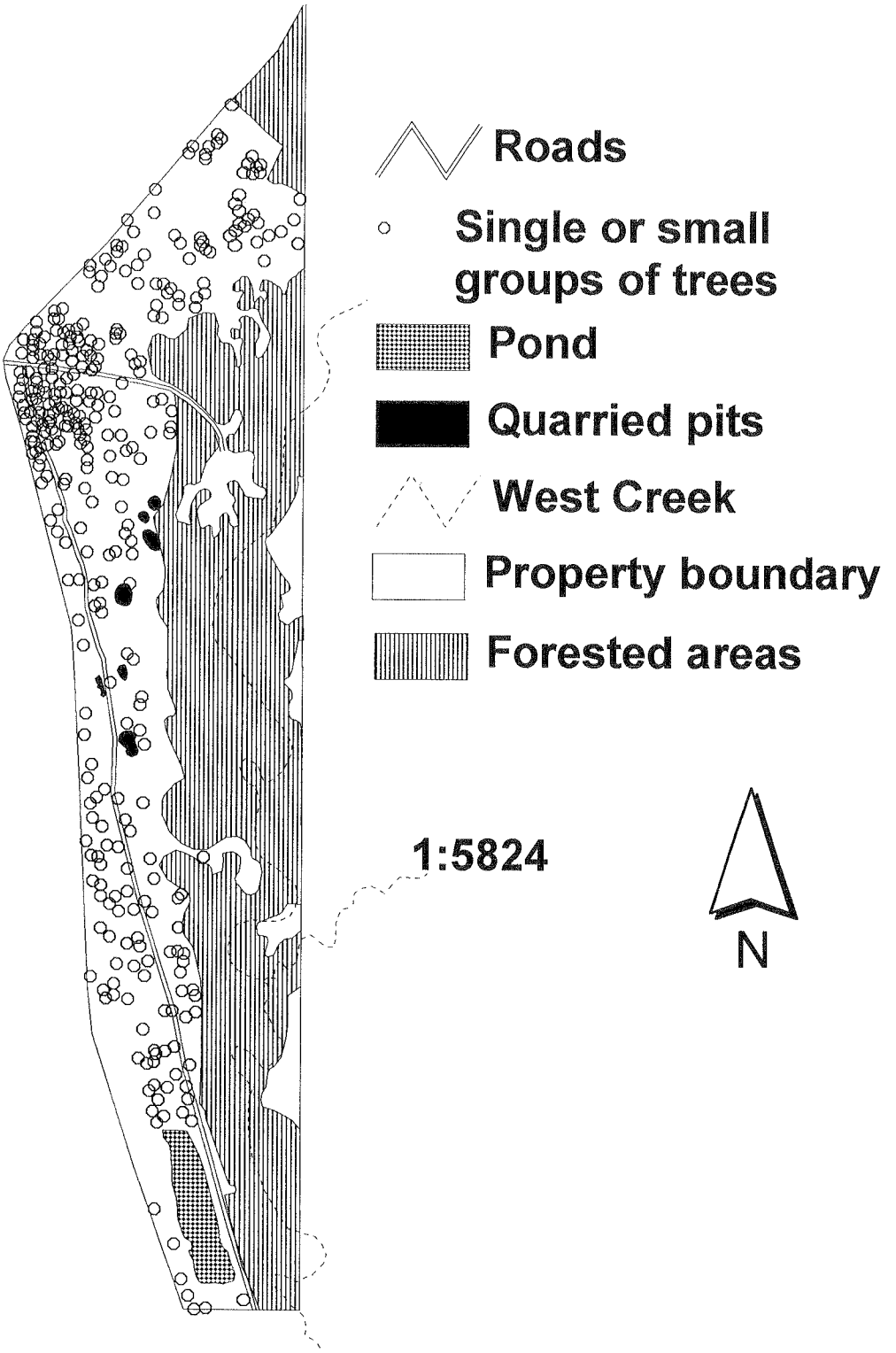


Figure 1. Map of Emporia State University's Hamilton Quarry Property (Courtesy of Scott A. Chilcutt)

