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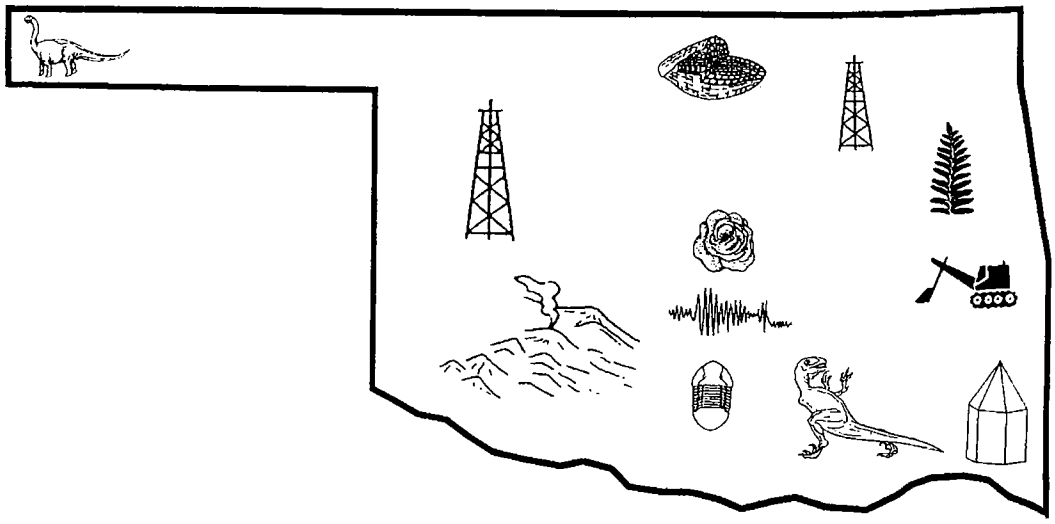
OKLAHOMA GEOLOGY



Activity Sheets for EARTH-SCIENCE TEACHERS and STUDENTS

◆◆ James R. Chaplin ◆◆

The University of Oklahoma
Norman, Oklahoma

2003

Introduction

The primary objective of this resource is to expose more teachers and students to the earth science/geology of Oklahoma through educational activities that include crossword puzzles, word searches, word unscrambles, geodetective clues, and the matching of clues with pictures. Although this resource is not an exhaustive text on the geology of Oklahoma, it contains sufficient basic information on earth-science concepts and facts to provide a foundation for a beginner to ask, as well as answer, some questions about the geology of Oklahoma.

The activities differ in difficulty and complexity to provide for a variety of ability levels and thinking skills of students. Some of the information is repeated within the different activity formats for the purpose of emphasis and learning from repetition. It is hoped that the variable activity formats used to present some basic concepts and facts of earth science will facilitate the learning process.

Some teachers may choose to simplify or amplify an activity or merely use the information in a classroom discussion or laboratory. Initiating inquiry-based hands-on activities is not the objective of this resource. It is the teachers' responsibility to use their own discretion in creating and maintaining inquiry-based hands-on activities at whatever point they consider important in the learning process.

Earth-science topics covered about Oklahoma include:

Minerals and rocks	Everyday use of resources
General geology	Nonfuel and fuel resources
Arbuckle Mountains	Energy facts
Ouachita Mountains	Oil trivia
Wichita Mountains	State parks
Earthquakes	Invertebrate fossils
Water resources	Dinosaurs

A common question science teachers hear from their students on a daily basis is, "Why do I have to know this information, and how will I ever use it in the future?" This resource was created to help you answer that question, we hope, to your students' satisfaction. The truth is that earth-science issues are a part of the everyday world. As long as we are inhabitants of our Earth, we must have an understanding interest and knowledge not only about the planet on which we live but also about the State in which we reside! For example:

- "What minerals and rocks can be found in Oklahoma, and what role do they play in the making of a pencil, a bicycle, a house, an automobile, a computer, and a light bulb?"
- "What important role do fuel resources of Oklahoma play in the State's economy?"
- "Why do many house foundations crack in Oklahoma?"
- "Why should we restrict urban development in flood-prone areas?"
- "Do we have enough ground water to meet our present and future needs?"

- "How does ground water become polluted?"
- "How does the United States' dependence on foreign-imported oil affect the oil industry in Oklahoma?"
- "What observations can we make about the past geologic history of our State from examining the fossil record?"
- "How can we identify and extract fuel and nonfuel resources in an environmentally friendly manner?"

These questions should help to make clear that earth science includes human activity, and that the search for the understanding of nature is an ongoing, open-ended process in which not only teachers and students but also the general citizenry can and must participate. All of these questions can be addressed and answered only with a well-informed and literate government and citizenry in the earth sciences that can make intelligent political and economic decisions that affect people on local, regional, and global levels. It is important that everyone must study and understand basic geologic concepts and Earth systems. The understanding of how to interact with an Earth that provides our natural resources will always be an important component of what sets our citizens free.

Word lists are provided for the crossword puzzles and geodetective activities at the bottoms of the pages. Teachers may choose to make the activities more challenging for the students by blocking out or removing the word lists. Answer keys for all activities are provided for the teacher. The concepts and activities are targeted for teachers and students in grades 6–12, but several may be adapted for younger or older learners.

The learning process can be fun. I hope the students enjoy the different activities. While simple and fun, these activities can be used to help students develop a basic understanding and appreciation of earth-science concepts in their daily lives.

Acknowledgments

Many people helped with the preparation of this resource. I owe a great debt to my 10- and 13-year-old daughters, Kathleen and Abigail, who spent many hours helping me construct crossword puzzles and word searches. The support and encouragement of my wife, Barbara, never faltered throughout the compilation process; she spent much time listening to my geological thoughts.

Most of the ideas for the activities came directly from earth-science-teacher workshops, field trips, and classroom visits. I owe these Oklahoma teachers a big "Thank you!" for encouraging me to pursue this resource, and most importantly for giving me a real teacher's perspective in the compilation and final construction of the activities.

I want to thank Susan Houck, who spent many hours in creating computer-generated crossword puzzles and word searches at a time when acceptable puzzle software was not available. In addition, Susan typed many of the activity descriptions. I also would like to thank Laurie Lollis for her assistance in designing the cover. I am also indebted to Betty Bellis for the final typing of several activity descriptions.

Contents

MINERALS AND ROCKS OF OKLAHOMA

Across

1 Black Mesa in Cimarron County is capped by a lava flow composed of the igneous rock called _____.

3 The mineral _____ is the chief ore of zinc and was once mined in the lead–zinc district of northeastern Oklahoma.

5 This rock is one of the few types of metamorphic rocks known in Oklahoma. It was derived from sandstone and occurs only in the Wichita Mountains. _____

6 Thick beds of this clastic sedimentary rock composed mainly of quartz-sand grains have been worked in the Arbuckle Mountains region as a source of high-purity silica sand for glass making. _____

8 In the Wichita Mountains are many pink intrusive igneous rocks called _____, which are quarried for monuments and building stone.

9 Most of the red color in Permian-age rocks in Oklahoma is caused by the mineral _____, which has been quarried in the past to make a red paint pigment.

11 This volcanic igneous rock has a similar composition to granite, but a finer texture than granite, and occurs in the Wichita and Arbuckle Mountains. _____

14 The biochemical sedimentary rock called _____, composed primarily of plant material, is an important fossil fuel used to generate electricity.

15 The rock _____ (or flint) is common in the Ouachita and Arbuckle Mountains and in the Ozark region, where it was used by Paleoindians to make spear points, knives, axes, and scrapers.

16 The mineral _____ is the chief ore of lead. It occurs in Oklahoma as an ore in the lead–zinc district of Ottawa County.

17 The mineral _____ is ranked no. 2 on Moh's scale of hardness and is extensively quarried in western Oklahoma for wallboard, plaster of Paris, and soil conditioner.

Down

1 The official State rock of Oklahoma is the rose rock, composed of the mineral _____, which is used in drilling mud.

2 This fine-grained clastic sedimentary rock is composed primarily of clay minerals and quartz and is the raw material for brick, tile, pottery, and the manufacture of cement. _____

3 These types of rocks contain all of the gas, oil, and coal deposits of the State. _____

4 The chemical sedimentary rock called _____ is used for making portland cement, agricultural lime, and crushed stone.

5 The mineral _____, with a hardness of 7 on Moh's scale of hardness, is common in the Ouachita Mountains and is used primarily for glass making.

7 A dark-colored, coarse-grained intrusive igneous rock found in the Wichita Mountains. _____

10 The mineral _____ is the most important constituent of limestone found in many parts of Oklahoma. A drop of dilute hydrochloric acid applied to this mineral will cause the mineral to bubble or fizz vigorously.

12 Thick deposits of this mineral can be found underground in western Oklahoma. This mineral is common table salt and is also used to remove ice from roadways. _____

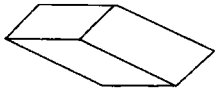
13 The oldest rocks exposed at the surface in Oklahoma are in the eastern Arbuckle Mountains and are classified as _____ rocks.

WORD LIST

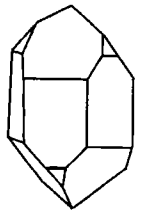
Some of the words may be used more than once.

BARITE	GABBRO	HEMATITE	RHYOLITE
BASALT	GALENA	IGNEOUS	SANDSTONE
CALCITE	GRANITES	LIMESTONE	SEDIMENTARY
CHERT	GYPSUM	QUARTZ	SHALE
COAL	HALITE	QUARTZITE	SPHALERITE

MINERALS AND ROCKS OF OKLAHOMA—Crossword Puzzle



CALCITE



QUARTZ

MINERALS AND ROCKS OF OKLAHOMA—Word Search

Look for the words below, all related to minerals and rocks of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to minerals and rocks of Oklahoma is included in the crossword puzzle.

S	P	H	A	L	E	R	I	T	E	S	T	W	O	R	B	B	A	G
K	L	E	R	O	W	E	T	I	R	A	B	M	O	P	F	G	R	A
N	W	M	C	D	M	O	P	R	S	T	B	G	F	H	O	A	O	L
H	C	A	L	C	I	T	E	A	B	Y	O	K	T	M	N	A	U	E
M	E	T	S	T	W	E	D	C	R	P	S	L	O	I	H	K	T	N
E	H	I	T	E	T	I	L	A	H	R	A	N	T	G	N	E	N	A
N	T	T	R	H	O	N	T	K	L	S	W	E	O	N	M	T	C	S
O	S	E	N	I	T	N	M	O	A	R	S	B	C	E	O	I	H	T
T	R	C	B	S	E	N	S	B	O	W	M	N	C	O	A	L	E	Z
S	O	A	R	M	L	W	P	S	R	G	Y	P	S	U	M	O	R	T
D	N	L	I	M	E	S	T	O	N	E	Z	C	D	S	W	Y	T	R
N	M	D	O	W	L	K	H	G	M	N	T	O	S	R	N	H	N	A
A	E	D	K	L	M	N	S	T	R	W	A	C	D	P	O	R	W	U
S	H	A	L	E	W	B	C	A	B	E	T	I	Z	T	R	A	U	Q

WORD LIST

Some of the words may be used more than once.

BARITE
BASALT
CALCITE
CHERT
COAL
GABBRO
GALENA
GRANITES
GYPSUM
HALITE
HEMATITE
IGNEOUS
LIMESTONE
QUARTZ
QUARTZITE
RHYOLITE
SANDSTONE
SEDIMENTARY
SHALE
SPHALERITE

GENERAL GEOLOGY OF OKLAHOMA—Crossword Puzzle

Across

2 The _____ _____ was declared the official State rock of Oklahoma in 1968.
6 Oklahoma is divided into 22 geomorphic (physiographic) provinces based on _____.
7 Flat-topped erosional remnant of Tertiary basaltic lava flow extruded from volcanoes in Colorado. _____ _____
9 Most of the red beds that crop out in north-central and central Oklahoma are _____ in age.
10 Rich Mountain (elevation, 2,800 feet) is the highest point in the _____ Mountains of southeastern Oklahoma.
11 Sandstone is a type of sedimentary rock formed by the cementation of sand grains composed mostly of this mineral. _____
12 The major mountain belts of Oklahoma occur in the southern third of the State and were formed from faulting and folding primarily during the _____ Period of geologic time.
16 Limestone is a sedimentary rock composed mostly of this mineral. _____
17 The oldest rocks on Oklahoma are _____ in origin.
19 Rocks of _____ age are the most important to us, since they crop out over more than 95% of Oklahoma.
23 The _____ Mountains contain the most diverse suite of mineral resources in Oklahoma.
24 The _____ Mountains in southeastern Oklahoma represent the central part of a great chain of mountains that include the Appalachian Mountains of the eastern United States and the Marathon Mountains of west Texas and northern Mexico.

Down

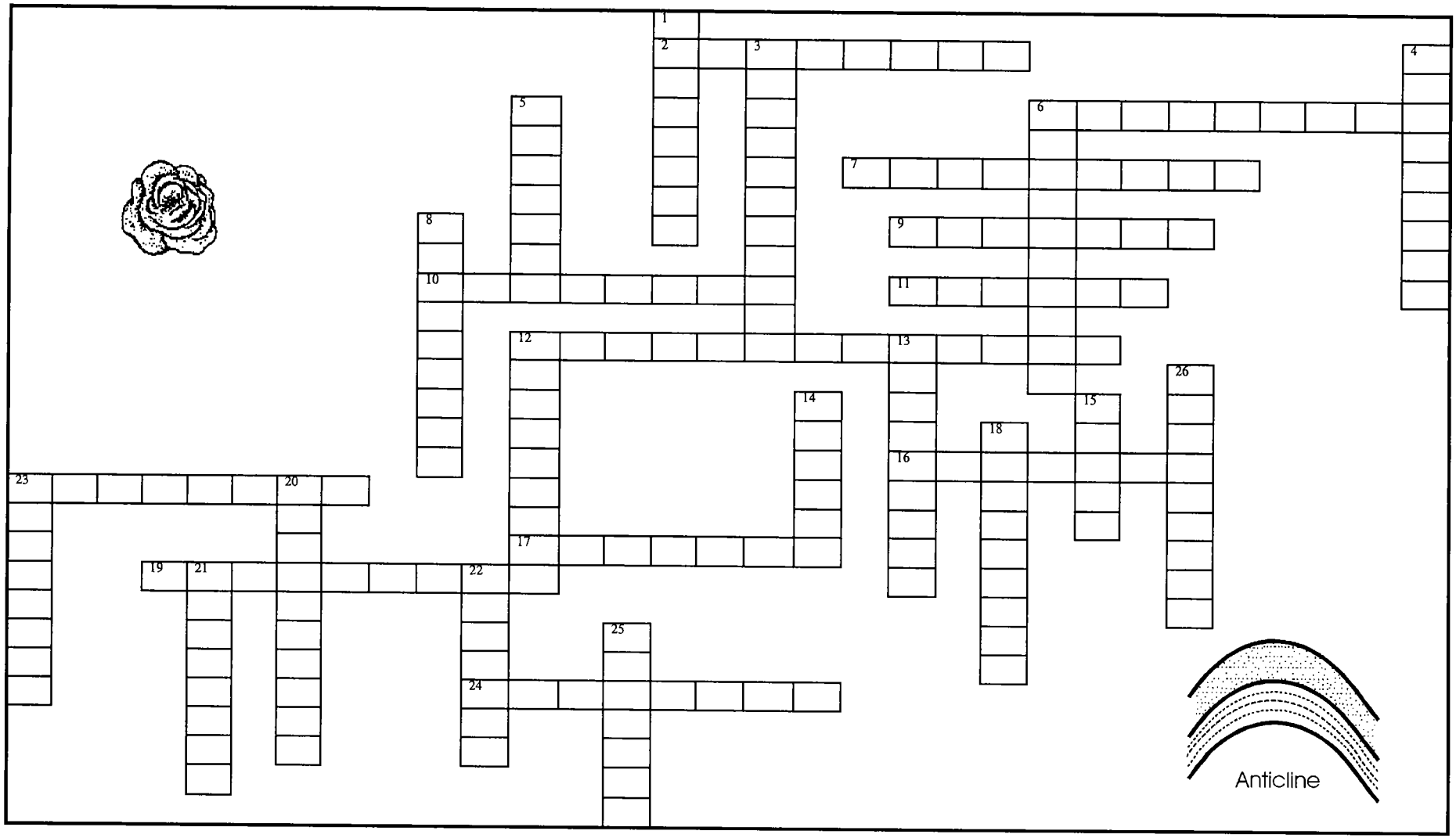
1 The oldest rocks in Oklahoma are granites 1.3 billion years old, found in the _____ Mountains.
3 Most of the surface rocks in Oklahoma are classified as _____ rocks.
4 The central Oklahoma region (Noble–Norman area) has become famous for the collecting of _____ _____ from Permian-age sedimentary rocks.
5 Mt. Scott is the best-known peak in the _____ Mountains.
8 A scientist who studies the Earth's materials, surface features, and history is called a _____.
13 An upward-bent (convex) fold of the Earth's crust commonly associated with oil and gas deposits in Oklahoma. _____
14 Continental glaciers during the "Great Ice Age" extended from Canada southward only as far as northeastern _____.
15 A sedimentary rock commonly collected by Native American Indians to make arrowheads, spear points, and tools. _____
18 The highest elevation (4,973 feet) in Oklahoma is found at _____ ____.
20 Geologically, _____ _____ lies in the Ardmore basin, a basin filled with rocks of Precambrian to Permian ages.
21 One of the most spectacular exposures of lower Paleozoic rocks in the world occurs along Interstate Highway 35 in the _____ Mountains.
22 The word _____ means "of fire" or "born of fire" and is applied to all rocks that have cooled from magma or lava.
23 "Tombstone topography," consisting of steeply dipping limestone beds, is a significant geologic feature seen in the _____ Mountains.
25 The largest exposure of igneous rocks in Oklahoma is in the _____ Mountains.
26 Rocks of this geologic era contain practically all of the fuel and nonfuel resources in the State.

WORD LIST

Some of the words may be used more than once.

ARBUCKLE FLINT KANSAS PALEOZOIC QUARTZ
ANTICLINE GEOLOGIST LAKE MURRAY PENNSYLVANIAN ROSE ROCKS
BLACK MESA IGNEOUS LANDFORMS PERMIAN SEDIMENTARY
CALCITE OUACHITA WICHITA

GENERAL GEOLOGY OF OKLAHOMA—Crossword Puzzle



GENERAL GEOLOGY OF OKLAHOMA—Word Search

Look for the words below, all related to the general geology of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to the general geology of Oklahoma is included in the crossword puzzle.

N	A	I	N	A	V	L	Y	S	N	N	E	P	W	I	C	H	I	T
S	E	N	I	L	C	I	T	N	A	C	E	L	K	C	U	B	R	A
K	D	N	A	I	M	R	E	P	Y	L	A	K	G	E	O	L	O	G
C	E	R	A	T	I	H	C	A	U	O	L	C	A	L	C	I	T	E
O	S	A	S	N	A	K	R	R	A	R	B	U	L	S	N	A	K	O
R	P	E	R	M	I	R	M	A	K	S	M	R	O	F	D	N	A	L
E	C	A	L	C	U	R	B	L	A	C	K	M	E	S	A	Z	R	O
S	E	D	I	M	E	N	T	A	R	Y	O	E	G	E	O	T	B	G
O	U	A	E	P	E	K	C	O	R	E	S	O	R	S	O	R	U	I
R	L	K	R	O	S	U	O	E	N	G	I	G	N	E	B	A	C	S
A	A	N	L	A	C	W	I	C	H	I	T	A	N	T	I	U	K	T
L	P	A	L	E	O	Z	O	I	C	T	N	I	L	F	C	Q	L	A

WORD LIST

Some of the words may be used more than once.

ARBUCKLE
ANTICLINE
BLACK MESA
CALCITE
FLINT
GEOLOGIST
IGNEOUS
KANSAS
LAKE MURRAY
LANDFORMS
OUACHITA
PALEOZOIC
PENNSYLVANIAN
PERMIAN
QUARTZ
ROSE ROCK
SEDIMENTARY
WICHITA

A LOOK AT OKLAHOMA GEOLOGY—Crossword Puzzle
(Part 1)

Across

2 The most severe storms in Oklahoma consist of violently, vertically rotating columns of air called _____.

3 The largest active oil refinery in Oklahoma is located in this city. _____ _____

7 Shannon Lucid from Bethany, Oklahoma, was an _____.

11 More than 95% of the surface of Oklahoma is covered with _____ rocks.

13 This geologic agent is most responsible for changing the surface of the State of Oklahoma _____.

14 This sedimentary rock was collected by Native American Indians to make arrowheads, spear points, and scraping tools. _____

16 Currently in Oklahoma there are no active _____.

17 Coal deposits in Oklahoma were formed from the accumulation of _____ in swamps and marshy areas.

18 Each year in Oklahoma tons of rocks are broken up or worn away by water, air, and living things. This process is called _____.

21 This important natural resource is often removed and carried to a new place by natural processes when severe flooding occurs in Oklahoma. _____

22 The central Oklahoma area (Noble–Norman) has become famous for the collecting of _____ _____.

24 The igneous rock granite can be seen in Oklahoma in the _____ Mountains.

Down

1 Name for scientist who studies the Earth's materials, surface features, and history. _____

4 These large vertebrate animals lived in southeastern Oklahoma during the Cretaceous Period, between 100 and 110 million years ago. _____

5 The outer, thinnest layer of the Earth we live on in Oklahoma is called the _____.

6 The _____ _____ was declared the official State rock of Oklahoma in 1968.

8 In western Oklahoma, farmers and ranchers must provide water for their crops when there is little rainfall. This process is called _____.

9 Coal, natural gas, and oil are important natural fuel resources produced in Oklahoma to supply _____.

10 In Oklahoma, more erosion (movement of rock and soil) occurs in the spring than in the summer because of greater amounts of _____.

12 In southern Oklahoma, periodic vibrations occur in the Earth's crust. These vibrations are called _____.

15 Remains or traces of animals and plants found preserved in sedimentary rocks of Oklahoma are called _____.

19 One of the most impressive waterfalls in Oklahoma, with a vertical fall of about 77 feet, can be seen at _____ _____.

20 The official State _____ of Oklahoma is a Jurassic-age dinosaur.

23 Reclamation is the process of restoring the land to its original condition after surface _____ in Oklahoma.

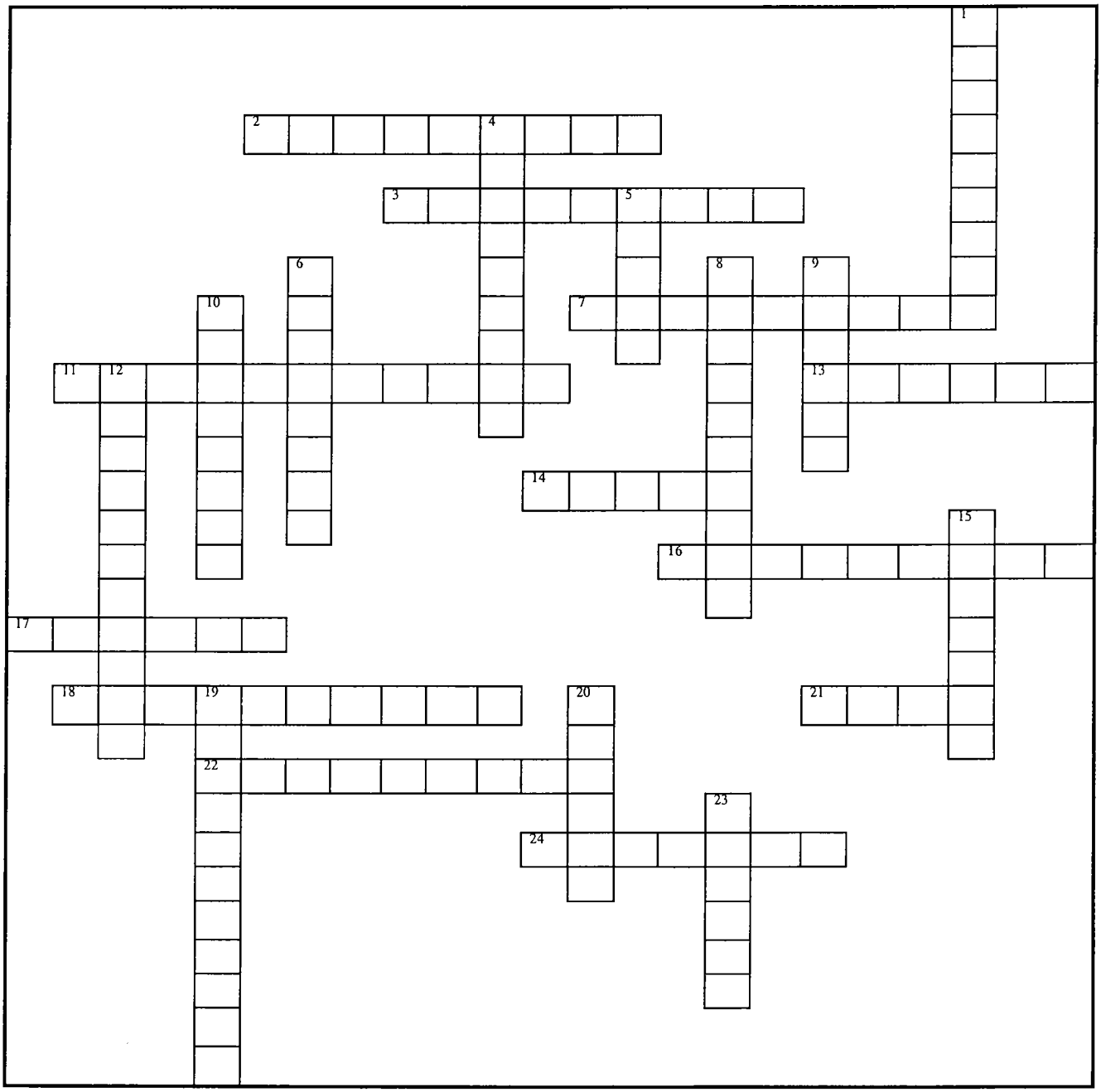
WORD LIST

Some of the words may be used more than once.

ASTRONAUT	FOSSIL	PONCA CITY	SOIL
CRUST	FOSSILS	RAINFALL	TORNADOES
DINOSAURS	GEOLOGIST	RIVERS	TURNER FALLS
EARTHQUAKES	IRRIGATION	ROSE ROCK	VOLCANOES
ENERGY	MINING	ROSE ROCKS	WEATHERING
FLINT	PLANTS	SEDIMENTARY	WICHITA

A LOOK AT OKLAHOMA GEOLOGY—Crossword Puzzle

(Part 1)



A LOOK AT OKLAHOMA GEOLOGY—Word Search (Part 1)

Look for the words below, all related to the geology of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to the geology of Oklahoma is included in the crossword puzzle.

M	Y	T	I	C	A	C	N	O	P	S	E	O	D	A	N	R	O	T
E	S	R	E	V	I	R	U	T	U	A	N	O	R	T	S	A	U	O
D	I	L	R	Y	G	R	E	N	E	K	A	U	Q	H	T	R	A	E
L	I	R	I	R	F	S	E	O	N	A	C	L	O	V	N	C	K	B
L	A	N	G	O	O	G	N	I	R	E	H	T	A	E	W	I	C	H
A	S	T	O	R	S	K	C	O	R	E	S	O	R	D	I	N	O	S
F	O	O	I	S	S	S	L	I	S	S	O	F	O	T	S	U	R	C
N	I	R	W	H	A	I	L	F	N	I	A	R	S	O	E	D	E	R
I	N	S	U	R	C	U	N	O	P	L	A	N	T	S	D	E	S	U
A	S	T	R	O	N	I	R	F	L	I	N	T	L	I	S	S	O	F
R	G	N	I	N	I	M	W	S	E	D	I	M	E	N	T	A	R	Y
T	S	I	G	O	L	O	E	G	N	O	I	T	A	G	I	R	R	I

WORD LIST

Some of the words may be used more than once.

ASTRONAUT
CRUST
DINOSAURS
EARTHQUAKE
ENERGY
FLINT
FOSSIL
FOSSILS
GEOLOGIST
IRRIGATION
MINING
PLANTS
PONCA CITY
RAINFALL
RIVERS
ROSE ROCK
ROSE ROCKS
SEDIMENTARY
SOIL
TORNADOES
TURNER FALLS
VOLCANOES
WEATHERING
WICHITA

A LOOK AT OKLAHOMA GEOLOGY—Crossword Puzzle
(Part 2)

Across

1 A reading from at least three or more seismograph stations is needed to locate an earthquake's _____.
3 To be preserved as fossils, plants and animals must be buried rapidly by _____.
6 What herbivorous dinosaurs ate. _____
7 The name for the actual location of an earthquake below the Earth's surface. _____
8 About 80% of all volcanic and earthquake activity in the world occurs in and around the _____ Ocean.
11 The Mesozoic Era of geologic time is known as the age of the _____.
12 The average number of earthquakes reported felt each year in Oklahoma is _____.
13 Fossils are found most commonly in _____ rocks.
15 This State park in Oklahoma was famous as a former hideout for outlaws. _____ _____
16 Alabaster Caverns in Woodward County is the largest commercial gypsum _____ in North America.
18 The word _____ means "of fire" or "born of fire" and is applied to all rocks that have cooled from magma or lava.
19 Most earthquakes originate at _____ boundaries.
20 The largest fault in North America is located primarily in California and is called the ___ _____ fault.

Down

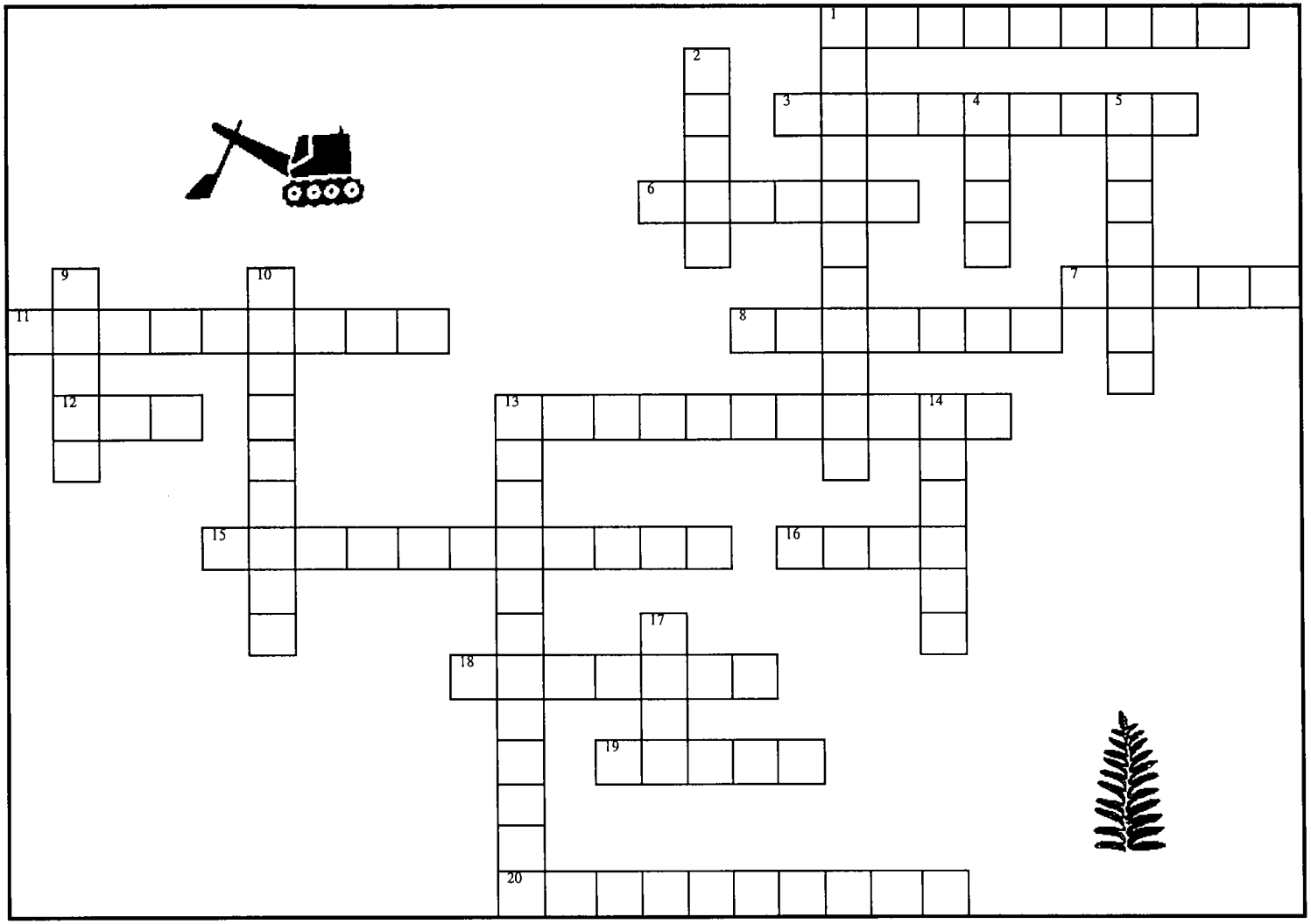
1 Coal in Oklahoma is used primarily for the generation of _____.
2 A surface or zone of rock fracture along which there has been movement is called a _____.
4 The Earth's largest satellite, which experiences about 3,000 "quakes" per year. _____
5 Name for shaking of the ground that is felt just before an earthquake. _____
9 Approximate number of earthquakes recorded in Oklahoma each year. _____
10 Robbers Cave State Park near Wilburton, Oklahoma, is unique in that caves are developed in the sedimentary rock called _____.
13 Instruments designed to record earthquake waves are called _____.
14 In Oklahoma, the primary cause of erosion (movement of weathered material) is _____.
17 A fuel resource in Oklahoma that may cause acid-mine drainage is _____.

WORD LIST

Some of the words may be used more than once.

CAVE
COAL
DINOSAURS
ELECTRICITY
EPICENTER
FAULT
FIFTY
FOCUS
IGNEOUS
MOON
PACIFIC
PLANTS
PLATE
RIVERS
ROBBERS CAVE
SAN ANDREAS
SANDSTONE
SEDIMENTARY
SEDIMENTS
SEISMOGRAPHS
TREMORS
TWO

A LOOK AT OKLAHOMA GEOLOGY—Crossword Puzzle
(Part 2)



A LOOK AT OKLAHOMA GEOLOGY—Word Search (Part 2)

Look for the words below, all related to the geology of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to the geology of Oklahoma is included in the crossword puzzle.

N	A	S	A	E	R	D	N	A	N	A	S	U	O	E	N	G	I	N
S	E	I	S	M	O	G	R	A	P	H	E	S	D	N	A	S	C	Y
O	O	M	C	I	F	I	C	A	P	I	D	T	C	E	L	E	S	T
E	S	R	O	M	E	R	T	A	L	G	I	R	I	V	E	I	R	I
N	T	L	U	A	F	L	R	N	A	A	M	E	I	D	E	S	U	C
O	N	S	A	C	A	G	O	M	T	S	E	T	A	L	E	M	A	I
T	E	R	O	O	O	O	M	E	E	O	N	N	F	V	P	O	S	R
S	M	E	C	M	M	V	I	R	W	N	T	E	A	S	I	G	O	T
D	I	V	S	A	N	O	S	T	R	I	A	C	B	D	C	R	N	C
N	D	I	X	Y	T	F	I	F	M	D	R	I	B	N	E	I	I	E
A	E	R	S	T	N	A	L	P	O	W	Y	P	O	A	B	V	D	L
S	S	U	C	O	F	T	W	R	O	B	B	E	R	S	C	A	V	E

WORD LIST

Some of the words may be used more than once.

CAVE
COAL
DINOSAURS
ELECTRICITY
EPICENTER
FAULT
FIFTY
FOCUS
IGNEOUS
MOON
PACIFIC
PLANTS
PLATE
RIVERS
ROBBERS CAVE
SAN ANDREAS
SANDSTONE
SEDIMENTARY
SEDIMENTS
SEISMOGRAPH
TREMORS
TWO

ARBUCKLE MOUNTAINS—Crossword Puzzle

Across

2 The oldest rocks in the Arbuckle Mountain region are _____ rocks of Precambrian age.

3 Crushed-stone and building-stone resources from primarily the sedimentary rock _____ are important mineral resources in the Arbuckle Mountains.

5 The black Woodford Shale of Devonian–Mississippian age is exposed in the Arbuckle Mountains and is an important _____ source rock.

6 A high-purity silica sand in the Arbuckle Mountains is used primarily for _____ making.

7 Major mountain-building events in _____ time are recognized in the Arbuckle Mountains by the deposition of several tectonic conglomerates.

8 Steeply dipping beds of limestone/dolomite produce _____ topography, resembling rows of tombstones seen in a cemetery.

12 The Arbuckle Mountains contain a _____ of Precambrian granite and gneiss formed about 1.3 billion years ago.

14 The highest elevation in the eastern Arbuckle Mountains is about 1,377 feet on the Arbuckle _____.

15 The highest elevation in the Arbuckle Mountains is about 1,415 ft in the West _____ ____, about 9 miles west-southwest of Davis.

Down

1 The Arbuckle Mountains are in _____ _____ Oklahoma.

4 The Arbuckle Mountains are primarily in _____, Carter, and Johnston Counties.

6 The first unroofing (exposure) of Precambrian _____ in the Arbuckle Mountains occurred near the close of the Pennsylvanian Period.

7 The emplacement of both extrusive and shallow intrusive igneous rocks occurred in late _____ time.

9 The Arbuckle Mountains contain the most diverse suite of _____ resources in Oklahoma.

10 _____ ____, a popular tourist attraction in the Arbuckle Mountains, is the most impressive waterfall in Oklahoma.

11 Extensive erosion of the Arbuckle Mountains area occurred in the _____ Period.

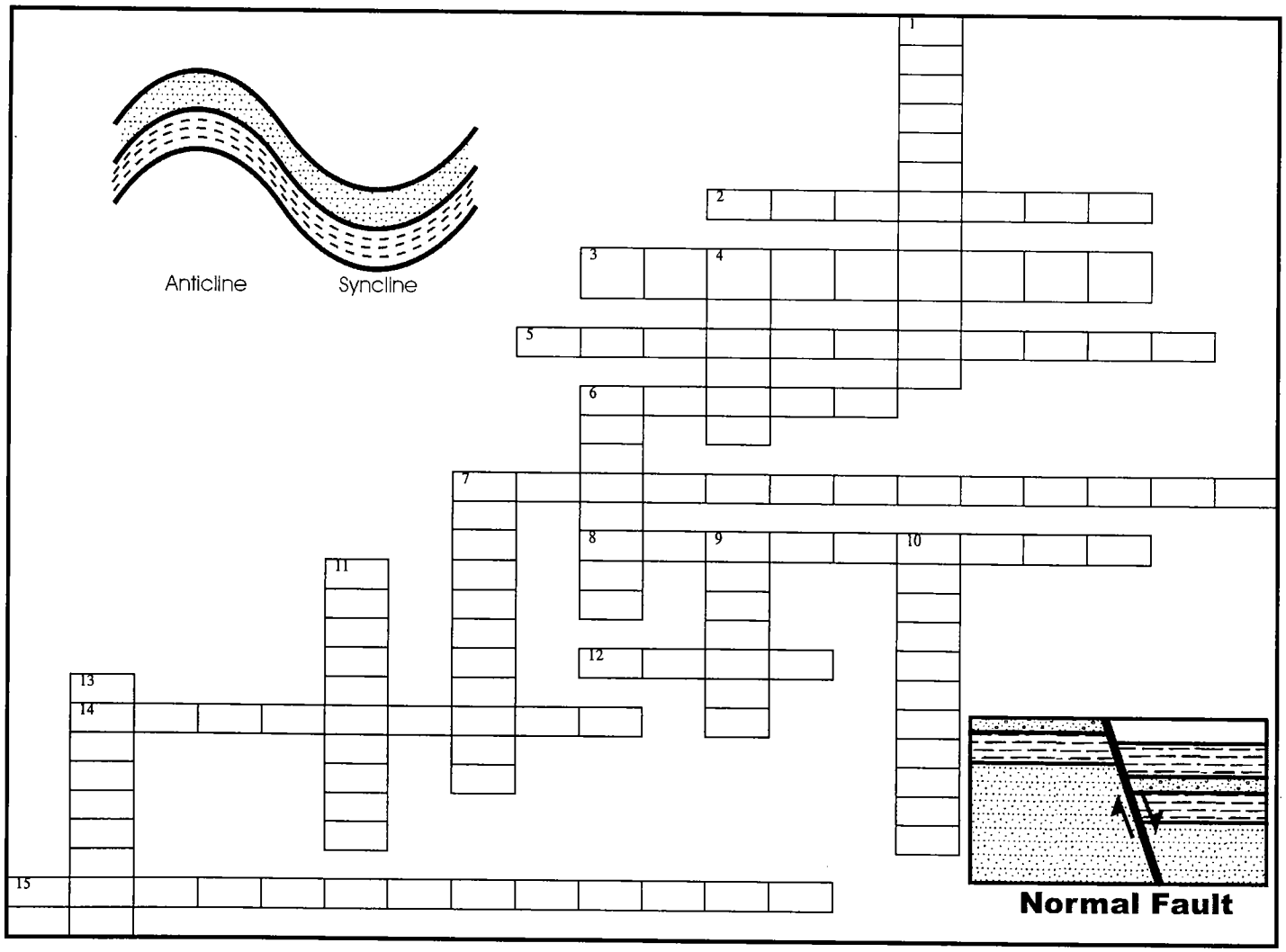
13 Deep road cuts on Interstate 35 expose some of the thickest limestones and dolomites of early _____ age seen anywhere in the world.

WORD LIST

Some of the words may be used more than once.

ANTICLINE	HYDROCARBON	MURRAY	SOUTH-CENTRAL
CORE	IGNEOUS	PALEOZOIC	TIMBERED HILLS
CRETACEOUS	LIMESTONE	PENNSYLVANIAN	TOMBSTONE
GLASS	MINERAL	PRECAMBRIAN	TURNER FALLS
GRANITES			

ARBUCKLE MOUNTAINS—Crossword Puzzle



ARBUCKLE MOUNTAINS—Word Search

Look for the words below, all related to the Arbuckle Mountains of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to the Arbuckle Mountains of Oklahoma is included in the cross-word puzzle.

M	I	N	E	R	A	L	A	N	T	S	L	L	A	F	R	E	N	R	U	T
S	R	S	O	U	T	H	C	E	N	T	R	A	L	M	B	W	T	P	I	O
A	U	P	W	N	I	Y	E	N	G	O	P	S	C	R	I	S	O	M	H	M
L	M	R	E	R	M	D	W	E	E	R	E	O	A	G	E	N	B	N	E	B
G	R	E	N	U	B	R	N	R	D	T	N	C	N	M	M	E	B	A	N	S
C	E	C	G	T	R	O	O	Y	I	A	O	E	I	D	R	M	O	I	I	T
I	N	A	I	R	T	C	H	N	R	R	O	L	E	E	O	W	N	R	L	O
O	R	M	U	S	A	A	A	G	D	U	S	R	D	T	P	A	L	B	C	N
Z	U	M	E	L	S	R	W	Y	S	S	E	H	Y	A	R	R	U	M	I	E
O	T	M	G	H	G	B	H	S	A	B	I	S	O	U	T	H	C	A	T	A
E	I	G	N	E	O	O	U	L	M	L	L	I	M	E	S	T	O	C	N	T
L	M	I	N	E	R	N	G	I	L	V	L	Y	S	N	N	E	P	E	A	E
A	C	R	E	T	A	C	T	S	X	S	U	O	E	C	A	T	E	R	C	R
P	E	N	N	S	Y	L	V	A	N	I	A	N	P	A	L	E	O	P	Z	C

WORD LIST

Some of the words may be used more than once.

ANTICLINE
CORE
CRETACEOUS
GLASS
GRANITES
HYDROCARBON
IGNEOUS
LIMESTONE
MINERAL
MURRAY
PALEOZOIC
PENNSYLVANIAN
PRECAMBRIAN
SOUTH-CENTRAL
TIMBERED HILLS
TOMBSTONE
TURNER FALLS

OUACHITA MOUNTAINS—Crossword Puzzle

Across

2 The Ouachita Mountains are an extension of the _____ Mountains of the eastern United States.

3 The greatest period of mountain building in Oklahoma was in _____ time, when the Ouachitas were folded, tilted, and faulted.

6 The Ouachita Mountains are characterized by long and sinuous ridges of folded Mississippian and Pennsylvanian sandstones towering above subparallel _____ valleys.

7 The topography of the Ouachita Mountains is controlled by _____ type, with valleys underlain by shales and ridges held up by sandstones.

9 "Talihina" is a Choctaw word meaning "iron road"; it refers to the 1888 arrival of the Frisco _____ to the Ouachita region.

10 The Ouachita Mountains are in southeastern Oklahoma and western _____.

12 Lower Paleozoic limestones and dolomites in the Arbuckle Mountains are equivalent to thick shales and _____ in the Ouachita Mountains.

13 The highest elevation in the Ouachita Mountains is 2,666 feet on _____ Mountain.

14 The Ouachita Mountains consist of a thick sequence of largely clastic rocks formed during the _____ Era.

15 _____ resources that are, or have been, produced in the Ouachitas include limestone, quartzite, sand and gravel, asphaltite, lead, and oil and gas.

Down

1 The first successful oil well in the Ouachitas was drilled in 1914 near what later became known as the _____ field.

2 Early Native Americans used solid hydrocarbons called _____ as adhesives to bind stone arrowheads to wooden shafts.

4 The Ouachita orogeny (uplift) resulted from the collision of the ____ _____ Plate into the central stable region of North America.

5 The principal mineral resources of the Ouachita region are _____ ___, coalbed-methane gas, and oil.

8 The Ouachita Mountains represented a major source area for _____ in post-Mississippian rocks.

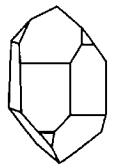
11 The leading thrust fault of the Ouachita fold and thrust belt is the _____ fault.

WORD LIST

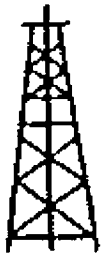
Some of the words may be used more than once.

APPALACHIAN	CLASTICS	PENNSYLVANIAN	ROCK
ARKANSAS	NATURAL	RAILROAD	SANDSTONES
ASPHALTITES	NATURAL GAS	REDDEN	SHALE
CHOCTAW	PALEOZOIC	RICH	SOUTH AMERICAN

OUACHITA MOUNTAINS—Crossword Puzzle



QUARTZ



OUACHITA MOUNTAINS—Word Search

Look for the words below, all related to the Ouachita Mountains of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to the Ouachita Mountains of Oklahoma is included in the crossword puzzle.

Z	O	E	L	A	P	S	A	G	L	A	R	U	T	A	N	P
S	H	A	S	S	S	N	A	T	U	H	L	A	H	S	E	A
B	N	C	O	P	A	I	R	H	C	O	W	I	E	N	S	L
S	A	C	U	H	S	T	O	I	P	N	A	L	N	R	O	E
E	V	I	T	A	N	S	R	N	A	R	A	S	H	A	U	O
T	L	O	H	L	A	A	O	I	W	P	Y	E	R	M	T	Z
I	Y	Z	A	T	K	L	H	E	C	L	A	S	T	I	C	S
T	S	O	M	I	R	C	N	W	V	E	N	I	M	N	C	E
L	N	E	E	T	A	O	D	A	W	L	I	A	R	E	A	N
A	N	L	R	L	T	A	N	S	N	A	O	K	C	R	L	O
H	E	A	A	S	O	I	A	N	H	A	T	H	H	A	A	T
P	P	P	D	R	A	T	R	E	P	A	K	C	O	L	P	S
S	P	N	L	N	C	O	C	D	O	T	L	R	O	W	P	D
A	A	I	T	O	C	I	W	D	R	S	P	E	A	H	A	N
S	A	A	H	K	R	N	P	E	N	N	S	Y	L	V	C	A
R	N	C	R	N	A	C	I	R	E	M	A	H	T	U	O	S

WORD LIST

Some of the words may be used more than once.

APPALACHIAN
ARKANSAS
ASPHALTITES
CHOCTAW
CLASTICS
MINERAL
NATURAL GAS
PALEOZOIC
PENNSYLVANIAN
RAILROAD
REDDEN
RICH
ROCK
SANDSTONES
SHALE
SOUTH AMERICAN

WICHITA MOUNTAINS—Crossword Puzzle

Across

3 The Wichita mountains were formed during the _____ Period, caused by 20,000 feet of local uplift of the Earth's crust.

6 The metamorphic rock _____, one of the few types of metamorphic rocks known in Oklahoma, occurs only in the Wichita Mountains near the town of Meers.

7 Important nonfuel resources produced in the area include limestone, sand and gravel, and _____.

8 The _____ fault is an active fault in the Wichita Mountains capable of causing large, damaging earthquakes.

10 The uplift of the Wichita Mountains was accompanied by extensive weathering and _____, so the mountains probably never reached elevations of more than 3,000 to 5,000 feet above the surrounding area.

11 The best known peak in the Wichita Mountains is ___ _____, with a summit elevation of 2,464 feet.

12 The Wichita Mountains are composed mainly of _____ rock types.

Down

1 The Meers fault, an integral part of the Wichita Mountain frontal fault system, is considered to represent the best known surface expression of _____ faulting in the eastern United States.

2 The highest elevation in the Wichita Mountains is about 2,475 feet above sea level on an _____ peak 4 miles east-southeast of Cooperton.

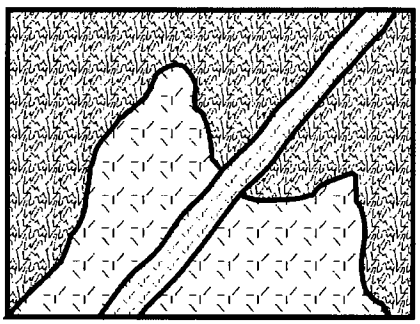
4 _____ rocks that surround the Wichita Mountains produce oil and gas.

5 The _____ Mountains are in southwestern Oklahoma.

6 _____ Mountain State Park and Great Plains State Park are in the Wichita Mountains.

8 The igneous rock granite is quarried in the Wichita Mountains and polished for use as _____ and building trim.

9 Most of the Wichita Mountains is in the Wichita Mountains National Wildlife Refuge and the _____ _____ Military Reservation.



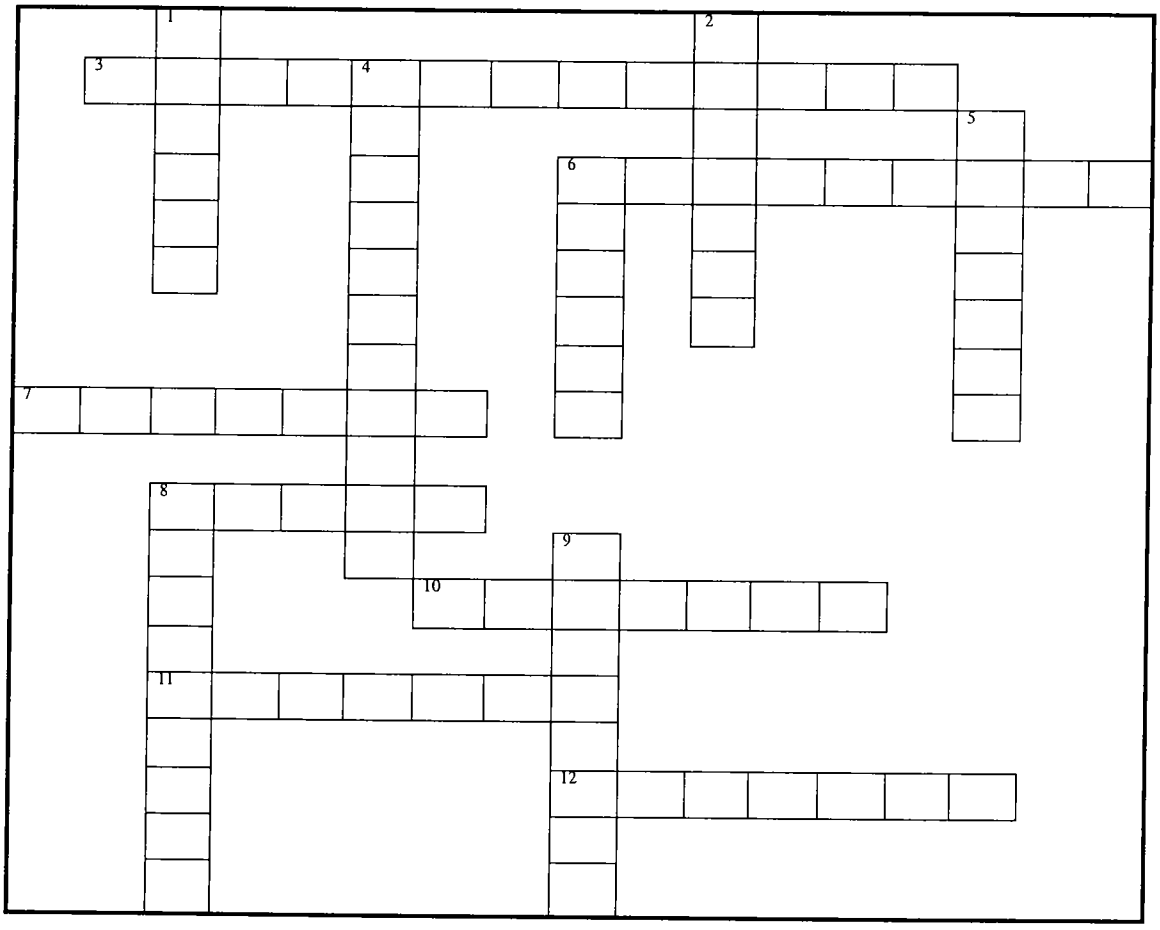
Relationship of igneous rock bodies

WORD LIST

Some of these words may be used more than once.

EROSION	PENNSYLVANIAN
FORT SILL	QUARTZ
GRANITE	QUARTZITE
IGNEOUS	RECENT
MEERS	SEDIMENTARY
MONUMENTS	UNNAMED
MT. SCOTT	WICHITA

WICHITA MOUNTAINS—Crossword Puzzle



WICHITA MOUNTAINS—Word Search

Look for the words below, all related to the Wichita Mountains of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to the Wichita Mountains of Oklahoma is included in the crossword puzzle.

O	B	C	H	A	V	L	Y	S	N	N	E	P	S	R	E	E	M
P	O	I	S	O	R	E	D	E	M	A	N	N	U	F	R	N	T
M	O	N	U	M	E	N	C	K	H	W	A	O	W	O	O	W	S
Y	Y	S	R	S	U	O	E	N	G	I	I	S	I	R	S	E	C
U	R	T	E	O	P	T	U	M	N	C	H	E	C	T	M	T	O
A	A	R	E	N	R	O	T	A	M	H	C	D	H	N	L	I	T
R	T	A	M	A	E	I	V	O	S	I	I	I	E	L	M	N	T
T	N	U	U	N	N	L	N	E	N	T	W	C	I	U	C	A	X
Z	E	Q	G	A	Y	U	D	I	O	A	E	S	N	H	B	R	Z
I	M	I	R	S	M	I	N	A	I	R	T	O	S	T	W	G	T
M	I	G	N	E	M	A	N	A	S	R	M	T	N	E	C	E	R
C	D	N	N	E	R	N	R	W	O	L	Y	S	N	N	E	P	A
N	E	T	N	G	U	G	N	F	R	N	B	I	H	C	I	W	U
P	S	T	Q	U	A	R	T	B	E	T	I	Z	T	R	A	U	Q

WORD LIST

Some of the words may be used more than once.

EROSION
FORT SILL
GRANITE
IGNEOUS
MEERS
MONUMENTS
MT. SCOTT
PENNSYLVANIAN
QUARTZ
QUARTZITE
RECENT
SEDIMENTARY
UNNAMED
WICHITA

THERE'S A WHOLE LOTTA SHAKIN' GOIN' ON— OKLAHOMA EARTHQUAKES—Crossword Puzzle

Across

3 Most earthquakes originate at _____ boundaries.
4 The Oklahoma Geological Survey in Norman operates a geophysical observatory to measure earthquake activity near _____, Oklahoma, in southern Tulsa County.
6 The approximate distance North America moves west from Europe each year is ___ _____.
10 This instrument, designed and operated to record earthquake waves, has operated in Oklahoma since 1961. _____
11 Of the more than 800 earthquakes recorded in Oklahoma from 1977 through 1993, most had magnitudes of less than _____.
12 Approximate number of earthquakes located in Oklahoma each year. _____
13 What unreinforced concrete does under intense earthquake activity. _____
14 Japanese city proclaimed "earthquake-proof" because of strict building codes. _____
15 Spot on the Earth's surface directly above the focus of an earthquake. _____
18 The 25-mile-thick granitic skin of the earth. _____
20 Direction the North and South American plates are moving. _____
21 An earthquake that exceeds a magnitude of 7.0 is considered to be a _____ earthquake.
22 These two counties have recorded the most earthquakes in Oklahoma since 1979. _____/_____
25 Earthquake that follows a large earthquake and originates at or near the focus of the larger earthquake. _____
26 The actual location of an earthquake below the Earth's surface. _____
28 The average number of earthquakes reported felt each year in Oklahoma. _____
29 In Oklahoma, ground motion is recorded at 11 widely separated _____ stations.
30 Readings from at least three seismograph stations are needed to locate the earthquake's _____.

Down

1 Geologic features often associated with earthquake activity. _____
2 The largest known Oklahoma earthquake (magnitude of 5.50) occurred on April 9, 1952, in Canadian County near this city. ___ _____
5 Probably the earliest historical earthquake tremor felt in Oklahoma was the ____ _____ earthquake of 1811–1812.
7 About 80% of all volcanic and earthquake activity occurs in and around the _____ Ocean.
8 Earthquake rating system developed by Charles Richter. _____ _____
9 Name of an active fault in the relatively recent past in the Wichita Mountains. _____
11 Shaking of the ground that precedes an earthquake. _____
16 Primary wave, which travels first and fastest. ___ _____
17 Deadly surface waves that roll the Earth's surface like flipping a carpet. ___ _____
19 Geologic feature formed when an oceanic plate slides under another oceanic plate. _____
23 The significance of the 8.9 Alaskan earthquake of March 27, 1964. _____
24 The biggest fault in North America, nearly 800 miles in length. _____ _____
27 The Earth's largest satellite, which experiences about 3,000 "quakes" per year. _____

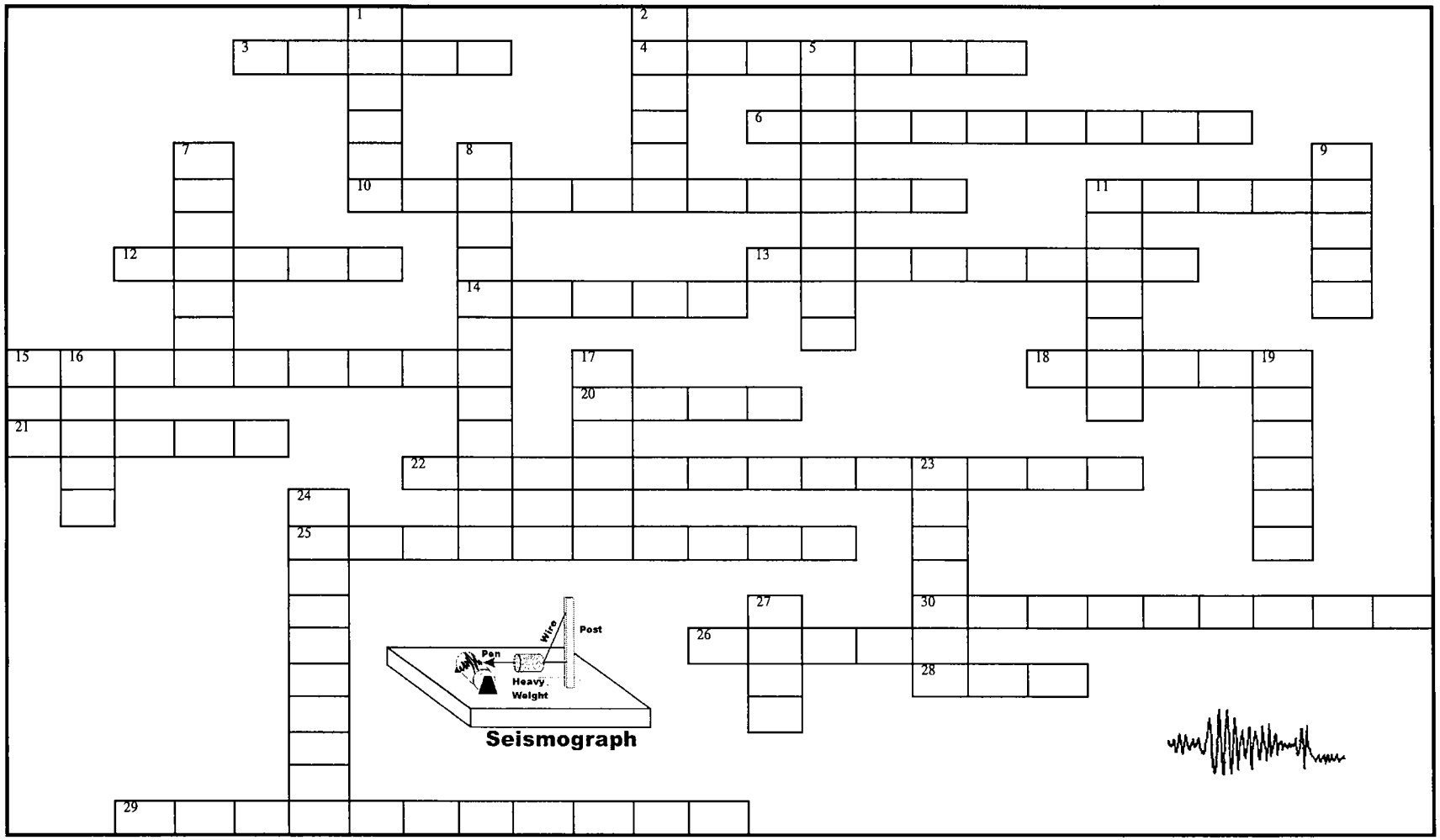
WORD LIST

Some of the words may be used more than once.

AFTERSHOCK FIFTY MAJOR P WAVE TREMORS
CRUMBLES FOCUS MEERS RICHTER SCALE TRENCH
CRUST GARVIN/MCCLAIN MOON SAN ANDREAS TWO
EL RENO LARGEST NEW MADRID SEISMOGRAPH TWO INCHES
EPICENTER LEONARD PACIFIC THREE WEST
FAULTS L WAVES PLATE TOKYO

THERE'S A WHOLE LOTTA SHAKIN' GOIN' ON—OKLAHOMA EARTHQUAKES

Crossword Puzzle



THERE'S A WHOLE LOTTA SHAKIN' GOIN' ON—OKLAHOMA EARTHQUAKES—Word Search

Look for the words below, all related to earthquakes of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to earthquakes of Oklahoma is included in the crossword puzzle.

W	S	O	F	A	U	L	S	A	E	R	D	N	A	N	A	S	F	S	R	E	E	M
A	E	E	C	O	R	O	J	A	M	S	H	O	A	E	F	I	F	T	Y	F	A	E
F	L	R	R	E	C	H	N	J	E	C	H	O	W	W	T	A	W	P	E	P	E	E
T	B	L	S	P	O	U	A	I	N	S	T	M	P	M	E	O	E	V	A	W	P	T
E	M	E	R	I	Y	N	S	E	I	G	A	R	V	I	N	M	C	C	L	A	I	N
R	U	S	O	C	K	M	R	M	L	O	N	E	R	L	E	B	R	S	A	L	C	S
S	R	T	M	E	O	T	H	R	E	E	T	W	E	C	R	U	U	E	R	A	E	E
H	C	L	E	G	T	D	I	R	D	A	M	W	E	N	R	A	M	M	G	R	N	V
O	A	U	R	D	R	A	N	O	E	L	K	W	E	S	O	U	B	E	E	G	T	A
C	W	A	T	O	S	E	H	C	N	I	O	W	T	S	R	O	S	R	S	E	E	W
K	P	F	P	L	A	T	E	P	A	C	I	F	I	C	T	E	G	T	T	S	R	L
H	P	L	E	L	A	C	S	R	E	T	H	C	I	R	N	L	A	F	T	E	R	V

WORD LIST

Some of the words may be used more than once.

AFTERSHOCK
CRUMBLES
CRUST
EL RENO
EPICENTER
FAULTS
FIFTY
FOCUS
GARVIN/MCCLAIN
LARGEST
LEONARD
L WAVES
MAJOR
MEERS
MOON
NEW MADRID
PACIFIC
PLATE
P WAVE
RICHTER SCALE
SAN ANDREAS
SEISMOGRAPH
THREE
TOKYO
TREMORS
TRENCH
TWO
TWO INCHES
WEST

WATER RESOURCES IN OKLAHOMA—Crossword Puzzle

Across

1 Modern drainage systems today were primarily initiated about 2 million years ago during the _____ Epoch of geologic time.

4 Unique in being one of the few lakes in Oklahoma with no rivers or streams flowing into it. ____ _____

5 The largest river in Oklahoma is the _____.

7 Lake Texoma is fed by the _____ and Red Rivers.

9 Most of the lakes and _____ in Oklahoma were made mainly for flood control, water supply, recreation, fish, wildlife, and hydroelectric power.

11 Each major drainage system in Oklahoma consists of a principal _____ with smaller tributaries.

12 Historically, flooding in Oklahoma has decreased owing to the development of man-made _____ on major streams.

13 Major rivers and their tributaries flow mainly to the southeast and _____ across Oklahoma.

15 Most of the ground water in Oklahoma is used for _____.

17 The entire State of Oklahoma is drained by the Arkansas and _____ Rivers and their tributaries.

18 The source of the _____ River is in the Rocky Mountains of central Colorado.

Down

2 The lowest elevation in Oklahoma is 287 feet, where _____ _____ enters Arkansas in the southeast corner of the State.

3 Oklahoma's major water-bearing strata (aquifers) are _____ deposits.

4 The largest water reservoir in Oklahoma is at ____ _____.

6 About 80% of all water used by cities and industries in Oklahoma is taken from _____ _____ sources.

8 A most impressive waterfall in Oklahoma with a vertical fall of about 77 feet is in the Arbuckle Mountains at _____ _____.

10 _____ Lake, in eastern Oklahoma, has the largest surface area and the second largest volume of water in the State.

14 These areas adjacent to major streams are not considered to be good sites for urban development. _____ _____

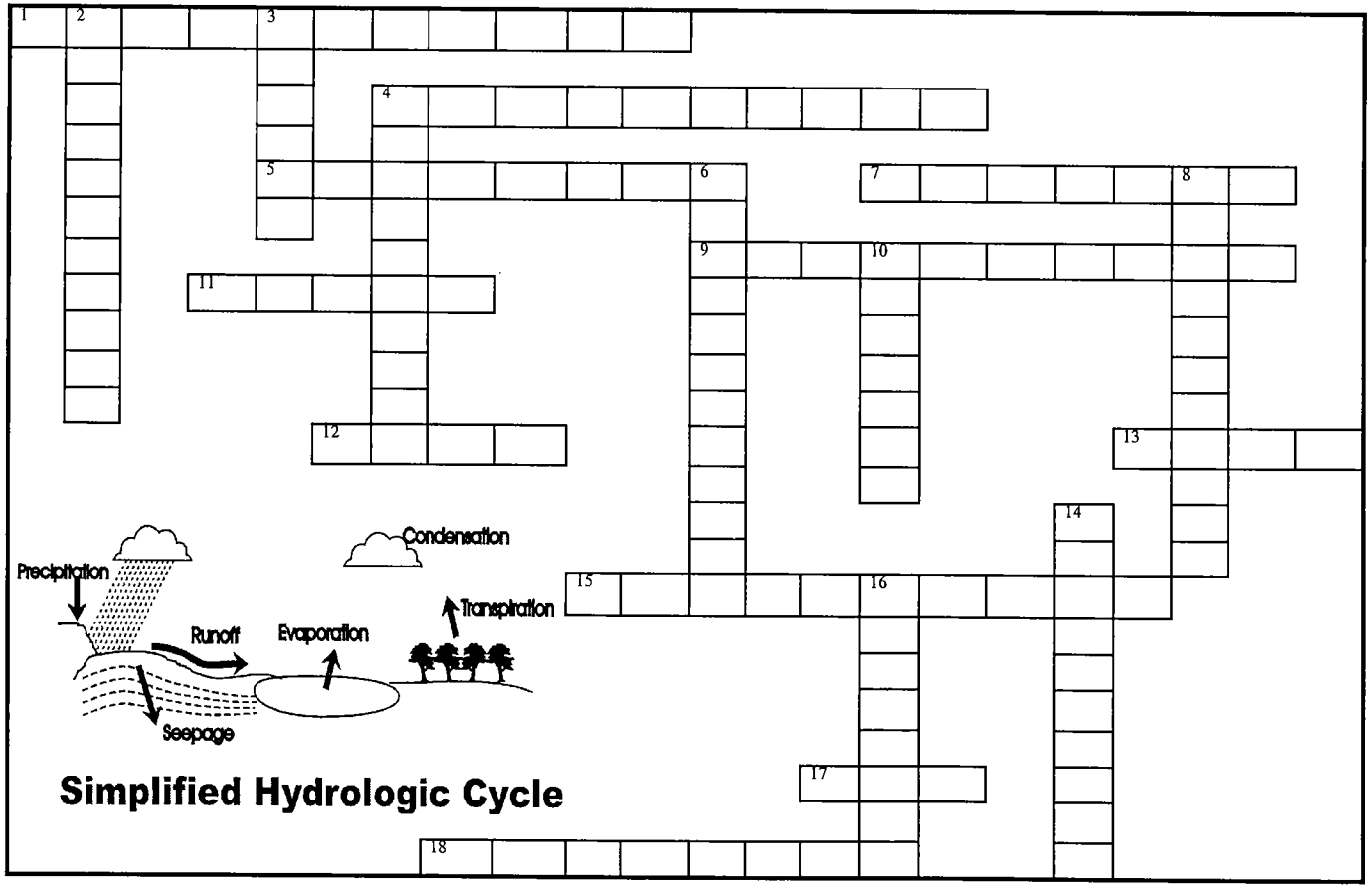
16 The Ogallala Formation in the Oklahoma Panhandle and the Garber–Wellington Formations in central Oklahoma must be environmentally protected, as these two major _____ are major suppliers of water.