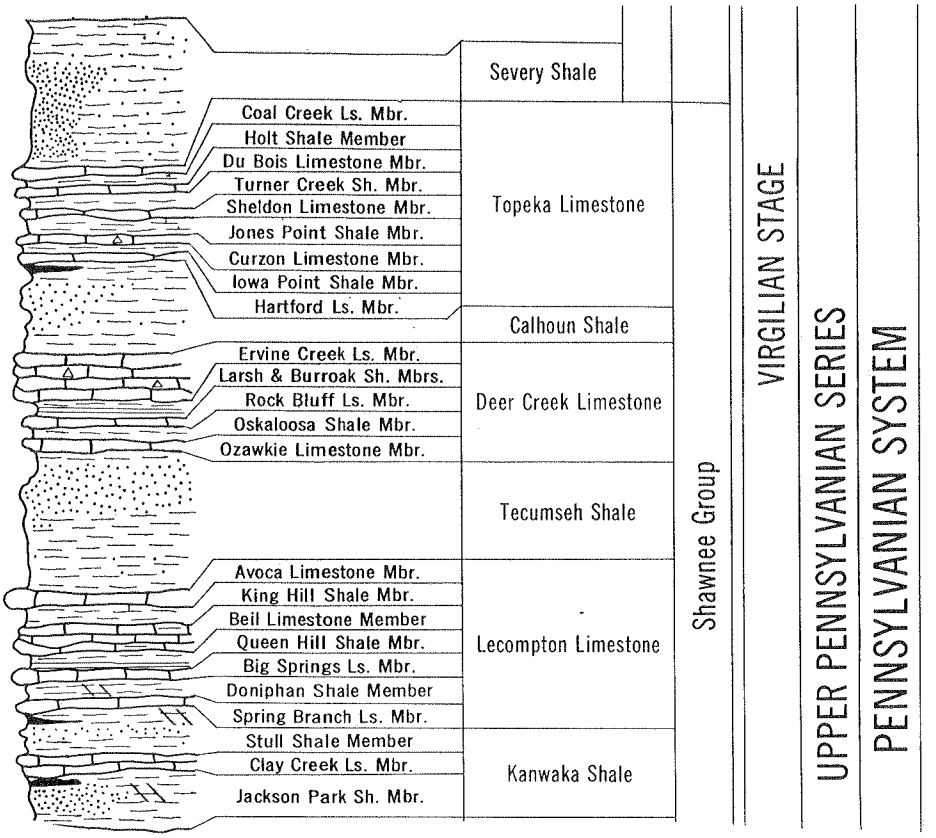


Figure 2. Generalized Stratigraphic Column of the Area (From Zeller, 1968, plate 1)

on a surface that had previously eroded down to these strata. Furthermore, the degree of marine influence during the time of deposition of the quarry's sediments is disputed (Mapes and Mapes, 1988). Some researchers believe there was mainly freshwater deposition in the paleochannels with little marine influence, whereas others think that estuarine or lagoonal influences were more important. In any case, the main fossiliferous part of Hamilton quarry is a carbonate unit approximately four meters thick made up primarily of wackestones and mudstones with interbedded limey conglomerates.

Fossil Flora and Fauna

The Hamilton quarry fossil assemblage includes a well preserved terrestrial flora and fauna that is rather diverse, and a less diverse freshwater to brackish water fauna. Many of the fossil specimens show indications of soft body parts through impressions, compressions, and organic stains in the rock. This allows us to know these ancient animals and plants not only from their preserved hard parts (bones, teeth, shells, wood, etc.) but from their soft parts

as well. Very few fossil localities around the world have yielded specimens of high enough quality to reveal such soft tissues.

Vertebrate fossils from the quarry include sharks, spiny finned fish (acanthodians), lobe-finned fish (lungfish and coelacanths), ray-finned fish (palaeoniscids), amphibians, and reptiles. The marine or brackish water invertebrates include brachiopods, bryozoans, bivalves (clams), crinoids, and annelid worms. The non-marine (i.e., terrestrial or freshwater) invertebrates include bivalves, crustaceans, eurypterids (water "scorpions"), arachnids, millipedes, and insects. Plants specimens from the site come in two forms: body fossils (twigs, leaves, fronds, etc.) and microfossil palynomorphs (spores and pollen). The plants include lycopods, seed ferns, and gymnosperms, but no tree ferns. The flora suggests an upland habitat somewhat removed from typical Pennsylvanian coal forest environments (Leisman et. al, 1988).

Fossil-Lagerstätten

The fossils from Hamilton Quarry are so important that the locality has been designated as one of the world's unique Fossil-Lagerstätten, a German term that roughly translates as "fossil bonanza" or "fossil mother lode" (Whittington and Conway Morris, 1985). This rare type of fossil locality combines the criteria of very fine preservation, often including the remains of delicate soft tissues, with high diversity (number of different species) and great abundance (number of individual specimens of the same species). This combination of characteristics is very infrequently encountered in a single fossil locality.