WORD LIST

Some of the words may be used more than once.

AQUIFERS EUFAULA LITTLE RIVER STREAM
ARKANSAS FLOOD PLAINS PLEISTOCENE SURFACE-WATER
DAMS IRRIGATION RED TURNER FALLS
EAST LAKE MURRAY RESERVOIRS WASHITA
LAKE TEXOMA RIVER

WATER RESOURCES IN OKLAHOMA—Crossword Puzzle



WATER RESOURCES IN OKLAHOMA—Word Search

Look for the words below, all related to the water resources of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to the water resources of Oklahoma is included in the crossword puzzle.

L	O	S	S	S	E	B	R	E	V	I	R	E	S	E	R	V	O	I
A	S	R	A	R	F	R	T	S	H	E	U	F	A	U	L	A	W	S
K	L	I	S	E	I	T	N	M	T	U	R	N	E	R	F	A	L	N
E	L	O	N	F	U	S	L	A	K	E	T	E	X	O	M	A	G	I
M	A	V	A	I	Q	A	W	D	C	O	T	S	I	E	L	P	R	A
U	F	R	K	U	A	E	E	M	A	T	I	H	S	A	W	R	P	L
M	R	E	R	Q	C	R	E	V	I	R	E	L	T	T	I	L	D	P
A	E	S	A	A	I	R	R	I	G	A	T	I	O	N	R	I	O	D
E	N	E	F	I	R	R	A	S	N	A	K	R	A	X	E	T	O	O
R	R	R	L	S	U	R	F	A	C	E	W	A	T	E	R	T	L	O
T	U	R	W	E	N	E	C	O	T	S	I	E	L	P	C	L	F	L
S	T	V	R	E	S	E	R	Y	A	R	R	U	M	E	K	A	L	F

WORD LIST

Some of the words may be used more than once.

AQUIFERS
ARKANSAS
DAMS
EAST
EUFAULA
FLOOD PLAINS
IRRIGATION
LAKE MURRAY
LAKE TEXOMA
LITTLE RIVER
PLEISTOCENE
RED
RESERVOIRS
RIVER
STREAM
SURFACE–WATER
TURNER FALLS
WASHITA

NONFUEL RESOURCES OF OKLAHOMA—Crossword Puzzle

Across

2 Igneous rock quarried near Tishomingo and Troy, Oklahoma, as a building stone and used in the construction of the State Capitol building. _____

5 This rock-forming mineral has a hardness of 6 and is used in bath tiles, abrasives in cleansers, and roofing shingles. _____

8 Oklahoma ranks no. 1 nationally in the production of this element from natural oil-field brines. _____

9 Oklahoma is one of the very few places in the world where sand rosettes composed of the mineral _____ are found.

12 Sand and gravel deposits in Oklahoma are used mostly in the _____ industry.

13 Sedimentary rock formed by the lithification of clay-size particles. It is mined in Oklahoma for use in the brick and tile industry. _____

14 McCurtain County in southeastern Oklahoma produces some of the finest and most diverse specimens of this mineral found anywhere in the world. _____

16 Extensive subsurface salt deposits are found in the _____ part of Oklahoma.

17 A mineral with a hardness of 2 that is used in wallboard, plaster of Paris, and caulking compound mined in western Oklahoma. _____

18 Important ore minerals were once mined in the Oklahoma lead–zinc district in the _____ Plateau.

19 A variety of the mineral gypsum called _____ occurs in unique hourglass crystals that can be collected at the Great Salt Plains National Refuge in Alfalfa County, Oklahoma.

20 Sand and _____ are important resources in the construction industry.

Down

1 In the Lawton area, deposits of the mineral _____ have been worked in the past for making a red-paint pigment.

3 Mineral with cubic cleavage used as a food additive, water-softening agent, and for ice control on roads. _____

4 Appreciable concentrations of worked pieces of the rock _____ can be interpreted as indications of former campsites of early Indians in Oklahoma.

6 Sedimentary rock extensively quarried in Oklahoma and used for road surfacing, making cement, and agricultural lime. _____

7 This mineral resource in known as halite. _____

10 Boulders called _____ are often used on steep slopes to hold the soil in place, preventing erosion.

11 The tri-state area of _____ County is the most mineral-productive area of Oklahoma.

12 Leading nonfuel construction resource by value in Oklahoma in 1996. _____ _____

15 In the 1920s, Oklahoma was the largest producer in the world of this metal. _____

17 Pure silica sand from the Arbuckle Mountains is used primarily for making _____.

19 The raw material for brick, tile, and pottery is provided by this sedimentary rock. _____

20 Oklahoma ranks no.1 nationally in the production of this mineral commodity. _____

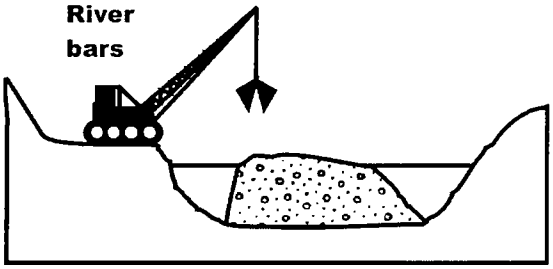
WORD LIST

Some of the words may be used more than once.

BARITE	GLASS	IODINE	SALT
CONSTRUCTION	GRANITE	LIMESTONE	SELENITE
CRUSHED STONE	GRAVEL	OTTAWA	SHALE
FELDSPAR	GYPSUM	OZARK	WESTERN
FLINT	HALITE	QUARTZ	ZINC
	HEMATITE	RIPRAP	

NONFUEL RESOURCES OF OKLAHOMA—Crossword Puzzle


Clay



NONFUEL RESOURCES OF OKLAHOMA—Word Search

Look for the words below, all related to nonfuel resources of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to nonfuel resources of Oklahoma is included in the crossword puzzle.

F	E	Z	T	R	A	U	Q	G	Y	P	C	I	O	T	R	A	U	Q	R	G	Y	P
P	O	E	G	R	A	W	A	T	T	O	S	E	L	E	G	R	A	N	I	T	E	C
E	Z	T	L	I	M	E	S	E	N	H	C	N	I	Z	A	S	E	R	P	L	L	E
T	A	I	A	T	S	H	T	S	S	A	L	G	B	Z	F	L	I	N	R	A	E	T
I	R	T	L	Z	I	I	T	G	Y	P	S	U	O	B	A	R	Z	W	A	H	S	I
L	K	A	A	H	R	R	E	N	O	T	S	D	E	H	S	U	R	C	P	S	A	N
A	S	M	C	A	U	F	L	G	N	C	O	N	S	T	I	E	I	O	D	I	N	E
H	A	E	B	C	R	I	P	N	R	E	T	S	E	W	A	U	Q	R	A	U	Q	L
Z	I	H	T	C	R	F	U	S	H	A	D	R	A	P	S	D	L	E	F	G	F	E
I	L	I	M	E	S	T	O	N	E	S	V	L	H	A	N	A	R	G	M	L	E	S
N	O	B	N	I	D	O	I	K	T	S	E	E	E	S	H	A	L	M	I	A	L	A
N	O	Z	A	R	I	P	M	U	S	P	Y	G	L	O	T	T	N	I	L	F	D	L

WORD LIST

Some of the words may be used more than once.

BARITE
CONSTRUCTION
CRUSHED STONE
FELDSPAR
FLINT
GLASS
GRANITE
GRAVEL
GYPSUM
HALITE
HEMATITE
IODINE
LIMESTONE
OTTAWA
OZARK
QUARTZ
RIPRAP
SALT
SELENITE
SHALE
WESTERN
ZINC

ENERGY FACTS ABOUT OKLAHOMA-(OIL AND GAS)— Crossword Puzzle

Across

1 The deepest producing ____ _____ in Oklahoma is about 22,850 feet.
2 The demand for petroleum products on a worldwide basis is _____ at a record rate.
4 Approximately 500,000 oil and gas wells have been _____ in Oklahoma.
6 Oklahoma consumes less than _____ percent of the gas produced in the State.
7 Historically, Oklahoma's total _____ production is worth about $80 billion.
10 The average cost of drilling an ____ _____ in Oklahoma is about $340,000.
11 Oklahoma's daily production of natural gas is about 5.5 _____ cubic feet.
13 Oklahoma's daily oil production is less than one-half of _____ percent of the world oil supply.
14 Oklahoma is the largest exporter of _____ ___ to out-of-state markets.
17 Oklahoma entered _____ in 1907 as the nation's no. 1 oil-producing State.
19 The average cost of drilling a _____ well in Oklahoma is about $570,000.
20 By the end of 1907, Oklahoma was the nation's largest oil-producing area and supplied _____ % of the world's oil needs.
23 Oklahoma's _____ production of oil is about 250,000 barrels.

Down

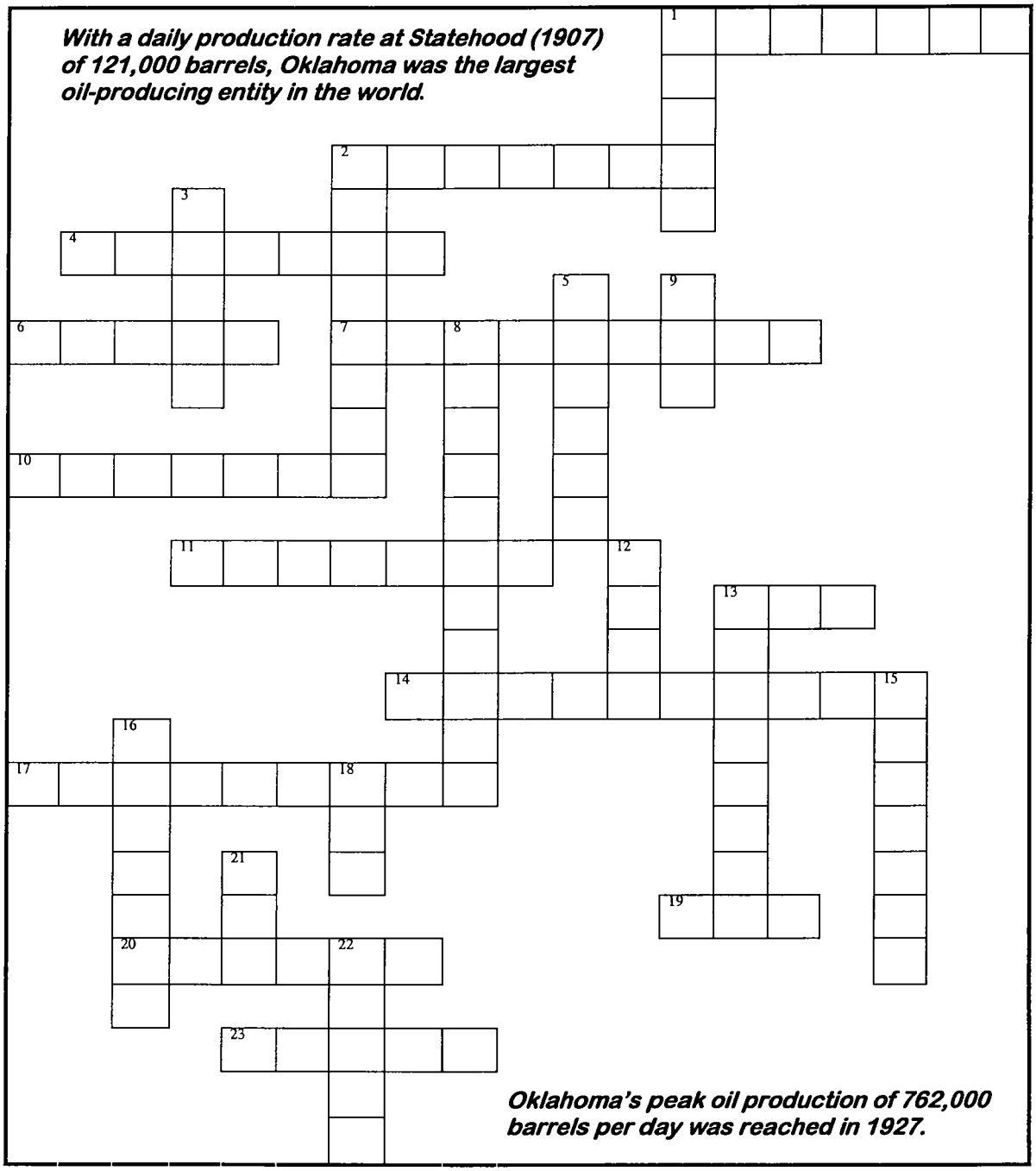
1 The "million dollar elm" was a shade tree under which oil leases were auctioned in the 1920s on the _____ reservation in Pawhuska.
2 Name of the first major oil field in Oklahoma, discovered in 1905 about 10 miles southwest of Tulsa. _____ _____
3 Oklahoma ranks _____ in national oil production after Texas, Alaska, California, and Louisiana.
5 Oklahoma's first waterflood project to extend the life of an oil reservoir began in _____ County.
8 Prior to the 1970s, most Oklahoma wells were ___ _____ feet or shallower.
9 Oklahoma produces about _____ percent of the domestic natural-gas supply.
12 Oklahoma's production of oil per day is less than _____ % of the U.S. production.
13 The _____ Capitol is the only State Capitol with producing wells on its grounds.
15 In 1995, of Oklahoma's 77 counties, _____ were producing petroleum.
16 The Bertha Rogers No. 1 well, drilled in _____ County in 1974, reached a depth of 31,441 feet and was proclaimed the world's deepest hole.
18 The peak production year for _____ in Oklahoma was 1927.
21 During most of the 1920s, Oklahoma ranked as the no. _____ oil-producing State in the Southwest.
22 Oklahoma ranks _____ in national gas production after Texas and Louisiana.

WORD LIST

Some of the words may be used more than once.

BILLION	GAS	OKLAHOMA	STATEHOOD
DAILY	GLEN POOL	ONE	TEN
DRILLED	GROWING	OSAGE	TEN THOUSAND
FIFTH	NATURAL GAS	PETROLEUM	THIRD
FORTY	OIL	ROGERS	TWENTY
FOUR	OIL WELL	SEVENTY	WASHITA

ENERGY FACTS ABOUT OKLAHOMA—(OIL AND GAS)—
Crossword Puzzle



ENERGY FACTS ABOUT OKLAHOMA—Word Search
(OIL AND GAS)

Look for the words below, all related to energy facts about Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to energy facts about Oklahoma is included in the crossword puzzle.

D	A	I	L	B	I	L	L	L	E	W	L	I	O	E	Y	T	N	E	V	E	S	M
N	L	I	R	D	E	L	L	I	R	D	L	O	R	G	L	E	N	P	O	O	L	S
O	K	L	A	H	D	L	F	O	N	N	I	V	H	A	I	O	P	N	E	L	G	A
I	E	G	O	R	A	L	I	A	D	E	B	A	T	S	A	M	B	O	E	Y	M	G
L	N	M	I	R	H	X	S	T	A	T	E	H	O	O	D	U	C	N	A	T	A	L
L	E	H	U	T	S	U	O	K	L	A	H	O	M	A	L	E	O	W	H	N	B	A
I	T	T	F	A	O	C	A	T	I	H	S	A	W	L	A	L	S	I	O	E	E	R
B	A	I	G	H	B	W	M	L	O	R	T	E	P	A	R	O	R	R	C	W	W	U
N	F	Y	T	R	O	F	I	T	W	E	N	T	N	H	U	R	B	G	E	T	L	T
T	A	N	F	A	S	O	K	H	E	T	A	T	S	O	T	T	W	A	R	G	I	A
S	E	V	E	N	T	U	W	O	H	T	N	E	T	M	A	E	N	S	T	W	O	N
T	E	N	T	H	O	R	G	N	I	W	O	R	G	A	N	P	E	O	E	G	O	R

WORD LIST

Some of the words may be used more than once.

BILLION	GAS	OKLAHOMA	STATEHOOD
DAILY	GLEN POOL	ONE	TEN
DRILLED	GROWING	OSAGE	TEN THOUSAND
FIFTH	NATURAL GAS	PETROLEUM	THIRD
FORTY	OIL	ROGERS	TWENTY
FOUR	OIL WELL	SEVENTY	WASHITA

FUEL RESOURCES OF OKLAHOMA—Crossword Puzzle

Across

2 Deep underground in Oklahoma, sandstone beds are important _____ for oil and gas.
5 Oklahoma was the leading producer of _____ in the nation from 1907 through 1923.
7 The first field test of the _____ seismograph was conducted in 1921 near Belle Isle, a suburb of Oklahoma City.
9 In 1924, _____ drilling was introduced to Oklahoma.
10 The Oklahoma Capitol is the only Capitol with producing _____ on its grounds.
11 One of the largest active oil refineries in Oklahoma is located in this city. _____ _____
13 The mineral fuels coal, petroleum, natural gas, and uranium provide the primary sources of _____ currently consumed in the world.
15 The discovery well for one of the world's greatest oil fields was drilled in June 1928 in _____ ____.
17 _____ ___ presently provides two-thirds of the total revenue from petroleum production in Oklahoma.
20 In 1996, Oklahoma ranked _____ in the production of petroleum among the producing states.
21 The process of restoring the land to its original condition after surface mining in Oklahoma is called _____.
22 Earth material overlying a coal bed is called _____ and must be removed before the coal can be "stripped."
23 The Burbank field, one of the oldest and most productive large oil fields in Oklahoma, is in _____ County, the largest county in the State.
25 Fuel resource in Oklahoma that may cause acid-mine drainage. _____
28 In 1996, Oklahoma's _____ production was just over 85 million barrels, the lowest total production for the State since 1914.

Down

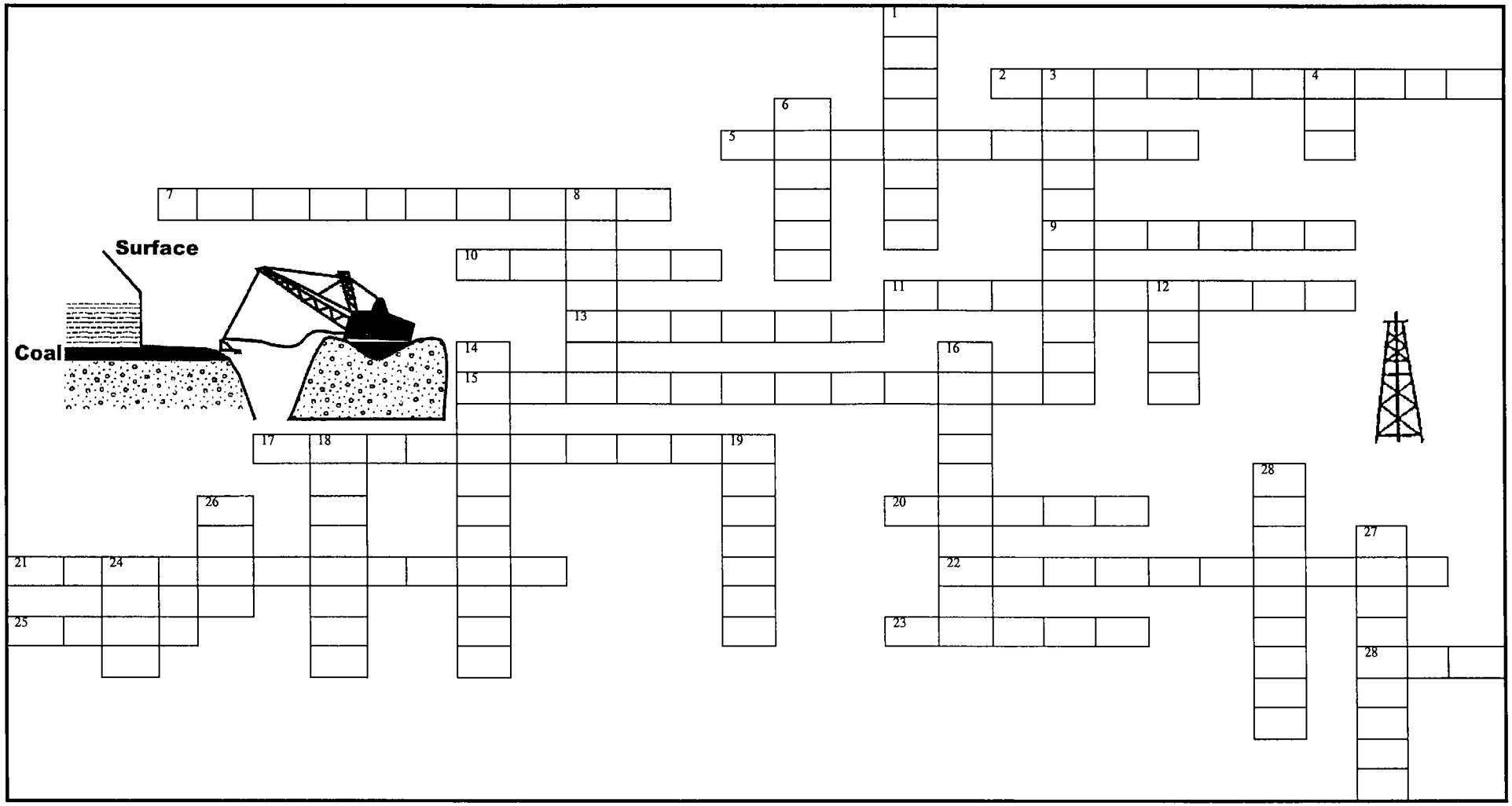
1 In the early days of coal mining, miners used _____ to detect deadly gases.
3 Coal in Oklahoma is used primarily for the generation of _____.
4 The first commercial _____ well in Oklahoma was completed at Bartlesville, Washington County, in 1897.
6 In 1996, Oklahoma was the _____ largest producer of natural gas among the producing states.
8 The first exploratory ____ _____ in Oklahoma was drilled in 1884.
12 _____ beds are mined either by surface stripping or by underground mining in Oklahoma.
14 _____ ____ are sedimentary rocks rich in organic material that were changed into petroleum through pressure, heat, and time.
16 The most common rank (type) of coal mined in Oklahoma is called _____.
18 A prolific oil- and gas-producing basin in western Oklahoma with as much as 40,000 feet of sediment. _____
19 Almost all Oklahoma coal has been mined by _____ methods.
24 Perhaps the largest _____–burning cogeneration plant in the world is near the town of Spiro in Le Flore County, Oklahoma.
26 Vast resources of bituminous _____ are present in eastern Oklahoma.
27 The _____ industry has been the greatest single source of revenue in Oklahoma every year since Statehood.
28 Of Oklahoma's 77 counties, 70 were producing _____ in 1995.

WORD LIST

Some of the words may be used more than once.

ANADARKO	FIFTH	OVERBURDEN	ROTARY
BITUMINOUS	NATURAL GAS	PETROLEUM	SECOND
CANARIES	OIL	PONCA CITY	SOURCE ROCKS
COAL	OIL WELL	RECLAMATION	SURFACE
ELECTRICITY	OKLAHOMA CITY	REFLECTION	WELLS
ENERGY	OSAGE	RESERVOIRS	

FUEL RESOURCES OF OKLAHOMA—Crossword Puzzle



FUEL RESOURCES OF OKLAHOMA—Word Search

Look for the words below, all related to fuel resources of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to fuel resources of Oklahoma is included in the crossword puzzle.

M	A	T	I	O	N	S	V	M	U	E	L	O	R	T	E	P	O	R	S	E	C	R
E	L	E	C	A	F	R	U	S	E	C	O	N	D	R	O	K	R	U	R	D	E	N
C	A	N	A	R	I	E	S	O	V	E	V	O	S	A	R	E	O	A	Y	C	R	N
L	E	W	E	L	E	C	T	R	I	C	I	T	Y	A	F	N	N	G	L	L	E	A
F	I	F	T	H	L	L	E	W	L	I	O	M	D	L	I	A	R	A	N	D	S	T
Y	T	I	C	A	M	O	H	A	L	K	O	A	E	M	C	E	M	E	R	C	E	U
S	K	C	O	R	E	C	R	U	O	S	N	C	U	A	N	A	R	U	O	S	R	R
W	H	O	Y	R	A	T	A	O	R	A	T	T	L	E	T	T	B	O	I	G	V	A
E	Y	T	I	C	A	C	N	O	P	I	I	H	I	I	C	R	E	G	A	S	O	L
L	L	E	O	O	A	R	Y	W	O	B	P	F	O	W	E	N	E	G	A	S	I	G
L	R	E	F	L	E	C	T	N	D	O	C	N	B	V	Y	R	A	T	O	R	R	A
S	L	A	O	C	I	C	A	C	N	O	P	I	O	L	E	R	V	O	I	R	S	S

WORD LIST

Some of the words may be used more than once.

ANADARKO
BITUMINOUS
CANARIES
COAL
ELECTRICITY
ENERGY
FIFTH
NATURAL GAS
OIL
OIL WELL
OKLAHOMA CITY
OSAGE
OVERBURDEN
PETROLEUM
PONCA CITY
RECLAMATION
REFLECTION
RESERVOIRS
ROTARY
SECOND
SOURCE ROCKS
SURFACE
WELLS

"BLACK GOLD"—OKLAHOMA OIL TRIVIA
Crossword Puzzle

Across

3 One of the most prolific gas provinces in North America in which some of the world's deepest wells have been drilled. _____ ____

4 The world's first school of _____ geology was established in 1900 on the University of Oklahoma campus, Norman.

8 The introduction of _____ drilling to Oklahoma was in 1924.

9 Location of the State's earliest oil refinery, built in 1905. _____

10 First oil-well site on Spencer Creek, near Chelsea in _____ County.

11 The first oil-well discovery of the 20th century occurred at Red Fork, just southwest of _____.

14 In 1930, the ___ ___ ____ in the Oklahoma City Field blew out and remained out of control for 11 days.

17 A new well in unproved territory. _____

18 In 1996, Oklahoma's oil production was just over 85 _____ barrels, which is the lowest total production for the State since 1914.

19 Well without commercial quantities of oil or gas. ____ _____

20 In 1982, Oklahoma _____ ____ reached a high point of $37.60 per barrel.

24 Areas on a seismic recording suggesting the possibility of oil or gas. _____ _____

25 Small-volume well in older field usually producing less than 10 barrels of oil per day. _____

26 Sampling rock from a well for study. _____

Down

1 Underground strata containing petroleum. ____ _____

2 Name for crew shelter on drilling rig. _____

5 In 1986, Oklahoma crude oil reached a _____ point of $11.15 per barrel.

6 Assistants to the head driller on a rig. _____

7 Contains 42 gallons of oil. _____

9 The high-level platform on a derrick. _____ ____

12 The first commercial oil well was the Nellie Johnstone No. 1, discovered in 1897 at _____, Indian Territory.

13 One of the nation's leading oil fields discovered in 1928. _____ ___

15 Member of a seismic crew. _____

16 Name for recovering drilling tools lost down the well. _____

18 Drilling lubricant and circulating agent. _____

21 Collecting geophysical data from inside the well. _____

22 The first field test of the _____ seismograph was conducted in 1921 near Belle Isle, a suburb of Oklahoma City.

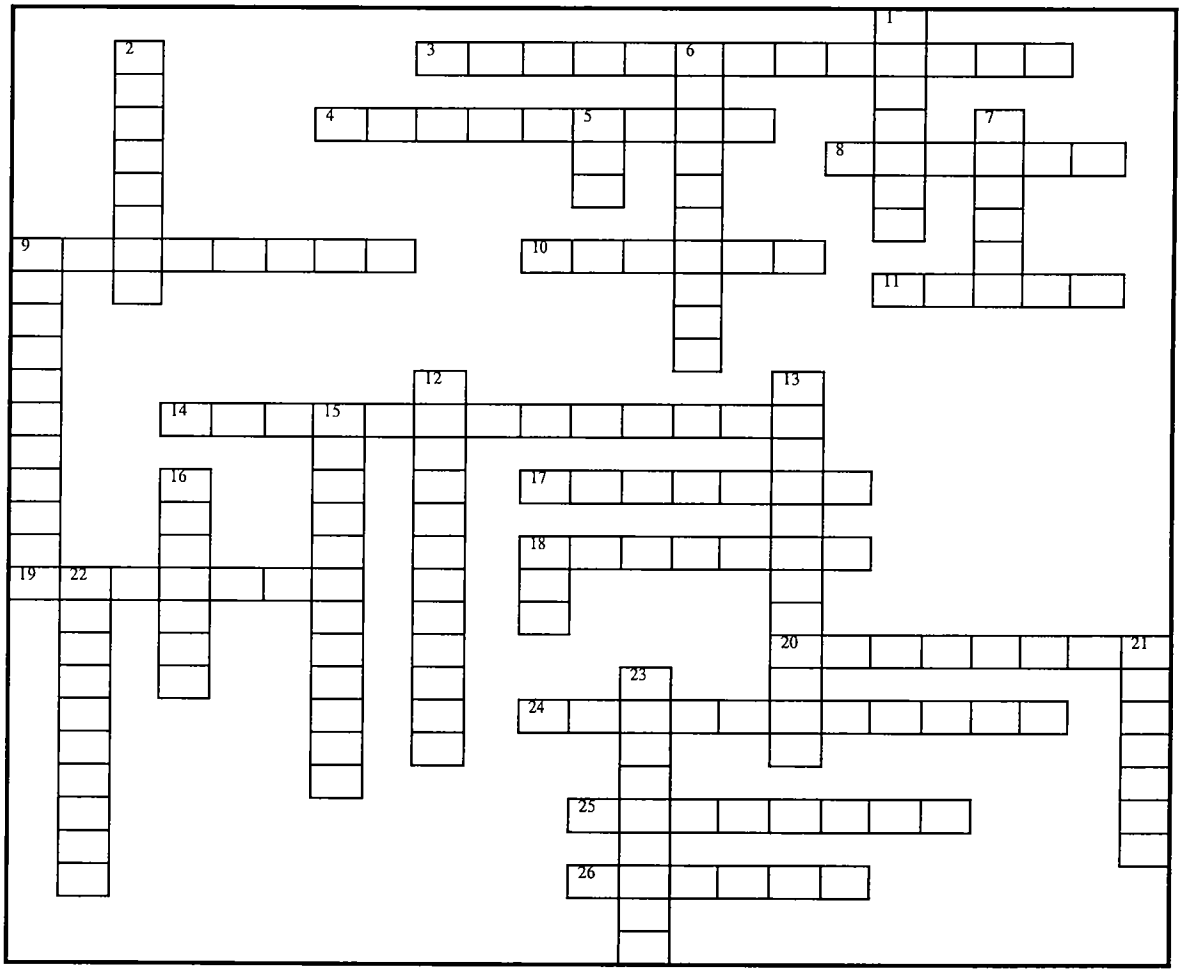
23 Well about which all information is kept secret. _____ ____

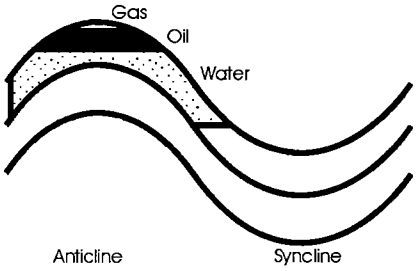
WORD LIST

Some of the words may be used more than once.

ANADARKO BASIN	DOODLEBUGGER	MUD	ROUGHNECKS
BARREL	DRY HOLE	MUSKOGEE	ROTARY
BARTLESVILLE	FISHING	OKLAHOMA CITY	STRIPPER
BRIGHT SPOTS	LOGGING	PAY ZONE	TIGHT HOLE
CORING	LOW	PETROLEUM	TULSA
CRUDE OIL	MILLION	REFLECTION	WILDCAT
DOGHOUSE	MONKEY BOARD	ROGERS	WILD MARY SUDIK

"BLACK GOLD"—OKLAHOMA OIL TRIVIA
Crossword Puzzle





"BLACK GOLD"—OKLAHOMA OIL TRIVIA
Word Search

Look for the words below, all related to oil trivia of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to oil trivia of Oklahoma is included in the crossword puzzle.

E L L I V S E L T R A B M U S K O G E E S I F
S W G N O I L L I M D U M N O I T C E L F E R
K M N D K A N A U B K I D U S Y R A M D L I W
C E I U L W S E S O K L A H O M A C I T Y R I
E N G R A L L Y W S T O P S T H G I R B G O L
N O G C U O R O G U O R E G G U B E L D O O D
H Z O T R A L O B Y E K N O M L I O E D U R C
G Y L T M O N K E Y B O A R D M G N I R O C A
U A E D B A R R E L I R O C E L O H T H G I T
O P L B E L D O O D S R E G O R E P P I R T S
R I R O T A R Y E S U O H G O D G N I H S I F
W D R Y H O L E P A N I S A B O K R A D A N A

WORD LIST

Some of the words may be used more than once.

ANADARKO BASIN
BARREL
BARTLESVILLE
BRIGHT SPOTS
CORING
CRUDE OIL
DOGHOUSE
DOODLEBUGGER
DRY HOLE
FISHING
LOGGING
LOW
MILLION
MONKEY BOARD
MUD
MUSKOGEE
OKLAHOMA CITY
PAY ZONE
PETROLEUM
REFLECTION
ROGERS
ROUGHNECKS
ROTARY
STRIPPER
TIGHT HOLE
TULSA
WILDCAT
WILD MARY SUDIK

"GEOLOGIC SCENERY"—A LOOK AT OKLAHOMA'S STATE PARKS
Crossword Puzzle

Across

1 Glass Mountain State Park in Major County is known for its bluffs and slopes littered with crystals and fragments that look like glass but in fact are fragments of the mineral _____.

4 Alabaster Caverns in _____ County is the largest known commercial gypsum cave in North America.

5 Red Rock Canyon near Hinton, Oklahoma, was formed primarily by _____ erosion in sandstones of Permian age.

6 The rocks that crop out in Wister State Park are assigned to the _____ Period of geologic time.

8 Little Sahara Recreation Area in Woods County is a popular place to observe ____ _____.

9 This State park enjoys notoriety as a former hideout for outlaws. _____ ____

10 Wister State Park is in the southern part of the coal- and gas-producing _____ basin.

11 This geologic feature (sandstone butte) near Red Rock Canyon State Park in Caddo County was a landmark for emigrants traveling west during the California gold rush. _____ _____

13 Beavers Bend State Park in McCurtain County is noted for a volcanic rock called _____, which is made up of volcanic ash and pumice.

16 Magnificent _____ cliffs surround Lake Tenkiller State Park in eastern Oklahoma.

17 Unusual rock formations referred to as "The Old Maid's Profile" and "The Wedding Party" can be seen at _____ ____ State Park in Cimarron County.

18 Beavers Bend State Park is in the southeastern corner of Oklahoma in the _____ Mountains.

19 At Sequoyah State Park in Cherokee County, common marine fossils found are crinoids in sedimentary rocks formed during the _____ Period of geologic time.

Down

2 Robbers Cave State Park near Wilburton is unique in that caves are formed in the sedimentary rock _____.

3 Caves in gypsum layers at Roman Nose State Park serve as natural outlets for _____ ____ in that area.

7 "Cathedral Dome," "Devil's Bathtub," and "Gun Barrel Tunnel" are features seen at _____ ____ State Park.

11 The mineral gypsum is very common at _____ ____ State Park in Blaine County.

12 _____ quartz is a variety of the mineral quartz having a cloudy white appearance that can be collected in the Beavers Bend State Park area.

14 In the 1930s, several _____ quarries were opened and excavated at Black Mesa State Park.

15 The dam at Wister State Park impounds waters of Fourche Maline and the _____ River.

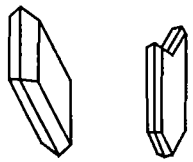
WORD LIST

Some of the words may be used more than once.

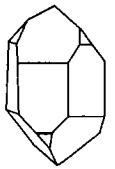
ALABASTER CAVERNS	GYPSUM	PENNSYLVANIAN	SAND DUNES
ARKOMA	LIMESTONE	POTEAU	SANDSTONE
BLACK MESA	MILKY	ROBBERS CAVE	STREAM
DINOSAUR	MISSISSIPPIAN	ROCK MARY	TUFF
GROUND WATER	OUACHITA	ROMAN NOSE	WOODWARD

"GEOLOGIC SCENERY"—A LOOK AT OKLAHOMA'S STATE PARKS

Crossword Puzzle



GYPSUM



QUARTZ

"GEOLOGIC SCENERY"—A LOOK AT OKLAHOMA'S STATE PARKS
Word Search

Look for the words below, all related to State parks of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to State parks of Oklahoma is included in the crossword puzzle.

N	R	A	S	S	D	A	S	E	M	K	C	A	L	B	L	N	R	E
A	A	L	A	B	I	A	S	T	E	R	C	A	V	M	I	L	K	Y
I	G	R	O	U	N	D	W	A	T	E	R	H	M	F	M	B	B	R
N	T	K	A	R	O	M	A	N	N	O	S	E	A	M	E	U	S	A
A	L	A	B	A	S	T	E	R	C	A	V	E	R	N	S	E	M	M
V	L	O	D	R	A	W	D	O	O	W	M	U	K	A	T	I	A	K
L	M	A	T	I	U	A	T	I	H	C	A	U	O	L	O	I	P	C
Y	Y	D	Y	G	R	U	O	G	Y	P	S	U	M	R	N	B	H	O
S	K	U	O	I	R	O	B	B	E	R	S	C	A	V	E	E	O	R
N	T	E	E	C	R	N	A	I	P	P	I	S	S	I	S	S	I	M
N	A	R	L	O	U	P	E	N	N	T	Y	P	R	I	K	M	A	Y
E	A	L	E	Y	S	S	A	N	D	D	U	N	E	S	N	T	O	Y
P	O	T	E	A	U	S	A	R	K	C	N	F	M	U	O	P	N	E
F	E	R	G	N	M	G	H	J	K	U	T	D	F	O	K	C	R	O

WORD LIST

Some of the words may be used more than once.

ALABASTER CAVERNS
ARKOMA
BLACK MESA
DINOSAUR
GROUND WATER
GYPSUM
LIMESTONE
MILKY
MISSISSIPPIAN
OUACHITA
PENNSYLVANIAN
POTEAU
ROBBERS CAVE
ROCK MARY
ROMAN NOSE
SAND DUNES
SANDSTONE
STREAM
TUFF
WOODWARD

OKLAHOMA FOSSILS—Crossword Puzzle

Across

2 Marine invertebrate fossils, including ammonites, primitive oyster-like clams, and echinoids called "heart urchins," are common in Cretaceous-age rocks in the _____ _____ area.

3 The earliest preserved shelled invertebrate animals found in Oklahoma rocks are called _____.

6 Asphalt-impregnated limestone of _____age near Sulphur in Murray County contains some of the world's oldest fossils exhibiting pristine preservation, with their shells retaining their original iridescence.

8 Fossils of Jurassic-age dinosaurs have been found in the _____ of western Oklahoma.

10 Scientists who study fossils. _____

14 Pleistocene-age fossils of mammoths and _____ that inhabited Oklahoma about 12,000–14,000 years ago have been found throughout Oklahoma.

15 The first (earliest) documented terrestrial (land) _____ appeared in Oklahoma in Devonian-age rocks, forming an extensive forest in the Ada vicinity.

17 Large, fin-backed primitive reptiles, amphibians, and conifer-like plants dominate this geologic period. _____

19 The earliest record of _____ life in Oklahoma occurs in the form of small fish scales and plates in Ordovician-age rocks.

20 The first reported fossils of Mesozoic mammals in Oklahoma occur in _____ -age rocks.

21 Coal deposits are formed primarily from fossil _____.

23 During the Mesozoic Era (the "Age of Reptiles") many kinds of _____ roamed what is now Oklahoma.

Down

1 Based on skeletal and artifact evidence, _____ (the earliest people in North America) lived in Oklahoma about 11,000–12,000 years ago.

4 The most common fossils found in Paleozoic-age rocks in Oklahoma. _____

5 White Mound in southeastern Murray County is world famous for its Early _____ invertebrate fossils.

6 About 50 localities in Oklahoma have yielded the remains of fossil elephants in _____-age rocks.

7 Fossil structures called stromatolites, formed by _____, have been found in Ordovician-age rocks in Oklahoma.

9 A spectacular _____trackway is preserved in the Jurassic-age Morrison Formation near Kenton, Oklahoma.

11 Fossil leaf impressions from flowering plants called _____ are common in Cretaceous-age deposits.

12 Any remains, traces, or imprints of a plant or animal preserved in rock is called a _____.

13 The Mesozoic Era of geologic time is commonly called the "Age of _____."

16 *Stegosaurus, Apatosaurus,* and *Acrocanthosaurus* are all examples of fossil _____ found in Oklahoma.

17 One of the richest deposits of _____ -age reptile and amphibian fossils in the world is found in a limestone quarry at Richards Spur, near Fort Sill, Oklahoma.

18 1.4-billion-year-old rocks of _____ age have yielded no fossils in Oklahoma.

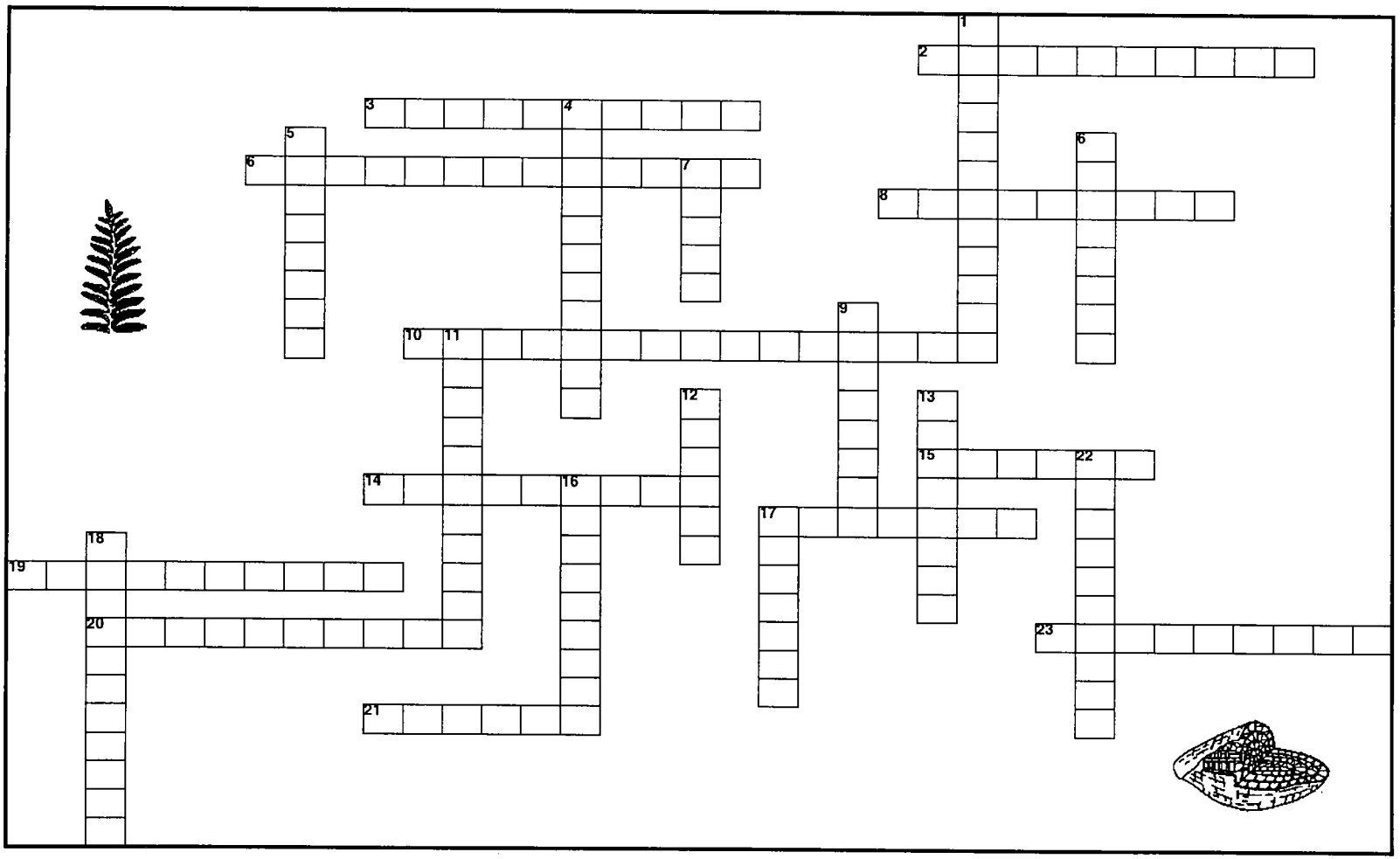
22 The largest (up to 3 inches long) fossil _____ west of the Mississippi River are found in rocks of Ordovician age in Oklahoma.

WORD LIST

Some of the words may be used more than once.

ALGAE	CRETACEOUS	LAKE TENKILLER	PALEONTOLOGISTS	PRECAMBRIAN
ANGIOSPERMS	DEVONIAN	LAKE TEXOMA	PANHANDLE	REPTILES
BRACHIOPODS	DINOSAUR	MASTODONS	PENNSYLVANIAN	TRILOBITES
CENOZOIC	DINOSAURS	MESOZOIC	PERMIAN	VERTEBRATE
CORALS	FOSSIL	PALEOINDIANS	PLANTS	

OKLAHOMA FOSSILS—Crossword Puzzle



OKLAHOMA FOSSILS—Word Search

Look for the words below, all related to fossils of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to fossils of Oklahoma is included in the crossword puzzle.

S	D	O	P	O	I	H	C	A	R	B	W	D	I	N	O	S	A	U	R	W	P	L
L	B	T	W	S	M	P	A	L	E	O	N	T	O	L	O	G	I	S	T	S	A	M
O	R	I	O	N	E	M	N	H	C	B	R	A	C	H	I	W	V	T	S	K	N	L
M	A	B	I	O	S	E	Z	I	B	C	E	W	N	T	E	K	A	L	E	C	H	K
E	C	O	T	D	O	S	O	O	M	N	P	A	V	E	R	T	E	T	A	B	A	H
S	H	L	P	O	Z	Z	A	N	T	R	I	L	O	B	I	T	E	S	O	N	N	C
U	I	I	E	T	O	P	L	E	W	M	O	N	A	F	W	X	A	L	G	A	D	A
O	O	R	R	S	C	O	G	C	R	W	N	A	S	R	O	B	C	E	A	G	L	A
E	R	T	E	A	R	S	A	E	T	S	R	I	C	M	N	S	O	L	G	A	E	R
C	T	M	S	M	R	E	P	S	O	I	G	N	A	D	I	N	S	W	M	N	O	B
A	W	V	E	R	T	E	R	S	T	N	M	O	B	C	S	E	L	I	T	P	E	R
T	P	A	L	E	O	N	G	B	C	W	R	V	P	E	R	M	I	O	L	W	X	N
E	M	D	E	V	O	N	H	A	P	C	R	E	T	A	S	T	H	M	N	O	E	L
R	O	C	R	E	T	A	K	O	U	E	S	D	H	A	N	D	L	E	P	A	N	O
C	E	N	O	Z	O	I	C	B	O	N	K	M	E	T	A	R	B	E	T	R	E	V

WORD LIST

Some of the words may be used more than once.

ALGAE
ANGIOSPERMS
BRACHIOPODS
CENOZOIC
CRETACEOUS
DEVONIAN
DINOSAUR
FOSSIL
LAKE TEXOMA
MASTODONS
MESOZOIC
PALEONTOLOGISTS
PANHANDLE
PERMIAN
REPTILES
TRILOBITES
VERTEBRATE

"TREASURES BURIED IN ROCKS"—Oklahoma Fossils
Crossword Puzzle

Across

2 Fossil bones of camels, elephants, horses, and saber-toothed cats have been found in western Oklahoma from sediments of _____ age.

3 The Arbuckle Limestone of the Arbuckle Mountains contains excellent "heads" of these primitive plants. _____

6 The most common Paleozoic fossils in Oklahoma are _____.

8 The Cretaceous Period began the rise of modern plants with the early appearance of flowering plants called _____.

9 The oldest fossil _____ in Oklahoma is *Callixylon* (350 m.y. ago), which can be seen in the restored state at the campus entrance of East Central State University at Ada.

12 The official State _____ of Oklahoma is a Jurassic-age dinosaur.

13 A type of sedimentary rock formed from the consolidation of fossil plant material. _____

15 One type of extinction of animals may have been caused by a change in the _____ in which the animals may not have been able to adapt.

16 Specimens of the genus *Isotelus* found in Ordovician rocks of the Criner Hills represent the largest _____ west of the Mississippi River.

17 _____ resources are, in fact, the result of highly altered remains of plants and animals that populated the Earth in the geologic past.

19 The first unquestioned land plants occurred in Oklahoma with the beginning of the _____ Period.

20 Fossils occur most commonly in _____ rocks.

22 Permian-age rocks in central Oklahoma have yielded extensive collections of these vertebrates. _____

Down

1 Large, coiled invertebrate fossils (now extinct) of Cretaceous age called _____ can be collected in the vicinity of Lake Texoma.

4 These extinct invertebrate fossils are found commonly preserved as black carbon films resembling saw blades in lower Paleozoic rocks in the Arbuckle Mountains. _____

5 Commonly found in Pennsylvanian and Permian rocks of north-central Oklahoma are small wheat-grain-shaped ("football-shaped") fossils called _____.

7 The oldest fossil tree was collected from the Devonian-age Woodford Formation in the _____ Mountains.

9 The climate of the Pennsylvanian Period in Oklahoma, as evidenced from plants, was _____.

10 Scientist who studies life from the geologic past. _____

11 An aquatic shelled animal collected from creeks and streams was a common food staple for native American Indians in Oklahoma. _____

14 Occasionally in Oklahoma, specimens of mammoth or mastodon teeth and tusks (fossil elephants) are dug out of sand or gravel terrace deposits of _____ age.

18 Native American Indians in Oklahoma collected these invertebrate fossils (animals without backbones) to make ceremonial necklaces and bracelets. _____

21 Fossils commonly found when mining coal in Oklahoma. _____

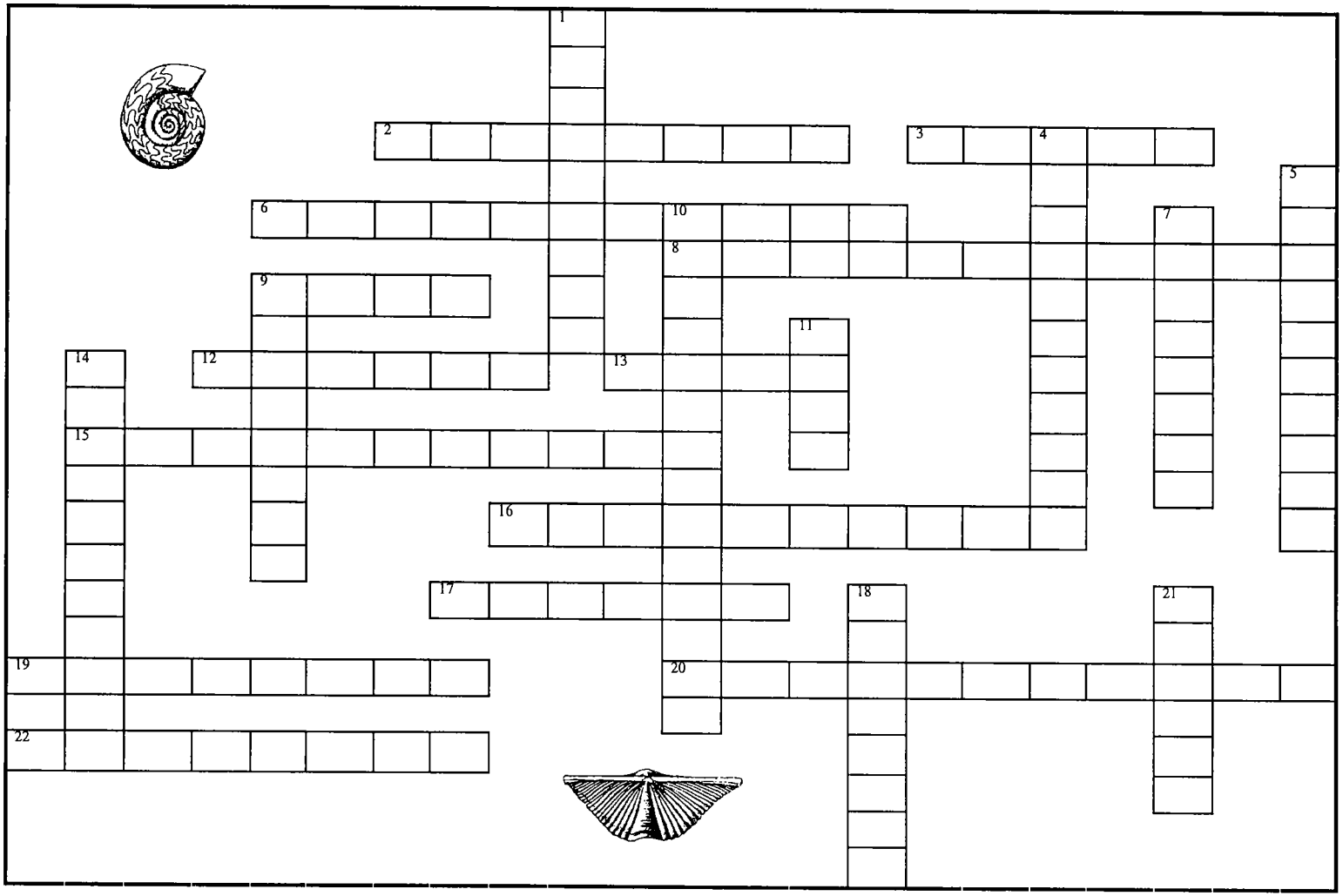
WORD LIST

Some of the words may be used more than once.

ALGAE	CLAM	FOSSIL	REPTILES
AMMONITES	COAL	FUSULINIDS	SEDIMENTARY
ANGIOSPERMS	CRINOIDS	GRAPTOLITES	TREE
ARBUCKLE	DEVONIAN	PALEONTOLOGIST	TRILOBITES
BRACHIOPODS	ENERGY	PLANTS	TROPICAL
CENOZOIC	ENVIRONMENT	PLEISTOCENE	

"TREASURES BURIED IN ROCKS"—OKLAHOMA FOSSILS

Crossword Puzzle



"TREASURES BURIED IN ROCKS"—OKLAHOMA FOSSILS
Word Search

Look for the words below, all related to fossils of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to fossils of Oklahoma is included in the crossword puzzle.

A	Y	G	R	E	N	E	M	A	R	B	U	C	K	L	E	P	L	A	N	T	S	A
M	O	L	A	C	I	P	O	R	T	R	I	L	O	B	I	T	E	S	N	A	L	P
M	T	R	S	D	O	P	O	I	H	C	A	R	B	F	U	M	A	L	C	O	A	R
O	S	E	T	I	N	O	M	M	A	Y	R	A	T	N	E	M	I	D	E	S	K	E
L	F	O	S	S	E	N	V	I	R	O	N	M	E	N	T	C	E	N	O	Z	N	P
I	G	R	A	P	T	T	S	I	G	O	L	O	T	N	O	E	L	A	P	L	A	T
S	D	I	N	I	L	U	S	U	F	S	M	R	E	P	S	O	I	G	N	A	I	I
S	H	C	I	O	Z	O	N	E	C	P	A	L	E	T	R	I	L	O	B	T	N	L
O	C	R	L	O	H	E	P	L	E	I	S	T	O	C	E	N	E	P	L	E	O	E
F	O	G	Y	C	E	E	K	C	U	B	R	A	L	G	A	E	B	R	A	C	V	S
B	A	E	N	R	G	Y	L	A	O	C	R	I	N	O	I	D	S	V	E	D	E	U
E	A	N	T	R	O	P	S	E	T	I	L	O	T	P	A	R	G	G	L	A	D	E

WORD LIST

Some of the words may be used more than once.

ALGAE
AMMONITES
ANGIOSPERMS
ARBUCKLE
BRACHIOPODS
CENOZOIC
CLAM
COAL
CRINOIDS
DEVONIAN
ENERGY
ENVIRONMENT
FOSSIL
FUSULINIDS
GRAPTOLITES
PALEONTOLOGIST
PLANTS
PLEISTOCENE
REPTILES
SEDIMENTARY
TREE
TRILOBITES
TROPICAL

THOSE TERRIBLE "LIZARDS"—DINOSAURS OF OKLAHOMA
Crossword Puzzle

Across

2 Remains of these large vertebrate fossils have been collected in the Oklahoma Panhandle and in southeastern Oklahoma. _____

6 The _____ Mountains stood high during the time dinosaurs roamed coastal areas in what is now southeastern Oklahoma.

7 Dinosaurs, along with flying reptiles, many swimming reptiles, and giant clams, disappeared at the end of the _____ Period.

9 The age of the dinosaurs was the _____ Era.

10 What herbivorous dinosaurs ate. _____

12 Some workers have suggested that dinosaurs may be more like these than reptiles. _____

14 Supposedly the most ferocious dinosaur that ever lived. _____ ____

15 One of the largest collections of _____ fossils in the United States is housed at the Oklahoma Museum of Natural History in Norman.

16 The name of the geologic formation in which specimens of the dinosaur *Acrocanthosaurus* were found. _____

17 Scientist who coined the word "dinosaur" in 1841. _____

18 Sauropods—herbivorous dinosaurs with huge bodies and very long necks and tails—were _____ to *Acrocanthosaurus*.

19 *Stegosaurus* had one the size of a walnut. _____

20 *Acrocanthosaurus* was one of the largest _____ that lived during the Early Cretaceous.

Down

1 The name *Acrocanthosaurus*, which means "high-spined _____," comes from the ridge of bony spines extending upward from vertebrae of the backbone.

3 Two specimens of this general dinosaur group, which may represent some of the last of this group native to North America, were discovered in rocks representing the same time period in Oklahoma when *Acrocanthosaurus* lived. _____

4 During the Early Cretaceous, the southern coastline of North America was much farther _____ than it is today.

5 _____ footprints can be observed in a stream bed near Kenton, Oklahoma.

8 To be preserved as fossils, animals must be buried rapidly by _____.

11 Abbreviation for workers who assisted scientific field parties in the collecting of dinosaur bones in Oklahoma during the Great Depression. _____

13 Southeastern Oklahoma was a _____ ____ during the days of *Acrocanthosaurus*.

16 The meat-eating dinosaur *Acrocanthosaurus atokensis* was collected from Cretaceous-age deposits in _____ County.

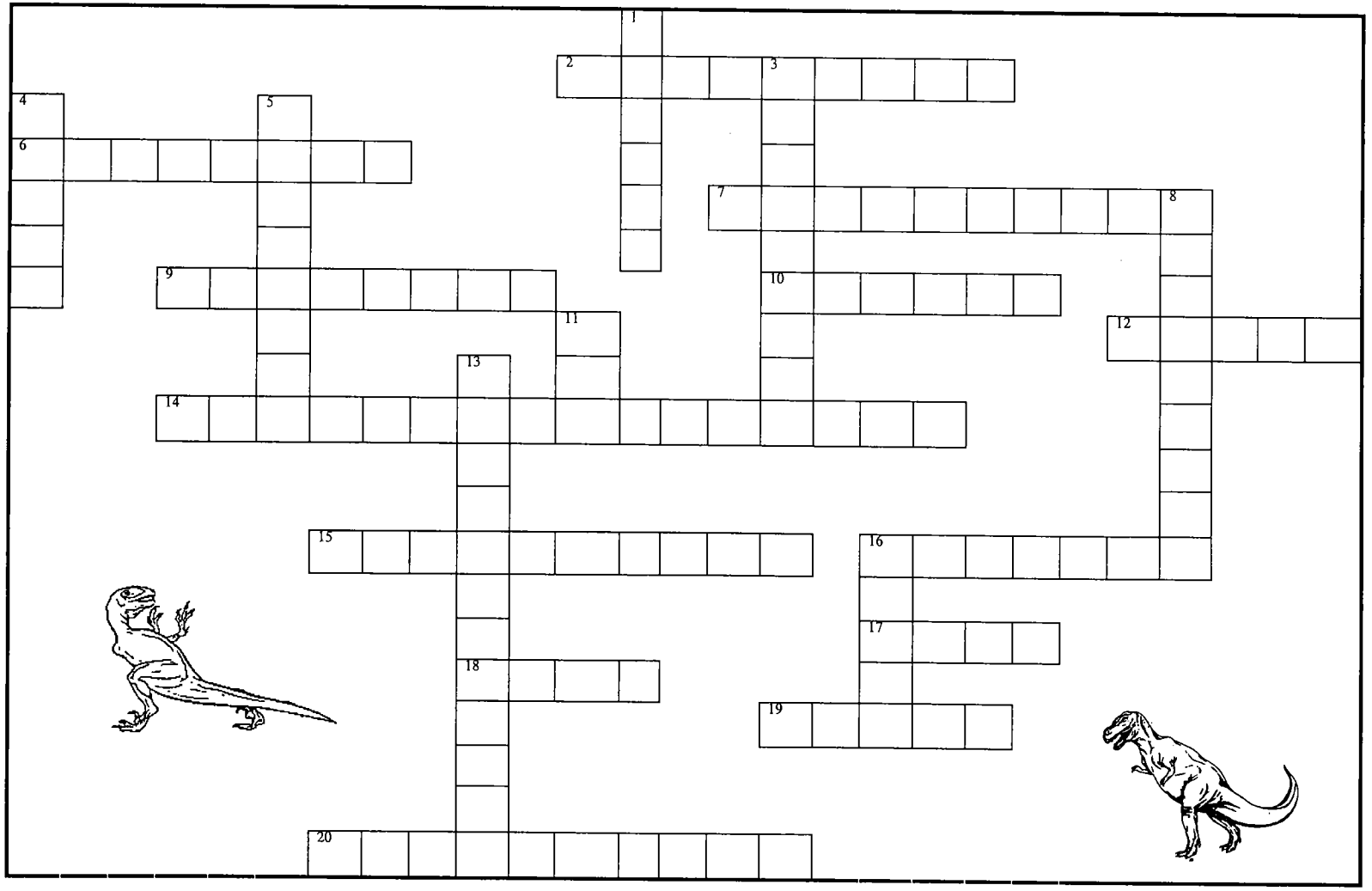
WORD LIST

Some of the words may be used more than once.

ANTLERS	DINOSAUR	PLANTS
ATOKA	DINOSAURS	PREY
BIRDS	LIZARD	SAUROPODS
BRAIN	MESOZOIC	SEDIMENTS
CARNIVORES	NORTH	TYRANNOSAURUS REX
COASTAL PLAIN	OUACHITA	VERTEBRATE
CRETACEOUS	OWEN	WPA

THOSE TERRIBLE "LIZARDS"—DINOSAURS OF OKLAHOMA

Crossword Puzzle



THOSE TERRIBLE "LIZARDS"—DINOSAURS OF OKLAHOMA
Word Search

Look for the words below, all related to dinosaurs of Oklahoma. The words may read forward, backward, across, down, or diagonally. Further information on these words and their relation to dinosaurs of Oklahoma is included in the crossword puzzle.

A	T	O	K	W	O	N	N	B	A	K	O	T	A	S	A	N	O	W	C	R	N	N
W	P	R	U	A	S	E	S	I	A	N	T	L	E	R	S	I	G	P	L	A	N	I
V	E	W	O	U	A	W	S	E	A	B	R	A	S	R	U	A	S	O	N	I	D	A
E	M	E	S	O	Z	O	I	C	F	L	I	Z	A	R	D	L	P	R	E	Y	S	R
R	B	T	Y	R	A	N	N	R	E	X	P	S	E	D	I	P	R	C	A	E	E	B
T	R	L	T	N	A	A	T	H	T	R	O	P	C	O	A	L	U	R	T	R	D	R
E	L	I	E	T	A	R	B	E	T	R	E	V	D	I	N	A	A	E	I	P	I	E
X	E	R	S	U	R	U	A	S	O	N	N	A	R	Y	T	T	S	T	H	N	M	X
B	I	N	O	R	T	H	C	R	E	T	A	C	E	O	U	S	O	A	C	T	E	O
S	D	O	P	O	R	U	A	S	E	D	I	M	E	N	T	A	N	M	A	R	N	N
S	D	R	I	B	O	W	E	S	T	N	A	L	P	C	A	O	I	E	U	O	T	I
D	I	N	O	C	A	R	N	I	V	O	R	E	S	P	L	C	D	S	O	N	S	D

WORD LIST

Some of the words may be used more than once.

ANTLERS
ATOKA
BIRDS
BRAIN
CARNIVORES
COASTAL PLAIN
CRETACEOUS
DINOSAUR
DINOSAURS
LIZARD
MESOZOIC
NORTH
OUACHITA
OWEN
PLANTS
PREY
SAUROPODS
SEDIMENTS
TYRANNOSAURUS REX
VERTEBRATE
WPA

GEODETECTIVES

INDUSTRIAL MINERALS

Fill in the blanks with the correct answer. The first letter of each correct answer will give you clues to the name for nonfuel, nonmetallic minerals that have potential for economic use.

1. _____ Oklahoma is now the sole source of domestic _____ in the United States, which is used for pharmaceuticals and disinfectants.
2. _____ Some examples of _____ commodities include crushed stone, portland cement, and gypsum.
3. _____ Oklahoma has a variety of sandstones, limestones, and granites suitable for _____ stone.
4. _____ Asphalt forms where crude oil migrates _____ near the land surface, leaving a heavy residue.
5. _____ Material called _____ represents deposits suitable for the manufacture of brick and tile products.
6. _____ Important _____ deposits are present in northeastern Oklahoma, and this mineral is used as a mild abrasive or in buffing and polishing compounds.
7. _____ Crushed granite is used mainly for _____ ballast (stone in railroad beds).
8. _____ Most shale deposits in Oklahoma contain _____ as the dominant clay mineral.
9. _____ An oil-based commodity used mainly as a road-surfacing and tar material in Oklahoma.
10. _____ Oklahoma is the _____ producer of crude gypsum in the United States.
11. _____ Gemstone production in Oklahoma includes fresh-water _____ shells and fresh-water pearls.
12. _____ Numerous and varied _____-mineral industries are active in 69 of Oklahoma's 77 counties.
13. _____ A number of major _____ salt springs have been used commercially since the turn of the 20th century.
14. _____ Oil, natural gas, and coal are all major sources of _____ to extract industrial-mineral resources.
15. _____ Limestone is used mainly as aggregate (crushed stone) in concrete, but it also is used in _____ construction.
16. _____ The major sources of rock asphalt and _____ are sedimentary rocks in and around the Arbuckle and Ouachita Mountains.
17. _____ Used as an aggregate in concrete, making cement, dimension stone, and road construction.
18. _____ Used primarily in recharging water softeners, for stock feed, food additives, and ice removal.

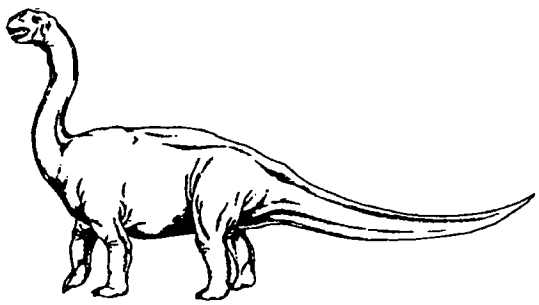
WORD LIST

ASPHALT ILLITE LEADING NONFUEL SALT
ASPHALTITE INDUSTRIAL LIMESTONE RAILROAD SHALE
DIMENSION IODINE MUSSEL ROAD TRIPOLI
ENERGY NATURAL UPWARD

GEODETECTIVES
OKLAHOMA DINOSAURS

Fill in the blanks with the correct answer. The first letter of each correct answer will give you clues to the name of the geologic period in which flying and many swimming reptiles, dinosaurs, and giant clams disappeared.

1. _____ *Acrocanthosaurus* was one of the largest _____ that lived during the Early Cretaceous.
2. _____ Dinosaurs, along with flying and swimming _____, disappeared at the close of the Cretaceous Period.
3. _____ The "age of the dinosaurs" was the Mesozoic _____.
4. _____ Supposedly the most ferocious dinosaur that ever lived was _____.
5. _____ Cretaceous-age deposits in _____ County have yielded important dinosaur skeletons.
6. _____ Southern Oklahoma was a _____ _____ during the reign of *Acrocanthosaurus*.
7. _____ Dinosaurs developed protective armor to prevent being attacked and _____ by predators.
8. _____ The name of the scientist who first used the word "dinosaur" in 1841 was _____.
9. _____ One of the largest collections of dinosaur skeletons in the _____ States is housed at the Oklahoma Museum of Natural History in Norman.
10. _____ This armor-plated dinosaur had a brain believed to be the size of a walnut.