None of the world's Fossil-Lagerstätten gives scientists the same "window into the geologic past" as that provided by Hamilton Quarry. When the fossilized organism were alive, eastern Kansas was a shoreline near a sea that extended westward. The rocks and fossils of the quarry represent not a single ancient environment, as is usually the case, but at least two, and possibly three different interconnected environments: a freshwater stream flowing down to a seashore and a mixed water (brackish) estuary bordering the shore (Mapes and Mapes, 1988). Open marine water existed further offshore, and deposits from this environment may also occur in the quarry or nearby. This unusual mixture of paleoenvironments greatly enhances Hamilton Quarry's scientific significance.

Many technical and popular papers have been written about the quarry and its fossils (see Mapes and Mapes, 1988 for the most complete summary, and Cunningham, 1993 for the most recent review). Today, Hamilton quarry is known by paleontologists and geologists throughout the world as one of the best single fossil localities ever discovered.

References

Bridge, T.E., 1988. Geology and stratigraphy of the Hamilton quarry area. *Kansas Geological Survey Guidebook Series 6*, p.27-35.

Bridge, T.E. and R.H. Mapes, 1988. Background history of the discovery and development of the Hamilton quarry site. *Kansas Geological Survey Guidebook Series 6*, p.21-25.

Cunningham, C. R., 1993. Hamilton Fossil-Lagerstätte (Upper Pennsylvanian, Greenwood County, Kansas): internal stratigraphy and addition to the microfossil assemblage.

Transactions of the Kansas Academy of Science 96(1-2), p. 131-139.

Leisman, G.A., W.H. Gillespie, and G. Mapes, 1988. Plant megafossils from the Hartford Limestone (Virgilian-Upper Pennsylvanian) near Hamilton, Kansas. *Kansas Geological Survey Guidebook Series 6*, p.203-212.

Mapes, G. and R.H. Mapes (editors), 1988. Regional geology and paleontology of upper Paleozoic Hamilton quarry area in southeastern Kansas. *Kansas Geological Survey Guidebook Series 6*, 273 pages.

Whittington, H.B. and S. Conway Morris (editors), 1985. Extraordinary Fossil Biotas: Their Ecological and Evolutionary Significance. *Philosophical Transactions of the Royal Society of London B 311.*

Zeller, D. (editor), 1968. The stratigraphic succession in Kansas. *State Geological Survey of Kansas, Bulletin 189,* 81 pp.

Zidek, J., 1988. Hamilton quarry *Acanthodes* (Acanthodii; Kansas Late Pennsylvanian). *Kansas Geological Survey Guidebook Series 6*, p.155-159.

The Turkey Point Fossil Locality, North of Melvern Lake, Osage County, Kansas

Michael Morales

Johnston Geology Museum
Emporia State University
1200 Commercial Street, Box 4030
Emporia, KS 66801
moralesm@emporia.edu

One of the best places in eastern Kansas to collect marine invertebrate fossils is a locality north of Melvern Lake in Osage County. Generally the fossils are easy to see and have weathered out of the rock, so they can simply be picked up off the ground with little or no digging. Fossils here are diverse (high number of different species) and abundant (high number of individual specimens of the same species). Preservation is usually in the form of well preserved fragments, but whole specimens of fossils can be found too.

The site is at the T-shaped intersection of county road W301 and the turnoff to Turkey Point Park, which is located on the north shore of Melvern Lake. Hence, the name Turkey Point Fossil Locality. Directions from Interstate 35, which is south of the locality, are as follows: Get off Interstate 35 at exit 148 and continue north on Fauna Road. Drive north on this road for five or six miles (it curves a bit) up to Melvern Lake. Continue north over the bridge that crosses Melvern Lake. Continue two miles farther north until you reach a stop sign at the intersection with Kansas highway K-170. Turn right onto K-170. Drive eastward on K-170 for a mile or two, to where the road curves sharply northward. Slow down and turn right onto country road W301. Drive eastward on this road for two or three miles until you reach the T-intersection with a sign that reads "Turkey Point Park". (There is also another sign nearby that reads "Bait Shop".) You've the locality. Park your car off to the side of the road away from traffic.

On the northern, southeastern and southwestern sides of the T-intersection you will see horizontally layered beds of gray shale forming the lower slopes of the hills that surround the intersection. In some places the shale includes some yellow-brown sandstone beds as well. These are strata of the Severy Formation, which is one of several formations included within the Wabaunsee Group (Figure 1). Strata of the Severy Formation were deposited during the late part of the Pennsylvanian Period, approximately 300 million years ago.

The best place to look for fossils is in the flat area of gray shale on the southeastern part of the intersection. During construction of the intersection, the ground was bulldozed flat here to provide better visibility for cars approaching the intersection. Take zip-lock plastic bags and collect as many different kinds (as indicated by different shapes) of fossils as you can. Differences in size between fossils do not matter as long as the specimens have the same shape. You should be able to find ten or more different kinds (shapes) of fossils. Be careful not to be fooled by broken pieces of one kind of fossil, which you might misinterpret to represent another kind. Try to find whole or nearly whole fossils, or at least fossils that are a fair representation of what the whole fossil may have been like.

At this locality you should be able to easily find bryozoans ("moss" animals), brachiopods (lampshells) , bivalves (clams), gastropods (snails), cephalopods (*Nautilus*-like), crinoids (sea lilies), echinoids (sea urchins), and very rare shark teeth. These animals all lived in marine waters not too far from an ancient shoreline.

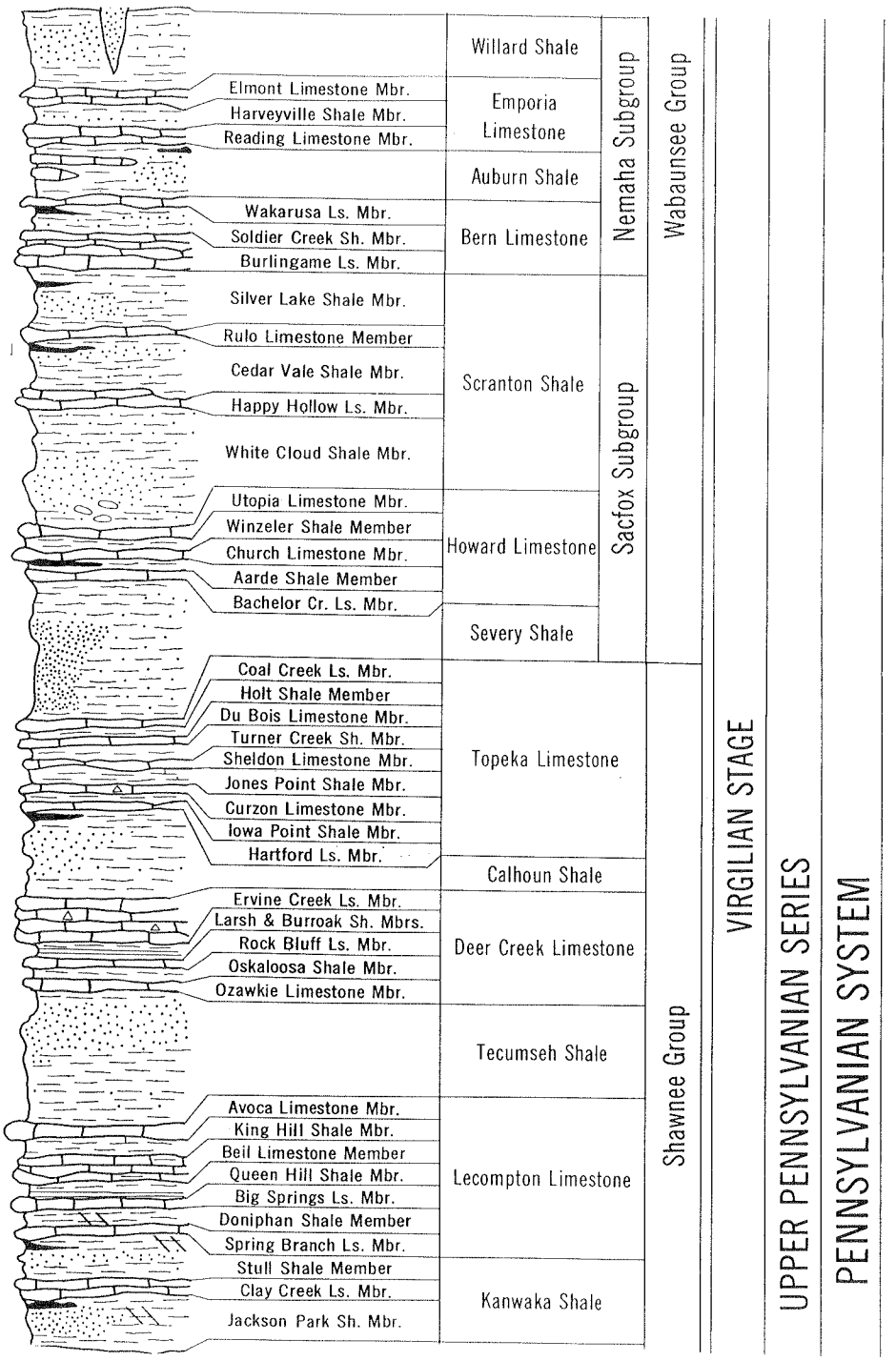


Figure 1. Generalized Stratigraphic Column for the Area (From KGS Bulletin No. 189 (1968)