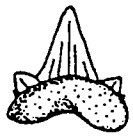
WORD LIST

ATOKA
CARNIVORES
COASTAL PLAIN
EATEN
ERA
OWEN
REPTILES
STEGOSAURUS
TYRANNOSAURUS
UNITED

FOSSILS—DIGGING UP THE PAST
PART 1

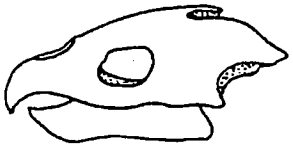
Draw a line matching the fossil picture with the correct fossil name.

ECHINOID

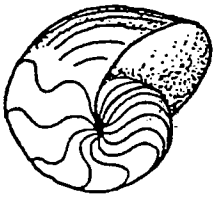


MARINE TURTLE SKULL

SHARK TOOTH

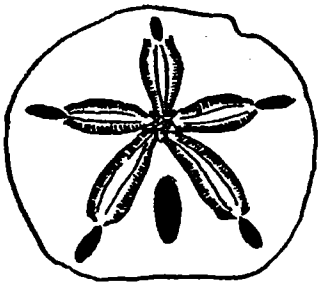


CEPHALOPOD



CLAM

CORAL

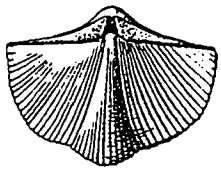


FOSSILS—DIGGING UP THE PAST
PART 2

Draw a line matching the fossil picture with the correct fossil name.

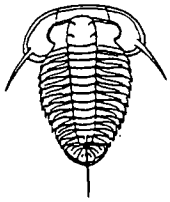
GASTROPOD (SNAIL)

WOOLY MAMMOTH

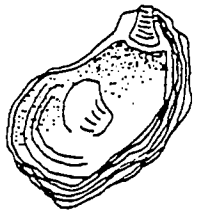


CRINOID

BRACHIOPOD



TRILOBITE

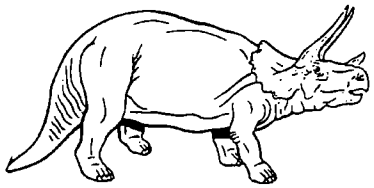


OYSTER

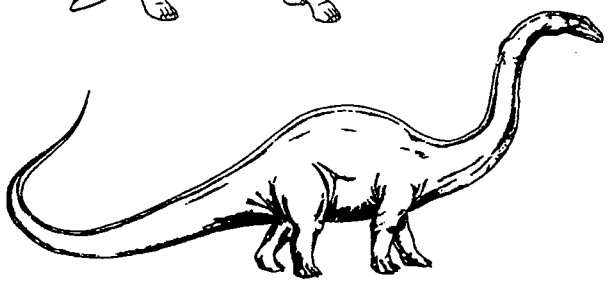
DINOSAURS IDENTIFIED
PART 1

Draw a line matching the dinosaur picture with the correct name of the dinosaur.

Dromaesaurid

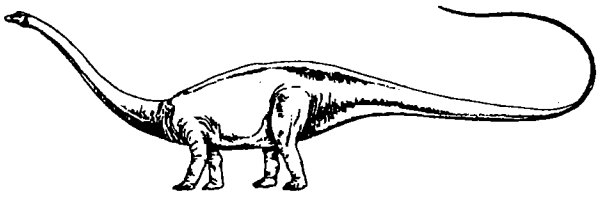


Stegosaurus

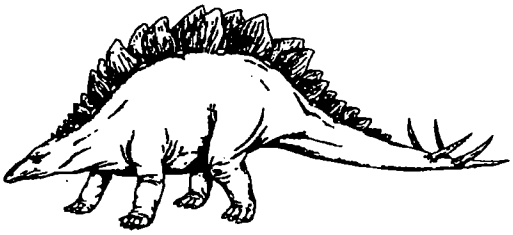


Tyrannosaurus

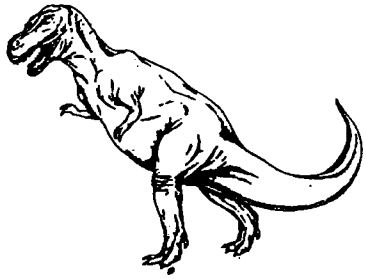
Apatosaurus



Triceratops



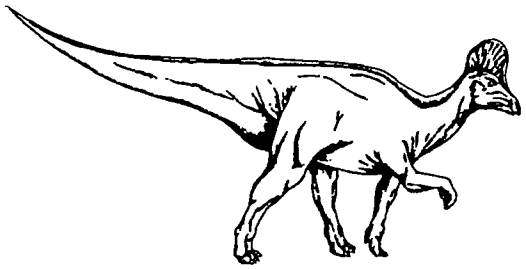
Diplodocus



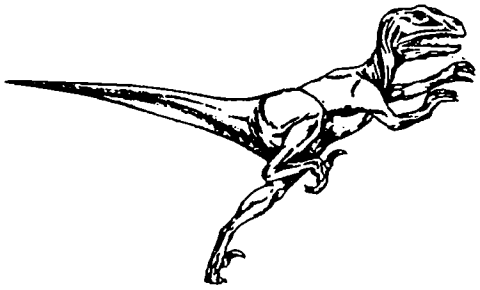
DINOSAURS IDENTIFIED
PART 2

Draw a line matching the dinosaur picture with the correct name of the dinosaur.

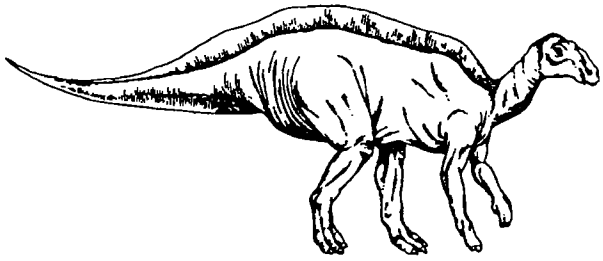
Hadrosaurus



Chasmosaurus

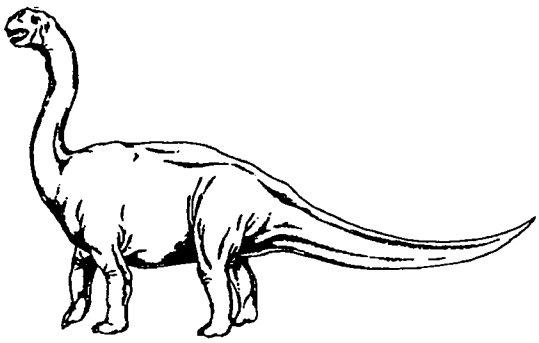


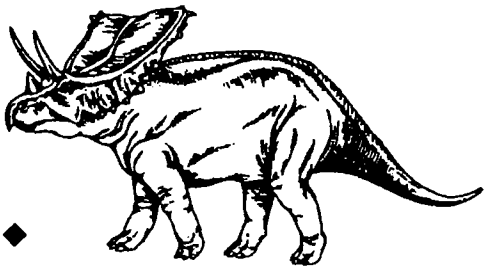
Camarasaurus



Corythosaurus

Deinonychus





SOME FACTS ABOUT OKLAHOMA GEOLOGY— Word Unscramble

Unscramble the words in the sentences below to learn more about Oklahoma geology.

The highest elevation in Oklahoma is about 4,973 feet and is located at _____ _____ (ablkc easm) in western Oklahoma. The three major mountain ranges in Oklahoma are the Arbuckles, Ouachitas, and _____ (tiswicha). The two major rivers in Oklahoma are the Red and the _____ (kasarnas). Most of the outcropping (exposed) rocks in Oklahoma are _____ (demsirytnae) in origin. The major source of ground _____ (rwate) in Oklahoma is precipitation. The weathering of rocks is responsible for most of the _____ (lrinmae) content of natural water. The light-colored, coarsely crystalline igneous rock _____ (egiantr) is also the name of an Oklahoma town. The chemical element _____ (lusfru) is the name of an Oklahoma town and is used in making matches. The official State rock is the _____ (oers) rock, commonly found in the Norman–Noble area. Currently in Oklahoma there are no active _____ (cnsvloaoe). The official State _____ (ssflio) for the State of Oklahoma is a Jurassic-age dinosaur. Coal deposits in eastern Oklahoma were formed from the accumulation of _____ (aptnls) in swamps. The most severe storms in Oklahoma consist of violently rotating columns of air called _____ (sotondrea).

The major geologic agents responsible for changing the surface of the State of Oklahoma through time are _____ (iervsr). The largest river in Oklahoma is the _____ (asaskarn). The most common rank (type) of _____ (laoc) produced in Oklahoma is bituminous. Most of the ground water in Oklahoma is used for _____ (itiongarri). Oklahoma's major ground-water aquifers (permeable rocks or deposits that are water-bearing) are _____ (tmeasr) deposits.

OKLAHOMA'S NATURAL RESOURCES—
Word Unscramble

Unscramble the words in the sentences below to learn more about Oklahoma's natural resources.

The rock-forming mineral _____ has a hardness of 6 and is used in bath tiles,
pdfearls

abrasives in cleansers, and roofing shingles. A common mineral extracted in the Oklahoma Panhandle with cubic cleavage and used as a food additive and for ice control on roads: _____.
elitah

The mineral _____ is mined in western Oklahoma and is used in wallboard and plaster of
ymusgp

Paris. The igneous rock _____ is quarried near Troy, Oklahoma, and is used as building trim
igraten

and monuments. Oklahoma ranks no. 1 in the production of _____ from natural oil-field brines.
oenidi

Oklahoma is one of the very few places in the world where sand rosettes (State rock) composed of the mineral _____ are found. High-purity silica sand from the _____ Mountains is used
abrtei auelkrbc

primarily for glass making. Oklahoma ranks no. 1 in the production of the mineral _____.
smupyg

The fuel resource in Oklahoma that may cause acid-mine drainage is called _____. The
aloc

_____ industry has been the greatest single source of revenue in Oklahoma every year since
etrepmulo

Statehood. Most Oklahoma coal has been mined by _____ methods. Oklahoma is the largest
rsufcea

exporter of _____ _____ to out-of-state markets. Oklahoma's production of oil per day is less
atralnu asg

than _____ % of U.S. production. Crushed granite is used mainly for _____ ballast.
rfou raiadorl

The sedimentary rock _____ is used for the manufacture of brick and tile products. Some
hesal

examples of _____ commodities include crushed stone, portland cement, and gypsum.
fluenon

EVERYDAY USE OF OKLAHOMA RESOURCES

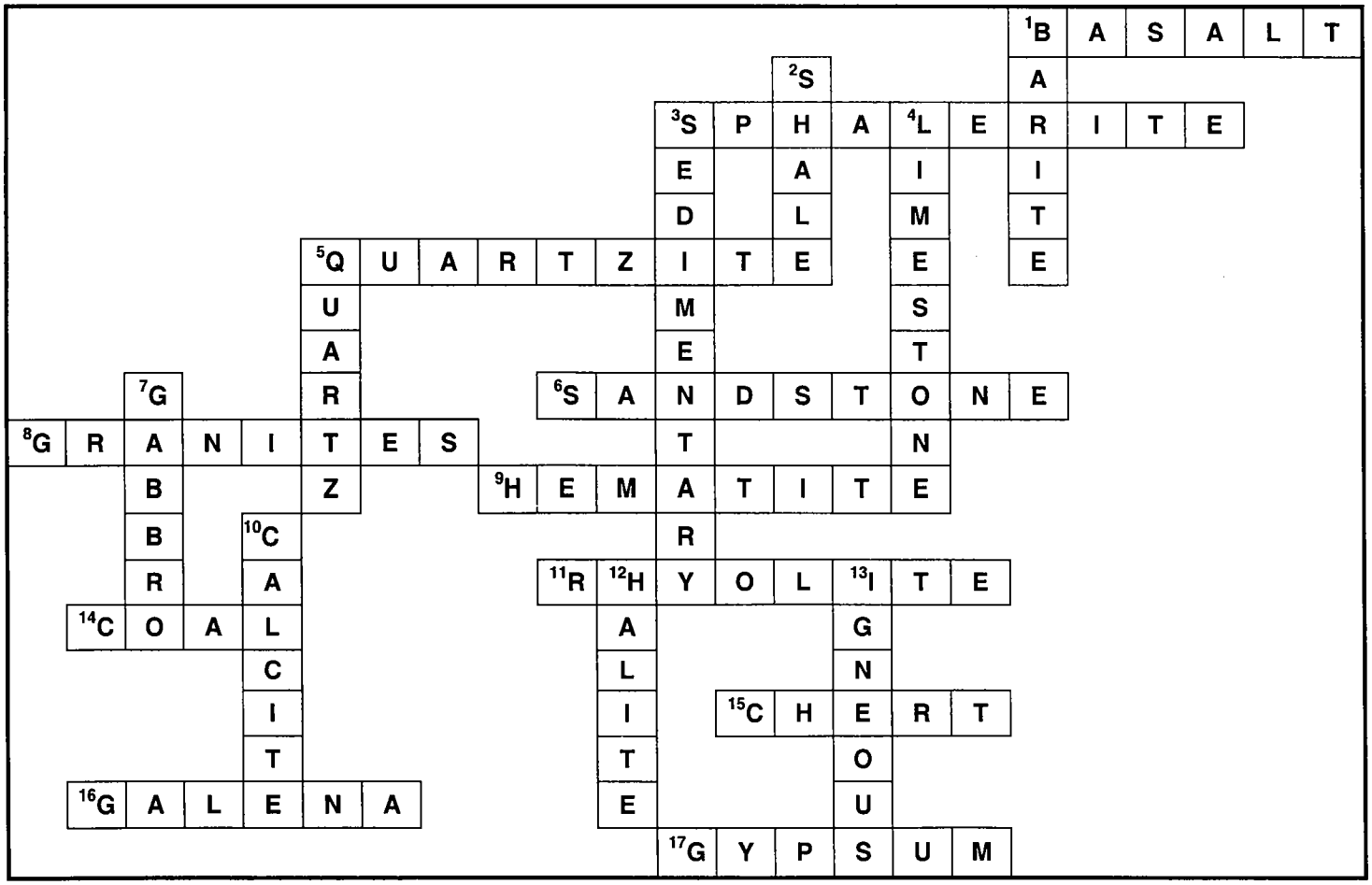
The following mineral and rock resources are common to Oklahoma. Match the name of the mineral/rock with its everyday use by putting the correct number in the blank next to its common economic use.

MINERAL/ROCK RESOURCES	ECONOMIC USE
1. Silica sand	____ Building construction
2. Galena (lead)	____ Building stone; abrasive
3. Gypsum	____ Road aggregate; brick making; ceramics
4. Sphalerite (zinc)	____ Building stone; monuments; headstones
5. Clay	____ Combs; clothing; energy
6. Sand/gravel	____ Road deicer; food preservative
7. Granite	____ Wallboard; plaster of Paris
8. Shale	____ Ceramics; glossy paper; pottery
9. Sandstone	____ Portland cement; road aggregate; riprap; building stone
10. Iodine	____ Glass making; ceramics; transistors
11. Halite (salt)	____ Chief ore of lead; fishing sinkers; solder; pewter
12. Petroleum	____ Generating electricity; methane gas; coke for steel manufacturing
13. Limestone	____ Principal ore of zinc; used to galvanize steel for rain gutters
14. Coal	____ Pharmaceuticals; salt

ANSWERS FOR ACTIVITIES

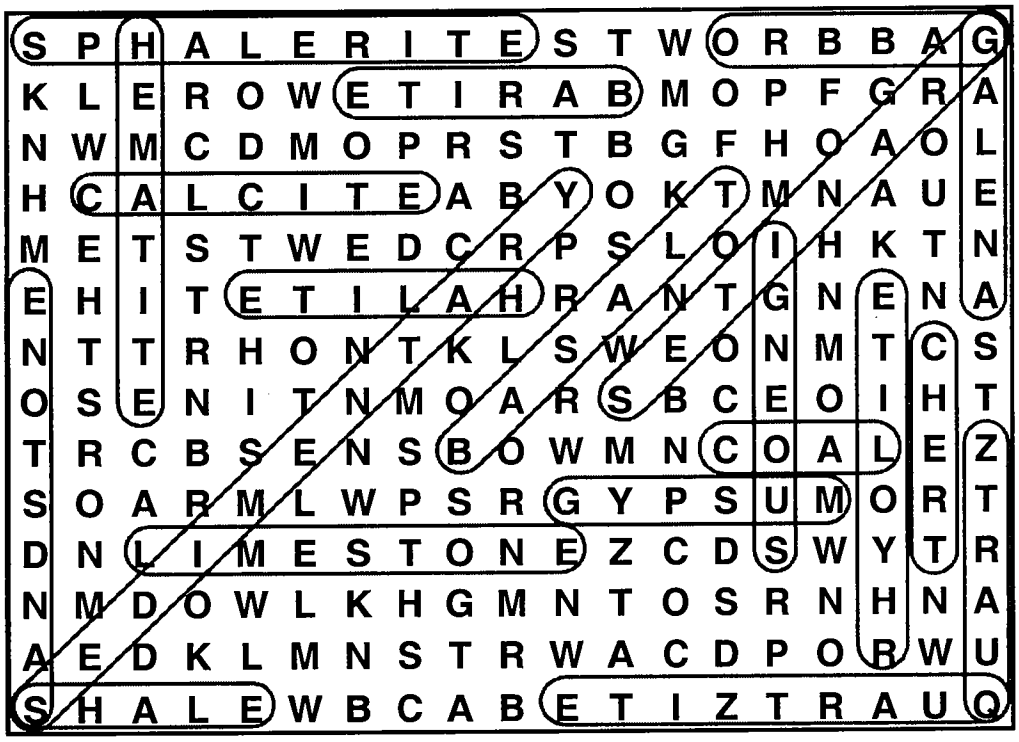
MINERALS AND ROCKS OF OKLAHOMA

Crossword Puzzle (pages 1-2)



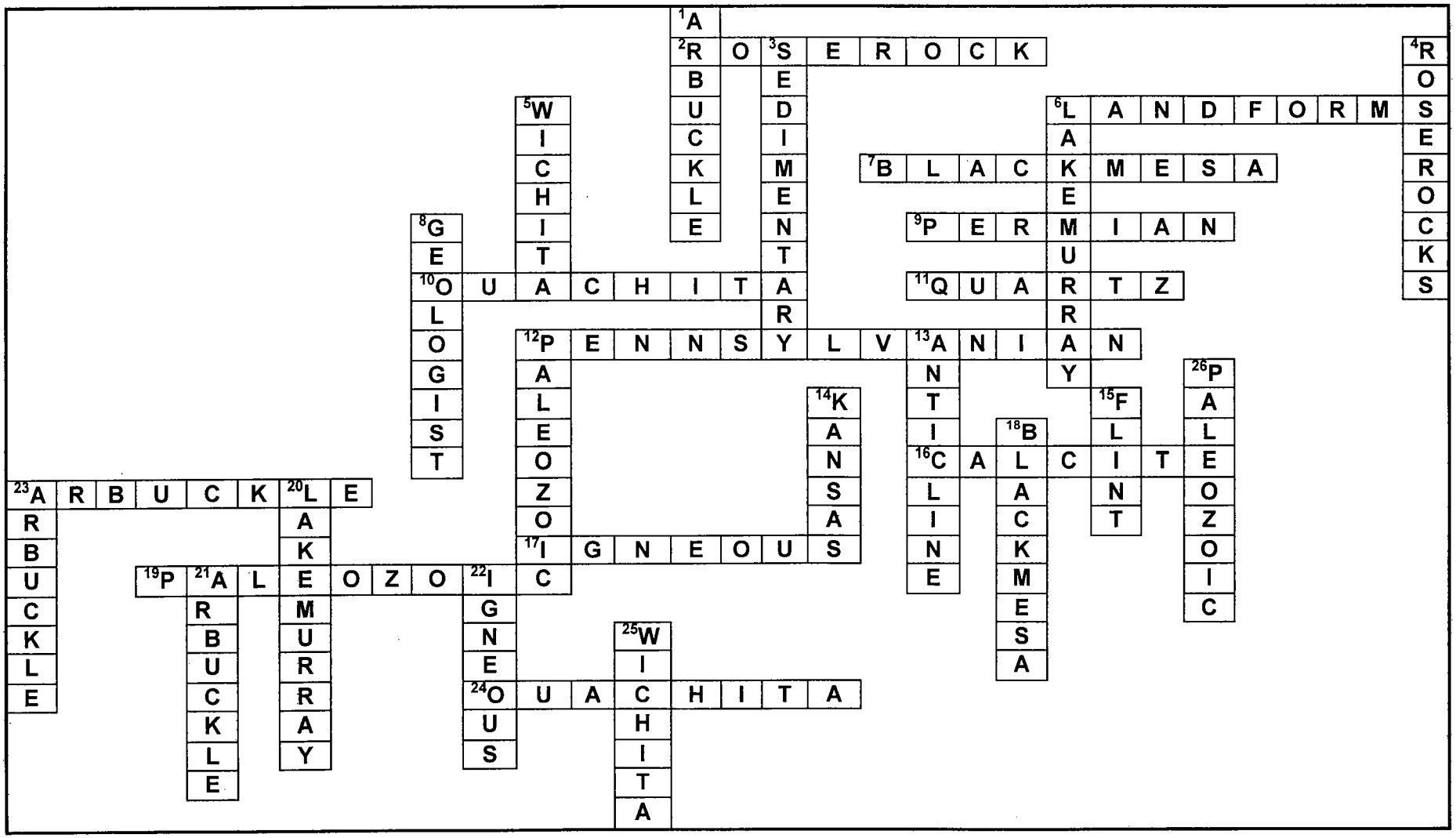
MINERALS AND ROCKS OF OKLAHOMA

Word Search (page 3)



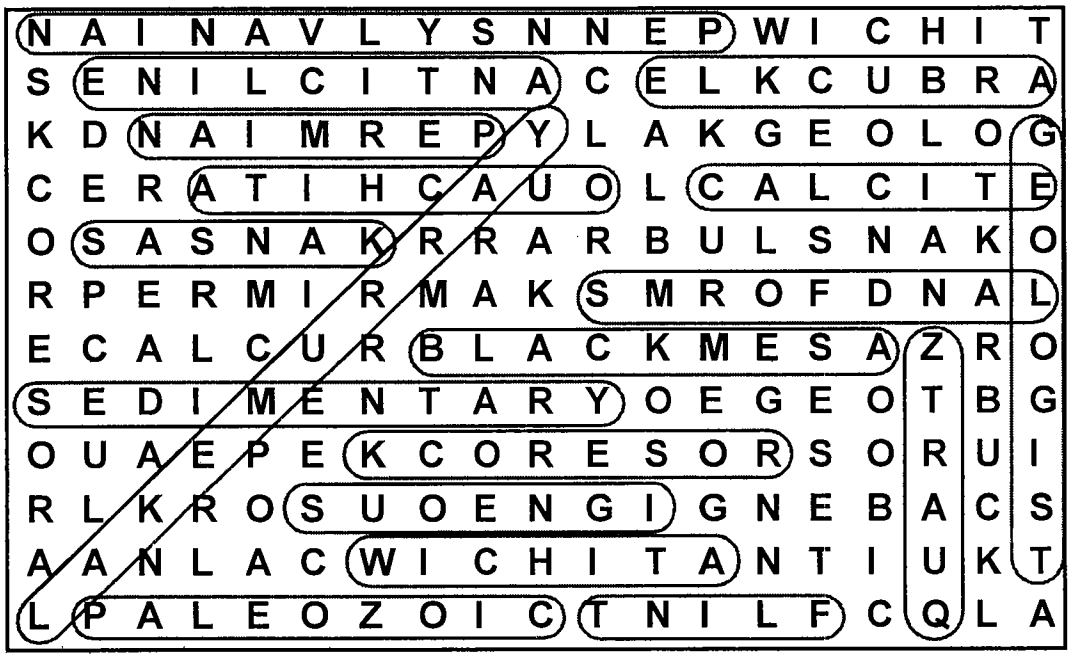
GENERAL GEOLOGY OF OKLAHOMA

Crossword Puzzle (pages 4-5)



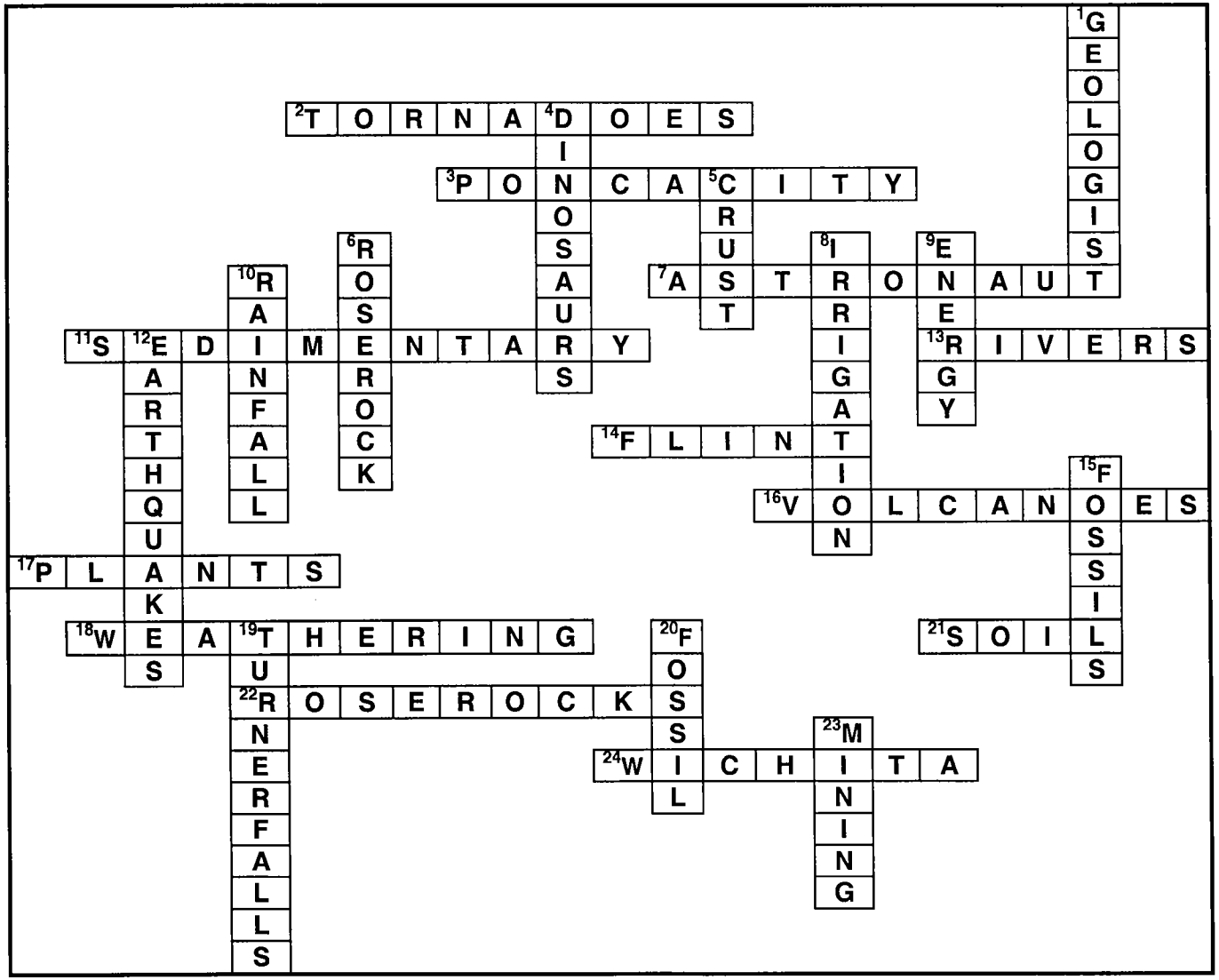
GENERAL GEOLOGY OF OKLAHOMA

Word Search (page 6)



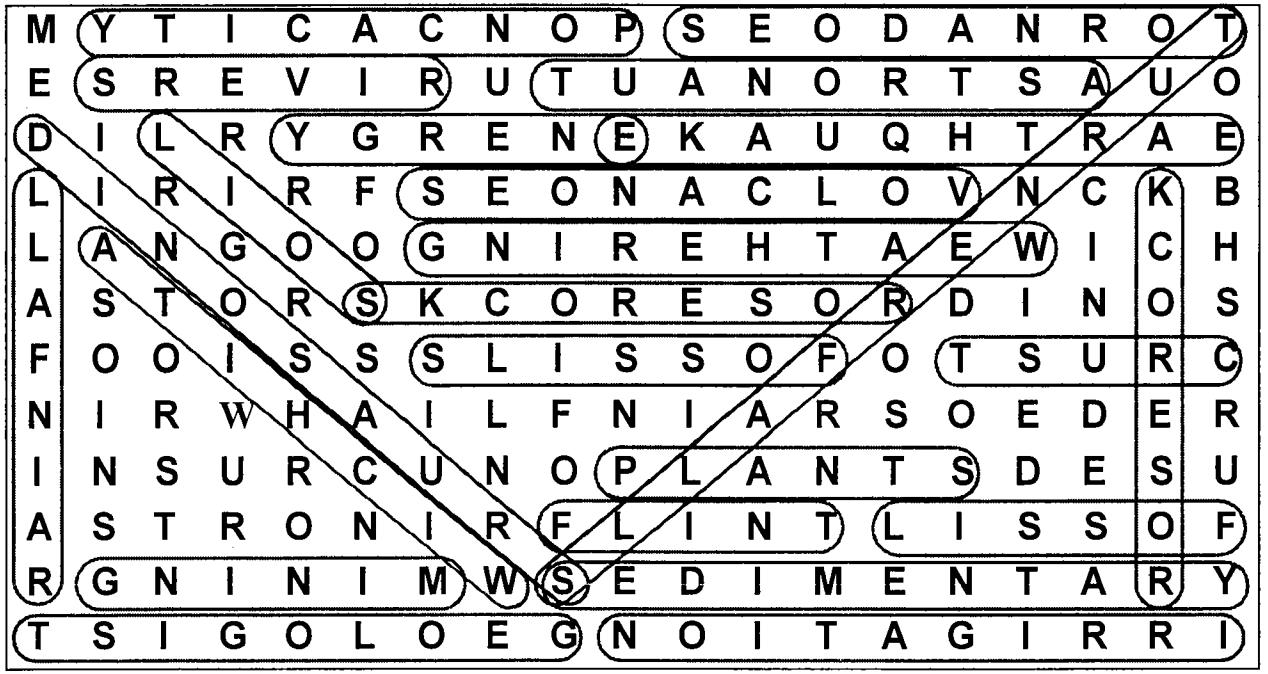
A LOOK AT OKLAHOMA GEOLOGY—(Part 1)

Crossword Puzzle (pages 7-8)



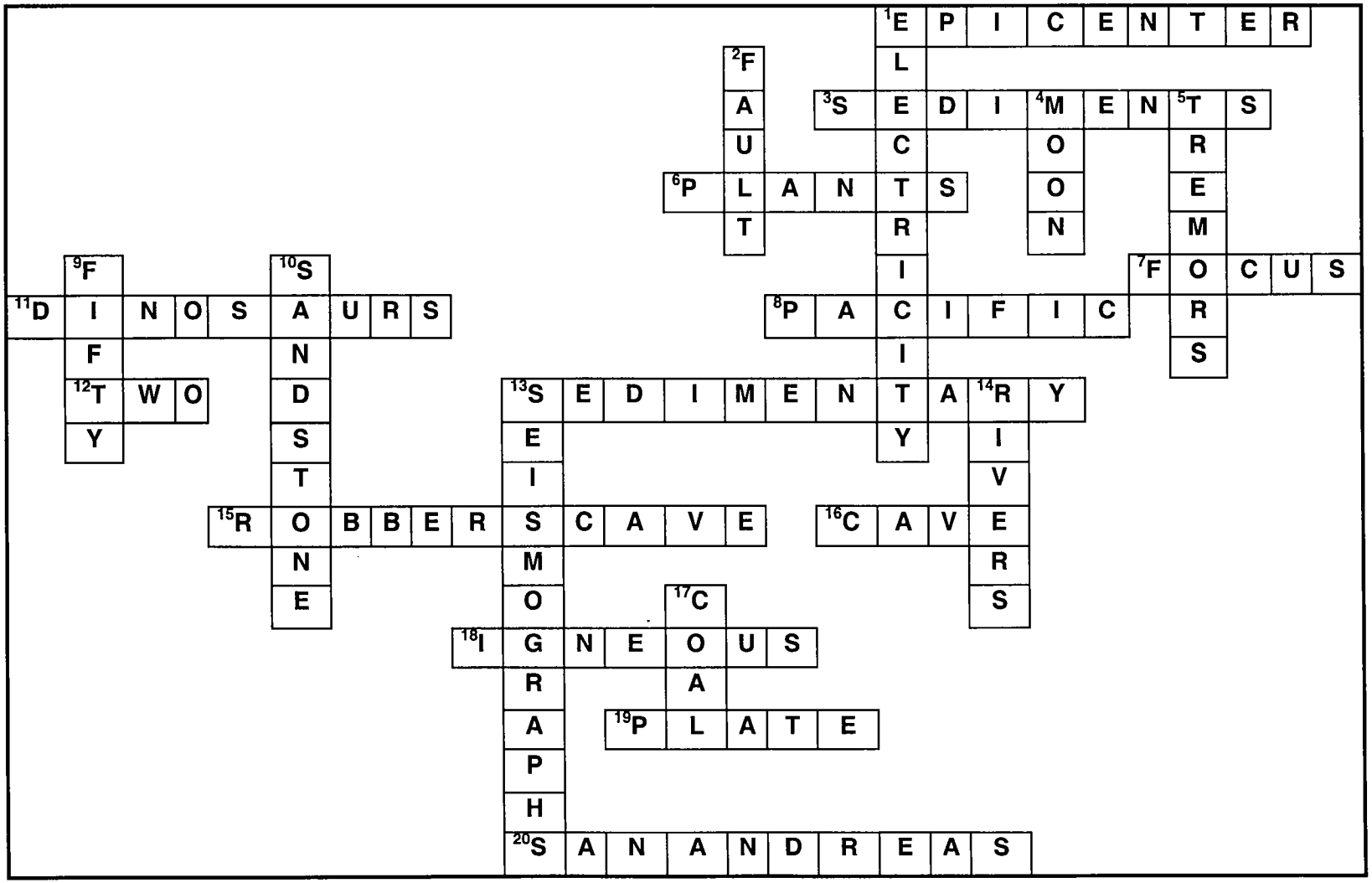
A LOOK AT OKLAHOMA GEOLOGY—(Part 1)

Word Search (page 9)



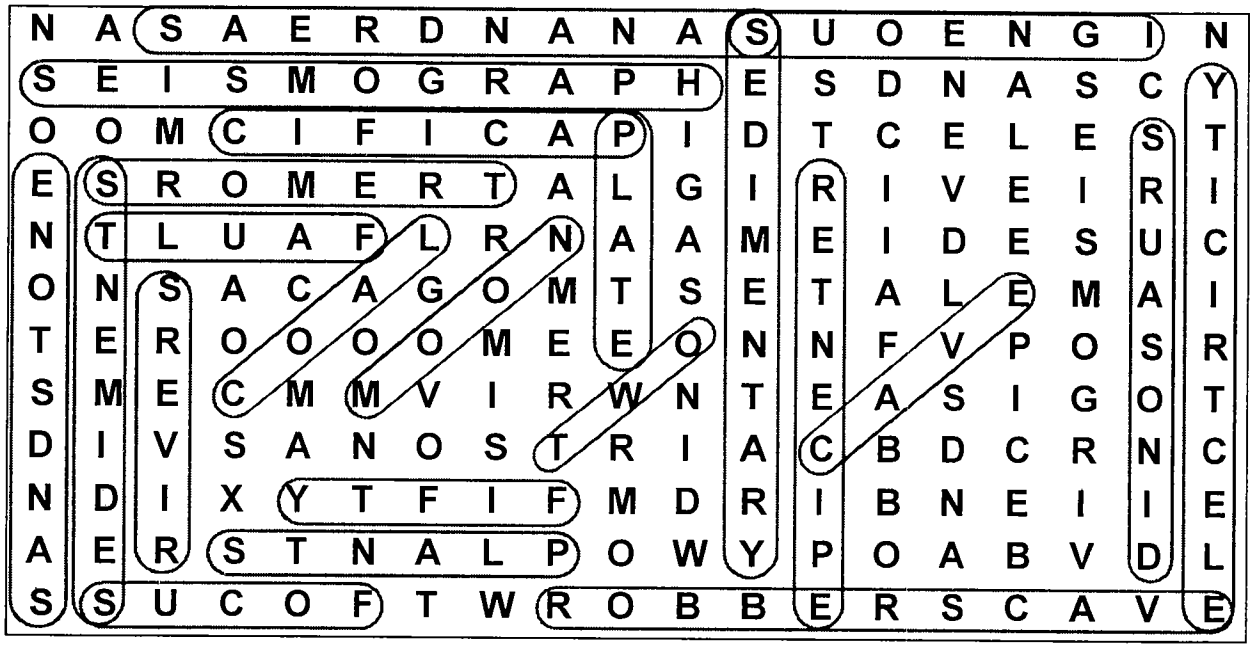
A LOOK AT OKLAHOMA GEOLOGY—(Part 2)

Crossword Puzzle (pages 10-11)



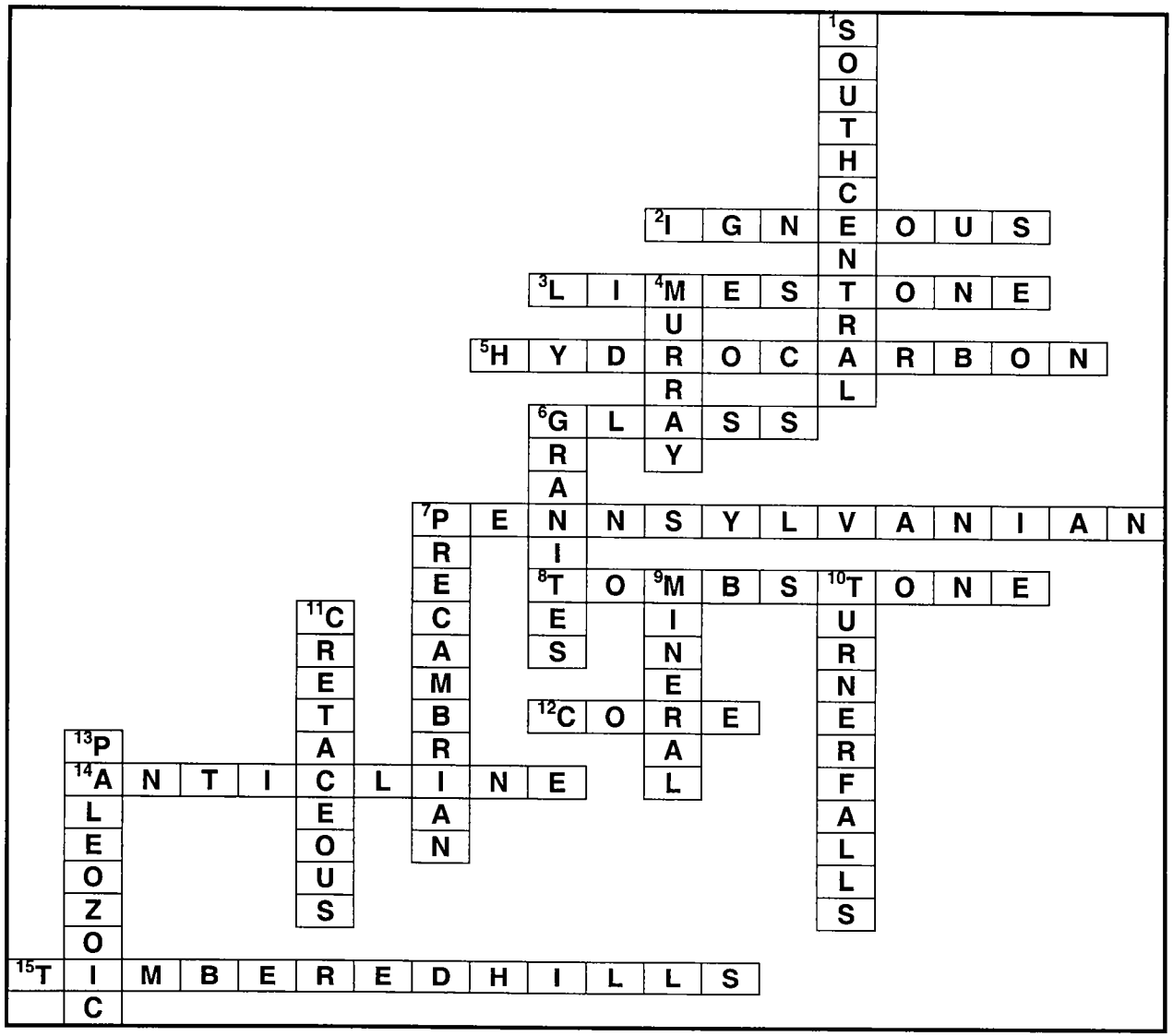
A LOOK AT OKLAHOMA GEOLOGY—(Part 2)

Word Search (page 12)



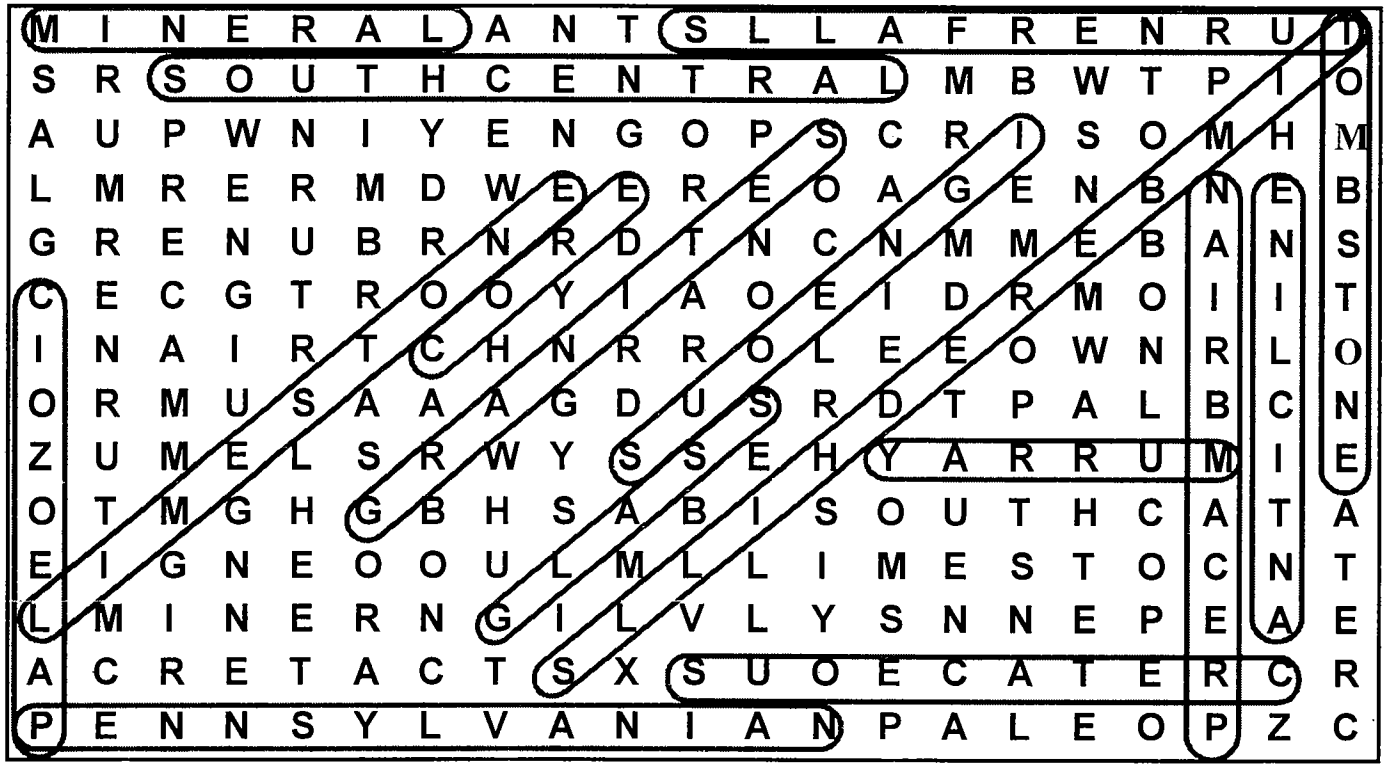
ARBUCKLE MOUNTAINS

Crossword Puzzle (pages 13-14)



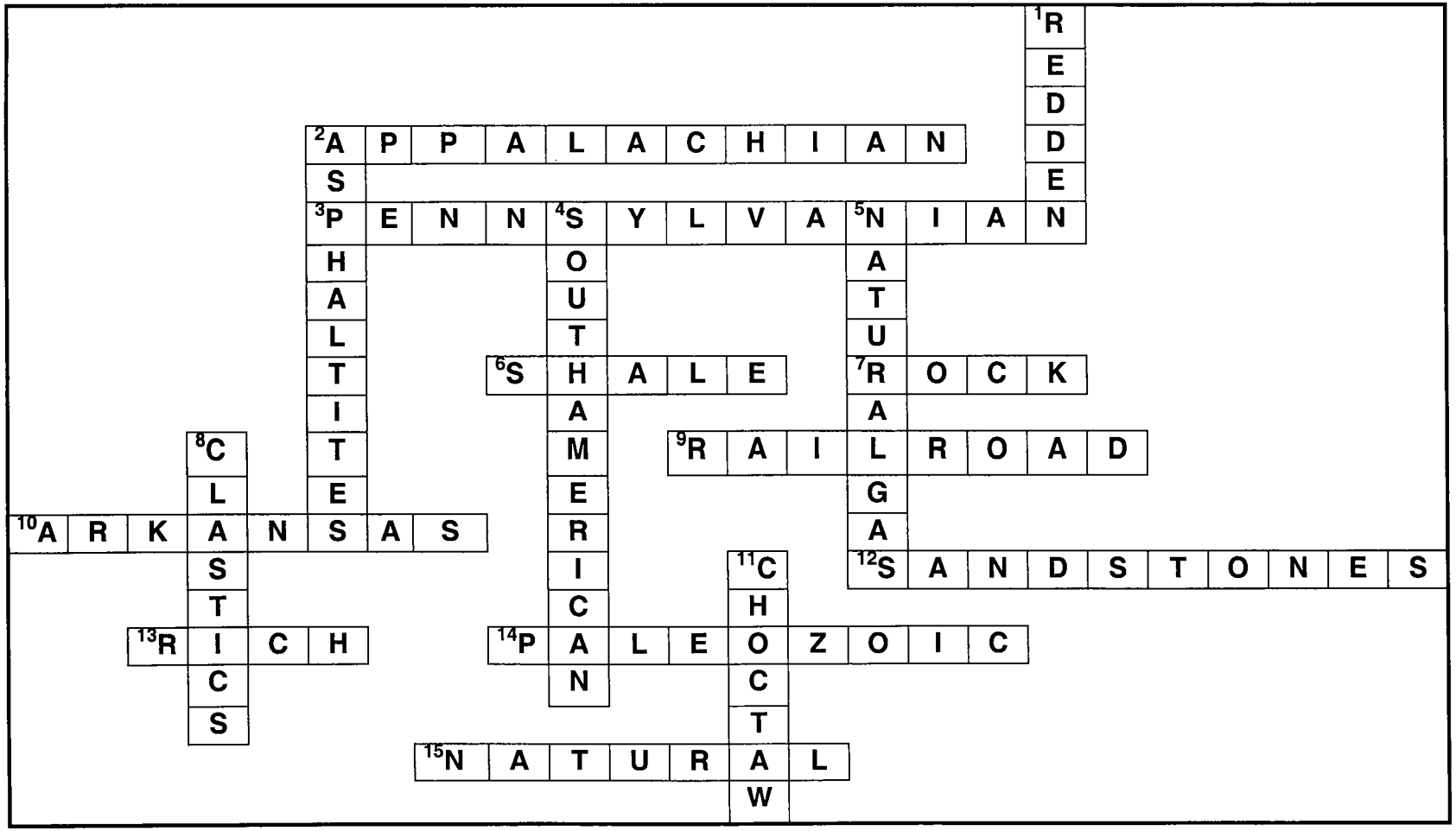
ARBUCKLE MOUNTAINS

Word Search (page 15)



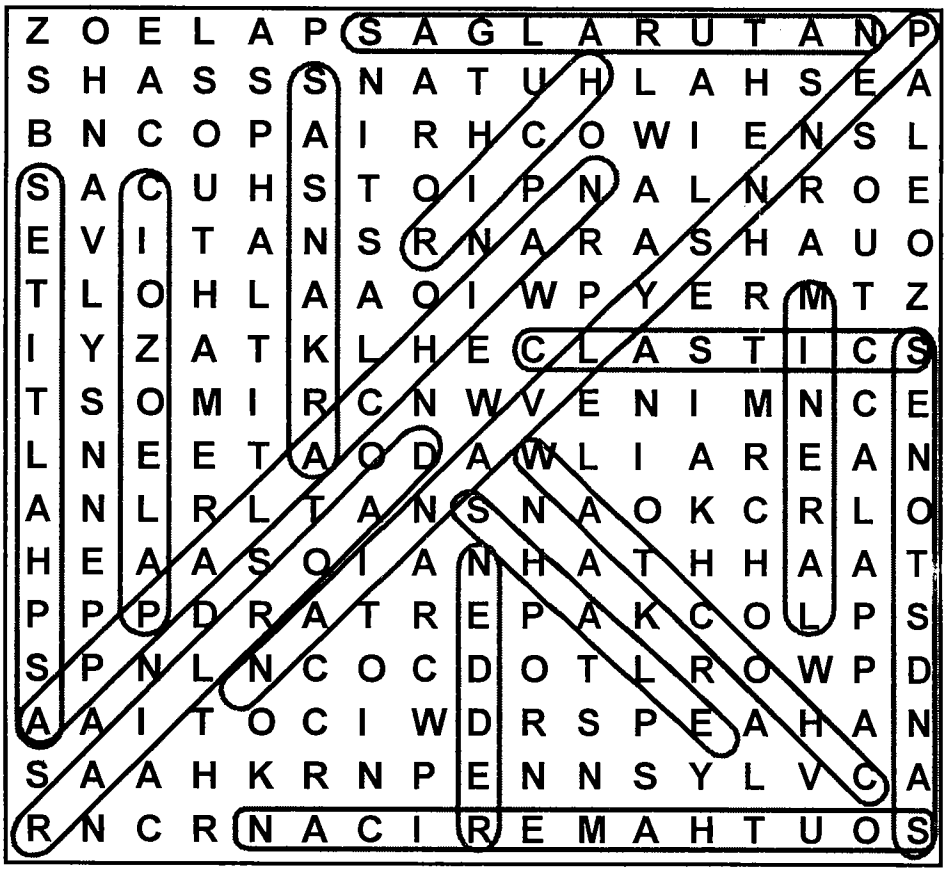
OUACHITA MOUNTAINS

Crossword Puzzle (pages 16-17)



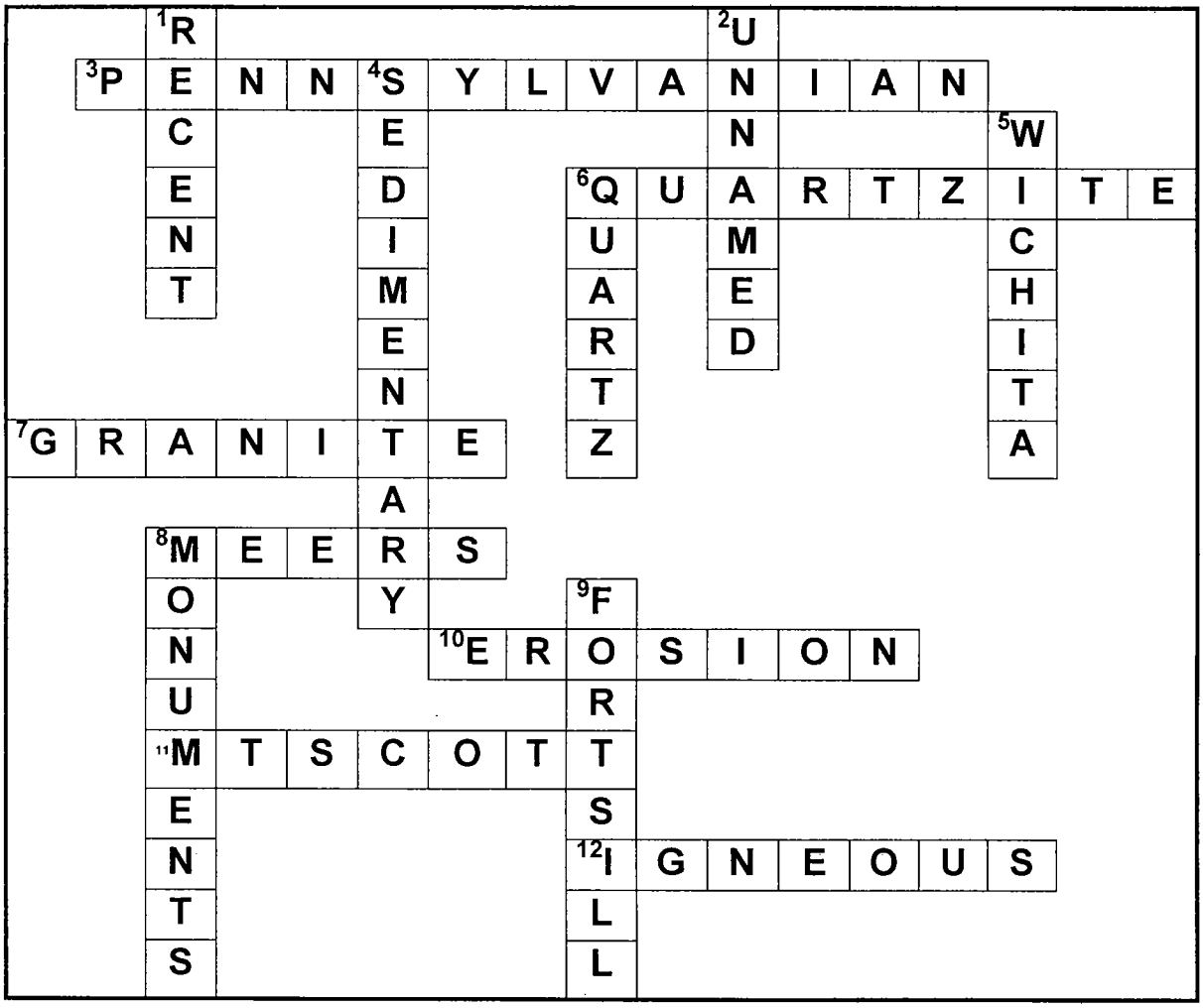
OUACHITA MOUNTAINS

Word Search (page 18)



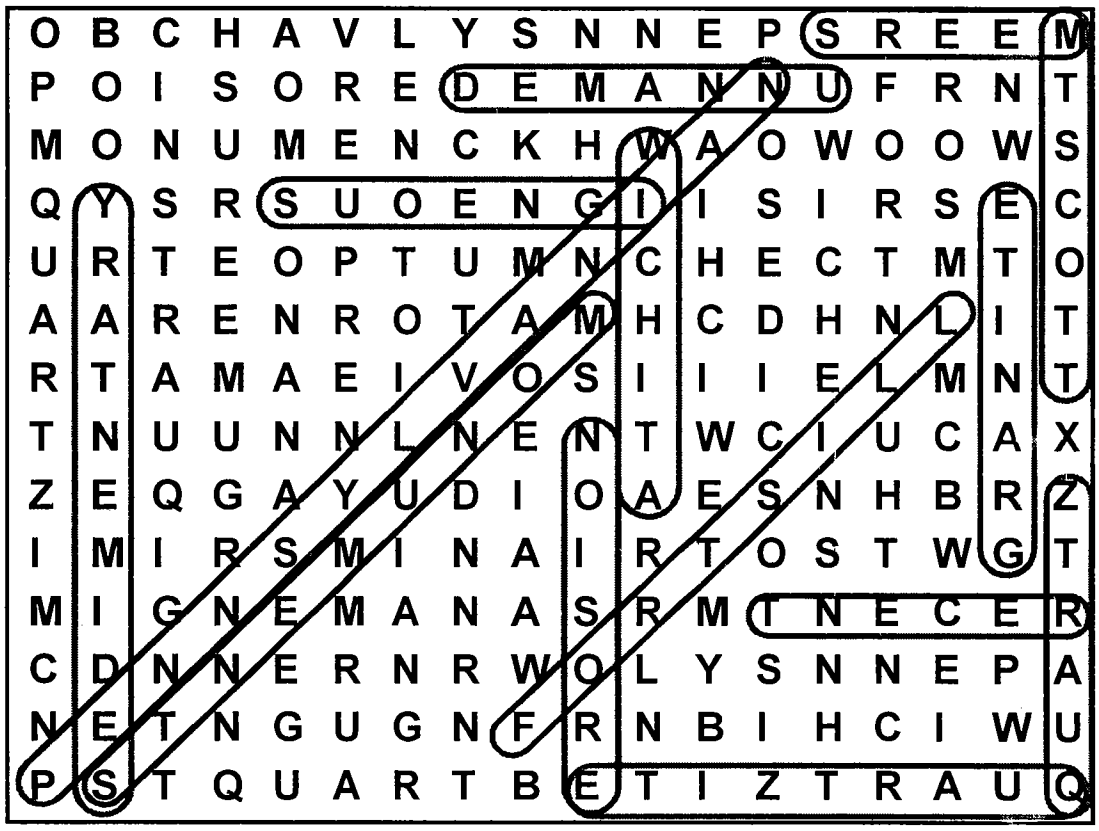
WICHITA MOUNTAINS

Crossword Puzzle (pages 19-20)



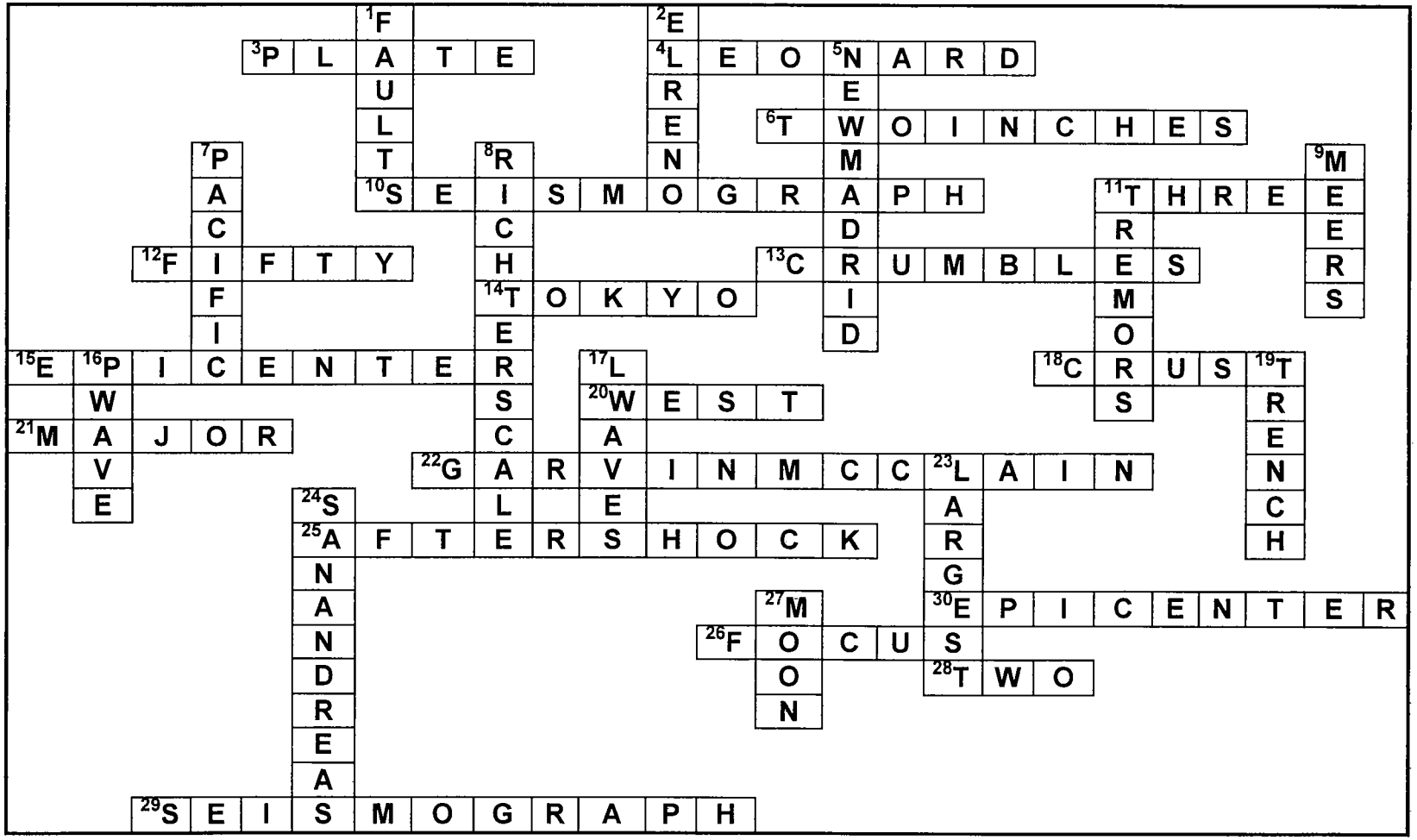
WICHITA MOUNTAINS

Word Search (page 21)



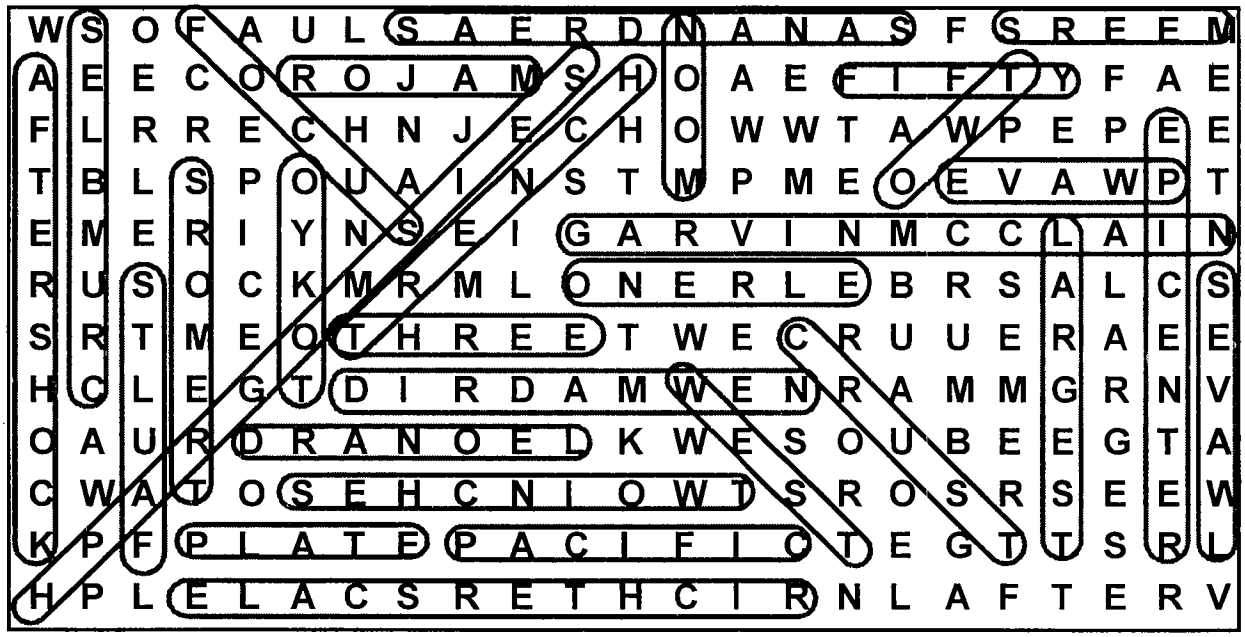
THERE'S A WHOLE LOTTA SHAKIN' GOIN' ON—OKLAHOMA EARTHQUAKES

Crossword Puzzle (pages 22-23)



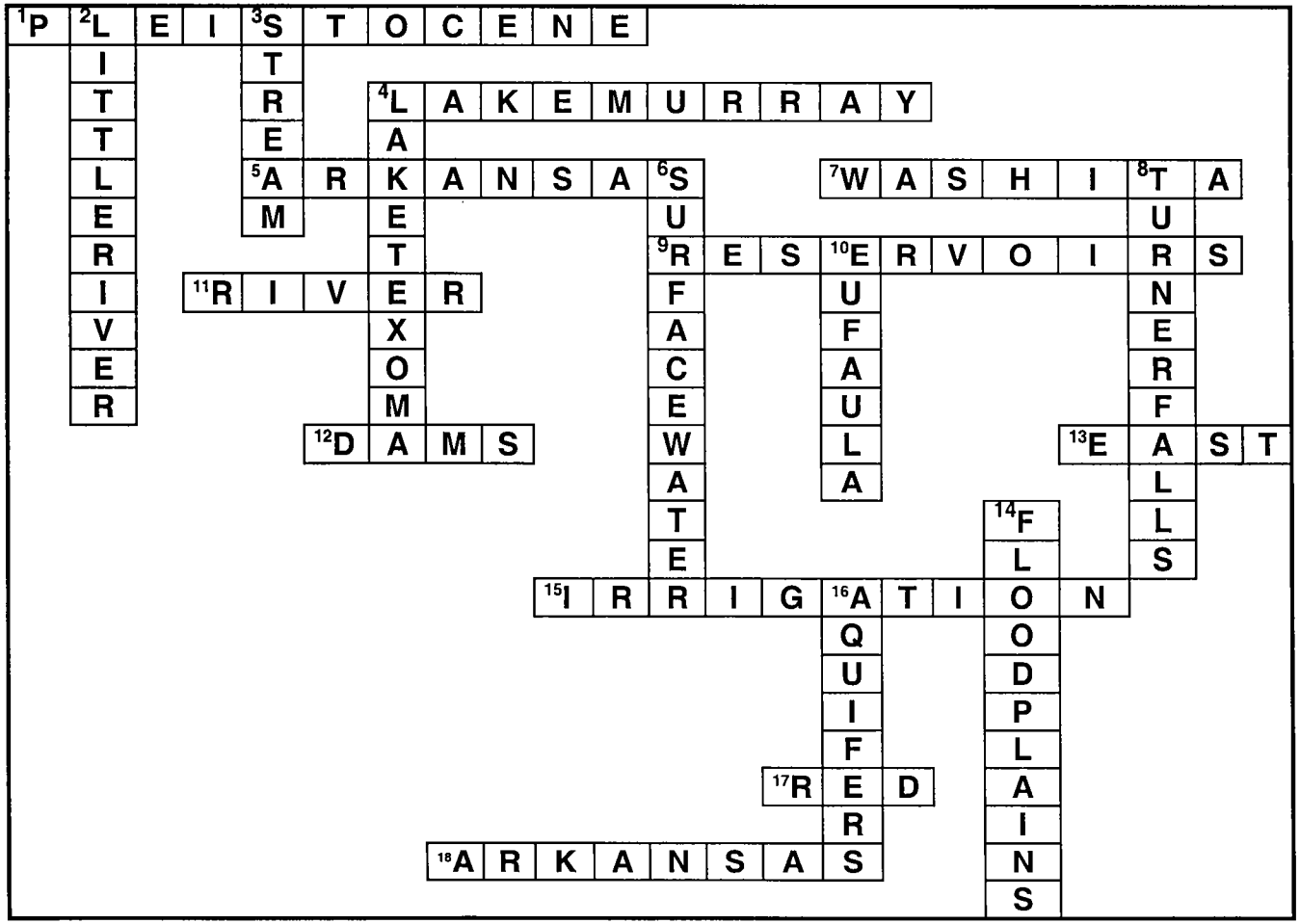
THERE'S A WHOLE LOTTA SHAKIN' GOIN' ON— OKLAHOMA EARTHQUAKES

Word Search (page 24)



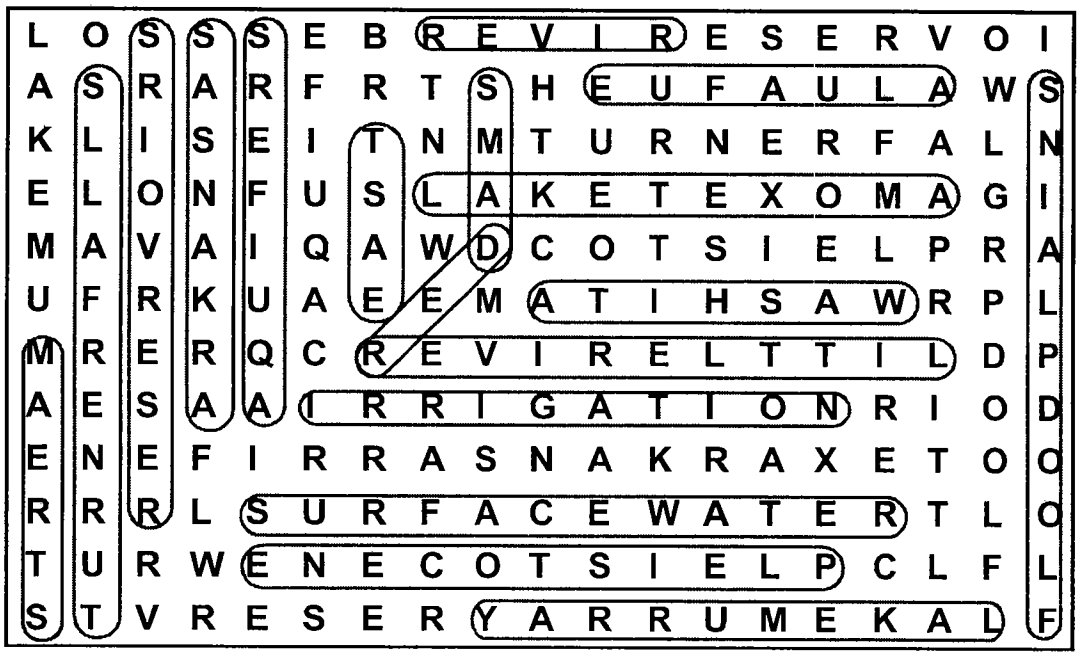
WATER RESOURCES IN OKLAHOMA

Crossword Puzzle (pages 25-26)



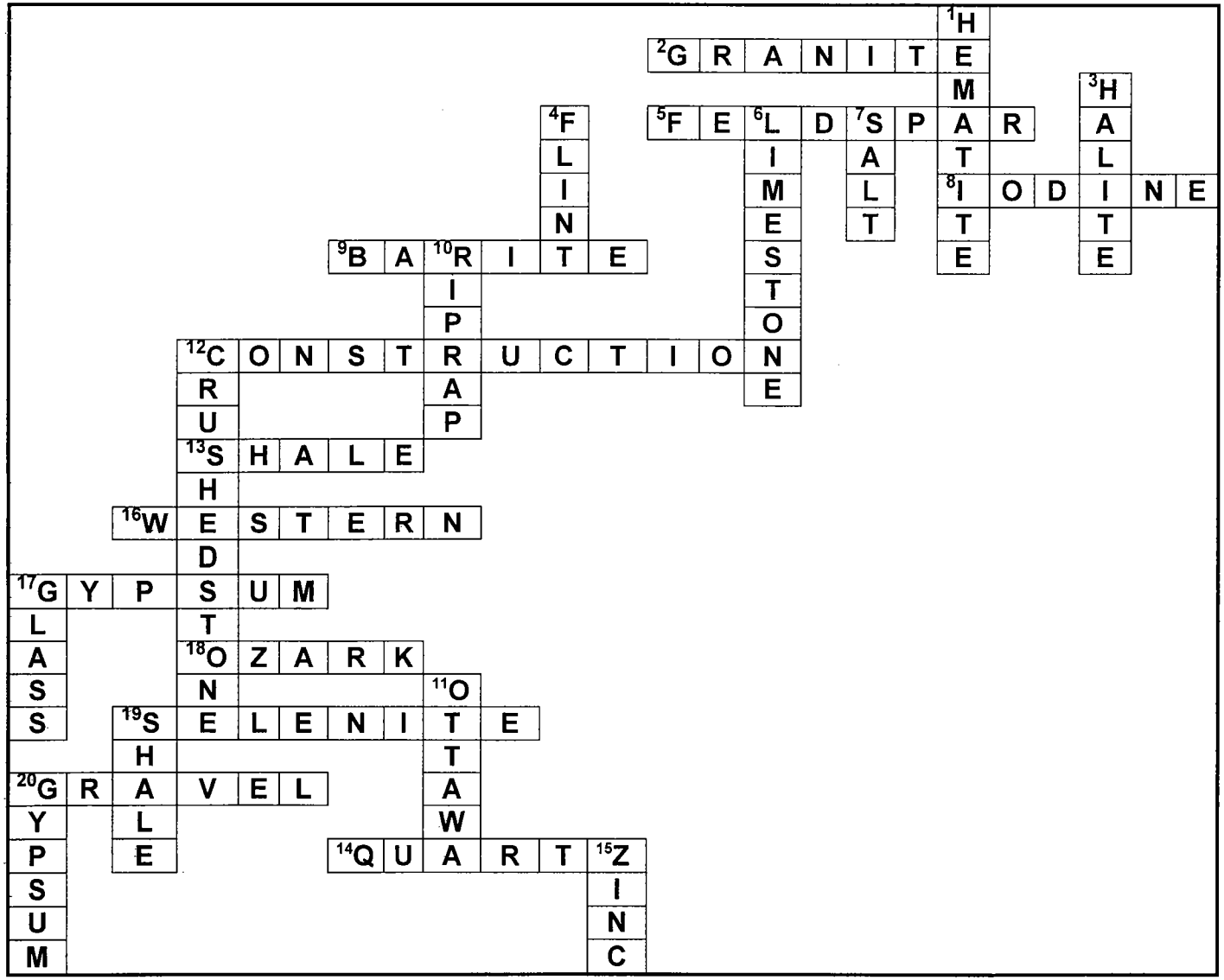
WATER RESOURCES IN OKLAHOMA

Word Search (page 27)



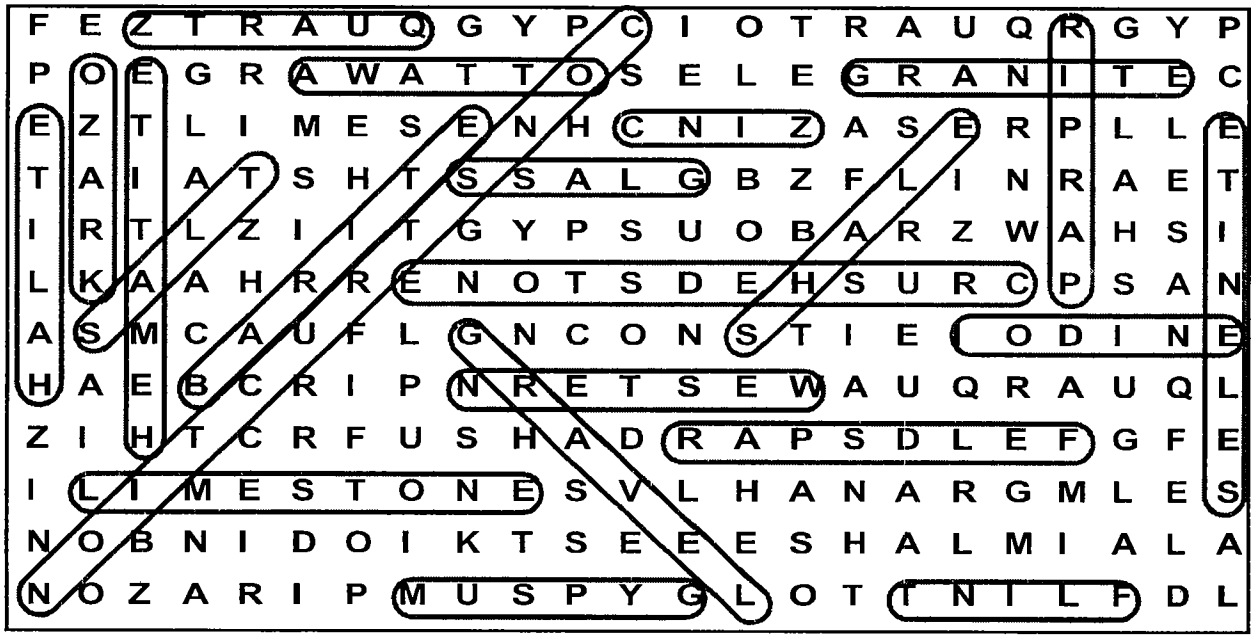
NONFUEL RESOURCES OF OKLAHOMA

Crossword Puzzle (pages 28-29)



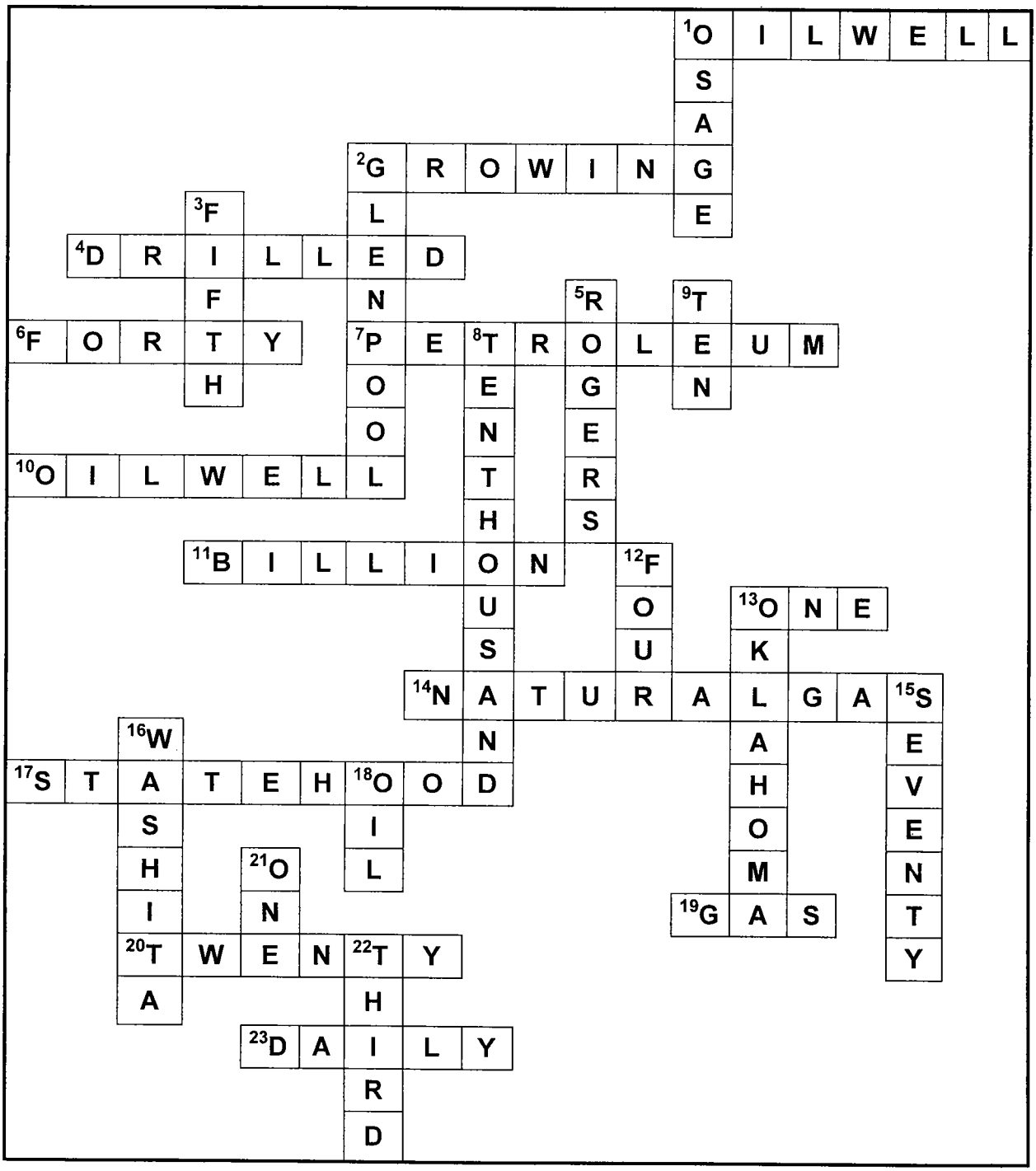
NONFUEL RESOURCES OF OKLAHOMA

Word Search (page 30)



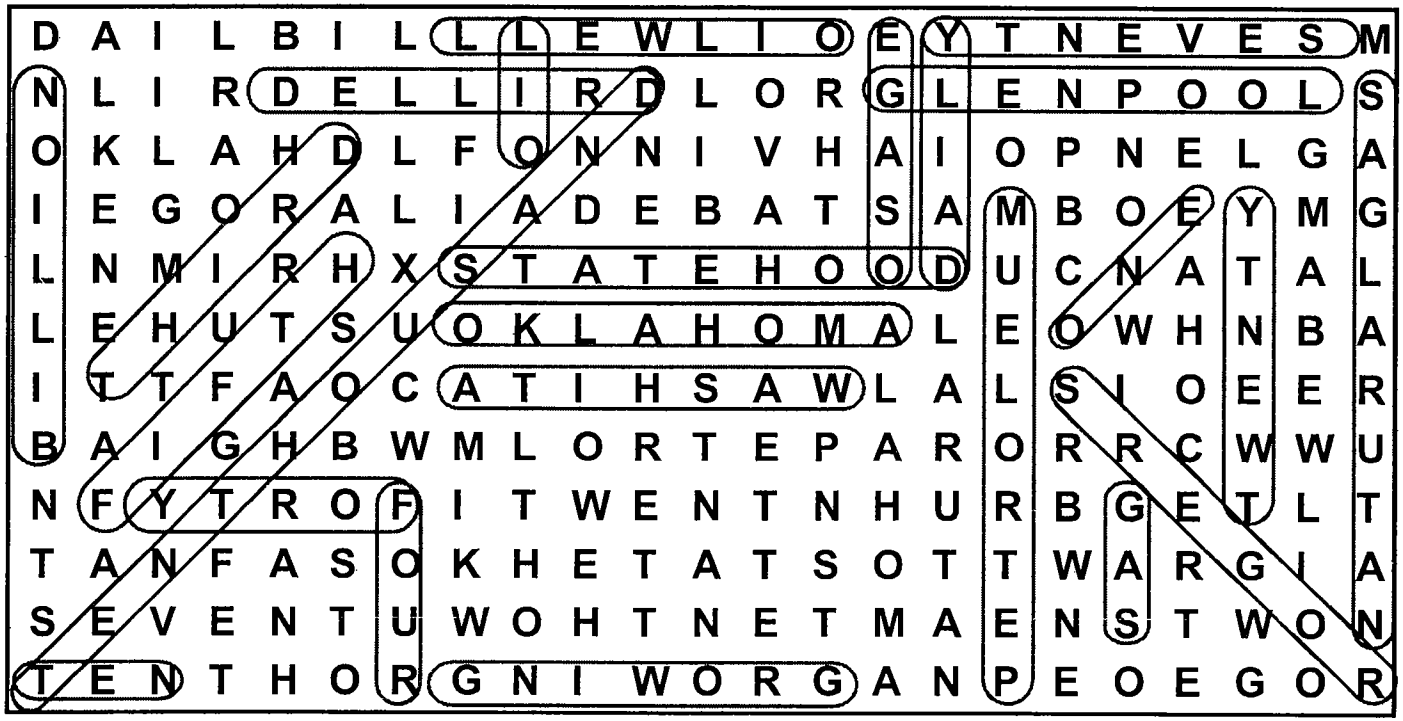
ENERGY FACTS ABOUT OKLAHOMA (OIL AND GAS)

Crossword Puzzle (pages 31-32)



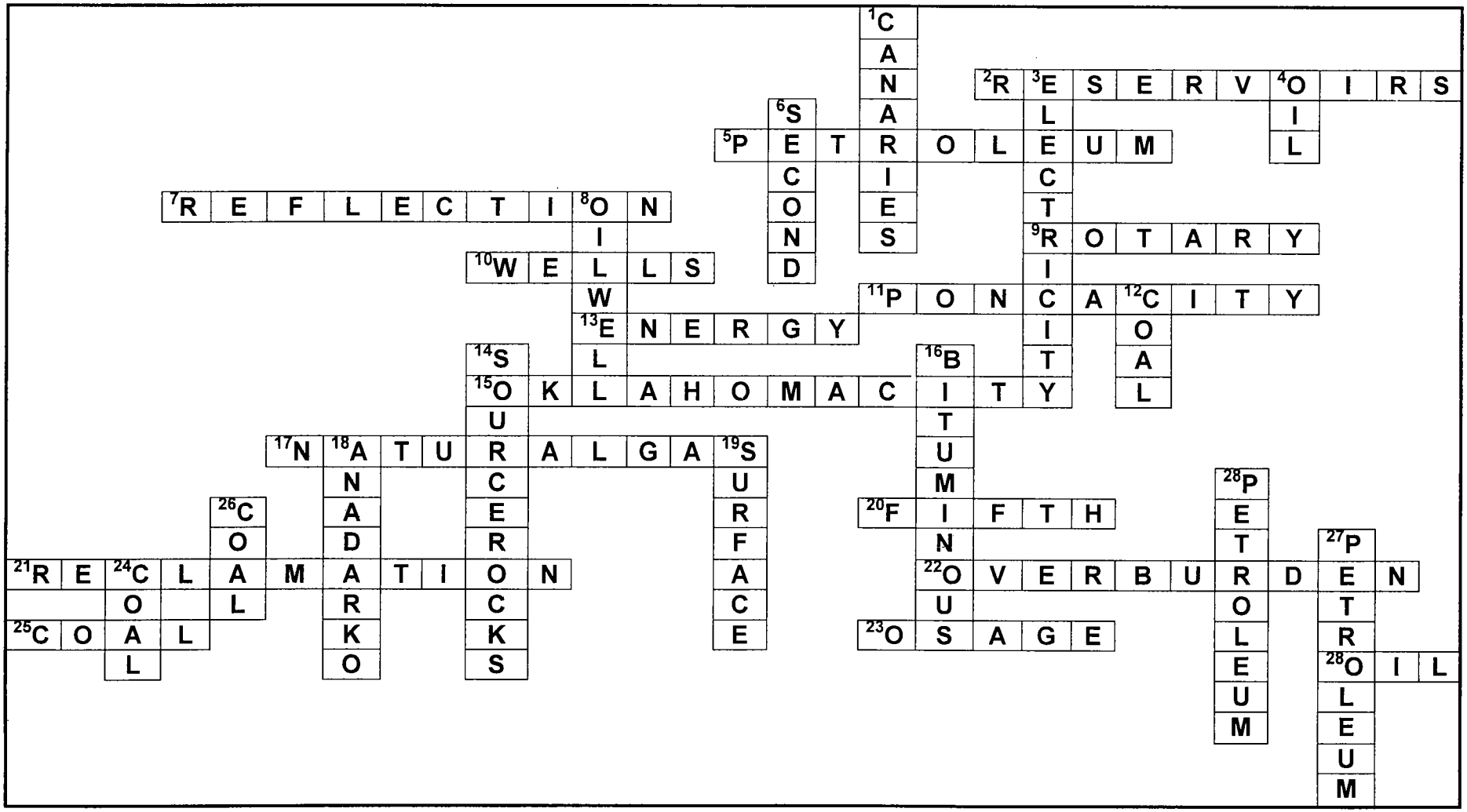
ENERGY FACTS ABOUT OKLAHOMA (OIL AND GAS)

Word Search (page 33)



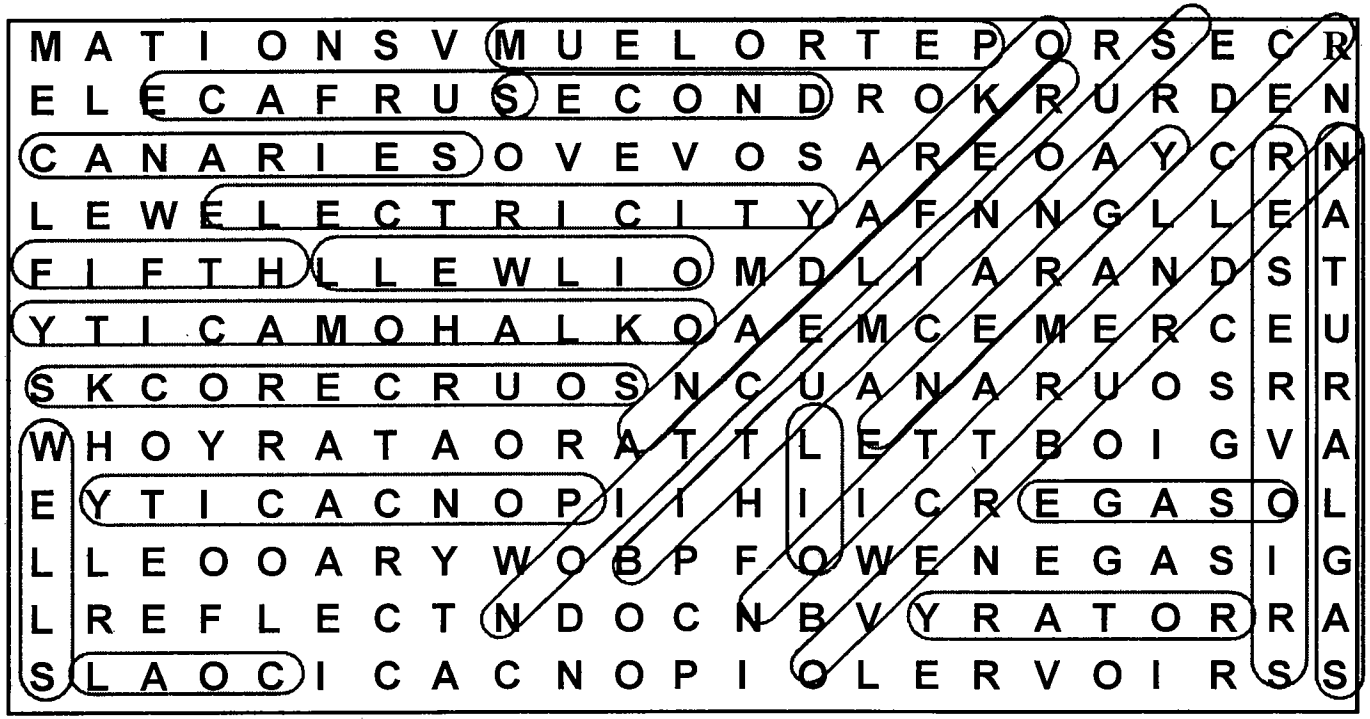
FUEL RESOURCES OF OKLAHOMA

Crossword Puzzle (pages 34-35)



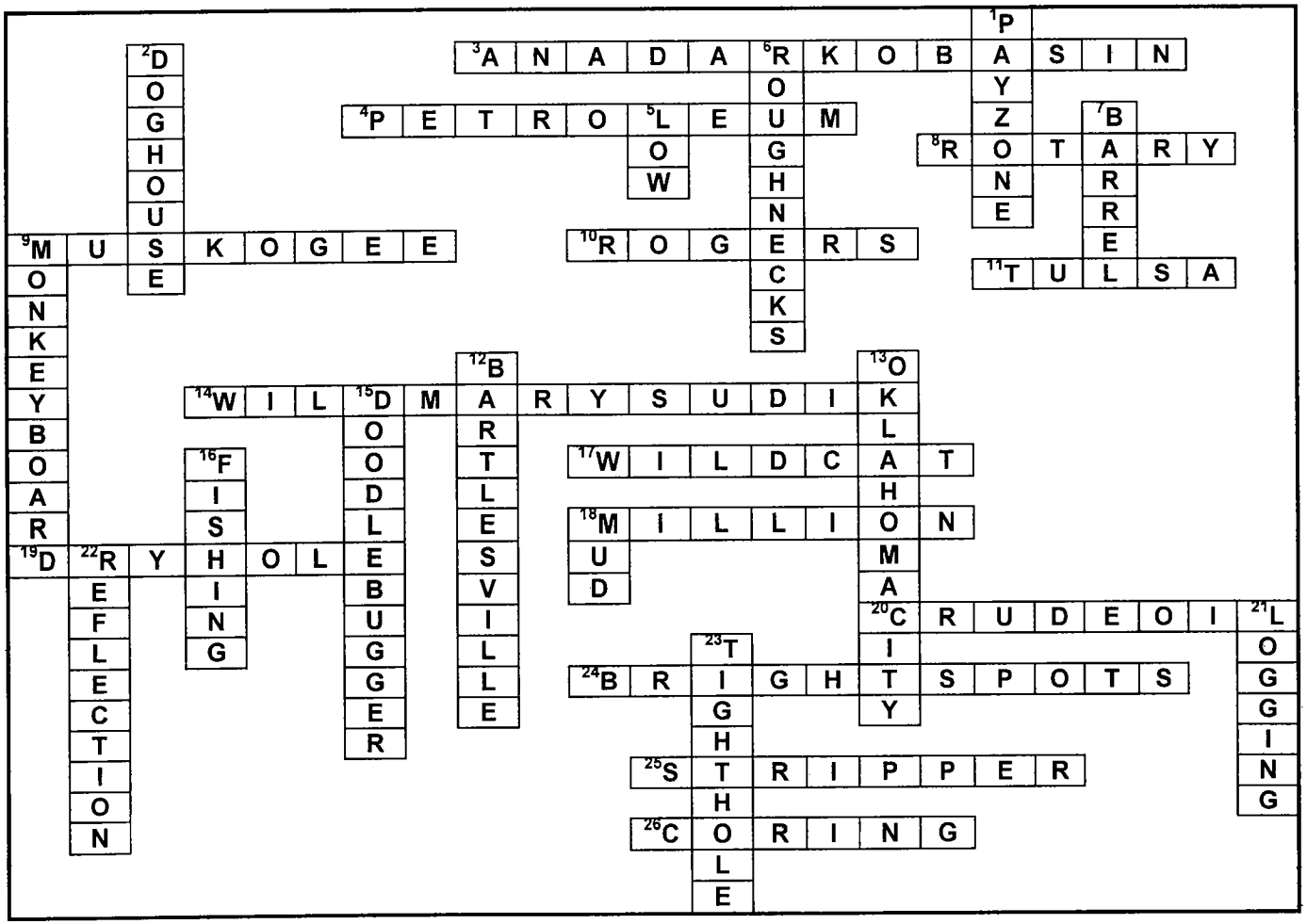
FUEL RESOURCES OF OKLAHOMA

Word Search (page 36)



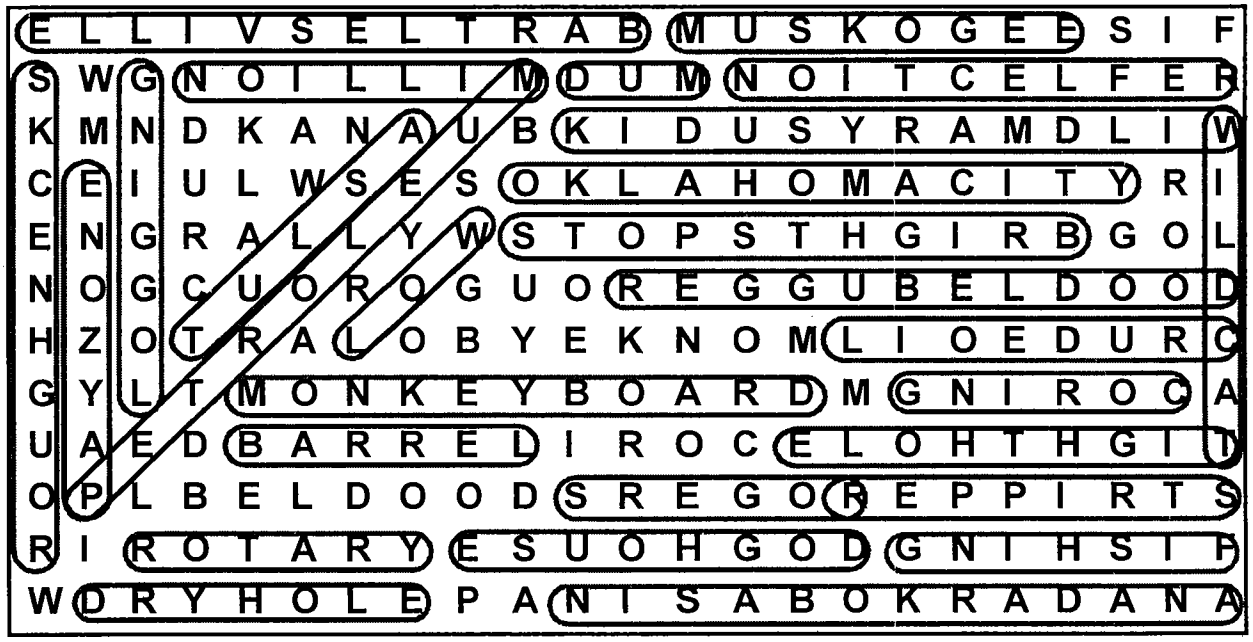
"BLACK GOLD"—OKLAHOMA OIL TRIVIA

Crossword Puzzle (pages 37-38)



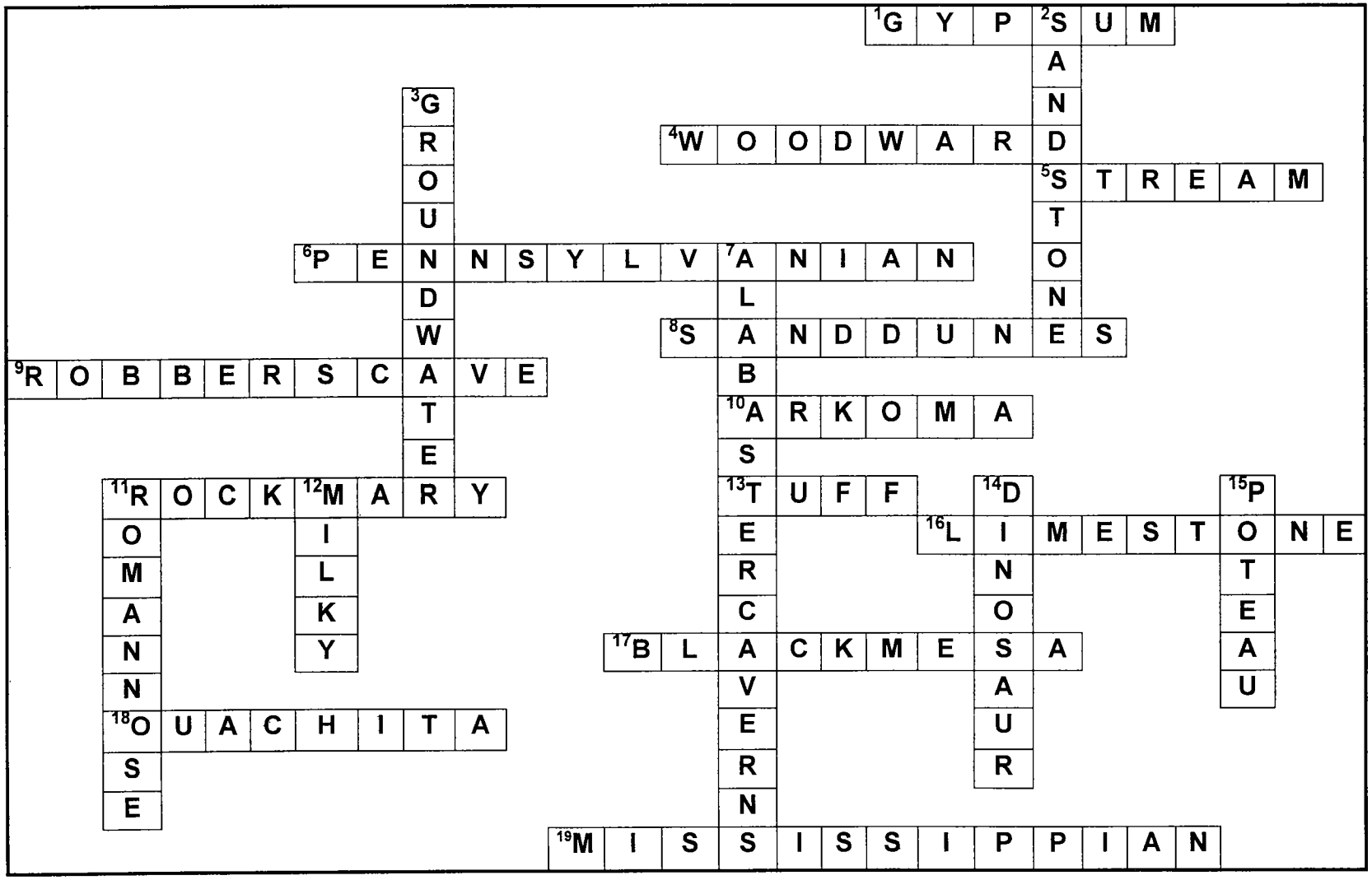
"BLACK GOLD"—OKLAHOMA OIL TRIVIA

Word Search (page 39)



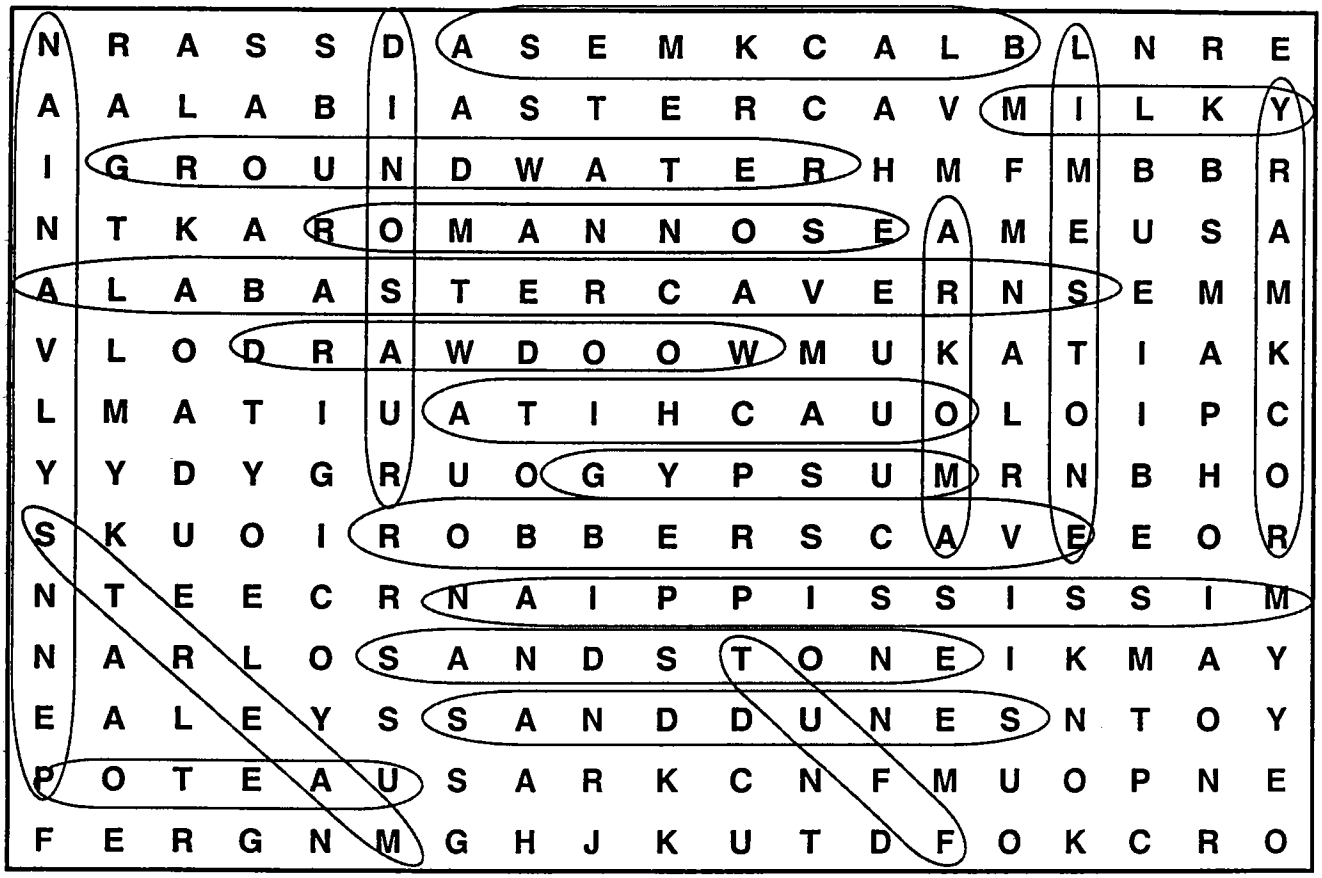
"GEOLOGIC SCENERY"—A LOOK AT OKLAHOMA'S STATE PARKS

Crossword Puzzle (pages 40-41)



"GEOLOGIC SCENERY"—A LOOK AT OKLAHOMA'S STATE PARKS

Word Search (page 42)



N	R	A	S	S	D	A	S	E	M	K	C	A	L	B	L	N	R	E
A	A	L	A	B	I	A	S	T	E	R	C	A	V	M	I	L	K	Y
I	G	R	O	U	N	D	W	A	T	E	R	H	M	F	M	B	B	R
N	T	K	A	R	O	M	A	N	N	O	S	E	A	M	E	U	S	A
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V	L	O	D	R	A	W	D	O	O	W	M	U	K	A	T	I	A	K
L	M	A	T	I	U	A	T	I	H	C	A	U	O	L	O	I	P	C
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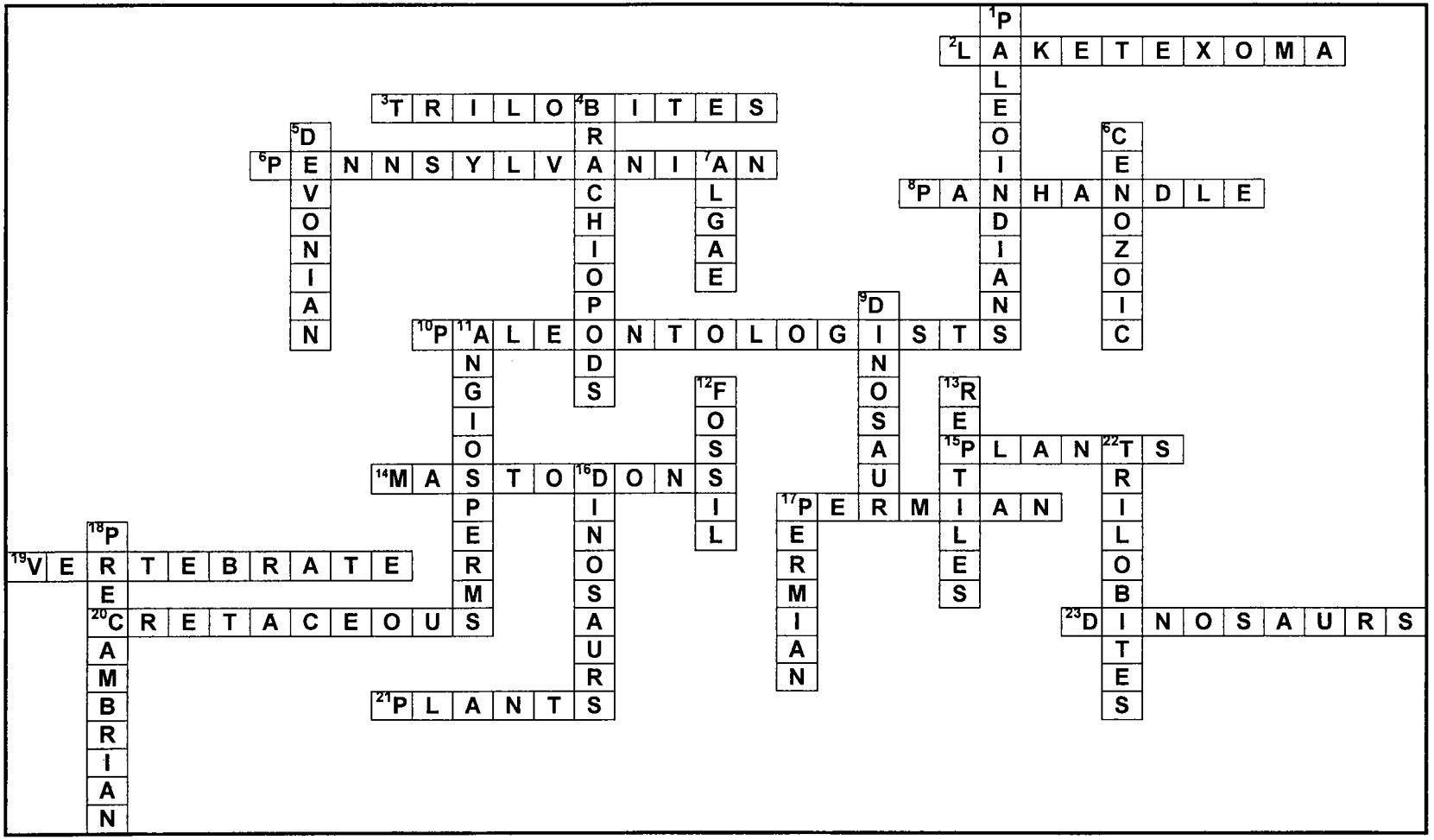
N	T	E	E	C	R	N	A	I	P	P	I	S	S	I	S	S	I	M
N	A	R	L	O	S	A	N	D	S	T	O	N	E	I	K	M	A	Y
E	A	L	E	Y	S	S	A	N	D	D	U	N	E	S	N	T	O	Y
P	O	T	E	A	U	S	A	R	K	C	N	F	M	U	O	P	N	E
F	E	R	G	N	M	G	H	J	K	U	T	D	F	O	K	C	R	O

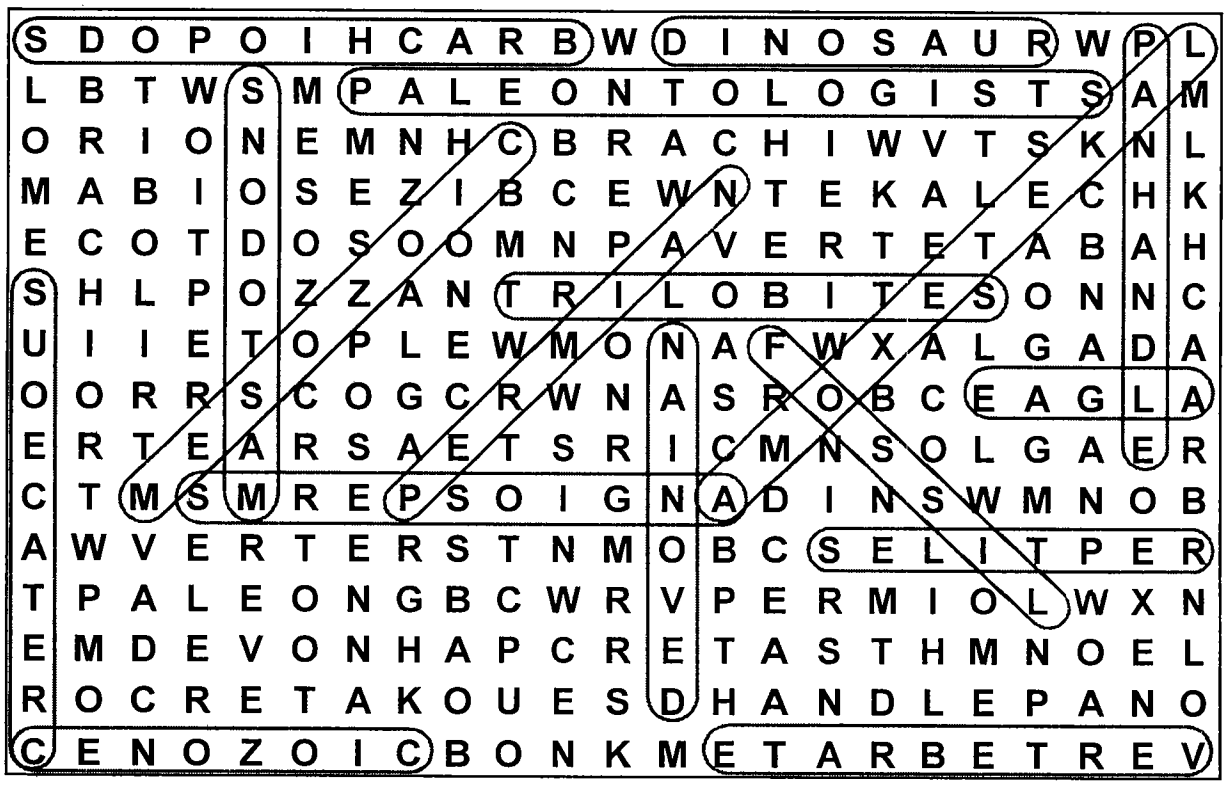
OKLAHOMA FOSSILS

Crossword Puzzle (pages 43-44)



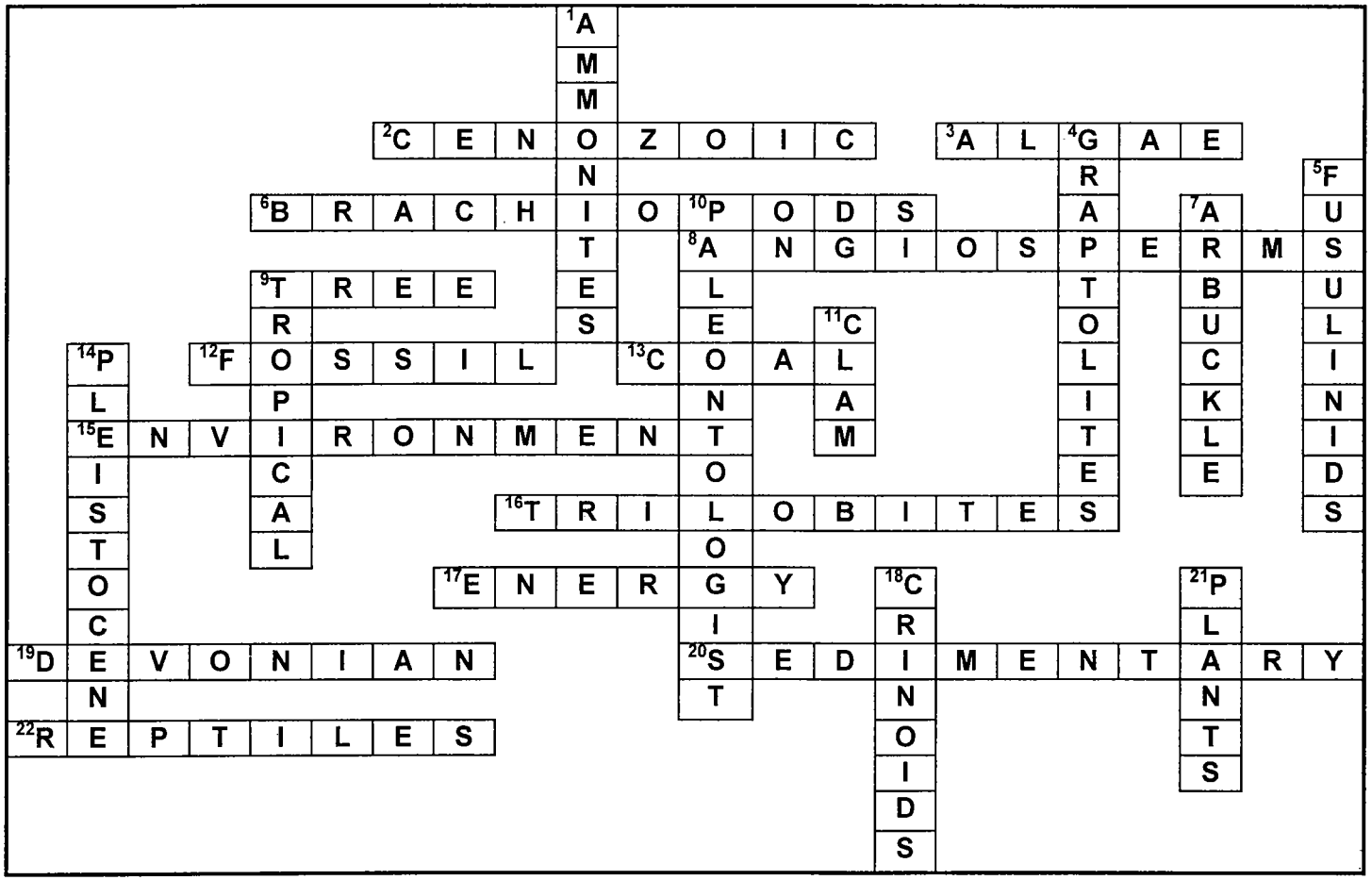
OKLAHOMA FOSSILS

Word Search (page 45)



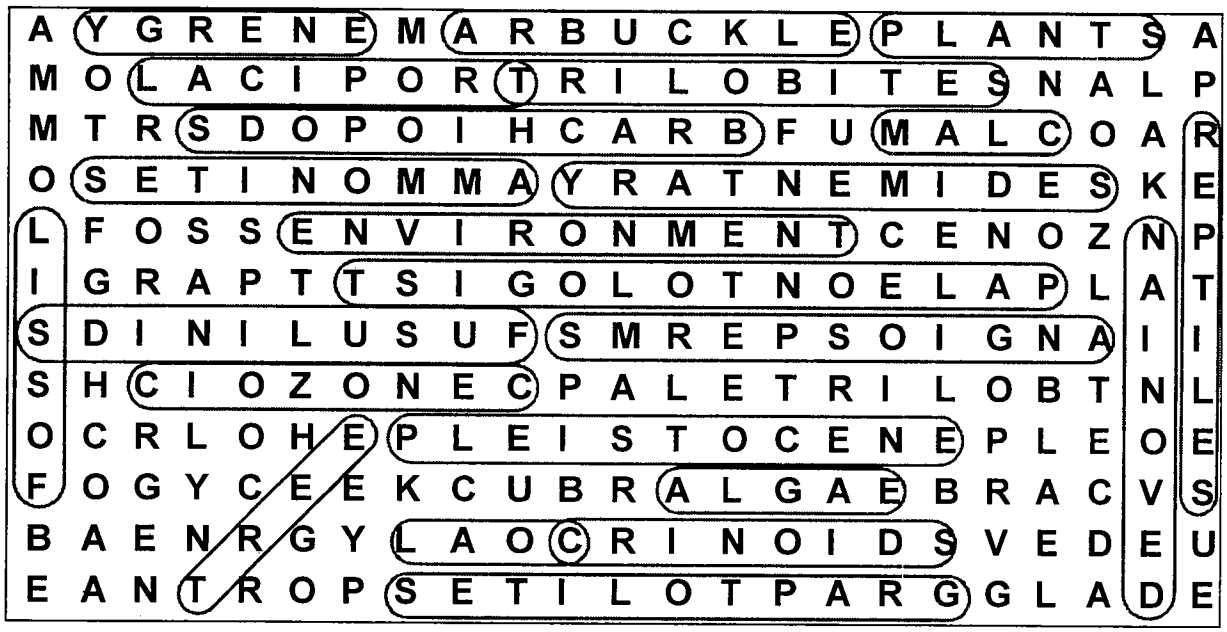
TREASURES BURIED IN ROCKS"—OKLAHOMA FOSSILS

Crossword Puzzle (pages 46-47)



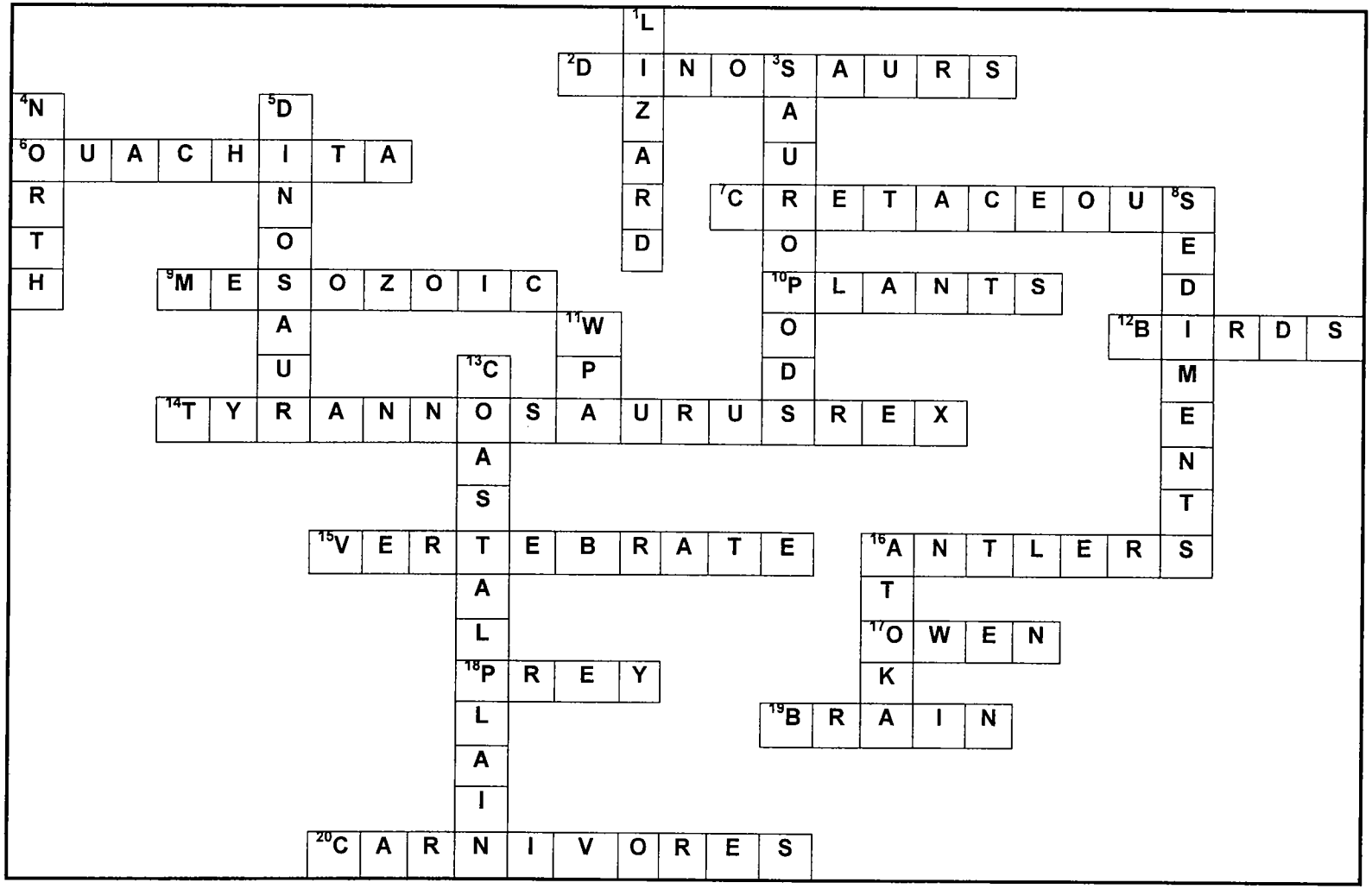
TREASURES BURIED IN ROCKS"—OKLAHOMA FOSSILS

Word Search (page 48)



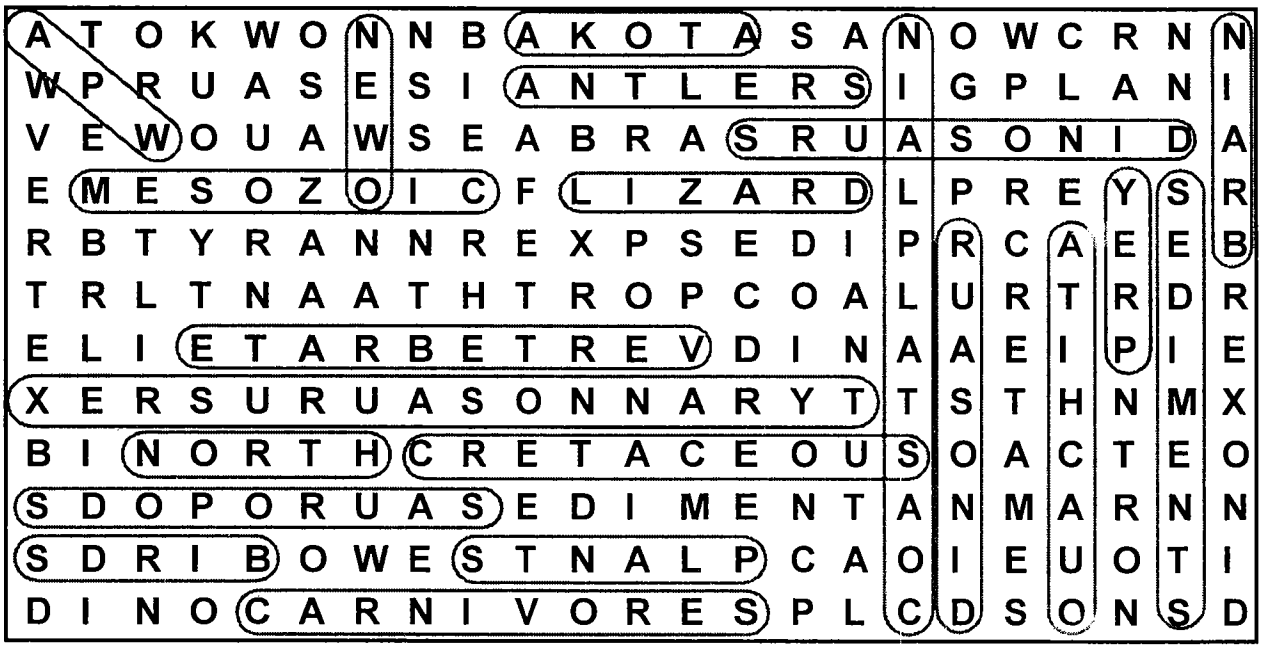
THOSE TERRIBLE "LIZARDS"—DINOSAURS OF OKLAHOMA

Crossword Puzzle (pages 49-50)



THOSE TERRIBLE "LIZARDS"—DINOSAURS OF OKLAHOMA

Word Search (page 51)



GEODETECTIVES

INDUSTRIAL MINERALS—(page 52)

1.	**I** odine	Oklahoma is now the sole source of domestic _____ in the United States, which is used for pharmaceuticals and disinfectants.
2.	**N** onfuel	Some examples of _____ commodities include crushed stone, portland cement, and gypsum.
3.	**D** imension	Oklahoma has a variety of sandstones, limestones, and granites suitable for _____ stone.
4.	**U** pward	Asphalt forms where crude oil migrates _____ near the land surface leaving a heavy residue.
5.	**S** hale	Material called _____ represents deposits suitable for the manufacture of brick and tile products.
6.	**T** ripoli	Important _____ deposits are present in northeastern Oklahoma, and this mineral is used as a mild abrasive or in buffing and polishing compounds.
7.	**R** ailroad	Crushed granite is used mainly for _____ ballast (stone in railroad beds).
8.	**I** llite	Most shale deposits in Oklahoma contain _____ as the dominant clay mineral.
9.	**A** sphalt	An oil-based commodity used mainly as a road-surfacing and tar material in Oklahoma.
10.	**L** eading	Oklahoma is the _____ producer of crude gypsum in the United States.
11.	**M** ussel	Gemstone production in Oklahoma includes fresh-water _____ shells and fresh-water pearls.
12.	**I** ndustrial	Numerous and varied _____-mineral sites are active in 69 of Oklahoma's 77 counties.
13.	**N** atural	A number of major _____ salt springs have been used commercially since the turn of the 20th century.
14.	**E** nergy	Oil, natural gas, and coal are all major sources of _____ to extract industrial-mineral resources.
15.	**R** oad	Limestone is used mainly as aggregate (crushed stone) in concrete, but it also is used in _____ construction.
16.	**A** sphaltite	The major sources of rock asphalt and _____ are sedimentary rocks in and around the Arbuckle and Ouachita Mountains.
17.	**L** imestone	Used as an aggregate in concrete, making cement, dimension stone, and road construction.
18.	**S** alt	Used primarily in recharging water softeners, for stock feed, food additives, and ice removal.

Answer: ***Industrial Minerals***

GEODETECTIVES

OKLAHOMA DINOSAURS (page 53)

1.	**C**	ARNIVORES	*Acrocanthosaurus* was one of the largest _____ that lived during the Early Cretaceous.
2.	**R**	EPTILES	Dinosaurs, along with flying and swimming _____, disappeared at the close of the Cretaceous Period.
3.	**E**	RA	The "age of the dinosaurs" was the Mesozoic _____.
4.	**T**	YRANNOSAURUS	Supposedly the most ferocious dinosaur that ever lived was _____.
5.	**A**	TOKA	Cretaceous-age deposits in _____ County have yielded important dinosaur skeletons.
6.	**C**	OASTAL PLAIN	Southern Oklahoma was a _____ _____ during the reign of *Acrocanthosaurus*.
7.	**E**	ATEN	Dinosaurs developed protective armor to prevent being attacked and _____ by predators.
8.	**O**	WEN	The name of the scientist who first used the word "dinosaur" in 1841 was _____.
9.	**U**	NITED	One of the largest collections of dinosaur skeletons in the _____ States is housed at the Oklahoma Museum of Natural History in Norman.
10.	**S**	TEGOSAURUS	This armor-plated dinosaur had a brain believed to be the size of a walnut.

Answer: ***Cretaceous***

FOSSILS—DIGGING UP THE PAST
PART 1 (page 54)

Draw a line matching the fossil picture with the correct fossil name

ECHINOID

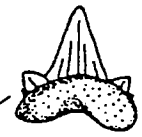
MARINE TURTLE SKULL

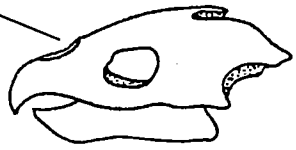
SHARK TOOTH

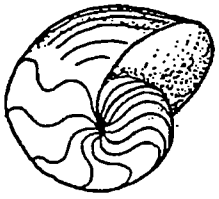
CEPHALOPOD

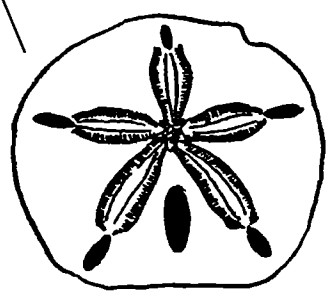
CLAM

CORAL









FOSSILS—DIGGING UP THE PAST

PART 2 (page 55)

GASTROPOD (SNAIL)

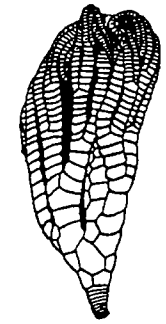
WOOLY MAMMOTH

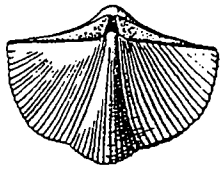
CRINOID

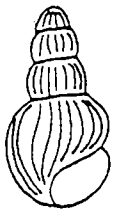
BRACHIOPOD

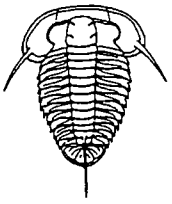
TRILOBITE

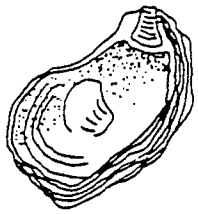
OYSTER

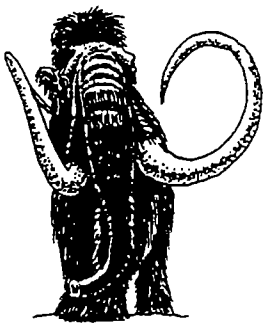












DINOSAURS IDENTIFIED
PART 1 (page 56)

Dromaesaurid

Stegosaurus

Tyrannosaurus

Apatosaurus

Triceratops

Diplodocus

DINOSAURS IDENTIFIED
PART 2 (page 57)

Draw a line matching the dinosaur picture with the correct name of the dinosaur.

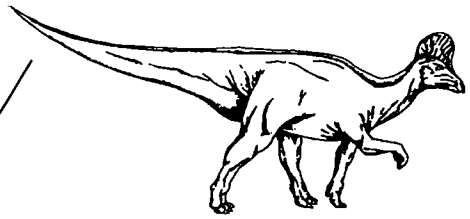
Hadrosaurus

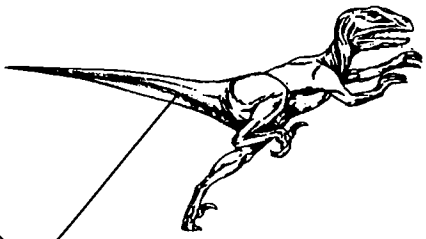
Chasmosaurus

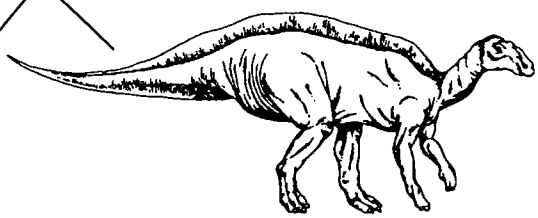
Camarasaurus

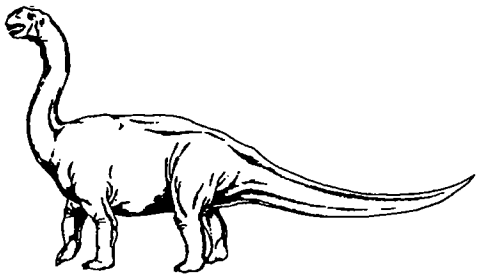
Corythosaurus

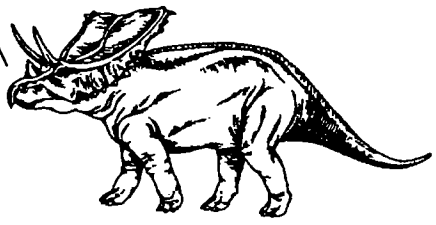
Deiononychus











SOME FACTS ABOUT OKLAHOMA GEOLOGY
Word Unscramble (page 58)

The highest elevation in Oklahoma is about 4,973 feet and is located at Black Mesa in
ablkc easm

western Oklahoma. The three major mountain ranges in Oklahoma are the Arbuckles,

Ouachitas, and Wichitas. The two major rivers in Oklahoma are the Red and the
tiswicha

Arkansas. Most of the outcropping (exposed) rocks in Oklahoma are sedimentary in
kasarnas demsirytnae

origin. The major source of ground water in Oklahoma is precipitation. The weathering
rwate

of rocks is responsible for most of the mineral content of natural water. The light-colored,
lrinmae

coarsely crystalline igneous rock granite is also the name of an Oklahoma town. The
egiantr

chemical element sulfur is the name of an Oklahoma town (Sulphur) and is used in making
lusfru

matches. The official State rock is the rose rock, commonly found in the Norman–Noble
oers

area. Currently in Oklahoma there are no active volcanoes. The official State fossil
cnsvloaoe ssflio

for the State of Oklahoma is a Jurassic-age dinosaur. Coal deposits in eastern Oklahoma

were formed from the accumulation of plants in swamps. The most severe storms in
aptnls

Oklahoma consist of violently rotating columns of air called tornadoes.
sotondrea

The major geologic agents responsible for changing the surface of the State of Oklahoma

through time are rivers. The largest river in Oklahoma is the arkansas. The
iervsr asaskarn

most common rank (type) of coal produced in Oklahoma is bituminous. Most of the
laoc

ground water in Oklahoma is used for irrigation. Oklahoma's major ground-water
itiongarri

aquifers (permeable rocks or deposits that are water-bearing) are stream deposits.
tmeasr

OKLAHOMA'S NATURAL RESOURCES
Word Unscramble (page 59)

The rock-forming mineral __feldspar__ has a hardness of 6 and is used in bath tiles,
pdfearls

abrasives in cleansers, and roofing shingles. A common mineral extracted in the Oklahoma

Panhandle with cubic cleavage and used as a food additive and for ice control on roads: __halite__.
elitah

The mineral __gypsum__ is mined in western Oklahoma and is used in wallboard and plaster of
ymusgp

Paris. The igneous rock __granite__ is quarried near Troy, Oklahoma, and is used as building trim
igraten

and monuments. Oklahoma ranks no. 1 in the production of __iodine__ from natural oil-field brines.
oenidi

Oklahoma is one of the very few places in the world where sand rosettes (State rock) composed

of the mineral __barite__ are found. High-purity silica sand from the __Arbuckle__ Mountains is used
abrtei auelkrbc

primarily for glass making. Oklahoma ranks no. 1 in the production of the mineral __gypsum__.
smupyg

The fuel resource in Oklahoma that may cause acid-mine drainage is called __coal__. The
aloc

__petroleum__ industry has been the greatest single source of revenue in Oklahoma every year since
etrepmulo

Statehood. Most Oklahoma coal has been mined by __surface__ methods. Oklahoma is the largest
rsufcea

exporter of __natural__ __gas__ to out-of-state markets. Oklahoma's production of oil per day is less
atralnu asg

than __four__ % of U.S. production. Crushed granite is used mainly for __railroad__ ballast.
rfou raiadorl

The sedimentary rock __shale__ is used for the manufacture of brick and tile products. Some
hesal

examples of __nonfuel__ commodities include crushed stone, portland cement, and gypsum.
fluenon

EVERYDAY USE OF OKLAHOMA RESOURCES (page 60)

	MINERAL/ROCK RESOURCES		ECONOMIC USE
1.	Silica sand	6	Building construction
2.	Galena (lead)	9	Building stone; abrasive
3.	Gypsum	8	Road aggregate; brick making; ceramics
4.	Sphalerite (zinc)	7	Building stone; monuments; headstones
5.	Clay	12	Combs; clothing; energy
6.	Sand/gravel	11	Road deicer; food preservative
7.	Granite	3	Wallboard; plaster of Paris
8.	Shale	5	Ceramics; glossy paper; pottery
9.	Sandstone	13	Portland cement; road aggregate; riprap; building stone
10.	Iodine	1	Glass making; ceramics; transistors
11.	Halite (salt)	2	Chief ore of lead; fishing sinkers; solder; pewter
12.	Petroleum	14	Generating electricity; methane gas; coke for steel manufacturing
13.	Limestone	4	Principal ore of zinc; used to galvanize steel for rain gutters
14.	Coal	10	Pharmaceuticals; salt